

EXPLANATORY MATERIALS

NOTE TO REVIEWERS

This document provides Explanatory Materials that support but are **not** part of project BSR/ACCT 03-202X.

Explanatory Materials: Explanatory materials are not part of the American National Standard, have not been processed in accordance with ANSI requirements, and are not subject to public review or consensus for this action. As such, explanatory materials do not contain requirements necessary for conformance to the BSR/ACCT 03-202X.

Included in this Document:

- Rationale for Proposed Revisions to the Standard
- Definitions
- Explanatory Notes
- Annex A – Referenced Documents

RATIONALE

Included herein is rationale for select revisions proposed in the draft standard. This summary is not exhaustive but is intended to provide clarity on key changes.

The inclusion of this information is for explanatory purposes only and is not intended to create additional requirements, interpretations, or obligations beyond those contained in the draft standard.

This summary is not intended to identify all changes or to characterize the relative significance of any revision. Interested parties are encouraged to review the draft in its entirety and submit comments on any changes requiring clarification or which they believe would cause undue harm.

The intent of providing this rationale is to support transparency, improve understanding of selected revisions, and facilitate meaningful participation in the Public Review process.

1. Changes to Chapter References and Terminology

The draft standard is structured and intended to function as a single, unified standard. References to individual chapters as separate standards (e.g., Design, Performance, and Inspection (DPI) Standard; Operations Standard; Training Standard) have been removed.

The standard is intended to be viewed and applied as a whole. Where specific provisions are referenced, the applicable chapter number is used in place of previously defined terms.

This change is intended to reduce ambiguity and reinforce consistent interpretation.

2. Updated Reference Standards

The draft standard has been updated to include referenced life safety standards developed or revised since the last publication of the American National Standard (ANS).

Examples include:

- NFPA 2500, a consolidation NFPA 1983 and NFPA 1670
- EN 17109 Mountaineering equipment - Individual safety systems for rope courses - Safety requirements and test methods, which was first published in 2020.
- New EN standards have been proposed for inclusion to reflect the increasing use of new equipment and technologies manufactured in Europe.

3. Measurement Systems

Revisions are proposed to provide measurements consistently in SI units, followed by Imperial units.

Where appropriate, nominal values (rounded rational numbers) are provided in both systems where values are reasonably equivalent, represent meaningful differences in magnitude, and are practically applicable.

SI units are intended to serve as the primary units of record.

4. Updates to Terminology

Revisions are proposed throughout the document to improve consistency in terminology and application.

Examples include:

- *Tensioned Rope System* replaces *Rope Rigging System* to better align with systems commonly used in the industry and with terminology used in other relevant standards.
- Inspection terminology (e.g., pre-use checks, periodic monitoring, and professional inspection) has been revised to ensure consistent usage throughout the standard.

5. Changes to list-based language

The draft standard replaces instances of “includes, but is not limited to” with “to include” or “to include, at a minimum” to promote clarity and consistent interpretation.

6. Reorganization

Some items were relocated within the document to better reflect the hierarchical structure and reduce the number of internal references. For instance:

- **Chapter 1, A.3.2.1 – System Integrity for Critical Components**
System integrity requirements previously located under Life Safety Equipment (Chapter 1, E.1.2) have been relocated to A.3.2.1.
This revision reflects that critical components encompass a broader range of systems beyond those classified solely as Life Safety Equipment. Corresponding references throughout the standard were updated for consistency.
- **Chapter 1, A.3.3 – Access and Evaluation**
The existing standard emphasizes inspector access. The proposed revision expands this requirement to include the designer, manufacturer, and/or inspector's determination of appropriate methods of evaluation for each inspection type.
- Where access is required to perform evaluation, the standard requires that a safe means of access be provided.

7. Chapter 1 & 2 – Zip Line Systems

Proposed revisions enhance consistency in terminology, structure, and application, with integration of evolving industry practices and technological developments.

- **Chapter 1, H.1.2 Design Considerations**
The added language clarifies that where “arrest” is identified as a critical function, it shall meet the applicable requirements of Chapter 1, A.3.2.1 (System Integrity for Critical Components).
- **Chapter 1, H.3. Collision Mitigation**
A new requirement establishes that the designer or a qualified person shall specify rider-launch procedures and other appropriate measures to mitigate the risk of collisions (e.g., rider-to-rider or rider-to-obstacle). This revision addresses a recognized hazard within the industry and establishes minimum expectations for control measures.
- **Chapter 2, C.2.4.1.1**
A new requirement establishes that staff shall understand and utilize established methods of communication between take-off and dismount locations. Operations shall cease if established communication methods are not functional. This revision addresses known operational risks associated with communication failures that have resulted in serious incidents within the industry.

8. Chapter 1 – Lifeline Systems

- **E.2.7 Backup Loops**

Language has been revised to clarify that backup loops shall be sufficiently taut to minimize fall distance upon failure of the primary connection for all anchor types, not just for tree-based anchors).

- **E.2.3.1 Horizontal Lifeline Strength**

The proposed revision uses a load-based approach rather than a diameter-based one to align with international practices. This approach provides a more performance-based framework while maintaining the requirement for review and approval by a licensed professional engineer.

9. Chapter 3 – Training

Revisions reorganize the chapter to expand and clarify requirements related to training design and evaluation.

Proposed revisions directly address ambiguity in existing language related to trainer qualifications (B.1.3). The proposed revision distinguishes between:

- Design of training and evaluation methods shall be performed by a qualified person; and
- Delivery of training, which shall be performed by a competent person.

This approach aligns with practices reflected in other safety standards and is consistent with the roles and responsibilities established throughout this standard, wherein competent persons perform tasks using procedures, tools, and systems developed and controlled by a qualified person. The revision aligns with established roles and responsibilities in other areas of the standard, including design, installation, inspection, and operations.

DEFINITIONS

The information in this portion of the document is not part of the American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, the definitions may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the standard.

Acceptance Inspection

The final inspection of a course performed by a competent person upon completion of installation and prior to commissioning.

Accepted Engineering Practice

That which conforms to accepted principles, tests or standards of technical authorities recognized by the authority having jurisdiction.

Accessory Cord

Small diameter cordage used in a personal safety system or tensioned rope system, but not suitable as a primary lifeline.

Activity/Activities

Group or individual action(s) designed and facilitated to generate learning or specific outcome(s).

Aerial Adventure Experience

An opportunity designed for individuals and groups to engage in a challenge course program, zip line or canopy tour, or aerial adventure park. Delivery of the experience may be facilitated, guided, or self-guided.

Aerial Adventure/Trekking Park

A self-guided challenge course that is supervised and open to the public. Access is controlled.

Anchor System

A system of anchorage(s) and anchorage connector(s) that provide a secure termination for a life safety system, personal safety system, belay system or tensioned rope system.

Anchorage

The terminal component of a life safety system, personal safety system, belay system or tensioned rope system intended to support the expected load in the system plus the applicable safety factor.

Anchorage Connector

An interface component that couples an anchor system or system component to an anchorage.

Authority Having Jurisdiction (AHJ)

Organization, office, or person responsible for enforcing legislation, the requirements of a code or standard, or for approving equipment, materials, and installation, or a procedure.

Automatic Deadend

A type of coupling device that grips the terminated end of wire rope and attaches it to a support structure without requiring a separate step or adjustment to complete the installation process.

Belay Beam

A horizontal structural component that supports a belay system or tensioned rope system.

Belay Device

A manufactured apparatus designed for use on a life safety rope that allows rope to be taken in, let out, and secured to arrest a participant fall. Belay devices may employ a manual brake or have an assisted braking mechanism.

Belaying

The individual or group action of managing the tension in a life safety rope with the intention of protecting the climber at height.

Belay System

An equipment system and corresponding techniques used to control a life safety rope connected to a participant where the rope may be taken in, let out and secured in order to protect participants at height. Included are top rope and team belay systems. Belay system components may include rope, connectors, shear reduction devices, belay devices and descent control devices.

Brake

A device, method, or system used to arrest the motion of a person.

Brake System

An arrangement of primary and emergency brakes that are designed to function together to arrest the motion of a person.

Breaking Strength

The load at which a material or assembly of materials fails to support the applied force. A manufacturer's minimum-rated strength of a material is considered equivalent to the breaking strength for the purposes of this document. Breaking strength is also known as ultimate strength.

Canopy Tour

A guided aerial exploration or transit of the forest canopy, most commonly by means of a series of zip lines or aerial walkways with platforms.

Challenge Course

A facility or facilities consisting of one or more elements that challenge participants including zip line tours, canopy tours or aerial adventure/trekking parks.

Challenge Course Program

An opportunity designed and facilitated to provide participants with an adventure based learning experience that will lead to a desired outcome. The program may include high and low elements along with non-spotted activities.

Collective Safety System

Permanent and/or temporary systems that allow free movement on an elevated surface while reducing the risk of injury from falls. Examples include and are not limited to guard rails, balustrades, fences, stairs, and safety nets.

Commissioning

Systematic process used to verify that a newly installed or altered challenge course or challenge course element operates as intended and is ready to be turned over to the owner.

Competent Person

A person possessing the skills, knowledge, experience, training, and judgment to perform assigned tasks or activities satisfactorily as determined by the employer, industry standards, or authority having jurisdiction. A competent person acts under the supervision of a qualified person.

Connector

A component that is used to couple parts of a system together. Examples of connectors are carabiners, snap clips, and rapid links.

Course

Short form for challenge course, zip line tour, canopy tour, or aerial adventure/trekking park.

Critical

A defining characteristic of any component or system where the consequence of failure is likely to lead to serious injury or death to any person.

Dead Load

Static forces on a structure due to the weight of construction materials, equipment, or components. These forces are, by definition, relatively constant for the life of the structure.

Descent Control Device

A manufactured apparatus designed for use on a life safety rope for the purpose of maintaining a controlled vertical speed of descent of a person from an elevated position.

Designer

A qualified person who specifies in detail the design and operation of a challenge course element before it is put into service.

Dismount

The act of disembarking from an element and proceeding away from the landing area.

Dynamic Rope

Climbing rope of kernmantle construction that has an elongation between approximately 4% and 10% under a 176 lb (80 kg) static load, enabling it to absorb the energy of a fall, therefore reducing the impact force transferred to a person and anchorage.

Element

An apparatus that provides for a unit of activity on a challenge course. Elements may include, and not be limited to, items designed to simulate rock climbing, beams, bridges, cable traverses, climbing walls, nets, platforms, ropes, swings, towers, zip lines, or jump systems. Elements may be installed on or in trees, poles, portable structures, buildings, or be a part of a self-supporting structure.

Element Support System

An integral part of an element intended to suspend or position components of challenge course elements. Examples include platforms, foot cables, horizontal or vertical obstacles, logs, etc.

Emergency Brake

A brake located on a zip line that engages without any participant input upon failure of the primary brake in order to prevent serious injury or death.

Energy (Shock) Absorber

A component with the primary function of dissipating energy and limiting the load imposed on a person's body by the system during fall arrest.

Engineered System

Equipment assembled and used as an integral part of the installation of a course. It is designed and used for a particular purpose and generally used as a complete assembly without substantive changes to the component parts. An engineered system is designed by a qualified person and installed and used for its designed purpose. Some examples are cable grab systems (including the grab), continuous lifeline systems, overhead beam/trolley systems, self-retracting lanyards, etc. The system is tested and labeled as a complete unit.

Equipment

Short for Life Safety Equipment.

Expected Load

The maximum foreseeable load on a component, structure, or system during normal service as determined by a qualified person. The expected load includes wind, ice, and other environmental and dynamic loads, as well as maximum foreseeable additional loads that may be applied in emergency response or rescues. Expected load is also known as service load.

Factor of Safety

See the definition for Safety Factor.

Fall Arrest System

An anchor system and equipment that arrests a free fall before the user contacts the surface below and limits the impact force experienced by the user to predefined conditions. Operational definitions for fall arrest vary across jurisdictions.

Fall Restraint System

A device or devices, including any necessary components, for the purpose of preventing a person from reaching a fall hazard.

Fastener

A hardware device that mechanically joins or affixes two or more objects together. Examples are nails, bolts, screws, etc.

Flying Fox

See the definition for Zip Line.

Free Fall

Unrestrained motion due solely to gravity. Describes an uncontrolled fall before a life safety system begins to apply force.

Guide

A staff member trained to assist, accompany, supervise, and provide instructions to participants on a zip line or canopy tour.

Guy

A rope (either wire or synthetic) designed to limit or eliminate bending generated by horizontal lifelines and activity support systems in the pole, tree, or other support structure by transferring the load through the guy(s) to a resisting component such as a tree, dead-man, ground anchor, or other support structure.

High Element

An element installed at a height that requires a participant to be connected to a life safety system.

Incident

An unplanned or unintended, potentially dangerous or harmful occurrence or condition that could result in injury, illness, property damage, loss, or potential loss. A "near miss" or "close call" is considered an incident.

In-House Inspector

The competent person who performs, manages, and documents the on-going periodic internal monitoring system at a specific site. Their scope of practice does not extend to professional or third-party inspections.

Inspector

Individual who has the skills, knowledge, and ability to identify hazards and communicate them to the challenge course operator.

Installer

The competent person(s) who performs the installation of the element or course.

Intermediate Anchorage or Connector

An attachment that provides support or redirects a lifeline along a continuous length of that lifeline. An intermediate anchorage or connector may be considered critical depending on the consequence(s) of its failure.

Landing Area

The area provided for braking, arrest, and dismount after completing an element.

Lanyard

A component consisting of a flexible wire rope, rope, or webbing, which typically has a connector at each end for connecting the harness to a life safety system. Lanyards are often connected to other components of personal safety systems such as vertical fall arresters and energy (shock) absorbers.

Life Safety

Feature of a component, equipment, system, or technique that is intended to support and suspend human life in aerial adventure environments including managing the forces generated by falling.

Life Safety Equipment

For the purpose of this standard, specialized non-consumable life safety products intended to function together to protect a participant at height. Includes both metallic items (colloquially called hardware) and synthetic items (colloquially called software) such as life safety rope, accessory cord, harnesses.

Life Safety System

A configuration of components including lifelines, belay beams, and anchorages that support fall restraint and arrest systems, personal safety systems, belay systems, and/or tensioned rope systems.

Lifeline

A component of a life safety system consisting of a flexible line designed to be oriented in either horizontal or vertical directions between appropriate anchorages. Lifelines may be made from synthetic fiber or metallic rope. Zip lines are considered to be lifelines in this standard.

Live Load

Temporary, short duration, or moving loads, including all the variable forces within a structure. Examples of live loads would be those loads produced by a person while on the structure, including loads generated by the belay system and personal safety system. Also included are wind, ice, and other environmental loads.

Local Operating Procedures (LOP)

Written information describing the practices and procedures at a particular site. These are often based on the industry standards of practice and requirements from the designer, manufacturer, or training entity.

Low Element

An element designed to be operated without the use of a life safety system.

Low Stretch Rope

Rope of kernmantle construction that has an elongation greater than 6% and less than 10% at 10% of the manufacturer's minimum rated breaking strength. This rope is often referred to as static rope and is commonly used for top rope belay systems on challenge courses.

Manufactured

A system or subsystem that has been designed and fabricated by hand or machine to create a finished tangible product that differs significantly in form or function from the materials or components used to create it.

Manufacturer

A person, group, or entity that creates the design and operational guidelines for, and is responsible for determining the performance criteria for, materials, components, or equipment, and the compatibility of manufactured components in, and/or installs a course.

Minor Modification

Any change that does not alter the structural or operational characteristics of the element or device nor change its performance from that specified in the manufacturer's design criteria. Does not require an Acceptance Inspection.

Major Modification

Any change in either the structural or operational characteristics of the element or device that will alter its performance from that specified in the manufacturer's design criteria. Requires an Acceptance Inspection.

Newton (kilonewton)

A unit of force in the SI system (The International System of Units), which is comparable to pounds-force (lbf), usually abbreviated to pounds (lb) in the U.S. system.

1 kilonewton (kN) = 1000 newtons (N) = 224.8 lbf.

Operator

The person or entity directly responsible for the operation of an element, course or program.

Organization

A business or administrative concern engaged in the administration and operation of a course.

Owner

Person(s) with ultimate responsibility for the organization.

Participant

An individual who uses an element or engages in a program activity under the supervision of an organization's staff.

Personal Safety System

A system of equipment that connects a person to an anchorage or lifeline with the intention of limiting fall distance and impact force to a predetermined maximum. Used in situations where the individual is likely to regain footing and positioning. Operational requirements for personal safety systems vary across jurisdictions.

Positioning System

A personal safety system configured to allow a user to be positioned at height through the combined use of a tensioned rope system and balance from his/her feet. The tension in the rope prevents free fall.

Practice Course

A challenge course with representative elements that enable participants to learn, practice and demonstrate competency in the use of applicable operating and life safety systems and equipment deemed to require practice prior to participating.

Practitioner

A person who is trained to facilitate the activities included in a challenge course program.

Primary Brake

The principal brake in a zip line brake system, engaged during normal operation to arrest a user's motion. Primary brakes include both gravity assisted brakes and other brake force-generating devices.

Professional Inspection

An inspection carried out by a qualified person to assess the condition of the course and its environment and identify any current or imminent standards deficiencies.

Program

Short for challenge course program.

Proof Load

The greatest load that can be applied to an item without straining it beyond its elastic limit.

Proof Test

The test applied to a product solely to determine injurious material or manufacturing defects.

Qualified Person

An individual who, by possession of a recognized degree, certificate, or professional standing; or who, by possession of extensive knowledge, training, and/or experience in the subject field; has successfully demonstrated ability in design, analysis, evaluation, installation, inspection, specification, testing, or training in the subject work, project, or product, to the extent established by this standard.

Qualified Third Party

A qualified person not directly employed by the challenge course owner or by the manufacturer at the time of installation and prior to commissioning.

Quality Assurance Process

A sequence of actions or observations taken to provide adequate confidence that a structure, system, or component will perform satisfactorily in service. Quality assurance includes quality control.

Quality Control

A system for verifying and maintaining a desired level of quality in a product or process by careful planning, use of proper equipment, continued inspection, and corrective action as required.

Safety Factor

The reserve structural capacity of a component or system beyond the working load limit. Safety factor is usually computed by dividing the catalog ultimate or breaking strength by the working load limit. It is generally expressed as a ratio, e.g., 5:1. Safety factor is also known as factor of safety.

Sag

The vertical deflection in a horizontal line.

Shall

Denotes a mandatory requirement.

Shear Reduction Device

A device that reduces the shear (cutting) force on a rope by creating a large bend radius for directional changes.

Shock Load

A load that results from the rapid application of a force (such as impacting or jerking) or rapid movement of a static mass. A shock load significantly adds to the static load.

Should

Advised or recommended.

Soils Investigation

Geotechnical investigations performed by a geotechnical engineers or engineering geologists to obtain information on the physical properties of soil and rock around a site to design earthworks and foundations for proposed structures. A soils investigation includes surface and subsurface exploration of a site. Sometimes, geophysical methods are used to obtain data about sites. Subsurface exploration usually involves soil sampling and laboratory tests of those soil samples.

Spotted Activity

An activity that uses spotting to protect the participant against the consequences of a fall. Spotted activities may take place on low elements or on the ground.

Spotting

A rehearsed technique used to reduce the risk of physical injury to a person. Typically, spotting requires no specialized equipment and involves one or more persons working together to be ready to catch, lift, physically support another, or minimize the effects of a fall if necessary.

Staff (Staff Member)

Any person with functional responsibility for the ongoing or day-to-day operation of an organization, including administrative or technical personnel, both paid and not paid.

Static Load

A load resulting from an external force, applied and held in a fixed position for a specific amount of time.

Static Rope

Rope of kernmantle construction that has an elongation less than 6% at 10% of the manufacturer's minimum rated breaking strength. This rope is a specialty product and is generally not appropriate for belay applications on courses.

Tensioned Rope System

A system of equipment and corresponding techniques used to connect a harnessed person to, and support or control the primary movement of that person on, a tensioned rope or other flexible line. Included are ascending systems, descending systems (including rappelling/abseiling), haul systems, zip line systems, and other specialized elements such as the Flying Squirrel and the Giant Swing (by choice). Components of a tensioned rope system may include rope or line, connectors, pulleys or trolleys, ascenders, and descent control devices. In a tensioned rope system, the participant may travel along a stationary line, or the line may move under load.

Top Rope Belay

A belay system where the participant is protected by a belay rope that is terminated or redirected above his/her head, and rope is paid out or taken in by a belayer or belay team. Top rope belay systems may use traditional or team-style belaying techniques.

Ultimate Strength

The peak load or force that a product sustains before failure.

Vendor

An individual or organization offering challenge course related products or services to one or more challenge course operators.

Vertical Fall Arrester

A device that travels on a vertical lifeline and will automatically engage or lock onto the lifeline in the event of a fall. Vertical fall arresters include cable and rope grabs.

Working Load Limit (WLL)

The maximum allowable load on a component or system during normal service as determined by the designer or manufacturer. WLL is determined after considering the properties of the materials used and all design assumptions, such as the type and magnitude of operating load, material reliability, operating environment, intended use, localized stress, etc. The WLL may be restricted to a particular configuration or application. The term "maximum rated load" also equates to the WLL.

Zip Line

A lifeline suspended between support structures that enables a person attached to a pulley to traverse from one point to another propelled only by the force of gravity.

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Zip Line Brake System

A system that controls and/or arrests the motion of a person along a zip line. Brake systems can be active or passive.

Zip Line Landing Area

See Landing Area.

Zip Line Tour

A guided aerial exploration or transit of a landscape by means of a series of zip lines and platforms.

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EXPLANATORY NOTES

CHAPTER 1: DESIGN, PERFORMANCE, AND INSPECTION (DPI)

Explanatory Note to A.2. A structurally sound element or course does not necessarily mean that the design is appropriate for every person, program or site. A structure may meet all strength requirements of this Chapter and still be inappropriate for use, as few requirements within this Chapter relate to specific element or course configuration. For example, the height of a zip line above the starting platform or of a low element foot cable above the ground is not prescribed. Element configurations vary based on the particular element, population, terrain, local training practices, etc. and are difficult to quantify in a global standard. Design is the “art” of the field requiring considerable experience, understanding of program or client need, and sound judgment. This Chapter is not intended to be an instruction manual on how to design or install a course. It leads a knowledgeable designer, engineer, manufacturer, or installer in the direction of appropriate materials and practices. Proper element design, equipment use, training, and element sequencing are major considerations in overall course safety. The consideration of these factors in conjunction with this Chapter is essential when designing a course.

Explanatory Note to A.3.2.1. The proof testing requirement states: “a non-destructive test load shall be applied...if no permanent deformation or displacement in anchorage or components results from the application of the proof load”. Proof tests performed on anchorage placed in soft materials, such as softwood trees, may display some displacement or settling without permanent deformation or other detrimental effect to the anchorage, fastener, or material substrate. It should be verified following proof tests in these conditions that no permanent deformation has occurred.

A verifiable Life Safety System standard describes an established standard of a kindred association which provides an equivalent level of safety. Examples include belay anchors that meet climbing wall industry standards (CWA design and engineering standard or EN 12572).

Explanatory Note to A.3.3. Climbing is a common practice to be in close proximity with the element and to handle the materials or components. In air access may sometimes be limited, precluding hands-on aerial inspection and requiring the use of alternative assessment methods such as the use of binoculars, drones or other technologies. There are times when an alternative method does not provide enough information to properly judge the condition of an item. If the alternatives are inadequate and the item is a critical component, then a plan should be developed to determine its pass/fail status.

Explanatory Note to A.4.1.2. This documentation requirement is not a substitute for proper training in the use of the element or course, or proper monitoring of its operation, nor does it diminish the responsibility of the owner and operator in obtaining proper training or in the ongoing proper use of the element or course.

The manufacturer is not responsible for the actions of the owner and operator after the element or course is commissioned.

Explanatory Note to A.4.1.4. The commissioning process may include: provision of an operations manual; staff orientation, training, and certification; equipment supply and delivery; and manufacturer’s instructions for periodic monitoring. Provided documentation should also contain wire rope mill certificate(s), critical component information, proof test results, etc. Client orientation is not to be construed as a substitute for proper training in the use of the element or course.

Explanatory Note to A.4.2.1. Pre-existing materials and systems that have a history of reliability and meet the strength and performance requirements of this Chapter but do not have the accompanying documentation required of new installations are allowable by this Standard. Common materials that have a history of reliability but where original documentation may not be available are: wire rope, wire rope clips and ferrules, or other critical fasteners.

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Explanatory Note to A.4.3.1. Adoption of technological improvements in materials and systems are essential to progress. As such, strict application of provisions of this Chapter may not be appropriate in every instance.

Explanatory Note to B.1.1. The acceptance inspection is a tool intended to verify that nothing has been neglected in the element or course installation and that it is operating as intended before being turned over to the owner. Complete independence (e.g. third-party status) is not a requirement for this procedure unless specified by contract or statute.

Explanatory Note to B.1.3. The inspector may be an employee of the owner but should have additional inspection training beyond that provided to employees who perform pre-use checks. Specifically, performing pre-use checks is part of regular operational duties and is NOT sufficient training for conducting periodic monitoring. Additionally, similar requirements exist in Chapter 2, B.2.8. and B.2.11- B.2.16.

Explanatory Note to B.2.4. Load measurement and non-destructive testing are examples of verification techniques.

Explanatory Note to B.2.6. Even though a professional inspection excludes assessment of course operations, improper use of elements or associated equipment may be apparent to the inspector.

Explanatory Note to B.3.1.1. Optional Information: The following information should be included in the written report:

- Minor modifications or repairs that are to be completed in a timely fashion and are not serious enough to prevent the operation of the element (for example, reattachment of a serving sleeve)
- Projected repair schedule (e.g. time frame for cable adjustment or replacement)
- Suggestions to improve the design or operation of an element considering the population served and industry advancements
- Concerns warranting continued observation which are not of a critical nature (ground surface condition, worn stairs, compromised health and integrity of trees, etc.)
- Photographs and drawings (if available)

Explanatory Note to C.1.1. When locating outdoor elements, the following may need to be considered: terrain and topography, weather patterns, presence of existing structures and utilities, erosion potential, accessibility, overhead and underground utilities, environmental hazards, brush, limbs, roots, stumps, poisonous plants, etc.

Project size, scope and character should trigger consideration for environmental impact and associated regulatory requirements. Considerations may include short- and long-term impact to surrounding environments, wildlife habitat, adjacent neighborhoods, etc.

Other site selection considerations include adequate space for safe operation of the element, participants and group members, access to and from elements; spotting and belaying, landing areas; pendulum or swing zones around elements when used as designed and intended.

Explanatory Note to C.1.3. Many elements, particularly those involving climbing or activity at height, would be considered inherently dangerous if used by untrained and unsupervised persons. The designer, manufacturer, owner, and operator have the responsibility to take steps to limit access by unauthorized persons in a manner that is appropriate for the site. Access limitation may include: fencing, removable components, and disabling of element function. The likelihood of unauthorized access due to environmental, social, or physical site characteristics should be considered in determining the type of access limitation required. When appropriate, access limitation should also be evaluated and implemented during the installation process.

Explanatory Note to D.2.1. Assessment of trees may involve gathering information regarding species, size, health, terrain, erosion potential and root structure. The location(s), direction, and magnitude of loading on the tree are critical considerations in proper tree assessment. Environmental loads such as those from wind and snow are part of tree assessment.

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Explanatory Note to D.2.2. Design and installation techniques that are appropriate on poles and columns may be destructive to living trees.

Explanatory Note to D.2.3. This assessment includes: health and structural impact due to defects such as dead wood, cracks, weak branch unions, decay, cankers, exposed roots, root problems, diseases, excessive lean, lightning damage, poor tree architecture, and adjacent trees. Soil analysis and the impact of soil erosion and compaction may be included in this assessment.

Explanatory Note to D.2.3.1. Load measurement and non-destructive testing are examples of verification techniques.

Explanatory Note to D.3.1. Load capacities are available in recognized design codes for materials used.

Explanatory Note to D.3.2. Environmental factors include prevailing weather conditions (heat/cold extremes, wet/ dry cycles, etc.), proximity to salt spray or other corrosive atmospheric conditions, ground contact, etc.

Explanatory Note to D.3.3.1. Examples of fasteners in this application are through-bolts and lag screws. Alternatives, such as an engineered steel pole cap, may be fastened closer to the top of a wood pole because the top is protected from deterioration.

Explanatory Note to D.4.4. Anchor heads installed above the ground minimize corrosion and facilitate inspection of cable terminations. Ideally, anchor rods are aligned with the load so as not to adversely affect the operation of the element or compromise anchor integrity due to concentrated bending, particularly for critical guys. It is understood that it may not be possible to achieve exact or even approximate alignment due to installation machinery limitations.

Explanatory Note to D.6.2. Assessment of an existing element or course in or on a building or structure is a specialized skill that may warrant consultation with a structural engineer or other qualified person. Assessment may include hands-on inspection and/or an "as built" construction plan review.

Explanatory Note to E.2.1. Lifelines experience a range in the amount of flexing during operation based on line diameter, tension, and the type of equipment used in operation (e.g. pulleys, brake systems). Flexible wire rope is generally recommended for wire rope lifelines. This requirement is intended to apply to synthetic fiber rope and webbing used in lifeline systems.

Explanatory Note to E.2.2. Examples of lifeline anchorages are: eye bolts, bolt hangers, beam clamps, and slings made from cordage, cable or chain.

Explanatory Note to E.2.4. Operational wear and fatigue points include intermediate anchorage or connectors, zip line loading and unloading areas, brake system contact areas, and areas where wire rope passes around or through another object. Self-retracting lifelines are part of an engineered system and shall be inspected according to the system manufacturer's inspection and replacement policies.

Explanatory Note to E.2.6.1. Many different termination materials and techniques are employed on lifelines including poured zinc and resin, mechanical socket fittings, clamp plates, etc. Three common wire rope termination fittings are listed below because of specific material requirements for each.

Explanatory Note to E.3.2.2. Design considerations include belay stations or floor anchorage positioning that affects the resolved angle of belay load(s) as referenced above. A moving anchorage belay (see Diagram E.3.2.2. a) is a special case that will have a variable and possibly severe resolved angle.

Explanatory Note to E.4.1. Examples of installed anchorages are eye bolts, bolt hangers, beam clamps, and slings made from cordage, cable, or chain.

Explanatory Note to E.5.1.1. Primary ground belay anchor systems are those that support the belay device and the full load transmitted from a falling person. Some examples are belay posts (e.g. Just-Rite Descenders), utility ground anchors, foundations, floor anchorages, horizontal lifelines, and belay benches. These anchor systems are defined as "primary" because they directly connect the belay device to the load from the falling person and are critical.

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Explanatory Note to E.5.2.1. Examples of secondary ground belay anchor systems are those used for maintaining position or offering additional belayer support while belaying from a harness. An example includes using group members as anchors.

Explanatory Note to F.1.2. Environmental factors include prevailing weather conditions (such as heat/cold, wet/ dry cycles, etc.), proximity to salt spray or other corrosive atmospheric conditions, ground contact, etc. Commercial wood preservatives and coatings applied by hand at manufacturer's recommended intervals may be suitable treatments for untreated wood products.

Explanatory Note to F.1.3. For example, wire rope clips that conform to US Federal Specification number FF-C-450, EN 13411-5 (or equivalent) and proof-tested rapid links of known quality are chosen for use on critical systems, whereas non-critical systems may use alternative components.

Explanatory Note to G.1.2. Factors such as variation in platform height, platform size, terrain features, and dynamics associated with incoming zip line riders may contribute to the underestimation of the consequences of falls from platforms.

Explanatory Note to H.1. Brake systems may arrest a participant in many ways, ranging from the use of gravity alone to sophisticated mechanical systems. Brakes are divided into two types, primary brakes and emergency brakes. Primary brakes may be either active or passive in nature whereas emergency brakes engage without input from the zip line participant.

Explanatory Note to H.1.1.1. This standard takes into account brake systems that induce pendulum swing to the participant as well as those that do not.

Explanatory Note to H.1.5. A brake system inspection may require a comparison of current performance for compliance with the manufacturer's specification. Measurements of wear in brake system components may also be necessary.

Explanatory Note to H.2. Hazards include platform components, participants, staff, steps, etc. Other hazards are discussed in the August 2015 ACCT Advisory Notice for Zip Line Landing Area Platforms. See also Chapter 1, G.1.2.

Explanatory Note to H.3. Collisions include: rider-to-rider on the same zip line, rider-to-rider on adjacent zip lines, and rider-to-mobile-obstacle (such as a person, ladder, vehicle, or horse). Engineering controls, administrative controls, training, participant instruction, and signage are acceptable methods for mitigating collisions.

Explanatory Note to I.3.1.1. An example of a condition that reduces the strength of a component is the loss of strength in a rope due to knots.

Explanatory Note to I.3.1.2. The compatibility of components in a system is essential to ensure that a system works as intended. Examples of compatibility include the use of proper diameter ropes in belay devices as prescribed by the manufacturer. Compatibility is also meant to address material interactions, such as the use of an appropriate pulley sheave on a zip line cable. Compatibility requirements are not intended to limit the use of products from a variety of manufacturers in a particular system.

Explanatory Note to I.3.1.4. When variant use for equipment is prescribed, it may result in the "manufacturer" becoming the person or entity who prescribes the variant use of the equipment, with all the legal implications that this change entails.

Explanatory Note to I.3.2.2. Synthetic materials such as polyamide (e.g. nylon, Kevlar, Technora) and polyester degrade with time and use, presenting additional challenges in determining retirement criteria for equipment. Factors such as environmental exposure, stress cycling, solvent damage, and abrasion should be factors considered, amongst others, when determining the retirement of synthetic equipment. Manufacturer's instructions along with usage history will provide a baseline for assessment of such equipment.

Explanatory Note to I.3.3.2. This limitation is often determined by the authority having jurisdiction (for example, state regulators). See definition for personal safety system.

Explanatory Note to I.3.3.3. Examples of personal safety system compatibility include: diameter and type of host lifeline(s), wear resistance, harness attachment point, and need for shock absorber.

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Explanatory Note to I.3.4.1. When creating a rope system, the designer should take into account the expected load at different points in the rope load path and strength loss due to knots or other contributing factors.

Explanatory Note to I.3.4.2. The designer of belay systems and tensioned rope systems should consider rope elongation and length of rope in service when determining impact forces and the likelihood of the participant hitting the ground or other part of the element.

Explanatory Note to I.3.6.1. Lanyards may be supplied as pre-assembled products with integrated connectors, or as individual components supplied by one or more manufacturers and operator-assembled. Assembly activities such as tying knots or attaching connectors into formed loops are considered rope rigging and not manufacturing. However, due to their intended permanent nature, spliced terminations are considered manufactured.

Explanatory Note to I.3.6.3. Self-retracting lanyards are part of an engineered system and shall be inspected according to the manufacturer's inspection and replacement specifications. Anchorages for self-retracting lanyards should be inspected according to Chapter 1, E.4.

Explanatory Note to I.3.7.2. Zip line pulleys (trolleys) may be considered to be part of a personal safety system.

Explanatory Note to I.3.7.3. Pulleys that may be used as part of an activity and will only be subjected to static loads use the same strength criteria as element support systems (see Chapter 1, F.1.1.). An example of pulleys in a tensioned rope system are pulleys in a 4:1 haul system. Pulleys that are part of the belay system may be subject to greater impact forces and therefore have a higher strength requirement. An example of this application is a cable pulley that supports a shear reduction device.

Explanatory Note to I.3.10.2. When using cable grabs, the occurrence of a phenomenon called delayed lock-on is possible and remedial action may be required. Information about delayed lock-on and its risks is found in the ACCT Safety Awareness Bulletin dated January 2009

Explanatory Note to I.3.11.1.3. References: PIA (Parachute Industry Association) standard for webbing (PIA-W-5625), EN 565 or UIAA 103.

EXPLANATORY NOTES

CHAPTER 2: OPERATION

Explanatory Note to B.1.6. It is recommended that the organization take adequate steps to mitigate the environmental impact of programming in areas or on courses where they conduct activities. Examples include: care of the natural environment; proper waste disposal; respect for wildlife; and minimized impact from fire, erosion, and soil compaction.

Explanatory Note to B.2.1. A functioning risk management system has components or features in place allowing an organization to comprehensively identify risks to itself, staff, and its clients. Risk management may include such mitigation strategies as eliminating, minimizing, transferring, or accepting certain risks. A risk management system also includes components that allow an organization to monitor risks on an ongoing basis, resulting in intervention and adaption of operations or programming as prudence dictates. Appropriate signage may be an important component of the risk management system as follows:

- List of facility rules and essential operational guidelines (e.g. restrictions for minimum height, weight limits, minimum age, etc.)
- Guidance to and along designated trails
- Warning signs for restricted areas or hazards

Explanatory Note to B.2.3. Manufacturer instructions, recall notices, and advisories pertaining to the element should also be retained.

Explanatory Note to B.2.4. Document(s) that define adequate policies, procedures, and/or practices include: a discussion of adequate preparation and planning for activities; conduct of specific activities or types of activities; appropriate curriculum; competent instruction; sufficient participant supervision; appropriate safety procedures; care and use of equipment; and emergency response.

Explanatory Note to B.2.5. A reasonable emergency response plan includes, at minimum: prevention strategies; emergency preparedness; administrative response to emergencies; field response to medical emergencies; field response to incidents/accidents and fatalities; technical rescues; activating the emergency medical system; evacuations; addressing severe weather, natural disasters, terrorism, violent crime, missing persons, and notification of next of kin; media relations; or response to any reasonably foreseeable emergency situation. Periodic training and practicing of emergency action plan should occur.

Explanatory Note to B.2.6. Insurance coverage may include general liability and other coverage required by law, such as workers compensation.

Explanatory Note to B.2.7. The organization engages person(s) outside the organization to review risk management and program quality. This could include a comprehensive review of documentation (pre-use checks, periodic monitoring, annual professional inspections, near miss logs, training documents, participant screening and informed consent procedures, etc.), interacting with and shadowing staff to determine culture and common practices, reviewing equipment storage, etc.

Explanatory Note to B.2.10. Significant environmental impacts such as ice storms, hurricanes, tornadoes, or earthquakes, lightning strike, or other events that may affect the structural integrity of components on the course may trigger the need for an inspection. See Chapter 1, B. Inspection Requirements for detail on the information required in the report.

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Explanatory Note to B.2.11. Appropriate actions may include: making recommended repairs to or replacing course elements or equipment; and/or alterations or maintenance of the environment. This may include suspending operations of all or specific elements, activities, or areas until repairs or other actions have been completed.

Explanatory Note to B.2.12. Internal monitoring assesses the condition of the following: course environment/ area; and all constructed course elements and equipment. The frequency of internal monitoring is contingent upon course location, frequency of use, and course design.

Explanatory Note to B.2.13. The pre-use check may be a routine visual examination. Checks may be ongoing throughout the use of an element or event to monitor changes in element conditions, weather, or other related factors.

Explanatory Note to B.2.13.1. It is strongly recommended that staff visually examine all terminations and cables from the ground before completing one full cycle on the tour.

Explanatory Note to B.2.17. This includes assessing and confirming that zip lines, giant swings, etc. are clear of obstacles such as ladders, trees and branches, people, vehicles, and dismounting devices.

Explanatory Note to B.2.18. An appropriate participant screening process varies according to specific circumstances including: types of activities offered; activity difficulty levels; and type of environment. The organization solicits sufficient information from the client or participant to facilitate screening, which may include collecting pertinent medical or other information to achieve maximum participant inclusion.

Explanatory Note to B.2.20. A supervisory plan may include participant appropriate measures, such as adequate ratios of practitioners to participants, taken during both structured and unstructured program time.

Explanatory Note to B.2.23. The incident data is analyzed at least annually to identify trends, evaluate performance, and inform prudent corrective action.

Explanatory Note to B.2.24. Basic amenities include: adequate nourishment and water, access to appropriate bathroom facilities, provision for hand washing, and provision of clean equipment.

Explanatory Note to B.3.3. The minimum qualifications may address age, educational requirements, prior experience, necessary skills or competencies, specific job responsibilities and duties, and essential functions.

Explanatory Note to B.3.4. Screening procedures may include: having candidates complete a written application; face-to-face or telephone interviews; reference check; medical examinations; review of driving record; and criminal background check.

Explanatory Note to B.3.5. The personnel file may include: an application form, résumé or curriculum vitae, letter of application, written references, certifications, records of training completed, proof of identity, proof of citizenship, job description, compensation agreement, or other documents.

Explanatory Note to C.2.1.5. These checks should include pre-use inspection of personal safety equipment and equipment used for participant assistance and/or rescue.

Explanatory Note to C.2.1.14. This may include:

- Proficiency in use of Personal Safety System equipment
- Proficiency in identification and use of appropriate connection points on all elements
- Ability to apply communication protocol

Explanatory Note to C2.1.15. For example, operating staff may cease operations because communication was interrupted, or a course manager may determine to cease operations while monitoring lightning activity, etc.

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Explanatory Note to C.2.3.16. Established methods for accessing and working on high elements and elevated structures are based on analysis of potential hazards and specify the type and application of personal protective equipment. When hazard analysis determines that a person may be pulled off a launch or landing area/platform to a position where there is risk of a fall, that person shall use fall prevention/protection methods that have been established for working on high elements and elevated structures.

Explanatory Note to C. 2.4.1. The dynamics of each zip line are unique. Staff need to understand and be able to communicate to participants the actions required to manage those differences.

Explanatory Note to C.2.4.1.1. Methods of communication may include visual signals (e.g., hand signals, flags, lights), auditory devices (e.g., radios, telephones), or other effective means. 'Cable tapping' is not recommended as it may result in miscommunication or be mimicked by wind, or a person travelling across a zip line. Due to the potential for a communication system to become temporarily unreliable (batteries die, lighting makes visual signals hard to see), staff should understand how to use at least 2 communication methods.

Explanatory Note to C.2.4.2. This may include:

- Proficiency to check and set braking system on all elements
- Ability to determine a fault in a braking system
- Knowledge of communication protocol for braking system operation
- Proficiency in the use of all braking systems on all elements

Explanatory Note to C.2.5.5. Personal Safety System Categories are defined as follows:

- **Non Auto-Locking Lanyard Connections:** Self-closing but not auto-locking connections (e.g. non-locking or screw-locking carabiners). This system is not suitable for use in commercial operations.
- **Auto-Locking Lanyard Connections:** Self-closing and auto-locking connections. (e.g. twist-locking carabiners, snaps).
- **Interconnected Lanyard Connections:** Interconnected to reduce the likelihood of unintentional detachment from the lifeline or anchorage.
- **External Keyed Locking Lanyard Connections:** Interconnected to prevent unintentional detachment from the lifeline or anchorage using an external keyed locking system.
- **Consistent Lanyard Connections:** Remains attached to the Life Safety System without the need for the participant to transfer connectors between elements (i.e. continuous lifeline system).
- **Collective Safety System:** Permanent and/or temporary systems that allow free movement on an elevated work surface while reducing the risk of injury from falls. Examples include: and are not limited to guard rails, balustrade, fences, stairs, and safety nets.

Supervision Strategies are defined as follows:

- **Strategy A:** The monitor can physically intervene with a participant to ensure proper use of the Personal Safety System (PSS).
- **Strategy B:** The monitor is able to see to confirm that the participant is clipped to a lifeline during connector transfers and able to communicate verbally.
- **Strategy C:** The monitor is able to see and communicate verbally with the participant.
- **Strategy D:** The monitor is able to hear and promptly respond to a participant's call for assistance and provide that assistance.

Note: Strategies A, B and C supervision are proactive in nature and Level 4 supervision is primarily reactive in nature.

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Minimum supervision strategies are defined as follows:

Safety System Category	Age 6 and under	Age 7 to 9	Age 10 and over
Non Auto-Locking	Not Suitable	Not Suitable	Not Suitable
Auto-Locking	A	A	B
Interconnected	B or C*	C	C
External Keyed	B or D*	D	D
Consistent**	D	D	D
Collective***	D	D	D

* Accompanied by an adult with supervision strategy A capability who provides strategy D response

** There must be a system, human or mechanical or combination, in a place that ensures that participants are correctly secured to the lifeline before beginning the circuit.

*** If participants can escape from the collective system, strategy C supervision is needed

Explanatory Note to C.3.1.1. Age of participants, number of participants, participant expectations and course types are some of the considerations when determining what to say to participants and when to say it.

Explanatory Note to C.3.2.1. The organization solicits relevant information about the group prior to programming that may include: the number of participants; ages; identified group goals and objectives; and any needs related to accessibility, nutrition, or medical conditions.

Explanatory Note to C.3.2.2. Appropriate client programming includes: the type of activities selected, the length of program and the presentation of activities. Activities selected should reflect the expressed goals, needs and abilities of each group. Activities are appropriately sequenced, monitored, and adjusted as needed.

Explanatory Note to C.3.3.2. A self-assessment may include: the type of activities selected, the length of program and the presentation of activities. Activities selected should reflect the expressed goals, needs and abilities of each group. Activities are appropriately sequenced, monitored, and adjusted as needed.

Explanatory Note to C.3.4.1. Specific information may include: a program format overview, planned activity types, physical exertion levels required, a "level of choice" participation philosophy, and a group agreement/contract facilitation or presentation.

Explanatory Note to C.3.4.6. Staff provides participants opportunities to reflect and express thoughts and ideas related to their experience. These may include discussion, writing, art, journaling, or other methods; identifying any generalizations or learning applications to other environments; or other techniques as applicable. This dedicated time may integrate experiential learning cycles or other appropriate reflection and learning models and may vary widely from one program design to another.

Explanatory Note to C.3.4.7. Staff have knowledge of and the skills necessary to promote and monitor safety in physical, emotional, and social domains. Minimizing potential harm may incorporate a group agreement or contract.

Explanatory Note to C.3.4.9. Common group behaviors include: resistance, avoidance, transference, counter transference, sabotaging, and discounting. The "How and When" to deal with such behaviors is directly relevant to the program type provided.

Explanatory Note to C.3.4.10. As an extension of monitoring and managing the group, a primary function of staff is aiding and assisting group difficulties. This may include: verbal redirection to a group having difficulty performing tasks; group intervention for behaviors that increase risks or potentially cause harm; or facilitating a discussion to resolve a group dispute or conflict. Some situations may require separation or removal of disruptive participants.

Explanatory Note to C.3.4.12. A diversity of responses to course experiences may arise in individual participants resulting from past experiences or memories. Negative or positive course activities may elicit strong recall of emotionally intense past experiences. Staff shall respect and assist any participant experiencing this during programming, while also assisting the group as a whole to achieve its purpose. Staff may suggest professional assistance to an individual.

EXPLANATORY NOTES

CHAPTER 3: TRAINING

Explanatory Note to B.1.1. Any individual training event may address some or all aspects of program operation.

Explanatory Note to B.4.2.1. For example, when learning to access an element using a personal safety system, the trainee may also be on a separate belay.

Explanatory Note to B.5.2. This could be an accurate and current operations manual, a basic list of learning objectives, or a training skills assessment record.

ANNEX A

REFERENCED DOCUMENTS

The following documents are cited in this Standard and are necessary for its application. Unless a specific date is provided, the reader is directed to the latest edition.

American Wood Protection Association, Accredited Standards Committee (ASC O5). Birmingham, AL.

- ANSI O5.1. Wood Poles – Specifications and Dimensions.
- ANSI O5.2. Structural Glue Laminated Timbers for Utility Structures.

American Ladder Institute, Accredited Standards Committee (ASC A14). Chicago, IL.

- ANSI A14.3. American National Standard for Ladders – Fixed – Safety Requirements.

American Society of Safety Professionals (ASSP). Park Ridge, IL.

- ANSI Z359.3. Safety Requirements for Lanyards and Positioning Lanyards.
- ANSI Z359.9. Personal Equipment for Protection Against Falls - Descent Controllers.
- ANSI Z359.11. Safety Requirements for Full Body Harnesses.
- ANSI Z359.12. Connecting Components for Personal Fall Arrest Systems.
- ANSI Z359.16. Safety Requirements for Climbing Ladder Fall Arrest Systems.

International Safety Equipment Association (ISEA). Arlington, VA.

- ANSI Z89.1. Industrial Head Protection.

ASTM International. West Conshohocken, PA.

- ASTM F1772. Standard Specification for Harnesses for Rescue and Sport Activities.

Cordage Institute (CI). Wayne, PA.

- CI 1801. Low Stretch and Static Kernmantle Life Safety Rope.
- CI 1803. Kernmantle Accessory Cords for Life Safety Applications.
- CI 1805. 3-Strand Life Safety Rope, Moderate Stretch.

Canadian Standards Association (CSA). Toronto, ON.

- CSA Z94.1. Industrial protective headwear – Performance, selection, care, and use.
- CSA Z259.2.5. Fall arresters and vertical lifelines.
- CSA Z259.10. Full Body Harnesses.
- CSA Z259.11. Personal energy absorbers and lanyards.
- CSA Z259.12. Connecting components for personal fall-arrest systems (PFAS).

European Committee for Standardization (CEN). Brussels, Belgium.

- EN 341. Personal fall protection equipment - Descender devices for rescue.
- EN 353-2. Personal fall protection equipment - Guided Type Fall Arresters including a Flexible Anchor Line.
- EN 354. Personal fall protection equipment — Lanyards.
- EN 355. Personal protective equipment against falls from a height — Energy Absorbers.
- EN 358. Personal protective equipment for work positioning and prevention of falls from a height - Belts and lanyards

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for work positioning or restraint.

- EN 361. Personal protective equipment against falls from a height - Full body harnesses.
- EN 362. Personal Protective Equipment against Falls from a Height – Connectors.
- EN 397. Industrial protective helmets
- EN 564. Mountaineering equipment - Accessory cord - Safety requirements and test methods.
- EN 566. Mountaineering equipment – Slings - Safety requirements and test methods.
- EN 795. Personal fall protection equipment - Anchor devices.
- EN 813. Personal fall protection equipment - Sit harnesses.
- EN 892. Mountaineering equipment - Dynamic mountaineering ropes - Safety requirements and test methods.
- EN 1891 (Type A). Personal Fall Protection Equipment - Low Stretch Kernmantel Rope.
- EN 12275. Mountaineering equipment – Connectors – Safety requirements and test methods.
- EN 12277. Mountaineering equipment – Harnesses – Safety requirements and test methods.
- EN 12278. Mountaineering equipment – pulleys – Safety requirements and test methods.
- EN 12492. Mountaineering equipment – Helmets for mountaineers - Safety requirements and test methods.
- EN 13411-3. Terminations for steel wire ropes - Safety - Part 3: Ferrules and ferrule-securing.
- EN 13411-5. Terminations for steel wire ropes. Safety - U-bolt wire rope grips.
- EN 15151. Mountaineering equipment – Braking Devices- Safety requirements and test methods.
- EN 17109. Mountaineering equipment – Individual safety systems for rope courses - Safety requirements and test methods.

International Organization of Standards (ISO). Geneva, Switzerland.

- ISO 22159. Personal equipment for protection against falls - Descending devices.

National Fire Protection Association (NFPA). Quincy, MA.

- NFPA 2500. Standard for Operations and Training for Technical Search and Rescue Incidents and Life Safety Rope and Equipment for Emergency Services.

International Climbing and Mountaineering Federation (UIAA). Bern, Switzerland.

- UIAA 101. Dynamic Ropes.
- UIAA 102. Accessory Cord.
- UIAA 104. Slings.
- UIAA 105. Harnesses.
- UIAA 106. Helmets.
- UIAA 107. Low Stretch Rope.
- UIAA 109. Belay Lanyard.
- UIAA 121. Connectors/Karabiners.
- UIAA 127. Pulleys.
- UIAA 129. Braking Devices.

United States of America Defense Logistics Agency (DLA) Land and Maritime. Fort Belvoir, VA.

- US Federal Specification number FF-C-450. Clamps, Wire Rope.
- MIL-DTL- MS51844. Sleeve, Swaging - Wire Rope.