Technical Rescuer
Lesson One
Fixed Rope Systems

DOMAIN: COGNITIVE / PSYCHOMOTOR

LEVEL OF LEARNING: COMPREHENSION
APPLICATION

MATERIALS

IFSTA 7th Edition Fire Service Search and Rescue; High Angle Rescue Techniques, 3rd Edition, by Tom Vines and Steve Hudson, available through Mosby/Jems publishers or Firehouse.com; Delmar Engineering Practical Rope Rescue Systems; NFPA 1983, Standard on Fire Service Life Safety Rope and System Components; computer; multimedia projector; whiteboard or flipchart; marking pens; a suitable number of 1" or 2" flat or tubular web slings for anchor slings, or anchor straps in suggested pre-tied lengths of 5' and 12'; 1-3/4" or 2" x 12' web slings for tying diaper seats and chest harnesses; a suitable number of 1/2 inch NFPA approved lifelines, a minimum 100’ in length; rescue figure-of-eight plates; brake bar racks and edge protection one of each Class I, Class II, and Class III NFPA approved commercial harnesses. Students may use their own harness providing it meets NFPA 1983 requirements for rescue operations. Adjustable rescue pick-off straps; carabiners; various lengths of 6 - 8mm prussik cords for ascending and descending and several pre-tied lengths of 53" and 65" specifically for belay systems; Prussik minded pulleys; commercial belay systems used by the AHJ; emergency escape kits; commercial rope grab devices such as Gibbs Ascender, Rock Exotica Ascender or equivalent; several ascender slings constructed of webbing and or 8 - 9mm rope; and portable radios or head set systems.

NFPA 1006, 2013 edition JPRs

6.1.5 Construct a fixed rope system
6.1.7 Ascend a fixed rope system
6.1.8 Descend a fixed rope system
6.2.1 Complete an assignment while suspended from a rope rescue system
6.2.2 Move a victim in a high-angle or vertical environment
6.2.4 Direct a team in the removal of a victim

Junior Member Statement:

Junior Member training activities should be supervised by qualified instructors to assure that the cognitive and psychomotor skills are completed in a safe and non-evasive manner. While it is critical that instructors be constantly aware of the capabilities of all students both mentally and physically to complete certain tasks safely and successfully, the instructor should take every opportunity to discuss with departmental leaders and students the maturity and job awareness each participant has for the hazards associated with fire and rescue training.

TERMINAL OBJECTIVE

The Technical Rescuer shall correctly identify, describe, and demonstrate the setup, operation, and function of fixed rope systems used during rope rescue incidents.

ENABLING OBJECTIVES

1. The Technical Rescuer given the appropriate equipment shall correctly identify, describe, and demonstrate rigging and using various rappelling techniques.

2. The Technical Rescuer, given the appropriate equipment shall correctly identify, describe and demonstrate rigging and using various ascending techniques.

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MOTIVATION

High and low angle rescue operations can occur in all types of environments. The Technical Rescuer will either have to go up or down to reach a patient. Differences in elevation will usually require the use of a fixed rope system to simply gain access to these patients. This lesson plan deals with various techniques of moving rescuers and patients in elevated situations. Rappelling and ascending are the basic functions of high and low angle rescue. Each is covered here along with an emphasis on safety and technique. The Technical Rescuer must be proficient and comfortable working with fixed rope systems whether they are rigging the system or traveling on it. This degree of comfort is directly related to the level of confidence each Technical Rescuer has in their ability to correctly rig and use these systems. Confidence only comes with knowledge and practice. Needless to say, these operations will place personnel in precarious situations; therefore, safety is paramount. Working from elevated points can be intimidating, but with proper training, practice and encouragement, the intimidation can be successfully dealt with.

PRESENTATION

ENABLING OBJECTIVE #1

The Technical Rescuer given the appropriate equipment shall correctly identify, describe, and demonstrate rigging and using various rappelling techniques.

1. Describe the purposes of rappelling.
    a) Rappelling is the controlled descent of a rope using friction of a rope through a descender as a means of control.
    b) It is a necessary skill for operating in a high angle environment.

c) Learning safe rappelling skills greatly enhances the rescuer's confidence and comfort while working from heights.
d) A key point to convey to students is the absolute necessity of control. Avoid rapid bouncing rappels. The use of a top belay is recommended and is the only true belay. A belay line should be mandatory for any rescue operation where a person is attached to the line and the mainline cannot be totally protected from potential damage or entrapment.
e) Rappelling should be taught by a qualified and experienced instructor.
f) For rookie personnel, techniques should be practiced on level ground before moving to gradual elevations in vertical height; and shallow to steep angles that require a top belay.

Reference: Delmar Engineering Practical Rope Rescue Systems, page 160.

2. Describe the principle of rappelling.
   a) Although techniques like arm rappels and body rappels are available to the rescuers, they are primarily recommended for use in the low angle environment only. They require continuous training or they can do more harm than good for the rescuers.
   b) For high angle work the use of a descent control device is the preferred and safest method.
   c) There are many brands of descent control devices available on the market.
   d) The AHJ should make the final decision as to what type of device is best suited for operations in their jurisdiction.

NOTE: For the purpose of this lesson plan the Rescue 8 descender and a brake bar rack will be the devices of choice.

3. Discuss the advantages and disadvantages, and demonstrate the arm rappel for low slope descent.
   a) This rappel is used for short, low-angle slopes.
   b) There is potential injury from abrasions to the arms and hands.

4. Discuss the advantages and disadvantages, and demonstrate the body rappel for low slope descent.
   c) There is potential injury from abrasions to the arms and hands.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 117 through 118.

5. Identify and discuss the purpose and limitations of each classification of harness as specified in the NFPA 1983, Standard on Fire Service Life Safety Rope and System Components, including commercial types and types constructed with NFPA 1983 approved material.
   a) Class I harness: has been deleted from NFPA 1983.
   b) Class II harness: a harness that fastens around the waist and around thighs or under buttocks and is designed for rescue with a design load of 2.67 kN (600 lbf) shall be designated as a Class II life safety harness.
   Class III harness: A harness that fastens around the waist, around thighs or under buttocks, and over shoulders and is designed for rescue with a design load of 2.67 kN (600 lbf) shall be designated as Class III life safety harness. It is designed for rescue operations where the potential for inversion may occur.

Reference: IFSTA 7th Edition, Fire Service Search and Rescue manual, pages 115 through 120.
Reference: High Angle Rescue Techniques, 3rd Edition, page 10, 116 and 119.
Reference: NFPA 1983, Standard on Life Safety Rope and Equipment for Emergency Services, 2012 Edition.
Reference: Delmar Engineering Practical Rope Rescue Systems page 87.
Reference: CMC Rope Rescue Manual, 4th Edition revised, pages 63-65.

6. Demonstrate constructing a modified Class II seat harness, also known as a Swiss seat.
   a) Using a 12’ piece of webbing, attach the two ends with a water knot soured with an overhand safety knot on each side to form a loop.
   b) Pass the loop behind the legs and buttocks.

c) Reach between the legs and bring the webbing under the section that is around the waist and dress it down snugly.

Reference: Delmar Engineering Practical Rope Rescue Systems, pages 89 and 90.

7. Demonstrate how to tie a chest harness.
   a) Take a 12' piece of webbing; attach the two ends with a water knot secured with an overhand safety knot on each side to form a loop.
   b) Form a twist in the webbing, creating a figure eight in the loop.
   c) Slip the rescuers arms through the ends of the figure-of-eight so that the crossover point rests in the middle of the rescuer's upper back.
   d) Connect the ends of the chest hitch with a locking carabiner.
   e) Connect the chest harness to the seat harness using two carabiners between a short webbing tether creating a modified Class III harness.

NOTE: There are many techniques for creating a modified Class II and Class III harness that may be used by the AHJ. It is acceptable to demonstrate these as long as they are proven to be safe and webbing or material widths are not specified in NFPA 1983.

Reference: IFSTA Fire Service Search and Rescue, 7th Edition, page 119 and 120.

8. Discuss the advantages and disadvantages of using conventional figure-of-eight descenders.
   a) The figure-of-eight is molded to form a large ring stacked on top of a small ring constructed from aluminum or steel.
   b) The larger ring creates friction on the rope and the smaller ring is attached to a seat harness carabiner.
   c) Drawbacks include large rope won't thread through the smaller designs. Ropes can slip over the large ring causing a girth hitch.
   d) As a drawback the Rescue 8 descender twists the rope.

e) The rabbit ear design allows for extra friction to be applied and the ears prevent the formation of a girth hitch across the larger ring.

9. Most manufacturers of figure-of-eight descenders do not recommend using these devices for rappels exceeding 75' - 100' due to excessive heat buildup and potential damage to lifelines. A significant amount of rope twist is incurred with a figure 8 descender as well.

Reference: IFSTA Fire Service and Rescue Rescue, 7th Edition, pages 124 and 125.
Reference: Delmar Engineering Practical Rope Rescue Systems, pages 57 and 58.
Reference: CMC Rope Rescue Manual 4th Edition revised, pages 46-47.

10. Demonstrate rigging a Rescue 8 descender rappel system.
    a) Secure one end of the lifeline to a secure anchor.
    b) Form a bight in the lifeline with running end on rescuer's brake hand side.
    c) Slip the bight through the large ring from the top. For extra friction that may be needed for large rescuers, bring the bight through the large ring twice.
    d) Slip the bight over the small ring.
    e) Connect the Rescue 8 descender to the rescuer's seat with a carabiner, with the gate in the up position.
    f) Locking off the Rescue 8 descender requires the rescuer to bring the running end up parallel to the Rescue 8 plate.
    g) Cross over the top of the Rescue 8 descender so that the running end drops down between the back of the Rescue 8 descender and the standing part of the rope.
    h) Pull the running end back towards the body allowing the running to lock inside the large ring.
    i) Bring the running end under the Rescue 8 and back up parallel to the standing part of the rope on the brake hand side, form a large bight and secure two half hitches to the standing part of the rope above the Rescue 8 descender and dress them down snugly.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 122 through 128.
Reference: Delmar Engineering Practical Rope Rescue Systems, page 168 and 169.

NOTE: There are other acceptable locking methods for securing the Rescue 8 descender. The one described is one of the easiest to understand.

11. Demonstrate rigging a brake bar rack rappel system to include the following:
    a) Lay lifeline across the top of the training groove on the rack.
    b) Weave the lifeline under and over each bar until desired friction is obtained. This will vary depending on the weight of the rescuer.
    c) The running end coming out the bottom of the rack is held in the rescuer's brake hand and positioned between the center of the rescuers back and hip.
    d) Connect the rack to the rescuer's harness with a carabiner, with the gate in the up position.
    e) The speed of descent is controlled by manipulating the slack in the rope, and by adding or subtracting bars from the system. Descent is slowed by pulling the running end of the rope up towards the top of the rack. The descent speed can be increased by slacking the running end of the rope and loosening one's grip.
    f) Locking off the rack requires the rescuer to make a round turn around the rack with the running end, then securing two half hitches to the standing part of the lifeline. This is the end that extends above the top of the rack.

Reference: IFSTA Fire Service Search and Rescue 7th Edition, pages 124 and 125.
Reference: High Angle Rescue Techniques, 3rd Edition, pages 130 through 137.

NOTE: There are other acceptable locking methods for securing the rack.

12. Demonstrate the "Butt Thrust" method for rappelling out of a window and off the top of a building.
    a) Face the anchor.

b) Slowly thrust your butt out over the edge and slowly begin to lower yourself.
c) When the standing part of the rope reaches the edge, begin to ease yourself over the edge keeping your feet shoulder width apart and begin a controlled descent.

13. Demonstrate the “Knees Over the Edge Method”.
    a) Walk back to the edge with no slack in the rope.
    b) Get down on your knees.
    c) Lean back, thrusting your butt over the edge.
    d) ON your knees, slide over the edge until your toes touch the edge.
    e) Continue to lower yourself until you can push your legs away from the edge and position your body so your legs are perpendicular to the edge and begin a controlled descent.

NOTE: Brake bar racks and Rescue 8 descenders will work but they tend to create too much friction thus preventing the rescuer from having a smooth descent

Reference: High Angle Rescue Techniques, 3rd Edition, pages 128 through 129.

NOTE: There are many belay devices available for the rescue team to use; the AHJ should train with the ones the rescue team feels most comfortable using. For the purpose of this lesson plan the Prussik hitch and the commercial ascenders will be used as belaying devices.

14. Discuss procedures for belaying a rescuer
    a) When rappelling off an elevated point, a belay line, controlled by a top belayer, should be locked into the rescuer’s harness using a separate carabiner. The preferred connection point is into the mid-sternal point of a chest harness.
    b) When working from an unprotected edge, the belayer and spotter should be clipped into a secure anchor point.

15. Discuss selecting accessory cord for Prussik hitches
    a) The selection of belay control devices is ultimately the choice of the AHJ.
    b) The diameter of Prussik, as a general rule, should be 2/3 to 3/4 the diameter of the lifeline.

c) Mathematically, an 8mm Prussik hitch will work on a 7/16" diameter lifeline and a 9mm Prussik hitch will work on a 1/2" and 5/8" lifeline.
d) Some AHJs prefer to use 7mm Prussik hitches on all lifeline.
e) 6mm Prussik hitches would be the recommended smallest diameter for use in rescue operations.
f) The accessory cord should not be stretchy.
g) Stay away from Kevlar accessory cord for use as Prussik hitches, although strong, the fibers tend to break when knots are tied in it and the cord is loaded.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 145 through 147.

16. Demonstrate using Prussiks for belay control.
a) The selection of belay control devices is ultimately the choice of the AHJ.
b) Create two Prussiks slings using a 53" and 65" length of 7mm of accessory cord.
c) Secure a sling around an anchor and clip a locking carabiner into it.
d) When using Prussik slings for any life safey load; it is strongly recommended that, a tandem, triple-wrap Prussik be used..
e) Attach both Prussik hitches into the locking carabiner at the anchor sling.
f) Secure the other end of the lifeline to the rescuer using a separate carabiner or tying into a connection point.

17. Discuss the types and purpose for using a load release hitch. Demonstrate how to rig a load release hitch.
a) A type of hitch constructed using 8 or 9 mm accessory cord.
c) It has two purposes. It sustains major loads, and when tension is applied, it is used to release tension in the system. The load release hitch has some shock absorbing capability.
d) It can be used in the switching over from a raising system to a lowering system and vice versa

18. Demonstrate setting up the primary Prussik minded pulley belay system in a raising system.

a) Attach the Prussik minded pulley to the load release hitch system.
b) Attach the end loops of the two Prussik hitches to the carabiner that supports the pulley.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 192 through 198.
Reference: CMC Rope Rescue Manual 4th Edition revised, page 82.

19. Demonstrate operating a Prussik belay system incorporating a load release hitch.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 144 through 145, and 192 through 197.

20. Discuss and demonstrate the use of a Munter hitch for emergency descents. Munter Hitches should not be applied as belay methods
    a) The Munter hitch, over the body rappel and the carabiner wrap afford the best protection to the rescuer during an emergency descent when Rescue 8 descenders or brake bar racks are unavailable.
    b) Tie a figure-eight-on-a-bight into the end of a lifeline and clip a locking carabiner into it.
    c) Clip the carabiner into the rescuers seat harness using a separate carabiner.
    d) Tie the Munter hitch into the seat harness so that the running end is on the rescuers brake hand side.
    e) Control of the Munter hitch is accomplished by applying friction to the seat harness carabiner.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 138 through 139.
Reference: CMC Rope Rescue Manual 4th Edition revised, pages 79.
Reference: Delmar Engineering Practical Rope Rescue Systems, pages 173 through 175.

NOTE: There are many commercial belay plate systems available. If one or more of these are available from the AHJ, demonstrate their use.

18. List and discuss rappel commands.

a) On-belay - command given by rescuer asking if belayer is ready to control the rescuer's descent.
b) Belay on - response by belayer confirming that belayer is ready.
c) On rappel - command given by rescuer denoting start of descent.
d) Off rappel - command given by rescuer denoting safe arrival on the ground.
e) Off belay - command given by rescuer denoting that the rescuer has unhooked from the lifeline.

19. Describe and discuss a self-belay, also known as a pseudo or false belay. Great for single line work in a low angle environment
    a) This may have to be used in the event that a top belay system is not available or the lifeline cannot be controlled by a belayer from below.
    b) The theory behind the self-belay is when a rescuer's descent becomes uncontrolled, the Prussik hitch locks down on the lifeline, thus stopping the descent.
    c) The hazards of this technique include using the wrong size accessory cord for the lifeline, the Prussik hitch is too loose to grab the lifeline when loaded; or the rescuer, in a panic, lets go of his rappelling system and grabs the Prussik hitch causing a rapid descent possibly to the bottom or off the lifeline if a safety knot has not been tied into the lifeline.
    d) Continuous practice of this technique is critical to ensure the rescuers responses are safe and automatic.

20. Demonstrate a self-belay.
    a) Attach a triple wrap Prussik hitch to the lifeline at a point within arm's length of the rescuer above the descending device.
    b) The length of the Prussik sling should be long enough to span the space between seat harness or chest harness and the attachment point on the lifeline.
    c) Attach the loop end of the Prussik sling to the seat harness or chest harness.
    d) Make sure the wraps are dressed down snugly.
    e) While rappelling, the rescuer's brake hand would control the descent and the non-brake hand

would be in contact with the Prussik hitch sliding it down the lifeline during the descent.

f) In the event of loss of control, the rescuer should release the non-brake hand from the Prussik hitch allowing it to grab and lock onto the lifeline.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 138 through 139.

21. Demonstrate procedures for attaching a self-rescue system to the lifeline.
    a) Attach an ascending device such as a triple-wrap Prussik sling or commercial ascending device to the lifeline above the jammed rappelling device.
    b) Connect the ascending device to the seat harness via a web sling.
    c) Attach a second ascending device to the lifeline at a point just below the first ascending device.
    d) Attach a 3' to 4' long web sling to the second ascender, which will act as a stirrup for a foot to rest in.
    e) Slide both ascenders up the lifeline to take weight off jammed descending device.
    f) Move the seat ascender first, then the foot ascender.
    g) Load the ascending devices with body weight.
    h) Unlock descending device.
    i) While holding pressure on the descending device, remove both ascending systems.

Reference: High Angle Rescue Techniques, 3rd Edition, page 139.

22. Discuss the guidelines for performing a personal escape.
    a) Most manufacturers currently manufacture emergency escape systems strong enough to meet the escape requirement mandated by NFPA 1983. The key to remember is that the emergency escape system will remain in a bag or a rescuer’s PPE pocket for most of its life. Periodic inspection is critical and required.
    b) When selecting or creating an emergency escape system, pay attention to the rope construction features such as strength and susceptibility to heat.

c) Remember, escape systems are designed for one time actual emergency use. Training use is permitted by manufacturers and NFPA 1983.

Reference: High Angle Rescue Techniques, 3rd Edition, page 141.

23. Identify and discuss situations where one rescuer may have to rescue a victim using a pick-off method.
    a) A firefighter's escape route from an upper level has been blocked and there is no time to set up a ladder and the firefighter does not have a self-escape system.
    b) A window cleaner is stranded at an elevated height out of reach of an aerial.
    c) A stranded rock climber has fallen and is injured.
    d) A suicide victim is stranded and has second thoughts.

24. Discuss the procedure for rescuing a victim wearing a harness.
    a) Rappel, using a brake bar rack, to just above the victim and lock the rappel system.
    b) Clip in a rescue strap or sling between the victim's harness and the rescuer's harness.
    c) Adjust the friction on the brake bar rack to compensate for the additional load.
    d) Make sure the link between the rescuer and victim is secured and locked.
    e) Unlock the rappel system and slowly descend to the ground.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 204 through 208.
Delmar Engineering Practical Rope Rescue Systems, page 176 and 177.

25. Discuss the procedure for rescuing a victim not wearing a harness.
    a) Have the rescuer lowered to the victim.
    b) This technique allows the rescuer to have both hands free to secure the harness to the victim.
    c) The rescuer should carry a tied web sling of approximately 5' - 7' long wide for use as a seat harness and a tied 4' - 5' long of the same width for use as a chest harness, 3 extra carabiners, a

rescue strap or sling and a short tether sling.

d) The rescuer is lowered into position behind the victim.
e) The rescuer attaches the modified seat and chest harness and connects the two together.
f) The rescuer then secures the rescue strap or sling between the victim's seat harness and the rescuer's seat harness.
g) Make sure the rescue strap is secured and locked.
h) The rescuer can then be raised, using a pig-rig on the lower line, until the slack is taken up on the rescue strap, and enough slack is created in the victim's line so it can be released from the victim's harness.
i) Both victim and rescuer can be lowered to the ground.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 209 through 212.
Reference: Delmar Engineering Practical Rope Rescue Systems pages, 176 through 178

APPLICATION

Assemble the Technical Rescuers at the training site. Inspect the site to ensure all safety issues have been addressed. Inspect equipment. Verify the security of all anchor points. Provide edge protection for lifelines. Make sure all the Technical Rescuers have the appropriate PPE to perform the skills. Divide the Technical Rescuers into task groups. Assign each group to a skill station. Upon each group's completion of a skill, have each group rotate to the next station.

Skill Station 1 - Have the Technical Rescuer demonstrate rigging a rappelling system using a rescue figure-of-eight plate and rappel to the ground demonstrating control and proper posture. At some point during the descent, have the Technical Rescuer stop the descent and demonstrate safely locking off the rescue figure-of-eight plate, then unlocking it and completing the descent.

Skill Station 2 - Have the Technical Rescuer demonstrate rigging a rappelling system using a brake bar rack and rappel to the ground demonstrating control and proper

posture. At some point during the descent, have the Technical Rescuer stop the descent and demonstrate safely locking off the brake bar rack then unlocking it and completing the descent.

Skill Station 3 - Have the Technical Rescuer rappel a short distance down a lifeline incorporating a Prussik belay attached between the seat harness and the lifeline. Advise the Technical Rescuer to let the Prussik belay jam, then have the Technical Rescuer demonstrate the correct procedures for performing a self rescue maneuver and continue the rappel to the ground.

Skill Station 4 - Have the group of Technical Rescuers construct a lowering system with a back-up safety line. The rescuer carrying the appropriate victim harness equipment, shall be lowered to the victim and secure the seat and chest harness and rescue strap to the victim. The Technical Rescuers will then demonstrate a coordinated pick-off evolution using a lowering system to safely bring the rescuer and victim to the ground.

Skill Station 5 - Have the group of Technical Rescuers construct a rappelling system with a back-up safety line. The rescue shall rappel down to the victim and perform the necessary skills to transfer the victim over to the rescuer's line. The Technical Rescuer will then demonstrate a coordinated pick-off evolution and rappel with the victim safely to the ground.

Skill Station 6 - Have the group of Technical Rescuers construct a rappelling system with a back-up safety line, the rescuer shall demonstrate a controlled rappel using an emergency escape system.

NOTE: Each station should have a minimum of 2 instructors. Depending on how many stations are run simultaneously, more instructors may be required. If deemed necessary by the lead instructor, a safety instructor should be on a rappel line to assist students that may get into trouble. If there are Technical Rescuers who have no rappelling experience or who have a fear of heights, a suggestion might be to start them at a low level height before requiring them to rappel from the recommended height. Have a top belay

system attached to the Technical Rescuer while they are performing all of the above skills.

PRESENTATION

ENABLING OBJECTIVE 2

The Technical Rescuer given the appropriate equipment shall correctly identify, describe, and demonstrate rigging and using various ascending techniques.

1. Discuss the benefits that fire/rescue personnel receive when learning basic ascending techniques.
   a) It builds confidence for high angle rescue operations.
   b) It allows rescuers more flexibility to move up and down a fixed lifeline.

2. Describe how mechanical ascenders work.
   a) The ascender when under load, creates an offset camming action by pressing the cam against the lifeline preventing the ascender from slipping down the lifeline.

3. Identify the three types of ascenders.
   a) Friction hitches are the most commonly used. They are the triple wrap Prussik hitch, and the Purcell Prussik. Friction hitches offer the best friction and rope protection.
   b) Light use ascenders, also called personal use ascenders, include tooth type cams and other ascenders rated for technical load.
   c) General use ascenders include Gibbs, Rock, Exotica, and others rated for rescue loads.
   d) Ascender frames are made of cast aluminum and can crack or break when subjected to high stress.
   e) Ascenders with teeth (light duty) can tear the rope when subjected to a shock load as little as 800 pounds.
   f) Light duty ascenders work best is a vertical mode.
   g) When placed at an angle the rope may pop out of the ascender.

4. Demonstrate procedures for attaching an ascender to a lifeline.

Reference: High Angle Rescue Techniques, 3rd Edition, page 144 through 151.

5. Discuss and demonstrate the procedures for constructing a two point ascending system, and point out the important steps.
    a) Attach the harness sling to the lifeline using a triple wrap Prussik and connect it to the rescuer's seat harness.
    b) Connect the medium Prussik below the harness sling, using a triple wrap Prussik hitch.
    c) To start ascending, stand up on the foot sling.
    d) Move the harness sling up the lifeline as far as it will go.
    e) Load the seat ascending device with body weight.
    f) Slide the foot ascending device up the lifeline as far as it will go, and then step up.
    g) Repeat steps listed in e - f until the destination is reached.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 151 through 155.

6. Discuss and demonstrate procedures for constructing a three point ascending system.
    a) Attach the harness sling to the lifeline using a triple-wrap Prussik and connect it to the rescuer's seat harness.
    b) Connect the long Prussik below the harness sling using a triple wrap Prussik hitch.
    c) Connect the medium Prussik below the harness sling using a triple wrap Prussik hitch.
    d) To start ascending, stand up on foot slings.
    e) Move the seat ascender up the lifeline as far as it will go.
    f) Load the seat ascending device with body weight.
    g) Slide the dominant foot ascending device up the lifeline as far as it will go, and then step up.
    h) Repeat steps listed in e - g until the destination is reached.

NOTE: As an alternate method, the Prussiks and harness sling can be attached to the lifeline using commercial ascenders.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 155 through 157.

7. Discuss the technique of tying off short, and discuss situations that may cause the rescuer to use the technique.
    a) Tying off short is a technique whereby the rescuer ties directly to the mainline to ensure added protection in the event trouble occurs during the ascent.
    b) The rescuer, using a two point ascending system, may have to cross over a knot.
    c) The rescuer is using a system that cannot guarantee the rescuer remains upright in the system.

8. Demonstrate tying off short.
    a) Pick up the slack out of the lifeline just below the lowest ascender and tie a figure-eight-on-a-bight into it.
    b) Clip the knot into a spare carabiner and attach it to the rescuer's seat harness.
    c) Complete the move past the obstacle.
    d) Unclip and untie the knot and let the slack of the lifeline drop below the rescuer.

Reference: High Angle Rescue Techniques, 3rd Edition, page 152 through 154.

9. Demonstrate switching from an ascending system to a rappelling system.
    a) Assume a sitting position to allow the seat harness ascender to lock.
    b) Slide the foot slings down the lifeline to create slack in the lifeline between the seat harness and the foot slings.
    c) Attach the rappelling device onto the lifeline between the seat harness and the foot slings.
    d) Take up any slack that exists between the seat harness ascender and the rappelling device.
    e) Lock off the rappelling device.
    f) Slide the foot slings back up the lifeline enough to allow the rescuer to step up and take pressure off the seat harness ascender.
    g) Remove the seat harness ascender from the lifeline.

h) Sit back down on seat harness until the rappelling device takes the load.
i) Remove foot sling ascenders from the lifeline.
j) Unlock rappelling device and perform a controlled descent to the ground.

Reference: High Angle Rescue Techniques, 3rd Edition, page 158 through 160.

10. Demonstrate switching from a rappelling system to an ascending system.
    a) Stop the rappel and lock off the rappel device.
    b) Attach the top ascender, coming from the seat harness, just as high above the descender as it can be pushed.
    c) Attach the foot ascender and sling to the lifeline at the appropriate point below the descender.
    d) When the ascenders are securely attached, unlock the descender and slowly let the lifeline through it.
    e) When the rescuer's weight is off the descender, remove the descender from the lifeline and clip it to the seat harness and begin the ascent.

Reference: High Angle Rescue Techniques, 3rd Edition, page 158 through 161.

11. Discuss and demonstrate extricating a jammed obstacle from a descender.
    a) Begin rappelling.
    b) Simulate a jammed descender by locking the descender off.
    c) Attach the top ascender, coming from the seat harness, just as high above the descender as it can be pushed.
    d) Attach the foot ascender and sling to the lifeline above the descender.
    e) When the ascenders are securely attached, step on the foot sling and take the weight of the descender.
    f) Remove the obstruction. Unlock the descender and let it go slack.
    g) Put your weight on the foot ascender sling and remove the seat harness ascender.
    h) Shift your weight off the foot ascender onto the rappel device.

i) Remove both ascenders from the lifeline.
j) Unlock the descender and continue with the rappel.

Reference: High Angle Rescue Techniques, 3rd Edition, page 160 through 163.

APPLICATION

Assemble the Technical Rescuers at the training site. Inspect the site to ensure all safety issues have been addressed. Inspect equipment and check anchor points. Provide edge protection for lifelines. Make sure all of the Technical Rescuers have the appropriate PPE to perform the skills. Divide the Technical Rescuers into three groups and assign each group to a skill station. Upon each group's completion of a skill, have each group rotate to the next station. A minimum of two instructors is recommended for this session. One instructor should be assigned to the top location where the rappelling begins, while another instructor should be assigned to the ground level.

Skill Station 1 - Have the Technical Rescuer construct a two point ascending system and demonstrate rappelling a fixed line a minimum of 15'. Have the Technical Rescuer then demonstrate safely switching to an ascending system and ascend the same distance.

Skill Station 2 - Have the Technical Rescuer construct a three point ascending system and demonstrate ascending a fixed line a minimum of 15'. Have the Technical Rescuer then demonstrate safely switching to a rappelling system and rappelling back to the ground.

Skill Station 3 - Have the Technical Rescuer demonstrate, using a two point ascending system, tying off short to pass a knot and recover.

NOTE: A Prussik hitch can be placed on the lifeline to simulate a knot.

Skill Station 4 - Have the Technical Rescuer demonstrate dislodging a jammed obstruction from a rappel device.

NOTE: If deemed necessary by the lead instructor, a safety instructor should be on a rappel line to assist students that

may get into trouble. A dynamic fixed rope system is recommended, allowing the fixed rope to be lowered with the student on the system in the event of an emergency. Have a top belay system attached to the Technical Rescuer's chest harnesses while they are ascending and descending. Have a person hold tension on the lifeline at ground level initially for an easier start of the ascending operation.

SUMMARY

Being able to safely establish and utilize fixed rope systems in rope rescue operations is a critical component of the Technical Rescuer's overall abilities. Rappelling and ascending are both necessary components of the Technical Rescuer's knowledge base. Each of these operations involves specific steps and techniques, both of which are based on safety and efficiency. A thorough review of each of these operations is warranted due to the fact that all of them are conducted at some level of elevation above or below ground. Mistakes are not tolerated well in these situations. They usually have catastrophic results for patients and rescuers. It is imperative that the Technical Rescuer practice the lessons learned here, not only from the aspect of safety, but also for confidence and comfort. For a Technical Rescuer to safely perform rescue operations from a lifeline with confidence, a certain sense of being comfortable with the operation is required.