

Suffolk County Fire Academy
Rope Rescue Operations





Suffolk County Fire Academy

1

House-Keeping

- Instructors
- Students
- Paperwork (SCFA, NYS ID #)
- Student Manuals
- Exits
- Cell Phones and Pagers.




2

Course Overview

2 Sessions

- Session 1
 - Safety Orientation
 - Risk Assessment
 - Rescue Knots
 - Rappel and Ascending Overview
 - Hands-on Evolutions.



3

Course Objectives

- Describe size-up of a rope rescue incident to include determination of the type of rescue, number of victims and their last reported location, resource assessment, identification of search parameters, and incident action plan development (NFPA 1006 5.2.1)
- List maintenance and inspection procedures used for rope rescue equipment and PPE following organizational standard operating procedures and manufacturing guidelines (NFPA 1006 5.2.2 & 5.2.3)
- Demonstrate knots, bends, and hitches so that the knots are dressed, recognizable, and backed up as required (NFPA 1006 5.2.4).

4

Course Objectives (Cont'd)

- Construct a single point anchor system ensuring an efficient anchor point is chosen, the need for redundant anchor points is assessed and used as required, the anchor system is inspected and loaded prior to being placed into service and the integrity of the system is maintained throughout the operation (NFPA 1006 5.2.5)
- Construct a multiple-point anchor system ensuring appropriate anchor points are chosen and are visually inspected prior to being put into service, the integrity of the system is maintained throughout the operation, and the force will be distributed between more than one anchor point (NFPA 1006 5.2.6).

5

Course Objectives (Cont'd)

- Perform a system safety check so that a physical/visual check of the system is made to ensure proper rigging, a load test is performed prior to life-loading the system, and verbal confirmation of these actions are announced and acknowledged before life-loading the rope system (NFPA 1006 5.2.7)
- Construct a system intended to provide belay within a single or two-tensioned rope system so that the system is capable of properly arresting a fall (NFPA 1006 5.2.9)
- Operate a system intended to provide belay within a single or two-tensioned rope system during a lowering or raising operation so that the potential fall factor is minimized, the belay is not actuated during normal lowering and raising operations, and the belay system is always prepared for actuation during the operation (NFPA 1006 5.2.10).

6

Course Objectives (Cont'd)

- **Construct a fixed rope system so that the system constructed can accommodate the load, is efficient, and is connected to an anchor system and the load, and is system safety checked prior to use (NFPA 1006 5.2.12)**
- **Construct and operate a lowering system so that the system can accommodate the load, is efficient, can control the descent, can hold the load in place or lower with minimal effort over the required distance, and is connected to an anchor system and the load (NFPA 1006 5.2.13 & 5.2.14).**

7

Course Objectives (Cont'd)

- **Construct and operate a simple mechanical advantage system so that the system constructed can accommodate the load, is efficient, and is connected to an anchor system and the load (NFPA 1006 5.2.15 & 5.2.16)**
- **Negotiate an edge while attached to a rope rescue system during a high-angle lowering and raising operation in a fashion which minimizes the risks to the rescuer and equipment (NFPA 1006 5.2.19)**
- **Prepare for transfer of victims so that rescuers and victims are protected from hazards and simulated victim injuries or illnesses are managed (NFPA 1006 5.2.20).**

8

Course Objectives (Cont'd)

- **Operate a litter-lowering and litter-raising operation in a high-angle environment so that the litter is attached to the lowering/raising and belay systems, an edge is negotiated during a lower and raise, tag lines are used to manage the litter during the lower and raise, the litter can be held in place when needed, operating methods do not stress the system to the point of failure, rope commands are used to direct the operation, and potential problems are identified, communicated, and managed (NFPA 1006 5.2.23)**
- **Demonstrate the ability to ascend and descend a fixed line (NFPA 1670 5.3.2)**
- **Identify and demonstrate the ability to perform self-rescue procedures while attached to a fixed line (NFPA 1670 5.3.2).**

9

Session Objectives
Session 1

- Demonstrate safe practices for working around vertical drops
- Perform a risk assessment of different vertical accident situations and determine a safe strategy for Rescue vs. Recovery
- Demonstrate an understanding of ropes and other specialized equipment used in urban/suburban vertical rope rescue and the correct procedures for the use and maintenance of that equipment.

10

Session Objectives (Cont'd)
Session 1

- Demonstrate an understanding of low angle vs. high angle rope systems and limitations of each
- Perform a self-controlled descent and demonstrate its application for rescue purposes
- Perform a self rescue during a self-controlled descent
- Construct a 3 prusik ascending rig and ascend a rope.

11

Safety Orientation



12

Safety Guidelines

- Never Step On Software
- Never Throw Or Drop Hardware
- Always Dress Your Knots
- Always Back Up Your Knots
- We Belay All "Lives."




DOUBLE OVERHAND
BACKUP KNOT



13

Safety Guidelines


- Never Hesitate To Ask A Question
- Always Ask "What If This Part Falls?"
- Lock All Carabiners
- Use And Follow Clear, Simple Communications
- Utilize The Incident Command System.



14

Safety Guidelines


- Smoking Is Not Permitted Around Equipment Or In The Drill Facility.
- Helmets With Chin Straps Fastened Are Required On Or Around The Drill Facility.
- Gloves Will Be Worn Whenever Working With Rope That Is "Under Load."



15

Safety Guidelines

DO NOT APPROACH AN EDGE UNLESS PROPERLY SECURED TO A SAFETY



16


Risk Assessment



17

Pre-plan Information

- **Site Survey**
- **Analysis of Past Incidents**
- **Assessment of Available Resources**
- **Training At The Site.**



18

Determination of Rescue vs. Recovery

- **Know Victim Is Alive**
 - Can see or hear victim
 - Report from a reliable source.



19

Determination of Rescue vs. Recovery

- **High Probability Victim Is Alive**
 - No known toxic conditions
 - Air space available
 - Victim fell less than 25 feet onto a moderately soft surface.



20

Determination of Rescue vs. Recovery


- **Low Probability Victim Is Alive**
 - Exposed to toxic or hazardous gasses or highly probable exposure
 - Minimal chance of air space remaining
 - Victim fell 50 feet or more onto a moderately hard surface.



21

Determination of Hazards


- **General Hazards Present or Potentially Present Might Include:**
 - **Unsafe ground or footing**
 - **Inadequate anchors**
 - **Improper equipment**
 - **Potential for falling objects**
 - **Potential for equipment damage from the work environment.**



22

Risk vs. Benefit

- **Danger To Rescuers**
- **Number of Victims**
- **Are Victims Salvageable**
- **Capabilities of Department**
- **Anything Overlooked?**



23


Rescue Knots



24

Knot Breaking Strengths

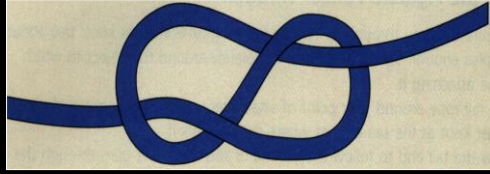
	Strength In lbs.	Percent Lost
ROPE	10,750	---
Figure 8	8,640	19%
Double Fisherman	8,440	21%
Figure 8 on a Bight	8,560	20%
Figure 8 Follow Through	8,640	19%
Double Loop Figure 8	8,820	18%
Bowline	7,180	33%
WEBBING	4,800	---
Water Knot	3,060	36%
Overhand Knot	5,128	35%



25

Figure 8 On A Bight

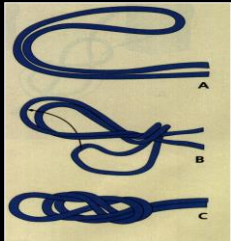

Used at **STOP**.
You, the rope bag,
"Whatever needs stopping"



26

Figure 8 On A Bight


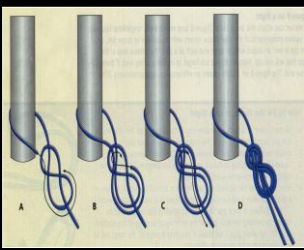
Primarily used
for anchor
systems and
attaching into
the rope

27

Figure 8 Follow Through


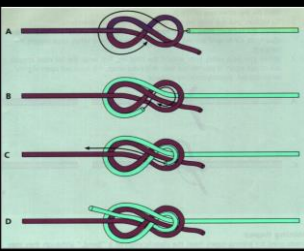
- Used to tie around an anchor OR through a point and around



28

Figure 8 On A Bend


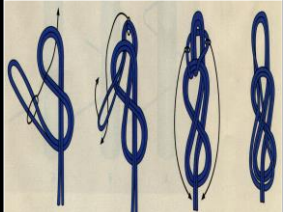
- Used to join two ropes together



29

Double Looped Figure 8

- Stronger version of 8 on bight
- Used to anchor OR as an attachment point



30

Overhand Knot

- Can be used as a safety OR to terminate the dead end of the rope











31

Butterfly Knot

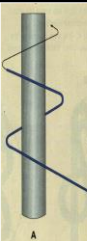



- Used to create a loop in the middle of the rope for an attachment point in a three directional pull

32

Tensionless Wrap

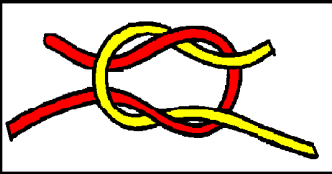

- Minimum of three wraps
- Number of wraps depends on anchor size
- Maintains 100% rope strength.

33

Square Knot

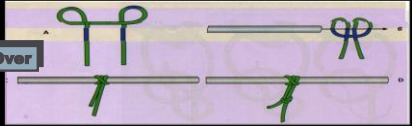
- Used to join two like size ropes together


34

Clove Hitch

Slip Over



In Line



35

Handcuff Knot

- Used for rapid victim removal




36

Munter Hitch

- Belay line
- Use X-large carabiner




37

Munter Hitch







Most Closed Position (Maximum Friction) Most Open Position (Least Friction) Tied Off




38

Double Fisherman Knot

- Connects two ropes OR rope into a loop (prusik cord)
- Triple wrapped used in tandem belay (safety)

- 1 
- 2 
- 3 
- 4 



39


Prusik Cord / Loop




40

Prusik Loop Diameter and Uses


- 6 MM
 - Personal use
 - Ascending and self rescue
- 7 MM
 - Personal use and rigging
- 8 and 9 MM
 - System applications
 - Shock absorbers, clutch systems, safeties.



41

Prusik Loop



- Useful As A Rope Grab
- Will Not Damage Rope
- “CLUTCHES” Rope Preventing Failure
- *SELF RESCUE & ASCENDING*
- In Tandem For Rescue Loads.



42

Prusik Loop Lengths


- SMALL - 5 FEET
- MEDIUM - 6 FEET
- LARGE - 8 FEET.



43

Webbing

- 1" Tubular (Spiral Weave Construction)
- 4000 lbs. - End to End
- 6000 lbs. - When Tied in a Loop
- 12,000 lbs. - Looped and Doubled
- Does Not Take Shock Well - Allows Little Stretch
- Should Be Replaced Often.



44

Water Knot



45

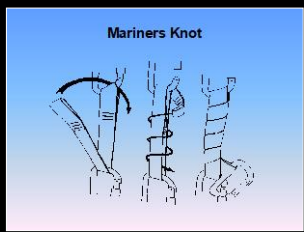
Care For Webbing

- Same as RESCUE ROPE
- Look For Glazed Areas
- Remember:
 - Single Pull Rating 4,000 lbs. End to End
 - Looped - 6,000 lbs.
 - Looped and Doubled - 12,000 lbs.
- Usually Needs Replacing More Often.



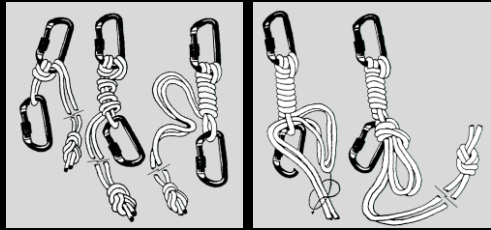
46

Mariners Hitch



47

BC Hitch



48


Rappel & Ascending Overview



49

Rappel Figure Eight With Ears

<p>Advantages</p> <ul style="list-style-type: none"> • Simple to use • Adjustable friction • Less expensive • Small size 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Imparts spin on rope • Height limited • Friction can not be adjusted once loaded.
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50

Rappel Figure Eight With Ears






51

Rappel Figure Eight With Ears



Locked
Off





52

Rappel Figure Eight With Ears




53

Rappel Brake Bar Rack

Advantages	Disadvantages
• Adjustable Friction	• More Complex
• Less Spin On Rope	• Takes Longer To Rig
• Dual Descent Control	• Bulkier
• Bars Confirm Correct Rigging	• Heavier.
• Can Accept Two Ropes	




54

Rappel Brake Bar Rack



55

Rappel Brake Bar Rack

Locked
Off



56

Rappel Brake Bar Rack



57

Prusik Self-Rescue



58

Ascend Single Line Technique



- Use Single 7mm (minimum) double wrapped prusik
- Prusik Guided By Free Hand
- Attached To Second Carabiner On Harness.



59

Ascend 3 Knot Prusik System



Dual Prusiks Attached To Harness

Prusik Foot Loop



60

**Ascend
3 Knot Prusik System**

61

**Ascend
3 Knot Prusik System**

62

Hands-On Stations

- Figure 8 Rappel
- Figure 8 Rappel With Self-Rescue
- Rack Rappel
- 3 Knot Prusik System and Rope Ascend.

63



64