

## **SAFE PRACTICES FOR ROPE ACCESS WORK**



Society of Professional Rope Access Technicians

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**Registry Number:**

SPC-01

**Revision History:**

Version 23A Board and SOC Approved April 2023

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**Notes for Usage:**

Terminology from SPRAT's *Defined Terms* used in this document is shown in ***bold, italic*** type unless written in a primary section heading.

Use of the word 'shall' denotes a mandatory requirement.

Use of the word 'should' denotes a recommendation. The word 'should' does not connote indifference or ambivalence regarding a statement.

Approximate conversions of units are presented in parentheses. These approximations are provided as a reference and are not the standard. When a value is presented as a limit, approximations are greater than an expressed minimum or less than an expressed maximum.

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## 1. Purpose, Scope, Exceptions

### 1.1. Purpose

- 1.1.1. The purpose of this document is to provide accepted practices for rope access work.
- 1.1.2. This document is to be used in conjunction with SPRAT's *Defined Terms*, SPRAT's *Rope Access Certification Requirements*, and SPRAT's *Fall Protection Certification Requirements*.

### 1.2. Scope

- 1.2.1. This document provides practices and procedures to protect persons from the hazards associated with rope access work.
- 1.2.2. This document provides requirements and recommendations for establishing, managing, and working within a comprehensive rope access program.
- 1.2.3. This document is written for all persons involved with rope access work, including clients, **employers**, **rope access technicians**, and regulatory authorities.

### 1.3. Exceptions

- 1.3.1. This document does not address the use of single **main systems** without **backup systems** during planned work.
- 1.3.2. This document does not apply to technical rescue, emergency response, or emergency response training, except as provided in Section 16.

## 2. Rope Access Program Management

- 2.1. The **employer** has the overall responsibility for its rope access program.
- 2.2. The **employer** shall provide the resources that are necessary for the development, implementation, and operation of its rope access program.
- 2.3. The **employer** shall appoint a **Rope Access Program Administrator** to manage and direct the rope access program.
  - 2.3.1. The **Rope Access Program Administrator** should, at a minimum, have the knowledge and experience of a **Level 3 Technician**.
  - 2.3.2. The **Rope Access Program Administrator** shall have knowledge of and ensure compliance with relevant regulations that apply to rope access and working at height.
  - 2.3.3. The **Rope Access Program Administrator** should have knowledge of and experience in supervising fall protection programs and incorporating fall protection systems with rope access work.
- 2.4. The **Rope Access Program Administrator** is responsible for the development, implementation, and management of the **employer's** rope access program in accordance with Section 3.
- 2.5. The **Rope Access Program Administrator** shall be the main contact point for matters relating to the safety, training, and regulatory aspects of the rope access program.
- 2.6. When the **Rope Access Program Administrator** delegates a requirement of the rope access program to another work team member, the **Rope Access Program Administrator** remains responsible to ensure completion of the requirement.

## 3. Rope Access Program Requirements

### 3.1. General

- 3.1.1. A policy statement shall be developed and implemented that provides general goals and guidance for a rope access program that emphasizes the **employer's** commitment to ensuring a safe work environment.
- 3.1.2. Rope access program policies and procedures shall be documented and available to all affected personnel.
- 3.1.3. Policies and procedures shall be consistent with **presiding regulatory authority** requirements.
- 3.1.4. The program shall ensure communication and coordination with clients and their safety representatives regarding rope access and rescue policies and procedures.

### 3.2. Training, Certification, Experience

3.2.1. The program shall provide for or verify provision of, and ensure the maintenance of all work team member training and certification in accordance with Section 6.

3.2.2. Rope access experience and training hours shall be recorded in accordance with Section 7.

### 3.3. Worksite Requirements

3.3.1. Work team members used for rope access work shall meet the requirements of Section 8.1.

3.3.2. Rope access work shall be supervised in accordance with Section 8.2.

3.3.3. Work team members shall be informed of foreseeable hazards they may encounter during the performance of their responsibilities.

3.3.4. The program shall ensure that work team members have the knowledge, training, skills, and experience necessary to safely perform their responsibilities and the rope access work to which they are assigned in accordance with Section 4 and Section 5.

3.3.5. The program shall recognize the limitations of work team members to perform rope access work and ensure that no work is undertaken that exceeds those limitations.

3.3.6. Prior to beginning rope access work, an **access work plan** shall be completed in accordance with Section 9.

3.3.7. Work zones shall be identified and marked in accordance with Section 10.

### 3.4. **Rope Access Systems** and Equipment

3.4.1. **Rope access systems** shall be installed and used in accordance with Section 12.

3.4.2. The program shall provide, or verify provision of all appropriate rope access equipment in accordance with Section 13.

3.4.3. Rope access equipment shall be inspected and maintained in accordance with Section 13.3.

3.4.4. The program shall provide, or verify provision of all appropriate tools, work equipment, materials, and personal protective equipment in accordance with Section 14.

### 3.5. Rescue

3.5.1. Prompt rescue shall be ensured for work team members in accordance with Section 16.

### 3.6. Post-Job Debriefs and Accident Reporting

3.6.1. Post-job debriefs should be conducted in accordance with Section 17.

3.6.2. An accident reporting system shall be established in accordance with Section 17.

## 4. Responsibilities of the Rope Access Supervisor

### 4.1. General

4.1.1. A **Rope Access Supervisor** is responsible for the implementation and oversight of the **employer's** rope access program at the worksite.

4.1.2. When the **Rope Access Supervisor** delegates a task that is their responsibility to another work team member or appropriate work team members, the **Rope Access Supervisor** remains responsible to ensure completion of the task.

4.1.3. The **Rope Access Supervisor** has the responsibilities of a work team member in accordance with Section 5 to the extent that they do not prevent the effective performance of the responsibilities required by this section.

4.1.4. The **Rope Access Supervisor** shall perform any other responsibilities designated in the **employer's** rope access program or identified by the **Rope Access Program Administrator**.

4.1.4.1. Such responsibilities shall remain within that **Rope Access Supervisor's** training and abilities for conducting rope access operations and maintaining a safe worksite.

4.1.4.2. The **Rope Access Supervisor** shall notify the **Rope Access Program Administrator** if assigned a task or responsibility beyond the **Rope Access Supervisor's** training and abilities.

#### 4.2. Training, Certification, Experience

- 4.2.1. The **Rope Access Supervisor** shall verify the required training and certification of work team members in accordance with Section 6.
- 4.2.2. The **Rope Access Supervisor** shall verify rope access hours of **rope access technicians** at the worksite in accordance with Section 7.

#### 4.3. Worksite Requirements

- 4.3.1. The **Rope Access Supervisor** shall communicate and coordinate with clients, their safety representatives, and other work team members.
- 4.3.2. The **Rope Access Supervisor** shall complete or ensure the completion of the **access work plan** in accordance with Section 9 prior to starting rope access work.
- 4.3.3. The **Rope Access Supervisor** shall direct work team members to ensure safety and compliance with the rope access program and **access work plan**.
- 4.3.4. The **Rope Access Supervisor** shall have sufficient knowledge of current regulations that apply to rope access and working at height to ensure compliance by the work team members.
- 4.3.5. The **Rope Access Supervisor** shall ensure that work zones are identified and marked appropriately in accordance with Section 10.
  - 4.3.5.1. The **Rope Access Supervisor** shall ensure that adequate measures are taken to ensure no unauthorized persons enter the work zones.
- 4.3.6. The **Rope Access Supervisor** shall direct work team members to identify hazards and take corrective measures to eliminate or control the risks associated with hazards at the worksite.

#### 4.4. **Rope Access Systems** and Equipment

- 4.4.1. The **Rope Access Supervisor** shall specify and verify the selection and installation of **rope access systems** in accordance with Section 12.
- 4.4.2. The **Rope Access Supervisor** shall verify the installation of **anchorage systems** in accordance with Section 12.1.
- 4.4.3. The **Rope Access Supervisor** shall verify the proper use and maintenance of rope access equipment in accordance with Section 13, removing equipment from service when appropriate.
- 4.4.4. The **Rope Access Supervisor** shall verify proper use and maintenance of tools, work equipment, materials, and personal protective equipment in accordance with Section 14.

#### 4.5. Rescue

- 4.5.1. The **Rope Access Supervisor** shall ensure that prompt rescue can be performed for any access or work location of a work team member in accordance with Section 16.
- 4.5.2. The **Rope Access Supervisor** shall verify that the necessary emergency services are available and that the means to summon them are functioning.
- 4.5.3. The **Rope Access Supervisor** shall manage and/or perform any rescue required during rope access work.

#### 4.6. Post-Job Debriefs and Accident Reporting

- 4.6.1. The **Rope Access Supervisor** shall participate in any relevant post-job debriefs or investigations of incidents in accordance with Section 17.

### 5. Responsibilities of Work Team Members

#### 5.1. General

- 5.1.1. Work team members are responsible for the completion of the rope access work under the direction of the **Rope Access Supervisor**.
- 5.1.2. Work team members shall follow applicable policies and procedures of the **employer's** rope access program.
- 5.1.3. Work team members shall perform any other responsibilities designated in the **employer's** rope access program or identified by the **Rope Access Program Administrator** or **Rope Access Supervisor**.
  - 5.1.3.1. Such responsibilities shall remain within that work team member's training and abilities.
  - 5.1.3.2. Work team members shall notify the **Rope Access Program Administrator** or **Rope Access Supervisor** if assigned a task or responsibility beyond their training and abilities.

## 5.2. Training, Certification, Experience

5.2.1. Work team members shall have the appropriate training and certifications to conduct assigned rope access work in accordance with Section 6.

5.2.2. Work team members shall document their work experience, certification, and training in accordance with Section 7.

## 5.3. Worksite Requirements

5.3.1. Work team members shall follow requirements of the rope access program and the *access work plan* in accordance with Section 9.

5.3.2. Work team members shall follow requirements of the *presiding regulatory authority* on the worksite.

5.3.3. Work team members shall be capable of identifying work zones and complying with their requirements in accordance with Section 10.

5.3.4. Under the direction of the *Rope Access Supervisor*, work team members shall identify hazards and take corrective measures to eliminate or minimize the risk associated with hazards at the worksite.

5.3.5. Work team members shall have the authority to stop work immediately if it is unsafe to proceed.

## 5.4. *Rope Access Systems* and Equipment

5.4.1. Work team members shall install, inspect, and analyze *rope access systems* in accordance with Section 12.

5.4.2. Work team members shall use, inspect, and maintain rope access equipment in accordance with Section 13.

5.4.3. Work team members shall use and maintain tools, work equipment, materials, and personal protective equipment in accordance with Section 14.

## 5.5. Rescue

5.5.1. Work team members shall perform and/or assist rescue under the direction of a *Rope Access Supervisor* in accordance with Section 16.

## 5.6. Post-Job Debriefs and Accident Reporting

5.6.1. Work team member should participate in relevant investigations of incidents in accordance with Section 17.

# 6. Training and Certification

## 6.1. Training

6.1.1. Training shall be provided, at a minimum, in a manner consistent with *Rope Access Certification Requirements* and *Fall Protection Certification Requirements*.

6.1.2. Additional training for specific work methods and work environments shall be provided as required by the *access work plan*, client, or the *presiding regulatory authority*.

6.1.3. First aid training appropriate to the environment where work is undertaken shall be provided to all work team members.

6.1.4. Refresher training should be provided to work team members:

6.1.4.1. That demonstrate inadequate retention from training.

6.1.4.2. That have not used *rope access systems* or other fall protection systems for six months or more.

6.1.4.3. At a minimum, on an annual basis and as required by the *presiding regulatory authority*.

## 6.2. Certification

6.2.1. Certifications for rope access should be maintained in accordance with *Rope Access Certification Requirements*.

6.2.2. Certifications for fall protection should be maintained in accordance with *Fall Protection Certification Requirements*.

## 7. Experience Documentation

- 7.1. **Rope access technicians** shall document their experience, including:
  - 7.1.1. Rope access work experience.
  - 7.1.2. Rope access certification.
  - 7.1.3. Rope access training.
- 7.2. Additional relevant experience should be documented as required by the **employer** or **presiding regulatory authority**.
- 7.3. Experience documentation shall provide the following information:
  - 7.3.1. Date(s) of work.
    - 7.3.1.1. The date range of an entry shall not exceed two weeks.
  - 7.3.2. Employer name.
  - 7.3.3. Work details.
    - 7.3.3.1. These details should include the industry, structure, location, and description of work.
  - 7.3.4. Rope access details.
    - 7.3.4.1. These details shall include the rope access techniques used to complete the work.
  - 7.3.5. Rope access hours worked.
    - 7.3.5.1. These hours shall be the time spent carrying out rope access tasks including establishing **rope access systems**, training, working **on-rope**, and worksite safety management.
- 7.4. Experience Verification
  - 7.4.1. Rope access hours shall be verified by another individual.
    - 7.4.1.1. Rope access hours should be verified by a **Rope Access Supervisor**, employer, competent trainer, evaluator, or client.
    - 7.4.1.2. A **Rope Access Supervisor's** rope access hours may be verified by a **rope access technician** from their work team.
  - 7.4.2. Individuals verifying rope access hours should provide their:
    - 7.4.2.1. Signature.
    - 7.4.2.2. Printed name.
    - 7.4.2.3. SPRAT number.
    - 7.4.2.4. Work title or role.
    - 7.4.2.5. Contact details.

## 8. Work Teams and Supervision

- 8.1. Work Teams
  - 8.1.1. Work teams shall consist of, at a minimum, the number of members required to ensure prompt rescue.
  - 8.1.2. Currently certified **rope access technicians** shall be used to conduct all rope access operations.
  - 8.1.3. Other work team members are permitted to operate their personal **rope access systems** if:
    - 8.1.3.1. Only descent is required to complete their work.
    - 8.1.3.2. They are currently certified in accordance with SPRAT's *Fall Protection Certification Requirements*.
- 8.2. Worksite Supervision
  - 8.2.1. At least one work team member shall be designated as the **Rope Access Supervisor**, fulfilling their responsibilities in accordance with Section 4.
  - 8.2.2. A **Rope Access Supervisor** should be a **Level 3 Technician**.

- 8.2.3. A **Level 2 Technician** may be designated as the **Rope Access Supervisor** if the following criteria are met:
- 8.2.3.1. Only ascent and descent are required for completing the work.
  - 8.2.3.2. No rope-to-rope transfers, knot passing, or passing intermediate **anchorage systems** (e.g., **re-anchors**, **deviations**) are required during planned work.
  - 8.2.3.3. Prompt rescue is effective directly down the **fall line** to the ground or platform level.
  - 8.2.3.4. Adjacent work does not foreseeably compromise the safety of the rope access work being conducted.
  - 8.2.3.5. Work does not involve:
    - 8.2.3.5.1. Confined space.
    - 8.2.3.5.2. Hot work.
    - 8.2.3.5.3. Live electrical work.
- 8.2.4. If a **presiding regulatory authority**, specific industry, and/or client requires a **Level 3 Technician** to be the designated **Rope Access Supervisor**, this requirement shall be followed.

## 9. Access Work Plan

- 9.1. An **access work plan** shall be completed prior to beginning all rope access work.
- 9.2. The **access work plan** shall be maintained at the worksite and available to all affected persons.
- 9.3. The **access work plan** shall be updated as necessary during rope access work.
- 9.4. A documented review of the **access work plan** by work team members shall be conducted prior to each work shift and after any updates.
- 9.5. The **access work plan** should be reviewed by any person affected by the rope access work.
- 9.6. For new work, a site survey should be conducted to help determine:
  - 9.6.1. The nature of the work environment.
  - 9.6.2. Feasibility of the means of access.
  - 9.6.3. Foreseeable hazards to work team members and others.
- 9.7. The **access work plan** shall, at a minimum, consist of the following:
  - 9.7.1. Work method.
  - 9.7.2. Risk assessment.
  - 9.7.3. Rescue plan.
- 9.8. Work Method
  - 9.8.1. The work method, shall, at a minimum, provide:
    - 9.8.1.1. Members of the work team by name and identify their roles and level of training.
    - 9.8.1.2. The **hazard** and **fall zones** in accordance with Section 10.
    - 9.8.1.3. The communication plan in accordance with Section 11.
    - 9.8.1.4. Required **rope access systems** in accordance with Section 12.
    - 9.8.1.5. Required rope access equipment in accordance with Section 13.
    - 9.8.1.6. Required tools and other materials in accordance with Section 14.
    - 9.8.1.7. Required personal protective equipment.
    - 9.8.1.8. Required permits.
- 9.9. Risk Assessment
  - 9.9.1. The work method and work environment shall be reviewed to identify all hazards that work team member or others may be exposed to during work.
  - 9.9.2. Modifications to the work method and/or controls shall be identified to either eliminate the identified hazards, or to reduce the associated risk to an acceptable level.
  - 9.9.3. If new hazards arise during work, work shall be stopped until appropriate controls have been identified, documented, and implemented.



9.9.4. The review of the work method, shall consider, at a minimum:

9.9.4.1. The time required for the work at any one location.

9.9.4.2. Whether adjacent work may affect the planned work.

9.9.4.3. Whether providing security to the **anchorage** location is warranted.

9.9.4.4. Whether any public safety provisions are required.

9.9.4.5. Clearance requirements of **rope access systems** and other fall protection systems.

9.9.4.6. Hazards associated with the use of tools, work equipment, and materials required for the work.

9.9.5. The review of the work environment shall consider, at a minimum:

9.9.5.1. Adverse weather.

9.9.5.2. The effects of wind on **rope access systems**, positioning, and work environment.

9.9.5.3. Lock out tag out (LOTO) requirements.

9.9.5.4. Potential loose material.

#### 9.10. **Rescue** Plan

9.10.1. The work method and risk assessment shall be reviewed to identify where **rescue** could be required.

9.10.2. Modifications to the work method and/or controls should be identified to facilitate prompt rescue.

9.10.3. The **rescue** plan shall provide procedures for prompt **rescue** from these foreseeable scenarios in accordance with Section 16.

### 10. Work Zones

#### 10.1. **Hazard Zone**

10.1.1. A **hazard zone** shall be identified, established, and maintained.

10.1.2. A **hazard zone** should be marked or blockaded to warn work team member and others, including the public, of hazards associated with the work being performed.

10.1.3. Appropriate personal protective equipment, including helmets, shall be used by anyone in the **hazard zone**.

#### 10.2. **Fall Zone**

10.2.1. **Fall zones** shall be identified and established.

10.2.1.1. The **fall zone** extends a minimum distance of 2 m (6.6 ft) from any unprotected edge.

10.2.2. A **fall zone** should be marked or blockaded to warn work team members and others, including the public, of the risk of a fall.

10.2.3. No one shall enter a **fall zone** without appropriate fall protection.

10.2.3.1. Fall protection shall be used in a **fall zone** when not **on-rope**.

10.2.3.2. Fall protection shall meet the requirements of any **presiding regulatory authority** where work is conducted.

10.2.3.3. **Anchorage systems** should be established outside a **fall zone** so that the work team member can establish their **rope access systems** before entering the **fall zone**.

### 11. Communication Plan

11.1. An effective communication plan shall be established prior to beginning work and shall remain effective while work is actively taking place.

11.2. Communication systems shall be compatible with the work environment.

11.3. Electronic communication systems should be used.

11.4. Hand or whistle signals shall be reviewed by work team members prior to beginning work.

## 12. Rope Access Systems

### 12.1. Anchorage Systems

- 12.1.1. **Anchorage systems** used as the primary support within a **main** or **backup system** shall have a minimum strength of either 12 kN (2700 lbf), or two times the maximum arrest force of the **backup system** when used in accordance with manufacturer specifications, whichever is greater.
- 12.1.2. A minimum of two **anchorage systems** shall be used to establish the **main** and **backup systems**.
  - 12.1.2.1. One **anchorage** may be used to establish multiple **anchorage systems**.
  - 12.1.2.2. **Main** and **backup systems** should use independent **anchorage systems**.
- 12.1.3. **Anchorage systems** shall accommodate the range of direction of pull.
- 12.1.4. **Anchorage systems** shall be protected appropriately.
- 12.1.5. Load-sharing **Anchorage Systems**
  - 12.1.5.1. Load-sharing **anchorage systems** may be used to:
    - 12.1.5.1.1. Incorporate multiple **anchorages** to achieve the required **anchorage system** strength.
    - 12.1.5.1.2. Achieve a desired direction of pull or **fall line**.
  - 12.1.5.2. Load-sharing **anchorage systems** should distribute forces appropriately between the anchorages.
  - 12.1.5.3. A table of loads applied to **anchorage systems** where the forces are distributed equally based on the interior angle is provided in [Table 1](#).
- 12.1.6. **Directional Anchorage Systems**
  - 12.1.6.1. The minimum strength of a **directional anchorage system** is determined by:
    - 12.1.6.1.1. The interior angle created by the rope passing through the **directional anchorage system**.
    - 12.1.6.1.2. The anticipated load.
  - 12.1.6.2. A table of loads applied to a **directional anchorage system** based on the interior angle is provided in [Table 2](#).

### 12.2. Two-Rope Systems

- 12.2.1. **Two-rope systems** shall be installed in a manner that if a component of one system were to fail, there would be minimum **swing fall**.
- 12.2.2. **Two-rope systems** should be installed in a manner that minimizes movement along sharp and/or abrasive surfaces.
- 12.2.3. Rope and edge protection shall be used when appropriate.
  - 12.2.3.1. Consideration should be given to protect each rope individually from potential damage.

### 12.3. Backup Systems

- 12.3.1. A **backup system** shall be used with any **main system**, except for dual **main systems**, as discussed in Section [12.4](#).
- 12.3.2. **Backup systems** shall be constructed and used in a manner that:
  - 12.3.2.1. Minimizes **free fall distance** and clearance requirements.
  - 12.3.2.2. Limits impact forces.
- 12.3.3. **Backup systems** shall be separately fixed to an appropriate harness attachment point.
- 12.3.4. A **backup system** may be attached to the same harness attachment point as the **main system**.
- 12.3.5. **Fixed backup systems** shall use **anchorages** meeting the requirements of Section [12.1](#).

#### 12.4. Dual **Main Systems**

12.4.1. Dual **main systems**, where two systems are used to share the load, may be used when the **anchorage systems** for each **main system** are separated horizontally by no more than 1 m (3.2 ft), and the interior angle from the load to the **anchorage systems** is less than 90 degrees.

12.4.2. Dual **main systems** are typically used in:

12.4.2.1. **Aid climbing.**

12.4.2.2. Interchanging the ropes within a **two-rope system** as **main** and **backup systems**.

12.4.2.3. Long descents.

12.4.2.4. Long lowering or raising applications.

12.4.3. If a single piece of equipment is used to support the load in this scenario, a **backup system** shall be incorporated within the **rope access system**.

### 13. Rope Access Equipment

#### 13.1. General

13.1.1. Rope access equipment used in any system shall be compatible.

13.1.2. Rope access equipment should be used according to the manufacturer's instructions and recommendations.

13.1.3. Rope access equipment shall be suitable and functional in the environment in which it is used.

13.1.4. Rope access equipment shall have features that prevent unintentional detachment or removal from the rope under normal use.

#### 13.2. Standards

13.2.1. Rope access equipment shall satisfy the requirements of the **presiding regulatory authority** where work is conducted.

13.2.2. Rope access equipment should conform to standards relevant to the intended use.

#### 13.3. Rope Access Equipment Management

13.3.1. Documentation provided with rope access equipment by a manufacturer should be retained.

13.3.2. Rope access equipment should be inspected, maintained, and retired in accordance with manufacturer's specifications.

13.3.3. Rope access equipment shall be inspected before use to confirm serviceability.

13.3.4. Inspection of rope access equipment in service shall be documented, at a minimum, annually, from purchase to retirement.

13.3.5. Rope access equipment that does not pass inspection shall be removed from service.

#### 13.4. Helmets

13.4.1. Helmets shall have a chinstrap or other retention system.

#### 13.5. Harnesses

13.5.1. Harnesses shall be of the full body type.

13.5.2. Harness attachment points should have a **minimum breaking strength** of at least 16 kN (3600 lbf).

13.5.3. Rope access harnesses should have, at a minimum, two attachment points:

13.5.3.1. Sternal: Upper frontal attachment point typically used for establishing a **backup system**.

13.5.3.2. Ventral: Lower frontal attachment point typically used for establishing a **main system**.

13.5.4. Harnesses should be compatible with a work seat.

#### 13.6. Connectors

13.6.1. **Carabiners** used within **main** and **backup systems** shall have gates that close automatically and a locking feature (e.g., screw-gate or auto-locking gate).

13.6.2. Connectors should have a **minimum breaking strength** in the designed direction of loading of at least 18 kN (4047 lbf).

### 13.7. Rope and Textiles

13.7.1. Rope and textiles shall be made from synthetic fibers.

13.7.2. Rope used within **main** and **backup systems** should have minimal elongation.

13.7.3. Rope should have an outer sheath that resists undue wear from edges and system components.

13.7.4. Rope and textiles without terminations should have a **minimum breaking strength** of at least 22 kN (4946 lbf).

13.7.5. Rope and textiles with terminations should have a **minimum breaking strength** of at least 18 kN (4047 lbf).

### 13.8. Lanyards

13.8.1. Lanyards shall have appropriate terminations for their intended use.

13.8.2. Lanyards should be as short as practical.

13.8.2.1. The length of a lanyard used within a **backup system** should be less than 0.6 m (2 ft).

### 13.9. Backup Devices

13.9.1. Backup devices shall be intended for rope access use.

13.9.2. A backup device should be suitable for use in rescue.

### 13.10. Descenders

13.10.1. **Descenders** shall allow for controlled descent.

13.10.2. **Descenders** should be auto-stopping or used in conjunction with another component to enable the user to stop automatically.

### 13.11. Ascenders

13.11.1. **Ascenders** shall require two or more deliberate actions by the user to be removed from the rope.

13.11.2. **Ascenders** should be easily adjustable in both directions along the **main rope**.

## 14. Tools, Work Equipment

14.1. Tools and work equipment shall be suitable for the intended rope access work and compatible with the **rope access systems**.

14.2. Tools and work equipment shall be secured to prevent dropped objects.

14.2.1. Tool tethers shall be used when practicable.

14.2.2. Tools and work equipment more than 10 kg (22.1 lb) in mass should be suspended with a separate **rope system** secured to an independent **anchorage system**.

14.2.3. **Anchorage** and **rope systems** used for tools and work equipment should be clearly identified to avoid confusion with those used to support persons.

14.2.4. When significant risk of harm to work team members or property from component failure of a **rope system** suspending or transporting tools, work equipment, and/or materials exists, a **backup system** should be considered.

14.3. Moving parts of tools should be kept clear of the work team members, the **rope access systems**, and power cables.

14.4. Power tools that could cause injury to the work team member or **rope access systems** shall be fitted with an automatic shut off switch.

14.5. Appropriate grounding and ground fault circuit interruption shall be provided for as necessary.

14.6. Power cables shall be adequately supported and secured.

## 15. Use of Suspended Work Platforms in Conjunction with Rope Access

15.1. A suspended temporary work platform should be used if a work team member may be suspended at work for an extended period of time.

15.2. When such platforms are used in conjunction with rope access methods, the **anchorage systems** for the platform should be independent of those used for the **main** or **backup systems**.

15.3. If a work seat is used, it shall be fitted in a manner that does not interfere with the harness' connections to the **main** or **backup systems**.

## 16. Rescue and Emergency Services

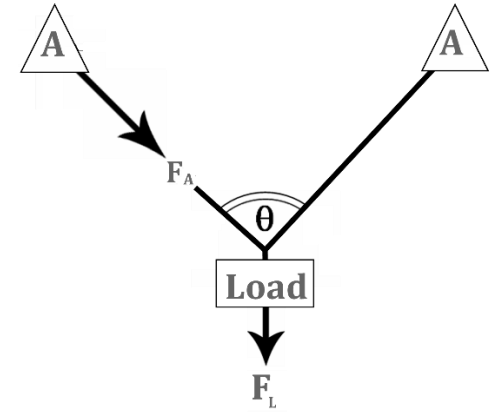
- 16.1. Rescue procedures shall include, at a minimum:
  - 16.1.1. Work team members requirements.
  - 16.1.2. Contact information of appropriate emergency services.
  - 16.1.3. Provision to ensure arrival of emergency services at the appropriate location.
  - 16.1.4. Required equipment and its location.
  - 16.1.5. Method(s) to ensure prompt rescue.
- 16.2. Rescue procedures shall consider the level and experience of work team members.
- 16.3. Rescue procedures should use *remote rescue systems*.
- 16.4. Rescue procedures should use *rope systems* with an appropriate *backup system*.
  - 16.4.1. In extenuating circumstances where a *backup system* impedes the ability to perform prompt rescue, single *main systems* may be used.
- 16.5. Rescue procedures, including self-rescue, should be practiced at regular intervals and before the start of any work in situations that are unfamiliar to the work team members.
- 16.6. Rescue should be performed by *rope access technicians*.
  - 16.6.1. While a *rescue service* may be used, *rope access technicians* at the worksite are best suited for ensuring prompt rescue.
- 16.7. Work team members shall perform or manage initial emergency care within the scope of their training.

## 17. Post-Job Debriefs and Accident Reporting

- 17.1. Post-Job Debriefs
  - 17.1.1. A documented post-job debrief should be conducted to retain any efficiencies or deficiencies from a rope access job.
- 17.2. Accident Reporting
  - 17.2.1. All incidents related to significant injuries to work team member or damage to property shall be investigated and documented.
  - 17.2.2. Corrective action shall be taken to eliminate the causes of such incidents.
  - 17.2.3. All affected persons should be informed of the root cause of the incident and of corrective actions taken.

TABLE 1

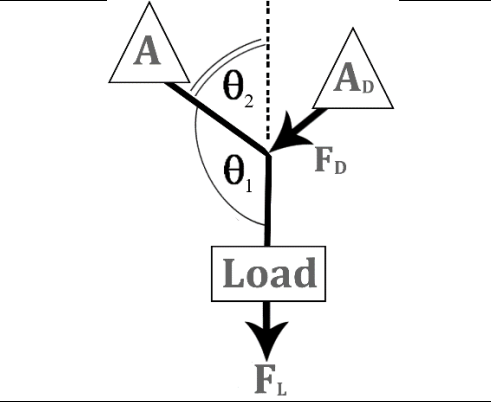
Forces on a single anchorage in an equally distributed, load-sharing *anchorage system* as a function of the applied load.

	$\theta$	$\%F_A/F_L$
	0	50%
	30	52%
	60	58%
	65	59%
	90	71%
	120	100%
	150	193%
	160	288%
	170	574%

$\theta$ : Interior angle at *anchorage connector*  
 $F_A$ : Force at *anchorage*  
 $F_L$ : Force from applied load

TABLE 2

Forces on a *directional anchorage system* as a function of the applied load.

	$\theta_1$	$\theta_2$	$\%F_D/F_L$
	0	180	200%
	30	150	193%
	60	120	173%
	90	90	141%
	120	60	100%
	150	30	52%
	160	20	35%
	165	15	26%
	180	0	0%

$\theta_1$ : Interior angle at *anchorage connector*  
 $\theta_2$ : Angle of *fall line* displacement  
 $F_D$ : Force at *anchorage*  
 $F_L$ : Force from applied load