

4123:1-21-02 Personal protective clothing and equipment for structural fire fighting.

- (A) The employer shall provide and require the use of personal protective clothing and equipment, as specified in this rule, when employees are required to work in a hazardous environment that may be encountered during structural fire fighting activities and under similar conditions during training activities.
- (B) The employer shall assure that protective clothing protects the head, body, and extremities and consists of at least the following components: foot protection; hand protection; body protection; eye, face, and head protection; and respiratory protection.
- (C) Personal protective clothing and equipment shall be properly sized for the wearer.
- (D) Personal protective clothing and equipment that is damaged or otherwise defective to the point of voiding its intended protection shall be removed from service.
- (E) Employers shall develop and require use of a written plan covering the safe use, limitations, care, inspection, maintenance, and replacement of the clothing and equipment required by this rule, and all affected employees shall be trained in accordance with such plan.
- (F) Employers shall develop and retain records for the life of the protective clothing and equipment.
- (G) Employer shall provide for the cleaning of personal protective clothing.
- (H) Where employees choose to provide their own protective clothing and equipment, such clothing and equipment shall give equal or greater protection than that provided by the employer.
- (I) It shall be the responsibility of the employee to properly use the equipment provided by the employer, as required in this rule.
- (J) Body protection.
 - (1) Body protection shall consist of a protective coat and trousers, or equivalent protection.
 - (2) Protective clothing shall be flame-resistant, durable, light-weight, water-resistant, nonirritating to the skin, and cleanable as set forth in paragraph (J) of this rule.
 - (3) Protective clothing shall be cleaned per the manufacturer's recommendations.

- (4) Protective clothing for structural fire fighting shall be repaired in accordance with manufacturer's requirements. If protective clothing cannot be repaired properly without decreasing the protective qualities, it shall be replaced.
- (5) Protective clothing shall be designed to give minimum interference to physical movement, the use of fire-fighting tools, and protective breathing apparatus.
- (6) There shall be at least a two inch overlap of all layers of the protective coat and the protective trousers so there is no gaping of the total thermal protection when the protective garments are worn. The minimum overlap shall be determined by measuring the garments on the wearer, without SCBA, in both of the following positions:
 - (a) "Position A:" standing, hands together, reaching overhead, as high as possible.
 - (b) "Position B:" standing, hands together, reaching overhead, with body bent forward, to the side, and to the back, as much as possible.
- (7) Employers that provide protective coats with protective resilient wristlets secured through a thumb opening shall be permitted to provide gloves of the gauntlet type for use with these protective coats. Employers that do not provide such wristlets attached to the protective coats shall provide gloves of the wristlet type for use with these protective coats.
- (8) Design requirements.
 - (a) Protective clothing shall consist of an outer shell, moisture barrier, and thermal barrier.
 - (b) A means shall be provided to secure the moisture barrier and thermal barrier to the outer shell.
 - (c) Garments, including the front closure, shall be constructed in a manner that provides secure and complete moisture and thermal protection. Closure systems shall be secured with positive locking fasteners including, but not limited to, hooks and dees or zippers. Nonpositive fasteners, such as snaps or hook and pile tape, shall not be used as positive locking fasteners but shall be permitted to be utilized as supplementary garment closure devices.
 - (d) Moisture barriers and thermal barriers shall extend to within three inches (seventy-five mm) of the outer shell at the cuffs and hems of protective garments. At the neck, the coat moisture barrier and thermal barrier shall extend to the neckline seam. At the waist, the trouser moisture barrier and thermal barrier shall extend to the waistline seam. In coats, the moisture

barriers and thermal barriers shall also extend to within one inch (twenty-five mm) of the sleeve end of the outer shell, and in trousers shall extend to within three inches (seventy-five mm) of the bottom outer shell hems. The liner system shall be attached at or adjacent to the end of the coat sleeves or the end of the trouser legs. Any mechanism used to attach the liner system at or adjacent to the end of the coat sleeves and the end of the trouser legs shall not be greater than one inch (twenty-five mm) between the attachment points, and shall not be expandable. Moisture barriers and thermal barriers shall be configured in a manner that provides continuous moisture and thermal protection.

- (e) Cargo pockets, where provided, shall have a means of drainage of water and shall have flaps with a means of fastening them in the closed position.
- (f) Trim used to meet visibility requirements shall be no less than two inches (fifty mm) wide and shall have retroreflective and fluorescent areas. Retroreflective areas of trim shall be no less than five-eighths inch (sixteen mm) wide. Fluorescent areas of trim shall have a minimum surface of two inches²/linear inch (fifty mm²/linear mm). Fluorescent and retroreflective areas of trim shall appear to be continuous at a distance of one-hundred ft (30.5 m) for the length of the trim, with gaps between areas of retroreflectivity of no more than one-eighth inch (three mm).
- (g) Trim affixed to protective garments for the purpose of meeting visibility requirements specified in paragraph (J)(12)(q) of this rule may be obscured by garment components such as, but not limited to, pockets, storm flaps, and reinforcing patches, as long as the minimum trim required in paragraphs (J)(8)(f), (J)(9)(e), and (J)(10)(c) of this rule is not obscured.
- (h) The outer shell and each separable layer of protective garments shall have a label permanently and conspicuously attached to the inside upon which at least the following warnings and information are printed:
 - (i) "This structural fire fighting garment meets the garment requirements of NFPA 1971, 2007 Edition.
 - (ii) Manufacturer's name, identification, or designation.
 - (iii) Manufacturer's address.
 - (iv) Country of manufacture.
 - (v) Manufacturer's garment identification number, lot number, or serial number.

- (vi) Date of manufacture (not coded).
 - (vii) Model name, number, or design.
 - (viii) Size.
 - (ix) Principal material(s) of construction.
 - (x) Cleaning precautions.
 - (xi) Certification organization's label, symbol, or identifying mark.
- (i) The manufacturer shall provide a user information guide that describes the care, use, inspection, maintenance, limitations, and replacement of personal protective clothing.
- (9) Additional requirements for protective coats.
- (a) Protective coats shall provide protection to the upper torso, neck, arms, and wrists, excluding the hands and head.
 - (b) Protective coat hardware shall not penetrate through the outer shell, moisture barrier, and thermal barrier to contact the wearer's body when the coat is worn with closures fastened, unless the hardware is completely covered by external closure flaps.
 - (c) Each protective coat sleeve shall have a permanent protective wristlet, made of an inherently flame-resistant fiber, meeting requirements as specified in paragraph (J)(12) of this rule. The wristlet shall be attached to the protective coat sleeve in a manner that will not permit a gap in the thermal protection.
 - (d) Protective coats shall have a composite collar no less than three inches (seventy-five mm) in height at any point with a closure system. The collar and closure system shall consist of an outer shell, moisture barrier, and thermal barrier that meet all performance requirements as specified in paragraph (J)(12) of this rule.
 - (e) Each protective coat shall have a drag rescue device (DRD) installed in the upper torso portion of the coat. It shall be accessible from the exterior of the garment. It shall be designed so that when deployed, the DRD secures the fire fighter by the upper torso or shoulders so that the DRD pull directly on the body and shall not pull only the garment.

- (f) The trim configuration for the coat shall be in accordance with figure 1. The minimum trim pattern for the coat shall have one circumferential band of trim or a staggered three hundred sixty-degree visibility pattern meeting or exceeding the surface area of a continuous circumferential band around the bottom of the coat. Where a staggered pattern is used in the lower circumferential trim band, the lower edge of the upper trim piece shall not be higher than the upper edge of the lower trim piece. The lower edge of the circumferential band on the lower part of the coat shall be within one inch (twenty-five mm) of the coat hem's highest point. The front of the coat shall also have at least one band of horizontal trim at the chest level. No vertical stripes of trim shall be permitted on the front of the coat. The back of the coat shall also have a minimum of either two vertical stripes of trim, perpendicular to the bottom band and with one strip located on both the left and right sides of the of the back of the coat, or a minimum of one horizontal band of trim at the chest/shoulder blade level. The minimum trim configuration for each sleeve shall be one circumferential band, or a staggered three hundred sixty-degree visibility pattern meeting or exceeding the surface area of a continuous circumferential band, between the wrist and elbow level. Where trim on the coat intersects a zipper, a maximum gap in the trim of one inch (twenty-five mm) shall be permitted.

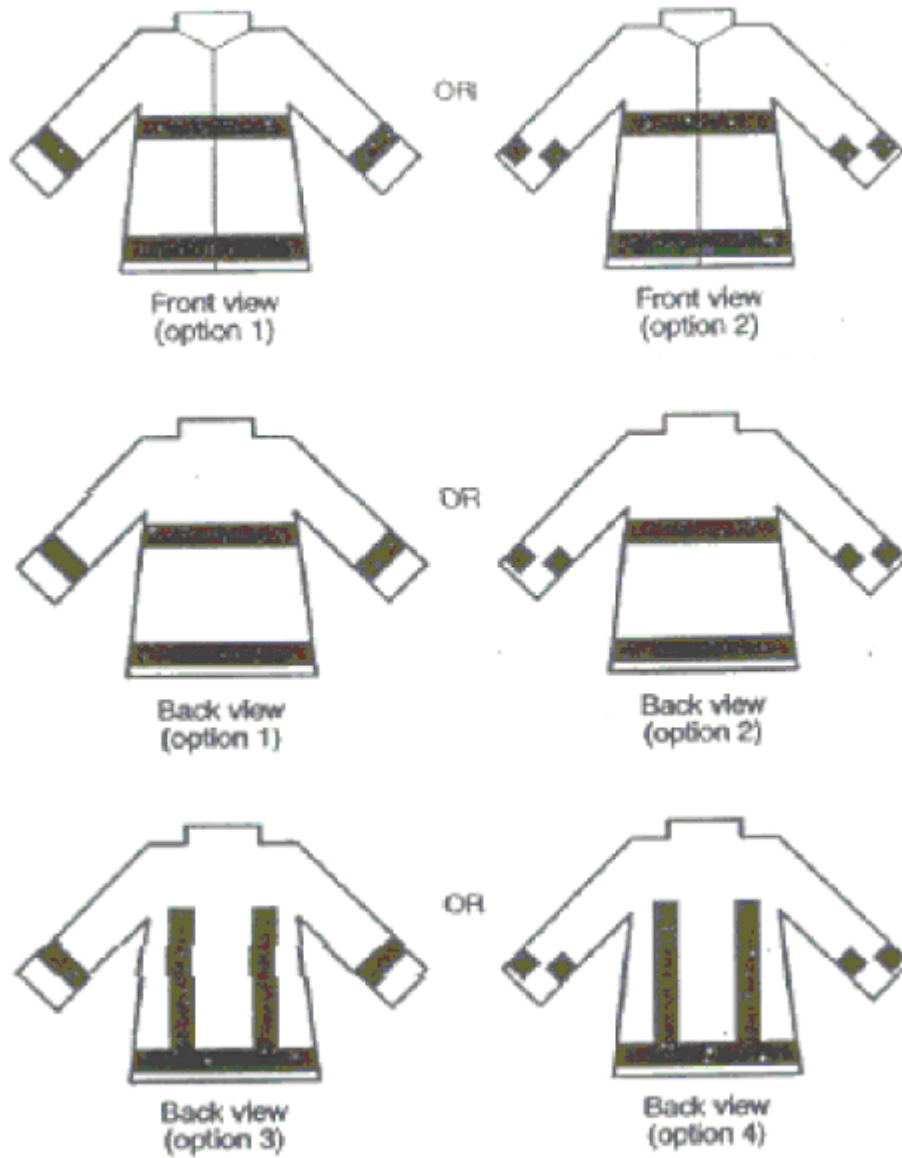


FIGURE 1 Minimum required coat trim patterns

(10) Additional requirements for protective trousers.

- (a) Protective trousers shall provide protection to the lower torso and legs, excluding the ankles and feet.
- (b) Protective trouser hardware shall not penetrate through the outer shell, moisture barrier, and thermal barrier to contact the wearer's body when the trouser is worn with closures fastened, unless the hardware is located on or above the waistline or the hardware is completely covered by external closure flaps.
- (c) The trim configuration for the trousers shall be in accordance with figure 2. Protective trouser trim shall include a circumferential band around each leg between the hem and knee. Where trim on the trousers intersects a zipper, a maximum gap in the trim of one inch (twenty-five mm) shall be permitted.



FIGURE 2 Minimum required trouser trim patterns

- (11) Additional requirements for protective coveralls.
 - (a) That portion of the protective coverall which corresponds to the protective coat shall meet all requirements of paragraph (J)(9) of this rule.
 - (b) That portion of the protective coverall which corresponds to the protective trouser shall meet all requirements of paragraph (J)(10) of this rule.
- (12) Performance requirements.

Protective garments shall be capable of withstanding all tests specified in NFPA 1971, "Protective Ensemble for Structural Fire Fighting, 2007 Edition," with the following results:

(a) Thermal insulation.

The protective garment fabric composite consisting of outer shell, moisture barrier, and thermal barrier shall have an average thermal protective performance (tpp) of no less than thirty-five. Wristlets shall have a tpp of no less than twenty.

(b) Seam strength.

Woven, knit, or combination garment seam assemblies shall demonstrate a sewn seam strength equal to or greater than one hundred fifty lbf force for "Major A" seams, and forty lbf force for minor seams. Knit wristlet seams shall have a breaking strength of not less than forty-one lbf (one hundred eighty-one N).

(c) Flame resistance.

(i) The outer shell, moisture barrier, thermal barrier, collar linings, wristlets, drag rescue devices (DRD) winter liner fabric where provided, trim, lettering, and other materials used in garment construction including, but not limited to, padding, reinforcement, interfacing, binding, hanger loops, emblems, patches, and labels (if placed on the exterior of the garment) shall have an average char length of no more than four inches (101.6 mm), an average afterflame of no more than two seconds, and shall not melt or drip.

(ii) Zippers and seam-sealing materials shall meet the requirements specified in NFPA 1971, "Protective Ensemble for Structural Fire Fighting, 2007 Edition," only where located on the exterior of the garment or located where they will directly contact the wearer's body.

(iii) Elastic and hook and pile fasteners shall meet the performance requirements specified in NFPA 1971, "Protective Ensemble for Structural Fire Fighting, 2007 Edition," only where located where they will directly contact the wearer's body.

(d) Thermal shrinkage.

The outer shell, moisture barrier, thermal barrier, collar linings, wristlets, and winter liner fabric, where provided, shall not shrink more than ten per cent in any direction.

(e) Heat resistance.

- (i) The outer shell, moisture barrier, thermal barrier, collar linings, DRDs, and winter liner fabric, where provided, and other materials used in construction, including, but not limited to, padding, reinforcement, wristlets, labels, interfacing, binding, hanger loops, and emblems or patches, but excluding elastic and trim and hook and file fasteners when not placed in direct contact with the body, shall not melt, separate, or ignite.
- (ii) Garment moisture barrier seams shall not drip or ignite.
- (iii) Garment outer shells and collar linings shall not char.
- (iv) All garment hardware, excluding hook and pile fasteners, where placed so that they will not directly contact the wearer's body, shall not ignite and shall remain functional.

(f) Cleaning shrinkage.

The outer shell, moisture barrier, thermal barrier, collar linings, wristlets, and winter liner fabric shall not shrink more than five per cent in any direction.

(g) Total heat loss.

Garment composite consisting of outer shell, moisture barrier, and thermal barrier shall have a total heat loss of not less than two hundred five W/m².

(h) Whole garment liquid penetration.

Garment composite shall be tested for overall liquid penetration resistance and shall allow no liquid penetration.

(i) Tear strength.

(i) The outer shell fabric and collar linings shall have a tear strength of no less than twenty-two lbf (ten kg).

(ii) Garment moisture barriers, thermal barriers, and winter liners, where provided, shall have a tear strength of not less than five lbf.

(j) Water absorption.

The outer shell fabric and collar linings shall have a water absorption of no more than thirty per cent

(k) Viral penetration resistance.

Garment moisture barriers and moisture barrier seams shall be tested for resistance to liquid or blood-borne pathogens and shall allow no penetration of the PHI-X-174 bacteriophage for at least one hour.

(l) Water penetration resistance.

The moisture barrier fabric shall have a minimum water penetration resistance of twenty-five psi.

(m) Liquid penetration resistance.

Garment moisture barrier materials and seams shall show no penetration of the test liquids for at least one hour.

(n) Breaking strength.

Garment outer shells and collar linings shall be individually tested for strength after washing and shall have a breaking strength of not less than one hundred forty lbf (six hundred twenty-three N).

(o) Burst strength.

Knit wristlet material(s) shall be tested for material strength and shall have a burst strength of not less than fifty-one lbf (two hundred twenty-five N).

(p) Thread melting test.

All sewing thread utilized in the construction of garments and DRDs shall be made of an inherently flame-resistant fiber and shall not melt below five hundred degrees Fahrenheit (two hundred sixty degrees Celsius).

(q) Retroreflectivity and fluorescence.

Garment trim shall be tested for retroreflectivity and fluorescence and shall have a coefficient of retroreflection of not less than one hundred cd/lux/ft² (- one-hundred cd/lux/m²) and shall have the color fluorescent yellow-green, fluorescent orange-red, or fluorescent red.

(r) Conductive and compressive heat resistance.

The garment composite from the shoulder areas and the knee areas shall be tested for resistance to heat transfer and shall have a minimum cchr - (conductive and compressive heat resistance) rating of twenty-five for the shoulder area and for the knee areas.

(s) Label durability.

Labels shall be tested for durability and legibility and shall remain in place and shall be legible.

(t) DRD Test

(i) DRD materials, seams, splices, and joints shall be tested for material strength and have a minimum tensile strength of one thousand five hundred seventy-three lbf.

(ii) DRD shall be tested for functionality and shall allow for the mannequin (Rescue Randy Model one thousand four hundred seventy-five) to be dragged for a minimum of ninety-eight inches and the DRD deployed within ten seconds.

(u) Moisture barrier light degradation.

Garment moisture barrier shall be tested for light degradation and water shall not appear on the surface.

(v) Corrosion resistance.

All garment metal hardware and specimens of all garment hardware that include metal parts shall be individually tested for corrosion. Metals inherently resistant to corrosion including, but not limited to, stainless steel, brass, copper, aluminum, and zinc, shall show no corrosion of the base metal and shall remain functional.

(w) All hardware finish shall be free of rough spots, burrs, or sharp edges.

(x) Snaps shall meet the requirements of MIL-F-10884F "Fastener, Snap."

(y) Aramid hook and pile fastener tapes shall not be permitted.

(z) Zippers shall meet the requirements of A-A-55634, Commercial Item Description, Zippers "Fasteners, Interlocking, Slide." Zippers shall be size nine or larger when measured in accordance with A-A-55634.

(aa) Hooks and dees shall be non-ferrous and shall conform to the design of figure 3 of this rule.

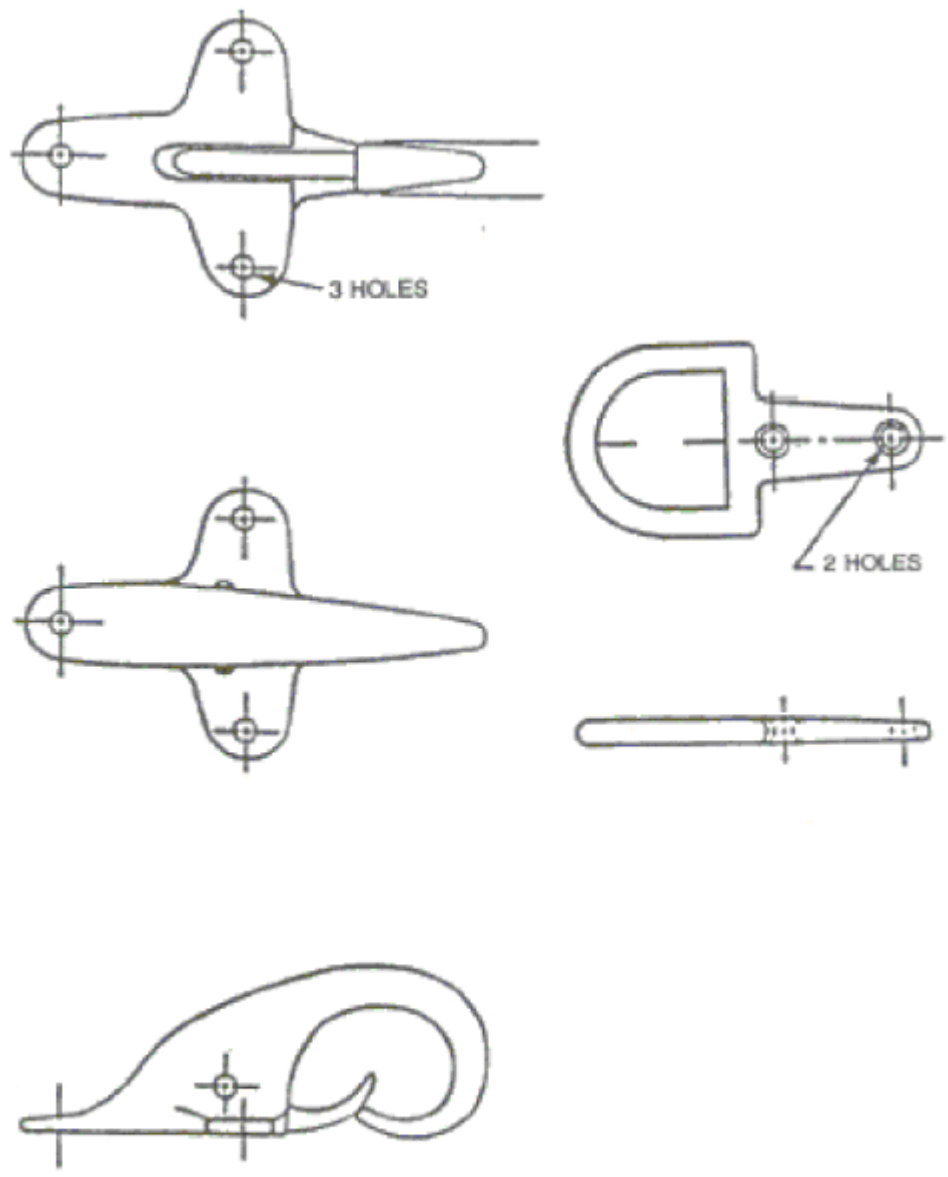


FIGURE 3
Hook and Dee Ring (Inward Facing)
Not to Scale

(K) Foot protection.

(1) Design requirements.

- (a) Protective footwear shall consist of a sole with heel, upper with lining, an insole, a puncture-resistant device, a ladder shank or whole sole equivalent and an impact and compression-resistant toecap permanently attached.
- (b) Protective footwear shall be no less than ten inches in height when measured from the plane of the wear surface at the heel to the lowest point of the throat.
- (c) The heel breast shall be no less than one-half inch or more than one inch. The heel breasting angle shall be no less than ninety degrees or more than one hundred thirty-five degrees. The edges shall not be less than, or extend more than, one-half inch laterally from the upper at any point. The width of the footwear heel shall be equal to or greater than the width of the sole at the intersection of the heel breast and the sole bottom.
- (d) Metal parts shall not penetrate from the outside to the lining or insole at any point. All hardware and external fittings shall be free of rough spots, burrs, or sharp edges.
- (e) No metal parts, including but not limited to nails or screws, shall be present or used in the construction or attachment of the sole (with heel) to the puncture-resistant plate, insole, or upper.
- (f) The puncture-resistant device shall cover the maximum area of the insole.

(2) Performance requirements.

Protective footwear shall be capable of withstanding all tests specified in NFPA 1971, "Protective Ensemble for Structural Fire Fighting, 2007 Edition," with the following results:

(a) Heat resistance.

No part of the footwear shall melt, separate, or ignite, and all accessories shall remain functional and show no water penetration.

(b) Corrosion resistance.

Metal parts of protective footwear, including but not limited to the toecap, ladder shank, puncture-resistant plate and accessories, shall show no sign of corrosion or oxidation, and accessories shall remain functional, after

individual exposure to a five per cent saline solution for no less than twenty hours.

(c) Puncture resistance.

(i) Protective footwear shall not allow puncture through the sole with heel when tested to no less than two hundred seventy-two lbf.

(ii) The footwear upper shall not puncture under an average applied force of thirteen lbs.

(iii) The footwear puncture-resistance device shall be tested for resistance to flex cracking and show no signs of cracking.

(d) Electrical resistance.

Protective footwear shall have an electrical leakage of less than three - milliamperes when tested to fourteen thousand volts.

(e) Compression and impact resistance.

(i) Compression: two thousand five hundred pounds.

(ii) Impact: seventy-five foot-pounds.

(f) Upper cut resistance.

Protective footwear shall have a cut distance resistance of more than 0.8 - inch (twenty mm).

(g) Liquid penetration liquid resistance.

Protective footwear shall not allow liquid penetration through the lining at any point for at least one hour.

(h) Flame resistance.

Protective footwear shall have an afterflame of no more than two seconds and shall not melt or drip, and shall not exhibit any burn-through.

(i) Abrasion resistance.

The sole with heel shall have an abrasion resistance rating of no less than one hundred.

(j) Conductive heat resistance.

(i) The temperature of the insole surface in contact with the foot shall not exceed one hundred eleven degrees Fahrenheit.

(ii) The temperature of the upper lining surface in contact with skin shall have a second-degree burn time of not less than ten seconds and shall have a pain time of not less than six seconds.

(k) Radiant heat resistance.

The temperature of the upper lining surface in contact with the skin shall not exceed one hundred eleven degrees Fahrenheit.

(l) Viral penetration resistance.

The footwear upper material composite, upper seams, and vamp seams shall allow no penetration of the test liquids for at least one hour.

(m) Ladder shank bend resistance.

The ladder shank shall not deflect more than one-fourth inch.

(n) Thread melting test.

All sewing thread utilized in the construction of the footwear shall be made of an inherently flame-resistant fiber. All sewing thread utilized shall not melt below five hundred degrees Fahrenheit (two hundred sixty degrees Celsius).

(o) Slip resistance.

The soles shall have a static coefficient of 0.75 or greater in a dry condition.

(p) Attachment.

Footwear stud posts and eyelets shall have a minimum detachment strength of sixty-six lbf.

(q) Label durability.

Labels shall remain in place and shall be legible to the unaided eye.

(3) Labeling requirements.

(a) Labels shall be legible to the naked eye and permanently affixed to all protective footwear by stamping, embossing, gluing, or stitching.

(b) Labels shall state:

- (i) "This structural fire fighting protective footwear meets the footwear requirements of NFPA 1971, 2007 Edition. Do Not Remove This Label."
- (ii) Manufacturer's name, identification, or designation.
- (iii) Manufacturer's address.
- (iv) Country of manufacture.
- (v) Size or size range.
- (vi) Model or stock number.
- (vii) Manufacturer's element identification number, lot or serial number.
- (viii) Month and year of manufacture.
- (ix) Principle material(s) of construction.
- (x) Cleaning precautions.
- (xi) Certification organization's label, symbol, or identifying mark.

(L) Head protection.

- (1) Head protection shall consist of a fire fighters' helmet and a protective hood. The helmet shall consist of a shell, an energy-absorbing system, a retention system, retroreflective and fluorescent markings, ear covers, and either a faceshield, or goggles, or both.
- (2) Each helmet shall be durably and legibly labeled in a manner such that the label can be easily read without removing any permanent helmet part. Each label shall include the following information:
 - (a) "This structural fire fighting protective helmet meets the helmet requirements of NFPA 1971, 2007 Edition. Do not remove this label."
 - (b) Name, identification, or designation of manufacturer.
 - (c) Manufacturer's address.
 - (d) Country of manufacture.

- (e) Manufacturer's element identification number, lot number, or serial number.
 - (f) Model number, name, or design.
 - (g) Month and year of manufacture (not coded).
- (h) Cleaning precautions.
- (i) Helmet size or size range.
 - (j) Principle material(s) of construction.
 - (k) Certification organization's label, symbol, or identifying mark.
- (3) The helmet manufacturer shall place a unique manufacturer's part number, the symbol of the certification organization, and the words "N FPA 1971, 2007 Edition" permanently on each replaceable critical part of the goggle lens or faceshield.
- (4) The helmet with faceshield/goggle component(s) stowed shall provide peripheral vision clearance of at least ninety-four degrees to each side when measured from the center of the eye with the helmet positioned according to its helmet positioning index on the Alderson fiftieth-percentile male headform.
- (5) The faceshield or faceshield/goggle component shall be attached to the helmet. When deployed in accordance with its helmet eye/face-positioning indexes on the Alderson fiftieth-percentile male headform, the faceshield or faceshield/goggle component shall provide at least the following field of vision when measured from the center of the eye:
- (a) A dihedral angle of at least eighty-five degrees.
 - (b) An upper dihedral angle of at least ten degrees.
 - (c) A lower dihedral angle of at least forty degrees.
- (6) Where the goggle component is selected, the goggles shall be permitted to be unattached, not assembled, to the helmet.
- (7) There shall be no openings penetrating the shell except those provided by the manufacturer for mounting energy-absorbing systems, retention systems, and accessories.

- (8) The addition of helmet accessories shall not interfere with the function of the helmet or its component parts and shall not degrade the helmet's performance below the requirements of this rule.
- (9) The retention system shall include a chin strap and a nape device. The chin strap shall have a minimum width of three-fourths inch (nineteen mm).
- (10) The helmet ear covers or portion of the helmet providing the coverage of the ears, when deployed with the helmet positioned on the ISO J headform according to its helmet positioning index, shall provide at least the following coverage from the reference plane downward to the lower edge of the ear covers:
 - (a) Three and three-fourths inches (ninety-five mm) where measured two inches (fifty mm) forward of the coronal plane.
 - (b) Four and three-fourths inches (one hundred twenty mm) where measured one inch (twenty-five mm) forward of the coronal plane.
 - (c) Five and 1/8 inches (one hundred thirty mm) where measured at the coronal plane.
 - (d) Five and 1/8 inches where measured at the midsagittal plane at the rear of the headform.
- (11) All sewing thread used in construction of helmets shall be made in inherently flame-resistant thread.
- (12) Performance requirements.

Helmets shall be capable of withstanding all tests specified in NFPA 1971, "Protective Ensemble for Structural Fire Fighting, 2007 Edition," with the following results:

- (a) Top impact requirement: force transmission.
 - No sample shall transmit an average force of more than eight hundred fifty pounds.
- (b) Top, front, side, and back impact requirement: acceleration.
 - (i) The maximum acceleration shall be as indicated in table 1 of this rule.

-Table 1-

	Maximum accelerations		
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Impact Location	Maximum Acceleration*	(M/Sec/Sec)	(FT/Sec/Sec)
Top	150 x Gn	(1471.5)	(4830)
Front	300 x Gn	(2943.0)	(9660)
Side	300 x Gn	(2943.0)	(9660)
Back	300 x Gn	(2943.0)	(9660)

[Comment: *Gn denotes "gravitational acceleration" which is defined as 9.81 meters per second per second (32.2 feet per second per second.)]

- (ii) Acceleration durations above two hundred Gn shall not exceed three milliseconds; acceleration durations above one hundred fifty Gn shall not exceed six milliseconds.

(c) Penetration resistance.

Helmets shall exhibit no electrical or physical contact between the penetration test striker and the headform.

(d) Heat resistance.

- (i) Helmets shall be conditioned for both radiant and convected heat (heat and thermal shrinkage test) and shall meet the requirements of paragraphs (L)(12)(a) to (L)(12)(c) of this rule.

- (ii) When subjected to heat resistance test conditions, helmets shall:

- (a) Have no part of the helmet shell touch the headform.
- (b) Have no shell distortion in the back of the head extend more than one and five-eighths inches below the original position of the helmet.
- (c) Have no distortion of the front and side of the headform extend more than one and three-sixteenths inches below the original position of the helmet.
- (d) Have no separation, melting, nor dripping of the retention system, energy-absorbing system, or ear covers.
- (e) Have no dysfunctional chin strap closure device.
- (f) Have no ignition of any part of the helmet assembly.
- (g) Have no ignition nor melting of the product labels.

(h) Have no part of the faceshield/goggle component that was below the brim line prior to the test be below the brim line after the test.

(i) Have no dripping of the faceshield/goggle component.

(e) Flame resistance.

Helmets shall show no visible flame or glow five seconds after removal from the test flame.

(f) Electrical insulation.

Helmets shall not have a leakage current exceeding three milliamperes.

(g) Corrosion resistance.

All helmet metal hardware shall show no more than light surface-type corrosion or oxidation and shall remain functional. Ferrous metals shall show no corrosion of the base metal and shall remain functional.

(h) Label durability and legibility.

Labels shall remain in place and shall be legible.

(i) Retention system.

(i) The retention system shall not break or slip or stretch more than thirteen-sixteenths inches.

(ii) The suspension system shall not separate from the helmet shell during testing.

(iii) The helmet shell shall not separate from the helmet suspension and retention systems.

(j) Ear covers and chin straps.

(i) Materials used for ear covers and chin straps shall have a maximum char length of four inches, an afterflame of two seconds, and shall not melt or drip.

(ii) Materials used for ear covers and chin straps shall not shrink more than ten per cent in any direction, and shall not melt, separate, or ignite. Helmet chin strap material shall meet the thermal shrinkage requirement for the length dimension only.

(iii) All sewing thread used in the construction of helmets shall be of inherently flame-resistant fiber and shall not melt below five hundred degrees Fahrenheit (two hundred sixty degrees Celsius).

(iv) Helmet ear covers shall have an average TPP rating of at least 20.0.

(k) Faceshield/goggles.

(i) Faceshield/goggle components shall have no contact with an eye of the headform nor shall any parts or fragments be ejected from the component that could contact the eye of the headform from the impact resistant test.

(ii) Faceshield/goggle components and all attachment hardware shall not show any visible afterflame for five seconds.

(iii) All fabrics used in the construction of faceshield/goggle components shall not have a char length of more than four inches average and shall not have an afterflame of more than five seconds.

(iv) Faceshield/goggle component lenses shall not exhibit a delta haze of greater than twenty-five per cent.

(v) Clear lenses shall transmit no less than eighty-five per cent of the incident-visible radiation. Colored lenses shall transmit a minimum of forty-three per cent of the incident visible radiation.

(l) Fluorescent retroreflective markings.

(i) Helmets shall have fluorescent retroreflective markings on the shell exterior. A minimum of four square inches of the retroreflective markings shall be visible when the helmet, with the faceshield/goggle component in the stowed position, is viewed at the intersection of the midsagittal plane and the coronal plane at a distance of eight feet (2.4 m).

(ii) Helmet trim shall have a coefficient of retroreflection of not less than one hundred cd/ft candle/ft^2 (cd/lux/m^2) and shall have the color be fluorescent yellow-green, fluorescent orange-red, or fluorescent red.

(M) Primary eye protection.

(1) Primary eye protection appropriate for a given specific hazard shall be provided for and used by employees exposed to that specific hazard.

- (2) Primary eye protection shall meet the requirements of ANSI Z87.1. Practice for occupational and educational eye and face protection.
- (3) The helmet faceshield, or flip-down eye shields, alone shall not be considered and shall not be used as primary eye protection.
- (4) The full facepiece of SCBA, with the regulator attached, shall constitute face and primary eye protection.

(N) Protective Hood

- (1) The hood shall be designed to cover and provide the limited protection to the head, face, and neck areas that do not receive primary protection from the helmet or the "SCBA" facepiece.
- (2) The hood shall be donned properly, in accordance with the manufacturer's instructions for wearing.
- (3) The hood shall provide a minimum coverage (as measured on the ISO size J headform) as follows:
 - (a) On each side measured downward from the reference plane at the coronal plane of nine inches (two hundred thirty mm).
 - (b) In the back measured downward from the reference plane at the rear midsagittal plane of thirteen inches (three hundred thirty mm).
 - (c) In the front measured downward from the reference plane at the front midsagittal plane, excluding the face opening, of twelve inches (three hundred five mm).
- (4) The hood shall be designed with a face opening. Other than where the hood face opening is designed to interface with a specific "SCBA" facepiece or where the hood face opening is designed to be adjustable, the opening shall measure five and five-eighths inches, plus zero/minus one inch (one hundred forty-five mm, plus zero/minus twenty-five mm) in any direction when the hood is laid out in a relaxed condition on a flat surface, smoothed out, and with the face opening up.
- (5) Where the hood face opening is provided with manual adjustment, the hood face opening shall be adjustable to achieve a face opening of five and five-eighths inches (one hundred forty-five mm).
- (6) Where the hood face opening is designed to interface with a specific "SCBA" facepiece, the hood face opening shall overlap the outer edge of the specific "SCBA" facepiece-to-face seal perimeter by not less than one-half inch (thirteen mm).

- (7) The hood shall have a label(s) permanently and conspicuously attached upon which the following information is legibly printed:
- (a) "This structural fire fighting hood meets the hood requirements of NFPA 1971, 2007 Edition. Do Not Remove this label."
 - (b) Manufacturer's name, identification, or designation.
 - (c) Manufacturer's address.
 - (d) Country of manufacture.
 - (e) Manufacturer's element identification number, lot number, or serial number.
 - (f) Month and year of manufacture (not coded).
 - (g) Model name, number or design.
 - (h) Size or size range.
 - (i) Principle material(s) of construction.
 - (j) Cleaning precautions.
 - (k) Certification organization's label, symbol, or identifying mark.
- (8) Where the hood is designed to be used with a specific "SCBA" facepiece(s), the hood manufacturer shall add to the hood product label the following statement: "This hood is designed to be used only with (Manufacturer to insert specific SCBA facepiece(s), model(s), and size(s) in this space) for compliance with NFPA 1971. This hood can only be used with the above noted facepiece(s)."
- (9) Hoods shall be capable of withstanding all tests specified in NFPA 1971, "Protective Ensemble for Structural Fire Fighting, 2007 Edition," with the following results:
- (a) Hood opening size retention.
 - (i) Hood face openings that are not manually adjustable or that are not designed for interface with a specific "SCBA" facepiece shall retain at least eighty per cent of the original face opening size but shall not exceed five and five-eighths inches (one hundred forty-five mm).
 - (ii) Where hood openings are designed to interface with a specific "SCBA" facepiece, the hood shall overlap the outer edge of the specific "SCBA"

facepiece-to-face seal perimeter by not less than one-half inch (thirteen mm).

(b) Thermal protective performance.

Hoods shall have a tpp of not less than twenty.

(c) Flame resistance.

Hood material(s), including labels but excluding hook and pile fasteners and elastic when placed in direct contact with the body, shall not have a char length of more than four inches (one hundred mm) average, shall not have an afterflame of more than two seconds average, and shall not melt or drip.

(d) Heat and thermal shrinkage.

(i) Hood material(s), excluding labels, hook and pile fasteners and elastic, shall not shrink more than ten per cent in any direction.

(ii) Hood material(s), including labels but excluding hook and pile fasteners and elastic when these items are placed where they will not directly contact the wearer's body, shall not melt, separate, or ignite.

(e) Cleaning shrinkage.

Hood material(s), including labels but excluding hook and pile fasteners and elastic when these items are placed where they will not directly contact the wearer's body, shall not shrink more than five per cent in any direction.

(f) Thread melting test.

All sewing thread utilized in the construction of hoods shall be made of an inherently flame-resistant fiber and shall not melt below five hundred degrees Fahrenheit (two hundred sixty degrees Celsius).

(g) Burst strength.

Knit hood material(s) shall have a burst strength of not less than fifty-one lbf (two hundred twenty-five N).

(h) Seam-breaking strength.

Knit hood seams shall have a burst strength of not less than forty-one lbf (one hundred eighty-one N).

(i) Label durability and legibility.

Labels shall remain attached to the hood and shall be legible to the unaided eye.

(O) Personal alert safety system ("PASS").

- (1) Each member shall be provided with, use, and activate his\her "PASS" device in all emergency situations that could jeopardize that person's safety due to atmospheres that could be IDLH, incidents that could result in entrapment, structural collapse of any type, or as directed by the incident commander or incident safety officer.
- (2) Each "PASS" device shall be tested at least weekly and prior to each use.
- (3) Each "PASS" device shall be maintained in accordance with the manufacturer's instructions.
- (4) Each "PASS" device shall have a product label(s) permanently and conspicuously attached upon which the following information is legibly printed:
 - (a) "This PASS meets the requirements of NFPA 1982, Standard on Personal Alert Safety Systems (PASS), 2007 Edition. Do not remove this label."
 - (b) Manufacturer name, identification, or designation.
 - (c) Country of manufacture.
 - (d) Model name, number, or design.
 - (e) Identification, lot, or serial number.
 - (f) Month and year of manufacture (not coded).
 - (g) Recommended power source type and size if user replaceable.
 - (h) Certification organization's label, symbol, or identifying mark.
 - (i) "PASS" also shall meet the labeling requirements for Class I, Division I Hazardous Locations of ANSI/UL 913, "Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division I Hazardous Locations."
- (5) "PASS" devices can be designed to be either a stand-alone "PASS," or a "SCBA-integrated PASS, which can be removable/non-removable."

- (6) PASS shall incorporate data logging in nonvolatile memory and, at a minimum, the following events shall be identified and recorded with the data log and shall also have a date and time stamp for each event in the data log:
- (a) When PASS is turned on;
 - (b) When PASS activates any alarm or pre-alarm;
 - (c) When PASS alarm is activated by the user;
 - (d) When the PASS alarm was reset;
 - (e) When the PASS was turned off;
 - (f) When the PASS low power source warning signal activates.

The data logging information shall be downloadable by the employer.

- (7) "PASS" shall incorporate a mode selection device or devices to allow for operation in at least three modes: "Off," "Alarm," and "Sensing."
- (a) All mode selection devices shall be capable of being switched to the alarm or sensing mode by a single gloved hand.
 - (b) Only one action shall be required to switch the mode selection device(s) from any mode to alarm.
 - (c) When "PASS" is sounding the alarm signal it shall require at least two separate and distinct manual actions to silence the alarm signal.
- (8) PASS shall be provided with a light source capable of providing a visual indication of mode status as well as an audible source capable of providing an aural indication of a change in the mode selection when switching from "off" to "alarm" and "alarm" to "sensing."
- (9) "PASS" shall incorporate a motion detector, and while in the sensing mode, shall sound the alarm signal when the "PASS" is motionless for thirty seconds, plus five/minus zero seconds. The alarm signal shall be preceded by a pre-alarm signal that shall sound ten seconds, plus three/minus zero seconds, before the sounding of the alarm signal.
- (a) The motion detector shall be operable regardless of the angle of deployment of the "PASS."
 - (b) Any failure of the motion detector shall cause the "PASS" to sound the alarm signal within thirty seconds, plus five/minus zero seconds, of such failure.

- (10) "PASS" shall emit an audible operational signal within one second of being switched to sensing mode, indicating to the user that the device is functioning properly.
- (11) "PASS" shall have at least an audible primary pre-alarm signal. The primary pre-alarm signal shall be a distinct and different sound from the alarm signal. This signal shall sound no more than ten seconds prior to the sounding of the alarm signal.
- (12) "PASS" shall sound the alarm signal when switched to the alarm mode. The alarm signal shall have a duration of at least one hour at a sound pressure level of not less than ninety-five dBa.
- (13) While in the sensing mode, "PASS" shall emit a recurrent audible low power source warning signal when the battery voltage is depleted to the level that will maintain the alarm signal level of at least ninety-five dBa for at least one hour. This sound shall be distinct and different from the pre-alarm and alarm signals. The low power source warning signal shall have an interval of not greater than thirty seconds.
- (14) The cancellation of the pre-alarm signal or the silencing of the alarm signal shall automatically reset the "PASS" to the sensing mode.
- (15) "PASS" devices shall be capable of withstanding all performance requirement tests specified in NFPA 1982, "Personal Alert Safety Systems (PASS), 2007 Edition," with the following results:

- (a) Primary pre-alarm signal.

The primary pre-alarm signal shall have an initial sound pressure level of at least eighty dBa to ninety-five dBa. Within six to ten seconds the sound pressure level shall increase, in at least two distinct sound pressure level increments, to at least one hundred dBa and shall remain at or above one hundred dBa for an additional three to five seconds. The entire primary pre-alarm signal shall not sound for more than thirteen seconds.

- (b) Alarm signal.

The alarm signal shall have the sound pressure level be not less than ninety-five dBa for an uninterrupted duration of not less than one hour. The alarm signal, once activated, shall not be deactivated by the motion detector.

- (c) Low power source warning signal.

The low power source warning signal shall have the sound pressure level be between seventy and one hundred dBa and shall have the signal continue to sound until the power source voltage is depleted to the level that will no longer operate the "PASS," but not less than one hour.

(d) Signal frequency.

(i) The primary pre-alarm signal shall consist of a minimum of two primary frequencies, shall not be less than one thousand hertz nor more than two thousand hertz, and shall have these frequencies sounded either sequentially or simultaneously.

(ii) The alarm signal shall consist of a minimum of three primary frequencies, at least one of which shall be five-hundred hertz, plus/minus twenty hertz, and at least two other frequencies shall not less than one thousand hertz nor more than four thousand hertz, and shall have these frequencies be sounded either sequentially or simultaneously.

(e) Electronic temperature stress.

"PASS" shall be subjected to a series of three temperature stress tests: elevated temperature, low operating temperature, and temperature shock. "PASS" shall be evaluated for proper functioning and meet the requirements as specified in paragraphs (O)(6) to (O)(14) of this rule and shall have the data logging functions operating properly.

(f) Corrosion resistance.

"PASS" shall be tested for resistance to corrosion and shall be evaluated for proper functioning and meet the requirements as specified in paragraphs - (O)(6) to (O)(14) of this rule and shall have the data logging functions operating properly.

(g) Immersion/leakage resistance.

"PASS" shall be tested for resistance to leakage by covering the uppermost point of the "PASS" with a depth of 4.9 feet (1.5 m) of water. There shall be no water inside the battery compartment(s) and shall have no water in the electronics compartment(s). "PASS" shall be evaluated for proper functioning and meet the requirements as specified in paragraphs (O)(6) to - (O)(14) of this rule and shall have the data logging functions operating properly.

(h) Case integrity.

"PASS" shall support the test weight of four hundred forty-two pounds (two hundred kg) on all surfaces of the pass case for one minute, plus fifteen/minus zero seconds, without affecting case integrity or causing visible damage. "PASS" shall be evaluated for proper functioning and meet the requirements as specified in paragraphs (O)(6) to (O)(14) of this rule and shall have the data logging functions operating properly.

(i) Shock sensitivity.

"PASS" shall be tested for signal cancellation sensitivity and the pre-alarm signal shall not cancel.

(j) Impact and vibration resistance.

"PASS" shall be tested for resistance to vibration and resistance to impact, and shall be evaluated for proper functioning and meet the requirements as specified in paragraphs (O)(6) to (O)(14) of this rule and shall have the data logging functions operating properly. Nonremovable SCBA integrated PASS shall not be required to meet the impact acceleration resistance test.

(k) Retention system.

The retention system shall withstand a static force of not less than one hundred lbf (four hundred forty-five n) without separating. Nonremovable "SCBA"-integrated pass shall not be required to meet this requirement.

(l) Water drainage.

"PASS" shall be tested for water drainage and shall have the sound pressure level of the alarm signal be not less than ninety-five dBa at the sixty-second mark.

(m) Heat resistance.

"PASS" shall be tested at five hundred degrees Fahrenheit, plus ten degrees/minus zero degrees Fahrenheit (two hundred sixty degrees Celsius, plus 5 degrees/zero degrees Celsius) for a minimum of thirty minutes and shall not melt, drip, or ignite.

(n) Heat and flame resistance.

(i) The afterflame shall not exceed 2.2 seconds.

(ii) Nothing shall fall off the "PASS," and the "PASS" shall not fall from its mounted position.

(iii) "PASS" shall be evaluated for proper functioning and meet the requirements as specified in paragraphs (O)(6) to (O)(14) of this rule and shall have the data logging functions operating properly.

(o) Intrinsic safety.

"PASS" shall be tested for intrinsic safety as specified in ANSI/UL 913, standard for intrinsically safe apparatus and associated apparatus for use in class I, II, and III, division I hazardous locations, and shall meet the requirements for class I, division I hazardous locations and shall meet the requirements for class I, groups C and D, and class II groups E, F, and G, division I hazardous locations.

(p) Product label durability.

Product labels shall remain attached to the "PASS" and shall be legible to the unaided eye.

(q) Alarm signal muffle test.

PASS shall be tested for resistance to sound pressure level deadening or muffling and shall have the sound pressure level deadening or muffling and shall have the sound pressure level not be less than ninety-five dBa.

(P) Respiratory protection.

- (1) All fire fighters exposed to hazardous atmospheres from fires and other emergencies, or where the potential for such exposure exists, shall be provided with self-contained breathing apparatus ("SCBA") approved by the national institute for occupational safety and health (NIOSH) and the mine safety and health administration (MSHA).
- (2) The fire department shall adopt and maintain a respiratory protection program that addresses the selection, inspection, safe use, and maintenance of respiratory protection equipment, training in its use, and the assurance of air quality testing.
- (3) All members who might be required to use respiratory protection equipment shall be medically certified by a physician, or by a state of Ohio licensed health care professional who can perform medical evaluations under the supervision of a physician, on an annual basis. Medical certification can be obtained by a medical examination, or by using the medical questionnaire as referenced in CFR 1910.134 Appendix C.
- (4) The facepiece seal capability of each member qualified to use "SCBA" shall be verified by qualitative fit testing on an annual basis and whenever new types of "SCBA" or facepieces are issued. Each new member shall be tested before

being permitted to use SCBA in a hazardous atmosphere. Only members with a properly fitting facepiece shall be permitted by the fire department to function in a hazardous atmosphere with "SCBA."

- (5) Only "SCBA" with an approved service life of thirty minutes or more shall be considered acceptable.
- (6) The following "SCBAs" shall be considered to meet the requirements of this rule:
 - (a) Open circuit "SCBA" of the positive-pressure type that operate only in the pressure demand mode.
 - (b) Open circuit "SCBA" of the positive-pressure type, equipped with an air flow control device for doffing and donning purposes only. Such air flow control device shall not permit the continued use of the "SCBA" in the demand mode after donning.
 - (c) Closed circuit "SCBA" with a rated service life of more than two hours and a minimum protection factor of five thousand, as determined by an acceptable quantitative fit test performed on each individual. Such "SCBA" are acceptable only when long-duration respiratory protection is deemed necessary by the employer. Closed circuit "SCBA" shall operate in the positive-pressure mode only.
- (7) Open circuit "SCBA" approved by NIOSH/MSHA for use in the demand mode or for use in both the demand mode and the pressure demand mode are prohibited.
- (8) Breathing air supplied for a "SCBA" shall be of at least grade D quality as specified in "Compressed Gas Association Commodity Specification for Air, Pamphlet G-7.1" and shall have a dew point level of minus sixty-five degrees Fahrenheit (minus fifty-four degrees Celsius) or dryer (twenty-four v/v or less) and a maximum particulate level of five mg/m³ air.
- (9) Breathing air quality shall be tested quarterly and shall meet the requirements of paragraph (P)(8) of this rule. This shall also apply to vendor-supplied and other fire department-supplied compressed breathing air. The department receiving supplied air shall require the supplier to provide documentation that the air received has been tested quarterly and that it meets the requirements of paragraph (P)(8) of this rule. Written records shall be maintained.
- (10) The employer shall not permit any known interference with the facepiece-to-face seal or with the operation of the exhalation valve on the full facepiece of an "SCBA" on employees who are exposed to hazardous atmospheres from fires and other emergencies or where the potential for such exposure exists.

- (11) Respiratory equipment shall be inspected, maintained, and repaired in accordance with the manufacturer's recommendations. Maintenance shall include at least:
 - (a) A written record of such inspection and maintenance for each piece of equipment.
 - (b) Regulator calibration performed by a manufacturer-authorized person at no more than twelve-month intervals.
- (12) Approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus, provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet department of transportation (DOT) and NIOSH criteria.
- (13) SCBA cylinders shall be hydrostatically tested within the periods specified by the manufacturer and by DOT and NIOSH/MSHA.
- (14) The practice of buddy breathing by any means is strictly prohibited. Buddy breathing is the practice of sharing a single SCBA breathing air source between two persons.
- (15) The use of a universal air connection will be permitted to replenish the breathing air cylinder of an SCBA user from an independent rescue breathing air supply source. An independent rescue breathing air supply source does not include the breathing air from an SCBA being worn by another firefighter.

(Q) Hand protection.

- (1) Hand protection shall consist of protective gloves or a glove system which allows dexterity of hand movement and a sense of feel for objects.
- (2) Gloves of the gauntlet type shall be allowed if the protective coat provided has a protective resilient wristlet with a thumb opening.
- (3) Gloves shall be maintained and repaired in accordance with the manufacturer's requirements. If gloves cannot be repaired properly without decreasing the protective qualities required by this rule, they shall be replaced with gloves that meet the requirements of paragraph (Q) of this rule.
- (4) A label which includes the following information shall be permanently attached to each glove:

- (a) "This structural fire fighting glove meets the glove requirements of NFPA 1971, Standard on Protective Ensemble for Structural Fire Fighting, 2007 Edition. Do Not Remove This Label."
 - (b) Manufacturer's name, identification, or designation.
 - (c) Manufacturer's address.
 - (d) Manufacturer's element, identification, lot or serial number.
 - (e) Month and year of manufacture (not coded).
 - (f) Size or size range.
 - (g) Principle material(s) of construction.
 - (h) Cleaning precautions.
 - (i) Certification organization's label, symbol, or identifying mark.
- (5) Design requirements.
- (a) Gloves for structural fire fighters shall be made of durable outer material designed to withstand the effects of flame, heat, vapor, liquids, sharp objects, and other hazards that are encountered during structural fire fighting.
 - (b) Gloves shall be designed to give minimum interference to physical movement, the use of fire fighting tools, and "SCBA."
 - (c) Wrist protection shall be designed to prevent burns or injury by providing complete covering under all conditions to the wrist area.
 - (d) Wrist protection may be provided by either of the following methods:
 - (i) Gloves, including wristlets, that extend no less than two inches above the wrist crease as shown in figure 4 to this rule; or
 - (ii) Wristlets attached to the sleeves of the protective coat that extend to fit around the palm of the hand (see figure 4).

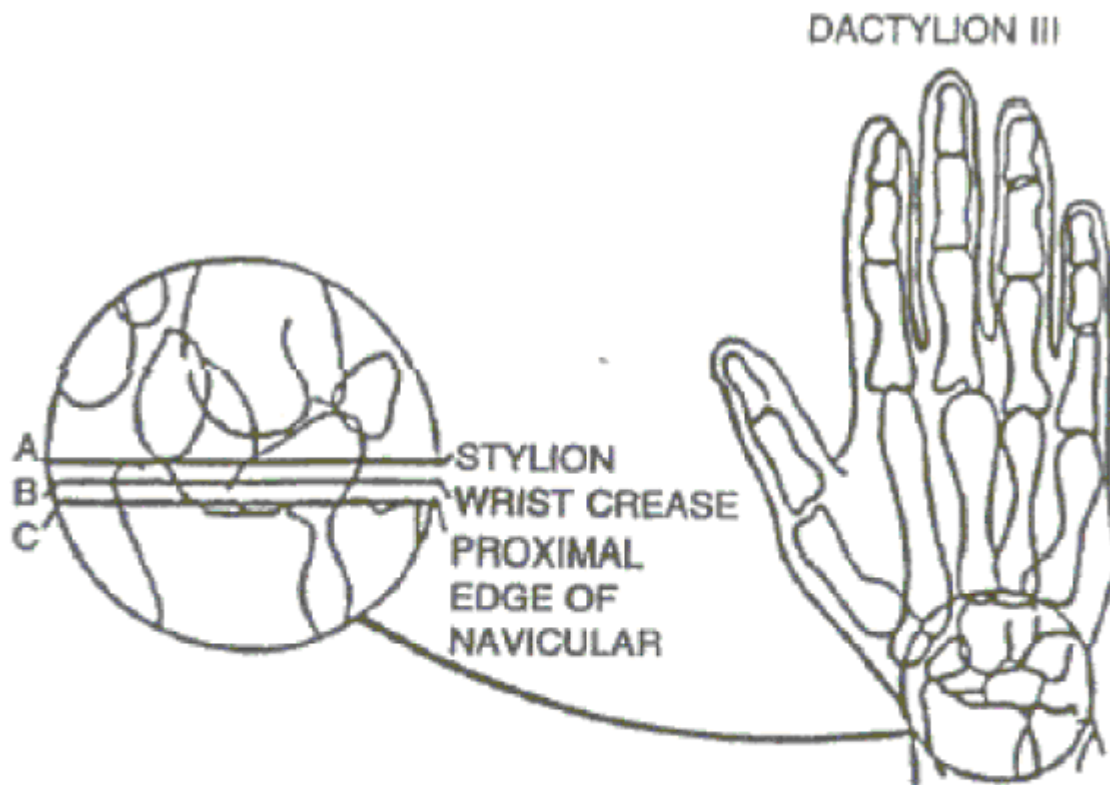


FIGURE 4
Anatomical Landmarks
at Base of Hand

- (e) Gloves shall be close-fitting above the wrist to restrict entry of liquids, embers, and other foreign particles.
 - (f) The glove material in contact with the skin shall be nonirritating.
- (6) Performance requirements.

Gloves shall be capable of withstanding all tests specified in NFPA 1971, "Protective Ensemble For Structural Fire Fighting, 2007 Edition," with the following results:

- (a) Thermal protective performance.

- (i) The glove body shall have an average tpp rating of at least thirty-five.
- (ii) Glove gauntlet or glove wristlet composite shall have an average tpp of at least twenty.

(b) Heat and thermal shrinkage resistance.

- (i) Gloves shall not separate, melt, or ignite. Gloves shall not shrink more than eight per cent in length and width, and shall be donnable and flexible. Wristlet material shall not shrink five percent in any direction.
- (ii) The innermost separable layer of the glove body composite that is designed to come into contact with the wearer's skin shall not melt, separate, or ignite.
- (iii) Wristlet material shall not shrink more than ten per cent in any direction.

(c) Flame-resistance.

Gloves and wristlet material shall not melt or drip. Gloves and wristlet material shall not exceed the following average values:

- (i) Afterflame: two seconds.
- (ii) Char length: four inches.
- (iii) Original weight: five per cent.

(d) Conductive heat-resistance.

The glove shall have a second-degree burn time of not less than ten seconds and shall have a pain time of not less than six seconds.

(e) Thread melting test.

All sewing thread utilized in the construction of gloves and wristlet material shall be made of an inherently flame-resistant fiber and shall not melt below five hundred degrees Fahrenheit (two hundred sixty degrees Celsius).

(f) Liquid penetration.

Gloves shall allow no penetration of test liquids for at least one hour.

(g) Viral penetration.

Gloves shall be tested for liquid or blood-borne pathogens and shall allow no penetration of the PHI-X-174 "Bacteriophage" for at least one hour.

(h) Cut-resistance.

Gloves shall have a cut distance resistance of more than 0.8 inch (twenty mm).

(i) Puncture-resistance.

Gloves shall not be punctured under an average applied force of 8.8 lbs (four N).

(j) Hand function.

Gloves shall have an average percent of barehand control not exceeding three hundred per cent.

(k) Grip test.

Gloves shall have a weight pulling capacity not less than ninety per cent of the bare-handed control valve.

(l) Burst strength.

Knit glove wristlet materials shall have a burst strength of not less fifty lbs (two hundred twenty-five N).

(m) Seam breaking strength.

Knit glove wristlet seams shall have a burst strength of not less than forty-one lbs (one hundred eighty-two N).

(n) Liner retention.

Gloves shall have no detachment of the inner liner or moisture barrier.

(o) Donning.

Gloves shall have:

(i) Dry hand donning time not to exceed ten seconds;

(ii) Wet hand donning time not to exceed fifteen seconds;

(iii) No detachment of the inner liner and moisture barrier;

(iv) Shall allow full insertion of all digits.

(p) Overall liquid integrity.

Gloves shall show no leakage of water.

(q) Corrosion test.

Any glove metal hardware that is inherently resistant to corrosion including, but not limited to, stainless steel, brass, copper, aluminum, and zinc shall show no more than light surface-type corrosion or oxidation and shall remain functional. Ferrous metals shall show no corrosion of the base metal and shall remain functional.

(r) Label durability and legibility.

Labels shall remain in place, and shall be legible.

(R) Fall protection.

(1) Life safety rope.

(a) Light-use life safety rope shall have a diameter of three-eighths inch (9.5 mm) or greater and less than one-half inch (12.5 mm). It shall have a minimum breaking strength of not less than four thousand four hundred ninety-six lbf (twenty kn). The minimum elongation shall be less than one percent at ten percent of breaking strength, and the maximum elongation shall not be more than ten percent at ten percent of breaking strength.

(b) General-use life safety rope shall have a diameter one-half inch (thirteen mm) or greater and not more than seven-sixteenths inch (eleven mm). It shall have a minimum breaking strength of not less than eight thousand nine hundred ninety-two lbf (forty kn). The minimum elongation shall not be less than one percent at ten percent of breaking strength, and the maximum elongation shall not be more than ten percent at ten percent of breaking strength.

(c) Life safety rope shall be constructed of virgin fiber and shall be of block creel construction. Load-bearing elements shall be constructed of continuous filament fiber.

(d) Fiber used for life safety rope shall have a melting point of no less than four hundred degrees Fahrenheit.

- (e) Each life safety rope shall have a product label. The label shall be permitted to be a hang tag affixed to each individual life safety rope or shall be permitted to be printed on a sheet that is inserted and sealed in the packaging that contains the life safety rope. At least the following information shall be legibly printed on the label:
- (i) "This rope meets the life safety rope requirements of NFPA 1983, Standard on Life Safety Rope and Equipment for Emergency Services, 2006 Edition."
 - (a) Class: manufacturer to insert specific information regarding use rope.
 - (b) Minimum breaking strength: manufacturer to insert specific information regarding pound/ (kN).
 - (c) Diameter: manufacturer to insert specific information regarding inch/(mm).
 - (d) Type of fiber(s).
 - (ii) Manufacturer's name, identification, or designation.
 - (iii) Manufacturer's address.
 - (iv) Country of manufacturer.
 - (v) Manufacturer's product identification.
 - (vi) Manufacturer's model, style, serial, or lot number.
 - (vii) Certification organization's label, symbol, or identifying mark.
 - (viii) Elongation at three hundred lbf (1.35 kN), at six hundred lbf (2.7 kN), and at one thousand lbf (4.4 kN).
- (f) In addition to the product label specified in paragraph (R)(5)(e) of this rule, each life safety rope shall be marked for its full length by insertion of a continuous identification tape. At least the following statement and information shall be legibly printed on the tape not less than once every thirty-nine inches (one meter):
- (i) "Meets requirements for life safety rope of NFPA 1983."
 - (ii) Certification organization's label, symbol, or identifying mark.

(iii) Name of manufacturer.

(iv) Year and quarter of manufacturer (not coded).

(g) The manufacturer of life safety rope shall furnish the purchaser with at least use criteria, inspection procedures, maintenance procedures, and retirement criteria.

(h) Life safety rope shall be inspected after being used for rescue at fires or other emergency incidents or for training. It may be reused if inspected before and after each such use in accordance with the manufacturer's instructions and provided that:

(i) The rope has not been visually damaged by exposure to heat, direct flame impingement, chemical exposure, or abrasion; and

(ii) The rope has not been subjected to any impact load; and

(iii) The rope has not been exposed to chemical liquids, solids, gases, mists, or vapors of any material known to deteriorate rope; and

(iv) The rope passes inspection when inspected by a qualified person following the manufacturer's inspection procedures.

(2) Life safety harness.

(a) Life safety harnesses shall be designed and designated in accordance with one of the following classes:

(i) Harness that fastens around waist and around thighs or under buttocks and designed to be used for emergency escape with a design load of three hundred lbf shall be designated as class I life safety harness.

(ii) Harness that fastens around the waist and around thighs or under buttocks and designed for rescue with a design load of six hundred lbf shall be designated as class II life safety harness.

(iii) Harness that fastens around waist, around thighs or under buttocks, and over shoulders, designed for rescue with a design load of six hundred lbf shall be designated as class III life safety harness. Class III life safety harness shall be permitted to consist of one or more parts.

(b) Life safety harness shall be permitted to be adjustable within a range of sizes, provided in a range of sizes, or custom-fitted for individuals.

- (c) Load-bearing textile materials used to construct life safety harness shall be constructed of virgin, synthetic, continuous filament fiber.
- (d) All webbing ends shall be secured by heat-sealing or by another method that prevents unraveling.
- (e) All thread shall be compatible with webbing used, shall meet the strength and heat resistance requirements specified in paragraphs (R)(2)(k) of this rule, and shall allow for ease of inspection. All stitching breaks or ends shall be backtacked no less than one one-half inch (thirteen mm).
- (f) Life safety harness shall have at least one load bearing attachment point located at the front waist or sternal location of the harness.
- (g) Casting shall meet class I, grade A requirements of SAE-STD 2175A, "Castings, Classification and Inspection."
- (h) Where a buckle is an integral part of a life safety harness, the buckle manufacturer shall provide written evidence that all load-bearing buckles have been proof-loaded to at least two thousand four hundred seventy-three lbf (eleven kN).
- (i) Each life safety harness shall have permanently affixed a product label embossed, printed, sewn, stapled, riveted, or otherwise permanently attached with a metal label plate. At least the following compliance statement shall be on the product label:
 - (i) "This life safety harness meets the harness requirements of NFPA 1983, "Life Safety Rope and Equipment for Emergency Services, 2006 Edition"; class: (manufacturer to insert specific information regarding class)."

The class designation shall be as determined by the certification organization.

- (ii) Name, identification, or designation of manufacturer.
- (iii) Manufacturer's address.
- (iv) Country of manufacture.
- (v) Manufacturer's product identification.
- (vi) Manufacturer's lot, model, style, or serial number.
- (vii) Certification organization's label, symbol, or identifying mark.

(j) In addition, for harnesses, at least the following information shall be provided on the label:

(i) For class I and II harnesses: "Fits waist size (manufacturer to insert specific size(s))."

(ii) For one-piece class III harnesses: "Fits waist size (manufacturer to insert specific size(s)); fits height (manufacturer to insert specific height(s))."

(iii) For multiple-piece class III harnesses: "Fits waist size (manufacturer to insert specific size(s)); fits height or chest size (manufacturer to insert specific height(s) or chest size(s)); fits height (manufacturer to insert specific height(s)). This is one part of a multiple-piece harness and must be used in conjunction with component part number (manufacturer to insert specific component part number[s]) in order to fully meet the criteria of class III harness."

(k) Life safety harness shall be capable of withstanding all tests specified in NFPA 1983, " Life Safety Rope and Equipment for Emergency Services, 2006 Edition," with the following results:

(i) Static test - upright (for class I, II, and III).

(ii) Static test - horizontal (for class II and III).

(iii) Static test - head down (for class III).

Class I, II, and III life safety harness shall not release from the test torso, the harness buckles and adjusting devices shall not slip more than 0.4 inch (ten mm), and the harness shall show no visible signs of damage that would affect its function.

(iv) For class III life safety harness that includes shoulder attachment points, such shoulder attachment points shall be tested only during the static test - upright. The shoulder attachment points shall not release from the test torso, and shall show no signs of damage that would affect their function.

(v) Fiber and thread used in the construction of life safety harness shall have a melting point of no less than four hundred degrees Fahrenheit.

(vi) Where class I, II and III life safety harness include side D-rings and attachment points designated by the manufacturer as positioning attachments only, these attachments shall show no visible signs of damage that affect its function.

(vii) All metal hardware and parts shall show no more than light surface-type corrosion or oxidation, and remain functional.

(l) The manufacturer of life safety harness shall furnish the purchaser with at least use criteria, inspection procedures, maintenance procedures, and retirement criteria for the product.

(3) Belt system.

(a) Belts shall be designed and designated in accordance with one of the following types:

(i) A belt that fastens only around the waist and is intended for use as a positioning device for a person on a ladder shall be designated as a ladder belt.

(ii) A belt that fastens only around the waist and is intended for use as a positioning device for a person on a ladder and also intended for use only by the wearer as an emergency self-rescue device shall be designated as a ladder/escape belt.

(b) All belts shall be permitted to be adjustable within a range of sizes, provided in a range of sizes, or custom-fitted for individuals.

(c) Load-bearing textile materials used in the construction of all belts shall be made of virgin, synthetic, continuous filament fiber.

(d) All belts shall have webbing ends secured by heat sealing or by another method that prevents unraveling.

(e) All thread utilized in the construction of all belts shall be compatible with the webbing used and shall allow for ease of inspection. All stitching breaks or ends shall be backtacked not less than one-half (thirteen mm).

(f) The ladder belt tether or device that connects the wearer to a ladder shall be permanently affixed to the ladder belt and shall not be greater than twenty-four inches (six hundred ten mm) in length. This requirement applies only to ladder belts as defined in paragraph (R)(3)(a)(i) of this rule.

(g) Each belt shall have permanently affixed a product label embossed, printed, sewn, stapled, riveted, or otherwise permanently attached with a metal plate. At least the following compliance statement shall be on the product label:

- (i) "This belt meets the belt requirement of NFPA 1983, "Life Safety Rope and Equipment for Emergency Services, 2006 Edition"; type (manufacturer to insert specific type)."

The belt type designation shall be determined by the certification organization.

- (ii) "Fits waist size (manufacturer to insert specific waist size(s))."
 - (iii) Name, identification, or designation of manufacturer.
 - (iv) Manufacturer's address.
 - (v) Country of manufacture.
 - (vi) Manufacturer's product identification.
 - (vii) Manufacturer's lot, model, style, or serial number.
 - (viii) Certification organization's label, symbol, or identifying mark.
- (h) All ladder belts and ladder/escape belts shall be capable of withstanding all tests specified in NFPA 1983, "Life Safety Rope and Equipment for Emergency Services, 2006 Edition," with the following results:
 - (i) Static test - upright; static test - horizontal.

All belts shall not release from the test torso, the belt buckles and adjusting devices shall not slip more than one inch (twenty-five mm), and the belt shall show no visible signs of damage that would affect its function.
 - (ii) Ladder belts and ladder/escape belts with side D-rings and attachment points designated by the manufacturer as positioning attachments only, shall show no visible signs of damage that would affect its function.
 - (iii) Metal hardware and metal parts shall show no more than light surface type corrosion or oxidation. Ferrous metals shall show no base metal corrosion. All hardware shall remain functional.
 - (iv) All fiber and thread used in the construction of all belts shall not have a melting point of less than four hundred degrees Fahrenheit (two hundred four degrees Celsius).

- (i) The manufacturer of belts shall furnish the purchaser with at least use criteria, inspection procedures, maintenance procedures, and retirement criteria for the product.

(4) Auxiliary equipment.

- (a) Auxiliary equipment shall be designated by the manufacturer for its intended use and design load as either escape, light-use, or general-use.
 - (i) Escape shall apply to equipment intended for the sole use of the rescuer for personal escape or self-rescue.
 - (ii) Light-use shall apply to equipment intended for a design load of three hundred lbf (1.33 kN).
 - (iii) General-use shall apply to equipment intended for design loads of six hundred lbf (2.67 kN).
- (b) Load-bearing hardware shall be constructed of forged, machined, stamped, extruded, or cast metal. Castings shall meet Class I, Grade A requirements of SAE-STD 2175A, "Castings, Classification and Inspection of."
- (c) Rope grab devices shall be designated for either light use or for general use.
- (d) All load-bearing buckles shall have been proof loaded to at least two thousand four hundred seventy-three lbf (eleven kn).
- (e) Snap-link and carabiner gates shall be self-closing and of a locking design.
- (f) Webbing used to construct auxiliary equipment software shall be constructed of virgin, synthetic, continuous filament fiber.
- (g) All webbing ends shall be secured by heat sealing or by another method that prevents unraveling.
- (h) All thread used to construct auxiliary equipment software shall be compatible with webbing used and shall allow ease of inspection. All stitching breaks or ends shall be backtacked not less than one-half inch (thirteen mm).
- (i) Each item of auxiliary equipment shall be permitted to have a hang tag affixed to each individual auxiliary equipment item or shall be permitted to be printed on a sheet that is inserted and sealed in the packaging that contains the item. At least the following compliance statements shall be on the product label:

- (i) "This (insert name of equipment item here) meets the auxiliary equipment requirements of NFPA 1983, Life Safety Rope and Equipment for Emergency Services, 2006 Edition."
 - (ii) Name, identification, or designation of manufacturer.
 - (iii) Manufacturer's address.
 - (iv) Country of manufacture.
 - (v) Manufacturer's product identification.
 - (vi) Manufacturer's lot, model, style, or serial number.
 - (vii) Certification organization's label, symbol, or identifying mark.
 - (viii) Auxiliary equipment shall also be stamped, engraved, or otherwise permanently marked with a "G" for general-use; "L" for light-use; "E" for escape, as designated in paragraphs (R)(4)(a)(i) to (R)(4)(a)(iii) of this rule.
 - (ix) Rigging and anchor straps shall add to the product label "Minimum breaking strength and rating are determined using a basket (U) configuration. In addition, this strap has a minimum breaking strength of: kN in a choker configuration ____kN when pulled end to end."
 - (x) Where detachable components must be used with the auxiliary equipment in order for the auxiliary equipment to be compliant, shall add to the product label: "To be compliant with NFPA 1893, the following additional components must be used in conjunction with this (insert type of auxiliary equipment here)."
 - (xi) Portable anchor devices shall add to the product label: "Minimum breaking strength and rating are determined at the configuration of lowest strength per manufacturer's instructions."
- (j) All auxiliary equipment shall be capable of withstanding all tests specified in NFPA 1983, "Life Safety Rope and Equipment for Emergency Services, 2006 Edition," with the following results:
- (i) Light-use carabiners and snap-links shall have a major axis minimum breaking strength (mbs), with gate closed, of at least six thousand sixty-nine lbf (twenty-seven kn). The major axis mbs, with gate open, and

the minor axis mbs shall be of at least fifteen hundred seventy-four lbf (seven kn) (see figures 5 & 6).

- (ii) General-use carabiners and snap-links shall have a major axis minimum breaking strength (mbs), with gate closed, of at least eight thousand nine hundred ninety-two lbf (forty kN). The major axis mbs, with gate open, and the minor axis mbs shall be of at least two thousand four hundred seventy-three lbf (eleven kN). (see figures 5 & 6).

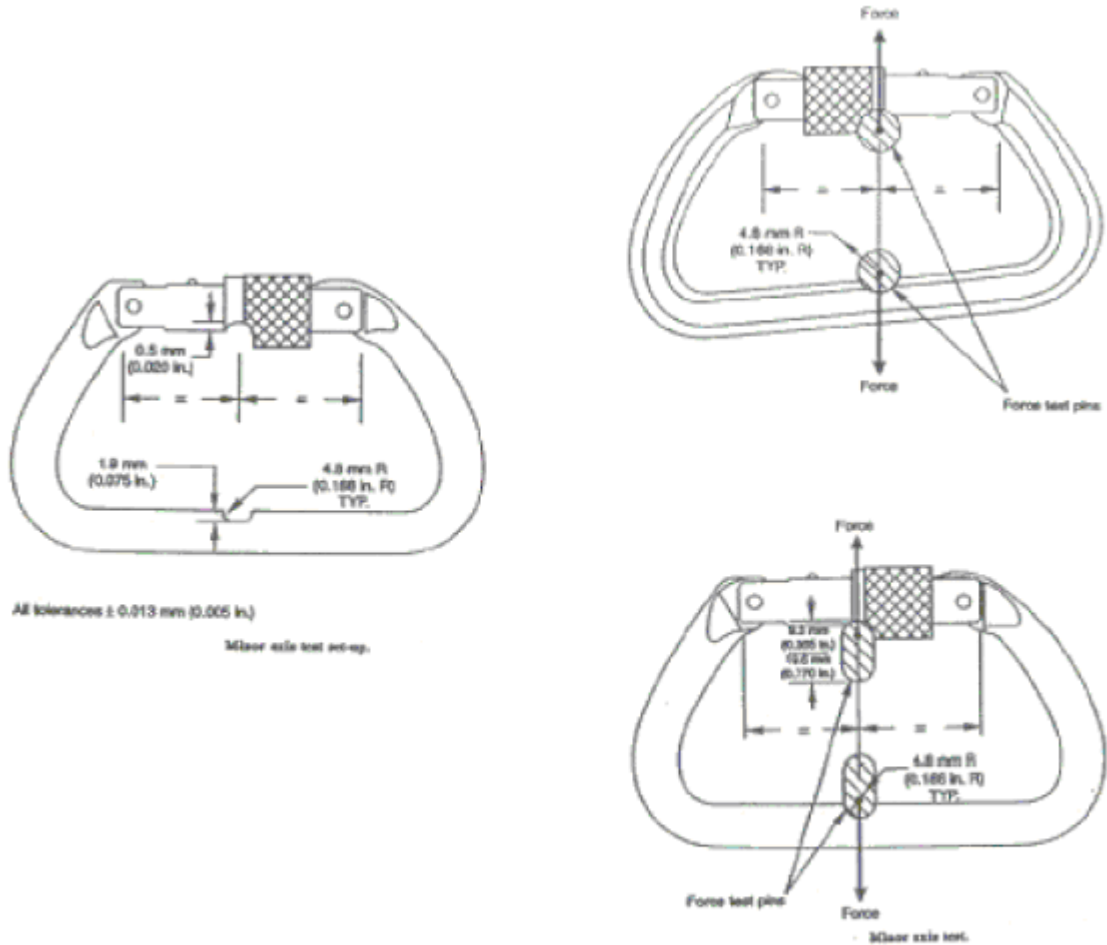


FIGURE 5

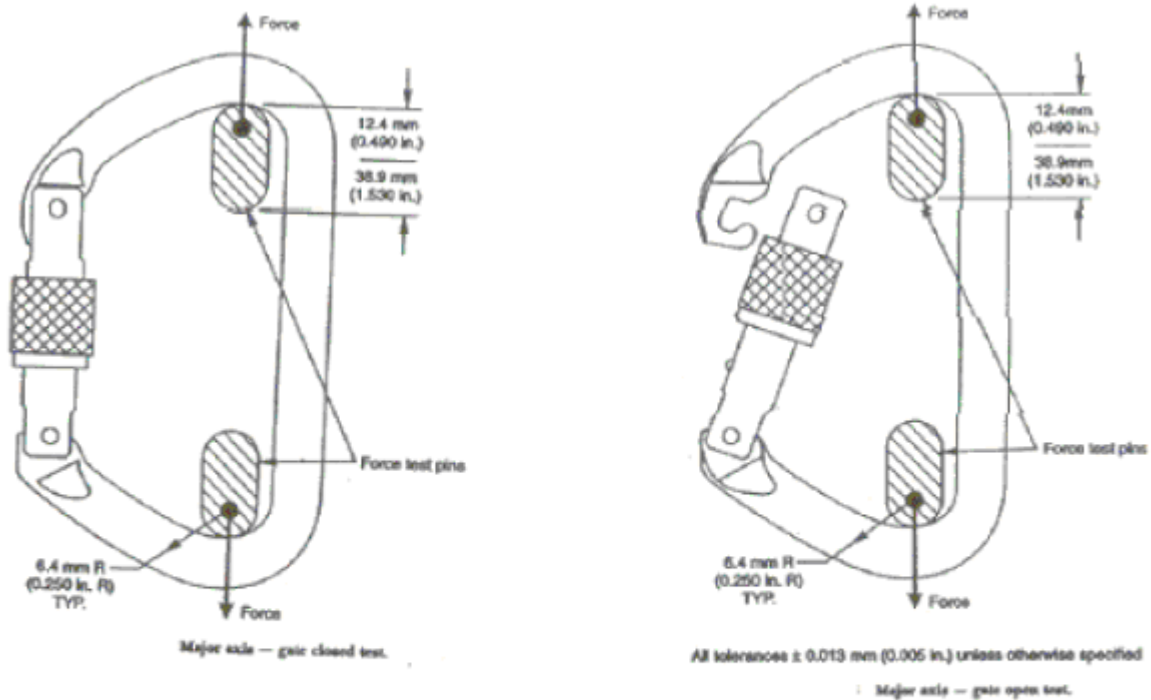


FIGURE 6

- (iii) Ascending devices shall withstand a minimum test load of at least one thousand one hundred twenty-four lbf (five kn) without permanent damage to the device or damage to the rope.
- (iv) General-use rope grab devices shall withstand a minimum test load of at least two thousand five hundred lbf (eleven kn) without permanent damage to the device or damage to the rope.
- (v) Escape descent control devices shall withstand a minimum test load of at least one thousand one hundred twenty-four lbf (five kn) without permanent damage or visible deformation to the general shape of the device or damage to the rope; and of at least two thousand twenty-three lbf (nine kn) without failure, when tested in manner of function.
- (vi) Light-use descent control devices shall withstand a minimum test load of at least one thousand one hundred twenty-four lbf (five kn) without permanent damage or visible deformation to the general shape of the

device or damage to the rope; and of three thousand thirty-four lbf (13.5 kN) without failure when tested in manner of function.

- (vii) The holding force for escape descent and light-use control devices that incorporates a passive braking feature, shall not slip more than one inch (twenty-five mm) when a three hundred pound load is applied.
- (viii) General-use descent control devices shall withstand a minimum test load of at least one thousand one hundred twenty-four lbf (five kN) without permanent damage or visible deformation to the general shape of the device or damage to the rope; and of least four thousand nine hundred forty-six lbf (twenty-two kN) without failure when tested in manner of function.
- (ix) The holding force for general-use descent devices, that incorporate a passive breaking feature, shall not slip more than one inch (twenty-five mm) when a six hundred pound load is applied.
- (x) Light-use portable anchor devices shall withstand a minimum load of at least one thousand one hundred twenty-four lbf (five kN) without permanent damage or visible deformation to the general shape device; and of at least four thousand nine hundred forty-six lbf (twenty-two kN) without failure.
- (xi) General-use portable anchor devices shall withstand a minimum load of at least two thousand nine hundred twenty-three lbf (thirteen kN) without permanent damage to the device or visible deformation to the general shape of the device; and of at least eight thousand ninety-three lbf (thirty-six kN) without failure.
- (xii) Light-use pulleys shall have a minimum tensile strength of at least one thousand one hundred twenty-four lbf (five kN) without permanent damage to the device or damage to the rope; and of least four thousand nine hundred forty-six lbf (twenty-two kN) without failure.
- (xiii) General-use pulleys shall have a minimum tensile strength of at least four thousand nine hundred forty-six lbf (twenty-two kN) without permanent damage to the device or damage to the rope; and at least eight thousand ninety-three lbf (thirty-six kN) without failure.
- (xiv) Pulley efficiency shall be tested and the rating provided on the product label.
- (xv) The becket on light-use pulleys shall have a minimum tensile strength of at least two thousand six hundred ninety-eight lbf (twelve kN) - without failure. The becket on general-use pulleys shall have a

minimum tensile strength of at least four thousand three hundred eighty-three lbf (19.5 kN) without failure.

(xvi) Light-use auxiliary equipment and light-use manufactured systems shall have a minimum tensile strength of at least one thousand one hundred twenty-four lbf (five kN) without permanent damage to the device or visible deformation to the general shape of the device or associated equipment; and at least four thousand nine hundred forty-six lbf (twenty-two kN) without failure.

(xvii) General use auxiliary equipment and general use manufactured systems shall have a minimum tensile strength of at least two thousand nine hundred twenty-three lbf (thirteen kN) without permanent damage to the device or visible deformation to the general shape of the device or associated equipment; and at least eight thousand ninety-three lbf (thirty-six kN) without failure.

(xviii) Light use rigging and anchor straps shall have a minimum breaking strength of seven thousand one hundred ninety-four lbf (thirty-two kN) without failure.

(xix) General use rigging and anchor straps shall have a minimum breaking strength of ten thousand one hundred twenty-three lbf (forty-five kN) without failure.

(xx) Light use pick off straps shall have a minimum breaking strength of four thousand five hundred (twenty kN) without failure.

(xxi) General use pick off straps shall have a minimum breaking strength of six thousand seventy lbf (twenty-seven kN) without failure.

(xxii) Where the anchor strap includes an adjustment device, the adjustment device shall not slip more than two inches (fifty mm).

(xxiii) All auxiliary equipment metal hardware and hardware that includes metal parts shall show no more than light surface-type corrosion or oxidation. Ferrous metals shall show no corrosion of the base metal. All hardware shall remain functional as specified in the manufacturer's operating instructions.

(xxiv) All fiber and thread utilized in the construction of all auxiliary equipment software shall not have a melting point of less than four hundred degrees Fahrenheit (two hundred four degrees Celsius).

- (k) The manufacturer of auxiliary equipment shall furnish the purchaser with at least use criteria, inspection procedures, maintenance procedures, and retirement criteria for the product.

(5) Escape rope.

- (a) Escape rope shall be constructed of virgin fiber and shall be of block creel construction. Load-bearing elements shall be constructed of continuous filament fiber.
- (b) Escape rope shall have a diameter of 0.295 inch (19/64th inch) (7.5 mm) or greater and less than three-eighths inch (9.5 mm).
- (c) Escape rope shall have a minimum breaking strength of not less than three thousand thirty- four lbf (13.5 kN).
- (d) Elongation of all new escape rope shall be less than one per cent and not more than ten per cent at ten per cent of breaking strength.
- (e) Fiber utilized for all escape rope shall not have a melting point of less than four hundred degrees Fahrenheit (two hundred four degrees Celsius).
- (f) Each escape rope shall have a product label. The product label shall be permitted to be a hang tag affixed to each individual escape rope or shall be permitted to be printed on a sheet that is inserted and sealed in the packaging that contains the rope. At least the following information shall be legibly printed on the label:
 - (i) "This rope meets the escape rope requirements of NFPA 1983, Life Safety Rope and Equipment for Emergency Services, 2006 Edition."
 - (a) Minimum breaking strength: (manufacturer will insert specific information regarding lbf/(kn).
 - (b) Diameter: (manufacturer will insert specific information regarding inch/(mm).
 - (c) Type of fiber(s).
 - (ii) Manufacturer's name, identification, or designation.
 - (iii) Manufacturer's address.
 - (iv) Country of manufacture.
 - (v) Manufacturer's product identification.

(vi) Manufacturer's product identification.

(vii) Certification organization's label, symbol, or identifying mark.

(viii) Elongation at three hundred lb (1.35 kN), at six hundred lb (2.7 kN), and at one thousand lb (4.4 kN).

(g) In addition to the product label specified in paragraph (R)(5)(f) of this rule, each escape rope shall be marked for its full length by insertion of a continuous identification tape. At least the following statement and information shall be legibly printed on the tape not less than once every thirty-nine inches (one meter):

(i) "Meets requirements for escape rope of NFPA 1983."

(ii) Certification organization's label, symbol, or identifying mark.

(iii) Name of manufacturer.

(iv) Year and quarter of manufacturer (not coded).

(h) The manufacturer of escape rope shall furnish the purchaser with at least use criteria, inspection procedures, maintenance procedures, and retirement criteria.

(6) Throwline.

(a) Throwline shall be constructed of virgin fiber and shall be of block creel construction. Load-bearing elements shall be constructed of continuous filament fiber.

(b) Throwline shall have a diameter of 19/64th inch (seven mm) or greater, but less than 3/8th inch (9.5 mm).

(c) The minimum breaking strength for new throwline shall not be less than two thousand nine hundred twenty-three lbf (thirteen kN).

(d) New throwline shall be tested for the ability to float and shall float.

(e) Each throwline shall have a product label. The throwline product label shall be permitted to be a hang tag affixed to each individual throwline or shall be permitted to be printed on a sheet that is inserted and sealed in the packaging that contains the throwline. At least the following information shall be legibly printed on the label:

- (i) "This rope meets the throwline requirements of NFPA 1983, Life Safety Rope and Equipment for Emergency Services, 2006 Edition."
 - (a) Minimum breaking strength: (manufacturer to insert specific information regarding lbf/(kn).
 - (b) Diameter: (manufacturer to insert specific information regarding inch/(mm).
 - (c) Type of fiber(s),
 - (ii) Manufacturer's name, identification, or designation.
 - (iii) Manufacturer's address.
 - (iv) Country of manufacture.
 - (v) Manufacturer's product identification.
 - (vi) Manufacturer's model, style, serial, or lot number.
 - (vii) Certification organization's label, symbol, or identifying mark.
- (f) In addition to the product label specified in paragraph (R)(6)(e) of this rule, each throwline shall be marked for its full length by insertion of a continuous identification tape. At least the following statement and information shall be legibly printed on the tape not less than once every thirty-nine inches (one meter):
- (i) "Meets requirements for throwline of NFPA 1983."
 - (ii) Certification organization's label, symbol, or identifying mark.
 - (iii) Name of manufacturer.
 - (iv) Year and quarter of manufacture.

Effective: 1/1/11

Prior Effective Dates: 3/1/88, 1/1/95, 11/1/03, 6/1/05