NFPA®

1858

Standard on Selection, Care, and Maintenance of Life Safety Rope and Equipment for Emergency Services

2018

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NFPA® 1858

Standard on

Selection, Care, and Maintenance of Life Safety Rope and Equipment for Emergency Services

2018 Edition

This edition of NFPA 1858, *Standard on Selection, Care, and Maintenance of Life Safety Rope and Equipment for Emergency Services*, was prepared by the Technical Committee on Special Operations Protective Clothing and Equipment and released by the Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was issued by the Standards Council on November 10, 2017, with an effective date of November 30, 2017.

This edition of NFPA 1858 was approved as an American National Standard on November 30, 2017.

Origin and Development of NFPA 1858

NFPA 1858 is written for organizations that evaluate the risks faced by emergency responders and their particular needs for life safety rope and equipment. It is also written for users of life safety rope and equipment to enable them to inspect, maintain, and care for the life safety rope and equipment they use during rescue and training operations that is compliant with NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services*.

The protection and safety of fire-fighting personnel depend equally on adequate life safety rope and equipment and on the organization's policies, training, and administration of the correct use of life safety rope and equipment in rescue and training situations. To satisfy those portions of the organization's life safety rope and equipment program, this document provides criteria for the selection, care, and maintenance of the life safety rope and equipment.

NFPA 1858 applies to life safety rope, escape rope, fire escape rope, fire escape webbing, escape webbing, throwlines, moderate elongation laid life saving rope, life safety harnesses, belts, auxiliary equipment, litters, and victim extrication devices certified as compliant with NFPA 1983.

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Committee Scope: This Committee shall have primary responsibility for documents on special operations protective clothing and protective equipment, except respiratory equipment, that provides hand, foot, torso, limb, head, and interface protection for fire fighters and other emergency services responders during incidents involving special operations functions including, but not limited to, structural collapse, trench rescue, confined space entry, urban search and rescue, high angle/mountain rescue, vehicular extraction, swift water or flooding rescue, contaminated water diving, and air operations.

This Committee shall also have primary responsibility for documents on station/work uniform garments that are not of themselves primary protective garments but can be combined with a primary protective garment to serve dual or multiple functions. Additionally, this Committee shall have primary responsibility for documents on the selection, care, and maintenance of special operations protective clothing and equipment by fire and emergency services organizations and personnel.

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Information on referenced publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1 Scope.

1.1.1 This standard shall specify the minimum selection, care, and maintenance requirements for rope and associated equipment that are compliant with NFPA 1983.

1.1.2 This standard shall also specify minimum selection, care, and maintenance requirements for rope and associated equipment that are compliant with the previous editions of NFPA 1983.

1.1.3 This standard shall not specify selection, care, and maintenance requirements for any accessories that could be attached to the certified product and are not necessary for the certified product to meet the requirements of this standard.

1.1.4 This standard shall not specify selection, care, and maintenance requirements for any rope or equipment for fall protection or coworker-assisted rescue pertaining to employees of general industry or the construction and demolition industry.

1.1.5 This standard shall not be construed as addressing all the safety concerns associated with the use of life safety rope and equipment. It shall be the responsibility of the persons and organizations that use compliant life safety rope and equipment to establish safety and health practices and to determine the applicability of regulatory limitations prior to use.

1.1.6 This standard shall not be construed as addressing all the safety concerns, if any, associated with the use of this standard by testing or repair facilities.

1.1.7 Nothing herein shall restrict any jurisdiction from exceeding these minimum requirements.

1.2 Purpose.

1.2.1 The purpose of this standard shall be to establish a program for life safety rope and equipment to reduce the risks and hazards associated with the selection, maintenance, improper use of, or damage to life safety rope and equipment.

1.2.2 The purpose of this standard shall also be to establish basic criteria for selection, inspection, cleaning, decontamination, repair, storage, and retirement of rope and associated equipment that are compliant with NFPA 1983.

1.3 Application.

1.3.1 This standard shall apply to life safety rope, escape rope, fire escape rope, fire escape webbing, escape webbing, throwlines, moderate elongation laid life saving rope, life safety harnesses, belts, auxiliary equipment, litters, and victim extrication devices certified as compliant with NFPA 1983.

1.3.2 The requirements of this standard shall not apply to accessories attached to any element of the technical rescue protective ensemble unless specifically addressed herein.

1.4 Units.

1.4.1 In this standard, values for measurement are followed by an equivalent in parentheses, but only the first stated value shall be regarded as the requirement.

1.4.2 Equivalent values in parentheses shall not be considered as the requirement because those values are approximate.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1006, *Standard for Technical Rescue Personnel Professional Qualifications,* 2017 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2018 edition.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents,* 2017 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2018 edition.

NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services,* 2017 edition.

2.3 Other Publications.

2.3.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM F1740, *Standard Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope*, 2012.

2.3.2 Cordage Institute Publications. Cordage Institute, 994 Old Eagle School, Wayne, PA 19087-1866.

CI 1202, *Terminology for Fiber Rope*, 2013.

2.3.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1855, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Technical Rescue Incidents,* 2018 edition.

NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services,* 2017 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the AHJ and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the AHJ and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Anchor Point. A secure object to which rope or webbing is connected either directly or with an escape anchor device such that the rope or webbing will support the user's weight.

3.3.2 Ascending Device. See 3.3.14.1.

3.3.3 Attachment Point.

3.3.3.1 ***Load Bearing Attachment Point.*** Point on a harness or an escape belt that is used for connection to an anchor system that will provide full support and fall arrest for the designed load.

3.3.3.2 ***Positioning Attachment Point.*** Point on a harness or belt that is used for connection to an anchor system that will support a person's weight for work at height.

3.3.4 Auxiliary Equipment. Equipment items that are load bearing and designed to be utilized with life safety rope and harness, such as ascending devices, carabiners, descent control devices, rope grab devices, and snap links.

3.3.5 Belt. An equipment item configured as a device that fastens around the waist only and designated as a ladder belt or an escape belt.

3.3.5.1 ***Escape Belt.*** A compliant equipment item that is intended for use by the wearer only as an emergency self-rescue device.

3.3.6 Carabiner. An auxiliary equipment system item that is a load-bearing connector with a self-closing gate used to join other components of life safety equipment.

3.3.7 Certification Organization. An independent, third-party organization that determines product compliance with the requirements of this standard with a labeling/listing/follow-up program.

3.3.8 Certified. A designation whereby a certification organization has determined that a manufacturer has demonstrated the ability to produce a product that complies with the requirements of this standard, authorizes the manufacturer to use a label on listed products that comply with the requirements of this standard, and establishes a follow-up program conducted by the certification organization as a check on the methods the manufacturer uses to determine compliance with the requirements of this standard.

3.3.9 Compliant. Certified as meeting or exceeding all applicable requirements of this standard.

3.3.10 Contamination/Contaminated. The process by which life safety rope and equipment are exposed to hazardous materialsand body fluids.

3.3.11 Corrosion. A condition exhibiting signs of deterioration, including pitting or loss of metal.

3.3.12 Descent Control Device. See 3.3.14.2.

3.3.13 Design Load. See 3.3.30.1.

3.3.14 Device.

3.3.14.1 ***Ascending Device.*** Auxiliary equipment that is a type of rope grab; a friction or mechanical device utilized to allow ascending a fixed line.

3.3.14.2 ***Descent Control Device.*** An auxiliary equipment item that is a friction or mechanical device used with rope to control descent.

3.3.14.2.1 ***Escape Descent Control Device.*** An auxiliary equipment system component that is a friction or mechanical device used with escape rope to control descent.

3.3.14.3 ***Rope Grab Device.*** An auxiliary equipment device used to grasp a life safety rope for the purpose of supporting loads; includes ascending devices.

3.3.15 Diameter (Rope). See 3.3.37.1.

3.3.16 Elongation. The increase in length, expressed in a percent of the original gauge length, that occurs in a sample of new rope when tested as specified herein.

3.3.17 Escape. Immediate self-rescue of a single fire or emergency services person from a life-threatening emergency situation, generally above ground, using system components or manufactured systems designed for self-rescue.

3.3.18 Escape Belt. See 3.3.5.1.

3.3.19 Escape Descent Control Device. See 3.3.14.2.1.

3.3.20 Escape Rope. See 3.3.37.2.

3.3.21* Fall Factor. A measure of fall severity calculated by dividing the distance fallen by the length of rope used to arrest the fall.

3.3.22 Follow-Up Program. The sampling, inspections, tests, or other measures conducted by the certification organization on a periodic basis to determine the continued compliance of labeled and listed products that are being produced by the manufacturer to the requirements of this standard.

3.3.23 General Use. One designation of equipment item or manufactured system designed for general-use loads, technical-use loads, and escape based on design loads and performance requirements.

3.3.24* Hand. The feel of flexibility and smoothness of a rope when tying knots or running it through equipment.

3.3.25 Hardware. Nonfabric components of protective clothing or equipment, including but not limited to those made of metal or plastic.

3.3.26 Harness. See 3.3.27.

3.3.27 Life Safety Harness. An equipment item that is an arrangement of materials secured about the body and used to support a person.

3.3.28 Life Safety Rope. See 3.3.37.3.

3.3.29 Line. See 3.3.37.4.

3.3.30 Load.

3.3.30.1* ***Design Load.*** The load for which a given piece of equipment or manufactured system was engineered for under normal static conditions.

3.3.31 Manufactured System. Preassembled system sold as a unit by the manufacturer and tested as a complete assembly.

3.3.32 Manufacturer. The entity that directs and controls any of the following: compliant product design, compliant product manufacturing, or compliant product quality assurance; or the entity that assumes liability for the compliant product or provides the warranty for the compliant product.

3.3.33 Manufacturer's Lot.

3.3.34 Melting. Response of a material to heat resulting in evidence of flowing or dripping.

3.3.35 Organization. The entity that provides the direct management and supervision for the emergency services personnel. [**1855,**2018]

3.3.36 Predeployment Inspection. An inspection performed prior to making the item available for service.

3.3.37 Rope. A compact but flexible, torsionally balanced, continuous structure of fibers produced from strands that are twisted, plaited, or braided together that serves primarily to support a load or transmit a force from the point of origin to the point of application.

3.3.37.1 ***Diameter.*** The length of a straight line through the center of the cross section of the rope.

3.3.37.2 ***Escape Rope.*** A single-purpose, emergency self-escape (self-rescue) rope; not classified as a life safety rope.

3.3.37.3* ***Life Safety Rope.*** Rope dedicated solely for the purpose of supporting people during rescue, fire-fighting, or other emergency operations or during training evolutions.

3.3.37.4 ***Line.*** See 3.3.37, Rope or 3.3.48, Webbing.

3.3.37.4.1 ***Throwline.*** A floating rope that is intended to be thrown to a person during water rescues or as a tether for rescuers entering the water.

3.3.37.5 ***Moderate Elongation Laid Life Saving Rope.*** Rope dedicated solely for the purpose of supporting people during rescue at fire-fighting operations or training evolutions.

3.3.38 Rope Grab Device. See 3.3.14.3.

3.3.39 Routine Inspection. An inspection performed at least prior to using an item.

3.3.40 Sample. An element, item, component, or composite that is conditioned for subsequent testing; an amount of the material, product, or assembly to be tested that is representative of the item as a whole.

3.3.41 Snap Link. An auxiliary equipment system component that is a self-closing, gated, load-bearing connector.

3.3.42 Software. A type of auxiliary equipment that includes, but is not limited to, anchor straps, pick-off straps, and rigging slings. [**1983,** 2017]

3.3.43 Soiled/Soiling. The accumulation of materials that are not considered hazardous materials, body fluids, or CBRN terrorism agents but that could degrade the performance of the life safety rope and equipment.

3.3.44 Technical Use. Designation of an equipment item or manufactured system designed for light-use loads and escape based on design loads and performance requirements.

3.3.45 Thorough Inspection. An in-depth inspection performed at intervals.

3.3.46 Throwline. See 3.3.37.4.1.

3.3.47 Waist. The area above the hips and below the xiphoid process.

3.3.48 Webbing. Woven material in the form of a long strip; can be of flat or tubular weave.

Chapter 4 Program

4.1 General.

4.1.1 The organization shall develop and implement a program for the selection, care, and maintenance of life safety rope and equipment used by the members of the organization in the performance of their assigned functions.

4.1.2 This program shall have the goal of providing life safety rope and equipment that are suitable and appropriate for the intended use; maintaining life safety rope and equipment in a safe, usable condition to provide the intended protection to the user; removing from use such life safety rope and equipment that, because their condition, could cause or contribute to user injury, illness, or death; and reconditioning, repairing, or retiring such life safety rope and equipment.

4.1.3 Where this program for the selection, care, and maintenance of life safety rope and equipment is part of an organization's overall program on protective clothing and protective equipment, the portion of the organization's overall program that affects life safety rope and equipment shall be in accordance with Section 4.2.

4.2 Program Organization for Life Safety Rope and Equipment.

4.2.1 The organization's program specified in Section 4.1 shall incorporate at least the requirements in Chapters 4 through 10 of this standard.

4.2.2 The organization shall develop written standard operating procedures (SOPs) that shall identify and define the various parts of the program, specified in Table 4.2.2, and the various roles and responsibilities of the organization and of the members in the program parts.

4.2.3 The organization shall develop specific criteria for removal of life safety rope and equipment from service, in accordance with Chapter 10. The criteria for retirement shall include but not be limited to issues that are specific to the life safety rope and equipment being used by the organization, the manufacturers' instructions, and the experience of the organization.

Table 4.2.2 Required Program Parts for Life Safety Rope and Equipment

Program Part	Chapter/Section of NFPA 1858
Records	Section 4.3
Selection	Chapter 5
Inspection	Chapter 6
Cleaning and decontamination	Chapter 7
Repair	Chapter 8
Storage	Chapter 9
Retirement and disposition	Chapter 10

4.3 Records.

4.3.1 The organization shall compile and maintain records on its life safety rope and equipment.

4.3.2* At least the following records shall be kept for each life safety rope and equipment item:

(1) Equipment identification
(2) Date of purchase
(3) Date placed in service
(4) Manufacturer and model number
(5) Month and year of manufacture
(6) Dates of use, including how used, weather conditions, potential damage, and other circumstances relating to use
(7) Dates of cleaning and inspection
(8) Removal from service and date of return

4.4 Manufacturer's Instructions.

4.4.1 When issuing new life safety rope and equipment, the organization shall provide users with the instructions provided by the manufacturer on the care, use, and maintenance of the life safety rope and equipment, including any warnings provided by the manufacturer.

4.4.2 Where the manufacturer's instructions regarding the care or maintenance of the life safety rope and equipment differ from a specific requirement(s) in this standard, the manufacturer's instructions shall be followed for that requirement(s).

4.4.3 The organization shall retain and make accessible to end users for reference purposes a copy of the manufacturers' instructions regarding the care, use, and maintenance of the life safety rope and equipment.

4.5 Product Failure.

4.5.1 The organization shall report all life safety rope and equipment health and safety concerns if caused by a known or suspected product failure to the manufacturer and the certification organization.

4.5.2 The organization shall notify the manufacturer and the certification organization in writing.

4.5.3 The organization shall request written acknowledgment from the manufacturer and certification organization within 30 days.

Chapter 5 Selection

5.1 Selection and Purchase.

5.1.1* Prior to starting the selection process for life safety rope and equipment, the organization shall evaluate and determine the level at which the organization shall train and respond to meet the requirements established by the AHJ.

5.1.2 The organization shall refer to its risk and hazard assessment of the response area to determine the types of incidents requiring life safety rope and equipment that could be encountered, including but not limited to the following:

(1)* Type of technical rescue incidents likely to occur in the response area
(2) Type of technical rescue incidents to which the organization plans to respond
(3) Frequency of each of these types of incidents
(4) Level of operational capability that the organization intends to maintain for each type of technical rescue incident — awareness, operational, technician — in accordance with NFPA 1670
(5) Maximizing response capabilities through cooperation with other response organizations, departments, or agencies
(6)* The organization's established acceptable safety factors for technical rescue operations
(7)* Geographic location and conditions

5.1.3* The organization shall refer to its risk and hazard assessment of the response area to determine the organization's protocols for an emergency escape from an elevated location in accordance with NFPA 1500.

5.1.4* The organization shall ensure that elements under consideration are certified as being compliant with the current edition of NFPA 1983, where applicable.

5.1.5 Based on the levels of operational capability established by the AHJ, the organization shall compile and evaluate information on the comparative advantages and disadvantages of the life safety rope and equipment under consideration.

5.1.6 The organization shall ensure that the life safety rope and equipment under consideration interface properly with other personal protective items in use within the organization.

5.1.7 Where a field evaluation of life safety rope and equipment is conducted, the organization shall establish criteria to ensure a systematic method of comparing products in a manner related to their intended use and assessing the products' performance relative to the organization's expectations.

5.1.8 Where the organization develops purchase specifications, the following criteria, as a minimum, shall be included:

(1) Purchase specifications shall require that the life safety rope and equipment to be purchased shall be compliant with the current edition of NFPA 1983.
(2) Where the organization selects criteria that exceed the minimum requirements of the current edition of NFPA 1983, such criteria shall be stipulated in the purchase specifications.
(3) Purchase specifications shall require that manufacturers' bids include substantiation of certification for each product and model stated in the bid.
(4) Where applicable, the purchase specifications shall define the process for determining proper compatibility with the organization's other NFPA 1983–compliant life safety rope and equipment components.
(5) The organization shall compare each bid submittal against purchase specifications.

5.1.9 Prior to placing life safety rope and equipment in service, the organization shall designate an individual to inspect purchased life safety rope and equipment to determine that the products meet the organization's specifications and were not damaged during shipment. The organization shall also verify the quantity and sizes of the life safety rope and equipment received.

5.1.10 The organization shall examine information supplied with the products, such as instructions, warranties, and technical data.

5.1.11 Before placing new equipment into service, the organization shall determine that all components are compatible and will function as intended with the technical rescue systems and escape systems on which the organization's personnel are trained in accordance with NFPA 1006.

5.1.12 Procedures shall be established for returning unsatisfactory products or products that do not meet the organization's specifications.

5.2 Life Safety Rope. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.2.1 through 5.2.12.

5.2.1* Specific performance or specific features shall be selected based upon the intended application of the rope being purchased. If the organization has multiple intended applications for life safety rope, the purchase of multiple ropes shall be considered that best fit those applications.

5.2.2* Type of fiber, including but not limited to nylon, polyester, or para-aramid, shall be considered.

5.2.3* Construction, including but not limited to kernmantle, double braid, single braid, or laid, shall be considered in accordance with CI 1202, *Terminology for Fiber Rope*.

5.2.4* Elongation, including but not limited to low stretch or static, shall be considered.

5.2.5* The required minimum breaking strength (MBS) to provide a sufficient safety factor for the intended application(s) shall be specified to ensure adequate strength.

5.2.6* The diameter shall be considered to ensure compatibility with the other components used in the system and the ability to grip the rope.

5.2.7* The total weight to be carried shall be considered as it is determined by length, diameter, and material of the rope.

5.2.8* The hand shall be considered for ease of tying knots, smoothness running through gear, and abrasion resistance.

5.2.9* The rope color shall be considered for the ability to be seen or camouflaged, as well as the ability for one rope to be distinguished from another when rigged side by side.

5.2.10* The length shall be considered, including but not limited to lengths sufficient to rig the longest anticipated site

with additional rope length for anchoring, mechanical advantage systems, or other rigging needs.

5.2.11* The heat resistance shall be considered, including but not limited to melting point, critical temperature, and friction.

5.2.12* For construction that includes a sheath, the sheath shall be considered, including but not limited to the number of yarns, braid pattern, thickness, and tightness as they apply to the hand; the abrasion resistance; and the amount of sheath slippage.

5.3 Escape and Fire Escape Rope. In the purchase specifications, the organization shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983 such as the following.

5.3.1* The organization shall consider the following performance factors when making the evaluations. Escape rope, fire escape rope, and equipment are available as individual NFPA 1983–compliant components or NFPA 1983–compliant escape systems. It is the responsibility of the organization to ensure that components, manufactured systems, and any other associated personal protective equipment (PPE) are compatible.

(1)* Selection of fire escape rope if the anticipated environment will expose the rope to elevated temperatures.
(2)* Type of termination at the anchor end of the rope.
(3)* Compatibility with the descent control device.
(4)* Ability to control the descent with the type of gloves worn.
(5)* Ability of the escape rope or escape system to absorb energy in a fall.
(6) Whether the AHJ has determined that the body belay or similar method is to be used as the escape or bail-out method of the organization. If the AHJ determines that the body belay or similar method is to be used as the escape or bail-out method of the organization, it is important to recognize the wide range of user gripping abilities, user fatigue, and environmental conditions presented by using this technique. Organizations should evaluate these factors and study the effectiveness of the body belay technique in their organization and the operational risk factors.

5.3.2 The organization shall consider the manner of use in the escape rope, such as the following:

(1)* The structures in the organization's response area in order to determine the appropriate length of rope
(2)* The location that the escape rope will be worn or carried and its effect on user's ability to deploy the escape rope
(3) The effect of deployment hazards, such as edge abrasion and sharp edges from windows and structural components
(4)* The expected number of descents and service life of the escape rope

5.4* Life Safety Harness. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.4.1 through 5.4.7.

5.4.1* The organization shall select a Class II or Class III harness depending on the type of life safety operations the users will be conducting. In some cases, the organization may require both types.

5.4.2* The organization shall select the attachment point or points appropriate for the intended use of the harness based on type and location.

5.4.3* The organization shall evaluate the harness for comfort and for ease of donning.

5.4.4* The organization shall consider the use of materials in the construction if the harness will be exposed to heat, flame, chemicals, or water.

5.4.5 The organization shall evaluate which accessories to select to maximize the usefulness of the harness, including but not limited to gear loops, pockets, or methods for holding the loose ends of the webbing.

5.4.6* The organization shall evaluate the function of each type of harness selected in the manner that it will be used.

5.4.7 Where a harness is integrated with bunker gear ensemble, it shall not compromise the integrity of the protective garment as outlined in NFPA 1971.

5.5* Ladder Belts and Escape Belts. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.5.1 through 5.5.8.

5.5.1 If the organization selects a belt for fall restraint during ladder operations, the organization shall select a ladder belt.

5.5.2* If the organization selects a belt rather than a harness for fire ground or elevated operations, the organization shall select an escape belt.

5.5.3* The organization shall select the attachment point or points appropriate for the intended use of the belt based on type and location.

5.5.4* The organization shall evaluate belts for comfort and for ease of donning in the intended manner of use.

5.5.5* The organization shall consider the use of materials in the construction if the belt will be exposed to heat, flame, and chemicals.

5.5.6* The organization shall evaluate which accessories to select to maximize the usefulness of the belt.

5.5.7* The organization shall evaluate the function of each type of belt selected in the manner that it will be used.

5.5.8 Where an escape belt is integrated with bunker gear ensemble, it shall not compromise the integrity of the protective garment as outlined in NFPA 1971.

5.6* Carabiners. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.6.1 through 5.6.4.

5.6.1* The organization shall determine the needs of a general use– or a technical use–rated carabiner depending on the performance needs determined by the risk assessment and the organization's needs, training, and capabilities.

5.6.2* The organization shall select the type of gate function that meets the operational needs of the organization.

5.6.3* The organization shall select the carabiner material that meets the operational needs of the organization regarding carabiner strength and exposure to corrosive atmospheres.

5.6.4* The organization shall select the size and shape of the carabiner that meet the operational needs of the organization.

5.7* Rope Grabs and Ascenders. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.7.1 through 5.7.4.

5.7.1* The organization shall determine its requirements for a general use– or technical use–rated rope grab depending on the performance needs determined by the risk assessment and the organization's needs, training, and capabilities.

5.7.2* The organization shall select the type of rope gripping function that meets the operational needs of the organization.

5.7.3* The organization shall select the rope grab material that meets the operational needs of the organization regarding carabiner strength and exposure to corrosive atmospheres.

5.7.4* The organization shall select the rope grab shape that meets the operational needs of the organization regarding strength of the device and possible rope damage under high loads

5.8 Throwlines. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.8.1 through 5.8.6.

5.8.1* The organization shall determine if the intended use of a throwline will require greater than the minimum performance specification for tensile strength listed in NFPA 1983.

5.8.2* The organization shall evaluate the throwline's capabilities and limitations based on the diameter as listed in NFPA 1983.

5.8.3* The organization shall determine the intended use of a throwline and its ability to float as listed in NFPA 1983.

5.8.4* The organization shall select a throwline that will handle well during the intended use.

5.8.5* The organization shall determine what length throwline will meet the requirements of the intended use.

5.8.6* The organization shall select throwline storage that will meet the requirements of the intended use.

5.9 Descent Control Devices. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements for descent control devices listed in NFPA 1983, such as those given in 5.9.1 through 5.9.5.

5.9.1* The organization shall determine the operational requirements of the descent control device for the following actions:

(1) Nonemergency rappel or single-person descent
(2) Emergency rappel or bailout
(3) For lowering a rescuer, a litter, or both
(4) Belay device
(5) Any combination of the above

5.9.2* The organization shall determine the selection of general- or technical-use descent control devices based on anticipated loads, acceptable safety margins as established by the AHJ, and the experience level of the rescuers.

5.9.3* The organization shall evaluate the following design and performance specifications to determine the descent control device or devices that meet its requirements,

(1) Manual device or auto-locking device
(2) Size and weight of the device
(3) Compatibility with the organization's life safety ropes for rappel or belay
(4) Compatibility with the organization's escape rope or webbing
(5) Material of construction
(6) Ability to dissipate heat

5.9.4* The organization shall evaluate the following levels of personnel competency and training to determine the descent control device or devices that meet its requirements:

(1) Pre-rigged or assembled on scene
(2) Panic stop
(3) Methods of use: rigging the life safety rope, adjusting friction, locking off, knot pass, changing system direction.

5.9.5* The organization shall evaluate the function of each descent control device selected by the department in the manner in which it will be used while the evaluator is wearing the clothing and PPE for that operation.

5.10* Portable Anchors. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.10.1 through 5.10.6.

5.10.1* The organization shall determine the need for a portable anchor device based on a risk assessment, equipment needs, training, and the organization's response capabilities.

5.10.2* The organization shall determine the selection of general- or technical-use portable anchors based on anticipated loads, acceptable safety margins as established by the AHJ, and the experience level of the rescuers.

5.10.3* The portable anchor shall be evaluated by the organization for a means to package and store the device.

5.10.4* The portable anchor shall be evaluated by the organization for component assembly.

5.10.5* The portable anchor shall be evaluated by the organization for the adjustability to meet the anticipated types of incidents.

5.10.6* The organization shall evaluate the footing for the portable anchor based on the surfaces encountered during the anticipated incidents.

5.11* Pulleys. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements for pulleys in NFPA 1983, such as those given in 5.11.1 through 5.11.3.

5.11.1* The organization shall determine the need for a pulleys based on a risk assessment, equipment needs, training, and response capabilities.

5.11.2* The organization shall determine the selection of general- or technical-use pulleys based on anticipated loads and acceptable safety margins as established by the AHJ as well as the experience level of the rescuers.

5.11.3* The organization's selection of pulleys shall be based on the intended use, and the following criteria shall be considered:

(1) Efficiency
(2) Single or double
(3) Ratchet
(4) Overall dimensions
(5) Sheave width
(6) Sheave diameter
(7) Strength
(8) Compatibility with rope

5.12* Belay Devices. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.12.1 through 5.12.5.

5.12.1* The organization shall determine the selection of general- or technical-use belay device based on anticipated loads and acceptable safety margins as established by the AHJ and the experience level of the organization's rescuers.

5.12.2* The organization shall select a maximum arrest distance for its belay system.

5.12.3* Organizations shall set the maximum allowable system capacity, given system configuration and methods used, so as to not exceed the capabilities of the belay device.

5.12.4* The organization shall select a belay device that is within the operational and training levels of the users.

5.12.5* The organization shall consider operational conditions, such as weight and environment.

5.13* End-to-End and Multiple Configuration Straps. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of, such as those given in 5.13.1 through 5.13.3.

5.13.1* The organization shall determine the selection of general- or technical-use end-to-end and multiple configuration straps based on anticipated loads and acceptable safety margins as established by the AHJ as well as the experience level of the organization's rescuers.

5.13.2* The organization's selection of end-to-end and multiple configuration straps shall be based on the intended use and shall consider the following performance and design features:

(1) Length
(2) Width
(3) Weight
(4) Terminations
(5) Material
(6) Adjustability
(7) Color

5.13.3* The organization shall evaluate the performance of end-to-end and multiple configuration straps in the manner of intended use as specified by the manufacturer.

5.14* Litters. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983.

5.14.1* The organization's selection of litters shall be based on the intended use and shall consider the following performance and design features:

(1) Material of construction
(2) One-piece or two-piece design
(3) Rigid or semi-rigid design
(4) Integrated attachment points
(5) Means of securing victim
(6) Shape of litter
(7) Size of litter
(8) Litter accessories

5.15 Manufactured Systems. The organization's purchase specifications for manufactured systems shall consider the organization's needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.15.1 and 5.15.2.

5.15.1 The organization shall refer to the appropriate sections of this document for information regarding the choices of components comprised by a manufactured system.

5.15.2* The organization shall evaluate the performance of the manufactured system in the manner of intended use.

5.15.3 The organization shall evaluate its needs with respect to removable components and ensure the system is compatible with these needs.

5.16* Escape and Fire Escape Systems. The organization's purchase specifications for escape systems shall consider the organization's needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.16.1 through 5.16.13.

5.16.1* The organization shall consider the manner of use of the escape system.

5.16.2* The organization shall consider selecting a system that is pre-connected to the fire fighter or will be connected immediately prior to use.

5.16.3* The organization shall consider selecting an escape rope–based system or an escape webbing–based system.

5.16.4* The organization shall consider selecting a fire escape system or an escape system.

5.16.5 The organization shall consider the method of deployment that will meet the time acceptable to the organization.

5.16.6* The organization shall consider whether the payout force is within the organization's parameters.

5.16.7* The organization shall consider selecting a system that is sealed or repackable.

5.16.8* The organization shall determine whether the individual components of the escape system meet its expectations for initial training as well as recurrent training.

5.16.9* In selecting a system, the organization shall evaluate which type of descent control device best meets the level of initial training and recurrent training.

5.16.10* The organization shall evaluate the structures and hazards in its response area to determine the operational length of the rope or webbing for the escape system in order to reach the surface or a safe area.

5.16.11* In selecting a system, the organization shall evaluate which type of anchoring method best meets the levels of initial training and recurrent training.

5.16.12* The organization shall consider the use and maintenance requirements of the escape system.

5.16.13* The organization shall evaluate the function of the escape system considered by the organization in the manner that it will be used while the evaluator is wearing full clothing and PPE.

5.16.14 The organization shall evaluate its needs with respect to removable components and ensure the system is compatible with these needs.

5.16.15 The organization shall consider the ability of the escape system to absorb energy and reduce the load transmitted to the anchor or human body during dynamic loading events.

5.17 Escape and Fire Escape Webbing. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.17.1 and 5.17.2.

5.17.1* The organization shall consider the following performance factors when making the evaluations. Escape webbing, fire escape webbing, and equipment are available as individual NFPA 1983–compliant components or as NFPA 1983–compliant escape systems. It is the responsibility of the organization to ensure that components, manufactured systems, and any other associated PPE are compatible.

(1)* Fire escape webbing if the anticipated environment will expose the webbing to elevated temperatures.
(2)* Type of termination at the anchor end of the webbing.
(3) Compatibility with the descent control device.
(4)* Ability to control the descent with the type of gloves worn.
(5)* Ability of the escape webbing or escape system to absorb energy in a fall.
(6)* Whether the AHJ has determined that the body belay or similar method is to be used as the escape or bail-out method of the organization. If the AHJ determines that the body belay or similar method is to be used as the escape or bail-out method of the organization, it is important to recognize the wide range of user gripping abilities, user fatigue, and environmental conditions presented by using this technique. Organizations should evaluate these factors and study the effectiveness of the body belay technique in their organization and the operational risk factors.

5.17.2 The organization shall consider the manner of use in the escape webbing, such as the following:

(1)* Structures in the organization's response area to determine the appropriate length of webbing.
(2)* The location that the escape webbing will be worn or carried and its effect on user's ability to deploy the escape webbing
(3) The effect of deployment hazards, such as edge abrasion from windows and structural components
(4)* The number of descents and service life of the escape webbing

5.18* Escape Anchor Devices. The organization's purchase specifications for an escape anchor device shall consider the organization's needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.18.1 and 5.18.2.

5.18.1 The organization shall refer to its risk and hazard assessment of the response area to determine the types of incidents requiring the use of escape anchor device and take into account the following considerations:

(1)* Security when the anchor device is deployed
(2)* How the escape anchor will be carried by the firefighter
(3) The ease of deployment of the escape anchor to determine if the time to deploy is acceptable to the organization
(4)* Whether the escape anchor device is compatible with the escape rope or webbing selected by the organization
(5) The primary and secondary locations:
  (a) Distance from window
  (b) Time it takes to set the device
  (c) Ability of individuals to set the device
  (d) Storage location

5.18.2* The organization shall evaluate the function of each descent control device selected by the department in the manner that it will be used while the evaluator is wearing the clothing and PPE for that operation.

5.19* Victim Extrication Device. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.19.1 through 5.19.7.

5.19.1 Because NFPA 1983 specification, design, and performance requirements are limited to determining minimum device strength and the security of the patient, the organization shall refer to its medical control or standards to comply with medical specifications, requirements, or performance metrics.

5.19.2 The organization shall determine the specific needs for selecting a victim extrication device by evaluating the device for multiple rescue situations, which can include, but are not limited to, confined space rescues, high-/low-angle rope rescues, vehicle/machinery rescue, and rescuing a downed fire fighter or victim in a structure.

5.19.3* The organization shall determine whether a Class II or a Class III victim extrication device is needed to meet its victim extrication requirements.

5.19.4 Victim extrication devices shall be evaluated based on ease of use, construction features, ease of transportation to rescue site, and storage requirements. These devices often consist of a means to secure straps, belts and hardware around the victim.

5.19.4.1 Evaluation on ease of use of these shall be performed with PPE donned and vision obscured.

5.19.5 The method of transportation of a victim with the victim extrication device shall be evaluated based on the manufacturer's instructions on intended use and shall be based on the following considerations:

(1) Providing a secure means of attachment to a rope rescue system (if so equipped)
(2) Ease of packaging and securing the victim in the device by the use of straps, buckles, or other mechanisms
(3) Ease of transporting the victim in the device over various terrains, up and down stairs, and in and out of confined spaces
(4) The ability of the device to prevent unnecessary movement to the victim

5.19.6 The components of the victim extrication device shall be evaluated for the following:

(1) Durability of materials in the manner of use specified by the manufacturer
(2) For components that might be exposed to corrosive environments, resistance to corrosive forces

5.19.7 The device shall be evaluated on ease of cleaning and decontamination following the manufacturer's instructions.

5.20* Moderate Elongation Laid Life Saving Rope. The organization's purchase specifications shall consider its needs for performance or features in excess of the minimum requirements of NFPA 1983, such as those given in 5.20.1 and 5.20.2.

5.20.1 Specific performance or features shall be selected based upon the intended application of the rope being purchased.

5.20.2 If the organization has multiple intended applications for moderate elongation laid life saving rope, the purchase of multiple ropes shall be considered that best fit those applications:

(1)* Fiber type: Nylon, polyester, para-aramid.
(2)* Construction: Laid construction of continuous filament yarn twisted into three or more strands.
(3)* Elongation: Moderate (10 percent to 15 percent) at 10 percent MBS.
(4)* Strength: Required MBS to provide a sufficient safety factor based on current NFPA guidelines.
(5)* Diameter: Compatible with other components used in the system.
(6)* Weight: Total weight to be carried affected by the length, diameter, and material.
(7)* Hand: Ease of tying knots, smoothness running through gear, and abrasion resistance.
(8)* Color: Per the requirements of the AHJ.
(9)* Length: Per the requirements of the AHJ. The actual length of certain materials can change over time due to natural shrinkage after several years in the field. Check with the ropes' manufacturers for specific information on individual materials.

Chapter 6 Inspection

6.1 General.

6.1.1 The AHJ shall specify minimum requirements for training and experience necessary for a person to be a competent equipment inspector.

6.1.2 The AHJ shall develop guidance for equipment inspection, based on Chapter 6, industry best practice, manufacturer's instructions, and other relevant information.

6.1.3 Manufacturer's instructions shall be followed for all inspection, care, and maintenance.

6.1.4 Universal precautions shall be observed, as appropriate, in the handling of life safety rope and equipment that was exposed to contamination during use.

6.1.5* Any life safety rope and equipment that is found to be soiled or contaminated shall be cleaned or decontaminated before any additional inspection is initiated. If decontamination is not possible or warranted, contaminated life safety rope and equipment shall be retired.

6.1.6 The organization shall establish guidelines for its members to follow in determining if an element is soiled to an extent that cleaning is necessary.

6.1.7 The organization shall determine appropriate actions to be taken if life safety rope and equipment is found to be in need of cleaning, decontamination, or repair.

6.1.7.1 At a minimum, any necessary cleaning or decontamination shall be done in accordance with the requirements specified in Chapter 7.

6.1.7.2 At a minimum, any necessary repairs shall be made in accordance with the requirements specified in Chapter 8.

6.1.8* Age of equipment shall be taken into consideration as part of the inspection process.

6.1.8.1* The maximum lifetime of software shall be no more than 10 years from the date of manufacture.

6.2 Inspection Procedures.

6.2.1* Life safety rope and equipment shall be inspected periodically according to the organization's policy for inspecting life safety rope and equipment.

6.2.1.1 Predeployment Inspection. Prior to making the item available for service, the user shall perform a predeployment inspection as follows:

(1) A visual check shall be performed in a manner sufficient to ensure that all the components are present and none of them are compromised.
(2) Where the equipment is assigned to an individual, the predeployment inspection shall be performed prior to a duty shift.
(3) Where the equipment is not assigned to an individual, the AHJ shall determine the appropriate interval.
(4) Any deficient components shall be removed from service and subjected to a thorough inspection.

6.2.1.2 Routine Inspection. The user shall perform a routine inspection before and after each use as follows:

(1) Routine inspection shall be performed in a manner sufficient to ensure that the product is safe for use.
(2) Routine inspection shall include, at a minimum, visual and tactile inspection for mildew, wear, damage, and other deterioration.
(3) Any deficient components shall be removed from service and subjected to a thorough inspection.

6.2.1.3 Thorough Inspection. The organization shall determine at what intervals a thorough inspection is needed as follows:

(1)* Thorough inspections shall be scheduled based on use of the equipment.
(2) Thorough inspections shall be performed at least once each year and shall include a more in-depth evaluation of equipment condition, including visual and tactile, and information including, but not limited to, age, date of purchase, and usage log review.
(3) This inspection shall be documented.

6.2.2 Life safety rope and equipment shall be inspected by an inspector meeting the organization's requirements for the type of inspection conducted of life safety rope and equipment.

6.2.3 The date of the inspection and the results of the inspection shall be recorded in the appropriate log or on a tag attached to the life safety rope and equipment for that purpose.

6.2.4 Each user shall be trained to conduct a predeployment and routine inspection.

6.2.5 Inspection shall include, as a minimum, the inspections specified in 6.2.5.1 through 6.2.5.15.

6.2.5.1* Life safety rope shall be retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Physical damage, including but not limited to the following:
    (a) Cuts, chaffing, broken fibers, or soft or hard spots on the sheath
    (b) Thermal or chemical damage that can be detected by sight, feel, or smell, such as melted fibers, glazed surfaces, or discoloration
    (c) Any variation in the rope diameter
(4) A history in the rope log of shock load, fall load, static load, or excessive loading
(5) Excessive age

6.2.5.2* Escape and fire escape rope shall be retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Physical damage, including but not limited to the following:
    (a) Cuts, chaffing, broken fibers, or soft or hard spots on the sheath
    (b) Thermal or chemical damage that can be detected by sight, feel, or smell, such as melted fibers, glazed surfaces, or discoloration
    (c) Any variation in the rope diameter
(4) A history in the rope log of shock load, fall load, static load or excessive loading
(5) Excessive age

6.2.5.3 Life safety harnesses, ladder belts, and escape belts shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Physical damage to the webbing components, including but not limited to the following:
    (a) Cuts, worn or frayed areas, broken fibers, or soft or hard spots
    (b) Thermal or chemical damage such as melted fibers, glazed surfaces, or discoloration
    (c) Pulled threads, abrasions, or breaks in the stitching
(4) Physical damage to the hardware components, including but not limited to the following:
    (a) Damage, sharp edges, or missing components
    (b) Failure to operate properly
(5) Excessive age

6.2.5.4 Carabiners and snap links shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Excessive wear
(4) Physical damage, including but not limited to the following:
    (a) Sharp edges,
    (b) Missing components
    (c) Misalignment
    (d) Cracks
    (e) Deformation
    (f) Corrosion or pitting
(5) Improper operation of the gate or locking mechanism

6.2.5.5 End-to-end and multiple-configuration straps shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Physical damage to the webbing components, including but not limited to the following:
    (a) Cuts, worn or frayed areas, broken fibers, or soft or hard spots
    (b) Thermal or chemical damage, such as melted fibers, glazed surfaces, or discoloration
    (c) Pulled threads, abrasions, or breaks in the stitching
(4) Physical damage to the hardware components, including but not limited to the following:
    (a) Damage, sharp edges, or missing components
    (b) Failure to operate properly
(5) History of shock load, fall load, or static load in excess of the design load
(6) Excessive age

6.2.5.6 Rope grabs and ascending devices shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Excessive wear
(4) Physical damage, including but not limited to the following:
    (a) Sharp edges
    (b) Missing components
    (c) Misalignment
    (d) Cracks
    (e) Deformation
    (f) Corrosion or pitting
(5) Improper operation of the cam or rope gripping component

6.2.5.7 Throwlines shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Physical damage, including but not limited to the following:
    (a) Cuts, chaffing, broken fibers, or soft or hard spots on the sheath

(b) Thermal or chemical damage that can be detected by sight, feel, or smell, such as melted fibers, glazed surfaces, or discoloration
(c) Any variation in the rope diameter
(4) A history in the rope log of shock load, fall load, static load, or excessive loading
(5) Loss of floatability

6.2.5.8 Descent control devices and belay devices shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Excessive wear
(4) Physical damage, including but not limited to the following:
(a) Sharp edges
(b) Missing components
(c) Misalignment
(d) Cracks
(e) Deformation
(f) Corrosion or pitting
(5) Improper operation of the gate or locking mechanism

6.2.5.9 Portable anchors shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Excessive wear
(4) Physical damage, including but not limited to the following:
(a) Sharp edges
(b) Missing components
(c) Misalignment
(d) Cracks
(e) Deformation
(f) Corrosion or pitting
(5) Improper operation of the gate or locking mechanism

6.2.5.10 Pulleys shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Excessive wear
(4) Physical damage, including but not limited to the following:
(a) Sharp edges
(b) Missing components
(c) Misalignment
(d) Cracks
(e) Deformation
(f) Corrosion or pitting
(5) Improper operation of the gate or locking mechanism

6.2.5.11 Litters and victim extrication devices shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Excessive wear
(4) Physical damage, including but not limited to the following:
(a) Sharp edges
(b) Missing components
(c) Misalignment
(d) Cracks
(e) Deformation
(f) Corrosion or pitting
(5) Improper operation of the gate or locking mechanism

6.2.5.12 Escape and fire escape webbing shall be retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Physical damage, including but not limited to the following:
(a) Cuts, chaffing, broken fibers, or soft or hard spots on the sheath
(b) Thermal or chemical damage that can be detected by sight, feel, or smell, such as melted fibers, glazed surfaces, or discoloration
(c) Any variation in the rope diameter
(4) A history in the rope log of shock load, fall load, static load, or excessive loading

6.2.5.13 Escape anchor devices shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Excessive wear
(4) Physical damage, including but not limited to the following:
(a) Sharp edges
(b) Missing components
(c) Misalignment
(d) Cracks
(e) Deformation
(f) Corrosion or pitting
(5) Improper operation of the gate or locking mechanism

6.2.5.14 Moderate elongation laid life saving rope shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling
(2) Contamination
(3) Physical damage, including but not limited to the following:
(a) Cuts, chaffing, broken fibers, or soft or hard spots on the sheath
(b) Thermal or chemical damage that can be detected by sight, feel, or smell, such as melted fibers, glazed surfaces, or discoloration
(c) Any variation in the rope diameter
(4) A history in the rope log of shock load, fall load, static load, or excessive loading

6.2.5.15 Escape systems, fire escape systems, and manufactured systems and escape systems shall be repaired or retired from service if inspection reveals damage resulting in a performance deficiency due to the following:

(1) Soiling

(2) Contamination
(3) Any component deficiency as described in 6.2.5.1 through 6.2.5.14 as applicable
(4) Incompatibility of subcomponents
(5) Missing or improperly assembled components

Chapter 7 Cleaning and Decontamination

7.1 General.

7.1.1 Organizations shall provide a means for having life safety rope and equipment cleaned and decontaminated.

7.1.1.1 Where possible, organizations shall refer to the manufacturer's recommendations for cleaning of life safety rope and equipment.

7.1.2* Life safety rope and equipment shall be evaluated by the user for application of appropriate cleaning level after each use.

7.1.3 Life safety rope and equipment that are known to be or suspected to be contaminated with hazardous materials shall be evaluated on the incident scene by members of the organization authorized to conduct a preliminary assessment of the extent of contamination and the need for life safety rope and equipment to be isolated, tagged, and bagged on scene.

7.1.3.1 Contaminated life safety rope and equipment shall be isolated during the incident personnel decontamination process and removed from service until the contaminant or suspected contaminant is identified and the equipment can receive specialized cleaning as necessary to remove the specific contaminant(s).

7.1.3.2 Where possible and where the contaminant and its source have been identified, the organization shall consult the supplier of the contaminant and the manufacturer of the life safety rope and equipment for the appropriate decontamination agent and process.

7.1.3.3 A member of the organization who has received training in the cleaning of life safety rope and equipment shall be responsible for performing or managing decontamination of life safety rope and equipment.

7.1.4 Life safety rope and equipment that are known to be or suspected to be contaminated with body fluids shall be evaluated on the incident scene by members of the organization authorized to conduct a preliminary assessment of the extent of contamination and the need for the life safety rope and equipment to be isolated, tagged, and bagged at the incident scene.

7.1.5 Organizations shall have written procedures detailing the decontamination and cleaning processes for life safety rope and equipment contaminated with body fluids. Universal precautions shall be observed at all times by members handling life safety rope and equipment known to be or suspected to be contaminated with body fluids.

7.1.6 Soiled or contaminated life safety rope and equipment shall not be brought into a home, washed in a home laundry, or washed in a public laundry unless the public laundry has a dedicated business to handle life safety rope and equipment.

7.1.7 If the organization does not have a means to decontaminate life safety rope, webbing, or other absorbent equipment, the contaminated life safety rope and equipment shall be disposed of following the organization's procedure for the disposal of equipment contaminated by hazardous materials or body fluids.

7.2 Cleaning.

7.2.1 The organization shall be responsible for the routine cleaning of life safety rope and equipment.

7.2.2 Organizations shall examine the manufacturer's label and user information for instructions on cleaning and drying that the manufacturer provided with the life safety rope and equipment. In the absence of manufacturer's instructions or manufacturer's approval of alternative procedures for the life safety rope and equipment, the routine cleaning and drying procedures provided in this section shall be used.

7.2.3 Cleaning Process for Life Safety Rope and Webbing.

7.2.3.1 The organization shall determine its requirements for when rope or webbing shall be cleaned.

7.2.3.2 The cleaning procedure shall be as follows:

(1) Remove as much debris, dirt, and mud as possible at the scene.
(2) Rinse off any excess dirt with a hose.
(3) Soak the rope or webbing for about 30 minutes in a plastic tub of water with nondetergent soap added.
(4) Rinse the rope or webbing by pulling it through a rope washing device twice.
(5) Hang the rope or webbing in a cool, shady place to dry.

7.2.4* Decontamination of Rope and Webbing.

7.2.4.1 The organization shall determine requirements pertaining to rope or webbing being taken out of service due to contamination.

7.2.4.2 Rope that has come into contact with blood or other body fluids shall be decontaminated using cleaners approved for removing biohazards according to the organization's protocols for decontaminating PPE.

7.2.5 Cleaning Process for Equipment.

7.2.5.1 The organization shall determine requirements pertaining to equipment being taken out of service due to damage or contamination.

7.2.5.2 The equipment shall be cleaned and dried in accordance with manufacturer's instructions.

7.2.5.3* If lubrication of moving parts is necessary, a dry or nonstick lubricant shall be used following washing.

7.2.6 Decontamination of Equipment.

7.2.6.1 The organization shall determine the requirements pertaining to equipment being taken out of service due to contamination.

7.2.6.2 Equipment that has come into contact with blood or other body fluids shall be decontaminated using cleaners approved for removing biohazards according to the organization's protocols for decontaminating PPE.

Chapter 8 Repair

8.1 General. Equipment shall not be modified, repaired, or otherwise altered without explicit authorization from the manufacturer.

8.2 Rope and Webbing. When damage to rope or webbing is detected, the rope or webbing shall be removed from service and destroyed or relegated to non-life safety duty.

8.3 Other Equipment. The organization shall consult the manufacturer for other equipment repair.

Chapter 9 Storage

9.1 Storage of Life Safety Rope, Moderate Elongation Laid Life Saving Rope, Escape Rope, Escape Webbing, Fire Escape Rope, Fire Escape Webbing, and Throwlines.

9.1.1* Rope and webbing shall be stored in a clean, dry, well-ventilated place away from direct sunlight and away from heat.

9.1.2 Rope shall be kept off of the floor and never stored on dirt or concrete floors without ventilation underneath.

9.1.3 Rope shall never be placed in areas where acids or alkalis are stored.

9.2* Storage of Equipment. Equipment shall be stored in such a manner as to prevent damage contact with other equipment and to prevent exposure to chemicals and atmospheres that can contribute to rust, corrosion, or oxidation.

Chapter 10 Retirement and Disposition Procedures

10.1* Retirement of Life Safety Software Products.

10.1.1* The organization shall develop specific criteria for the removal of software products from service based on the manufacturer's instructions and the experience of the organization.

10.1.2* Software products shall be retired in accordance with 10.2.1 no more than 10 years from the date of manufacture.

10.1.3 Software products that are not in compliance with the NFPA 1983 edition that was current when the product was manufactured shall be retired in accordance with 10.2.1.

10.1.4 Software products that are contaminated to the extent that the organization deems it not possible or cost effective to decontaminate them shall be retired in accordance with 10.2.1.

10.1.5 Software products that are no longer of use to the organization for emergency operations service but are not contaminated, defective, or damaged shall be retired in accordance with 10.2.1 or 10.2.2.

10.2* Disposition of Software Products.

10.2.1 Retired software products shall be destroyed or disposed of in a manner ensuring that they will not be used in any life safety or emergency activities, including training in accordance with ASTM F1740, *Standard Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope.*

10.2.2 Retired software products as determined in 10.1.5 shall be permitted to be used as follows:

(1) For training, if a software product has been inspected per 6.2.5 and meets the organization's criteria for life support

(2) As determined by the organization

10.3* Retirement of Life Safety Hardware.

10.3.1 The organization shall develop specific criteria for the removal of hardware from service based on the manufacturer's instructions and the experience of the organization.

10.3.2* Hardware that is worn or damaged to the extent that the organization deems it not possible or cost-effective to repair it shall be retired in accordance with 10.4.

10.4 Disposition of Hardware. Retired hardware shall be destroyed or disposed of in a manner ensuring that it will not be used in any life safety or emergency activities, including training.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the AHJ may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The AHJ may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the AHJ may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the AHJ. In many circumstances, the property owner or his or her designated agent assumes the role of the AHJ; at government installations, the commanding officer or departmental official may be the AHJ.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The AHJ should utilize the system employed by the listing organization to identify a listed product.

A.3.3.21 Fall Factor. Fall factors (see Figure A.3.3.21) are calculated by dividing the distance the person attached to the rope will fall by the length of the rope between the person and the rope anchor or belay. Thus, a 305 mm (1 ft) fall on a 150 mm (½ ft) rope would be a fall factor of 2.0; a 305 mm (1 ft) fall on a 305 mm (1 ft) rope would be a 1.0 fall factor; a 305 mm (1 ft) fall on a 1.12 m (4 ft) rope would be a 0.25 fall factor; and a 305 mm (1 ft) fall on a 12.2 m (40 ft) rope would

be a 0.025 fall factor. Note as well that a 7.6 m (25 ft) fall on a 30.5 m (100 ft) rope is also a 0.25 fall factor. This formula assumes the fall takes place in free air without rope drag across building edges or through intermediate equipment.

When fall factors of greater than 0.25 are anticipated, such as are possible in lead climbing, dynamic ropes specifically designed for climbing should be considered. Only ropes certified to appropriate climbing rope standards [e.g., the International Mountaineering and Climbing Federation (UIAA) and European Community (CE)] are appropriate for this use. Dynamic climbing ropes should be stored, maintained, inspected, and use-logged in a manner similar to that required for static/low-stretch rope. Such operations are outside the scope of this document. A fall factor of 0.25 is the maximum considered for NFPA 1983.

Research indicates that the "fall factor" method of estimating the effects of a fall on an anchor or a load does not translate equally between dynamic ropes and the static and low-stretch type ropes used for fire service rescue operations. Other methods of force calculation can be used as needed.

A.3.3.24 Hand. While a soft hand makes knots in ropes easier to tie, they might not untie after loading as easily if the hand is too soft. Ropes with a soft hand can also overly flatten out over edges and when running through descent control devices and pulleys.

Ropes with a very stiff hand have better abrasion resistance and flatten less in devices, and loaded knots might be easier to untie. The correct choice could be between these extremes, depending on the devices being used with the rope and the environment in which it will be rigged.

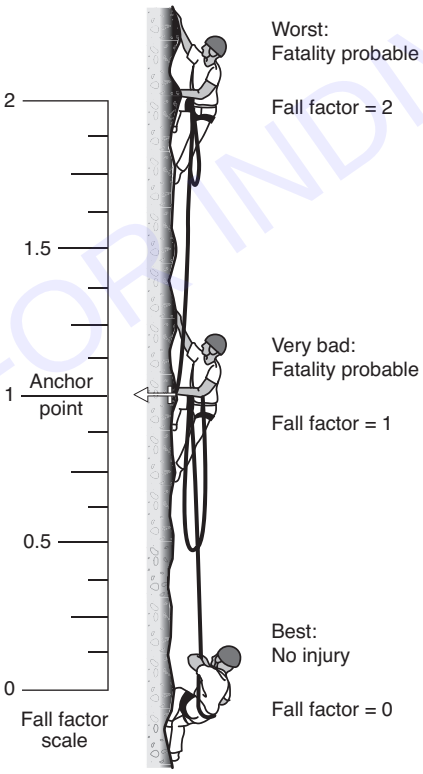

FIGURE A.3.3.21 Fall Factors.

A.3.3.30.1 Design Load. Design loads are used as reference loads for testing of products. This does not constitute any endorsement on behalf of NFPA that a product cannot or should not exceed this load. The designation of a 1-person or 2-person load was removed from the standard due to the misconception that items were not to exceed a 1-person or 2-two person load, depending on the items designation. Some items are tested with a 1.33 kN (300 lb) or a 2.67 kN (600 lb) load, but the test method results in forces being generated that far exceed the base load. The AHJ must determine the equipment capability based on manufacturer information, the intended use of the product, and the team capability in load or force calculations.

A.3.3.37.3 Life Safety Rope. The term *life safety rope* generally refers to any rope that is used specifically for the purpose of suspending or protecting human life. Only rope that is specifically designated and intended by the manufacturer for such use should be used to protect human life. Within the context of NFPA 1983 and NFPA 1858, certain specialty rope types exist within the broader classification of life safety rope, such as escape rope, fire escape rope, and moderate elongation laid life-saving rope. Where circumstances dictate, these specialty ropes should be specified and used. For rescue, safety, and other various non-specific uses, and where specialty rope is not necessarily called for, use of ropes meeting the broader classification of life safety rope is generally acceptable.

A.4.3.2 For more information on recording rope history, see ASTM F1740, *Standard Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope.*

A.5.1.1 Refer to NFPA 1670 for guidance in determining the requirements for life safety rope and equipment for technical rescue incidents.

Other resources include the following:

(1) NFPA 1500
(2) NFPA 1407
(3) NFPA 1006
(4) OSHA or state occupational safety and health standards applicable to technical rescue
(5) Standards or procedures developed by the AHJ or the organization

A.5.1.2(1) The type of technical rescue incidents to which the organization will respond determines the choice of life safety rope and equipment having the same functional capability. In most cases, the same equipment can be used for several different types of responses. In other cases, incident location and environmental conditions might require more specialized equipment. Examples of incident types include, but are not limited to, the following:

(1) High angle rescues
(2) Low angle or over-the-bank rescues
(3) Confined space rescues
(4) Subterranean rescues
(5) Industrial rescues, including structural tower rescues
(6) Wilderness or remote access rescues
(7) Water, flood, and swift water rescues
(8) Ice rescues

A.5.1.2(6) NFPA 1983 divides life safety rope and equipment into two designations: general use and technical use. NFPA does not establish or endorse a particular safety factor or ratio. Rescue organizations can elect to use either technical use– or

general use–labeled equipment based on the anticipated loads of the incident; training/skill level of responders; and the AHJ's established acceptable safety factors. What safety factor(s) is deemed appropriate might vary based on the acceptable level of risk, severity of consequences of a potential failure, types of technical rescues, and the corresponding level of operational capability of the organization. The AHJ should compile and evaluate information on the comparative advantages and disadvantages of the life safety rope and equipment under consideration. For example, an organization at the operational level performing a simple rescue might require the higher strengths offered by general-use equipment. A highly trained or specialized organization performing more complicated rescues might benefit from the lighter weight of technical-use equipment but, due to the level of training, can maintain an acceptable safety factor while increasing the efficiency of its operations. General-use equipment can provide greater durability and possibly an advantage for incidents in which the anticipated system loads are difficult to estimate.

A.5.1.2(7) The organization's geographic areas should include mutual aid or auto aid responses into other districts. Conditions include environmental factors that can make a rescue more difficult such as weather, terrain, vegetation, and distance from vehicular support.

A.5.1.3 The organization should take into account the following considerations in the risk and hazard assessment. While primarily considered an emergency means of egress from height for firefighters, escape capability is also appropriate for other emergency responders.

(1) Self-risk assessment.
(2) Escape situations that could occur in mutual aid and auto aid response areas. Consider type of escape situation that may occur in districts other than your own
(3) The organization's policy on staging for high rise or mid-rise structures. This will determine the length of the escape rope or webbing, whether purchased separately or as part of an escape system.
(4) The level of initial and ongoing training of the organization's personnel. This will determine the type of descent method, descent control device, and system. Different levels of training are required for the different escape devices and systems. For example, a larger-diameter escape rope is easier to grip, but it is bulkier and heavier for carrying.
(5) The type of operations conducted by the organization. For example, structural firefighting with its PPE might require a different escape system than an operation that does not have the potential for elevated temperatures but may still require emergency egress.
(6) The anticipated level of initial and ongoing training. This will determine the type of escape anchor device to be selected. A line around a solid object and secured by a carabiner is very secure but takes more time than other options. A hook or bar in the window allows for a rapid exit maneuver but is much less secure and requires a higher level of training.
(7) The compatibility of the escape system during transport, deployment, and use with the PPE worn by the organization's personnel. Evaluation of escape systems should be done with the evaluator wearing full PPE and SCBA or any other equipment normally carried.
(8) The situational use of the escape system. For example, the evaluator might want to start the escape system deployment while on knees or hands and knees.
(9) The type of structures and construction in the response area. Organizations should choose the anchor device best suited for the prevalent type of construction in their areas, such as interior anchor points, window framing of wood or brick, kinds of furniture, or exterior walkways or railings.

A.5.1.4 NFPA does not certify products. A third-party certification organization conducts the necessary evaluation and testing for certification to the applicable NFPA standard. Manufacturers cannot make a self-declaration that products meet the standard.

From time to time, NFPA receives complaints that certain items of fire and emergency services protective clothing or protective equipment could be carrying labels falsely identifying them as compliant with an NFPA standard. The requirement for placing the certification organization's mark on or next to the product label is to help ensure that the purchaser can readily determine compliance of the respective product through independent third-party certification.

NFPA advises those purchasing life safety rope or equipment to be aware that for life safety rope or equipment items to meet the requirements of NFPA 1983, they must be certified by an independent third-party certification organization. In addition, the item must carry the label, symbol, or other identifying mark of that certification organization.

A life safety rope or equipment item that does not bear the mark of an independent third-party certification organization is not compliant with NFPA 1983, even if the product label states that the item is compliant.

For further information about certification and product labeling, see Chapters 4 and 5 of NFPA 1983. Also, the definitions for *certification organization*, *certified*, *labeled*, and *listed* in Chapter 3 of this standard should be reviewed.

Third-party certification is an important means of ensuring the quality of emergency services protective clothing and equipment. To be certain that an item is properly certified, labeled, and listed, NFPA recommends that prospective purchasers require appropriate evidence of certification for the specific product and model from the manufacturer before purchasing. Prospective purchasers should also contact the certification organizations and request copies of the certification organization's list of products certified to the appropriate NFPA standard. Such a "listing" is a requirement of third-party certification by this standard and is a service performed by the certification organization.

All NFPA standards on fire and emergency services protective clothing and equipment require that the item be certified by an independent third-party certification organization, and all items of fire and emergency services protective clothing and equipment must carry the label, symbol, or other identifying mark of that certification organization.

Any item of protective clothing or protective equipment covered by an NFPA standard that does not bear the mark of an independent third-party certification organization is not compliant with the appropriate NFPA standard, even if the product label states that the item is compliant.

A.5.2.1 Typically the intended application of life safety rope is for protection of a person from fall or for actual access to or from height. While design for these applications might seem to be close, specific choices of life safety rope should be made for specific applications. Choices that the AHJ might make include, but are not limited to, material, construction, elongation, strength, diameter, weight, hand, color, and length. For example, a dynamic rope that has the ability to absorb energy safely might be more important than other qualities for protecting someone at risk of falling from height, while in a rope lowering or raising operation, a less elastic rope might be a better operational efficiency choice.

A.5.2.2 Cordage yarns typically used in life safety ropes are nylon, polyester, and para-aramids.

Nylon. Nylon for ropes comes in two types, Type 6 and Type 6,6. They have similar properties, but nylon 6,6 has less elongation and a slightly higher melting temperature (258°C) than Type 6. Type 6 nylon is often chosen if more elongation is desired *(see A.5.2.4)* and maximum strength *(see A.5.2.5)* and temperature resistance are not as important. Nylon, with a specific gravity of 1.14, is resistant to weak acids, decomposed by strong mineral acids, resistant to alkalis, resistant to organic solvents, and soluble in phenols and formic acid.

Nylon life safety ropes are very durable, usually have good handling qualities, and usually have a higher elongation percentage than other fibers. Nylon also absorbs water, resulting in increased weight and decreased strength.

Polyester. Polyester is lower in elongation than nylon, has about the same strength and temperature range as nylon 6,6, and has a specific gravity of 1.38. Polyester life safety ropes are selected if extremely low elongation is desired or the rope is expected to be used in wet conditions.

Life safety rope with a polyester sheath and nylon core has been available for several years and provides some of the advantages and disadvantages of each. Not as common and not around as long, nylon sheath and polyester core might have unique advantages for certain applications.

Para-aramids. Para-aramids include Kevlar®, Twaron®, and Technora®, among others. All of these fibers are much stronger than nylon and polyester and have very low elongation. They do not melt but decompose around 500°C. The specific gravity is over 1.39. Para-aramid ropes are selected when high temperature or flame resistance is required, often the choice for escape rope.

UHMWPE. Ultra high molecular weight polyethylene fibers include Spectra® and Dyneema®. The low melt point (150°C) of these yarns does not allow it to qualify for life safety rope, but its low specific gravity (0.97) and high strength make it a common choice for water rescue throwlines.

A.5.2.3 Rope construction is the method of assembling the yarn bundles into ropes. Different assembly types have various properties, making some constructions better than others for a particular application. NFPA 1983 does not specify any one particular rope construction type or material but provides performance requirements for a certified rope. Typical constructions found in emergency services are laid rope, double braid, and kernmantle

Braid. A rope or textile structure formed by a braiding process. [**CI 1202**, used with permission]

There are many subcategories of braids, each having its own advantages and disadvantages for use in rescue.

Braid Pattern. A description of the manner in which the strands of a braided rope are intertwined. A plain (diamond) pattern is when one strand (or multiple strand) of one direction of rotation about the axis passes over one strand in the opposite direction and it in turn passes under the next strand of the opposite direction. A twill pattern is when one strand (or multiple strand) of one direction of rotation about the axis passes over two strands of the opposite direction and it in turn passes under the next two strands of the opposite direction. [**CI 1202,** used with permission]

The diamond braid pattern is more common in life safety rope applications, but either pattern is permitted by NFPA 1983.

Hollow Braid. A single braided rope having a hollow center consisting of multiple strands which may be braided in a plain or twill pattern. A 12-strand braid is commonly used. [**CI 1202,** used with permission]

Hollow braids are the simplest of all braids to make. Their low strength compared to other constructions and soft hand make them seldom used in life safety rope applications, but they are found in utility fire service applications such as ladder halyards. Hollow braids lack the protective feature of a load-bearing core protected by an outer braid.

Double Braid. A rope constructed from an inner hollow braided rope (core) surrounded by another hollow braided rope (cover). Also called Braid-on-Braid, 2 in 1 Braid. [**CI 1202,** used with permission]

Double braids were popular with some fire rescue operations in the past. Their typical easy hand runs well in rigging gear such as pulley systems. Because the generally looser construction is easier to snag and abrade on rough surfaces, the double braids are no longer a selected as a life safety rope for fire ground or remote rescue operations.

Solid Braid. A cylindrical braid in which each strand alternately passes under and over one or more of the other strands of the rope while all strands are rotating around the axis with the same direction of rotation. On the surface, all strands appear to be parallel to the axis. [**CI 1202,** used with permission]

Solid braid is one of the more economical methods of manufacturing ropes, and many utility ropes in smaller diameters can be found in this construction style. They are often seen in water rescue ropes and hardware store general-duty small ropes.

Laid. Ropes made by twisting of three or more strands together with the twist direction opposite that of the strands. [**CI 1202,** used with permission]

Laid ropes are probably one of the earliest tools known. First made of natural plant fibers such as grass, they are now available in modern fibers like nylon and polyester. It is important to note any wear on the outside fibers because they are all twisted together without an independent inside core, unlike kernmantle and double braid constructions. Laid ropes are higher elongation than many other construction types. Elongation provides energy absorption in a fall but also makes for more work in haul and lower systems due to the same stretch. The

built-in twist in laid ropes can also be a management problem for the user in fire rescue operations.

Kernmantle. A rope design consisting of two elements: an interior core (kern) and an outer sheath (mantle). The core supports the major portion of the load; and may be of parallel strands, braided strands or braided. The sheath serves primarily to protect the core and also supports a portion of the load. There are three types: static, low stretch and dynamic. [**CI 1202,** used with permission]

Typical rescue kernmantle construction is a braided sheath over a continuous parallel core. This design provides relatively low elongation due to the parallel core strands and excellent protection of the core fibers from the covering sheath. Various models are available with thicker or thinner sheaths, tighter or looser sheaths, and low or high twist parallel core strands. Additionally, many different choices of materials and blends of materials are available. Most life safety ropes today are of kernmantle construction.

A.5.2.4 Elongation is the ratio of the extension of a rope, under an applied load, to the length of the rope prior to the application of the load expressed as a percentage. Rope increases in length as the load on the rope increases. [**CI 1202,** used with permission]

A rope's ability to elongate is important in that elongation can be a critical part of reducing the impact forces on the user and the system in a fall. Fall factors are a means of describing the relationship of the length of a fall to the amount (length) of rope available to absorb the fall's energy. Should a user fall from his or her position, rope anchored high above the user will provide a much lower fall factor than a rope of the same length anchored below the user.

NFPA 1983 requires manufacturers to provide users with the elongation of certified ropes at 1.35 kN (300 lbf), 2.7 kN (600 lbf), and 4.4 kN (1000 lbf). This information can provide a good comparison between one rope and another as to their elongation to load curves for typical working loads. The more a rope elongates, the more energy it will absorb in a fall. Too much elongation can cause problems such as rope bounce when lowering, excess resets in haul systems, and loss of control in mid-face loading in a pick-off rescue. Typical fire-rescue applications choose ropes classified by the Cordage Institute as either static or low stretch.

Static Rope. A rope with a maximum elongation of 6% at 10% of its minimum breaking strength. [**CI 1202,** used with permission]

Static life safety rope is usually selected when rope stretch will be a problem. This can occur with high lines, guiding lines, long rappels, or rope systems with a long length of rope involved. Static ropes allow a more efficient mechanical advantage haul system because less stretch must be removed from the rope after each reset of the system.

Low Stretch Rope. A rope with an elongation greater than 6% and less than 10% at 10% of its minimum breaking strength. [**CI 1202,** used with permission]

Low stretch life safety rope provides a balance between not too much stretch during use and some elongation to absorb energy should a shock load occur to the system. There is always a trade-off in arresting a falling rescuer or litter — the less distance the fall, the higher the impact force but also the less chance of hitting something on the way down.

Moderate Stretch Rope. A rope with elongation greater than 10% and less than 25% of the rope's minimum breaking strength. [**CI 1805,** used with permission]

Moderate stretch rope is not classified as life safety rope according to NFPA 1983 because of the greater amount of elongation. Moderate stretch rope is classified as a special-use rope defined by NFPA 1983 as moderate elongation life saving rope. The greater elongation allows for a lower impact force, but there is more movement when the rope is loaded.

High Stretch Rope. A rope with an elongation greater than 25% at 10% of the MBS. [**CI 1805,** used with permission]

Dynamic Rope. A very high elongation rope compared to static and low stretch ropes. Requirements for this rope are based on the UIAA climbing rope standard for mountaineers and are typically outside the scope of NFPA 1983. Dynamic ropes are used to lower the impact load on a climber's body, the anchors, and the equipment in a roped fall. One use in the fire service is for belaying a rescuer approaching a person who is threatening suicide by jumping from a height.

A.5.2.5 Life safety rope certified to NFPA 1983 must meet a minimum performance level for the intended use. The MBS is a statistical calculation that provides a number in which the user can have confidence that all new ropes of that design will meet or exceed that MBS. The MBS test is a best case test method, and real field applications are not likely to get the same strength.

Edges, knots, age, wear, temperature, moisture and many other factors can lower the real breaking strength of a rope in use. Some factors will change the strength, as when a knot is untied or replaced with a different knot, making the rope stronger or weaker. Others factors such as wear or chemical exposure can cause permanent loss of strength.

Simply specifying "the strongest rope available" is problematic because strength is directly proportional to rope diameter. As the diameter increases, so does the weight of the rope. An understanding of the organization's system safety factor will determine what strength specification will be sufficient when force multipliers, knot efficiency, possible dynamic loading, and the other system components are considered.

A.5.2.6 For NFPA 1983, the actual diameter of a certified rope is determined according to Section 9.1 of CI 1801, *Low Stretch and Static Kernmantle Life Safety Rope*, and then rounding to the nearest 0.5 mm .($\frac{1}{64}$ in.)

Equipment such as pulleys, ascenders, and descent control devices often work correctly only when matched with the correct diameter rope. In some combinations, a very small difference in rope diameters will change the performance of the other devices. The organization must take care to make sure the ropes purchased match the other devices in service or expected to be purchased in the future.

Larger diameter ropes are easier to grip by hand, but they also are heavier.

A.5.2.7 The weight per unit length of a rope is one indicator of the amount of material used to produce a rope when comparing one rope construction to another. Generally speaking, a rope with a higher per meter weight will be stronger than

a rope weighing less per meter when both are made from the same material. However, care should be taken with such an assumption because rope might also be weighted by other material.

Consideration needs to be given to the length and the diameter of a rope and the weight of a given rope length for deployment and transportation to the site. Bigger is not necessarily better if a rope has to be carried long distances and an adequate safety factor could be provided with a smaller diameter rope.

A.5.2.8 The feel of flexibility and smoothness of a rope when tying knots or running it through equipment such as descent control devices and pulleys is often referred to as "hand." While a soft hand makes knots in ropes easier to tie, they may not untie after loading as easily if the hand is too soft. Ropes with a soft hand can also overly flatten out over edges and when running through descent control devices and pulleys.

Ropes with a very stiff hand have better abrasion resistance and flatten less in devices, and loaded knots might be easier to untie. The correct choice could be between these extremes, depending on the devices being used with the rope and the environment it will be rigged in.

A.5.2.9 The most common use of color is to differentiate life safety rope while it is in service. For example, the main line would be one color and the belay line a different color — the rope that requires action can be quickly identified by the color.

Other choices for the use of color could be to designate different lengths of rope used by the organization or to indicate the year of purchase.

A.5.2.10 Length is a critical specification in that ropes must reach the ground (or location of the intended load) with enough length to tie into anchors, build haul systems, and allow for operational personnel at the top and bottom to be back from any hazard zone. While ropes can be knotted together to extend the length, passing a knot through a device or system is time consuming and should be avoided if sufficiently long ropes can be deployed. Shorter length ropes can also be carried to aid in rigging.

Organizations performing hazard assessments for their jurisdiction must consider all tall objects from which a rescue might be needed, not just high-rise or multistory buildings. Bridges, dams, radio towers, tunnels, ventilation shafts, and the like are all potential sites for rope rescue. Having adequate rope lengths and numbers are key to a smooth and safe operation. Some rescues off high objects are often best run from the ground requiring more than double the height of the object to operate successfully.

Jurisdictions that have a variety of heights should consider carrying different lengths of rope. For a rescue from a lower height, a shorter rope will reduce the bulk and weight needed to be carried to the rigging area. For rescues from higher structures, longer ropes allow a smoother rescue by avoiding a knot pass through a device or system.

A.5.2.11 NFPA 1983 requires the fiber of a life safety rope to have a melting point of not less than 204°C (400°F) when tested to ASTM E794. The thermal requirement limits damage to the rope due to heat generated by the friction of the life safety rope running through a descent control device or over edges.

The performance of nylon and polyester life safety ropes will begin to degrade at temperatures below the melting point of the fibers. For that reason, use intended on the fire ground or near high temperatures require some means of protecting the rope.

A.5.2.12 There are many factors to consider in the design of a rope. The AHJ should review, inspect, and compare a rope's interaction with the organization's equipment in expected conditions of use. No organization should assume that, given various types of ropes, all rope-related equipment will function or react the same. Rope sheath material, core material, and their interaction with each other should be considered. Rope performance can vary when materials used in the construction of the sheath differ from those used in the core.

Sheath designs, including the braid pattern, number of yarn carriers, and the tightness of the sheath, are critical elements to consider for the interface between the rope and various items of hardware, such as descent control devices, pulleys, ascenders, rope grabs, and belay devices. The organization must evaluate the interaction of its equipment to determine favorable performance for various styles of ropes and their materials and construction features.

Also of importance is the hand and abrasion resistance of the rope. The number of carriers and the tightness of the sheaths braid can affect the hand and the abrasion resistance of the rope. These characteristics should be evaluated by the AHJ to determine the desired performance of a rope.

A.5.3.1 Escape rope is part of an assembly worn by a rescuer and used to descend from a position of height to safety at a lower level. An escape assembly might have an escape anchor device, an escape rope, and an escape descent control device connected to a belt or harness or integrated into a SCBA or the turnout jacket or pants. The assembly might be carried in a pocket or bag attached to the rescuer. The organization should evaluate through practical testing to ensure that all the components are compatible and function as intended. For selection criteria on the other components that might be a part of the escape assembly, see Sections 5.6, 5.9, and 5.18.

A.5.3.1(1) Exposure to elevated temperatures degrades the strength of the any rope, which decreases the time that the rope is able to support the user. Larger diameter ropes provide a greater resistance to failure at elevated temperatures. Greater bulk takes longer for the effect of heat to weaken the rope, allowing more time to complete the egress. The trade-off is greater bulk and weight.

In general, fire escape rope should be used when higher temperatures are anticipated. Escape rope can be chosen when temperatures not requiring PPE for heat are anticipated.

It should be noted that no fiber is fire proof and that fire escape rope, while having a higher working temperature, is still susceptible to the high temperatures typically found in burning structures.

A.5.3.1(2) The termination at the anchor end of the rope determines how the user will connect the rope to a structure for a secure anchor that will support the user's weight. The end of the rope can be attached to a hook, bar, or carabiner using a knot or sewn termination. Either type of termination reduces the strength of the rope by some factor.

A.5.3.1(3) Not all ropes are tested or certified with all types of descent control devices. The organization should determine that the rope selected is compatible with the type of descent control device selected. The manufacturer of the device should be able to supply the information as to which specific ropes have been determined to function and consulted as to what type of rope was tested or certified with the selected descent control device

A.5.3.1(4) This is a function of the descent control device selected, the diameter of the rope, and the "gripping" surface of the rope. Proper technique for most escape descent control devices includes operating the device with one hand while the other hand grips the rope. The tension required with the hand gripping the rope depends on the particular descent control device. The more tension that must be held by the hand on the rope, the more important is the ability to grip the rope.

A.5.3.1(5) When making an emergency escape, there is a high probability that the user will impact the escape rope and system in an attempt to exit quickly. It is important that the system or components chosen will limit the impact forces on the user, the anchors, and other components to limit user injury and prevent a failure of the system.

There are a number of ways this can be addressed in the design of an escape system, including the following:

(1) Choosing an escape rope with sufficient elongation to absorb the expected impact force
(2) Choosing a descent control device that slips at approximately 8 kN to limit the forces on the system
(3) Choosing an escape system with a force limiter or absorber built into the system

A.5.3.2(1) Due to the bulk and weight of an escape system, only a certain amount of rope can reasonably be carried. The height of structures in the response area help determine a minimum length of rope for the escape system. If the structures are several stories high, the protocol could be to evacuate to a lower, safe level rather than completely to the ground.

A.5.3.2(2) Consideration should be given for additional weight and bulk during daily operations. For example, on the fire fighter the escape rope might be carried or worn in the turnout pants, in the turnout coat, on the SCBA, or on a belt. The location and the packaging affect the user's ability to deploy the rope and should be evaluated while the user is wearing full equipment, while the user is in different positions such as kneeling, and while the user is wearing SCBA and mask. The location of the rope cannot not interfere with the use or performance of other PPE worn by the user.

A.5.3.2(4) Because of the smaller diameter of escape ropes and the type of fibers that might be selected, fire escape ropes are not as durable as life safety ropes. Generally, escape ropes should have minimal use, such as one or two rappels, to verify the performance and the user's ability to operate the escape assembly, then annual training. If the organization's protocol calls for greater use, then a larger diameter rope should be selected to increase durability.

A.5.4 Life safety harnesses fulfill a variety of roles for both rescue and fire ground operations. Specialized harnesses might be required for different types of operations and levels of operational capability. Some harnesses are specialized, while other designs are suitable for a wider range of uses. Following is a list of specialized harnesses:

(1) An escape harness is intended to be worn during elevated operations and used with an escape system for an emergency descent to a lower position of safety.
(2) A rescue harness is designed to provide a safe working platform for a rescuer supporting the load of a victim.
(3) A travel restraint harness is a fall protection harness that prevents the wearer from reaching a position where a fall might occur. The rescue version of a travel restraint harness will have travel restraint attachment points.
(4) A fall arrest harness is a fall protection harness that stops a fall and supports the wearer until he or she can self-rescue or be retrieved by others. A rescue harness will have fall arrest attachment points.

A.5.4.1 NFPA 1983 divides harnesses into two classes, Class 2 and Class 3:

(1) A Class 2 life safety harness fits around the waist and around the thighs or under the buttocks. Sometimes referred to as a "sit" or "seat" harness, it is the primary load-bearing surface for both the Class 2 and Class 3 designs. A Class 2 harness provides greater mobility for some rescues and is all that is required for low-angle rescue.
(2) A Class 3 life safety harness fastens around the waist, around the thighs or under the buttocks, and over the shoulders; it is also referred to as a "full-body" harness. A Class 3 harness provides greater upper body support, which is useful for vertical operations such as confined space entry and helicopter hoists.

A Class 3 harness can be one piece or a combination of a Class 2 harness and a chest harness that connect together. A Class 2 harness used with a separate chest harness provides upper body support but might not transfer the user's load to the Class 2 harness.

While both types of harnesses are capable of fall arrest, the most commonly used industrial fall protection attachment points are sternal or dorsal, which requires a full body harness.

NFPA 1983 requires that both the Class 2 and Class 3 harnesses pass a head-down drop test to verify the harness will not allow the user to fall out of it.

A.5.4.2 NFPA 1983 provides for two types of attachment points: load bearing and positioning. A load bearing attachment point is designed for a higher static load and for an impact load. A positioning attachment point is intended only to support the user's weight while the user is sitting in the harness or for travel restraint to prevent the user from reaching a location where a fall could occur.

Load bearing attachment points are usually at the front waist and the sternal and dorsal locations. The front waist attachment point is the most common on life safety harnesses and provides the most useful attachment location for descents and for working in the harness. This attachment point allows the user to sit in the harness and allows maximum mobility for operations such as pick-offs and litter tending.

Because the sternal attachment point is above the user's center of gravity, it holds the user in a more upright position while transferring the load to the waist and leg straps of the harness. A sternal attachment point would be selected if a more upright position is required, such as for entry into a narrow space or helicopter hoist operations. The sternal point is also

used for limited fall arrest, allowing the user to be stopped in a more upright position and facing the life safety rope.

The dorsal attachment point is used for fall arrest system attachment in an industrial-type work situation where space below the user is provided for the arrest.

Positioning attachment points are usually at the side, shoulder, or rear waist. Side attachment points would be selected if the wearer will be leaning back into the harness while attached to a structure. They provide a more stable position than a single attachment point at the front waist.

A Class 3 harness with shoulder attachment points would be selected when there is a requirement to lift the user in linear body position for movement through a narrow space.

The rear waist attachment point is used for travel restraint to prevent a fall when the user is working near an edge.

A.5.4.3 Comfort and ease of donning are both subjective evaluations of harness performance. Due to the human factors involved, practice with different harnesses or review of evaluations by other organizations will be required.

Weight is another function of comfort. A Class 3 harness with multiple attachment points weighs several pounds and while providing the user comfort during suspension, the added weight must be carried when the user is walking or climbing.

A.5.4.4 Specialty fibers are used in construction of a harness to meet exposures not normally found in rescue situations.

Fire-resistant (FR) fibers provide a greater durability when exposed to the heat of fire ground operations and can be an essential specification for harnesses worn for escape. The FR fiber webbing is more expensive and has a shorter service life.

Hazmat or confined space operations can create an exposure to certain chemicals. If anticipated exposures are known, then webbing made from fiber resistant to that chemical can be specified.

For water and flood rescue operations, water reduces the performance of nylon; a hydrophobic fiber will dry quicker.

A.5.4.6 The personnel conducting the evaluations should wear the harness with the equipment to be used and with other required PPE. The evaluators should conduct simulated operations such as rappels, emergency escape descents, high angle stretcher tending, low angle stretcher tending, and work-at-height operations.

A.5.5 Belts do not provide the support of a harness, and their use must be limited to their specific functions.

A.5.5.2 An escape belt should be used only if the wearer will be suspended for the minimum amount of time necessary to reach a safe area. For most organizations, an escape belt is also used as a tool belt or an equipment belt.

A.5.5.3 A ladder belt has a positioning attachment point at the end of a tether. The maximum length of the tether is specified in NFPA 1983. The gate opening of the carabiner at the end of the attachment tether must be large enough to fit over the intended connection location on the organization's ladders.

An escape belt requires at least one load-bearing attachment point to which the escape system will be attached. This attachment point selected must be compatible with the escape system.

A.5.5.4 Comfort and ease of donning are subjective evaluations of belt performance. Due to the human factors involved, practice with different belts or a review of evaluations by other organizations might be required. Evaluations should be done with the ensembles intended to be worn by the personnel, taking into consideration whether the belt will be worn over or under a coat, integrated with pants, and compatible with an SCBA or other PPE.

A.5.5.5 Specialty fibers are used in construction of a belt to meet exposures not normally found in rescue situations.

FR fibers provide a greater durability when exposed to the heat of fire ground operations and can be an essential specification for a belt worn for escape. The FR fiber webbing is more expensive and has a shorter service life.

Hazmat or confined space operations may create an exposure to certain chemicals. If anticipated exposures are known, then webbing made from fiber resistant to that chemical can be specified.

A.5.5.6 Accessories include but are not limited to loops, holsters, or pockets for carrying tools. Any accessory added to the belt should not interfere with the performance of the belt's intended function.

A.5.5.7 The personnel conducting the evaluations should wear the belt with any equipment that might be carried, with the ensemble to be worn, and with other required PPE. The evaluators should conduct simulated activities such as emergency escape descents or climbing and descending ladders.

A.5.6 A carabiner is an auxiliary system equipment item used to join other components to life safety rope or other system components. It is a load-bearing connector with a self-closing gate *(see Figure A.5.6)*.

A.5.6.1 For evaluating whether the organization should select general-use or technical-use carabiner, see A.5.1.2(6).

A.5.6.2 Carabiner gates have several different methods of preventing the carabiner from accidently opening during use.

The simplest design does not have a locking system and is usually referred to as a nonlocking carabiner. While having a long history of use for life support in the recreational field, nonlocking carabiners are not considered adequate for industrial or fire service use. See 6.5.5 of NFPA 1983.

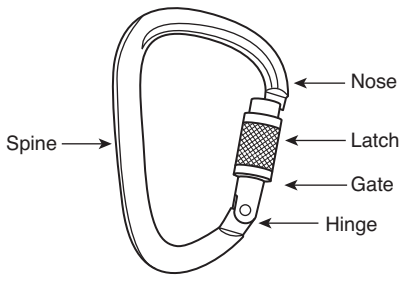

FIGURE A.5.6 Parts of a carabiner.

Manual lock designs require a physical movement to activate the locking mechanism, which can be either a sleeve that screws the gate over the nose or a sleeve that, once activated, snaps into place. A physical movement is required to move the sleeve down to unlock the carabiner. Common names for this type of carabiner lock design include screw gate and manual lock.

An automatic locking gate is designed so that when the gate closes, a spring moves the sleeve up the gate and over the nose. Two or three physical movements are required to unlock the gate. This type of carabiner is usually referred to as auto-locking.

Auto-locking carabiners might be preferred for life safety use because the user does not have to remember to activate the gate-locking mechanism. Manual-lock carabiners have the advantage of easier removal from their storage location because they do not need to be unlocked first. Before relying on the carabiner for life support, the user must verify for both types that they are locked; while the gate might close automatically on the auto-locking model, if webbing or clothing blocks the gate from closing, the carabiner will be unlocked and could even remain open.

Some jurisdictions and activities require the use of ANSI-rated connectors, which have additional design, strength, and rating requirements. The AHJ needs to determine if all applicable regulatory requirements have been addressed while conducting a safety analysis for both incident and training environments.

A.5.6.3 The most common carabiner materials are steel and aluminum. Steel carabiners generally are the strongest and heaviest, but they weigh more than comparable-sized aluminum carabiners. Carabiners of aluminum and steel meet the general-use performance requirements of NFPA 1983. Consider which criteria must be met: strongest without consideration of weight or lightest while maintaining an acceptable safety margin.

In general, steel carabiners are plated or coated to resist rust and other corrosive effects. The quality of the finish and the expected atmosphere should be considered. Aluminum and stainless steel carabiners are affected less by rust but can be corroded by chemicals and atmospheres. Special or unique operations might require a specific material or additional care.

A.5.6.4 The shape and size of the carabiner are determined by the anticipated strength requirements and the size of components to which the carabiners will be attached. For example, a carabiner connecting to a ladder will need a wide gate opening and might utilize a pear shape to minimize weight. A carabiner connecting to a descent control device needs only to be large enough to fit through the device and the attachment point on a harness.

A carabiner with an asymmetrical shape shifts the load toward the spine and away from the gate, resulting in a carabiner that is stronger for its weight and size. As the load moves away from the spine, such as with triaxial loading, the effective strength of the carabiner is reduced. Common asymmetrical shapes are "D" and a modified "D."

A symmetrical carabiner centers the load equally on the gate side and the spine and is less susceptible to strength loss due to triaxial loading. For the same size and weight, the symmetrical carabiner is generally not as strong as an asymmetrical carabiner. Common shapes are oval and pear shaped.

Larger carabiners tend to be stronger due to the larger diameter stock used. They also fit over larger diameter connection points. Some models use an offset or side-swing gate to increase the gate opening for fit over large connection points. Small carabiners also can be very strong and have an advantage in being lighter, allowing more equipment to be carried.

A.5.7 A rope grab is an auxiliary system equipment item used to grasp a life safety rope for the purpose of supporting loads. Rope grabs include ascending devices.

An ascender is a type of rope grab auxiliary equipment that is a friction or mechanical device used to ascent a fixed line. Ascenders typically have a handle or other method of grabbing to allow them to be easily pushed up a rope.

A.5.7.1 For evaluating whether the organization should select general-use or technical-use equipment, see A.5.1.2(6).

A.5.7.2 Rope grabs have several different methods of gripping the rope.

Pressure Plates. Typical fall protection rope garbs used in industrial fall arrest have wide plates that spread the force applied to the rope grab's attachment point to a large area of the rope compared to other rope grabs. This type of rope grab is often designed to slip on the rope at a force low enough to prevent injury to the user in a fall.

Enclosed Cams. Many technical rope rescue rope grabs have a cam that is also the direct attachment for the load on the rope grab in use. Typically, the cam is removable by a pin that acts as the fulcrum of the cam. The cam applies force by compressing the rope between the cam and the body of the rope grab. These types of rope grabs are often designed not to slip or to slip at a force high enough to allow them to be used in typical mechanical advantage rope systems. They should not be used for fall arrest.

Rope grabs used in hauling systems tend to be the heavier aluminum models that completely close around the rope. These types usually require two hands to place them on or remove them from the rope but are typically mechanically stronger frames because of the enclosed design. Even so, the true strength of a rope grab can be determined only in conjunction with the rope chosen to be used with it, since the action of the rope grab can cause failure in the rope. Some rope grabs are designed to slip at a high load to protect the rope from being cut; others will continue to dig in until the rope fails.

Handled ascenders. Rope grabs used as ascenders for personal ascending of a fixed line typically are made to be easily placed on or removed from the rope with one hand. They tend to have a single open side with a safety that prevents the ascender from coming off the rope inadvertently. The cam is often a fixed pivot point with a curved frame to guide the rope and a safety device to prevent accidental removal from the rope. These types of rope grabs (ascenders) typically are not rated as strong as other types and are usually used in pairs for ascending ropes. They should not be used for fall arrest or mechanical advantage rescue systems due to their typically lower strength rating.

A.5.7.3 The most common rope grabs are steel and aluminum. Steel rope grabs generally are the strongest and heaviest,

but they weigh more than a comparable-sized aluminum grab. Steel and stainless steel rope grabs typically are found as personal fall protection grabs for industrial use as worker protection. They can be used as self-trailing rope grabs on a second life line when ascending or descending a main life line or as a backup for ladder climbs. Industrial fall protection rope grabs carry an ANSI Z359 or similar certification.

In general, steel rope grabs are plated or coated to resist rust and other corrosive effects. The quality of the finish and the expected atmosphere should be considered. Aluminum and stainless steel rope grabs are affected less by rust but can be corroded by chemicals or atmospheres. Special operations might require a specific material or additional care.

A.5.7.4 Of all the equipment used in technical rope rescue, a rope grab's performance is affected the most by the rope used with the rope grab. Subtle differences in rope materials, sizes, and construction can give dramatically different strength or slippage results with rope grabs. Rope grabs of aluminum and steel might meet the general-use performance requirements of NFPA 1983, but the user must ensure that the desired strength has been tested on the specific rope that will be used with the rope grab. For that reason, most rope grabs on the market meet only the technical-use performance requirements of NFPA 1983. Consider which criteria must be met: strongest without consideration of weight and slippage or lightest while maintaining an acceptable safety margin.

A.5.8.1 The MBS of approved throwlines is specified in NFPA 1983, but consideration must be given to the possibility of a multi-person load when a throwline is used in actual rescue scenarios. Throwlines are designed primarily for the safe capture of single waterborne individuals from a land-based or boat-based platform.

A.5.8.2 The acceptable diameter range of approved throwlines is specified in NFPA 1983. End users must consider both volume (desired length) and grip (diameter and weave) characteristics of throwlines. Larger diameter throwlines require larger containment bags and take up increased storage space, but they offer both increased strength and better grip functions when wet.

A.5.8.3 The ability of throwlines to float, which is required by NFPA 1983, greatly enhances retrieval of a victim from water. Nonfloating throwlines have the disadvantage of increased weight when they become saturated during victim retrieval from a water environment. When rope submerges, it can create a snag hazard, potentially causing a hazardous situation in moving water. For a throwline to float, it must have a specific gravity of less than 1, and the fibers meeting that requirement usually are not as strong as the fibers used in life safety rope. The organization might determine that any throwline selected meets its requirements for floatability.

A.5.8.4 The handling characteristics of a throwline are important because it needs to remain flexible, wet or dry, and be supple enough to be readily repacked in its original form for immediate reuse.

A.5.8.5 The maximum length that a strong person can deploy a throwline using a throwline bag is about 24 m (80 ft). Shorter lengths depend on the width of the water courses in the jurisdiction and how the throwline is transported by the user. Longer lines might be selected for deployment from bridges or by other means. Users operating in boats often select a shorter length due to the greater limits on the distance the bag can be thrown.

A.5.8.6 A water rescue throwline should be stored in a bag that allows ease of transport and also allows the throwline to be deployed farther and with greater accuracy. The bag should have some flotation to help the end of the throwline stay on the surface and for greater visibility in the water. There also should be a means for connecting the throwline to the bag. The bag should be constructed in a manner that allows water to flow through it during deployment and provides air circulation. Other considerations include the ability to attach the bag to the rescuer for transport and attachment points or pockets for a carabiner or lightstick. High visibility materials improve the visibility of the bag when deployed.

A.5.9.1 The function of a descent control device is to control the lowering of a load suspended by a life-safety rope. The descent control device adds variable friction to the rope, allowing one person to control the rate of descent. The operator and the device could be stationary at the top or could be moving along the rope, as in a rappel. Some designs are limited to one type of descent, while others perform well for various applications. For example, a brake bar rack is a popular rappel device for cavers and a common device for the main line for lowering a litter system. The device used for both of those applications is too large and too heavy to be carried as an escape device and would not be the best fit for the smaller rope and webbing used for with the escape device.

A.5.9.2 Anticipated loads could be as high as 4 kN (900 lbf) for a litter system with a patient and two tenders. For a single-purpose escape descent device, the anticipated maximum load would be limited to 1.33 kN (300 lbf). For evaluating whether the organization should select general-use or technical-use equipment, see A.5.1.2(6).

A.5.9.3 Many different descent control devices are available to rescuers. It is important to note the vast design and operating differences in traditional variable friction devices to devices with auto-locking and/or panic-stop features. Selection should be based on an evaluation of the interaction of the descent control device with not only the life-safety rope selected but with the entire rescue system. For example, some descent control devices do not need to be removed from the system and can be used as a progress capture pulley during conversion from a lowering system to a mechanical advantage system. The experience of the rescuers and the organization's standard operating procedures also should be considered to ensure that a system is in place to stop a load from moving unintentionally (e.g., belay system, auto-locking descent control device). The following advantages and disadvantages should be compared when selecting a descent control device:

(1) Manual and auto-locking are the two primary functional types of descent control devices. An auto-locking device requires the operator to activate the device to allow the rope to slide through. If the operator lets go, the rope movement stops. A manual device requires the operator to maintain a grip on the rope during lowering and physically tying off the device when stopped. Most manufacturers of auto-locking devices recommend maintaining a hand grip on the rope as a safety back-up. Manual devices tend to be simpler, have fewer moving parts subject to wear, are easier to inspect, and might be lighter in weight than auto-locking devices. Many of the current auto-

locking designs are intended for rappel and might not be robust enough for litter systems.

(2) A descent control device designed for escape or bailout should be small and lightweight for wear with turnouts but still be easy for the rescuer to operate when wearing PPE gloves. A descent control device for a lowering system can be more robust, and weight might be less of a factor if it is used primarily when attached to a vehicle or over the side systems.

(3) Descent control devices are marked with the diameter of life safety rope for which they are designed to be used. Even with the compatible diameter, performance can vary both to the MBS and to their effectiveness. Descent control devices are tested in a manner of function, and the MBS can vary significantly, depending on the life safety rope used. The manufacturer can supply the specifications of the rope for which the descent control device has been tested. The amount of friction generated by the descent control device also varies, depending on the life safety rope used and should be evaluated with field trials.

(4) The material of manufacture is a consideration for durability. For surfaces contacting the life safety rope, generally steel or titanium wears longer than aluminum, an important consideration for heavily used descent control devices. The added weight or expense might not be warranted for a seldom used descent control device, such as an escape device.

(5) The ability of the descent control device to dissipate heat is important for long lowers. The simpler, manual devices such as brake bar racks and brake tubes seem to dissipate heat well. Some auto-locking devices have a manufacturer-specified maximum descent distance due to heat build-up.

A.5.9.4 The level of initial training and the frequency of ongoing training are factors in determining which descent control device is best suited for the organization. For example, a technical team that works with a variety of rope rescue equipment and trains regularly will maintain a competency that allows a wider choice of descent control device and might have different types available.

(1) Pre-rigged descent control devices are the preferred choice for escape and bailout primarily because of the requirement for immediate deployment. A pre-rigged descent control device also could be used for basic rope systems in which the response analysis shows a consistent type of rescue. For example, a truck company that responds to over-bank rescues could have the life-safety rope rigged to the descent control device and ready to attach to the anchor and the rescuer when the rope is pulled out of the rope bag.

(2) Auto-locking devices use a lever to vary the friction. Pushing or pulling the lever reduces friction and allows the rope to move through the device faster. Pushing or pulling more increases the rate. If the operator panics and holds the descent control device open, the load will not be stopped. Some of the auto-locking descent control devices have a panic-stop function in which a full push (or pull) slows or stops the movement. While this safety feature can be valuable, the trade-off is that the descent control device's "sweet spot," where the rope runs through best, can be hard to find in some designs.

(3) The organization should evaluate the compatibility of its operational procedures with rigging the rope into the device; manipulating the device to adjust the friction, stop movement, and lock off the descent control device in a safe manner; passing a knot; and converting from a lowering to a raising and back.

A.5.9.5 The personnel conducting the evaluations should be in response attire and PPE that will be worn during the operations in which the descent control device will be used.

For example, a descent control device for escape should be evaluated by a user wearing full turnouts with gloves and SCBA with mask and second-stage regulator in place and operated in the expected positions, such as on the knees or crawling. This simulates the physical state that users would be in when deploying the escape rope and equipment, due to the heat that would be pushing them to the floor. Performance of payout, handling, and accessibility also should be considered.

Field evaluations should determine how well the operators are able to rig the rope into the device, manipulate the device to adjust the friction, stop movement and lock off the descent control device in a safe manner, perform a knot passing procedure, and convert from a lowering to a raising and back.

Individuals conducting field evaluations at an elevation should be protected by a safety line.

A.5.10 NFPA 1983 defines a portable anchor as a "manufactured device with rigid arms, legs, or both designed to support human loads." A portable anchor device typically is a device to allow artificial multidirectional attachment points for rescuer access to confined spaces, to aid in rope rescue edge transitions, and to elevate a load abovegrade. The most common type is a tripod, but portable anchors include easel-leg tripods, A-frames (bipods), gin poles (monopods), davits, quad-pods, and cantilever devices.

A.5.10.1 Organizations responding to confined space rescues generally need a portable anchor. It can be one brought to the incident or, at some facilities, might already be on scene. Another situation is the use of a portable anchor as a directional for work near a cliff or roadside edge that is difficult to pass (e.g., instability or an overhang). Portable anchors brought to the incident require time to set up and must be stabilized prior to use. Incorrect rigging can result in an anchor toppling.

A.5.10.2 For evaluating whether the organization should select general-use or technical-use equipment, see A.5.1.2(6).

A.5.10.3 Portable anchors can be stored in one or more bags or cases. Personnel should evaluate ease of transportation to the rescue site. Portable anchors can be bulky and heavy, so a factor to consider in selection could be how readily the device can be packaged and transported to locations for intended use.

A.5.10.4 A portable anchor can have components that are required to be assembled according to the manufacturer's instructions. Evaluation should be conducted on the ease of assembling the components in the environment in which rescuers will use the device. Components should remain secure once assembled and be easy to disassemble once the operation is complete.

A.5.10.5 A portable anchor should provide the user with multiple configurations and adjustability appropriate to the application. The portable anchor should be evaluated for adjustability of legs and/or arms over both even and uneven terrain. Height adjustability also should be evaluated to ensure

that proper attachment point height is achieved in different configurations.

A.5.10.6 Davit-type portable anchors usually are mounted on a portable U-shaped frame or on a pre-installed mount. The frame should be evaluated based on its portability, type of surface it will be used on, and the size opening it must accommodate. Portable anchors with legs, such as tripods, all have some type of foot at the end of each leg. Sharp, pointed legs hold well on soft surfaces and often on rock or asphalt. Flat feet are used where the surface needs protection from penetration, such as on some roofs or floors.

A.5.11 A pulley is a device that allows for a rope to pass over one or two sheaves to apply a multiplication of force or simply to change the direction of the rope. *(See Figure A.5.11.)*

A.5.11.1 Pulleys are used primarily to set up mechanical advantage systems to increase the ability of personnel to lift a rescuer, litter, victim, or a combination of those. Pulleys are also used to change the direction of a life safety rope to increase the efficiency of a pull, to avoid friction-causing surfaces, to move the life safety rope away from abrasive surfaces, or as a carriage to transport the load along a life safety rope.

A.5.11.2 Pulleys used to change the direction of a life safety rope more than 120 degrees can be subjected to a force two times that of the load. Pulleys in mechanical advantage systems or used for changes in direction less than 120 degrees can see forces lower than the load. For evaluating whether the organization should select general-use or technical-use equipment, see A.5.1.2(6).

A.5.11.3 The selection of the pulley for an intended application requires a consideration of several design features: efficiency, single or double sheaves, ratchet, and size.

(1) *Efficiency.* Pulley efficiency is essentially the rolling resistance of the sheave and the rope. Many factors affect efficiency, including sheave size, bearings, and side plate interaction. For most applications, a pulley with ball-bearing provides the highest efficiency and the differences efficiency between the ball-bearing pulleys are virtually insignificant.

(2) *Single or Double Sheaves.* Single-sheave pulleys are the most common and are used in most applications. Double pulleys allow a simpler way to rig a higher mechanical advantage and are often seen in pre-rigged pulley systems. Double pulleys can have a becket or attachment point at the bottom. In a mechanical advantage system using double pulleys, one of them usually requires a becket. NFPA 1983 has performance requirements for beckets.

(3) *Ratchet.* A ratchet is a means of holding the life safety rope when the operator releases it. A ratchet can be internal on a self-tending pulley or an independent device rigged with the pulley. Self-tending pulleys should be evaluated on the ratchet's ability to support the load and the pulley's ability to be released remotely. Some require the load to be lifted first, others do not. If a Prusik hitch or similar knot is used as an independent ratchet, a flat-bottomed, or "Prusik minding," pulley might be needed to prevent the knot from jamming between the sheaves.

(4) *Overall Dimensions.* Manufacturers generally recommend that the minimum pulley sheave size be no less than four times the diameter of the rope, to reduce the loss of strength from compression and elongation of the rope fibers. For example, if a 12.7 mm (½ in.) life safety rope is used, a minimum of a 50.8 mm (2 in.) pulley should be selected. Smaller pulleys are lighter and more compact, and the strength loss down to a 25.4 mm (1 in.) pulley is minimal. A pulley with a larger sheave has a slightly higher efficiency than a smaller pulley with the same type bearing, but it is heavier and bulkier to store and transport.

(5) *Sheave Width.* Proper sheave width is necessary to prevent the life safety rope from dragging on the sideplates and reducing the pulley's efficiency. Most pulleys accommodate 12.5 mm (0.49 in.) life safety rope and can also be used for 11 mm (0.43 in.) rope. Consideration should be given if a pulley is sized for 11 mm (0.43 in.) rope and the organization also uses 12.5 mm (0.49 in.) rope. If the organization uses 16 mm (0.63 in.) life safety rope, a wider sheave pulley will be required.

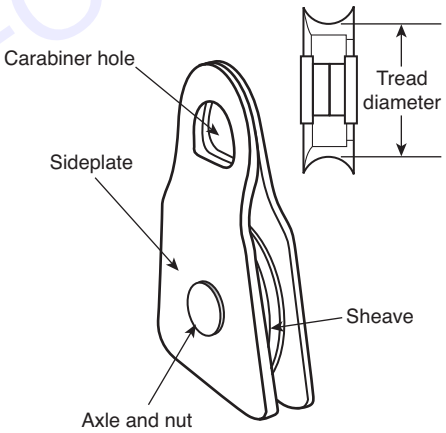

FIGURE A.5.11 Parts of a pulley.

A.5.12 A belay device is an item of equipment that attaches to the belay (safety) rope and grips that rope preventing rope slippage when the belay rope is suddenly tensioned. This usually occurs when a firefighter falls or loses control of a rappel or, in the case of a litter system, a main line failure occurs.

A.5.12.1 Consideration of the anticipated maximum impact loads and the maximum static loads will determine whether a general-use or a technical-use device should be selected. For evaluating whether the organization should select general-use or technical-use equipment, see A.5.1.2(6).

A.5.12.2 The total stopping distance is the total distance traveled after the belay device engages. To prevent injury to the load, the total stopping distance should be minimized to avoid impact with objects below.

A.5.12.3 Selection is based on the type of rope work that the organization intends to perform. While most belay devices are designed to manage a 200 kg load, specialty belay devices might exist to protect a single person such as during rappel training or two persons such as during a pick-off rescue.

The standard 200 kg load is derived from a worst case situation for a vertical rescue: a litter with a victim and a single tender suspended entirely on the belay line. As the angle of a rescue decreases, additional tenders are needed to support the litter off a slope. Because of the decrease angle, even though the entire load increases, the load on the belay line decreases.

A.5.12.4 Effective operation of the belay device is essential not only to maintain the impact force within safe limits but also to prevent the device from catching or jamming so often that the rescue is delayed. Prior training and experience with different belay devices are required to provide the operational understanding for the selection.

A.5.12.5 Operations that require the user to carry the belay device would suggest selecting a lighter-weight device. The organization should verify that the device will perform in the expected environmental conditions, such as cold and wet.

A.5.13 End-to-end straps typically are straps used to connect a person to the rescue system. Common types are pick-off straps, used to attach a subject to a life safety rope, and stretcher straps, used to connect a litter tender to a litter.

Multiple-use straps typically are used to set up anchor points. The term *multiple-use* indicates that the strap can be used in an end-to-end, basket hitch, or girth hitch configuration; each of which affects the strength of the strap.

A.5.13.1 End-to-end straps might see only the load of a subject or rescuer. A multiple-configuration strap might be used to anchor the main or belay line for a litter system and could be expected to support a much higher anticipated load than the minimum performance requirements in NFPA 1983. For evaluating whether the organization should select general-use or technical-use equipment, see A.5.1.2(6).

A.5.13.2 Certain design features should be considered in the selection of end-to-end straps: length, width, weight, terminations, material, adjustability, and color.

(1) *Length.* The type of anchor points used help determine what length straps should be purchased and whether several lengths might be needed. Overly long straps waste space, moving the operation of a system away from the anchor. Short straps might not fit around the anchor points encountered. Adjustable straps accommodate different sizes but, because they require enough webbing for the largest size, are bulky and heavy. A strap the right size for wrapping around a vehicle wheel in a basket hitch might also be the right size used in the girth hitch configuration and attached to a hard point under a vehicle.

(2) *Width.* Wider web straps are strong but bulkier and heavier. The additional material usually provides better resistance to abrasions and cuts. A narrow strap can be threaded through narrow openings if the connection point on the end is not too large.

(3) *Weight.* Wide straps provide the greatest strength but are heavier, particularly if they terminate in metal D-rings or O-rings. They might be suitable for vehicle-based rescue but make access difficult if the equipment must be carried or climbed to the rescue.

(4) *Terminations.* Web straps terminate in sewn loops or sewn hardware such as D-rings, O-rings, snaps, carabiners, or hooks. Some endings allow quicker attachment; some are stronger due to their simplicity. Wire straps usually end in swaged loops.

(5) *Material.* The same considerations for selecting a type of fiber for a life safety rope apply to straps. Nylon provides an all-around durable strap but will lose strength under wet conditions. Nylon is a little more forgiving with shock loads and might perform better in the adjusters used to shorten or lengthen straps. Steel or metallic straps work well on structures where web material could be cut, but generally are heavier and more difficult to transport in a gear bag. For industrial rescue, selecting a fiber resistant to the anticipated chemicals also allows the strap to maintain strength during the incident and have a longer service life.

(6) *Adjustability.* Most end-to-end straps have some sort of adjuster that allows the strap to be positioned at the best length to support the person being rescued (such as a pick-off strap) or to support a rescuer (such as a stretcher strap). The adjuster should allow easy movement while under a moderate load but not move on its own. Most adjustable anchor straps are set to their proper length before loading. The means of adjustment can also be the selection of one of a series of loops in the strap.

(7) *Color.* The ability to be seen or to be camouflaged distinguishes one strap from another when rigged side by side or to identify different materials and construction features.

A.5.13.3 Evaluations should be conducted in a manner replicating the intended use of the end-to-end strap. Participants should be wearing the equipment and PPE they would be using in an actual incident.

A.5.14 A litter is designed to secure, protect, and transport a patient vertically or horizontally. Litters are available as a single unit or a two-piece unit that can be nested for transport and assembled on scene. Litters are of a rigid or semi-rigid design.

A.5.14.1 Litters come in a variety of shapes, sizes, and materials. The organization should evaluate its responses to determine which type of litter best meets its requirements. In some cases, multiple litters might required, such as a basic litter on a first response truck and a lightweight, high-strength litter for the technical team. Several factors should be considered in the selection of litters: material, one-piece or two-piece design, rigid or semi-rigid design, integrated attachment points, means of securing the victim, shape, size, and accessories.

(1) *Material of Construction.* Stainless steel is durable, whereas titanium litters are considerably lighter. Plastic provides good patient protection from the environment but can be more fragile than a metal litter.

(2) *One-Piece or Two-Piece Design.* Consideration should be given to storage on apparatus and transportation of a single-piece litter over long distances. A two-piece litter can solve storage and transportation issues, but they require additional steps and time in setting up.

(3) *Rigid or Semi-Rigid Design.* The classic Stokes wire basket litter is a rigid design that provides great patient protection, both because of its rigidity and as a roll cage around the patient. It requires space to store, can be bulky to transport, and can be difficult to fit into tight places. Semi-rigid litters, usually of plastic or cloth, can be rolled into a small package for transport or storage. Most fold around the patient, allowing the litter with the patient to be moved through tighter openings.

(4) *Integrated Attachment Points.* The organization should evaluate the litter for integrated attachment points to ease connection to the rescue system. Both vertical and horizontal orientation attachments should be evaluated. Optional litter rigging slings, whether manufactured or field assembled, should provide for secure means of attachment of the litter to the rescue system.

(5) *Means of Securing the Victim.* Litters can include optional means of securing victims in the litter, such as integrated

seatbelts or other webbing. The organization should evaluate such means for the effectiveness of securing the victim to the litter and the rescue system. These components are not included in the performance requirements of NFPA 1983 for litters. Organizations can elect that manufacturer-included straps be used as ancillary attachment in conjunction with other manufactured or field-assembled systems or techniques used to secure the victim to the litter as well as a means of attaching the victim to the rescue system. Organizations should evaluate manufactured systems or field-assembled systems in preventing movement of the victim in multiple orientations of the litter, such as inverted, head-up, head-down, and vertical.

(6) *Shape of Litter.* Litters generally are rectangular or a tapered shape. The organization should evaluate the shape of the litter and determine compatibility with victim immobilization devices that might be used in conjunction with the litter, such as a long spine board.

(7) *Size of Litter.* The organization should evaluate the overall size of the litter to determine if it will meet storage requirements and is compatible with victim immobilization devices. Organizations should note that a standard-size litter might not be adequate for persons of taller stature or larger mass.

(8) *Litter Accessories.* The organization should evaluate the operational needs of optional litter accessories, including, for example, victim face shield, trail wheel attachment, snow ski, and flotation devices. Litter accessories are not included in the performance requirements of NFPA 1983.

A.5.15.2 Evaluations should be conducted in a manner replicating the intended use of the manufactured system. Participants should be wearing the equipment and PPE that would be used in an actual incident.

A.5.16 Under NFPA 1983, an escape system is a system designed to provide a means of escape from an immediately hazardous environment above grade and is intended for emergency self-rescue. There are two categories of escape system:

(1) A fire escape system is designed to be used in environments involving fire or fire products.

(2) An escape system is designed to be used in environments that do not involve fire or fire products.

A.5.16.1 The organization has to evaluate the placement of the escape system: fixed or not fixed to the turnout pant, fixed or not fixed to the turnout coat, fixed or not fixed to the SCBA, drop bag, utility belt, or other location on the firefighter. The location and attachment of the escape system should be evaluated for compatibility with department equipment.

A.5.16.2 The ability to deploy the system in a time acceptable to the organization will determine whether to select an escape system that is attached to an escape harness or escape belt or one that requires connection to the harness or belt prior to deployment. While a preconnected system might interfere with other operations, it minimizes the time needed to egress the environment. A stored system might provide a lower profile and be less in the way, but it takes a little longer to deploy. The time needed to deploy a system should be evaluated with regard to the department's protocols and expectations. As part of this evaluation, the means of attachment to the belt or harness should be considered.

A.5.16.3 Webbing-based systems tend to be more compact, allowing a longer length to be carried in the same space. A rope-based system can be easier for the user to grip with the safety hand. The amount of control provided by the escape descent control device can vary between systems and should be part of the webbing and rope evaluation. The construction and the fiber used for either the webbing or the rope should be evaluated regarding resistance to abrasions and cuts.

A.5.16.4 If the escape system will be exposed to temperatures higher than the maximum required for life safety rope, then a fire escape system should be considered. A fire escape system should be manufactured using fire escape rope or fire escape webbing. Other components of the system should also meet the same minimum temperature requirements as the fire escape rope and webbing.

A.5.16.6 Payout force is the force needed to pull the line once the escape system is assembled for use. This affects the ability of the firefighter to move across a floor space if the escape system is not anchored near an exit.

A.5.16.7 The choice between a repackable system and one that is not repackable is a cost factor to the organization for training, spare units, and ease of use. While a repackable system can be used for training, consideration must be given to overuse if the system will be used during fire operations. A system that is not repackable has the advantages of not requiring as detailed an inspection and eliminating the possibility of being incorrectly repacked. The organization should evaluate the performance differences between sealed package systems and systems used for practice or training.

A.5.16.8 A deciding factor in the selection of the escape system should be the evaluation of each component of the system and the function of those components when considered with the organization's training or protocols.

A manufactured system usually is not complete, and the organization will need to select additional components that will be compatible with the system and the organization's training and protocols. For example, many escape systems do not include a harness or belt.

A.5.16.9 Descent control devices come in a variety of types and usually are the key component in deciding which system best meets the organization's requirements. *(See Section 5.9.)*

A.5.16.10 Some organizations have the staging area in high-rises two floors below the fire and some do not. Some mid-rise fires have the staging area on the ground level, which could be four stories in height. While a longer line provides greater flexibility, it adds significantly to the bulk and weight that the user must carry.

A.5.16.11 The type and locations of primary anchor points within a structure determine which type of anchor method to select: escape anchor device, carabiner, or loop. Interior anchoring, window anchoring, exterior walls of structure, and furniture are all options for attaching the escape system. Depending on the anchoring location, some methods might be more difficult than others, so the organization must evaluate which anchoring methods are best. (See 5.18.1 for considerations.)

A.5.16.12 The organization should consider whether components can be replaced by the organization or only by the manufacturer. Due to the small diameter of the rope and webbing

used, the organization should consider the recommended service life of the escape system and evaluate how realistic that service life is when the organization's training requirements, frequency of exposure to fire ground elements, and maintenance procedures are considered.

A.5.16.13 The personnel conducting the evaluations should be wearing full turnouts with gloves and SCBA with mask and second-stage regulator in place and be operating in the expected positions, such as on the knees or crawling. This simulates the physical state that users would be in when deploying the escape system due to the heat that would be pushing them to the floor. Performance of payout, handling, and accessibility should be considered.

A.5.17.1 Escape webbing is part of an assembly worn by a rescuer and used to descend from a position of height to safety at a lower level. An escape assembly might have an escape anchor device, escape webbing, and an escape descent control device connected to a belt or harness. The assembly might be carried in a pocket or bag attached to the rescuer. The organization should evaluate through practical testing to ensure that all the components are compatible and function as intended. For selection criteria on the other components that might be part of the escape assembly, see Section 5.6 for carabiners, Section 5.18 for escape anchor devices, and Section 5.9 for descent control devices.

A.5.17.1(1) Exposure to elevated temperatures degrades the strength of the any webbing, which decreases the time that the webbing is able to support the user. Wider-width webbing provides greater resistance to failure at elevated temperatures. Greater bulk takes longer for the effect of heat to weaken the webbing, allowing more time to complete the egress. The trade-off is greater bulk and weight.

In general, fire escape webbing should be used where higher temperatures are anticipated. Escape webbing can be chosen for anticipated temperatures not requiring PPE for heat.

A.5.17.1(2) The termination at the anchor end of the webbing determines how the user will connect the webbing to a structure for a secure anchor that will support the user's weight. The end of the webbing can be attached to a hook, bar, or carabiner with a knot or sewn termination. Any of those three types of termination reduces the strength of the webbing by some factor.

A.5.17.1(4) Not all webbing is tested or certified with all types of descent control devices. The organization should determine that the webbing selected is compatible with the type of descent control device selected. The manufacturer of the device should be able to supply the information as to which specific webbing has been determined to function and should be consulted as to what type of webbing was tested or certified with the selected descent control device.

A.5.17.1(5) When making an emergency escape, there is a high probability that the user will impact the escape webbing and system in an attempt to exit quickly. It is important that the system or components chosen will limit the impact forces on the user, the anchors, and other components to limit user injury and prevent a failure of the system. There are a number of ways this can be addressed in the design of an escape system, including the following:

(1) Choosing an escape webbing with sufficient elongation to absorb the expected impact force
(2) Choosing a descent control device that slips at approximately 8 kN to limit the forces on the system
(3) Choosing an escape system with a force limiter or absorber built into the system

A.5.17.1(6) This is a function of the descent control device selected, the diameter of the webbing, and the "gripping" surface of the webbing. Proper technique for most escape descent control devices includes operating the device with one hand while the other hand grips the webbing. The tension required with the hand gripping the webbing depends on the particular descent control device. The more tension that must be held by the hand on the webbing, the more important is the ability to grip the webbing.

A.5.17.2(1) Due to the bulk and weight of an escape system, only a certain amount of webbing can reasonably be carried. The height of structures in the response area will help determine a minimum length of webbing for the escape system. If the structures are several stories high, the protocol may be to evacuate to a lower, safe level than completely to the ground.

A.5.17.2(2) For example, on the firefighter the escape webbing might be carried or worn in the turnout pants, in the turnout coat, on the SCBA, or on a belt. The location and the packaging affect the user's ability to deploy the webbing and should be evaluated while the user is wearing full equipment and SCBA and mask and in different positions, such as kneeling. The location of the webbing should not interfere with the use or performance of other PPE worn by the user.

A.5.17.2(4) Because of the smaller diameter of escape webbing and of the high-tech fibers that might be selected for fire escape webbing, webbing is not as durable as the life safety ropes. Generally, escape webbing has minimal use, such as one or two rappels, to verify the performance and the user's ability to operate the escape assembly, then annual training. If the organization's protocol calls for greater use, wider webbing should be selected to increase durability.

A.5.18 An escape anchor device allows a very fast connection on a wider range of anchor points, sometimes even with the ability to create an anchor point where one does not exist. The two basic types of escape anchor devices are the "hook" and the "T-bar."

T-bar devices are generally placed in the corner of a window or other opening with the weight of the user on the line holding them in place. The line can also be wrapped around an anchor point and a knot tied around the device.

Hook devices are most secure when wrapped around an anchor point and a knot tied around or through the device. Some have specific design features that allow the knot to be tied quickly. The hook can fit over many objects or pounded through a wall to attach to a stud. The hook can also be placed at the window edge, where, like the T-bar, the weight of the user on the line will hold it in place.

There are two other means of securing the end of an escape line. While slow and very dependent on the user's skill in high stress situations, the escape line can be simply tied to a solid object. Faster and more secure is a line with an integral carabiner on the end. The line is wrapped around a solid anchor point and the carabiner clipped over the line; in some cases, the carabiner's size allows it to be connected to an anchor point.

A.5.18.1(1) Escape anchor designs vary widely, from hooks to T-bars. The organization should evaluate the types of structures most likely to be encountered and how the escape anchor device will be attached. This should include an evaluation of circumstances when the firefighter has time to locate and set a secure anchor and when immediate deployment and exit are necessary.

A.5.18.1(2) An escape anchor device can be carried in the turnouts pants, in the turnout coat, on the SCBA, in a drop bag. The location should be considered carefully since it affects the user's ability to deploy the escape device. The storage location should be comfortable and efficient for everyday use.

A.5.18.1(4) There are several methods of attaching the escape rope or webbing to the escape device. The organization should evaluate the following:

(1) How is the rope or webbing to be attached to the device: sewn, swaged, or tied with a knot?
(2) Does the attachment meet the necessary strength requirements?
(3) Is the connection secure such that it will not disconnect during storage or deployment?
(4) Does the connection keep the escape rope or webbing located such that it will not cause the escape anchor device to fail to stay in position?

A.5.18.2 The personnel conducting the evaluations should be in response attire and PPE that will be worn when conducting the operations in which the escape anchor device will be used.

For example, the individual evaluating an escape anchor device should be wearing full turnouts with gloves and SCBA with mask and second-stage regulator in place and operating in the expected positions, such as on the knees or crawling. This simulates the physical state that users would be in when deploying the escape rope and equipment due to the heat that would be pushing them to the floor.

Field evaluations should determine how well the operators are able to set the device into an anchor point or tie off the device around an anchor point.

Field evaluations conducted at an elevation should be protected by a safety line.

A.5.19 NFPA 1983 defines a victim extrication device as a device designed to be secured about the body of a victim in a harness-like manner to provide support to a victim in a head-up or horizontal configuration for the purpose of lifting and transporting the victim with a life safety rope.

A.5.19.3 The specifications for a victim extrication device include Class II and Class III devices:

(1) *Class II.* A Class II device secures around the waist and around the thighs or under the buttocks for victim extrication in an upright position.
(2) *Class III.* A Class III device secures around the waist, around the thighs or under the buttocks, and over the shoulders or otherwise encapsulates a victim for extrication in an upright or horizontal configuration

Class II devices are best suited for patient transport when the patient is being lifted vertically or can be kept in an upright position during any movement in the horizontal plane. Class III devices, by encapsulating the patient, can be used for a patient in a horizontal position for transport in either a vertical or a horizontal plane.

A.5.20 NFPA 1983 performance requirements for moderate elongation laid life saving rope allows a maximum elongation at 10 percent of the breaking strength up to 25 percent compared to the maximum 10 percent elongation allowed for life safety rope. Life safety ropes are useful where a higher impact load is possible and there is room below the suspended person to safely allow for the extra elongation.

A.5.20.2(1) See A.5.2.2.

A.5.20.2(2) See A.5.2.3.

A.5.20.2(3) See A.5.2.4.

A.5.20.2(4) See A.5.2.5.

A.5.20.2(5) See A.5.2.6.

A.5.20.2(6) See A.5.2.7.

A.5.20.2(7) See A.5.2.8.

A.5.20.2(8) See A.5.2.9.

A.5.20.2(9) See A.5.2.10.

A.6.1.5 The seriousness of contamination should be determined by identifying the contaminant and referencing the manufacturer's information for the product. Direct consultation with the manufacturer could be necessary where information might be vague or nonexistent. Materials that are soiled with mud or dirt might only require general cleaning with a specified detergent and water. Some contaminants, such as blood or chemicals, could require a more aggressive process and special handling and care. Consultation with the manufacturer is warranted in cases where the AHJ is unsure of the proper cleaning and decontamination procedure. In addition, proper drying and inspection are also required prior to returning any item to service.

A.6.1.8 The maximum potential lifetime of hardware is less quantifiable because it is largely based on use, including frequency and extent of cyclic loading.

A.6.1.8.1 History and the amount and type of use will shorten the lifetime. Actual lifetime could be much shorter than 10 years if the product doesn't pass inspection.

A.6.2.1 Proper inspection procedures require that organizations develop an inspection policy for their equipment in service. The policy should be based on the information provided by the manufacturer in the manufacturer's instructions. An organization should identify qualifications for personnel conducting inspections, and inspections should be documented in an inspection log. Inspections should be conducted by a trained user prior to use and by a qualified inspector following use.

A.6.2.1.3(1) If life safety rope and equipment are deployed weekly, a weekly inspection is appropriate. If only deployed a few times a month, a monthly inspection might be adequate.

A.6.2.5.1 The decision whether to retire a life safety rope or keep it in service relies on good judgment that comes from experience in working with rope. Inspecting a life safety rope involves visually looking for damage, feeling for damage, and checking the rope's history in the rope log. A complete inspection includes both visual and tactile inspections. Because of the many variations of individual ropes and their use, it is impossi-

ble to state exactly when to retire a life safety rope. If there are any doubts about the integrity of a rope, it should be destroyed. Inspection of life safety rope should include the following steps:

(1) Visually inspect the sheath to identify chafed areas, glazed surfaces, discoloration. or variations in diameter. These areas should receive additional scrutiny during the tactile inspection. Look for areas of abrasion or cuts in the sheath where the core is exposed or enough of the sheath is worn that its ability to protect the core is compromised. If any of these problems is noted, the rope should be destroyed.
(2) The tactile inspection should be done with tension on the rope. Feel for variations in size and soft or hard spots, which could indicate damage to the core or that the rope that has been overstressed. If any of these problems is noted, the rope should be destroyed.
(3) While performing the tactile inspection, pay attention to strong or odd odors, which might indicate possible chemical contamination, signs of which are not always visible.
(4) Review the rope log. If the rope has been subjected to shock loads, fall loads, or use other than normal rappel or rescue use, the rope should be destroyed.
(5) Inspect a new rope before it is put into service and then after each use. The inspection should be done by an experienced person deemed qualified by the agency or organization. Each rope should be inspected before being used even if the rope has never been placed in service.

For more information on rope inspection, see ASTM F1740, *Standard Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope*.

A.6.2.5.2 Rope used for emergency egress is defined as a single-purpose rope. During actual use, the integrity of the rope can be assumed to be compromised, and the rope should be taken out of service and destroyed. Such rope generally is left behind at the scene of the incident, and the degree of exposure to heat and flame is unknown and probably will have substantial damage.

When used in a training context, escape rope should be inspected in the same manner as life safety rope.

Ultra high modulus fiber rope can lose a significant percentage of their original strength after many fewer cycles than ropes of nylon and polyester fibers. Special care should be taken for more frequent inspections in training with escape ropes made of ultra high modulus fibers.

A.7.1.2 Life safety rope does not require cleaning after every use; in fact, excessive cleaning can be harmful to the rope by removing the lubricant applied to the fibers during the manufacturing process. After most rescues, a minimal removal of dust, dirt, and water usually is all that is required to keep the equipment in good working order.

A.7.2.4 Biohazard cleaning agents can have an adverse effect on the strength of software products. The organization should determine the risk versus benefit of excessive decontamination of rope. At some point, it is best to take the rope out of service.

A.7.2.5.3 Equipment manufacturers recommend use of a dry or nonsticking lubricant to maintain performance. Petroleum-based products should be avoided because they attract and trap dirt as well as some products can have an adverse effect on software products.

A.9.1.1 In-service rope and webbing generally are stored in a rope bag or rope pack to allow for transport and deployment.

A.9.2 In-service equipment usually is stored in a gear bag for transport and deployment.

A.10.1 Software products include but are not limited to rope, webbing, harnesses, straps, and patient extrication devices. Many products combine hardware and software components, and retirement should be based on the software standard.

A.10.1.1 Organizations should consider changes in the performance requirements and test methods for software products when considering retirement or replacement.

A.10.1.2 The consensus of many users and manufacturers of life safety rope is that retirement should be considered after 10 years of service. The age of the rope is just one factor to consider. Much more critical is the exposure of the rope to abrasion, loading, weather, sunlight, chemicals, impact loading during use, and unknown environmental chemical exposure during storage. For more information on inspection and retirement, see ASTM F1740, *Standard Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope*.

A.10.2 See A.10.1.

A.10.3 Life safety hardware includes devices that are not software. Equipment or systems that contain both software and hardware components should be retired based on the software component.

A.10.3.2 While not readily apparent, hardware devices do show adverse effects due to long-term use. Often resulting in stress cracks or fractures, this damage is often difficult to observe during inspection. Organizations might want to consider a 10-year service life for hardware devices and components.

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in 2 for other reasons.

B.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1006, *Standard for Technical Rescue Personnel Professional Qualifications*, 2017 edition.

NFPA 1407, *Standard for Training Fire Service Rapid Intervention Crews*, 2015 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2018 edition.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*, 2017 edition.

NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services*, 2017 edition.

B.1.2 Other Publications.

B.1.2.1 ASSE Publications. American Society of Safety Engineers, 520 N. Northwest Hwy, Park Ridge IL 60068.

ANSI/ASSE Z359, *Fall Protection Code*, Version 3.0, 2012.

B.1.2.2 ASTM Publications. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E794, *Standard Test Method for Melting and Crystallization Temperatures by Thermal Analysis*, 2012.

ASTM F1740, *Standard Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope*, 2012.

B.1.2.3 Cordage Institute Publications. Cordage Institute, 994 Old Eagle School, Wayne, PA 19087-1866.

CI 1202, *Terminology for Fiber Rope*, 2013.

CI 1801, *Low Stretch/Static Kernmantle Safety Rope*, 2007.

CI 1805, *Standard: 3-Strand Life Safety Rope Moderate Stretch*, 2008.

B.2 References for Extracts in Informational Sections. (Reserved)

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Sequence of Events for the Standards Development Process

Once the current edition is published, a Standard is opened for Public Input.

Step 1 – Input Stage

- Input accepted from the public or other committees for consideration to develop the First Draft
- Technical Committee holds First Draft Meeting to revise Standard (23 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Technical Committee ballots on First Draft (12 weeks); Technical Committee(s) with Correlating Committee (11 weeks)
- Correlating Committee First Draft Meeting (9 weeks)
- Correlating Committee ballots on First Draft (5 weeks)
- First Draft Report posted on the document information page

Step 2 – Comment Stage

- Public Comments accepted on First Draft (10 weeks) following posting of First Draft Report
- If Standard does not receive Public Comments and the Technical Committee chooses not to hold a Second Draft meeting, the Standard becomes a Consent Standard and is sent directly to the Standards Council for issuance (see Step 4) or
- Technical Committee holds Second Draft Meeting (21 weeks); Technical Committee(s) with Correlating Committee (7 weeks)
- Technical Committee ballots on Second Draft (11 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Correlating Committee Second Draft Meeting (9 weeks)
- Correlating Committee ballots on Second Draft (8 weeks)
- Second Draft Report posted on the document information page

Step 3 – NFPA Technical Meeting

- Notice of Intent to Make a Motion (NITMAM) accepted (5 weeks) following the posting of Second Draft Report
- NITMAMs are reviewed and valid motions are certified by the Motions Committee for presentation at the NFPA Technical Meeting
- NFPA membership meets each June at the NFPA Technical Meeting to act on Standards with "Certified Amending Motions" (certified NITMAMs)
- Committee(s) vote on any successful amendments to the Technical Committee Reports made by the NFPA membership at the NFPA Technical Meeting

Step 4 – Council Appeals and Issuance of Standard

- Notification of intent to file an appeal to the Standards Council on Technical Meeting action must be filed within 20 days of the NFPA Technical Meeting
- Standards Council decides, based on all evidence, whether to issue the standard or to take other action

Notes:

1. Time periods are approximate; refer to published schedules for actual dates.
2. Annual revision cycle documents with certified amending motions take approximately 101 weeks to complete.
3. Fall revision cycle documents receiving certified amending motions take approximately 141 weeks to complete.

Committee Membership Classifications[1,2,3,4]

The following classifications apply to Committee members and represent their principal interest in the activity of the Committee.

1. M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.
2. U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.
3. IM *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.
4. L *Labor:* A labor representative or employee concerned with safety in the workplace.
5. RT *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.
6. E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.
7. I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.
8. C *Consumer:* A person who is or represents the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in (2).
9. SE *Special Expert:* A person not representing (1) through (8) and who has special expertise in the scope of the standard or portion thereof.

NOTE 1: "Standard" connotes code, standard, recommended practice, or guide.

NOTE 2: A representative includes an employee.

NOTE 3: While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of member or unique interests need representation in order to foster the best possible Committee deliberations on any project. In this connection, the Standards Council may make such appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.

NOTE 4: Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

Submitting Public Input / Public Comment Through the Online Submission System

Soon after the current edition is published, a Standard is open for Public Input.

Before accessing the Online Submission System, you must first sign in at www.nfpa.org. *Note: You will be asked to sign-in or create a free online account with NFPA before using this system:*

a. Click on Sign In at the upper right side of the page.
b. Under the Codes and Standards heading, click on the "List of NFPA Codes & Standards," and then select your document from the list or use one of the search features.

OR

a. Go directly to your specific document information page by typing the convenient shortcut link of www.nfpa.org/document# (Example: NFPA 921 would be www.nfpa.org/921). Sign in at the upper right side of the page.

To begin your Public Input, select the link "The next edition of this standard is now open for Public Input" located on the About tab, Current & Prior Editions tab, and the Next Edition tab. Alternatively, the Next Edition tab includes a link to Submit Public Input online.

At this point, the NFPA Standards Development Site will open showing details for the document you have selected. This "Document Home" page site includes an explanatory introduction, information on the current document phase and closing date, a left-hand navigation panel that includes useful links, a document Table of Contents, and icons at the top you can click for Help when using the site. The Help icons and navigation panel will be visible except when you are actually in the process of creating a Public Input.

Once the First Draft Report becomes available there is a Public Comment period during which anyone may submit a Public Comment on the First Draft. Any objections or further related changes to the content of the First Draft must be submitted at the Comment stage.

To submit a Public Comment you may access the online submission system utilizing the same steps as previously explained for the submission of Public Input.

For further information on submitting public input and public comments, go to: http://www.nfpa.org/publicinput.

Other Resources Available on the Document Information Pages

About tab: View general document and subject-related information.

Current & Prior Editions tab: Research current and previous edition information on a Standard.

Next Edition tab: Follow the committee's progress in the processing of a Standard in its next revision cycle.

Technical Committee tab: View current committee member rosters or apply to a committee.

Technical Questions tab: For members and Public Sector Officials/AHJs to submit questions about codes and standards to NFPA staff. Our Technical Questions Service provides a convenient way to receive timely and consistent technical assistance when you need to know more about NFPA codes and standards relevant to your work. Responses are provided by NFPA staff on an informal basis.

Products & Training tab: List of NFPA's publications and training available for purchase.

Information on the NFPA Standards Development Process

I. Applicable Regulations. The primary rules governing the processing of NFPA standards (codes, standards, recommended practices, and guides) are the NFPA *Regulations Governing the Development of NFPA Standards (Regs)*. Other applicable rules include NFPA *Bylaws*, NFPA *Technical Meeting Convention Rules*, NFPA *Guide for the Conduct of Participants in the NFPA Standards Development Process*, and the NFPA *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council*. Most of these rules and regulations are contained in the *NFPA Standards Directory*. For copies of the *Directory*, contact Codes and Standards Administration at NFPA Headquarters; all these documents are also available on the NFPA website at "www.nfpa.org."

The following is general information on the NFPA process. All participants, however, should refer to the actual rules and regulations for a full understanding of this process and for the criteria that govern participation.

II. Technical Committee Report. The Technical Committee Report is defined as "the Report of the responsible Committee(s), in accordance with the Regulations, in preparation of a new or revised NFPA Standard." The Technical Committee Report is in two parts and consists of the First Draft Report and the Second Draft Report. (See *Regs* at Section 1.4.)

III. Step 1: First Draft Report. The First Draft Report is defined as "Part one of the Technical Committee Report, which documents the Input Stage." The First Draft Report consists of the First Draft, Public Input, Committee Input, Committee and Correlating Committee Statements, Correlating Notes, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.3.) Any objection to an action in the First Draft Report must be raised through the filing of an appropriate Comment for consideration in the Second Draft Report or the objection will be considered resolved. [See *Regs* at 4.3.1(b).]

IV. Step 2: Second Draft Report. The Second Draft Report is defined as "Part two of the Technical Committee Report, which documents the Comment Stage." The Second Draft Report consists of the Second Draft, Public Comments with corresponding Committee Actions and Committee Statements, Correlating Notes and their respective Committee Statements, Committee Comments, Correlating Revisions, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.4.) The First Draft Report and the Second Draft Report together constitute the Technical Committee Report. Any outstanding objection following the Second Draft Report must be raised through an appropriate Amending Motion at the NFPA Technical Meeting or the objection will be considered resolved. [See *Regs* at 4.4.1(b).]

V. Step 3a: Action at NFPA Technical Meeting. Following the publication of the Second Draft Report, there is a period during which those wishing to make proper Amending Motions on the Technical Committee Reports must signal their intention by submitting a Notice of Intent to Make a Motion (NITMAM). (See *Regs* at 4.5.2.) Standards that receive notice of proper Amending Motions (Certified Amending Motions) will be presented for action at the annual June NFPA Technical Meeting. At the meeting, the NFPA membership can consider and act on these Certified Amending Motions as well as Follow-up Amending Motions, that is, motions that become necessary as a result of a previous successful Amending Motion. (See 4.5.3.2 through 4.5.3.6 and Table 1, Columns 1-3 of *Regs* for a summary of the available Amending Motions and who may make them.) Any outstanding objection following action at an NFPA Technical Meeting (and any further Technical Committee consideration following successful Amending Motions, see *Regs* at 4.5.3.7 through 4.6.5.3) must be raised through an appeal to the Standards Council or it will be considered to be resolved.

VI. Step 3b: Documents Forwarded Directly to the Council. Where no NITMAM is received and certified in accordance with the Technical Meeting Convention Rules, the standard is forwarded directly to the Standards Council for action on issuance. Objections are deemed to be resolved for these documents. (See *Regs* at 4.5.2.5.)

VII. Step 4a: Council Appeals. Anyone can appeal to the Standards Council concerning procedural or substantive matters related to the development, content, or issuance of any document of the NFPA or on matters within the purview of the authority of the Council, as established by the Bylaws and as determined by the Board of Directors. Such appeals must be in written form and filed with the Secretary of the Standards Council (see *Regs* at Section 1.6). Time constraints for filing an appeal must be in accordance with 1.6.2 of the *Regs*. Objections are deemed to be resolved if not pursued at this level.

VIII. Step 4b: Document Issuance. The Standards Council is the issuer of all documents (see Article 8 of *Bylaws*). The Council acts on the issuance of a document presented for action at an NFPA Technical Meeting within 75 days from the date of the recommendation from the NFPA Technical Meeting, unless this period is extended by the Council (see *Regs* at 4.7.2). For documents forwarded directly to the Standards Council, the Council acts on the issuance of the document at its next scheduled meeting, or at such other meeting as the Council may determine (see *Regs* at 4.5.2.5 and 4.7.4).

IX. Petitions to the Board of Directors. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the codes and standards development process and to protect the interests of the NFPA. The rules for petitioning the Board of Directors can be found in the *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council* and in Section 1.7 of the *Regs*.

X. For More Information. The program for the NFPA Technical Meeting (as well as the NFPA website as information becomes available) should be consulted for the date on which each report scheduled for consideration at the meeting will be presented. To view the First Draft Report and Second Draft Report as well as information on NFPA rules and for up-to-date information on schedules and deadlines for processing NFPA documents, check the NFPA website (www.nfpa.org/docinfo) or contact NFPA Codes & Standards Administration at (617) 984-7246.

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