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Standard Specifications for Personal Climbing Equipment[1]

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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

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

Climbers,
Climber straps,
Climber Pads,
Climber Footplates,
Body Belts,
Work Positioning Devices with Locking Snaphooks/Carabiners,
Wood Pole Fall Restriction Devices (WPFRD),
Arborist Saddle,
Harnesses,
Energy 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 energy absorbing lanyards are included for workers who may be exposed to thermal hazards of momentary electric arcs or flame.

1.2 Equipment may fall within one of the following categories:

1.2.1 *Fall (Travel) Restraint*—Prevents a user from reaching a fall hazard (allow 0 fall distance).

1.2.2 *Work Positioning*—Allows a 2 ft maximum free fall distance.

1.2.3 *Fall Arrest*—Allows a 6 ft maximum free fall distance with a maximum arrest force of 1800 lb.

NOTE 1—Under certain conditions and with the use of equipment designed for such conditions, a 12-ft free-fall distance with a maximum arrest force of 1800 lb is allowed.

1.2.4 *Suspension*—Allows 0 free-fall distance while supporting the user's weight.

1.2.5 *Fall Restriction*—to prevent or limit free fall from a work position or while ascending/descending a wood pole.

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

1.4 Two types of body belts, (Types A and B) are covered.

1.5 Eight types of work positioning devices: three positioning straps, (Types A, B, and C), three adjustable-positioning

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

lanyards, (Types A, B and C) and two nonadjustable positioning lanyards, (Types A and B) are covered.

1.6 Two types of WPFRD, (Types A and AB) are covered.

1.7 Arborist saddle, (Type A) Work Positioning and Suspension are covered.

1.8 Two types of harnesses, (Types A and B) are covered.

1.9 Two types of energy absorbing lanyards, (Types A and B) are covered.

1.10 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.

1.11 The following safety hazards caveat pertains only to the test method portions, 9.2, 10.3, 11.2, 14.1.4, 15.3, 15.4, 16.2, 17.2, 18.4, 21.2, 22, 23, and 25 of this standard: *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]

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

F1959/F1959M Test Method for Determining the Arc Rating of Materials for Clothing

2.2 *ANSI Standard:*[3]

ANSI 05.1 Wood Poles – Specification and Dimensions

2.3 *ANSI/ASSE Standard:*[4]

Z359.0-2012 Definitions and Nomenclature Used for Fall Protection and Fall Arrest

Z359.3-2007 Safety Requirements for Positioning and Travel Restraint Systems

Z359.11-2014 Safety Requirements for Full Body Harnesses

Z359.12-2009 Connecting Components for Personal Fall Arrest Systems

Z359.13-2013 Personal Energy Absorbers and Energy Absorbing Lanyards

Z359.14-2014 Safety Requirements for Self-Retracting Devices for Personal Fall Arrest and Rescue Systems

2.4 *CSA Standard:*[5]

CAN/CSA 015 Wood utility poles and reinforcing stubs

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 *arborist saddle, n*—an arrangement of straps, fittings and buckles or other elements in the form of a waist belt with a low attachment suitably arranged to support the body in a sitting position. The saddle may or may not include individual leg straps or a rigid batten seat section.

3.1.3 *attachment element, n*—part or parts of an arborist saddle intended for the load bearing connection of other components.

3.1.4 *attachment point, n*—specific connecting point on an arborist saddle for load bearing connection to other components, consisting of one or more attachment elements.

3.1.5 *auxiliary positioning belt, n*—a modular device made up of straps, pads, buckles, and attachment points for fastening to a waist body belt.

3.1.5.1 *Discussion*—An auxiliary positioning belt is used for attachment to a two ring body belt and intended for work positioning or fall restriction while transitioning past obstructions during an ascent or descent and for support for a two ring body belt.

3.1.6 *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.

3.1.7 *body belt (two or four dee), n*—an element of a work positioning system with two or four connection points consisting of straps, pads, buckles, and rings that allow a user to work freely with both hands (see Fig. 1).

3.1.7.1 *Discussion*—The width of the back section of a body belt is directly related to and can vary dependent on the number of dee rings that will be accommodated, for example, two dee rings, four dee rings, or more.

3.1.8 *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.

3.1.9 *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.

3.1.10 *dee-ring, D-ring, n*—an element which allows for attaching a connecting device such as a carabiner or snaphook.

3.1.11 *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.

3.1.12 *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.

[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 American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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

[5] Available from Canadian Standards Association (CSA), 178 Rexdale Blvd., Toronto, ON M9W 1R3, Canada, http://www.csagroup.org.

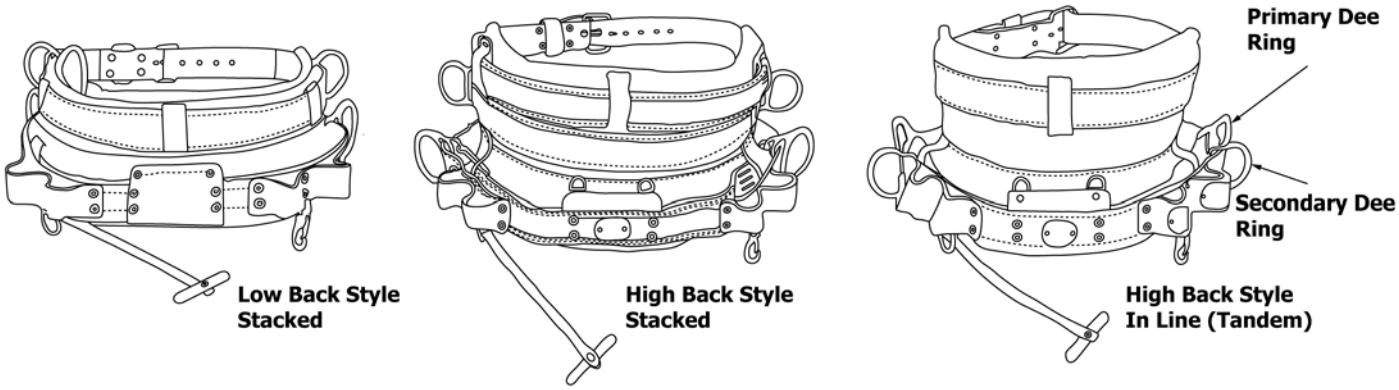


FIG. 1 Dee Ring Configurations for 4 Dee Body Belts

3.1.13 *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.

3.1.14 *element, n*—an integral part of a constituent, component, hybrid component, sub-system or system. (Webbing, attachments and fittings are examples of elements.)

3.1.15 *energy 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.

3.1.16 *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/ASSE Z359.0-2012.)

3.1.17 *fall restraint, n*—a fall protection system which prevents the user from falling any distance.

3.1.17.1 *Discussion*—Fall restraint systems prevent the user from falling any distance while performing work tasks on a horizontal surface.

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

3.1.19 *fastening and adjusting element, n*—devices that enable an arborist saddle to be fastened and allow adjustment to be made to meet sizing requirements of the user.

3.1.20 *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.

3.1.21 *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.

3.1.22 *gate/keeper, n*—a component of the snaphook/carabiner, that locks the snaphook/carabiner in a closed position by a spring and a separate locking mechanism (see Fig. 2).

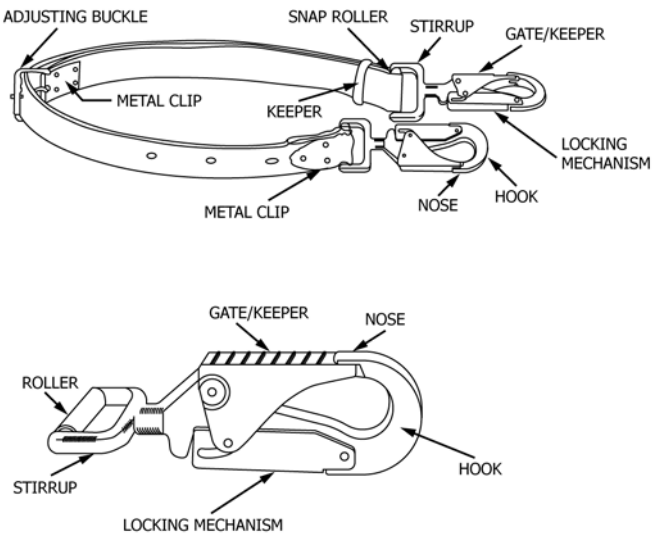


FIG. 2 Components of Positioning Strap

3.1.22.1 *Discussion*—The gate/keeper is the closing mechanism on the open end of the snaphook/carabiner which prevents the snaphook/carabiner from inadvertently opening up during use in an elevated workplace.

3.1.23 *hardware, connectors, n*—attaching components used to couple components of a fall protection system together.

3.1.23.1 *Discussion*—Hardware, connectors may be independent components of a system or may be integral elements of a component, hybrid component, subsystem or system used for fall protection.

3.1.24 *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).

3.1.25 *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.

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

3.1.27 *locking snaphook, n*—a snaphook with a locking mechanism (see 3.1.26).

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

3.1.29 *part (body belt), load-bearing, n*—a part of the body belt or work positioning strap that, when in use with both snaphook/carabiner of the work 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 work 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.

3.1.29.1 *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.

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

3.1.31 *part, load bearing, (positioning/restrict/suspension), n*—a component of the unit to which body weight forces are directly transmitted in the event of a fall.

3.1.32 *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.

3.1.33 *positioning lanyard, n*—a component of a climbing system consisting of a flexible line of rope or webbing generally with a connecting link at each end and may incorporate a length adjusting device to allow for adjustability.

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

3.1.35 *positioning, n*—the act of supporting the user's body with a work positioning system for the purpose of working with hands free.

3.1.36 *positioning system, n*—a combination of work positioning equipment defined by this standard intended for use in

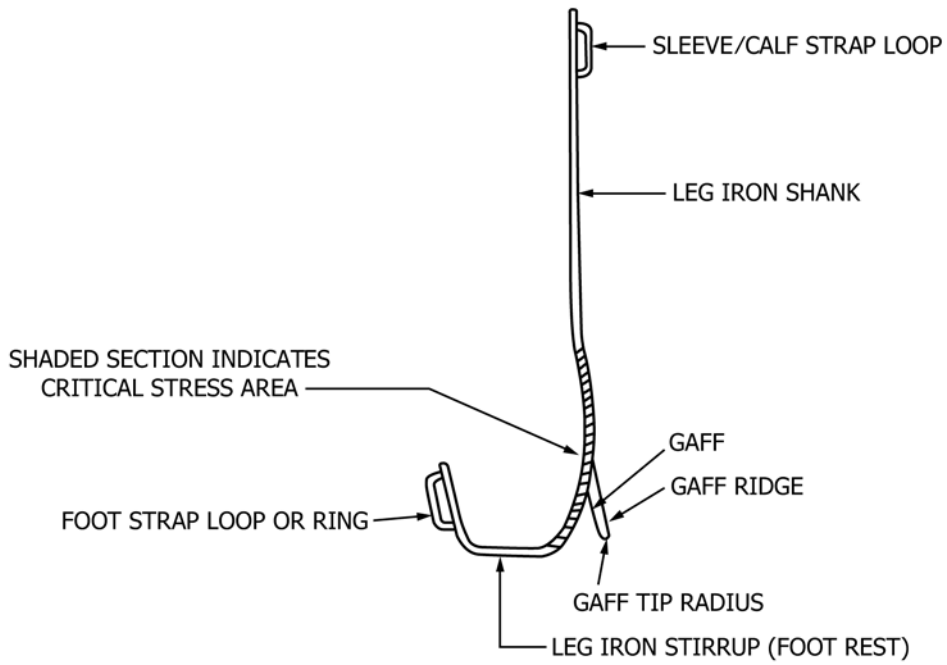


FIG. 3 Critical Stress Area of the Climber

supporting a user in a work position on an elevated vertical surface with both hands free (i.e. climber, body belt or arborist saddle, WPFRD & APL etc.)

3.1.37 *primary dee-ring (body belt), n*—main connection point on each side of the body belt.

3.1.37.1 *Discussion*—Primary dee rings serve as the connection point used to maintain a user in a hands free work position (see Fig. 1 and Fig. 4).

3.1.38 *primary positioning device, n*—a flexible line of rope or webbing that utilizes a connecting link at both ends and may include an adjustable length device.

3.1.38.1 *Discussion*—Primary positioning devices are used in work positioning as the support member between primary dee rings or connection points on a body belt to maintain a user in the hands free work position.

3.1.39 *secondary dee ring, D-ring (body belt), n*—connection point on each side of the body belt, used to maintain fall protection while transitioning above/below obstacles (see Fig. 1).

3.1.39.1 *Discussion*—Secondary dee rings are used on each side of the four dee ring body belt in a stacked or tandem position at the discretion of the user or using company's work practice.

3.1.40 *secondary positioning device, n*—a flexible line of rope or webbing that utilizes a connecting link at both ends and may include an adjustable length device for transitioning or traversing obstacles.

3.1.40.1 *Discussion*—Secondary work positioning devices are a component of a climbing system used to maintain fall protection when transitioning over/under obstacles.

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

3.1.42 *stirrup, snaphook/dee-ring, n*—the closed rectangular portion of the work positioning strap snaphook, or body belt dee-ring (see Fig. 2 and Fig. 5), that accepts the strap or belt material in a permanent manner.

3.1.43 *suspension, n*—the act of supporting a user's body weight, including equipment, for the purpose of accessing a work location with one or two points of contact.

3.1.44 *wood pole fall restriction device (WPFRD), 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 performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.

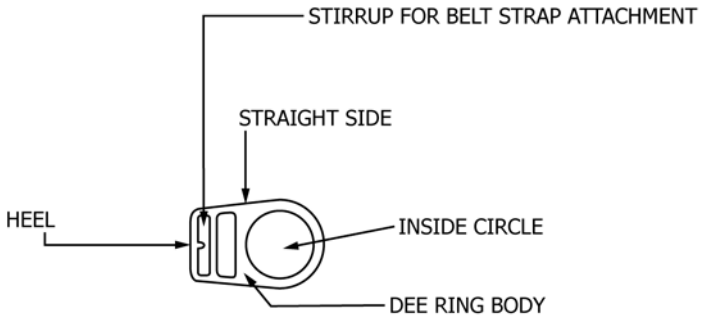


FIG. 5 Typical Body Belt Dee-Ring

3.1.45 *work positioning, n*—the act of supporting the body with a positioning system for the purpose of working with hands free. (See ANSI/ASSE Z359.0-2012.)

4. Significance and Use

4.1 The following personal tools or equipment covered by this standard 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 WPFRD 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 Arborist saddle is intended for work positioning and suspension (ascent and descent) primarily in trees. The arborist saddle is not intended for use in fall arrest (See Fig. 6).

4.1.5 Full body harnesses and energy absorbing lanyards utilized in preventing and arresting falls.

4.2 Test methods included in this standard 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 this standard, 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 this standard because of design limitations, the use and maintenance of this equipment is beyond the scope of the standard.

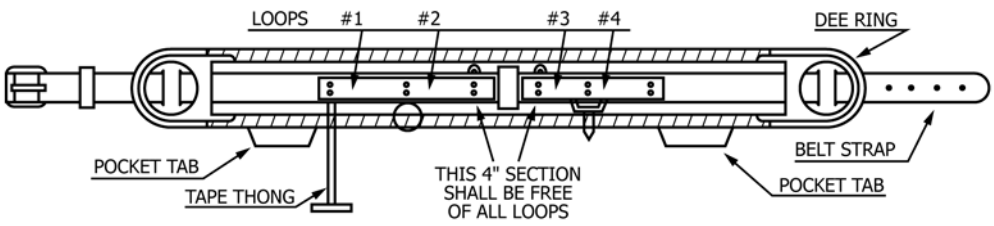


FIG. 4 Body Belt Nomenclature

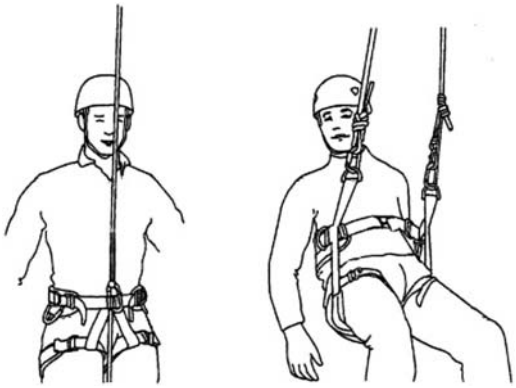


FIG. 6 Arborist Saddles, Shown in Typical Suspension Applications

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 this standard 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.

5.2 Climber straps covered under this standard 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 standard 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 this standard.

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 decarburization 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)

TABLE 1 Typical Material Properties for Climbers

	For Fixed Gaff Climbers	For Replaceable Gaff Climbers [A]
Steel:		
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]
Aluminum:		
Elongation in 2 in. (5 cm), min	...	10 %
Hardness	...	125 to 140 HB [B]
Yield Strength, min, psi (MPa)	...	65 000 (450)
Titanium:		
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.

7.5 *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:*

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. (2.5 mm) excluding measurement error after removal of the load. See Fig. 7.

7.6.1.2 *Fatigue Test*—When tested at room temperature (approx. 68°F (20°C)), 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. 8.

7.6.1.3 *Ductility Test—(a)* Leg iron: The leg iron shall withstand without fracture or cracking, a 180 degree bend about a mandrel near the midpoint of the shank area. Mandrel size shall be based upon the minimum allowable bend radius specified for the leg iron shank material, thickness and hardness properties. *(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.

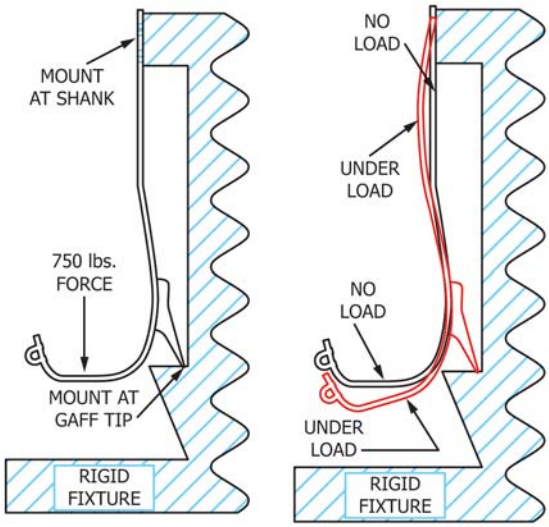


FIG. 7 Deformation Test Fixtures

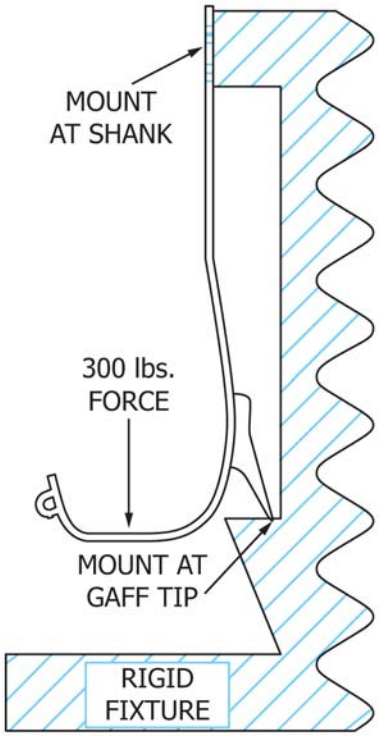


FIG. 8 Fatigue Test Fixture

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. 9a. If the gaff is properly 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. 9b. 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. 10a. 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

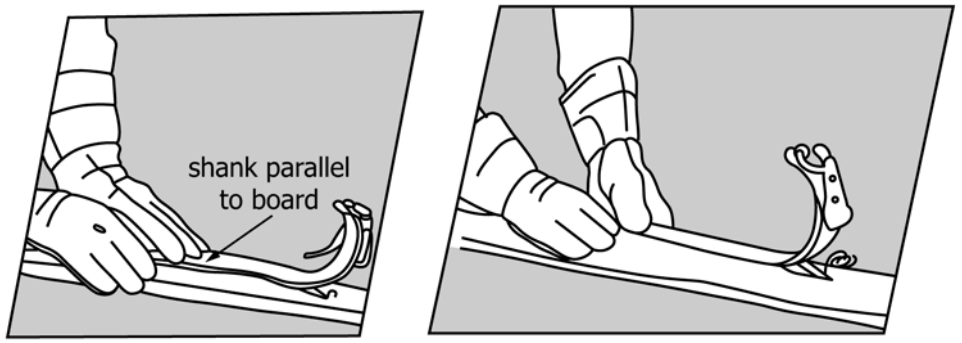


FIG. 9 a & b Plane Test

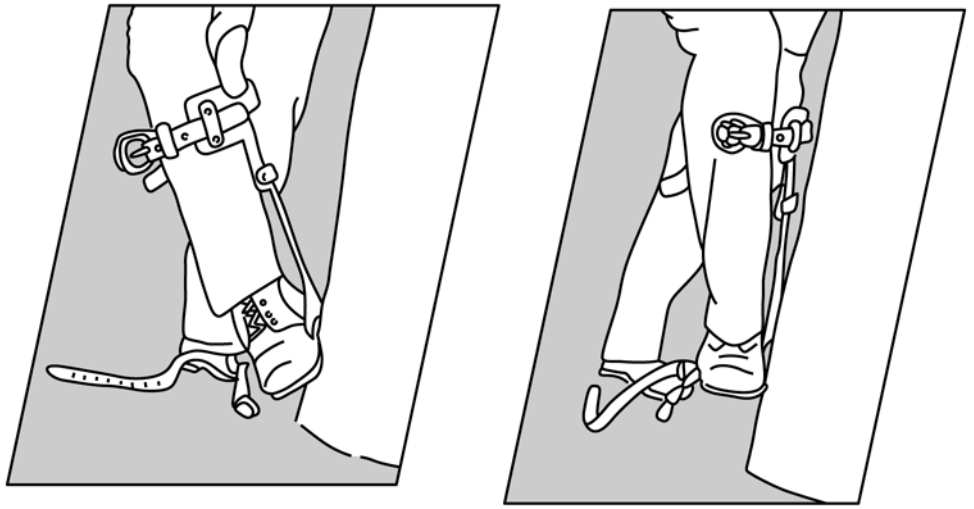


FIG. 10 a & b Pole Cut Out Test

other foot off the floor or ground, so as to maintain balance if the gaff does not hold. See Fig. 10b. 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 this standard.

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 7⁄16 in. (36.5 mm) on the underside. Tree gaffs shall measure not more than 3½ in. (88.9 mm), nor less than 2¼ in. (57.2 mm) on the underside. Gaff design shall be as shown in Fig. 11.

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.

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 this standard.

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

NOTE 2—Replaceable gaffs, whether pole or tree, fit only the climber iron of the particular manufacturer.

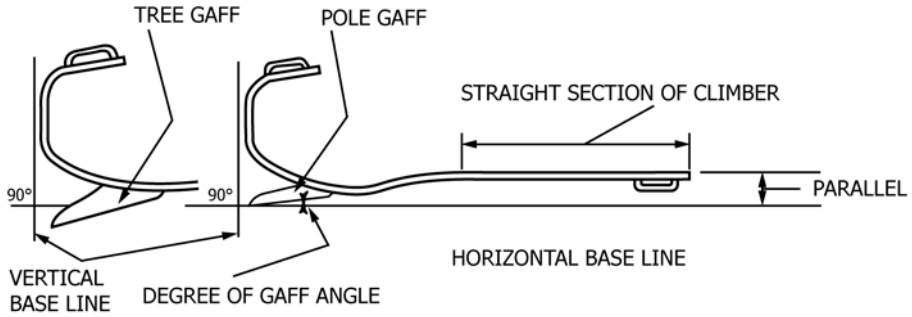
9. Climber Straps

9.1 *Sizes*—Climber straps shall be a minimum of 1 in. (25.4 mm) in width. 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 3⁄16 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



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 ⅜ 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 ¼ in. (6.4 mm) in accordance with the gage profile.

FIG. 11 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.

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. Folded 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 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 3⁄16 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 Hook and Loop Fastener style wrap pads covered under this standard 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 (4.4 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. 12a) 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. 12a).

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. 12b).

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.

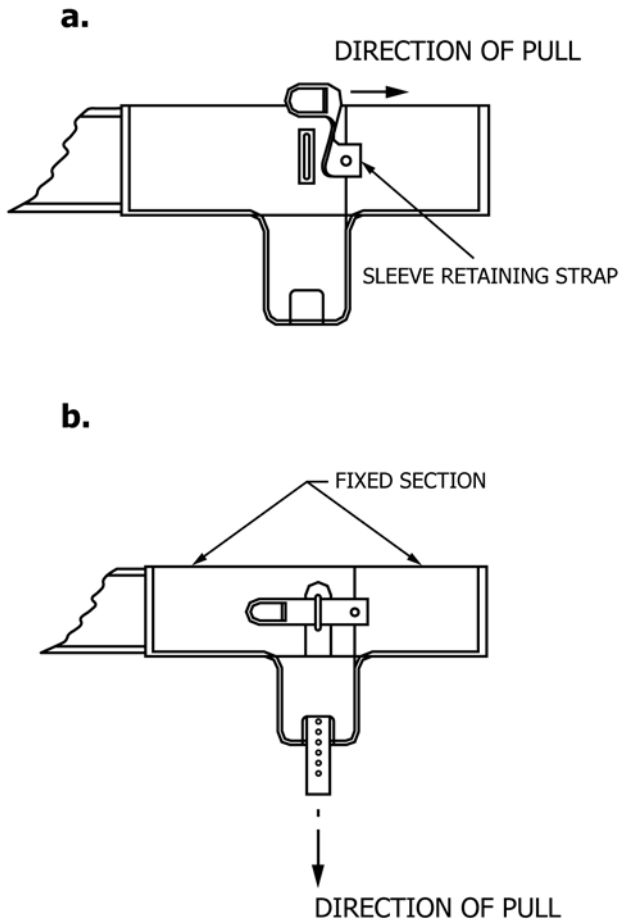


FIG. 12 a & b Sleeve Retaining Straps on Hook and Loop Fastener Wrap Style Pads

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

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 (WPFRD)

12. Classification

12.1 Body belts covered under this standard 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 standard 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 (see ANSI/ASSE Z359.3-2007).

12.2.2.3 *Type C*—6 to 10 ft retractable web (see ANSI/ASSE Z359.14-2014).

12.2.3 *Nonadjustable Positioning Lanyard:*

12.2.3.1 *Type A*—Nonadjustable Rope Lanyard (see ANSI/ASSE Z359.3-2007).

12.2.3.2 *Type B*—Nonadjustable Web Lanyard (see ANSI/ASSE Z359.3-2007).

12.3 WPFRD covered under this standard shall be designated as Type A or AB as follows:

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

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

12.4 Arborist saddle covered under this standard shall be designated as Type A, as follows:

12.4.1 *Type A*—Equipment for use in work positioning and suspension.

13. Ordering Information

13.1 Orders for equipment under this standard 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 this standard.

14. Two Dee Body Belts, Auxiliary Positioning Belts, and Four Dee Body Belts

14.1 *Two Dee Body Belts:*

14.1.1 *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. 13). 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. 14), however, belt strap measurements may vary on different style belts and with different manufacturers.

14.1.2 *Materials:*

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

14.1.2.2 *Fabric*—Plied fabric used in the manufacture of load bearing parts shall be constructed in such a way that no raw edges are exposed. Plied 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.

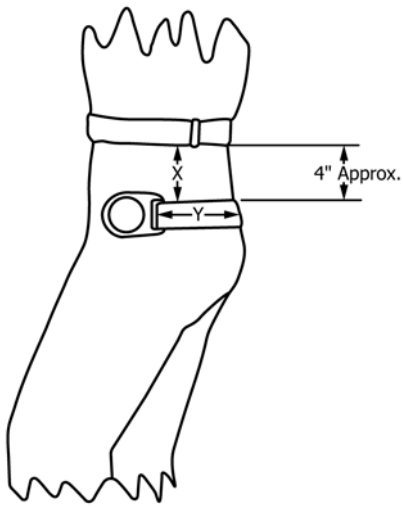
14.1.3 *Design:*

14.1.3.1 *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. 4 and Fig. 13). On shifting dee belts, the measurement for pocket tabs shall be taken when the dee ring section is centered.

14.1.3.2 *Belt Straps*—Belt straps shall be made of fabric described in 14.1.2. Buckle holes shall be spaced on 1 in. (25.4

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. 14 A Method Showing Where to Measure to Determine Correct " Dee" Size for a Body Belt

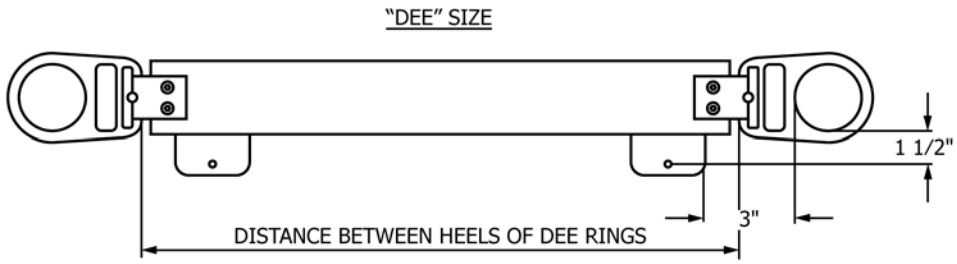


FIG. 13 "Dee" Measurement

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 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. 15).

14.1.3.3 *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. 4). The material may be either leather or fabric ⅛ in. (3.18 mm) thick, 1 in. (25.4 mm) nominal width, with the loops having a maximum diameter of 1¾ in. (44.4 mm) and a minimum diameter of ¾ in. (19.1 mm). If a hammer loop is desired, it should be ordered in the position nearest the belt buckle.

14.1.3.4 *Dee-Rings and Buckles*—Shall meet the applicable requirements specified in Section 23. Additionally, the dee ring strap and the belt shall not pass through or attach to that part of the dee ring to which a connecting device such as a carabiner or snaphook will be engaged. The Dee rings shall be installed in the body belt in such a manner that vertical travel in the assembly is prevented.

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

14.1.3.6 *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 3⁄16 in. (4.8 mm) from the edge of the narrowest member caught by the thread.

14.1.4 *Materials Test Method:*

14.1.4.1 *Tension Test*—Material when new, shall have a breaking strength of not less than 4500 lbf (20 kN) for a section free from buckle holes and not less than 3500 lbf (15 kN) for a section containing buckle holes for the specified buckle. The tension test to determine the breaking strength shall be made in a straight pull with a dynamometer, or equivalent.

14.1.5 *Inspection, Marking, and Testing:*

14.1.5.1 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 this standard.

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

14.2 *Auxiliary Positioning Belt and Four Dee Body Belts:*

14.2.1 *Sizes*—The Auxiliary Positioning Belt and Four Dee Body Belt is sized by either small, medium, large, extra-large, variations thereof or by dee size.

14.2.2 *Materials*—See 14.1.2.

14.2.3 *Design:*

14.2.3.1 The Auxiliary Positioning Belt shall have as a minimum, two dee rings located on opposite sides of the belt approximately in line with a vertical line passing through the hip bone (Fig. 14). As a minimum, it may include a belt (strap with buckle), body pad, dee ring strap, body belt attachment, and connectors that meet the requirements of Section 23. The four dee body belt, shall be manufactured to have a wider back pad that accommodates two sets of dee rings in either a stacked or tandem configuration (Fig. 1). In addition to including the additional criteria outlined for the two dee body belt, it may include a second strap with buckle. Connectors must meet the requirements of Section 23. The dee ring strap and the belt shall not pass through or attach to that part of the dee ring to which a connecting device such as a carabiner or snaphook will be engaged.

14.2.3.2 Four dee body belts as well as the Auxiliary Positioning Belt when incorporated into other equipment such as a body belt, shall meet all of the qualification testing requirements of this standard.

14.2.3.3 *Body Pad*—See 14.1.3.1.

14.2.3.4 *Belt Straps*—See 14.1.3.2.

14.2.3.5 *Fastening and Adjustment Elements*—See 17.3.5.

14.2.3.6 *Accessory Loops*—Ancillary accessories such as accessory loops, tool loops, tool carriers or pouches, should not impair the intended use of this product.

14.2.3.7 *Attachment Elements for Connection to a Body Belt*—If an independent component of a body belt, a minimum of two attachment elements shall be incorporated for the purpose of connecting to a body belt. Buckles and adjusters used for these attachments shall meet the applicable hardware requirements outlined in Section 23.

14.2.3.8 *Hardware Requirements*—See applicable sections of Section 23.

14.2.3.9 *Liners for Connector Elements*—See 14.1.3.5.

14.2.3.10 *Stitching and Thread*—See 14.1.3.6.

14.2.4 *Materials Test Methods*—See 14.1.4.

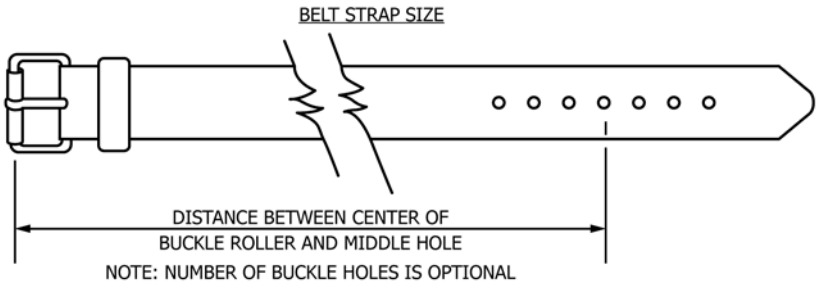


FIG. 15 Body Belt Strap Size

14.2.5 *Inspection and Marking*—See 14.1.5.

15. Positioning Devices

15.1 *Sizes:*

15.1.1 Work positioning straps can be made to whatever length the user specifies, measured from bearing point to bearing point (see Fig. 16). The work positioning strap shall have a nominal width of 1¾ in. (4.5 cm).

15.1.2 Adjustable positioning lanyards can be made to whatever length the user specifies and measured from bearing point to the terminated end of the lanyard. See Fig. 17.

15.1.3 Nonadjustable Positioning Lanyards can be made to whatever length the user specifies and are measured from bearing point to bearing point.

15.2 *Materials:*

15.2.1 *Positioning Straps (Materials):*

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 load bearing parts shall be constructed in such a way that no raw edges are exposed and shall consist of: *(1)* folded nylon with a minimum of six plies, *(2)* woven nylon, or *(3)* equivalent material. 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.

15.2.2 *Adjustable Positioning Lanyards (Materials):*

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.

15.2.3 *Nonadjustable Positioning Lanyards (Materials)*—Nonadjustable Positioning Lanyards meeting the requirements of ANSI/ASSE Z359.3-2007 shall be considered as meeting the requirements of this standard.

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 3—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 ac 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 ± 5°F (–40 ± 2.8°C) for 4 h. At –40 ± 5°F (–40 ± 2.8°C), it shall be bent over a ⅝ 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 (4.4 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 *Positioning Devices Hardware, and General Design/Requirements*—Hardware for positioning devices shall meet the applicable requirements of Section 23.

15.5 *Design:*

15.5.1 *Standard Positioning Straps:*

15.5.1.1 Shall be so constructed that the snaphook/carabiner will be gate/keeper side up when the strap is laid out flat with buckle tongue side up (see Fig. 2 and Fig. 16).

15.5.1.2 Snaphooks shall move freely within their rollers.

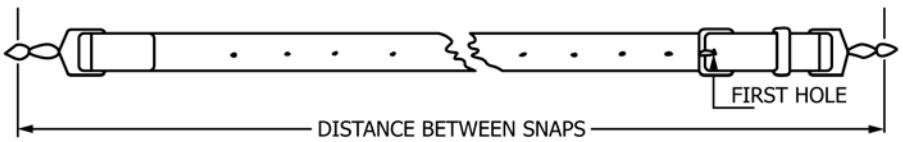


FIG. 16 Positioning Strap Measurement

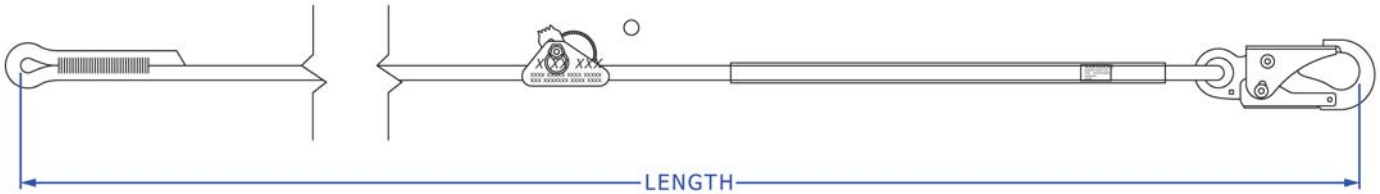


FIG. 17 Adjustable Positioning Lanyard Measurement

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

15.5.1.4 Stitching and thread, if any, shall be as specified in 14.1.3.6.

15.5.1.5 The buckle holes shall not exceed ¼ in. (6.3 mm) in diameter if round, or ¼ by ⅜ 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 work positioning strap components is at the discretion of the manufacturer as long as the completed product complies with the applicable testing outlined in 25.2 (see Fig. 18).

15.5.2 *Adjustable Positioning Lanyards:*

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

15.5.2.2 Stitching and thread, if any, shall be lock stitched and securely back stitched to prevent unraveling and contrasting in color on load bearing straps to facilitate visual inspection.

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 (Fig. 19) shall meet all applicable requirements outlined in Section 23.

15.5.2.6 All Formed eye terminations shall be either spliced, stitched or swaged (see Fig. 20). 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 or swaged eye terminations shall be manufactured to ensure compliance with the applicable performance requirements of 25.2.

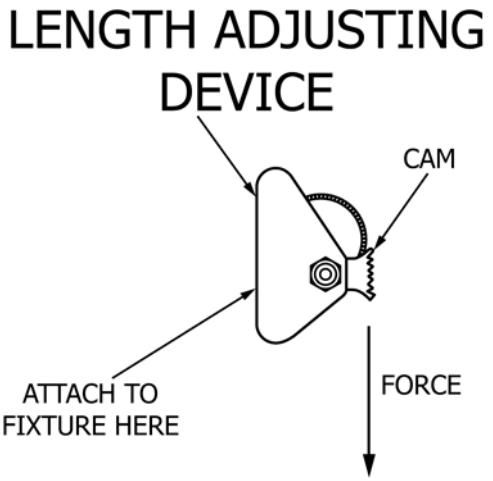


FIG. 19 Length Adjusting Device Tensile Test

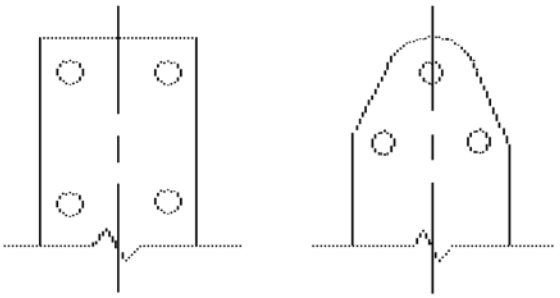


FIG. 18 Pole Strap Metal Clip

15.5.2.7 Assembly must maintain a minimum tensile of 1000 lbf (4.4 kN) 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 (4.4 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 work positioning devices shall be subjected to careful inspection by the manufacturer. When requested, the manufacturer shall provide certification that the work positioning devices meet all requirements set forth in this standard.

15.6.2 Completed work 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. 21).

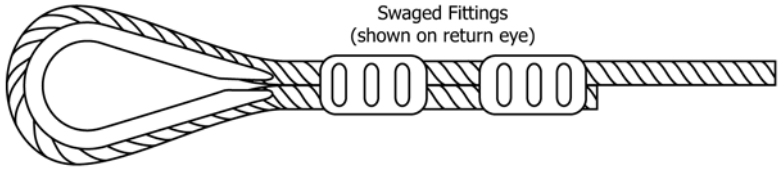


FIG. 20 Swaged Eye Termination

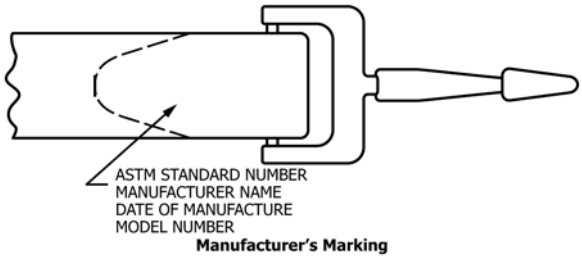


FIG. 21 Manufacturer's Marking

15.6.3 *Positioning Lanyards*—Work positioning lanyards manufactured under this standard in addition to meeting the requirements of 15.6.2, shall meet the specifications, tests and requirements of ANSI/ASSE Z359.3-2007, where applicable.

15.6.4 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 (WPFRD)

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

16.2 *Materials and Properties:*

16.2.1 *Leather*—See 15.2.1.1.

16.2.2 *Fabric*—All fabric used in the manufacture of the WPFRD shall meet the requirements of 15.2.1.2.

16.3 *Design*—Standard WPFRD shall be so constructed that the carabiners/snaphooks will be gate/keeper side out when properly attached to the body belt dee-rings. Stitching and thread, if any, shall be as specified in 14.1.3.6.

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 25.3 (see Fig. 18).

16.4 *Hardware for WPFRD:*

16.4.1 *Locking Snaphook with Eye/Carabiner*—See 23.3 (see Fig. 22).

16.4.2 *Locking Snaphook with Stirrup*—See 23.2.

16.4.3 *Strap Adjustment Assembly*—Assembly must maintain a minimum tensile of 1000 lbf (4.4 kN) with a maximum of 3 in. (76 mm) 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 (4.4 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*—See 15.3.1

16.5.2 *Tension Test*—See 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 this standard.

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.

17. Arborist Saddle

17.1 *Sizes*—The Arborist Saddle is sized by small, medium, large, extra large or variations thereof.

17.2 *Materials:*

17.2.1 *Leather*—Top grain leather or leather substitute, if used, shall meet the requirements of 14.1.2.1.

17.2.2 *Fabric*—Plied fabric used in the manufacture of load bearing parts shall meet the requirements of 14.1.2.2.

17.2.3 Webbing used in the construction of load-bearing straps shall be made from virgin synthetic materials having strength, aging, abrasion resistance, and heat resistance characteristics equivalent or superior to polyamides. Polypropylene is not allowed. Load bearing straps shall have a finished end to prevent fraying. Fabric shall be tested in accordance with 14.1.4.

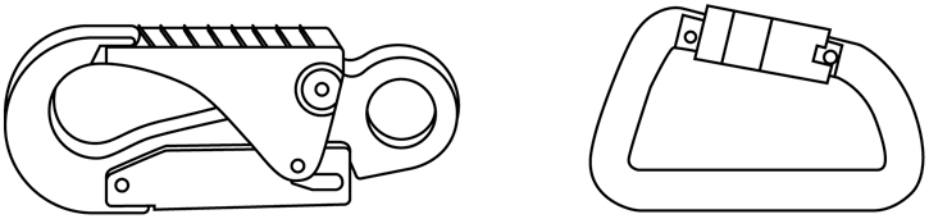


FIG. 22 Locking Snaphook with Eye/Carabiner

17.3 *Design:*

17.3.1 The Arborist Saddle shall have as a minimum, one attachment element centered at the front and arranged so that when suspended, the conscious person can be supported in the sitting position. There shall be no suspension or work positioning attachment point at the center rear waist position. As a minimum, it shall include a belt (strap with buckle), body pad, straps integral with the belt and connectors that meet the requirements of Section 25.4.

17.3.2 When an Arborist Saddle is incorporated into other equipment such as a full body harness the Arborist Saddle shall meet all of the qualification testing requirements of this standard.

17.3.3 *Body Pad*—The cushion or back support when fitted to a waist belt shall be designed to give physical support to the wearer without inhibiting either arm or leg movements. The minimum width of the back support shall be 3 in. (76.2 mm).

17.3.4 *Belt Straps:*

17.3.4.1 *Plied Fabric Belt Straps*—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 1⁄4 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 the length of the strap. The number of buckle holes shall be such that the total adjustment range is not less than 8 in. (200 mm) and not more than 10 in. (250 mm). 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. 15).

17.3.4.2 *Webbing Including Grommet Construction*—Buckle holes shall be no larger than No. 2 grommet. In addition, buckle holes shall be spaced on 1 ¾ in. (44.5) minimum centers. No hole shall be permitted within 4 in. (101.6 mm) of the end of the strap. The number of buckle holes shall be such that the total adjustment range is not less than 8 in. (200 mm). The nominal body strap width shall be 1¾ in. (44.5 mm) (see Fig. 15).

17.3.5 *Fastening and Adjustment Elements*—The fastening and adjustment element shall be so designed and constructed that when correctly fastened, any involuntary release or opening is prevented. Fastening Elements shall be of the tongue, friction, spring loaded (quick connect) or equivalent types (see Fig. 23).

17.3.6 When tested in accordance with 25.4.1 the slippage of fastening and adjustment elements shall not be more than 1 in. (25.4 mm). If fastening and adjustment elements can be fastened or adjusted in more than one manner, each manner of fastening or adjustment shall be tested.

17.3.7 *Accessory Loops*—Ancillary accessories such as accessory loops, tool loops, tool carriers or pouches, should not impair the intended use of this product.

17.3.8 *Dee-ring, D-ring, (Arborist Saddle)*—The design of the dee-ring shall be such that it is curved or straight-sided.

17.3.9 *Suspension Attachment Elements (Dee-Rings, loops, rings, bridges, etc.)*—Each attachment element of the arborist saddle used for suspension shall pass the static and dynamic strength tests outlined in 25.4.1 and 25.4.2 respectively.

17.3.10 *Hardware Requirements:*

FIG. 23 Typical Fastening and Adjusting Elements

17.3.10.1 Hardware for arborist saddles shall meet the applicable requirements of Section 23.

17.3.11 *Liners for Connector Elements*—Webbing shall be protected from concentrated wear at all interfaces with load bearing connector elements.

17.3.12 *Stitching and Thread*—Stitched splices on load bearing straps shall be sewn using lock stitches. Thread shall be of the same material type as the webbing. Webbing ends shall be finished in a manner to prevent fraying or raveling. Thread shall be of a contrasting color or shade in order to facilitate visual inspection. Webbing shall be protected from concentrated wear at all interfaces with load bearing connector elements.

17.4 *Inspection and Marking:*

17.4.1 All arborist saddles shall be subjected to careful inspection by the manufacturer. When requested, the manufacturer shall provide certification that the arborist saddle meets all requirements set forth in this standard.

17.4.2 Completed arborist saddles shall be permanently marked by the manufacturer with this ASTM standard, manufacturer's name, size, month and year of manufacture. It is also recommended that the statement "Warning – Not to be Used for Fall Arrest" be included on the equipment at time of shipment from the manufacturer.

HARNESSES

18. Classification

18.1 Harnesses (see Fig. 24) covered under this standard shall be designated as Type A or B as follows:

18.1.1 *Type A*—Full body harness.

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

18.2 *Ordering Information:*

18.2.1 Orders for equipment under this standard should include the following information:

18.2.1.1 Nomenclature,

18.2.1.2 Type,

18.2.1.3 Material, and

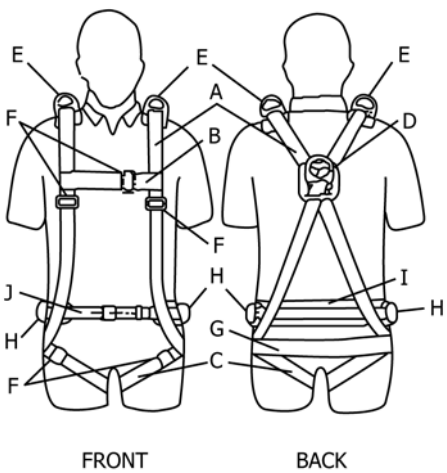
18.2.1.4 Size. (See Table 4).

18.2.2 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 this standard. 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.

18.3 *Sizing:*

18.3.1 *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.

18.4 *Marking:*



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. 24 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

18.4.1 Harnesses manufactured under this standard shall be labeled as meeting this standard providing they satisfy the following requirements:

18.4.1.1 All load bearing webbing used in the construction of the harness shall have a minimum breaking strength of 7000 lbf (31.14 kN).

18.4.1.2 All harnesses marked as meeting the requirements of this standard shall also meet all applicable requirements specified in ANSI/ASSE Z359.11-2014, Safety Requirements for Full Body Harnesses.

18.4.1.3 Harnesses shall meet the qualification testing requirements in Section 22 and 25.5 of this standard.

ENERGY ABSORBING LANYARDS

19. Classification

19.1 Energy absorbing lanyards (see Fig. 25 and Fig. 26) covered under this standard shall be designated as Type A or Type B as follows:

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

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

19.2 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.

20. Ordering Information

20.1 Orders for equipment under this standard should include the following information:

20.1.1 Nomenclature,

20.1.2 Type,

20.1.3 Material,

20.1.4 Size, and

20.1.5 Connectors (snap hooks, loops, carabineers, etc.) (see Fig. 22, Fig. 27, and Fig. 28).

20.2 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 this standard. 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.

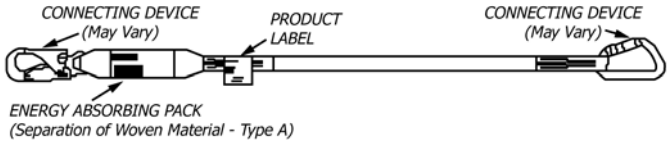


FIG. 25 Type "A" Energy Absorbing Lanyard

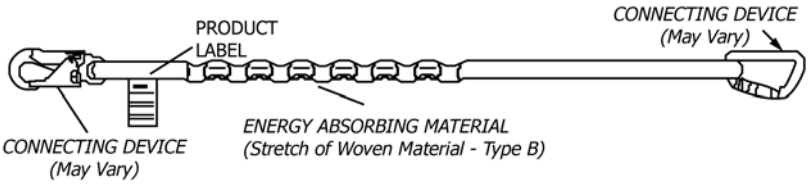


FIG. 26 Type "B" Energy Absorbing Lanyard

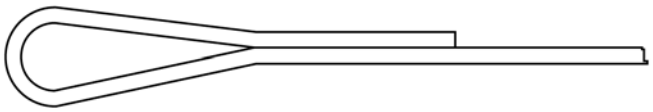


FIG. 27 Webbing Connector

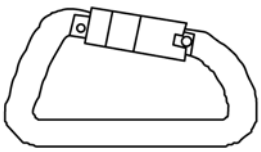


FIG. 28 Typical Carabineer

21. Energy Absorbing Lanyards

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

21.1.1 *Type A*—18 in. (45.7 cm) (Pack with one connector, See Fig. 25.)

21.1.2 *Type B*—48 in. (121.9 cm). See Fig. 26.

21.2 *Marking*—Energy absorbing lanyards manufactured under this standard shall be labeled as meeting this standard providing they satisfy the following requirements:

21.2.1 Energy absorbing lanyards when new shall meet the applicable specifications, tests, and requirements of ANSI/ASSE Z359.13-2013, Personal Energy Absorbers and Energy Absorbing Lanyards.

21.2.2 Energy absorbing lanyards shall meet the qualification testing requirements of Section 22 and 25.6 of this standard.

QUALIFICATION TESTING

22. Electric Arc Performance

22.1 *Electric Arc Test*—Harnesses and energy absorbing lanyards and their accessories shall be electric arc tested. This is a design test and personal climbing equipment shall be re-tested if any component is changed. Specimens shall be chosen to represent load bearing materials and any permanently attached options or accessories. Test specimens shall be exposed to electric arc with incident energy of 40 ± 5 cal/cm^2. The distance between the center line of the arc gap and mannequin or panel shall be 12 ± 0.5 in. (30.5 ± 1.2 cm).

22.2 *Harnesses*—Eight test specimens shall be placed on mannequins as normally worn and exposed to an electric arc using the Test Method F1958/F1958M mannequin test set up. Four of the test specimens shall be exposed on the front and four of the test specimens shall be exposed on the back. Mannequin chest shall be at the arc gap midpoint as shown in Fig. 29a in the case of a harness front exposure or in the case of a back exposure, mannequin back shall be facing the arc gap, chest elevation shall be at the midpoint of the arc gap and the fall arrest attachment generally in line with the armpit.

22.2.1 *Harness Accessories, Loops, etc.*—Three test specimens of each harness accessory, such as loops, plastic buckles, label pouches, labels, pads, etc., shall be exposed to an electric arc on mannequin setup of the Test Method F1958/F1958M or panel setup of Test Method F1959/F1959M. Accessories shall be tested as part of the finished harness assembly or tested individually by being attached to a piece of the approved harness webbing for example, and placed over the shoulder of the mannequin or on panel. When performing this test individually, the specimens shall be placed near the centerline of the mannequin or panel while separated by a minimum 1 in. (25.4 mm). A maximum of two samples may be tested on each mannequin or panel.

22.3 *Energy Absorbing Lanyards*—Three test specimens (see Note 4) shall be tested on mannequin setup of Test Method F1958/F1958M or panel setup of Test Method F1959/F1959M. Specimens shall be placed over the shoulder of the mannequin near the centerline as shown in Fig. 29b or on a panel and at the arc gap midpoint as shown in Fig. 29c, d, e, and f while separated by a minimum 1 in. (25.4 mm). The strap (webbing), energy absorbing pack or energy absorbing material, label or label pouch and section of strap (webbing) adjacent to the connecting device shall be exposed to the electric arc as shown in Fig. 29c, d, e, and f. A maximum of two samples may be tested on each mannequin or panel.

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.

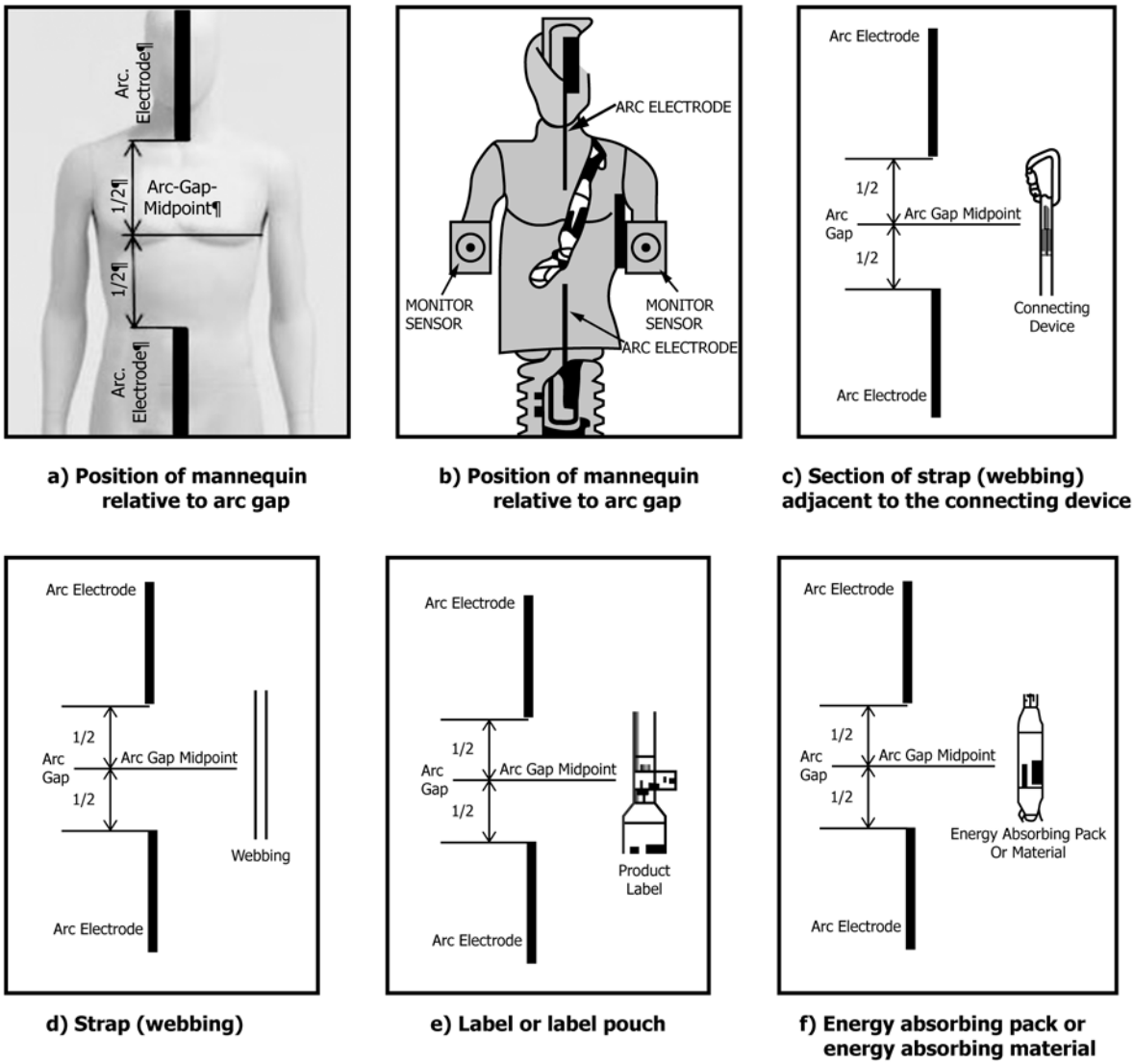


FIG. 29 Energy Absorbing Lanyard Placement for Electric Arc Testing

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

22.5 The arc exposed test specimens shall be exposed to the applicable required drop test specified in 25.5 or 25.6 after the arc exposure as soon as is practically possible.

NOTE 5—These drop tests are applicable to harnesses and energy absorbing lanyards only. Accessories such as tool loops or other non-personnel protection related options do not require drop testing.

22.6 To meet this standard, exposed test specimens shall pass the following criteria in addition to the other test criteria in this standard:

22.6.1 No electric arc ignition or greater than 5 s afterflame of any load bearing materials and 15 s for accessories or non-load bearing components as defined by Specification F1891.

22.6.2 No melting and dripping of any load bearing material as defined by Specification F1891. Accessories, such as elastic or hook, labels and loop fasteners, are allowed to exhibit melting and dripping provided they are not ignited while dripping or propagating the flames to other parts of the product.

22.6.3 Pass the specified drop test and meet the applicable requirements of Sections 25.5 and 25.6 as applicable after electric arc exposure defined above.

23. Hardware Requirements

23.1 All hardware used in the manufacture of product outlined in this standard must be in new and unused condition and meet all applicable requirements of this section. Hardware shall be of aluminum or alloy steel, produced by forging, stamping, forming, casting or machining. Materials other than aluminum or alloy steel and processed by other than those stated herein are permitted 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.

23.2 *Locking Snaphook ('D' Stirrup)*—As assembled, shall consist of a body, gate/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 snaphook shall:

23.2.1 be self-closing and self-locking,

23.2.2 be capable of being opened only by at least two consecutive deliberate actions,

23.2.3 meet all applicable requirements specified by ANSI/ASSE Z359.12-2009.

23.2.4 have a gate/keeper spring tension such that the gate/keeper shall begin to open with a force between 2.5 lb (11.2 N) and 4 lb (17.8 N). The force shall be applied on the gate/keeper and against the face of the snaphook nose with the upper surface of the gate/keeper held horizontally (see Fig. 30).

23.2.5 have a force in the range of 1.5 lb (6.7 N) to 4 lb (17.8 N) to properly activate and release the locking mechanism. This requirement applies regardless of the design of the locking mechanism (see Fig. 31).

NOTE 6—The spring tension of the locking mechanism shall always be less than or equal to the spring tension of the gate/keeper.

23.3 *Locking Snaphook (with Eye) Carabiner*—Snaphooks and carabiners (Fig. 22) shall:

23.3.1 be self-closing and self-locking,

23.3.2 be capable of being opened by at least two consecutive deliberate actions,

23.3.3 meet all applicable requirements specified by ANSI/ASSE Z359.12-2009.

23.4 All buckles and adjusters shall meet all applicable requirements specified by ANSI/ASSE Z359.12-2009.

23.5 The load bearing parts of the dee-rings, O-rings and oval rings shall meet all applicable requirements specified by ANSI/ASSE Z359.12-2009.

23.6 Length Adjusting Devices shall have an ultimate strength of not less than 3600 lbf (16 kN) when pulled end to end (or frame to eye) in a tensile testing machine (see Fig. 19). LAD must show no signs of binding, fracture, cracking or significant deformation that would render the device non-usable.

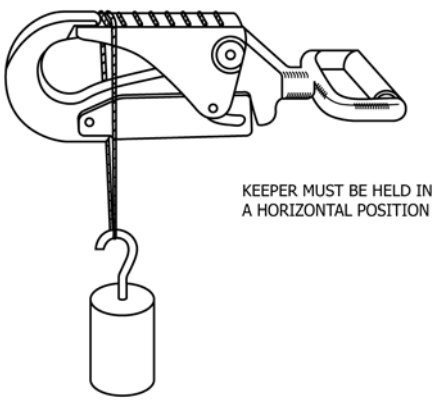


FIG. 30 Latch Test Method

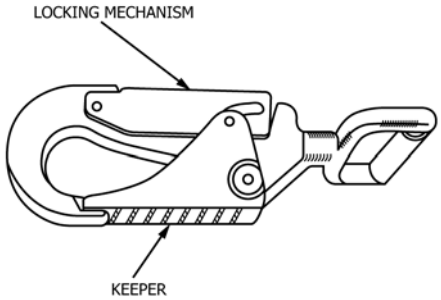


FIG. 31 Typical Locking Snaphook

24. Test Equipment

24.1 The tests described in Section 25 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, 4 Dee Body Belts, Auxiliary Positioning Belts, Positioning Devices, Arborist Saddles, Harnesses, or Energy Absorbers*—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 work 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 ± 5 Pilodyn

[A]The hardness shall be measured on a dry pole before the conditioning.

NOTE 7—For safety reasons, the structure should have ample stability to accommodate the possible lateral loading under rebound.

24.2.1.3 The test pole:

- 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 ±1°.

24.2.2 *Test Mass:*

24.2.2.1 *Body Belts, 4 Dee Body Belts, Auxiliary Positioning Belts, Positioning Devices, and Arborist Saddles*—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 work positioning straps or an equivalent supplementary mass.

24.2.2.2 *Harnesses, Arborist Saddles, and WPRFDs*—The torso shaped test mass 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). When used for testing the WPFRD, 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 in accordance with 14.1.1. 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, 4 Dee Body Belts, Auxiliary Positioning Belts, Harnesses, and Arborist Saddles*—A wire rope lanyard equipped with snaphooks or carabiners shall be provided for 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 bearing point to bearing point. The lanyard shall be fabricated from Type 302 stainless steel in a ⅜ 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 *WPFRD*—Two wire rope lanyards equipped with snaphooks/carabiners at each end shall be provided for the WPFRD tests. The lanyard shall be 24 in. (61 cm) long, from bearing point to bearing point, under a tension of 10 lbf (44.5 N) fabricated from Type 302 stainless steel in a ⅜ 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.

24.2.3.3 *Arborist Saddle*—A test yoke equipped with snaphooks/carabiners at all ends shall be provided for the Arborist Saddle tests. The test yoke 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 bearing point to bearing point. The test yoke shall be fabricated from Type 302 stainless steel in a ⅜ in. (9.5 mm) diameter 7 × 9 aircraft cable construction and manufactured as shown in Fig. 34. To prevent slippage, the lanyard eyes shall be formed by flemish splices and secured with mechanical sleeves.

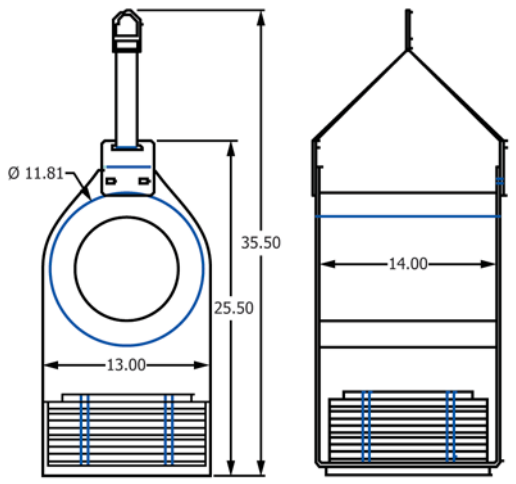


FIG. 32 Test Mass
Where the center of gravity shall be below the base of the mandrel

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 work 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 ±2 %.

24.2.6 *Test Leg, Leg Support Bracket (WPFRD)*—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. 35. Prior to initiating this test, the leg support bracket must be attached to the pole. The bracket is shown in Fig. 36.

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 ±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:

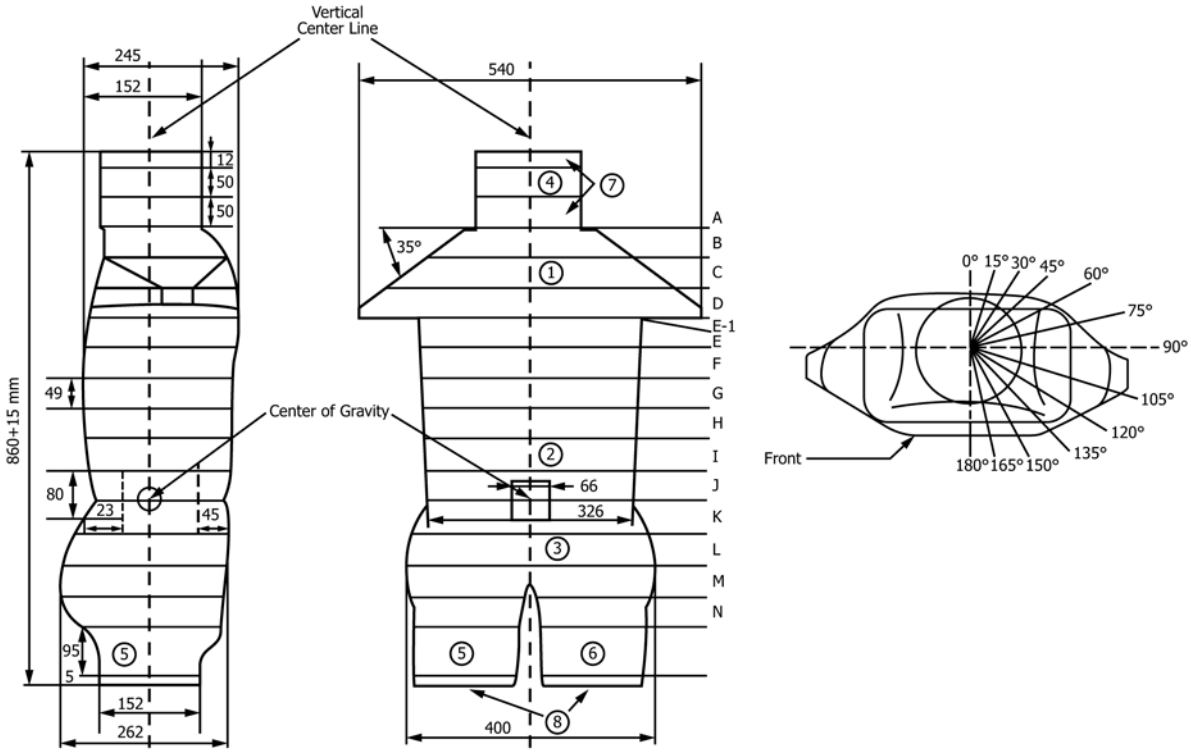
- spring injection force = 4.43 ft-lb (6J)
- striker pin total length = 3.16 in. (80.2 mm)
- striker pin diameter = 0.098 in. (2.5 mm)
- tool diameter = 1.97 in. (50 mm)
- total length = 13.19 in. (335 mm)
- total weight = 3.53 lb (1.6 kg)

25. Qualification Testing

25.1 *Body Belts, 4 Dee Body Belts, and Auxiliary Positioning Belts:*

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

25.1.2 *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



Shapes are approximate Materials:
Sections 1-, 2- and 3- hard wood
Sections 4-, 5- and 6- lead
Sections 7-, and 8- steel
Note: All dimensions are in millimeters.

Datum level	Back 0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	Front 180°
A	72	71	77	83	87	85	84	82	86	85	81	78	77
B	70	72	78	96	135	166	160	165	182	164	134	119	114
C	92	95	106	130	164	188	245	243	200	182	157	142	138
D	104	107	117	130	153	178	235	273	213	181	162	144	138
E-1	105	106	108	117	131	153	175	176	160	148	141	139	138
E	104	105	108	117	131	153	175	174	159	146	140	138	138
F	104	105	108	116	130	152	173	174	163	149	142	139	138
G	102	103	106	114	128	149	170	174	162	149	142	139	138
H	102	102	106	114	127	146	166	171	161	150	142	139	138
I	95	98	104	114	127	146	165	169	159	150	145	139	135
J	71	75	82	101	123	146	163	167	158	151	138	124	122
K	108	111	121	141	173	192	195	198	190	166	137	123	120
L	127	131	144	170	193	198	198	201	196	165	137	124	121
M	—	105	157	173	181	184	186	190	193	167	140	125	—
N	—	—	120	162	171	181	182	189	186	140	125	—	—

Notes:
(1) *Dimensions are in millimeters.*
(2) *Shapes are approximate.*

FIG. 33 Test Torso and Datum Size Chart

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. 37). Release the test mass by means of the quick-release mechanism. For 4 dee body belts (tandem or stacked), test dee ring closest to the buckle in accordance with the test described above. A new belt can be used for each test.

25.1.3 *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 for a minimum of 3 min.

25.2 *Positioning Devices:*

25.2.1 *Positioning Straps:*

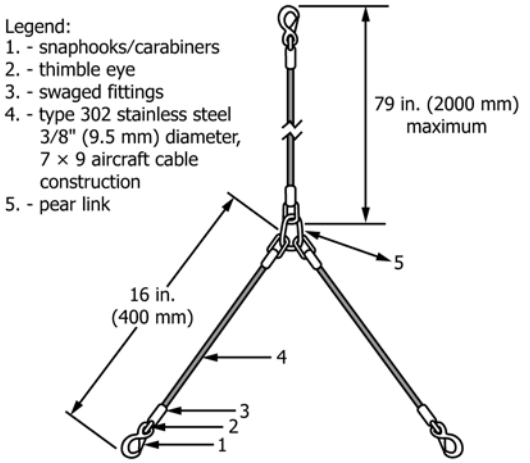


FIG. 34 Test Yoke

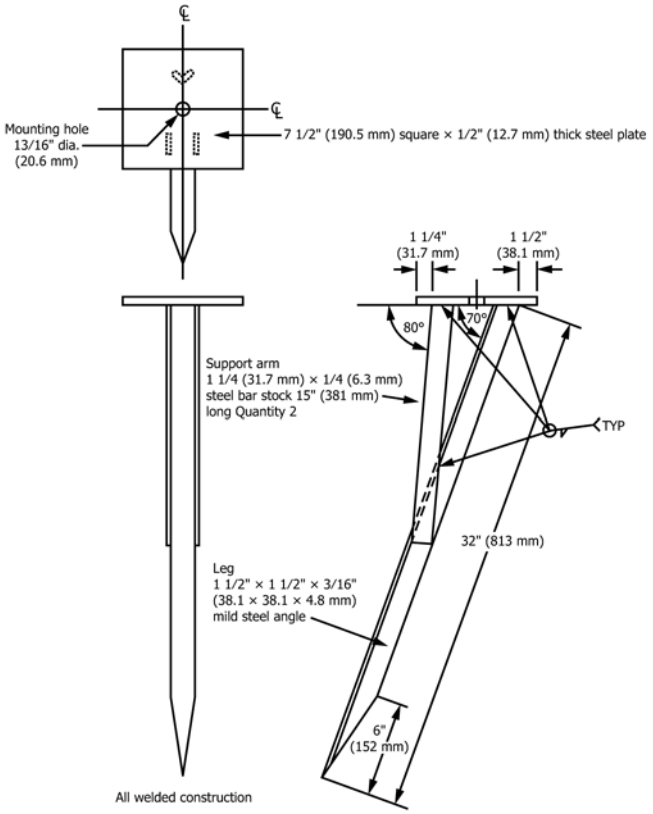


FIG. 35 Test Leg

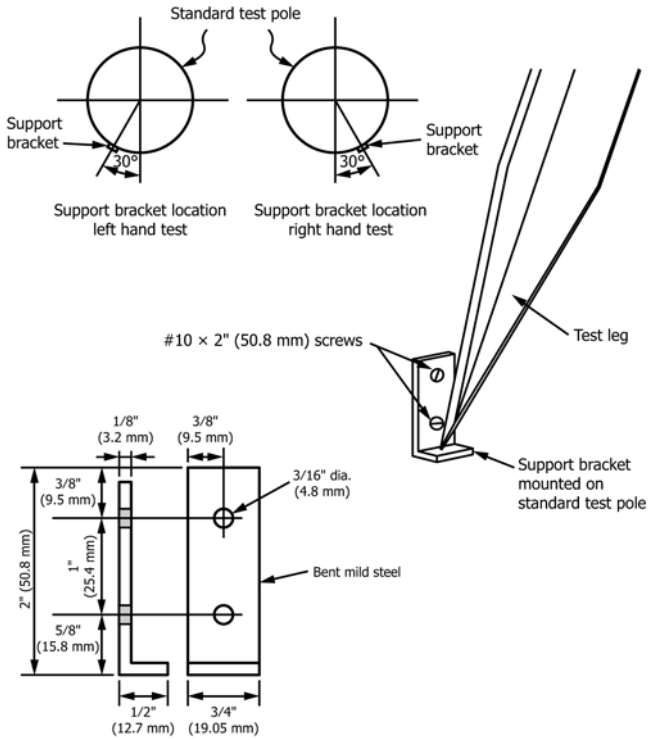


FIG. 36 Test Leg Bracket

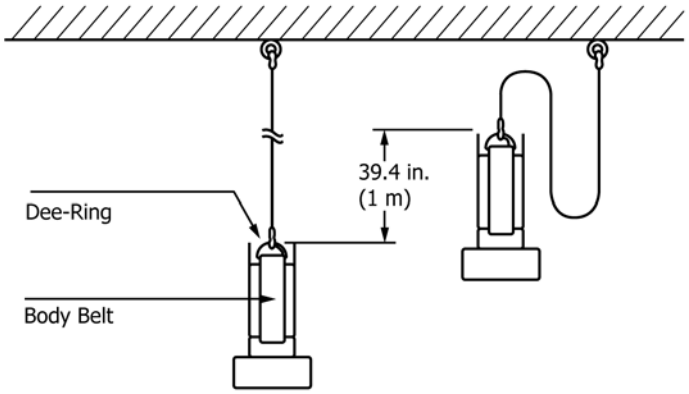


FIG. 37 Body-Belt Drop Test

25.2.1.1 *Drop Test Samples*—When a work 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 work 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.

25.2.1.2 *Drop Test Procedures*—The work 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. 38. The quick-release mechanism shall be hooked into the same point as the lower end of the work positioning strap. Lower the test mass until its full mass is being supported by the work positioning strap. 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.

25.2.1.3 *Drop Test Requirements*—Work positioning straps shall successfully arrest the fall of the test mass without breaking. In addition, the snaphook/carabiner on the work positioning strap shall not have distorted sufficiently to allow the gate/keeper to be released.

25.2.2 *Adjustable Positioning Lanyards:*

25.2.2.1 *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.

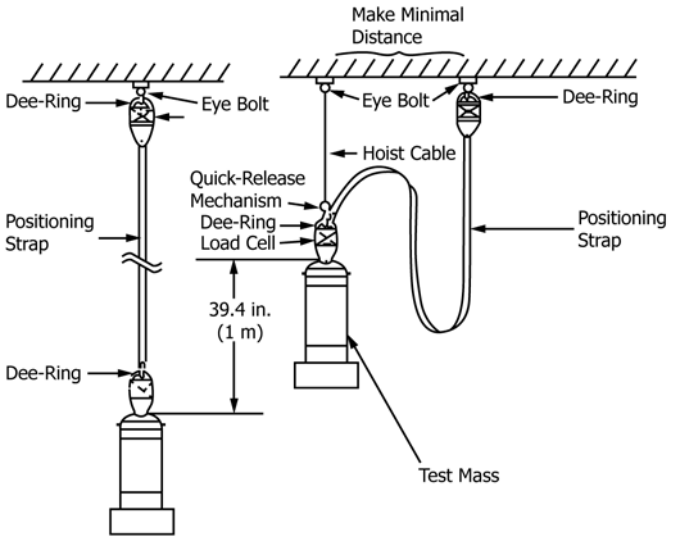


FIG. 38 Positioning Strap Drop Test

25.2.2.2 *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. 39. 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.

25.2.2.3 *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 gate/keeper to be released.

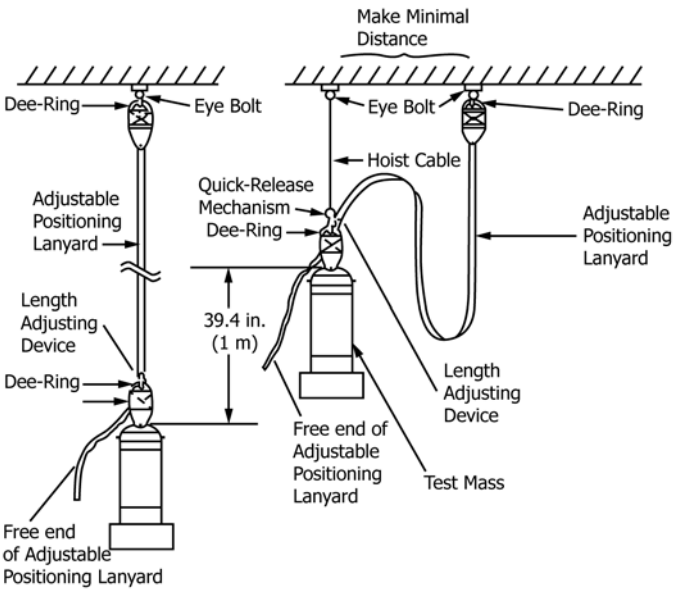


FIG. 39 Adjustable Positioning Lanyard Drop Testing

25.3 *WPFRD:*

25.3.1 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.

25.3.2 *WPFRD Test Samples*—WPFRD 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.

25.3.3 *Conditioning Procedures:*

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

25.3.3.2 *Conditioning for Wet Test:*

(a) 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.

(b) Attach the WPFRD within 15 min.

(c) Spray the pole and the WPFRD for one additional minute.

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

(e) Each additional test to be conducted requires the pole be sprayed for 2 min and the procedure in 25.3.3.2*(b)* – *(d)* be repeated.

25.3.3.3 *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 3⅛ ± ⅝ in. (80 ± 15 mm) U-shaped aluminum or galvanized steel guard on the pole as shown in Fig. 40. The length of the U-shaped guard shall be suitable to cover the fall restriction zone. Clamps securing the guard to the pole shall be kept clear of the fall restriction zone.

25.3.3.4 *Ice Pole Conditioning:*

(a) 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. 41).

(b) Applicability—The tests as defined in 25.3.3.4 apply only to Type AB devices.

(c) 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 ½ to ⅔ of the pole

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	25.3.3.7(1)(a)	25.3.3.7(1)(a)
Down the Pole Test with Torso below SPFRD	3 tests	3 tests	3 tests Bare side 3 tests Conduit side	NA	25.3.3.7(1)(b)	25.3.3.7(1)(b)
Off the Pole Test Right	3 tests	NA	NA	NA	25.3.3.8	25.3.3.8
Off the Pole Test Left	3 tests	NA	NA	NA	25.3.3.8	25.3.3.8
Dynamic Strength Drop Test	3 tests	NA	NA	NA	25.3.3.9	25.3.3.9(A)

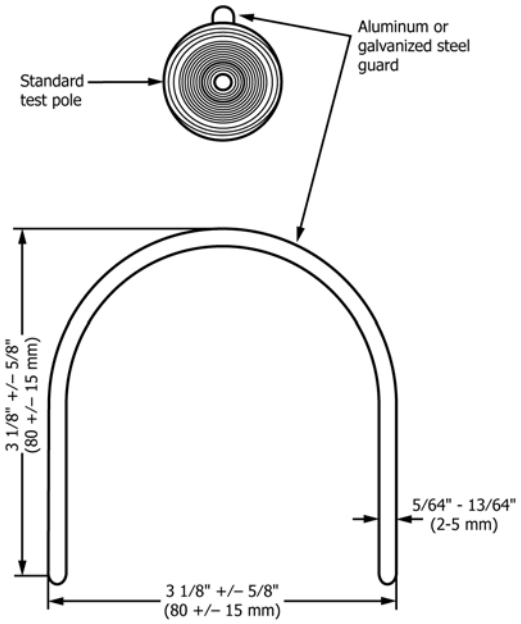
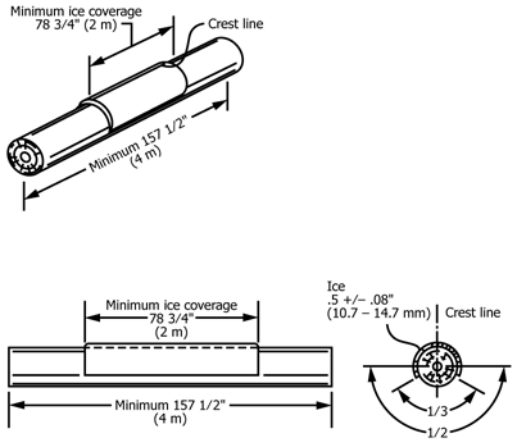


FIG. 40 Conduit Condition



Ice Coverage on a Wood Pole

FIG. 41 Iced Pole Condition

circumference in total. The back ½ to ⅓ circumference of the pole (side opposite the water source) shall have no ice buildup. (See Fig. 41.) Environmental temperature of 27°F (–3°C) maximum is recommended during the test.

25.3.3.5 *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 8—It has been noted that between 0.5–2 gal per hour per ft^2 (20 and 80 L per hour per m^2) of area sprayed will be required to cause ice to be deposited at a rate of approximately ¼ in./h (6 mm/h).

25.3.3.6 *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.

(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 in. (6 mm) thickness per hour (see Fig. 41).

(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. 41), 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

25.3.3.7 *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.

(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.

(A) 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)

(B) 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. 42):

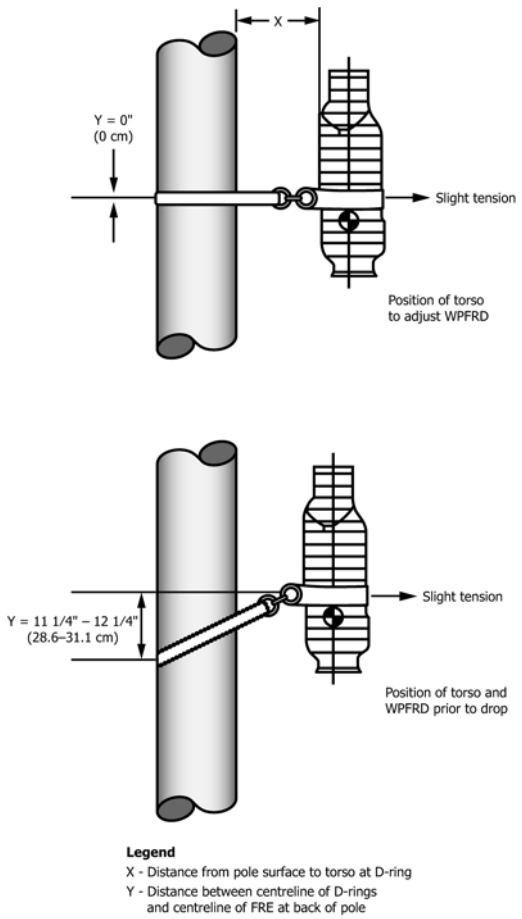


FIG. 42 Down the Pole with Torso Above WPFRD

(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 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.

(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.

(A) 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)

(B) 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. 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 torso, which is represented by dimension X (Fig. 43) 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.

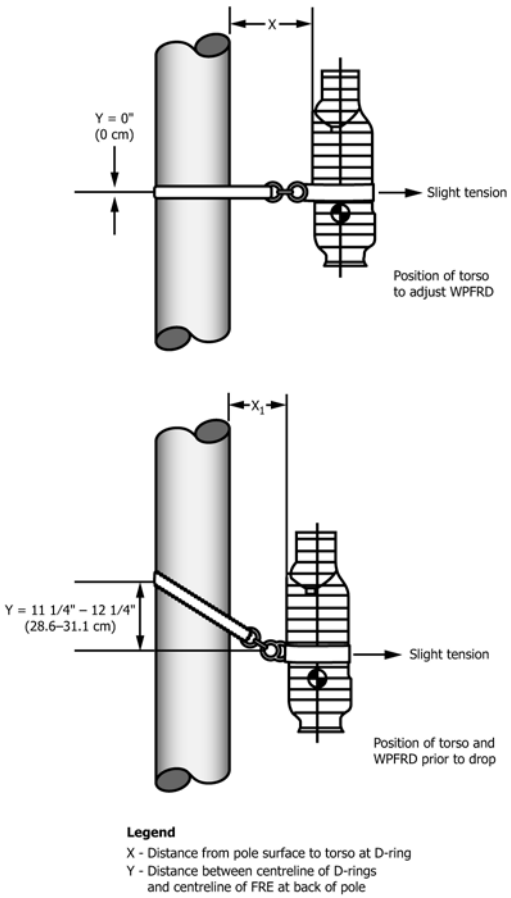


FIG. 43 Down the Pole with Torso Below WPFRD

(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).

(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.

25.3.3.8 *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.

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

(B) The procedure for this test shall be as follows:

(a) Torso modification: for symmetrical devices, attach the test leg (Fig. 35) 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. 36) 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. 44).

(1) Move the torso away from the pole so that slight tension, adequate to remove the slack in the connection hardware, is applied to the WPFRD. The gap between the pole surface and the torso, which is represented by dimension X (Fig. 44) 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 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.

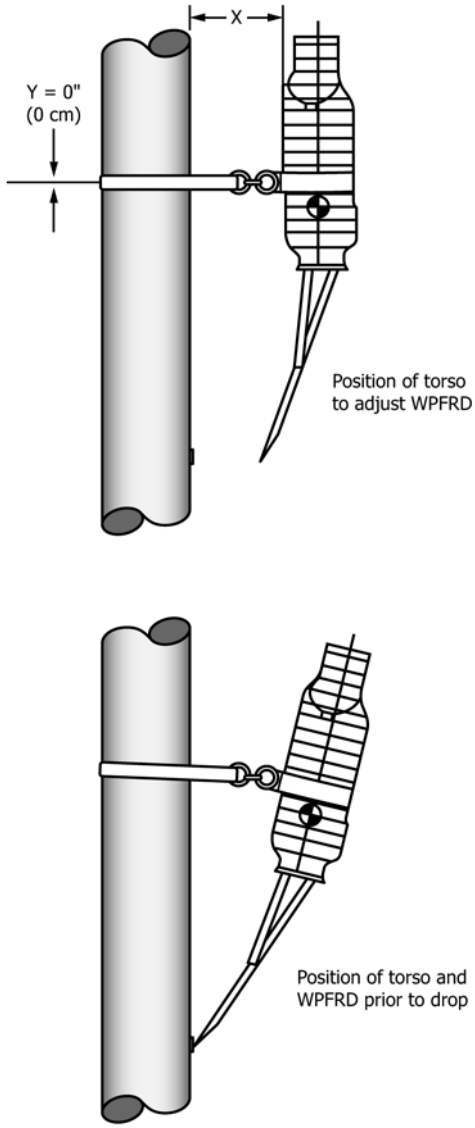


FIG. 44 Off the Pole Test

(h) Lower the torso until the tip of the leg contacts the bracket, then lower the torso by an additional 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 record the total WPFRD slippage on the back of the pole.

25.3.3.9 *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.

(A) The following procedure shall be followed during this test:

(a) Condition the WPFRD by placing it in a freezer at –31 ± 5°F (–35 ± 2.8°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, adequte 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 Belot 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. Place the WPFRD as much as possible in contact with the pole, that is, 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. 44).

(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.

(i) Measure the height of the torso.

(j) Raise the torso 47 in. (1.2 m) and maintain the dimension X as described in 25.3.3.9*(A)(e)(1)*.

(k) Ensure set up is correct.

(l) Release the torso.

(m) Leave the torso suspended by the WPFRD for 10 min.

25.4 *Arborist Saddle:*

25.4.1 *Static Strength Testing:*

25.4.1.1 *Static Strength Test Samples*—Samples of arborist saddles of each specific design and construction shall be tested and shall include all hardware and fittings intended to be attached to the commercial product.

25.4.1.2 *Static Strength Test Procedure:*

(a) Follow the manufacturer's instructions and fit the arborist saddle to the test torso as though the test torso were a person. All adjustments are to be made to ensure a snug fit of the arborist saddle to the test torso. Suspend the test torso as shown in Fig. 45.

(b) Mark the adjustment strap of each fastening and adjusting element in such a manner that any slippage can be measured.

(c) Apply a force of equivalent to 10 times the maximum load rating of the arborist saddle and not less than 3375 lbf (15 kN), between the front suspension attachment element of the arborist saddle and the lower ring of the test torso (see Fig. 45).

(d) Apply the force gradually over a period of 2 min ± 15 s.

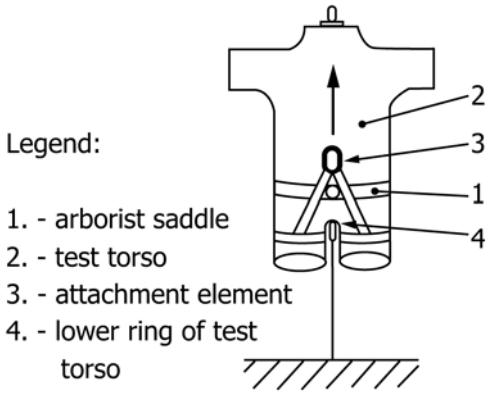


FIG. 45 Static Strength Test

(e) Maintain the force for a minimum of 3 min.

(f) Check if any of the arborist saddle attachment elements have become detached. Check the load bearing parts for breaking or rupture.

(g) Measure and record any slippage of the adjustment straps through the fastening and adjustment elements.

(h) When front suspension attachment elements differ in design, or manner of attachment to the arborist, the test shall be repeated for each different type of attachment. A new arborist saddle may be used for each test if necessary.

25.4.1.3 *Static Strength Test Requirements*—When tested at each suspension attachment element in accordance with 17.3.9.

(a) No load bearing part shall break or rupture.

(b) No element of the arborist saddle shall become detached.

(c) Slippage of the adjustment straps through the fastening and adjustment elements shall not be more than 1 in. (25.4 mm) as stated in 17.3.6.

25.4.2 *Dynamic Performance Testing:*

25.4.2.1 *Dynamic Performance Test Samples*—Samples of arborist saddle of each specific design and construction shall be tested and shall include all hardware and fittings intended to be attached to the commercial product.

25.4.2.2 *Dynamic Performance Test Procedures:*

(A) Suspension Attachment Element Testing:

(a) Follow the manufacturer's instructions and fit the arborist saddle to the test torso as though the test torso were a person. All adjustments are to be made to ensure a snug fit of the arborist saddle to the test torso.

(b) For arborist saddles with one suspension attachment element or closely spaced suspension attachment elements, the test lanyard shall be attached to the suspsension attachment element(s). For arborist saddles with two or more widely spaced suspension attachment elements, the test yoke shall be connected to the pair of front or side mounted attachment elements which are intended for suspension (ascent and descent).

(c) One end of the wire rope shall be hooked into the single or closely spaced suspension attachment elements. Each of the short legs of the test yoke shall be connected to the pair of front or side mounted attachment elements which are intended for suspension (ascent and descent).

(d) The hoisting means shall be attached to the neck attachment point on the test torso.

(e) Raise the test torso until the opposite end of the wire rope can be snapped into the test-structure anchorage point.

(f) Lower the test torso until the test lanyard/test yoke is at full tension.

(g) Note the level of the suspension attachment elements.

(h) Raise the test torso until the suspension attachment elements have been raised a distance of 39.4 in. (1 m) (see Fig. 46).

(i) Release the test torso by means of the quick-release mechanism.

(B) Side Positioning Dee Ring Testing

(a) The arborist saddle shall be snugly secured around the mandrel of the test mass.

(b) The arborist saddle shall be positioned such that the dee-ring closest to the buckle is pointing upward.

(c) One end of the wire rope shall be hooked into the dee-ring. The quick-release mechanism shall be hooked into the same point.

(d) Raise the mass until the opposite end of the wire rope can be snapped into the test-structure anchorage point.

(e) 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. 46).

(f) Release the test mass by means of the quick-release mechanism.

25.4.2.3 *Dynamic Performance Test Requirements*—Examine the arborist saddle for damage such as broken stitching, slipped grommets in buckle holes, and bent buckles or buckle tongues. Any such damage shall be recorded for the manufacturer's information. The arborist saddle shall successfully arrest the fall of the test mass/test torso and shall be capable of supporting it after the test for a minimum of 3 min.

25.4.2.4 *Tested Samples*—Tested sample units must be destroyed.

25.5 *Harness:*

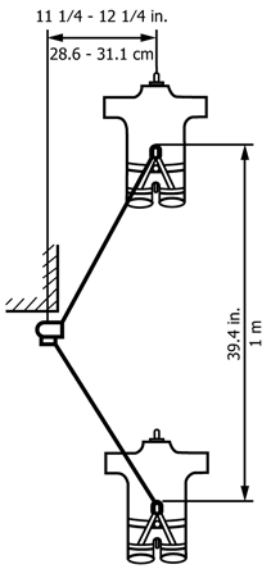


FIG. 46 Dynamic Strength Test

25.5.1 *Drop Test Samples*—A minimum of eight samples of harnesses of each specific design and construction shall be tested after exposure to the electric arc test of Section 22. Samples shall include all hardware and fittings intended to be attached to the commercial product.

25.5.2 *Drop Test Procedures*—The drop test is to be done on the eight samples exposed to the arc test as indicated in Table 6. A new harness may be used for each test. The harness shall be snugly secured about the test mass. One end of the wire rope shall be hooked into the fall arrest attachment and the other to the test structure anchorage point. 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 fall arrest attachment point and raise the test mass until the fall arrest attachment point has been raised a distance of 39.4 in. (1 m). The torso shall be lifted to a point no more than 12 in. (305 mm) horizontally from the anchorage. Release the test mass by means of the quick-release mechanism. After the drop, the torso is to remain suspended by the harness for a period of 5 min.

25.5.3 *Dynamic Performance Test Requirements*—All eight harness samples, when dynamically tested shall not release the test torso. No load-bearing element shall break or separate from the body support. During the post-fall suspension period, measure and record the angle at rest. The torso at rest shall be upright and be no more than 30° from vertical for the dorsal fall arrest attachment or 50° from vertical for the sternal fall arrest attachment. Examine the harness for damage such as broken stitching, slipped grommets in buckle holes, and bent buckles or buckle tongues. Any such damage shall be recorded for the manufacturer's information. The report shall provide details about the test procedure, angle at rest and examination of the harness after the test for each sample.

25.5.4 *Tested Samples*—Tested sample units should be destroyed.

25.6 *Energy Absorbers:*

25.6.1 *Six ft Freefall Units:*

25.6.1.1 *Drop Test Samples*—A minimum of three samples of energy absorbers of each specific design and construction shall be tested after exposure to the electric arc test of Section 22. Samples shall include all hardware and fittings intended to be attached to the commercial product.

25.6.1.2 *Drop Test Procedures*—The exposed test specimens shall be tested to the applicable ambient dry dynamic performance test of the ANSI/ASSE Z359.13-2013 standard.

25.6.1.3 *Dynamic Performance Test Requirements*—All three energy absorbers tested shall successfully arrest the fall of the test mass as per the ANSI/ASSE Z359.13-2013 standard. Examine the energy absorber for damage such as broken stitching, bent hardware, etc. Any such damage shall be

TABLE 6 Harness Electric Arc Drop Test Requirements

Harness FAA Type	Dorsal Attachment Only		Dorsal/Frontal Attachment	
Attachment Point	Dorsal	Dorsal	Frontal	Dorsal
Front Exposure	2 feet-first	2 head-first	2 feet-first	2 head-first
Rear Exposure	2 feet-first	2 head-first	2 feet-first	2 feet-first
Total	8		8	

recorded for the manufacturer's information. The report shall provide details about the test procedure and examination of the energy absorber after the test for each sample.

25.6.1.4 *Tested Samples*—Test sample units should be destroyed.

25.6.2 *Twelve ft. Freefall Units:*

25.6.2.1 *Drop Test Samples*—A minimum of three samples of energy absorbers of each specific design and construction shall be tested after exposure to the electric arc test of Section 22. Samples shall include all hardware and fitting intended to be attached to the commercial product.

25.6.2.2 *Drop Test Procedures*—The exposed test specimens shall be tested to the applicable ambient dry dynamic performance test of the ANSI/ASSE Z359.13-2013 standard.

25.6.2.3 *Dynamic Performance Test Requirements*—All three energy absorbers tested shall successfully arrest the fall of the test mass as per the ANSI/ASSE Z359.13-2013 standard. Examine the energy absorber for damage such as broken stitching, bent hardware, etc. Any such damage shall be recorded for the manufacturer's information. The report shall provide details about the test procedure and examination of the energy absorber after the test for each sample.

25.6.2.4 *Test Samples*—Tested sample units should be destroyed.

26. Instructions

26.1 Instructions shall be provided to the user 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 manufacturer, shall make repairs to the equipment.

26.2.12 Reference to ASTM F887 standard.

26.3 *Applicable Only to Arborist Saddles:*

26.3.1 Donning instructions.

26.3.2 A statement that this equipment is intended for use by properly trained professionals only.

26.3.3 Requirement that before use consideration should be given as to how any necessary rescue could be safely achieved.

26.3.4 A statement that before first time use the user should carry out a comfort and adjustability test in a safe place to ensure that the Arborist Saddle is the correct size, has sufficient adjustment and is of an acceptable comfort level for the intended use.

26.3.5 If the Arborist Saddle is of the modular design, instructions on how to disassemble and properly assemble to prepare for use.

26.4 Instructions shall provide warnings regarding at least:

26.4.1 Altering the equipment.

26.4.2 Misusing the equipment.

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

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

26.4.5 Using the equipment around moving machinery and electrical hazards.

26.4.6 Using the equipment around sharp edges or abrasive surfaces.

26.5 *Applicable Only to Arborist Saddle and Body Belts:*

26.5.1 Statement including "Warning" Arborist Saddle and body belts are not to be used for fall arrest.

27. Guarantee and Rejection

27.1 This standard 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 standard 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 standard which upon examination or test within six months of initial delivery of the shipment fail to meet any of the criteria of this standard.

27.3 If 5 % or more, but not less than two items in a lot or shipment, fail to meet the criteria of this standard, 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; energy absorbing lanyard;

gate/keeper; harnesses; lanyards; length adjusting device; locking snaphook; positioning strap; stirrup; wood pole fall restriction device

SUMMARY OF CHANGES

Committee F18 has identified the location of selected changes to this standard since the last issue (F887–13) that may impact the use of this standard. (Approved Nov. 15, 2016.)

(1) Added equipment categories, Section 1.2 and subsections: 1.2.1 Fall (Travel) Restraint; 1.2.2 Work Positioning; 1.2.3 Fall Arrest; 1.2.4 Suspension; 1.2.5 Fall Restriction.
(2) Added additional definitions of terms specific to this standard conformed with new OSHA Subpart V/1910.269.
(3) Added specifications and qualification testing for auxiliary positioning belts (gut straps with 'D' rings) and four dee body belts (see Section 14 and 25).
(4) Added requirement that all snap hooks and carabiners comply with 3,600 lbf side and gate face loading requirement.
(5) Added allowance for use of aluminum, alloy steel, and alternate materials for hardware when demonstrated by testing that all requirements of this standard are met.
(6) Added ASTM drop test procedure section, 25.5, for harnesses after electric arc testing.
(7) Added updated test criteria for Energy Absorbers as well as included 12 ft free fall units in 25.6.
(8) Removed hardware requirements from individual product sections to Section 23, an all-encompassing "Hardware Requirements" section.
(9) Removed forged steel requirement of hardware for body belts and positioning straps.
(10) Revised the test mass design for body belts to additionally complement the 4 "D" stacked body belt design.
(11) Updated ANSI Z359 and ASTM standards references.
(12) Updated "Terminology" as applicable.
(13) Updated more detailed specifications and procedures of the Electric Arc Performance Section 22 to include: increase in the hardness test specimens and testing requirements; update to the after-flame requirement for accessories or non-load bearing components; change to the melting and burning accessories requirements; inclusion of additional figures to illustrate placement of samples to be electric arc tested.