

Office of the State Fire Marshal

Rope Operations

Objectives

Cognitive Objectives

56-1 Course Introduction

- 56-1.1 State requirements
- A. Prerequisites for the course
 - i. FF II
 - ii. TRA
 - B. Length of course – minimum of 40 hours
 - C. Successful completion of the course
 - D. 100% completion of practical skills
 - E. Passing score on end of course examination
 - F. Passing score on the State Examination
- 56-1.2 Applicable Standards
- A. NFPA 1983, Standard on Fire Services Life Safety Rope and Components, 2001 Edition
 - B. NFPA 1670, Standard on Operations and Training for Technical Rescue Incidents, 1999 Edition
 - C. NFPA 1006, Standard for Rescue Technician Professional Qualifications, 2003 Edition
 - D. Authority Having Jurisdiction
- 56-1.3 Required student manual
- A. High Angle Rescue Techniques 2nd Edition, Tom Vines and Steve Hudson

56-2 Safety

- 56-2.1 Identify safety considerations for rope rescue operations.
(Students must practice safety techniques during the course.)
- A. Edge protection

- B. Belays
- C. Critical angles
- D. Safety checks
- E. Communications

56-3 Factors that influence rope rescue operations

56-3.1 Describe examples for each of the following factors that affect rope rescue operations.

- A. Human
- B. Risks/Benefits
- C. Equipment
- D. Weight
- E. Direction of forces
- F. Friction
- G. Weather

56-4 Rope

56-4.1 Describe the differences of the following standards and regulations that pertain to rope rescue operations

- A. NFPA 1983
- B. NFPA 1670
- C. NFPA 1006
- D. Authority having jurisdiction

56-4.2 Describe the criteria for the selection of rope according to work being performed

56-4.3 Name the following two categories of rope fibers

- A. Natural
- B. Synthetic

56-4.4 List characteristics of natural and synthetic fibers used to manufacture rope

56-4.5 List advantages and disadvantages of the following natural fibers used to manufacture rope

- A. Manila
- B. Hemp
- C. Sisal
- D. Cotton

56-4.6 List advantages and disadvantages of the following fibers

- A. Nylon
- B. Polyester
- C. Kevlar
- D. Aramine

56-4.7 Describe the characteristics for the following four types of rope construction

- A. Laid
- B. Braid
- C. Plait
- D. Kernmantle

56-4.8 Describe the following NFPA requirements for life safety rope

- A. Breaking (tensile) strength of
 - i. General use
 - ii. Personal use
- B. Diameter of
 - i. General use
 - ii. Personal use
- C. Rope inspection

56-5 Equipment

56-5.1 Describe the types, intended uses, limitations, care and maintenance of the following rescue software

- A. Accessory cord
- B. Webbing
- C. Adjustable straps
- D. Non-adjustable straps
- E. Harnesses

56-5.2 Describe the types, intended uses, limitations, care and maintenance of the following rescue hardware

- A. Descent control devices
- B. Mechanical rope grab devices
- C. Ascenders
- D. Carabiners
- E. Screw links
- F. Pulleys
- G. Rigging plates

- H. Anchor plates
- I. Rescue litters

56-5.3 Describe the types, intended uses, limitations, care and maintenance of the following personal protective equipment

- A. Helmets
- B. Gloves
- C. Boots
- D. Eye protection
- E. Ear protection
- F. Other clothing

56-6 Knots

56-6.1 Define the following terms associated with rope

- A. Bend
- B. Bight
- C. Hitch
- D. Knot
- E. Loop
- F. Round turn

56-6.2 List effects knots have on a rope

56-6.3 Describe qualities of good knots, bends, and hitches

56-6.4 Describe typical applications of the following knots, bends, and hitches

- A. Figure Eight
- B. Figure Eight on a Bight
- C. Figure Eight Follow-through
- D. Butterfly (Lineman's loop)
- E. Double overhand knot
- F. Triple Fisherman's Bend
- G. Triple-wrap Prusik Hitch
- H. Clove Hitch
- I. Load Releasing Hitch
- J. Overhand Bend (Water Knot, Ring Bend) in webbing

56-7 Anchors

56-7.1 Describe qualities of an anchor

56-7.2 Describe forces that are applied to anchors

56-7.3 Describe process for selecting an appropriate anchor

56-7.4 Explain purposes for directional anchors

56-7.5 Describe components for a load distribution anchor system

56-8 Belaying

56-8.1 Describe the characteristics of a belay system with a Munter Hitch.

56-9 Descending

56-9.1 Describe characteristics of a rescuer descent system with a fixed rope in a low angle environment

56-10 Ascending

56-10.1 Describe characteristics of a rescuer ascent system with a fixed rope in a low angle environment

56-11 Lowering

56-11.1 Describe characteristics of a lowering system with a fixed six-bar brake bar rack

56-12 Hauling

56-12.1 Describe characteristics of a mechanical advantage hauling system

56-12.2 Describe haul system commands

56-13 Hasty Harness

56-13.1 Describe intended uses of a hasty harness with an attachment point above the person's center of gravity

56-14 Patient Packaging

56-14.1 Describe procedures for packaging a patient using the following:

- A. Short / half boards
- B. Long boards
 - i. Rigid
 - ii. Semi-Rigid
- C. Rescue Litter (Stokes)

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56-15 Litter Basket Movement

56-15.1 Describe functions of litter team members in a low angle environment

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Practical Objectives

- 56-16** Given a summary of a system safety check, a rope rescue scenario, rope rescue equipment, the student shall demonstrate working knowledge and the ability to conduct a system safety check with 100 % accuracy.
- 56-17** Given a summary of the following knots, bends and hitches, rope rescue equipment, the student shall demonstrate working knowledge and tie the following knots, bends, and hitches with 100 % accuracy within the allotted time.
- 56-17.1** **Figure Eight**
 - 56-17.2** **Figure Eight on a Bight**
 - 56-17.3** **Figure Eight Follow-through**
 - 56-17.4*** **Butterfly (Lineman's loop)**
 - 56-17.5*** **Double Overhand Knot (Half of a double Fisherman's Bend)**
 - 56-17.6** **Triple Fisherman's Bend**
 - 56-17.7** **Triple Wrap Prusik hitch**
 - 56-17.8** **Load Releasing Hitch with Munter Hitch**
 - 56-17.9** **Overhand Bend (a.k.a Water Knot, Ring Bend) in webbing**
 - 56-17.10** **Clove Hitch**
 - 56-17.11** **Munter Hitch**
- 56-18** Given a summary of the following sling configurations, rope rescue equipment, the student shall demonstrate working knowledge and construct the following sling configurations with 100 % accuracy within the allotted time.
- 56-18.1** **Loop**
 - 56-18.2** **Basket**
 - 56-18.3** **Basket wrap**

56-19 Construct the following anchor systems

- 56-19.1** **Tensionless Hitch**
- 56-19.2** **Two-point load distribution (*self-adjusting*)**
- 56-19.3** **Three-point load distribution (*self-adjusting*)**

56-20 Demonstrate the construction of a belay system with a Munter Hitch**56-21 Demonstrate the ability to belay (with a Munter Hitch) a person being vertically lowered a minimum of 20'.****56-22 Demonstrate the ability belay (with a Munter Hitch) a person being vertically raised a minimum of 20'.****56-23 Demonstrate the ability to construct a fixed rope system****56-24 Demonstrate descending a fixed rope system using a mechanical device in a low angle environment****56-25 Demonstrate ascending a fixed rope system using a mechanical device in a low angle environment****56-26 Demonstrate the construction of a lowering system with a fixed brake bar rack****56-27 Demonstrate lowering a person with a fixed brake bar rack in a low angle environment****56-28 Demonstrate lowering a person with a fixed brake bar rack in a vertical environment a minimum of 20'.****56-29 Demonstrate the construction of the following mechanical advantage hauling systems**

- 56-29.1** **3:1 Z Rig (In-line)**
- 56-29.2** **3:1 attached to the main line**
- 56-29.3** **4:1 Piggy back (attached to the main line)**
- 56-29.4** **4:1 in-line (block and tackle)**

56-30 Demonstrate the use of the following mechanical advantage hauling systems in a vertical environment with a minimum of three sets hauling and readjusting (re-setting) the system

- 56-30.1** **3:1 Z Rig (In-line)**
- 56-30.2** **3:1 attached to the main line**
- 56-30.3** **4:1 Piggy back (attached to the main line)**
- 56-30.4** **4:1 in-line (block and tackle)**

- 56-31 Demonstrate the ability to convert a mechanical advantage system using a load releasing hitch from raising to lowering**
- 56-32 Demonstrate the construction of a hasty harness with an attachment point above the person's center of gravity so as to prevent inverting**
- 56-33 Demonstrate the ability to immobilize a person on a full body board for transport in a litter basket**
- 56-34 Demonstrate the packaging of a person in a litter basket**
- 56-35 Demonstrate the ability to function as a litter attendant in a low angle environment**
- 56-36 Demonstrate the ability to direct a team using a hauling system to raise a person over an edge.**
- 56-37 Demonstrate the ability to direct a team using a lowering system to lower a person over an edge.**
- 56-38 Demonstrate the ability to be lowered over the edge of a roof, a parapet, and/or a railing in an environment involving a free space a minimum of 20'.**
- 56-39 Demonstrate the ability to be raised over the edge of a roof, a parapet, and/or a railing in an environment involving a free space a minimum of 20'.**