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Standard Practice for Industrial Rope Access[1]

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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 Harnesses[4]
Cordage Institute C11801 Low Stretch and Static Life Safety Rope[5]
NFPA 1983 Fire Service Life Safety Rope[6]

[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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[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] Availble 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.

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

UIAA 101 & EN892 Standard/Testing for Dynamic Ropes[4]

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.

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 on an annual basis. Employers shall only authorize rope access work for personnel who are declared physically fit.

5.1.2.3 Workers shall have no recent injuries that could impair their ability to perform their responsibilities.

5.1.2.4 Workers shall not take any medication that can impair alertness or motor skills while performing rope access duties.

5.1.2.5 The physical fitness of workers shall be evaluated by the rope access supervisor prior to work.

5.2 Qualification levels for industrial rope access workers shall be based on a combination of training, experience, and competency. There are three internationally recognized qualification levels for industrial rope access technicians. An individual with Level 1 has the least and one with Level 3 has the

most training, experience, and competency to perform the work as a rope access technician. The qualifications are outlined in Appendix X1.

5.3 *Working Teams*:

5.3.1 Rope-access workers shall work in teams, each consisting of at least two certified rope access technicians. Personnel that are not certified in rope access are not counted as part of a rope access team.

5.3.2 At least one member of a rope access team shall be a Level 3 worker.

5.3.3 There shall be no more than six Level 1 and Level 2 workers supervised by one Level 3 worker. The Senior Level 3 worker shall determine if this ratio needs to be decreased.

5.3.4 A Level 3 worker shall be responsible for the direct supervision and guidance of unqualified personnel that are required to perform tasks alongside the rope access team. The Level 3 worker is the primary authority when deciding on the suitability and safety of unqualified personnel that perform tasks using rope access. The presence of unqualified personnel who are under the supervision of a Level 3 worker should only be for short periods of time to monitor/inspect tasks or participate in minor tasks.

5.4 *Training*:

5.4.1 All rope access workers shall be trained to a syllabus and assessed on the requirements of the various rope access levels. Such training shall be provided by an independent competent organization or individual to ensure that the training standard is to an accepted externally certified level (see Appendix X2).

5.4.2 Competency in rope access techniques is gained through hands-on experience and improvement in the various required skills. Lower level workers shall always be under the direct or close supervision of a supervisor.

5.4.3 All rope access workers shall maintain a record of their training and experience signed by a supervisor. Such records will be used for verification and preliminary assessment of an individual.

6. Industrial Rope Access Equipment

6.1 A helmet meeting the requirements of the ANSI 289.1 and other appropriate standards that addresses multi-directional impact as well as an appropriate means for keeping the helmet on the head shall be worn during all industrial rope access work.

6.2 A full body harness meeting the requirements of ANSI 2359.1, NFPA 1983, CE EN 361, EN 358 and other appropriate standards shall be worn during all industrial rope access work.

6.3 *Connectors*:

6.3.1 Connectors used in the construction of fall protection systems or suspension systems shall:

6.3.1.1 Have a rated strength of at least 5000 lb (22.2 kN) [OSHA 1926.502(d)(1)];

6.3.1.2 Be intended by the manufacturer to be used for the support of personnel; and

6.3.1.3 Incorporate a locking mechanism that prevents unintentional disengagement of the connector [OSHA 1926.502(d) (5)].

6.4 *Lanyards*:

6.4.1 Lanyards used in fall protection systems shall:

6.4.1.1 Be constructed of synthetic fibers;

6.4.1.2 Have a maximum length that, when loaded by the weight of the operator, enables the operator to reach and operate the device to which the lanyard is attached; and

6.4.1.3 Have a minimum breaking strength of 5000 lb (22.2 kN) [OSHA 1926.502(d) (9)].

6.4.2 An energy-absorbing lanyard shall have a rated strength of at least 5000 lb (22.2 kN) when fully extended [OSHA 1926.502(d) (13)].

6.5 *Backup Rope Grabs*:

6.5.1 Backup rope grabs used in fall protection systems shall:

6.5.1.1 Automatically grip the safety rope in the event of either a fall or a failure of the suspension system;

6.5.1.2 Incorporate a means of preventing unintentional removal from the safety rope;

6.5.1.3 Be permanently marked by the manufacturer showing the maximum and minimum rope diameters suitable for use with the device; and

6.5.1.4 Be permanently marked by the manufacturer showing details, where necessary, of the correct orientation in which the device is to be installed.

6.6 *Descenders*:

6.6.1 A descender shall be manufactured specifically to control the rate of descent of a person sliding down a working rope.

6.6.2 A descender used for work-level suspension shall:

6.6.2.1 Include a braking mechanism, which must be disengaged manually for a worker to descend. The braking mechanism shall automatically reengage on removal of the worker's hand from the device; and

6.6.2.2 Be capable of holding a worker in place on a working rope with both hands free.

6.6.3 Descenders shall be permanently marked by the manufacturer with details, where necessary, of the correct procedure for threading the rope through the device.

6.7 *Ascenders*:

6.7.1 Ascenders shall:

6.7.1.1 Be constructed so that it is not possible to move the device down the working rope without a deliberate action performed by the operator;

6.7.1.2 Be constructed so that a minimum of two distinct, deliberate actions are required to remove the device from the working rope;

6.7.1.3 Be intended by the manufacturer to be used primarily as a means of ascent of a rope by a person; and

6.7.1.4 Be used as a component of an ascent system, and shall not be used as fall protection.

6.8 *Ropes*:

6.8.1 Rope used as a safety rope or a working rope shall:

6.8.1.1 Be low-stretch static kernmantle rope constructed of synthetic fibers;

6.8.1.2 Have a rated strength of 5000 lb (22.2 kN) [OSHA 1926.502(d)(9)]; and

6.8.1.3 Have a minimum diameter of 7⁄16 in. (11 mm).

6.9 *Slings*:

6.9.1 Slings used to rig an anchor shall:

6.9.1.1 Be made of synthetic fibers or steel wire; and

6.9.1.2 Be constructed on site using a static rope, low stretch rope or webbing by a competent person using recognized knots; or they shall be of a type manufactured for personnel support and have an explicitly stated strength rating.

6.9.1.3 Steel wire rope slings should be one piece, manufactured with explicit stated strength rating, and have ends that are secured with a pressed metal sleeve. Where steel wire ropes are utilized, connectors shall be steel.

6.10 *Ancillary Equipment*:

6.10.1 In some situations rope access work may be more efficiently and safely carried out by supplementing it with ancillary equipment such as platforms, nets and purpose built items; in such situations rope access must remain the principal access system for workers and their anchor points must be separate from any used for supporting this equipment.

7. Care of Equipment

7.1 Equipment shall be used and maintained according to the instructions of the manufacturer including:

7.1.1 Cleaning and lubrication of hardware components;

7.1.2 Cleaning of soft goods such as webbing, straps, and harnesses; and

7.1.3 Equipment shall be used solely for purposes indicated by the manufacturer and shall not be modified by the user.

7.2 A program of periodic inspection of equipment shall include explicit criteria for inspection. Inspection results shall be documented. Damaged or non-functioning equipment shall be removed from service. This shall be prior to each use.

8. Industrial Rope Access Systems

8.1 *Anchors*:

8.1.1 *Anchor Point*:

8.1.1.1 The point of attachment of the working rope, or safety rope, to an anchor system. The failure strength of the anchor point shall be at least equal to the greater of 6 times the maximum intended static load and 2 times the dynamic load due to a potential fall. This corresponds to a minimum safety factor of 6 for this static load and 2 for this dynamic load. The capacity of the anchor point shall account for the anticipated direction of loading.

8.1.2 *Anchor System*:

8.1.2.1 A single attachment, or combination of attachments and rope, that connect an anchor point to the structure or feature such that it provides a minimum factor of safety of 6 against failure from the maximum intended static loads, and a minimum factor of safety of 2 against failure from dynamic loads due to a potential fall.

8.1.2.2 The Anchor Systems for each worker shall rely on at least two independent attachments to the structure. Anchor systems that rely on multiple attachments to the structure shall be rigged such that the failure of any single attachment will not cause the failure of any other attachment.

8.1.2.3 Anchor Points and Anchor Systems shall be rigged such that, in the event of the failure of one anchor point, the worker can not free fall more than 6 ft (1.8 m) and the failure of any one point will not result in a catastrophic failure, such as a progressive failure of other parts.

8.1.2.4 Connectors used in the rigging of anchors shall meet the requirements of 6.3.

8.1.2.5 Slings used to construct anchors shall meet the requirements of 6.9.

8.1.2.6 Slings and ropes used to construct an anchor shall be protected at all locations where they may be subject to abrasion or cutting. Suitable rope protection devices shall be selected by a competent person.

8.1.3 *Primary Anchor Point*:

8.1.3.1 An anchor that will bear directly a suspension system or fall protection system using a recognized knot or fastening that does not reduce the system strength to below OSHA minimum standards as determined by a competent person. A primary anchor point shall be considered an anchor point when determining the required anchor capacity and rigging requirements (see 8.1.1).

8.1.4 *Directional Anchor Point*:

8.1.4.1 Directional Anchor Points shall be considered anchor points when determining required anchor capacities and rigging requirements as determined by the competent person. Directional anchors shall be used when no suitable anchor is available at a location that is on a line which is perpendicular to the edge of the structure above the intended worksite or to redirect ropes away from a potential hazard (see 8.1.1.1).

8.1.5 *Anchor Attachments to the Structure*:

8.1.5.1 All anchor attachments to the structure shall be designed to carry the intended loads and installed by a competent person in accordance with the manufacturer's specifications.

8.2 *General Requirements for Fall Protection Systems*:

8.2.1 A fall protection system shall:

8.2.1.1 Limit the maximum arresting force on a falling worker to 1800 lb (8 kN) [OSHA 1926.502(d)(16)(ii)];

8.2.1.2 Limit a worker's free fall to a maximum of 6 ft (1.8 m) [OSHA 1926.502(d)(16)(iii)]; and

8.2.1.3 Bring a worker to a complete stop and limit maximum deceleration distance to 3.5 ft (1.07 m) [OSHA 1926.502(d) (16) (iv)].

8.3 *Selection of Components in Fall Protection Systems*:

8.3.1 Individual components of a fall protection system shall together comprise a system that meets the requirements of 8.2.1.

8.3.2 Workers performing industrial rope access work shall carry means of both ascent and descent regardless of the anticipated requirements of the job.

8.3.3 System components shall not be changed or substituted without the approval of a competent person.

8.4 *Use of Fall Protection Systems*:

8.4.1 Fall protection systems shall be provided for and used by workers during all rope suspension work and whenever a worker is less than 6 ft (1.8 m) from an unprotected edge that is without a guardrail at least 39 in. (1 m high) [OSHA 1926.502(b)(1)].

8.4.2 Each worker shall have a separate and independent fall protection system:

8.4.2.1 Only one worker shall be attached to a safety rope, except in a rescue situation; and

8.4.2.2 Each worker shall be attached to independent lanyards, rope grabs, or any other component of a fall protection system, except in a rescue situation.

8.4.2.3 Safety ropes shall be protected where they contact edges of a structure, anchor, obstruction, crossing rope, or other surface that might cut or weaken the rope. Suitable rope protection devices shall be selected by a competent person.

8.5 *Inspection of Fall Protection Systems*:

8.5.1 Fall protection systems and components subjected to impact loading shall be tagged and removed from service and shall not be used again for fall protection or suspension until inspected and determined by a competent person to be undamaged and suitable for reuse [OSHA 1926.502(d) (19)], except for safety ropes, which shall be immediately removed permanently from further service in fall protection or suspension systems.

8.5.2 Fall protection systems shall be inspected prior to each use for improper rigging, wear, damage, and other deterioration; defective components shall be immediately removed from service [OSHA 1926.502(d) (21)].

8.6 *Selection of Components in Descent Systems*:

8.6.1 Descenders shall be selected to function as part of a complete descent system and used in conformance with the manufacturer's recommendations. Several factors affect the performance of a descent system. Together, these factors determine the effective rate of descent, the ease of control, and the ability to lock the descender in place. The following factors shall be considered when matching a descender to a working rope:

8.6.1.1 Rope diameter, which shall meet manufacturer's specifications for the descender;

8.6.1.2 Rope handling characteristics;

8.6.1.3 Length of descent; and

8.6.1.4 Weight of worker and equipment.

8.7 *Use of Descent Systems*:

8.7.1 The descender shall either be attached directly to the worker's harness or, if attached to a swing seat, the descender shall be linked directly to the harness by a lanyard less than 2 ft long.

8.7.2 During the course of industrial rope access work, each worker shall have a separate descent system:

8.7.2.1 Only one worker shall be attached to a working rope, except in a rescue situation.

8.7.2.2 Workers shall not share lanyards, descenders, or any other component of a descent system, except in a rescue situation.

8.7.3 Working and safety ropes shall extend either to the ground or a safe location.

8.7.4 If the descent does not terminate at the ground, the working and safety rope shall extend below the lowest intended work level and have a knot or secure fitting at the terminal end to prevent the descender from running off the end of the ropes.

8.7.5 All ropes shall be protected where they contact edges of a structure, anchor, obstruction, or other surface that might cut or weaken the ropes. Suitable rope protection devices shall be selected by a competent person.

8.8 *Inspection of Descent Systems*:

8.8.1 Descent systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for fall protection or suspension until inspected and determined by a competent person to be undamaged and suitable for reuse, except for working ropes, which shall be removed permanently from service in fall protection or suspension systems immediately after impact loading.

8.8.2 Descent systems shall be inspected prior to each use for improper rigging, wear, damage, and other deterioration; defective components shall immediately be removed from service.

8.9 *Selection of Components in Ascent Systems*:

8.9.1 Ascenders shall only be used on working ropes of an appropriate diameter as specified by the manufacturer of the ascender.

8.9.2 A combination of ascenders and working rope shall be considered compatible if they meet the requirements of 6.7.

8.10 *Use of Ascent Systems*:

8.10.1 Ascenders shall be used in accordance with the manufacturer's specifications.

8.10.2 A worker shall remain attached by lanyards or a direct attachment to the harness to both ascenders during the operation of an ascent system.

8.10.3 All ropes in an ascent system shall be protected where they contact edges of a structure, anchor, obstruction, or other surface that might cut or weaken the rope. Suitable rope protection devices shall be selected by a competent person.

8.11 *Inspection of Ascent Systems*:

8.11.1 Ascent systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for fall protection or suspension until inspected and determined by a competent person to be undamaged and suitable for reuse, except for working ropes, which shall be removed permanently from service in fall protection or suspension systems immediately after impact loading.

8.11.2 Ascent systems shall be inspected prior to each use for improper rigging, wear, damage, and other deterioration; defective components shall immediately be removed from service.

9. Communication Systems and Methods

9.1 Direct communications shall be maintained between all workers performing industrial rope access work.

9.2 A system of radio communication shall be used unless the scale of the work area is such that all workers, including attendants or monitors, are within the line of sight of each other and can maintain direct voice communication.

9.3 Hand or voice signals, such as belay or hoist signals, shall be established and practiced before they are needed in the field.

10. Rescue Provisions

10.1 Adequate provisions for the rescue of a worker operating a suspension system shall be made prior to the commencement of industrial rope access operations. Such provisions shall include all of the requirements of rope access team rescue or prompt availability of professional rescue services.

10.2 Adequate provisions for rescue by the rope access team during the operation of rope suspension systems shall include:

10.2.1 Presence at all times of at least two workers trained in all aspects of rescue procedures,

10.2.2 Clear and regular communication between workers, and

10.2.3 The presence of all equipment necessary to perform rescue operations:

10.2.3.1 Assisted descent,

10.2.3.2 Lowering systems, and

10.2.3.3 Raising systems.

10.3 Rescue operations shall be conducted under the supervision of a competent person.

10.4 Only workers under the supervision of a competent person shall operate such systems.

10.5 During rescue operations performed by the rope access team, the rescuer and rescue subject shall be attached to separate and independent fall protection systems where feasible, or be protected by an active belay system capable of protecting the rescuer or rescue subject.

11. Method Statements and Risk Assessment

11.1 Site specific information should be obtained to enable a written Method Statement and risk assessment. The Method Statement should detail the means and method of work to be conducted at the specific site and set out general working procedures. The Method Statement should detail the scope of the intended work, number and location of drops and the primary anchors to be used. The risk assessment should identify foreseeable risks and the steps taken to minimize those risks. A copy of the document should be available for the rope access team, building owners/representatives and at the jobsite.

APPENDIXES

(Nonmandatory Information)

X1. QUALIFICATION LEVELS FOR INDUSTRIAL ROPE ACCESS WORKERS

X1.1 Qualification levels for industrial rope access workers shall be based on a combination of training, experience, and competency. There are three internationally recognized qualification levels for industrial rope access technicians. A Level 1 individual has the least, and the Level 3 individual the most training, experience, and competency to perform the work as a rope access technician.

X1.2 Qualification Level 1 defines the minimum extent of training, experience, and competency necessary to perform industrial rope access work:

X1.2.1 A Level 1 worker shall receive training in the basic techniques of industrial rope access.

X1.2.2 A Level 1 worker shall only work in the immediate presence of a worker having a higher level of qualification.

X1.2.3 A Level 1 worker is qualified to operate ascent systems, descent systems, fall protection systems, and affect a basic rescue under the supervision of a higher Level worker.

X1.2.4 A Level 1 worker shall receive a copy of this document.

X1.3 Qualification Level 2 defines the minimum extent of training, experience, and competency necessary to work as an independent member of a rope access team, construct anchors, and perform rescue operations:

X1.3.1 A Level 2 worker shall meet all of the requirements of a Level 1 worker.

X1.3.2 A Level 2 worker shall receive training in the techniques necessary to rig primary anchors, directional anchors, and anchor points constructed of multiple anchors.

X1.3.3 A Level 2 worker shall receive training in the techniques necessary to perform rescue operations, including the assembly and operation of assisted descent systems, lowering systems, and raising systems.

X1.3.4 A Level 2 worker shall complete a first aid training course.

X1.3.5 A Level 2 worker shall be familiar with this document.

X1.4 Qualification Level 3 defines the minimum extent of training, experience, and competency necessary to oversee the operations of an industrial rope access jobsite verified by independent third party assessment.

X1.4.1 A Level 3 worker shall meet all of the requirements for a Level 2 worker.

X1.4.2 A Level 3 worker shall supervise other rope-access workers by assessing their ability to work safely and ensuring all safety procedures are followed.

X1.4.3 A Level 3 worker shall evaluate anchor selection and rigging.

X1.4.4 A Level 3 worker shall coordinate with safety officials on site and ensure that measures have been taken to mitigate potential hazards to site personnel and the public.

X1.4.5 A Level 3 worker shall supervise rescue operations performed by the rope access workers and shall be conversant in advanced rescue techniques.

X1.4.6 On a job with more than one Level 3 worker, one of these workers shall be designated as the Senior Level 3 worker and oversee the operations of the industrial rope access jobsite.

X1.4.7 A Level 3 worker shall be familiar with this document and have knowledge of relevant State and Federal Legislation.

X2. SYLLABUS FOR ROPE ACCESS TECHNICIANS

X2.1 The following is an outline syllabus for the practical examination of the qualification levels for industrial rope access workers.

X2.2 *Level 1 Rope Access Technician Syllabus Practical Examination*:

X2.2.1 The candidate shall demonstrate the assembling and checking of his/her personal rope access equipment and knowledge of the safe working loads and breaking strengths of standard rope access equipment.

X2.2.2 The candidate shall demonstrate the tying of the following knots and their application in rigging (NB This is a minimum requirement):

X2.2.2.1 Figure of 8 and variations—figure of 8 on the bight;

X2.2.2.2 Alpine butterfly;

X2.2.2.3 Bowline; and

X2.2.2.4 Double Fisherman's.

X2.2.3 The candidate shall demonstrate safely the following rope maneuvers on a pre-rigged course:

X2.2.3.1 Getting on ropes;

X2.2.3.2 Descending;

X2.2.3.3 Ascending;

X2.2.3.4 Changeover from ascent to descent and vice-versa;

X2.2.3.5 Passing knots;

X2.2.3.6 Passing deviations;

X2.2.3.7 Transferring from rope to rope;

X2.2.3.8 Passing intermediate anchors;

X2.2.3.9 Locking off the descender to prevent accidental movement;

X2.2.3.10 Vertical and horizontal aid climbing;

X2.2.3.11 Horizontal traversing; and

X2.2.3.12 Getting off ropes.

X2.2.4 The candidate shall demonstrate the use of belay techniques in a fall protection, in particular:

X2.2.4.1 Paying out;

X2.2.4.2 Locking off; and

X2.2.4.3 Taking in on self-locking pre-rigged direct belay system, using appropriate communication.

X2.2.5 The candidate shall demonstrate the following rescue methods in a pre-set rescue scenario:

X2.2.5.1 Descent to an "unconscious" casualty who is locked off on a descender and a back up device;

X2.2.5.2 Bring the casualty upright;

X2.2.5.3 Attaching the casualty;

X2.2.5.4 Descending on the rescuer's ropes; and

X2.2.5.5 Awareness/knowledge of hauling systems.

X2.3 *Level 2 Rope Access Technician Syllabus Practical Examination*:

X2.3.1 The candidate shall have a minimum of 500 logged hours as a Level 1 prior to conducting a Level 2 examination.

X2.3.2 The candidate shall demonstrate Level 1 skills as well as the Level 2 skills below.

X2.3.3 The candidate shall demonstrate the rigging of ropes and rescue situations, and knowledge of safe use of the following:

X2.3.3.1 Wire strops;

X2.3.3.2 Tape slings;

X2.3.3.3 Deviations;

X2.3.3.4 Intermediate anchors;

X2.3.3.5 Mid-rope knots;

X2.3.3.6 Beam clamps;

X2.3.3.7 Rope protection;

X2.3.3.8 Expansion or resin anchors;

X2.3.3.9 The strengths and safe loading of X2.3.3.1-X2.3.3.8; and

X2.3.3.10 Relevant knots, characteristics and uses.

X2.3.4 The candidate shall demonstrate safe lead climbing and aid traversing, and have an understanding of rescue techniques from these situations.

X2.3.5 The candidate shall demonstrate the following rescue systems, from various working positions:

X2.3.5.1 Hauling;

X2.3.5.2 Lowering;

X2.3.5.3 The use of cable-ways or tensioned ropes; and

X2.3.5.4 The rescue of an "unconscious" casualty, who is in ascent mode.

X2.3.6 The candidate shall demonstrate:

X2.3.6.1 A thorough understanding of maintenance, inspection and working with equipment;

X2.3.6.2 An understanding of the logging and certification of equipment;

X2.3.6.3 A knowledge of the effects of hazardous substances; and

X2.3.6.4 A knowledge of fall factors and the effect of dynamic loads.

X2.4 *Level 3 Rope Access Technician Syllabus Practical Examination*:

X2.4.1 The candidate shall have a minimum of 1000 logged hours as a Level 2 prior to conducting a Level 3 examination.

X2.4.2 The candidate shall demonstrate Level 1 and 2 skills as well as the Level 3 skills below.

X2.4.3 The candidate shall demonstrate the rigging of ropes and rescue situations, and knowledge of safe use of the following:

X2.4.3.1 All skills and knowledge required of Level 1 and 2 technicians;

X2.4.3.2 Competence in a wide variety of work and rescue situations and supervision of staff;

X2.4.3.3 The rescue and rigging techniques of Level 1 and 2;

X2.4.3.4 A comprehensive knowledge of pulley systems and their load effects, the basic use of shackles, slings, winches, snatch blocks and similar basic lifting/rigging gear;

X2.4.3.5 A knowledge of the maintenance, inspection and certification of rope access equipment; and

X2.4.3.6 A knowledge of basic work site organization.