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Standard Practice for Industrial Rope Access¹

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INTRODUCTION

This standard applies where access is gained to structures, man-made or natural, by means of ropes suspended from the structure or the features concerned. It applies to cases where ropes are used (1) as the primary means of support, (2) as the means of primary protection or positioning, and (3) where operatives descend or ascend on a rope, or traverse along a tensioned horizontal rope where the use of hands and feet can no longer be used to fully support the body.

This standard is not intended to apply where rope access techniques are used by the fire department, other emergency services, and the armed forces. The authorities concerned with these activities have their own standards for such work.

This standard does not apply to other methods of working at height such as steeple jacking, suspended scaffolds, steelwork erection, or boatswain's chairs.

1. Scope

1.1 This practice provides a framework of practical and technical information within which the specifying authority and the operators using rope access techniques can develop effective arrangements to help ensure the safety and health of personnel involved in these projects.

1.2 This practice applies to the use of techniques whereby access is gained to structures, man-made or natural, by means of ropes suspended from the structure. It applies to all cases where ropes are used as the primary means of support and where persons descend or ascend a rope, or traverse along a tensioned horizontal or inclined rope.

1.3 This practice applies to all industrial uses of rope access techniques except use by the fire department and other emergency services for rescue work and training in connection therewith. Fire and rescue authorities have special procedures applicable to their circumstances. This standard does not apply to other methods of working at heights, such as suspended scaffolds.

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

1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ANSI Standards:²

ANSI 289.1 2003 Helmets

ANSI 2359.1 1992 Harnesses

2.2 OSHA Regulations (Standards—29 CFR):³

1910.66 App C Fall Protection System

1926.450 Scope, applications applicable to this subpart

1926.500 Scope, application, and definitions applicable to this subpart

1926.502 Fall Protection Systems Criteria and Practices

1926.503 Training Requirements

2.3 Other Standards:

CE EN361 & EN358 Harnesses⁴

Cordage Institute C11801 Low Stretch and Static Life Safety Rope⁵

² Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

³ Available from Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., NW, Washington, DC 20210.

⁴ Available from the International Mountaineering and Climbing Federation (UIAA) UIAA Office, Monbijoustrasse, 61 Postfach CH-3000, Bern 23, Switzerland.

⁵ Available from The Cordage Institute, 994 Old Eagle School Road, Suite 1019, Wayne, PA 19087.

¹ This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.55 on Exterior Building Wall Systems.

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NFPA 1983 Fire Service Life Safety Rope⁶
 UIAA 101 & EN892 Standard/Testing for Dynamic Ropes⁴

3. Terminology

3.1 Definitions:

3.1.1 *anchor, n*—a secure point of attachment having sufficient capacity to support elements of a *suspension system* or *fall protection system* (see *primary anchor* and *directional anchor*).

3.1.2 *ascent system, n*—a type of *suspension system* that allows a worker to ascend a *working rope*.

3.1.3 *ascender, n*—a type of rope grab designed to grip a rope firmly when loaded in one direction and which can slide freely along the rope in the opposite direction.

3.1.3.1 *Discussion*—Ascenders are used in pairs to ascend a working rope.

3.1.4 *basic rescue, v*—the unassisted controlled rescue of a coworker in an emergency using a combination of fall arrest ropes and *working ropes*.

3.1.5 *belay, v*—the active use of a rope, *anchor*, and friction system by a worker to arrest the fall of another worker.

3.1.6 *boatswain's chair, n*—a small sitting platform that is suspended on a multipart tackle, allowing the worker using the boatswain's chair to raise or lower the chair.

3.1.6.1 *Discussion*—A worker typically sits in a boatswain's chair without being directly attached to it (compare with swing seat).

3.1.7 *carabineer, n*—a type of connector formed as a complete loop and incorporating a spring-loaded entry gate. A locking carabineer includes a mechanism that prevents the entry gate from opening when the mechanism is engaged.

3.1.8 *chest harness, n*—an interconnected system of webbing straps, buckles and padding that is secured around the chest and shoulders and which should only be used in conjunction with a seat harness.

3.1.9 *connector, n*—a device used to couple (connect) together parts of a *fall protection system* or *suspension system*.

3.1.9.1 *Discussion*—A connector may be an independent component of the system, such as a *carabineer*, or it may be an integral component of part of the system, such as a buckle or D-ring sewn into a *seat harness*, or a snap hook sewn into a *lanyard* [OSHA 1926.500(b)].

3.1.10 *competent person, n*—a person who has, through a combination of training, education, and experience, acquired knowledge and skills enabling that person to correctly perform a specified task or oversee a specified operation.

3.1.10.1 *Discussion*—A competent person is capable of identifying existing and predictable hazards related to specified tasks and operations and has authorization to take prompt corrective actions to eliminate those hazards [OSHA 1910.66 App. C Section I(b)].

3.1.11 *deceleration device, n*—any mechanism, such as a *back-up rope grab*, *energy-absorbing lanyard*, or other device

that dissipates a substantial amount of energy during a fall arrest [OSHA 1926.500(b)].

3.1.12 *deceleration distance, n*—the additional vertical distance a falling worker travels, excluding safety rope elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate.

3.1.12.1 *Discussion*—Deceleration distance is measured as the distance between the location of a worker's harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the worker comes to a full stop [OSHA 1926.500(b)].

3.1.13 *descent system, n*—a type of *suspension system* that allows a worker to slide down a *working rope* in a controlled manner by means of a *descender*.

3.1.14 *descender, n*—a device that acts as a friction brake on a *working rope*.

3.1.14.1 *Discussion*—It is attached directly to a *harness* with or without a *swing seat* to enable a worker to descend the rope in a controlled manner.

3.1.15 *directional anchor point, n*—a secure point used to redirect the path of a *working rope* and *safety rope* from a *primary anchor* attachment point to the edge of a structure.

3.1.15.1 *Discussion*—The redirected ropes are reeved through a pulley or carabineer, which is attached to the directional anchor. A directional anchor is necessary when no suitable anchor is available at a location directly above the intended worksite (compare with *primary anchor*) or to redirect ropes away from a potential hazard.

3.1.16 *dynamic rope, n*—a rope that is designed with energy absorbing characteristics which minimum criteria as defined by UIAA 101, Cordage Institute C11801 and conforms to OSHA minimum standards.

3.1.17 *energy-absorbing lanyard, n*—a *lanyard* that deforms in a controlled manner to absorb energy during a fall arrest while maintaining its ultimate tensile strength.

3.1.18 *failure, n*—breakage or separation of component parts [OSHA 1926.450(b)].

3.1.19 *fall protection system, n*—a system used to arrest the descent of a worker in the event of a failure of the *suspension system*.

3.1.19.1 *Discussion*—A fall protection system consists of an *anchor*, *connectors*, and *harness*, as well as a *safety rope*, *lanyard*, and *backup rope grab* or an active *belay* provided by another worker [OSHA 1926.500(b)].

3.1.20 *fall factor, n*—the maximum distance a worker falls, divided by the length of the rope attaching the worker to the *anchor*.

3.1.21 *free fall, n*—the act of falling before the *fall protection system* begins to apply force to arrest the fall [OSHA 1926.500(b)].

3.1.22 *free fall distance, n*—the vertical displacement of the fall arrest attachment point on the worker's harness between the onset of the fall and just before the system begins to apply force to arrest the fall.

⁶ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

3.1.23 *full-body harness, n*—an interconnected system of webbing straps, buckles, and padding that is secured around the body of a worker to distribute fall arrest forces over the thighs, pelvis, waist, chest, and shoulders. A seat harness combined with a connected chest harness is considered a full-body harness.

3.1.24 *harness, n*—an assembly of webbing straps that encircle a worker's body and bears directly the weight of a worker who is using a *suspension system*, or which bears the weight of a worker during fall arrest or while working if a swing seat is not used (also see: *full-body harness*, *seat harness* and *chest harness*).

3.1.25 *impact load, n*—the dynamic forces applied to a *fall protection* or *suspension system* during the arrest of a *free fall*.

3.1.26 *industrial rope access, n*—the techniques by which rope systems are used to gain access to structures, man-made or natural. This definition includes all cases where ropes are used as both the primary means of support and as fall protection.

3.1.27 *kernmantle rope, n*—a rope consisting of an internal, load-bearing core covered by a separately woven sheath designed to protect the core from abrasion.

3.1.28 *lanyard, n*—a length of rope or webbing used to connect a worker's *harness* to an *anchor* or *rope grab* [OSHA 1926.500(b)].

3.1.29 *locking carabineer, n*—a type of *carabineer* that includes a mechanism that prevents the entry gate from opening when the mechanism is engaged.

3.1.30 *lowering system, n*—a system that enables a worker to use an *anchor*, rope, and friction brake to lower another worker in a controlled manner. Lowering systems are typically used during rescue operations.

3.1.31 *maximum intended load, n*—the total load of the worker, tools, equipment, materials, transmitted loads, and other loads reasonably anticipated to be applied to the suspension system [OSHA 1926.450(b)].

3.1.32 *primary anchor point, n*—a secure attachment point having sufficient capacity to support a *suspension system* or *fall protection system* (compare with *directional anchor point*).

3.1.33 *rated strength, n*—the minimum tensile strength specified by the manufacturer of a piece of equipment or component.

3.1.33.1 *Discussion*—The rope minimum breaking strength shall be determined by subtracting three standard deviations from the mean result of five samples.

3.1.34 *rope grab, back-up type, n*—a device that can be made to slide along a safety rope and whose purpose is to arrest the fall of a worker in case of any failure in the *suspension system*.

3.1.35 *safety factor, n*—a multiple applied to a *maximum intended load* that provides for additional capacity in a rigging system.

3.1.36 *safety rope, n*—a rope connected to an *anchor* used to arrest a fall in case of the failure of a *suspension system*.

3.1.36.1 *Discussion*—A safety rope is a primary component

of a *fall protection system*. Also known as a lifeline, back-up rope, or secondary rope.

3.1.37 *seat harness, n*—an interconnected system of webbing straps, buckles, and padding that is secured around the body of a worker to distribute fall arrest forces over the thighs, pelvis, and waist.

3.1.38 *static rope, n*—a rope exhibiting relatively low stretch under load and having only a limited ability to absorb energy during fall arrest as defined by the Cordage Institute C11801.

3.1.38.1 *Discussion*—Also known as low-stretch rope (compare with *dynamic rope*).

3.1.39 *suspension system, n*—the rigging system intended to bear the weight of a worker during the course of normal operations.

3.1.39.1 *Discussion*—A suspension system typically consists of a *working rope* and a *descender* or two *ascenders*, *lanyards*, and a *full-body harness* or *seat harness*. *Ascent systems* and *descent systems* are two types of *suspension systems*.

3.1.40 *swing seat, n*—a small sitting platform provided for the comfort of a worker.

3.1.40.1 *Discussion*—While using a swing seat, a worker also uses a *harness* that is attached directly to the *suspension system* (compare with *boatswain's chair*).

3.1.41 *working rope, n*—a rope connected to an anchor and used for the primary support during the descent and ascent of the worker.

3.1.41.1 *Discussion*—A working rope is the principle component of a suspension system. Also known as a main rope or suspension rope and is always used in conjunction with a safety rope.

4. Significance and Use

4.1 Access to the exterior and interior of structures is often required as part of maintenance or inspection work. Depending on the characteristics of the structure and site constraints, access can often be achieved using a number of methods other than industrial rope access, including ladders, stationary or removable suspended scaffolding, mechanical self-propelled aerial lifts, and other suitable means. There are instances where use of such means of access is not feasible or economical.

4.2 This standard provides guidance on the use of rope access as an alternative to other methods of access.

5. Personnel and Training

5.1 *General Requirements for Personnel (See OSHA 1926.503):*

5.1.1 Industrial rope access workers shall be at least 18 years of age.

5.1.2 Physical fitness for industrial access workers:

5.1.2.1 Industrial rope access workers shall pass a general physical test administered by a physician that declares the worker medically fit.

5.1.2.2 The medical examination shall be performed every three years or after every recent major injury or illness. Workers will self-certify their fitness to return to work.