ACUREN

ACU-ROPE-10P010 REV 00

ROPE ACCESS TRAINING MANUAL

SUBTITLE (E.G. RELATED STANDARDS)

Contributors & Authors:	Steve Hands Adam Kwan Nathan Bills
Revision Date:	January 7, 2022
Notes:	Replaces CAN- SMS -10P059 R00

Approval & Authority			
Position	**Name**	**Signature**	**Date**
Rope Access Compliance Manager	Nathan Bills		Jan 7, 2022
Rope Access Training Coordinator	Adam Kwan		Jan 10, 2022
Director, Operational Excellence	Umberto De Gaetano		Jan 10, 2022

QUALITY *"EVERY CLIENT, EVERYWHERE, EVERY DAY"*

Feedback/Comments

Quality Department
Corporate Office
#260, 2301 Premier Way
Sherwood Park, AB T8H 2K8
Canada
Phone: (780) 416-8700
Fax: (780) 416-8723

Revision Summary		
Revision No.	**Date**	**Description**
00	January 7, 2022	Replaces CAN- SMS -10P059 R00

TABLE OF CONTENTS

1.0 SCOPE

1.1 The following manual outlines the rope access trade and how Acuren/Tacten delivers training and guidance through our procedures to our students.

1.2 While there are many different rope access associations worldwide, only IRATA International (Industrial Rope Access Trade Association) is recognized as the highest standard in rope access in over 50 countries. SPRAT (Society of Professional Rope Access Technicians) is primarily a North American-based association.

2.0 CODES AND LEGISLATIONS:

The contents of this manual are a supplement to the following:

2.1 IRATA:

- 2.1.1 ICOP (International Code of Practice)
- 2.1.2 TACS (Training, Assessment and Certification Scheme)

2.2 SPRAT:

- 2.2.1 SPRAT Safe Practices for Rope Access Work
- 2.2.2 Certification Requirements for Rope Access Work
- 2.2.3 Define Terms
- 2.2.4 Evaluation Guidelines

2.3 Occupational Health and Safety in Canada:

- 2.3.1 Alberta:
  - a) Part 9- Fall Arrest
  - b) Part 41- Rope Access
- 2.3.2 British Columbia:
  - a) Part 11- Fall Arrest
  - b) Part 34- Rope Access
- 2.3.3 Nova Scotia:
  - a) Part 21- Fall Arrest
  - b) Part 22- Rope Access

Important: *IRATA technicians must always be aware of any differences between regional requirements and legislation and IRATA requirements. Further, IRATA technicians must always adhere to the higher standard of safety where differences exist.*

3.0 ROLES AND RESPONSIBLITIES

The following are the roles and responsibilities of the different levels of rope access technicians.

3.1 Level 1

3.1.1 A rope access technician who is able to perform a specified range of rope access tasks under the supervision of a Level 3 rope access safety supervisor. He/she is:

a) able to understand and follow the rope access procedures, method statements, and associated risk assessments

b) responsible for pre-use checks of his/her own rope access equipment

c) able to assist in rigging and other operations, under the guidance of a higher grade

d) undertake a simple rescue in descent and assist in rescue operations

3.2 Level 2

3.2.1 An experienced rope access technician who is able to perform more complex tasks under the supervision of a Level 3 rope access safety supervisor. He/she is:

a) able to demonstrate the skills and knowledge required of Level 1

b) capable of more complex rigging, including re-belays, deviations, and tensioned lines

c) able to undertake rescues from a variety of situations

d) able to assemble and implement hauling systems

3.3 Level 3

3.3.1 An experienced rope access technician who is responsible for understanding and implementing the rope access procedures, method statements and associated risk assessments, and:

a) is able to demonstrate the skills and knowledge required of Levels 1 and 2

b) understands the elements and principles of the rope access association's safe system of work

c) is conversant with relevant work techniques and legislation

d) has extensive knowledge of advanced rope access rigging and rescue techniques

e) holds an appropriate and current first-aid certificate

4.0 PRE-COURSE COMMUNICATION

4.1 Students shall be provided the following documents and advisements:

4.1.1 Requirements for certification, upgrading, recertifying and converting;

4.1.2 Information that supports the assessment criteria, including copies of the ICOP and TACS;

4.1.3 Contraindications of fitness for rope access

4.1.4 SPRAT Safe Work Practices (if applicable)

4.1.5 A pre-course logistics email that contains links to class information, course manual, and details about the course.

5.0 HAZARD / RISK ASSESSMENT

As per ACU-ROPE-10M002 R00

5.1 It should be remembered that Acuren/Tacten is not only a rope access company. Where access methods other than work positioning (roped access) can reduce the exposure to identified hazards they should be given consideration.

5.2 The following method of evaluating risk is subjective. For this discussion we will be utilizing Acuren/Tacten's Risk Matrix. However, this method is widely used and accepted within the roped access industry as a whole.

5.3 **Risk Matrix** (reference: Acuren/Tacten (n.d.))

RISK MATRIX

SEVERITY ⬇	LIKELIHOOD ➡ RARE (0-10%)	UNLIKELY (10-50%)	LIKELY (50-90%)	PROBABLE (>90%)
INSIGNIFICANT Easily handled by daily processes (First Aid; Minor Leak to Env.; Loss < $500)	1	2	3	4
MINOR Some disruption possible (Medical Aid; Rstr'd Work; Non-Reportable Spill; Loss < $15,000)	2	4	6	8
MODERATE Significant time and resources required (Lost Time; Long-Term Ill, Poll Release to Env.; Loss < $25,000)	3	6	9	12
MAJOR Operations severely damaged (Fatality; Toxic Release to Env.; Loss < $50,000)	4	8	12	16

5.4 **HAZARD:** is something that has the potential to cause harm. It is often associated with a condition or activity that, if left uncontrolled, could lead to injury or illness.

5.5 **RISK**: is a function of the likelihood the technician is exposed to a hazard/hazardous event and the severity of the outcome as a result of that exposure.

5.5.1 The formula for Risk is: Frequency (likelihood) x Severity (injury and or damage to equipment)

5.6 The frequency of an accident occurring is based on the values:

5.6.1 Rare

5.6.2 Unlikely

5.6.3 Likely

5.6.4 Probably

5.7 The severity of the accident is based on the following values:

5.7.1 Insignificant

5.7.2 Minor

5.7.3 Moderate

5.7.4 Major

5.8 Utilizing the above Risk Matrix will produce the risk ratings categorized below:

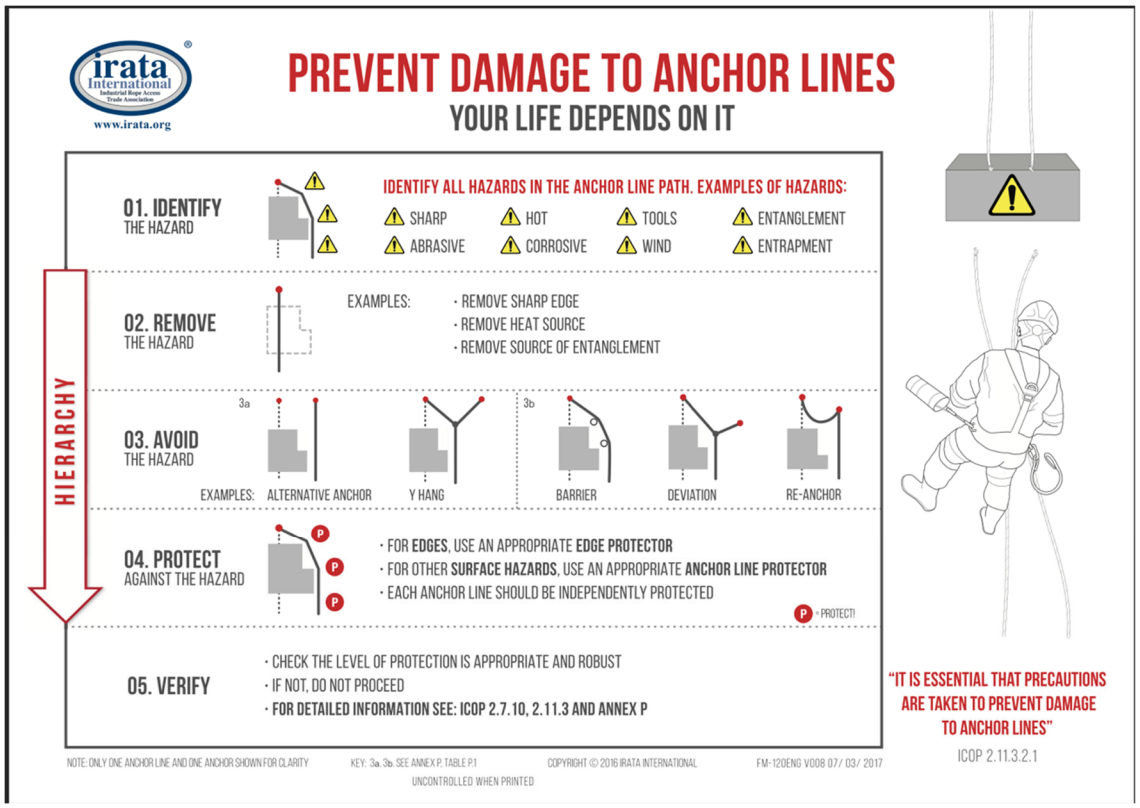
5.8.1 High Risk 12-16

5.8.2 Medium Risk 4-9

5.8.3 Low Risk 1-3

*Keys to Success: The objective is to identify the current risk category and then apply control measures to reduce the final risk category to which workers will be subjected. *

IRATA Methodology for Hazard Avoidance (reference: Irata International. (n.d.)).



***Keys to Success**: Remove, Avoid, Protect. *

6.0 ROPE ACCESS MANEUVERS HAULING/ LOWERING AND RESCUES

As per ACU-ROPE- 10T0005 Rev 00

6.1.1 In all rope access maneuvers, the technician must maintain a **minimum** of 2 independent points of attachment AT ALL TIMES.

<u>The following will pertain to all maneuvers:</u>

7.0 PERSONAL KITS

7.1 Cow's tails will be attached to personal kits per the methods below:

ALL LEVELS (Figure 8 on a bight cow's tails end).

LEVEL 2/3 ONLY (Scaffold(barrel) Knot on cow's tail end).

7.2 Alpine butterfly knots may **not** be used to "shorten" cow's tails.

7.3 Cow's tail lengths should not exceed 100 centimeters. **Important:** Strict adherence to manufacturer specified cow's tail lengths must be adhered to at all times.

7.4 Consult manufacturer's guidance for required cow's tail attachment lengths to EN 12841 Type-A backup devices.

8.0 BACKUP DEVICES

8.1 The backup device should be kept as high as possible (in all cases, shoulder height and above) on the safety rope throughout the ascent to help minimize the fall factor.

8.2 For manual placement rope grab devices, ensure that the maneuver/rescue techniques used will not affect the operation of the device. Further, in decent technicians should be taught to bring the backup device downward into contact with their shoulder to help prevent complacency in positioning relative to harness attachment points.

8.3 For trailing backup devices, such as the ASAP Lock or similar, ensure the lanyard is positioned above the arms while climbing and descending.

9.0 ASCENDING DEVICES

9.1 A cow's tail must be attached to the handled ascender and used with the chest ascender when climbing and when the chest ascender is not statically loaded.

10.0 DESCENDING DEVICES

10.1 Ensure the descending device is locked off if you need to stop and use both hands for a work task.

11.0 POSITIONING

11.1 Trainers will demonstrate techniques that will aid in movement and ergonomics.

12.0 ROPE MANEUVERS

Important: *The attached backup device should always be kept as high as possible while executing the maneuvers described in this manual.*

12.1 Ascending with Ascent Gear

12.1.1 Attach the chest ascender to the working rope. Gently sit down, weighting the chest ascender.

12.1.2 Attach the handled ascender and foot loop to the working rope above the chest ascender.

12.1.3 As you stand in the foot loop and weight the handled ascender, the working rope will slide through the chest ascender.

12.1.4 Sit back and rest on the chest ascender.

12.1.5 Lift foot in the foot loop and move the handled ascender further up the rope.

12.1.6 Repeat the process.

12.2 Descending with Ascent Gear

12.2.1 Position handled ascender at forehead height.

12.2.2 Place loose rope from below the chest ascender onto the left side of your body.

12.2.3 Place the right thumb on the backside of the chest ascender, and, using the right index finger apply pressure onto the top of the chest ascender's toothed cam.

12.2.4 Place the left-hand high onto the working rope above the handled ascender.

12.2.5 Stand up in the foot loop, bringing your chest and head as close to the working rope as possible to release the chest ascenders toothed cam from the rope.

12.2.6 Continue to push down the cam until the teeth are disengaged. Once disengaged, using your legs, slowly lower yourself by 1 or 2 feet.

12.2.7 Release pressure on the chest cam to reengage teeth on the working rope.

12.2.8 Repeat steps 1 through 7 as necessary.

12.3 Descending with Descent Gear

*__Keys to Success__: While the descent device is in an unlocked position the right hand must have control of the descent rope tail. *

12.3.1 Place the right (controlling) hand on the working line and position it below your waist (no less than 500mm from the descent device).

12.3.2 During the descent, use the right hand to detect knots or damage in the rope.

12.4 Ascending with Descent Gear

12.4.1 Attach the handled ascender and foot loop to the working rope above the descending device.

12.4.2 Move the handled ascender up the working rope as high as practicably possible.

12.4.3 Grab the working rope beneath the descending device, palm toward your face.

12.4.4 Unlock the descending device.

12.4.5 Stand in the foot loop while pulling the working rope tail through the device in an upward motion.

12.4.6 Sit down.

12.4.7 Repeat steps 1 through 6 as necessary.

12.5 Changing from Ascent to Descent (Changeover)

12.5.1 Attach the descending device to the working rope directly below the chest ascender. Remove slack between the descending device and the chest ascender.

12.5.2 Position handled ascender to forehead height.

12.5.3 Stand in the foot loop, disengage the chest ascender, and sit down onto the descender.

12.5.4 Remove the handled ascender and the foot loop from the working rope.

12.5.5 Descend.

12.6 Changing from Descent to Ascent

12.6.1 Attach the handled ascender onto the tensioned working rope above the descender. Leave adequate space between the two devices for attachment of the chest ascender.

12.6.2 Stand in the foot loop.

12.6.3 Attach the chest ascender onto the working rope between the handled ascender and the descent device.

12.6.4 Ensure the chest ascender cam is closed and gently weight the chest ascender.

12.6.5 Remove the descender for the working rope.

12.6.6 Ascend.

12.7 Passing Knots (knots at the same height)

***Key to Success:** Safety devices lead the way up. In descent, safety devices always follow.*

12.7.1 In Descent (Working line then Safety line)

a) Descend until the knot is approximately 50 mm from the descending device. Lock the descending device.

b) Changing from descent to ascent as described above under the heading *Changing from Ascent to Descent (Changeover)*.

c) Descend with ascending gear until the chest ascender is directly above the knot.

d) Place the descending device onto the working line directly below the knot.

e) Safety Line

f) Attach the secondary (unused) backup device under the knot on the safety rope.

g) Remove the original backup device from above the knot.

h) Continue to descend.

12.7.2 Ascent (Safety then Working lines)

a) Ascend until just below the knot.

b) Changeover from ascent to descent

c) Remove the handled ascender and reattach it above the knot.

d) Ascend with descending gear

e) Ascend until descending device is just below the knot.

f) Attach the 2nd backup device above the knot on the safety rope, remove the backup device below the knot.

g) Change from Descent to Ascent, attaching the chest ascender above the knot.

h) Remove the descending device.

i) Ascend.

12.8 Rope-to-Rope Transfer

__Keys to Success:__ Before making attachments to the new working and safety ropes, changeover from ascent to descent on the original working line.

12.8.1 Place a second backup device on the new safety rope.

12.8.2 Attach both the chest and handled ascenders to the new working rope.

12.8.3 Using the handled ascender, pull in the direction of the new anchor while ensuring the rope passes through the chest ascender to tension the new working rope.

12.8.4 Descend the original working and safety ropes until weight is transferred fully onto the new working rope.

12.8.5 If height is required, climb through the transfer.

12.9 Small Re-anchor

*__Keys to Success:__ Refer to Rope-to-Rope transfer maneuver. Avoid tangling the ropes with good rope management. *

12.9.1 In Ascent

a) Changeover from ascent to descent on the original working line.

b) Add a second safety device to the ropes on the far side of the re-anchor loops, ensuring it is oriented to the upper anchor.

c) Attach chest ascender to the ropes on the far side of the re-anchor loops, ensuring correct orientation.

d) Attach handled ascender to the same rope as and above the chest ascender, ensuring it is oriented correctly.

e) Conduct the rope-to-rope maneuver.

f) Ascend to the desired work position.

12.9.2 In Descent

a) Descend until eye level with the lower anchor knots.

b) Using the re-anchor loops, pull toward the lower anchors and retrieve the drop set ropes.

c) Load a second safety device onto the new safety line and ensure it is oriented correctly.

d) Load your chest ascender onto the new working line and ensure it is oriented correctly.

e) Load your handled ascender onto the same rope as your chest ascender and ensure it is oriented correctly.

f) Conduct a rope-to-rope transfer.

g) Descend.

12.10 Large Re-anchor (Levels 2 and 3)

__Keys to Success:__ The rope-to-rope transfer must be conducted within the loops to ensure the drop set ropes remain in place for rescue.

12.10.1 In Ascent

a) Ascend to knots of the lower anchor. Load descent device and secondary backup device onto inside (nearest) loop ropes. Stand in foot loop, disconnect chest ascender, and sit down onto descent device.

b) Follow the rope-to-rope maneuver outlined in the Rope Maneuvers section above to transfer from the inner loop ropes to the outer loop ropes while leaving the drop set in its original position.

12.10.2 In Descent

a) Descend until eye level with the lower anchor knots.

b) Load handled ascender and chest ascender onto inner loop working rope (not the drop set).

c) Load the secondary backup device onto the inner loop safety rope.

d) Rope-to-rope transfer from the outer loop ropes to the inner loop ropes.

e) Transfer the backup safety device from the outer loop ropes to the new drop set safety rope.

f) Transfer the descent device from the outer loop ropes to the new drop set working line rope.

g) Step up in foot loop, remove chest ascender, sit down onto descent device.

h) Remove handled ascender.

i) Remove secondary (inner loop) backup device.

j) Descend under control.

12.11 Passing Single/Double Deviations

__Keys to Success:__ Deviation carabiners are opened and closed. No changeover or addition of gear is required to navigate through the deviation.

Important: *A single deviation requires a single anchor sling and two carabiners. A double-anchor deviation requires two independent anchor slings, two carabiners for each sling (four carabiners total).*

12.11.1 In Ascent

a) Ascend until level with the deviation anchor point.

b) Place the loose ropes below the chest ascender and backup device into the empty carabiner/s of the deviation anchor sling/s.

c) Connect spare cow's tail to the same empty carabiner/s as above.

d) Tie a double alpine butterfly knot in both loose ropes beneath the deviation anchor sling/s. Ensure there is enough rope between the deviation and the knot to allow verticality beneath the upper anchor slings.

e) Pull chest as close to the deviation anchorage as possible. Remove the upper (impeding) carabiners from the working and safety ropes.

f) Pull the double alpine butterfly knot tightly against the deviation anchor sling/s.

g) Remove spare cow's tail from deviation carabiner/s.

h) Using the tensioned ropes in hand to control your momentum, carefully maneuver into position directly below the upper anchor slings.

i) Continue ascent.

12.11.2 In Descent

a) Descend to approximately eye level with the deviation.

b) Pull the ropes until the double alpine butterfly knot comes tight to the deviation carabiner/s.

c) Pull yourself towards the deviation.

d) Connect your spare cow's tail to the deviation carabiner/s containing the working and safety ropes.

e) Pull chest towards deviation anchorage.

f) Place the empty deviation carabiner/s around the working and safety rope above the descending and backup devices.

g) Remove the carabiners from the ropes beneath the descending and backup devices.

h) Remove the spare cow’s tail from the deviation carabiner.

i) Continue descent untying the double alpine butterfly knot when needed.

12.12 Horizontal Aid Climbing (Fixed and Mobile)

12.12.1 Horizontal aid climbing is used to make horizontal progress along a structure while in suspension.

__Keys to Success:__ Stay attached to at least two anchor slings at all times. Before you ascend to the aid climb, the étrier should be connected directly to the spare cow’s tail and the express sling (dog-bone) to the ventral D-ring.

12.12.2 For this maneuver the direction of travel will be to the left, and the étrier will be attached to the left-hand spare cow’s tail.

12.13 Fixed Aid Climb

12.13.1 Ascend the ropes stopping just below the horizontal aid route.

12.13.2 Attach the étrier cow's tail to the first open anchor sling to the left.

12.13.3 Remove the handled ascender from the working line and connect it to the drop set anchor slings, establishing a second point of attachment (anchor sling) on the horizontal aid climb.

12.13.4 Adjust foot loop length to ensure both left and right feet are at equal heights.

12.13.5 Position the foot loop and étrier to the outside of the thighs.

12.13.6 Stand and attach express sling (dog-bone) to the étrier cow's tail anchor sling.

12.13.7 Disconnect the chest ascender and the backup safety devices from the working and safety lines.

12.13.8 Transfer the étrier cow's tail to the next available anchor point carabiner.

12.13.9 Transfer the handled ascender cow's tail onto the express sling anchor sling.

12.13.10 Stand and transfer the express sling forward onto the same anchor sling as the étrier cow's tail attachment.

12.13.11 Repeat steps 8 through 10 until the desired work position.

12.14 Mobile Aid Climb

12.14.1 Ascend to the structure being traversed.

12.14.2 Place all three anchor slings around the structure/anchorage.

12.14.3 Attach the étrier cow's tail to the leftmost anchor sling.

12.14.4 Attach the handled ascender cow's tail to the trailing anchor sling.

12.14.5 Position the étrier and foot loop webbing to the outside of your thighs.

12.14.6 Stand up and attach the express sling to the central anchor sling.

12.14.7 Slide the étrier cow's tail anchor sling forward.

12.14.8 Stand and slide the express sling anchor sling forward and sit back down.

12.14.9 Slide the handled ascender anchor sling along behind the other two.

12.14.10 *This method of progress can continue until such a time as an obstruction preventing further sliding of anchor slings appears.

12.15 Passing an obstruction while mobile aid climbing.

12.15.1 Transfer your handled ascender cow's tail to the express sling anchor sling.

12.15.2 Remove the now-empty anchor sling from the structure and place it on the harness gear loop.

12.15.3 Stand in the foot loop and étrier to transfer the express sling to the étrier cow's tail anchor sling.

12.15.4 Remove anchor sling from harness gear loop and reattach to structure beyond the obstruction.

12.15.5 Transfer the étrier cow's tail to the empty anchor sling across the obstruction.

12.15.6 Stand and transfer the express sling to the étrier cow's tail anchor sling on the far side of the obstruction.

12.15.7 Remove the empty anchor sling from the structure and place it into the lead position (furthest left position) beyond the obstacle.

12.15.8 Transfer your étrier cow's tail onto the empty lead anchor sling.

12.15.9 Transfer your handled ascender and its anchor sling across the obstruction into the trailing position.

12.15.10 Repeat steps 7 through 9, and 10 through 18, as needed.

12.16 Exiting mobile and fixed aid onto drop set ropes.

12.16.1 Position your express sling so that the drop set ropes are within easy reach.

12.16.2 Load a safety and descent device onto the drop sets safety and working lines.

12.16.3 Stand and remove express sling from aid climb and sit down onto the descent device.

12.16.4 Remove cow's tail attachments from the aid climb anchor slings (gather mobile aid slings to bring down where required).

12.16.5 Descend under control.

12.17 Vertical Aid Climbing (Level 2 and 3)

*__Keys to Success:__ The express sling always moves up last on the way up. On the way down, the express sling always moves first. *

12.18 Ascending

12.18.1 Attach the express sling to the lowest anchor device.

12.18.2 Attach étrier cow’s tail to the second-lowest anchor device.

12.18.3 Attach foot loop cow’s tail to the third-lowest anchor device.

12.18.4 Stand in both foot loops and move the express sling up one anchor sling (pair with the lowest cow's tail).

12.18.5 Stand and move the lowest cow's tail upwards to the next empty (higher) anchor sling.

12.18.6 Repeat steps 1 through 5 until the desired position is reached.

12.19 Descending

12.19.1 From the starting position, transfer the express sling downward one anchor sling.

12.19.2 Transfer the uppermost cow's tail downward onto the express sling anchor sling.

12.19.3 Repeat steps one and two until the desired height.

12.20 Edge Obstruction (Ascent and Descent)

12.20.1 In Ascent

a) Ascend until just below the canvas rope protection.

b) Open the working and safety line's rope protection up to the edge (not over).

c) Changeover to descent device.

d) Ascend in descent device as close to the edge as possible.

e) Reaching up and over the edge, attach your spare cow's tail to the provided attachment point.

f) Stand in the provided étrier and your foot loop to navigate up and over the edge.

g) Once over the edge, attach two cow's tails to the provided connection points to prevent falling back down over the edge.

h) Remove all devices from and refasten the rope protection around the drop set ropes making the climb safe for the next technician.

12.20.2 In Descent

***Important**: Maintain your two high attachment points for steps 1 through 4.*

a) Attach your spare cow's tail to the connection point provided at deck level and close to the edge.

b) Reaching beneath the edge, open the rope protectors of both ropes, leaving at least for inches sealed beneath the edge.

c) Attach a backup device to the safety rope immediately below the edge. Ensure the orientation is correct.

d) Attach the descent device to the working rope beneath the rope protection (four to six inches beneath the edge. Ensure the orientation is correct.

e) Remove the two cow's tails from the high attachment points.

f) Place leg furthest from ropes into étrier and extend leg fully outward.

g) Twisting your body toward the ropes, slide over the ledge onto your étrier leg.

h) While standing in the étrier, remove the spare cow's tail attachment above the edge.

i) As you lower yourself to weight the descent device, monitor the working and safety ropes to ensure they remain inside the rope protection.

j) Close rope protectors as you descend.

12.21 Level 1 Rescue from descent mode

12.21.1 Ascend the ropes adjacent to the casualty's ropes until you are two feet higher than the casualty.

12.21.2 Changeover into your descent device.

12.21.3 Descend, if required, until your descent device is at the same height as the casualty's descent device.

12.21.4 Place the loose rope beneath your descent device over your right shoulder. Place the safety device and rope over a shoulder and behind you.

12.21.5 Move the casualty's working and safety lines to the far side of the casualty, leaving the space between you free of ropes.

12.21.6 Attach your spare cow's tail to the casualty's ventral attachment point.

12.21.7 Using the express sling, make a connection from the casualty's sternal attachment point to your descent device carabiner.

12.21.8 Remove the casualty's backup device.

12.21.9 Using the casualty's descent device, lower the casualty until they fully weight your descent device.

12.21.10 Remove the casualty's descent device.

12.21.11 Following the manufacturer's instructions (i.e., additional friction carabiner), carefully descend with the casualty.

12.22 Hauling and Lowering

12.22.1 Guidance to ACU-Ropes-10P007-R00

12.23 Hauling

12.23.1 Position a rope grab device high but within reach on the working line, ensure the device is oriented correctly (as in the diagram above).

12.23.2 Load the rope from beneath the descent device into a pulley.

12.23.3 Attach the loaded pulley to the rope grab on the working rope using a carabiner.

12.23.4 Pull down on the rope beneath the pulley and monitor the rising load.

12.23.5 Pull the slack safety rope through the safety device (not pictured) for every two feet the load rises.

***Note**: Unattended haul systems should be tied back with a suitable knot.*

12.24 Lowering

12.24.1 Remove rope grab device and pulley from working line.

12.24.2 Ensure the backup device is not locked.

12.24.3 Ensure the correct use of the descending device with consideration given to weight and type of load.

12.25 Hanging Haul (Extra rope)

12.25.1 This section will describe scenarios with the descending and backup device hanging from anchorage above the load and in an inverted orientation.

12.25.2 Before ascending, in a rope bag, build a rescue kit including an adequate length of rescue-rope attached with a carabiner to a rope grab, a descending device, a backup device, a second rope grab, two pulleys, five carabiners, and two anchor slings.

12.25.3 Hauling

a) Attach the two anchor slings from the rescue kit to the anchorage between you and the casualty's working and safety rope anchors.

b) Hang the backup device from the rescue kit to the casualty's safety line anchor sling.

c) Attach the backup device to the casualty's safety rope and ensure it is oriented to the casualty (not the anchorage).

d) Attach the descent device from the rescue kit to the empty anchor sling closest to the working line. The device is now in an inverted position.

e) Attach the rescue line rope grab to the working rope of the casualty.

f) Ensure the rope grab is oriented toward the casualty (not the upper anchorage).

g) Using the tail of the rescue rope, guide the rope grab as far down the working line as possible.

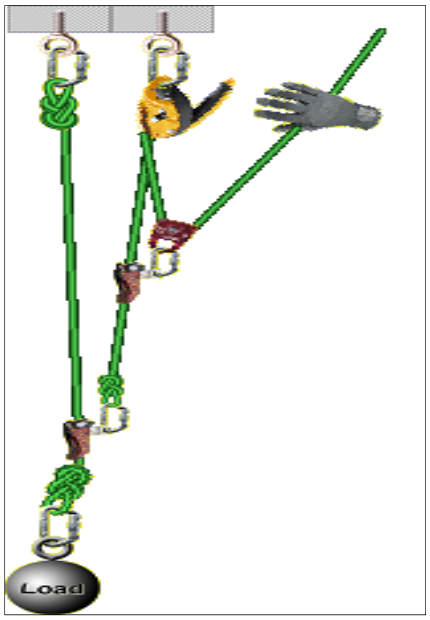


Figure 13:1 inverted haul system on casualty's working line.

h) Thread the rescue rope through the inverted descent device. Ensure the device is oriented correctly and pull excess slack through the device.

i) Load the loose rope beneath the descent device into a pulley. Connect the pulley to the second rope grab with a carabiner.

j) Load the rope grab and pulley unit onto the rescue-rope and guide it downward a few feet. Ensuring that the rope grab is oriented toward the load beneath.

k) Redirect the tail of the rescue-rope, through a second pulley and attach the pulley to the second empty anchor device between you and the casualty's drop set anchors.

l) *You have now created a 3:1 mechanical advantage haul system using the rescue rope, rope grab, and pulley.*

m) You are ready to begin hauling the load.

n) Manage the slack through the inverted backup device for every two feet the load is raised.

12.25.4 Lowering

a) Remove the 3:1 haul system from the rescue rope.

b) Unlock the inverted safety device.

c) Lower the load under control following the manufacturer's instructions.

13.0 RESCUE MANEUVERS

Guidance to ACU-Ropes-10P007-R00

Unless otherwise specified, all rescues described in this section are meant as guidance only. Given the wide variety of possible rescue scenarios, the rescuer will be expected to make the appropriate adjustments to the techniques presented below.

***Keys to Success**: Where a level 3 technician chooses to lower a casualty from the ventral connection steps must be taken to improve the casualty's body position. Tightening the casualty's shoulder straps and/or making a hard connection between the casualty's sternal and ventral connecters can be utilized to bring the casualty to a more upright position. *

13.1 Ascending to the Casualty

13.1.1 Ascend to the casualty on their backup line using their working line for your backup device.

13.1.2 While beneath the casualty, collect any gear from their harness required for the rescue.

13.1.3 Place your second backup device as high above the casualty as possible and remove your lower backup device.

13.1.4 Add a second carabiner to your descent device and attach it to your ventral connector. Your descent device now hangs from two carabiners: The upper or descent device carabiner and the lower or ventral attachment carabiner.

13.1.5 Changeover into descent mode.

13.2 Snatch Rescue: Casualty in Descent mode

13.2.1 Ascend to the casualty as in steps as described under the heading *Ascending to the Casualty* above.

a) Place loose rope beneath your descent device over your right shoulder.

b) Place your backup line on the far side of the casualty.

c) Connect your spare cow's tail to the casualty's ventral harness connector.

d) Connect the casualty's sternal attachment point to the rescue bridal's upper (descent device) carabiner using an express sling.

e) Ascend in your descent device until the express sling connection is taut.

f) Remove the casualty's backup device.

g) Using the casualty's descent device, lower them until they are suspended by your descent device and rescue bridal.

h) Remove the casualty's descent device.

i) Following the manufacturer's instructions (i.e., additional friction), descend with the casualty.

13.3 Pick Rescue: Casualty in Ascent mode.

13.3.1 Ascend to casualty as described under the heading *Ascending to the Casualty* in the *Rescue Maneuvers* section.

a) Place the loose rope beneath your descent device over your right shoulder.

b) Place your backup line on the far side of the casualty.

c) Connect your spare cow's tail to the casualty's ventral harness connector.

d) Connect the casualty's sternal attachment point to the rescue bridal's upper (descent device) carabiner using an express sling.

e) Ascend in your descent device until the express sling connection is taut.

f) Remove the casualty's backup device.

g) Remove casualty's cow's tail from their handled ascender.

h) Lengthen out the casualty's foot loop to the max, run foot loop through casualty's sternal D-ring, then back up and through the handled ascender carabiner.

i) *You have created a 2:1 mechanical haul system using the casualty's foot loop.*

j) Stand in the casualty's foot loop to lift and de-weight the casualty's chest ascender.

k) Remove the casualty's chest ascender.

l) Lower the casualty in a controlled manner using the foot loop until they are suspended by rescuers descending device.

m) Descend under control in accordance with the manufacturer's instructions (i.e., friction carabiner).

13.4 Rope to Rope Rescue

13.4.1 Ascend to the casualty as described under the heading *Ascending to the Casualty* in the *Rescue Maneuvers* section.

13.4.2 Conduct a Snatch or Pick rescue as required and described above.

a) Attach a second descending device to both the upper carabiner of the rescue bridal and the upper express sling carabiner.

b) Ensure the second descent device is attached to the rescuer via the rescue bridal and the casualty via the express sling.

c) Load the new working rope into the descent device.

d) Load the new safety rope into a second backup device.

e) Pulling towards the new anchorage, adjust the slack through the second descent device until the rope is taut.

f) Descend on the original working rope descent device until completely vertical beneath the new working and safety rope anchorage while making any required adjustments to the position of both backup devices.

g) Once Vertical beneath the new anchorage, disconnect the original descent and backup devices.

h) Following the manufacturer's instructions, descend with the casualty.

13.5 Small Re-Anchor Rescue (< 1.5m)

13.5.1 Ascend to the casualty as described under the heading *Small Re-anchor* in the *Roped Maneuvers* section of the manual, and the rescue maneuver heading *Ascending to the Casualty* as described above.

13.5.2 Conduct a Snatch or Pick rescue as required.

a) Before descending with the casualty, ensure that the re-anchor ropes are not trapped between you and the casualty.

b) Descend with the casualty until eye level with the lower anchorage termination knots.

c) Using the loops, pull towards the lower anchorage until the drop set ropes can be retrieved.

d) Return, under control, to a vertical position beneath the upper anchorage.

e) Set up a rope-to-rope rescue maneuver with the casualty as described under the *Rescue Maneuvers* heading above.

f) Using the drop set descent device for progress capture, pull as close to the lower anchorage as possible.

g) Adjust the drop set backup device as needed.

h) Conduct the rope-to-rope rescue maneuver.

i) Descend with the casualty.

13.6 Deviation Rescue (Single and Double Anchor)

13.6.1 Ascend to the casualty. Refer to *Passing Single/Double Deviations* under the *Rope Maneuver* section of this manual.

13.6.2 Conduct the Snatch or Pick rescue as required.

a) Before descending, ensure ropes are not trapped between the rescuer and casualty.

b) Descend with the casualty until eye level with the deviation.

c) Pull into the deviation and retrieve the loose ropes from beneath the deviation.

**The safety line above the deviation will be the working rope beneath the deviation. The working rope above the deviation will be the backup rope beneath the deviation. **

d) Attach a second descent device to the rope beneath the deviation.

e) Attach a second backup device to the rope beneath the deviation.

The working rope above the deviation is the backup rope beneath the deviation. The backup rope above the deviation is the working rope beneath the deviation.

f) Using the lower descent device to capture progress, pull towards the deviation until within a few inches of the same.

g) Lower the original descending device until evenly weighted on both descent devices.

h) Move the backup device above the deviation from the safety line to the rope above the original (upper) descending device.

i) Lower out on the upper descent device until vertical beneath the deviation.

j) Remove the upper descent device.

k) Pull all slack rope (created by removing the upper descent device) through the lower backup device, positioning it directly beneath the deviation.

l) Remove the backup device from above the deviation.

m) Continue descent.

13.7 Aid Climb Rescue: Lowering System

13.8 Before the ascent, you will require the items below for a rescue kit:

13.8.1 A rope of adequate length (greater than double the casualty's height)

13.8.2 A descending device

13.8.3 A backup device

13.8.4 An appropriate number of carabiners

13.9 Build Rescue Kit

13.9.1 Attach carabiners to termination knots on each tail end of the rope.

13.9.2 Attach descending and backup devices to the ropes orienting both towards the termination knot carabiners.

13.9.3 Place the bulk of the rope into the bag.

13.9.4 Clip the descent and backup devices to the bag handle/s.

13.9.5 Ascend to the casualty. Refer to the Fixed and Mobile Aid heading in the Rope Maneuvers section of this manual and the Ascend to Casualty heading in the Rescue Maneuvers section of this manual.

a) Attach the descending device to the casualty's express sling anchor sling.

b) Connect descent rescue rope carabiner to casualty's sternal connection point.

c) Attach backup device carabiner to a different available aid climb anchor.

d) Attach backup device rescue rope carabiner to casualty's sternal attachment point.

e) Remove any redundant casualty cow's tails.

f) Lengthen a foot loop fully. Attach to the casualty's ventral D-ring (or a lower point on the harness). Trace the foot up through the anchor sling carabiner, back down through the casualty's ventral D-ring, and redirect again through the anchor sling carabiner. You have created a 4:1 mechanical advantage.

g) Stand in the foot loop to de-weight casualty's express sling and remove it from the anchor sling.

h) Lower out foot loop in a controlled manner until the casualty is weighted onto the lowering system.

i) Lower the casualty.

13.10 Passing Knots Rescue (knots at the same level)

__Keys to Success__: Offset the safety rope knot from the working rope knot.

13.10.1 Ascend to casualty refer to *Passing Knots* heading in the *Rope Maneuvers* section of this manual and the *Ascending to the Casualty* under the *Rescue Maneuvers* section of this manual.

13.10.2 Conduct a Pick or Snatch rescue as required.

a) Descend with the casualty to approximately 4-5 ft above the knots.

b) Offset the safety rope knot by isolating it within a larger alpine butterfly.

c) Adjust the new larger alpine butterfly's position upward until it sits just below the backup device.

d) Attach a second descending device below the larger alpine butterfly knot.

e) Remove the backup device.

You are now on two descent devices.

f) Attach a backup device above the original working rope descent device.

g) Lower out on the original descending device fully weighting the new descending device beneath the larger alpine butterfly knot.

h) Remove the original descent device.

i) Descend with the casualty until the backup device is immediately above the new safety rope's knot.

j) Attach a 2nd backup device below the knot, and remove the backup device from above the knot.

k) Continue your descent.

14.0 RIGGING METHODS/ANGLES

As per ACU-ROPE-10T002 R00

14.1 Y-Hang Angles

*For angles over 120 degrees (critical angle), all anchor slings and ropes forming the y-hang must be load shared.

14.1.1 One anchor sling on each anchorage may be used for anchorage with less than 1.5 meters horizontal separation. Two anchor slings on each side of the y-hang for anchorage with 1.5 or more meters between anchorages. *

14.1.2 Key Takeaway: As the angle of the y-hang increases, so does the force exerted on each of the anchorages, anchor slings, and anchor devices relative to the force exerted on the working and safety ropes themselves.

14.1.3 For angles rigged at 90° ("Optimal Angle"), the force exerted on each anchor device will be about 71% of the force exerted on the drop set ropes.

14.1.4 For angles rigged at 120° ("Critical Angle"), the force placed on each anchor device will equal the force exerted on the drop set ropes.

14.1.5 For angles greater than 120 degrees, the force exerted on the anchorage and anchor devices is greater than the force exerted on the drop set ropes.

14.1.6 Below is a quick reference "Y-Hang" Angle loading chart. A load of 100 kg load is applied to the working line:

ANGLE OF 'Y' HANG		ANCHOR POINT LOAD (KG)
0°	=	50
60°	=	57
90°	=	71
120°	=	100
140°	=	146
150°	=	193
160°	=	288
161°	=	303

177°	=	1915
178°	=	2873
179°	=	5747

14.2 Deviations

*__Keys to Success__: Optimal angle: less than 20 degrees. Critical angle: 60 degrees. Deviation slings have two carabiners each. One (from each sling on a double-anchor deviation) to hold the ropes and one empty carabiner (utilization described below). *

***Important**: As the angle of the deviation increases, so does the force exerted on the deviation anchor devices relative to the force exerted on the ropes.*

14.2.1 The following criteria allows for the use of a single-anchored deviation:

a) the angle of deviation is less than 20°;

b) the horizontal distance between the top anchor and the deviation anchor is less than 1.5m;

c) there is no hazard present (ex. large swing into a structure or contact with sharp edge/hot pipes)

14.2.2 A doubled-anchored deviation is required when:

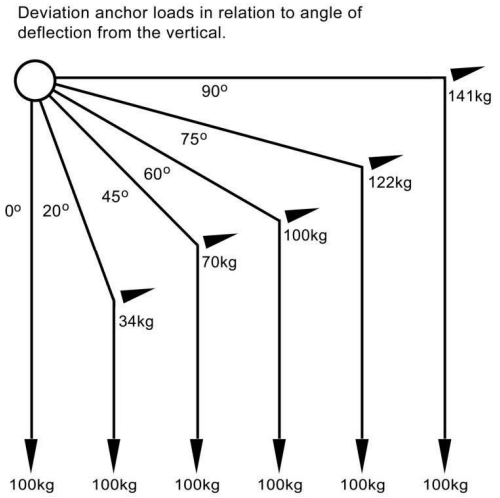
a) the angle is 20° or greater;

b) the distance between the top anchor and the deviation anchor is 1.5m or greater; or

c) there is a hazard present

14.2.3 Where a large deviation angle is required, consider alternative rigging methods (e.g., re-anchors, alternative anchor locations).

14.2.4 The below diagram shows the loading effect on the deviation anchor when using a 100kg load:



14.3 Re-anchors

*__Keys to Success__: On re-anchors both the upper and lower working and safety lines are to use either a figure of eight or a figure of nine as the anchor sling termination knot. *

14.4 Tensioned Lines

14.4.1 A tensioned line system can be defined as: A system of access utilizing pre-tensioned ropes and releasable anchor line devices.

*__Keys to Success__: All anchor slings within the tensioned line system must be load shared. Unattended tension lines should have a suitable knot tied back 1m from the device. *

14.4.2 Considerations when rigging tensioned lines:

a) Critical Angle of a Tensioned Lines: 160 degrees

b) One person on a tensioned line system at a time (except during a rescue).

c) The person on the tensioned line system or somebody of similar weight needs to be the one to have tensioned it using no more than a 3:1 mechanical advantage.

d) Tensioned line deflection is approx. 10% of the length holding up the rope. (examples in diagrams)

e) A tensioned line system differs from Y-Hangs of 120° or less in that:

- Connections encompass both ropes and are therefore load shared across the tensioned ropes.
- Use IDs or other suitable load limiting devices for slippage and release ability.

f) When using a tensioned line as a horizontal lifeline, it should be rigged as high as practical relative to the harness connection point with considerations given to the relative task at hand.

14.4.3 In a tensioned line system, there is deflection (downward pull) of approximately 10% of the length of the system between supports.

14.4.4 Where the deflection exceeds the desired amount, intermediary supports can be placed. Intermediary supports isolate sections of a tensioned line system, thereby reducing the amount of deflection between the intermediaries.

14.4.5 E.g., if a technician is on a 100ft tensioned line system, we expect a 10ft deflection. However, where intermediaries are used to section off a 20ft span of the same 100ft tensioned system, a technician between the intermediaries will experience deflection of only 2ft.

14.5 Vertical Life Lines for Ladder Climb

14.5.1 When using a vertical lifeline for ladder climbing, a single rope may be used so long as it is anchored to suitable anchorage at the top and bottom of the ladder. Using a backup device and suitable shock-absorbing lanyard on the vertical lifeline is recommended.

14.6 Work/Travel Restraint Lines

14.6.1 Travel restraint line systems differ from fall arrest systems in that while fall arrest systems catch a falling technician, travel restraint systems prevent the technician from falling in the first place. As such, travel restraint systems may utilize a single suitable point of attachment for the technician. Where technician restraint cannot be guaranteed, suitable anchorage and redundant attachment points are required.

14.7 Retrievable Rigging (Pull-Throughs)

14.7.1 There are many variations of retrievable rigging from which to choose. Consideration should be given to the following when selecting a suitable method:

a) Retrievable rigging is used for access and egress only and not for carrying out work at height.

b) Suitable anchorage must meet IRATA or local legislative requirements.

c) Anchorage condition (e.g., edge sharpness), anchorage position, and surrounding area obstacles, etc., may require the use of rope protection.

Important: *Technicians must ensure they load the correct ropes to begin their descent/ascent.*

Where the structure properties are unknown, suitable rope protection must be used.

14.8 Minimum Breaking Strength (MBS)

14.8.1 Minimum breaking strength is generally given in units of force (e.g., kN).

14.9 Safe Working Load (SWL)

14.9.1 The safe working load is determined by a competent person relative to the MBS of a piece of equipment.

14.9.2 A competent person is suitably trained or qualified by knowledge and practical experience and has the authority to enable the required task or tasks to be carried out properly.

14.9.3 In general, the safety factor for fabric equipment is 10 and for metallic equipment is 5.

14.10 Example Calculations:

14.10.1 Tape Sling

a) MBS: 22kN

b) SF: 10

c) Therefore 22kN/10= 2.2kN or 220kg would be the SWL of the sling.

14.10.2 Carabiner

a) MBS: 41kN

b) SF: 5

c) Therefore 41kN/5=8.2kN or 820kg would be the SWL of the carabiner.

14.10.3 Factors that must also be considered when determining safe working loads include but are not limited to:

a) Types of loads (heavy, large, odd-shaped),

b) environmental concerns (wind, ice, rain), and

c) orientation of anchor devices (basket, choke, vertical).

- Example:
- Choking or lark's footing a sling causes a reduction in strength of between 30% to 70%, depending on orientation. Other weakening factors include the fabric-on-fabric friction in a poorly orientated choke or lark's foot.

14.11 Working Load Limits (WLL)

*__Keys to Success__: No SWL calculation needs to be applied to a WLL under normal use conditions. *

14.11.1 The manufacturer or engineer determines the working load limit for equipment.

14.11.2 The WLL, usually listed in a mass rating (kgs or lbs), will be stamped on the equipment.

14.11.3 The WLL is the maximum weight that can be safely applied to the equipment under normal use conditions.

14.11.4 The manufacturer or engineer has already incorporated a safety factor (the "design factor") into the WLL.

14.11.5 The safety factor incorporated in the WLL will usually be in the range of 4:1 or 5:1 and can be found on the equipment's certificate of conformity.

14.11.6 Example Calculation:

a) Steel Sling with a design factor of 5:1

b) Vertical Pull: 2600lbs Choker: 2100lbs Basket: 5600lbs

c) MBS in a Choker orientation: 2100lbs x 5= 10500lbs

d) While NOT recommended as per Acuren/Tacten guidance, in this application, the calculated minimum breaking strength far exceeds anchor strength requirements in IRATA and most provinces.

15.0 MECHANICAL ADVANTAGES

15.1 General Rule of Thumb when calculating mechanical advantages:

15.1.1 There will be a mechanical advantage if a pulley or redirect moves through space as the system is used for hauling.

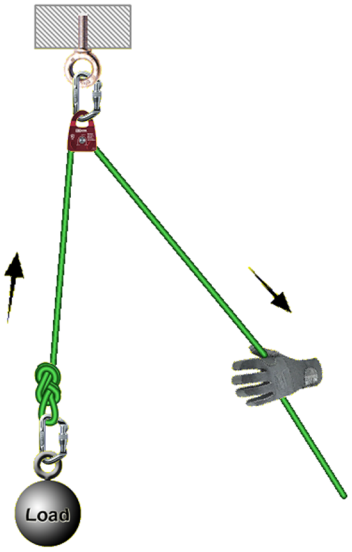
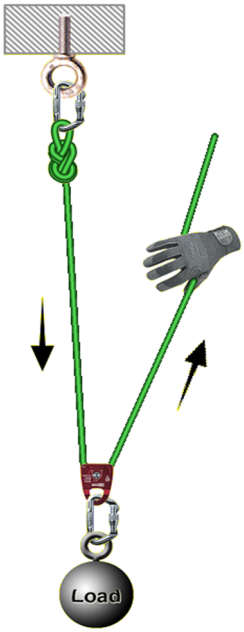
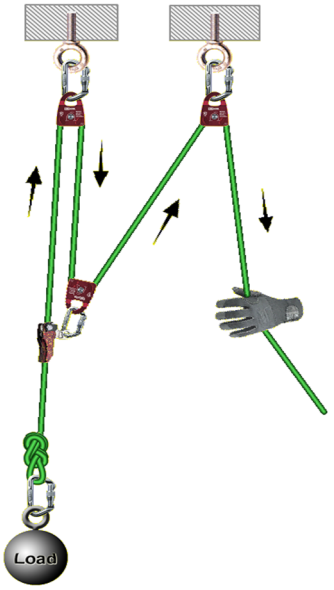
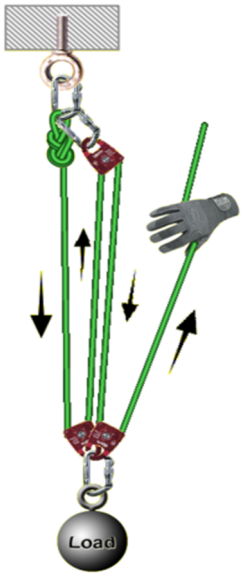
15.1.2 If the pulley or redirect does not move through space, it provides no mechanical advantage.

15.1.3 If the rope is terminated at the load, the mechanical advantage will be odd-numbered (1:1, 3:1, 5:1, etc.).

15.1.4 If the rope is not terminated at the load, the mechanical advantage will be even-numbered (2:1, 4:1, 6:1).

15.1.5 In a compound mechanical advantage system, multiply the mechanical advantages gained across multiple systems.

15.1.6 In a complex system, add the mechanical advantages gained across multiple systems.

	
1:1 System	2:1 System
	
3:1 System	4:1 System

16.0 EQUIPMENT INSPECTION

As per Acuren approved equipment list

This section is a brief overview of the types of gear used and should be used to supplement the manufacturers' specifications, ratings, and any other features.

Equipment	Certifications	Features	Inspection
Helmet	EN 397:2006, CSA Z94.1-05 type 1 Class E ANSI Z89.1-2003 Type 1 or 2, CEN 12492: 2000	-chinstrap clip designed for breakaway -rated for top and lateral impact -rated for electrical shock -temp rating of -30°C - be familiar with gear specific inspection points as outlined by the manufacturer	-deep gouges/cuts, stress in plastic, cracks/ deformations, discolouration or melted points -cuts in the webbing or excessive fraying in stitching -clip is functioning properly - be familiar with gear specific inspection points as outlined by the manufacturer -check any deformation indicators provided
Harness	EN 361 ANSI Z359.1-2007, EN 358, EN 813, CSA Z259.12-01	-Rated for work/travel restraint, fall arrest, work positioning -Rated with a WLL of 30-150kg -temp rating of +80°C to -30°C -gear loops rated from 8kg-15kg - be familiar with gear specific inspection points as outlined by the manufacturer	-cuts, excessive fraying, burns, discolouration on webbing or critical stitching -excessive wear, cracks, deformation, corrosion on metal components of the harness -ensure ascending device teeth are not worn, missing or damaged -ensure fall arrest attachment points have not been subjected to a fall, by checking manufacturer indicators - be familiar with gear specific inspection points as outlined by the manufacturer

Back-up Devices	EN 353-2:2002 EN 567:1997 ANSI Z359.1-2007	be familiar with gear specific inspection points as outlined by the manufacturer	- be familiar with gear specific inspection points as outlined by the manufacturer
Descenders	EN 341: 1997 NFPA 1983	-descenders that meet the EN 341 standard can be used for rescue	-check for excessive wear, corrosion, deep gouges on metal components, proper shape to components (faceplates, etc.) -be familiar with gear specific inspection points as outlined by the manufacturer
Ascenders	EN 567: 1997	be familiar with gear specific inspection points as outlined by the manufacturer	-check teeth are not worn, damaged or missing -ensure cams function properly -excessive wear, deep gouges, bends in metal components9proper shape to device) -be familiar with gear specific inspection points as outlined by the manufacturer -tend to damage the rope within the range of 3.5-4.5kN in a shock load situation
Pulleys	EN 12278	-reduces friction when hauling or lowering loads - follow manufacturer's specifications for further use and inspections -double wheeled pulleys with a single axel is considered a single point of attachment	-excessive wear, deep gouges, bends in metal components -wheel spins freely -look for overlapping, pinch points -be familiar with gear specific inspection points as outlined by the manufacturer

Rope **(Dynamic and Low Stretch)**	EN 892- Dynamic EN 1891- Low Stretch	be familiar with gear specific inspection points as outlined by the manufacturer	-excessive frays, deep cuts, burns, discolouration -abnormalities underneath the sheath - be familiar with gear specific inspection points as outlined by the manufacturer -Rope stretch ranges: low stretch: 3-5% dynamic: >10%
Anchor Devices: **Slings**		-Steel -load lifters -tape slings	-excessive wear, deformations, cracks, kinks -excessive fraying or discolouration in fabric slings -be familiar with gear specific inspection points as outlined by the manufacturer
Connectors: **Carabiners**	EN 362	- follow manufacturer's specifications for use and inspections -familiarize yourself with shape, kNs, in different orientations	- excessive wear, corrosion, cracks, deformation. -action functions properly -be familiar with gear specific inspection points as outlined by the manufacturer

17.0 GLOSSARY OF TERMS AND DEFINITIONS

As per ACU-Rope-10M002 R00

TERM	DEFINITION
"May"	Permissive Choice ("may" equals "is permitted").
"Must" or "Shall"	Mandatory ("must" or "shall" equals "is required to").
"Should"	Advisory. "Should" statements represent the best advice available at the time of printing ("should" equals "is recommended that").
"Will"	Mandatory, but allowing the responsible employee or party some discretion as to when, where, and how.

TERM	DEFINITION
Aerial Device	Any piece of equipment utilizing a bucket or platform to place the worker(s) at an elevated work position.
Aid Climbing	A method of vertical and/or lateral progression in suspension, either by moving directly from one anchorage system to another or by the use of moveable anchorage systems.
Anchor; Anchorage	Place, fixing or fixture to which an anchor rope is connected OSHA/CSA required.
Anchor Device	Assembly of compatible elements, which incorporates one or more anchor points or mobile anchor points that is intended for use as part of a personal fall protection system, is removable from the structure and can be part of the anchor system. NOTE The structural anchor is not part of the anchor device.
Anchor Lanyard	Lanyard connected to the main attachment point of the harness, which normally incorporates a connector and which is used for connection to an anchor point. NOTE Some anchor lanyards are also known as cow's tails.
Anchor Line/Rope	Flexible line/rope connected to a reliable anchor to provide a means of support, restraint or other safeguard for a person wearing an appropriate harness in combination with other devices. NOTE An anchor line/rope may be a working rope or a back-up safety rope.
Anchor Line Device	Collective term for ascending device, descending device and back-up device. NOTE Anchor line devices are also known as rope adjustment devices.
Anchor Point	Point at an anchor where personal fall protection equipment can be attached.
Anchor Sling	Sling or strop made from textiles, wire rope or chain, which is used to attach to a structure or natural feature to provide an anchor point for an anchor rope or for the direct connection of the rope access technician.

TERM	DEFINITION
ANSI	American National Standard Institute
Ascending Device	Anchor line device used primarily to assist progression along an anchor rope and for positioning the rope access technician on it, which, when attached to an anchor rope of appropriate diameter, locks under load in one direction and slips freely in the opposite direction.
Back-Up Device	Anchor line device for a safety rope, which accompanies the user during changes of position or allows adjustment of the length of the safety rope and which locks automatically to the safety rope, or only allows gradual movement along it, when a sudden load occurs.
Belay	A place where either anchor lines or people may be anchored or secured.
Carabiner	A type of connector, formed as a complete loop with a spring-loaded entry gate.
CE	Conformite Europeen or Euproean Conformity, For rope access equipment, it provides confirmation that a product meets the minimum requirements of the European Directive on Health and Safety: 'Personal protective equipment at work regulations 1992'.
Compatible	Functioning properly together in the manner intended.
Competent Person	Designated person suitably trained or qualified by knowledge and practical experience who has the authority to enable the required task or tasks to be carried out properly.
Connector	Opening safety device, which enables a person to link himself or herself directly or indirectly to an anchor point e.g. carabiner.
Cow's Tail	A short length of dynamic rope connected to the main attachment point of the harness.
CSA	Canadian Standards Association

TERM	DEFINITION
Descending Device	Manually-operated, friction-inducing anchor line device which, when attached to an anchor rope of appropriate type and diameter, allows the user to achieve a controlled descent and a stop with hands off anywhere on the anchor rope.
Design Factor	The factor of safety or safety factor that has been applied to the WLL as determine by the manufacturer or engineer. Generally, this ratio is 4:1 or 5:1 of the WLL
Deviation	Redirection of the path of the anchor ropes from the anchor points to avoid abrasion and other potential causes of damage to the anchor ropes or to provide more accurate access for the rope access technician.
Deviation Anchor device	Anchor placed primarily to alter the direction of an anchor rope and installed at a distance (unspecified) from the anchor point(s) used for the first attachment of an anchor rope.
Device Lanyard	Lanyard used to provide a link between the user's harness and the anchor line device. NOTE Some device lanyards are also known as cow's tails.
Dynamic Rope	Rope specifically designed to absorb energy in a fall by extending in length, thereby minimizing the impact force.
EN	European Norm, European Standard
Energy Absorber	Component or components in a fall arrest system designed to minimize the impact force generated in a fall.
Engineered Fall Protection Anchorage	A fall protection anchorage point which is designed and will operate to withstand the maximum expected impact load while maintaining a specified overload capacity factor of two.

TERM	DEFINITION
Engineered System	A fall protection system that is designed to absorb the energy of a worker(s) during a fall while accommodating the static loads of tools and hardware. See Fall Protection System.
Exclusion Zone	Zone designated to exclude the public from a hazardous area and from rope access equipment, or to exclude the operatives from a hazardous area, unless suitably protected.
Factor of Safety	Is a term describing the structural capacity of a system beyond the expected loads or actual loads (for IRATA rope access this is set at 2.5) (for fall protection OSHA require a minimum of 2.0).
Fall Arrest System	The assembly of equipment such as a full body harness in conjunction with a deceleration device and anchorage to limit the forces a worker experiences during a fall from one elevation to another.
Fall Prevention System	A system intended to prevent a worker from falling from one elevation to another. Such systems include positioning device systems, guardrail, barriers, and restraint systems. Fall prevention systems are used in an attempt to prevent workers from falling from an elevation. It should be noted that these devices do not absolutely prevent a worker from falling; their function is to keep the worker at the same elevation.
Fail to Safe	Revert to a safe condition in the event of a breakdown, failure, or mismanagement of a critical nature.
Failure Load	Minimum breaking load of an item of equipment when it is new.
Fall Factor (FF)	Measures the severity of the fall. Formula: Length of a potential fall divided by the length of rope or lanyard available to arrest it.
Free Fall Distance	The vertical displacement of a fall arrest attachment point on the climber's full body harness 6 feet (1.9 m maximum) between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes

TERM	DEFINITION
	deceleration distance, lifeline, and lanyards elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.
Full Body Harness	A component with a design of straps which is fastened about the worker in a manner so as to contain the torso and distribute the fall arrest forces over at least the upper thighs or buttocks, pelvis, chest, and shoulders with means for attaching it to other components or subsystems. NOTE: Wherever the word "harness" is used by itself in this handbook, it refers to full body harness unless otherwise specified.
Hazard	Anything that can potentially endanger personnel, impedes safe working conditions, and conceivably causes injury, or loss of life.
Hazard Zone	Any area where a person may be at risk as a result of the work being performed. This includes the rope access technicians on-rope as well as anyone at a lower level that may be struck by a falling object.
Job Site	The assembly point at the structure or equipment where the workers, tools, and vehicles are assembled to perform the climbing to the work position.
Kernmantel Rope	Textile rope consisting of a core enclosed by a sheath NOTE The core is usually the main load bearing element and typically consists of parallel elements which have been drawn and turned together in single or several layers, or of braided elements. The sheath is generally braided and protects the core, for example from external abrasion and ultra-violet degradation.
Lifting Equipment	Work equipment for lifting or lowering loads, including its attachments used for anchoring, fixing or supporting it, e.g. chain or rope sling or similar, ring, link, hook, plate-clamp, shackle, swivel, eyebolt, webbing.
Low-Stretch Rope	Textile rope with lower elongation and, therefore, less energy absorbing characteristics than dynamic rope. NOTE Low stretch rope is sometimes known as semi-static rope.

TERM	DEFINITION
Minimum Breaking Strength (MBS)	A value three standard deviations below the mean of the maximum force applied to five or more specimens before failure when tested. This value is used by the employer to calculate safe working loads.
Maximum Rated Load (RLMAX)	Maximum mass of one or more persons, including tools and equipment carried, with which a component of a rope access system can be used, as specified by the manufacturer. NOTE 1 Maximum rated load is expressed in kilograms. NOTE 2 See also safe working load (SWL) and working load limit (WLL).
Minimum Rated Load (RLMIN)	Minimum mass of one or more persons, including tools and equipment carried, with which a component of a rope access system can be used, as specified by the manufacturer. NOTE Minimum rated load is expressed in kilograms.
NFPA	National Fire Prevention Association
Peak Impact Force (PIF)	The amount of force that will be applied to a body at the end of a fall, generally measured in kN
PFAS	Personal Fall Arrest System
Portable Ladders	Portable ladders are those that are not permanently installed to a structure but are the normal means of accessing the facilities on the structure as well as the structure itself.
Positioning Lanyard	A lanyard (strap) with snap hook(s) to connect to the D-rings of a climber's full body harness. Used as a positioning device (also known as pole strap or safety strap).
Proof Load	Test load applied to verify that an item of equipment does not exhibit permanent deformation under that load, at that particular time. NOTE The result can then be theoretically related to the performance of the test piece under its expected conditions in service.

TERM	DEFINITION
Qualified Climber	A worker who has been certified through company sponsored approved training, satisfies medical qualifications and proficient in the risk assessment process, understands the methods, and has routinely demonstrated proficiency in climbing.
Rating	A manufacturer's designated operating limit or requirement for a component, device, apparatus, or system, based on testing and specified conditions.
Re-Anchor	Anchor installed at a distance (unspecified) from the anchor point(s) used for the first attachment of an anchor rope, to which the anchor rope is additionally attached, and which is not a deviation anchor or an anchor placed simply to maintain the position of an anchor rope. NOTE Re-anchors are also known as re-belays and intermediate anchors.
Rigging for Rescue	Establishing a rescue system which enables workmate retrieval to take place without the need for a rescuer to descend or ascend to the position of the injured person.
Rope Access	Method of using ropes, in combination with other devices, by which a user descends or ascends a working rope to get to or from the workplace, and for work positioning, while further protected by a safety rope, such that both ropes are connected to the user's harness and separately secured to a reliable anchorage in such a way that a fall is prevented or arrested NOTE 1 Ropes used for descending, ascending, work positioning or as a safety rope are known as anchor ropes or lines. NOTE 2 In this context, the term 'ropes' includes appropriate textile ropes, wire ropes and webbing.
Rope Access Service Delivery	Encompasses the Rockwood Group of companies, including the authorized use by ACUREN Inspection Inc., and those individuals or groups approved by the company.
Rope Grab	A device used to grasp a rope for the purpose of supporting a load.

TERM	DEFINITION
Safe Working Load (SWL)	Designated maximum working load of an item of equipment under particular, specified conditions, as determined by a competent person. Formula: MBS divided by Safety Factor NOTE See also working load limit (WLL) and maximum rated load (RLMAX).
Safety Factors for Equipment	For textiles/man-made fibres is 10 For metallic is 5
Safety Line/Rope	Anchor rope provided as a safeguard to protect against falls if the rope access technician slips or if the primary support (e.g. the working rope), anchor or positioning mechanism fails.
Self-Retracting Lanyard/Lifeline	A device that contains a drum-wound web lanyard or steel line that may be slowly extracted from or retracted onto the drum under slight tension during normal movement of the user. The line has means for attachment to the fall arrest attachment on the body support. After onset of a fall, the device automatically locks the drum and arrests the fall. The device may have integral means for energy absorption.
Screw Link Screw Lock	Type of connector formed as an open loop, which is closed by a threaded sleeve. NOTE Screw-links are also known as maillon rapides and quick-links.
Structural Anchor	Element or elements of an anchor designed for use in conjunction with a personal fall protection system, permanently incorporated into a structure, with the intention that it/they shall not be removed. NOTE An example of a structural anchor is an anchor device, such as an eyebolt, that is welded or resin bonded to the structure.
Transferring	The act of moving from one distinct object to another (e.g., between an aerial device and a structure).
Transitioning	The act of moving from one location to another on equipment or a structure while going around or over an obstruction.

TERM	DEFINITION
Working Line	Anchor line used primarily for access, egress, work positioning and work restraint.
Working Load Limit (WLL)	Maximum load that can be lifted by an item under conditions specified by the manufacturer, generally listed as a mass rating kg or lbs See Design Factor
Work Positioning	The elevated location on the structure or equipment where the worker is in position to perform the assigned work or task.
Work Restraint	Technique whereby a person is prevented, by means of personal fall protection equipment, including an appropriate belt or harness, from reaching zones where the risk of a fall from a height exists.

18.0 REFERENCES

18.1 Acuren/Tacten (n.d.). Retrieved January 7, 2022, from CAN-SMS-10F1017 R00 Jan 1, 201

18.2 Irata International. (n.d.). Retrieved January 7, 2022, from https://irata.org/downloads/3103