

Tower Rescue

Lesson Two

Tower Rescue: Climbing, Equipment, and Safety

DOMAIN: AFFECTIVE / PYSCHOMOTOR

LEVEL OF LEARNING: COMPREHENSION /
APPLICATION

MATERIALS

IFSTA Fire Service Search and Rescue, 7th edition; IFSTA 5th edition Essentials of Firefighting; Tower Rescue for Emergency Responders; NFPA 1983 edition Fire Service Life Safety Rope and System Components Standard. Laptop computer, multimedia projector, whiteboard or flipchart, and marking pens. A display of various rope rescue hardware should be made available; examples should include steel and aluminum carabiners, tri-links, a rescue 8 rappelling device, pulleys, rigging plates ascending devices, hardware used for controlling descents such as brake bar racks, brake tubes, **any other approved rope rescue hardware used by the AHJ.**

All equipment used for this lesson plan shall conform to the appropriate NFPA standards for use and safety.

TERMINAL OBJECTIVE

The tower rescue candidate, given the appropriate equipment, shall correctly identify various types of equipment used for rescue, describe in writing their purpose, and demonstrate the use of each type of equipment in various rescue applications.

ENABLING OBJECTIVES

1. The tower rescue candidate shall correctly identify in writing, guidelines established by NFPA and OSHA standards for the safe use of ropes and related rope rescue equipment.
2. The tower rescue candidate shall correctly describe in writing, how to correctly inspect and maintain lifeline rope.
3. The tower rescue candidate shall demonstrate knowledge in basic tower rescue equipment.
4. The tower rescue candidate when given an exam shall demonstrate knowledge of safety for tower rescue operations.
5. The tower rescue candidate when given an exam shall demonstrate knowledge in general rigging for tower rescue operations.
6. The tower rescue candidate when given an exam shall demonstrate knowledge of tower climbing and fall protection.

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MOTIVATION

Life safety rope and related equipment is used for a variety of rescue related functions. They are designed to protect rescuers and patients as they work and move in elevated and below grade environments. The ropes, knots, and rope related rescue equipment discussed in this lesson plan will assist the rescuers with raising and lowering rescuers and patients, and allow rescuers to create mechanical advantage systems. NFPA 1983 has established a set of guidelines that attempts to inform rescuers of the safe use and limitations of the ropes and related equipment. In order to operate safely at a rescue scene, it is important that rescuers have a good basic knowledge of the application and limitations of the ropes and related rope rescue equipment being used.

NOTE: Have a display of equipment available for discussion. (Show Petzel ID, Petzel Stop, and other specialty equipment, if available).

PRESENTATION

ENABLING OBJECTIVE #1

The tower rescue candidate shall correctly identify in writing, guidelines established by NFPA and OSHA standards for the safe use of ropes, and related rope rescue equipment.

1. Discuss the criteria and purpose of NFPA 1983.
 - a. These criteria are designed to address safety guidelines regarding the use of rope and related

- equipment that effect various fire and rescue activity.
- b. They are intended to provide minimum performance requirements to insure the safety of the rescuers and the general public that may be affected by the operational use of the equipment.
2. Discuss with the candidate terminology established by NFPA 1983 Standard for Fire Service Life Safety Ropes and System Components for rope rescue activities.
- a. Adjusting device – a connector device that allows adjustment to a piece of equipment.
 - b. Ascent device – a friction or mechanical device utilized to allow ascension of a fixed line.
 - c. Block and Creel – rope constructed without knots or splices.
 - d. Carabiner – an oval or "D" shaped metal load bearing connector with a self-closing gate used to join other components of a rope system.
 - e. Descent control device – a friction or mechanical device utilized with rope to control descent.
 - f. Design Load – the load for which a given piece of equipment or system is rated.
 - g. General use – previously designated as a two person load. A system or system component designed for general use loads, light use loads, and escape.
 - h. Hardware – auxiliary equipment that includes but not limited to ascent devices, carabiners, descent devices, pulleys, rings, snap links, and rigging plates.
 - i. Life safety harness – an arrangement of materials secured around the body used to support a person during a rescue operation.
 - j. Life safety rope – rope solely dedicated to supporting persons during rescue, firefighting, other emergency operations, or during training.
 - k. Light use – previously designated as a one-person load. A system or system component designed for light use loads and escape.
 - l. Rope grab device – auxiliary equipment used to grasp a life safety rope to support a load. It can be used as an ascension device.
 - m. Snap link – a self -closing, gated, load bearing connector.

3. Discuss the differences between the three classes of rescue harnesses. Also discuss and demonstrate tying the modified harnesses to include the rescue knot, the seat harness, and the seat harness with chest harness.
 - a. Class I – designed for emergency escape for light use, design load of 300 lb.
 - b. Class II – designed for rescue operations, design load is 600 lb. This is the same as a Class I harness except for labeling and load-rating. A “Swiss seat” is an improvised Class II harness.
 - c. Class III – designed for rescue operations. The design load is 600 lb.
 - d. Webbing used for constructing any improvised harness, used to support a human, shall be a minimum of 1 3/4" inch width and have a breaking strength of 6,000 lb.
4. Point out that a ladder belt is not classified as a life safety harness.
5. Identify and discuss the safety checks that should be conducted for rescue harnesses.
 - a. Check Class I, II, and III rescue harness straps and buckles. Check for frayed stitching and damaged metal. Follow the manufacturer’s guidelines for use, inspection, and maintenance.
6. Demonstrate the two modified harnesses listed in this lesson plan. Have the candidates practice each.
 - a. Seat harness with chest harness.
 - b. Other devices available to jurisdiction.
7. Illustrate various product label certifications.
 - a. Discuss the importance of product labeling and warning labels.
8. Discuss the design, use, and safety considerations of rescue rings.
 - a. Steel rings are used for various load-bearing applications.
 - b. They are also rated as a multi-directional anchor.
9. Discuss the design, use, and safety considerations of swivels.

- a. Swivels are applied at the anchor attachment point.
 - b. They must be rated for life safety loads.
 - c. Swivels prevent ropes in a mechanical advantage system from twisting, and reducing the friction created by ropes rubbing on each other.
10. Discuss the design, use, and safety considerations of a 540 belay.
- a. Device is designed to be a belay only.
 - b. Made up of a removable side plate, release lever, and oblong cam.
 - c. Must use a push pull technique with the rope to prevent the device from locking.
11. Point out that when using commercial rope grab devices follow the manufacturer's guidelines and safety precautions when incorporating these devices into a mechanical advantage system.
12. Emphasize the importance of verifying whether or not the device is designed for use in a mechanical advantage system and identify the limitations of its use.
13. Ascenders should not be used as a load-capturing device.
14. Discuss the design, use, and safety considerations of figure of eight plates.
- a. They are designed as a double ring unit made of steel or anodized aluminum.
 - b. They are used primarily as a descending device for rappelling.
 - c. Figure of eight plates with appendages (ears) on a larger ring are commonly called Rescue 8s.
 - d. The ears prevent the rope from slipping out of place and forming a girth hitch.
 - e. The Rescue 8s will easily accommodate up to a 5/8" single rope or a two 7/16" ropes.
 - f. Demonstrate rigging a figure of eight plate.
 - g. Descent distance should be limited to 75' to 100' when using a figure of 8 plate.

NOTE: Most manufacturers advise rescuers not to use a figure of eight plate or rescue eight plates as a multi-

directional load bearing device as shown in figure 4.47 on page 101 of the IFSTA Fire Service Rescue manual. Always follow manufacturer's guidelines for use.

15. Discuss and give an example of a brake tube.
 - a. A brake tube is a large aluminum alloy tube with a right angle vertical post and a screw locking gate, designed to function as an oversized friction device, rope is wrapped around the tube 3 - 4 times, it can accommodate single or double ropes, and has the capability of passing a knot.

16. Discuss the design, use, and safety considerations of edge protectors.
 - a. They reduce friction created by the rope going over the edge.
 - b. They protect rope from abrasion, cuts and snags.

17. Show examples of various edge protectors such as carpet, canvas pads, fire hose, and dynamic protectors such as edge rollers.

Reference: IFSTA Fire Service Search and Rescue, 7th edition Pages 120 through 127.

PRESENTATION

ENABLING OBJECTIVE #2

The tower rescuer candidate shall correctly describe, in writing, how to correctly inspect, and maintain lifeline rope.

Note: This Enabling Objective is designed to be a quick review of inspection and maintenance of lifeline rope. Students should already have a basic knowledge of this information.

1. Discuss the inspection, care and maintenance of lifeline rope.
 - a. The criterion for the inspection and care of lifeline rope is established by NFPA 1983.
 - b. Check for visible damage, such as a cut sheath or core, or soft spots on the sheath.
 - c. Check for irregular shape, foul smell, and discoloration.

- d. Make sure rope has not been exposed to heat, direct flame impingement, or abrasion. Mild abrasion after multiple uses is normal.
 - e. Rope has not been subjected to any shock load.
 - f. Rope has not been exposed to liquids, solids, gases, mist or vapors of any chemicals or other products that can deteriorate the rope.
 - g. Rope passes inspection when inspected by a qualified person following the manufacturer's procedure both before and after each use.
 - h. Rope not passing inspection should be discarded or cut into short lengths and used as utility rope.
 - i. Rope logs should be maintained for each lifeline for the duration of its in-service life.
 - j. Many rope rescue experts recommend a shelf life for lifeline of 5-7 years and not to exceed 10 years. Check with manufacturer.
 - k. A rope log should reflect types of usage and maintenance. Provide a sample rope log.
2. Emphasize that the individuals responsible for care and maintenance should have a thorough knowledge of lifeline construction and characteristics and potential hazards and limitations resulting from in-field application and be well versed with the NFPA 1983 ropes and ancillary equipment standard.

Reference: Fire Service Search and Rescue, 7th Edition, pages 111 through 113; Manufacturer's Specification manuals.

PRESENTATION

ENABLING OBJECTIVE #3

The tower rescue candidate shall demonstrate knowledge in basic tower rescue equipment.

1. Briefly discuss the importance of the following tower rescue equipment.
 - a. Anchors Straps
 - b. Hard Helmets
 - c. Positioning Lanyard (Safety Strap)
 - d. Other suggested Equipment for Tower Rescue

Reference: Tower Rescue for Emergency Responders, pages 61-67.

PRESENTATION

ENABLING OBJECTIVE #4

The tower rescue candidate when given an exam shall demonstrate knowledge of safety for tower rescue operations.

1. Discuss the need of a safety officer to be appointed.
2. Discuss how the safety officer should continue to keep their eyes on the tower.
3. Discuss the need for each connection to be double checked before performing a rescue.
4. Discuss the need of each rescuer to maintain two points of attachment while on the tower.
5. Discuss the need for establishing a safety line for the climbing emergency responders.

Reference: Tower Rescue for Emergency Responders, pages 43-44.

PRESENTATION

ENABLING OBJECTIVE #5

The tower rescue candidate when given an exam shall demonstrate knowledge in general rigging for tower rescue operations.

1. Discuss the importance of rigging the main or “working” line.
2. Discuss the following points about “brakes”:
 - a. Traveling brake.
 - b. Fixed brake.
 - c. Brake types (manual and auto stop).
 - d. Brake position relative to tower.
 - e. Methods of lifting a victim with traumatic injuries using a ground-based brake.
3. Discuss rigging the belay or safety line.
4. Discuss the belay line position.

5. Discuss rigging anchors.
 - a. Discuss individual anchors.
 - b. Discuss anchor systems.
6. Discuss methods of moving equipment up and down the tower.

Reference: Tower Rescue for Emergency Responders, pages 53-60, 73-75.

PRESENTATION

ENABLING OBJECTIVE #6

The tower rescue candidate when given an exam shall demonstrate knowledge of tower climbing and fall protection.

1. Define "Fall Severity".
2. Discuss how fall severity is dependent on three factors:
 - a. Mass
 - b. Nature of Rope
 - c. Fall Factor
3. Discuss various tips on tower climbing.
 - a. Look
 - b. Arms straight
 - c. Climb with hands in front
 - d. Climb with legs
4. Discuss rest positions.
 - a. Leg wrap technique
 - b. Positioning safety lanyard
 - c. Climb and/or rest on inside of tower
5. Discuss the different types of fall protection available to emergency responders when performing tower rescues.
 - a. General fall protection.
 - b. Towers with fall protection.
6. Discuss fall protection for towers without fall protection.

- a. Double lanyard fall protection
 - b. Advance-placement fall protection
 - c. Lead climbing fall protection
7. Discuss lead climbing communications.
 8. Discuss harness induced pathology and how it affects rescuers and victims.

Reference: Tower Rescue for Emergency Responders, page 69-93.

Summary

Safety is paramount in everything we do. Tower rescue as with all rescues must be accomplished with safety in mind, ensuring proven techniques and safety standards are always used and met.