



Tools/Ropes & Knots

Module 8



Basic tools

are used regularly on the fireground



Tools in the Fire Service

Introduction

Categories of Tools



Striking



Prying



Push/Pull



Cutting & Striking



Cutting



Power

Features of a Pick-Head Axe

Types of Tools: *Cutting Tools*

- Single-bit Axe
- Ideal axe head weighs 8 lbs
- Blade should be a smooth surface free of nicks and dings



Flat Head Axe

Types of Tools: *Cutting & Striking Tools*

Steel

single bit axe – blade smooth and free of nicks and dings



Opposite

side of the blade is a striking surface – can be used as a sledgehammer

Halligan Bar

Types of Tools: *Prying Tools*

Features

- Cross between a pry bar and claw tool
- Single piece of forged steel
- Commonly 30" long
- Weighs 9 lbs
- Works well as a forcible entry, ventilation and overhaul tool



Head

of the tool has several striking surfaces

Pike Pole

Types of Tools: *Push-Pull Tools*

One

of the oldest and most identifiable tools in the fire service

Uses

- Pull apart debris and burning materials
- Open walls and ceilings

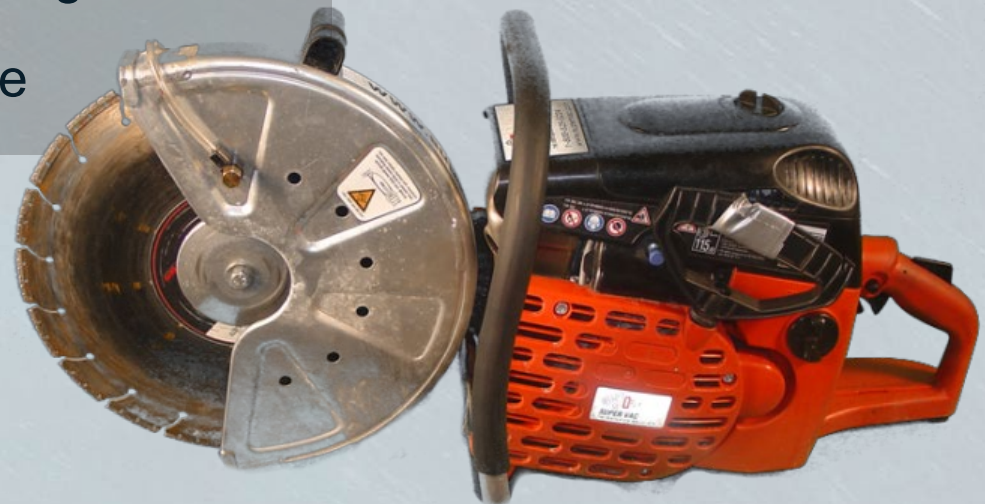


Rotary Power Saw

Power Saws: *Rotary Saws*

Basics

- Used in forcible entry, ventilation, breaching and demolition operations
- Also know as a cut-off, demolition or rescue saw
- Portable saw with 2-cycle engine
- Speed controlled by throttle



Design

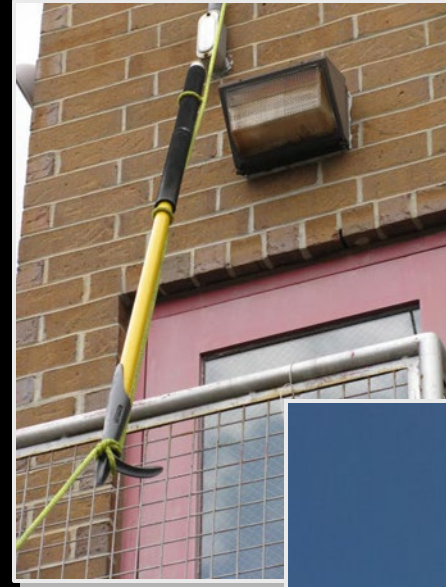
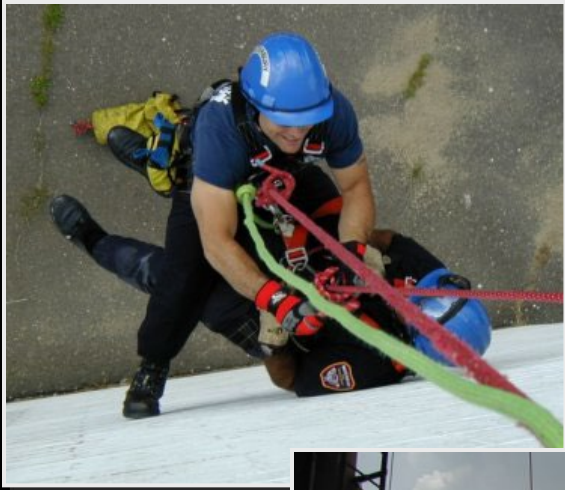
Power Saws: Chain Saws

Key Points

- Two-cycle engine
- Driveshaft rotates sprocket which spins the chain around the guide bar
- Throttle controls speed of chain
- Some saws have safety brake handle



Many types of incidents require the proficient use of ropes & knots



Ropes & Knots

Introduction

Knots

can be tied in more than one way -
Practice!



Firefighters

must understand how to tie knots as
well as inspect and maintain ropes

Synthetic Fiber Ropes

Rope Materials and Construction

Most

widely-used rope in the fire service



Advantages

- Excellent resistance to rot, mildew, physical & abrasion damage, and deterioration due to age
- Stronger than natural fiber ropes as each strand is continuous and identical

Rope Types

Rope Materials and Construction

Static

- Low-stretch
- Use by most FDs for rescue, hauling, and rappelling
- Has very little stretch

Vs.

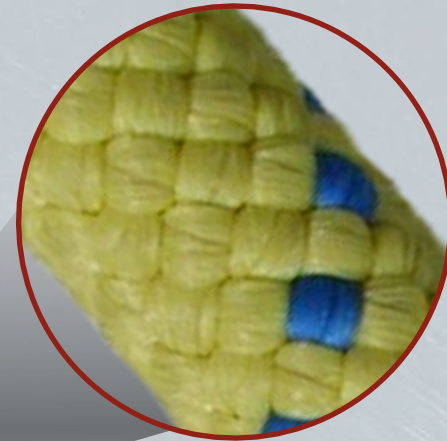
Dynamic

- High stretch
- Very flexible
- Used in rock climbing to absorb falls – puts less stress on the anchors

Construction Methods

Rope Materials and Construction

Kernmantle



Kern: Inner Core

Carries: 75% to 80%
of the load

Mantle: Outer Cover

Carries: 20% to 25%
of the load

Rope Strength

T&E Manual 306.003

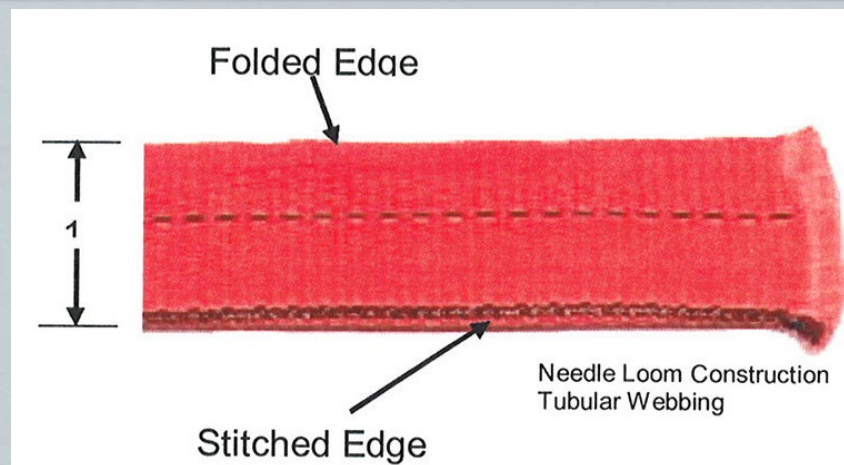
- Rated for specific amounts of weight under NFPA 1983
- Minimum breaking strength based on loading of 300 lb person with safety factor of 15:1
- Safety factor allows for knots, twists, abrasions, and other causes
- Also considers shock loading
- A personal escape rope is designed for a 300 lb person with a safety factor of 10:1.

Construction Methods

Rope Materials and Construction

Webbing

- Not really a rope
- Flat or tubular sewn fabric
- Used for slings, anchors, dragging trapped people, etc.
- 4,000 lb rating.



Green	5 Feet
Yellow	12 Feet
Blue	15 Feet
Orange	20 Feet

Categories of Uses

Rope Nomenclature

Life Safety



Life Safety

- Rappelling
- Belaying
- Hoisting and lowering of victims
- Must be downgraded after being used in a rescue or shock loaded (must be marked)

Categories of Uses

Rope Nomenclature

Utility

- Hoisting or lowering of tools
- Securing objects
- Search and rescue operations
- Downgraded life safety rope can be used

Utility



Parts of a Rope

Rope Nomenclature

Standing Part

above or below the knot – must be between the knot and the rest of the rope

Running End

part of the rope used for work; hoisting & pulling

Working End

used to tie the knot



Elements of a Knot

Rope Nomenclature

Bight

made by bringing the rope back along itself side-by-side

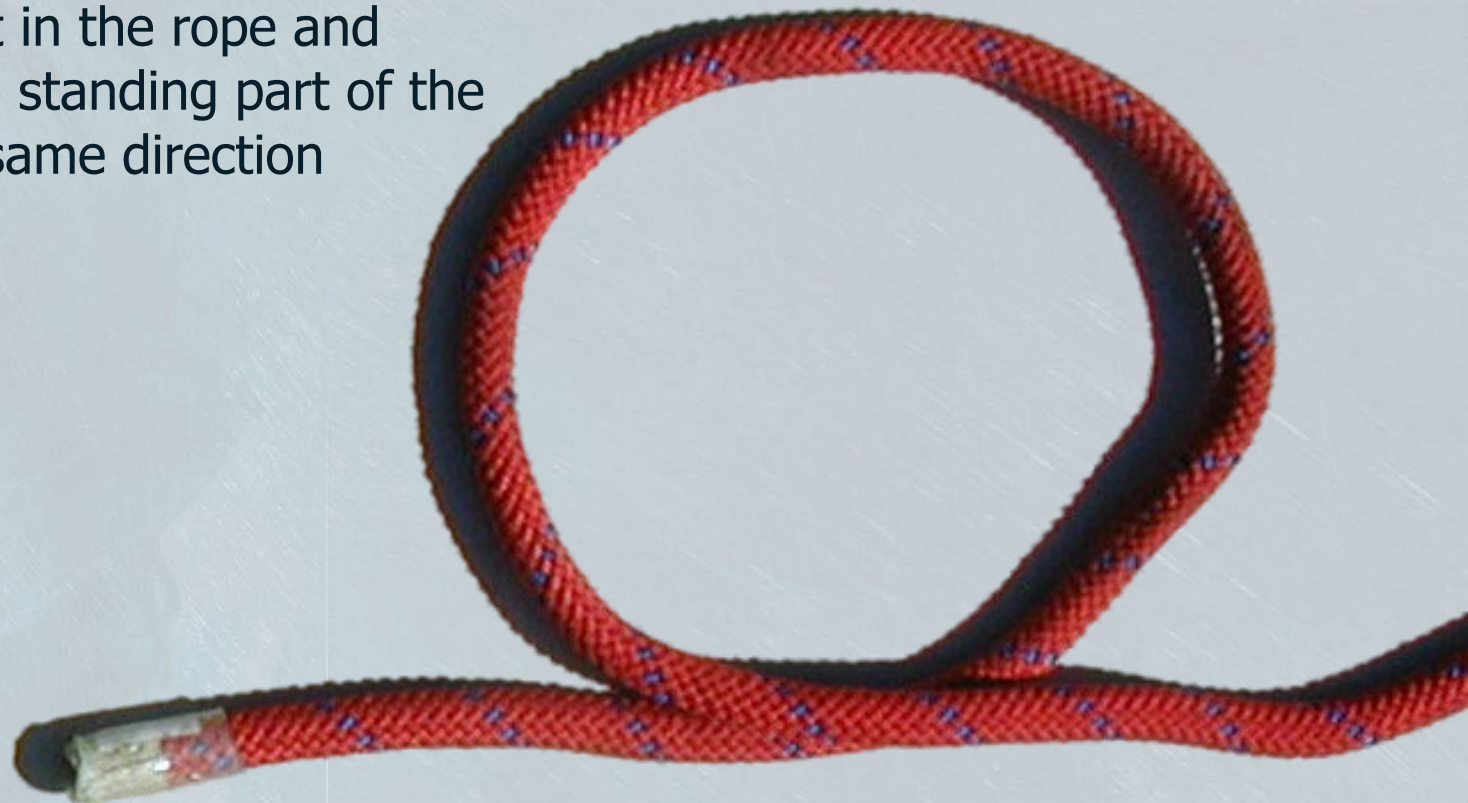


Elements of a Knot

Rope Nomenclature

Loop

place a twist in the rope and continue the standing part of the rope in the same direction



Elements of a Knot

Rope Nomenclature

Round Turn

make a loop and have the standing part continue in the same direction



FFD Maintenance

T&E Manual 306.003

- Life ropes shall be inspected quarterly
- January- April- July- October
- After each use or suspected damage.
- All other ropes and webbing shall be inspected annually in January or after each use.

Edge Protection

Proper Use of Rope

- Protect against sharp edges – use rounded object such as
 - A hose roller
 - Handle of a tool
- Use edge rollers
- Turnout jacket, old hose



- **Knots:**
- **Must be easily recognizable!**
- **Must be easy to tie and untie!**
- **Must be reliable!**
- **Must be used safely!**

Tied within 45 seconds

1. Figure 8 stopper
2. Figure 8 on a bight
3. Figure 8 follow through
4. Double loop figure 8
5. Inline figure 8
6. Figure 8 bend
7. Half Hitch
8. Clove Hitch
9. Water Knot

Figure Eight

Types of Knots

Important

Basis of most knots used.



Prevents

rope from pulling through hardware – acts as a “stop” knot

Figure Eight on a Bight

Types of Knots

Common

Climbing/Rescue knot



Forms

a loop in the end of a rope

Figure Eight Follow Through

Types of Knots

Strongest

Climbing/Rescue knot



Allows

user to tie a figure eight on a bight through an object

Double Loop Figure Eight

Types of Knots

Redundant

2 independent loops



Quick Harness

Loops large enough for legs

Double Loop Figure Eight

Types of Knots

Directional

Used for pulling along the same plane

Creates

mid-rope bight



Figure Eight Bend

Types of Knots

Join

Equal diameter ropes



Half Hitch

Types of Knots

Simple

knot - slips easily by itself
and can't hold anything



Clove Hitch

Types of Knots

Consists

of two half-hitches placed around an object



Water Knot

Types of Knots

Joins

two ends of webbing
together



Unlike

rope, knot must lie flat

Basics

Hoisting Tools and Equipment

Common

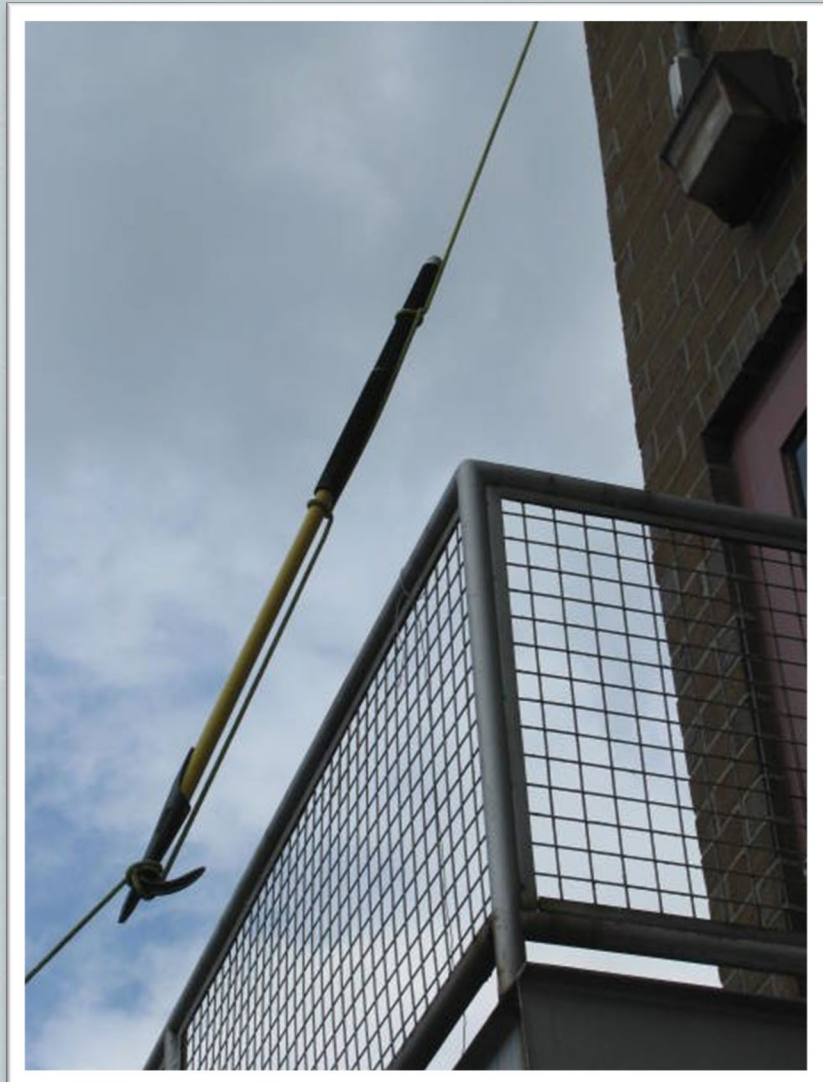
function of rope at emergencies

Safer

than carrying tools/equipment up a ladder

Use

utility rope for this purpose



Basics

Hoisting Tools and Equipment

Tag Lines

- Always use a tag line on equipment
- Keeps tools away from structure and obstructions such as
 - Branches
 - Overhangs

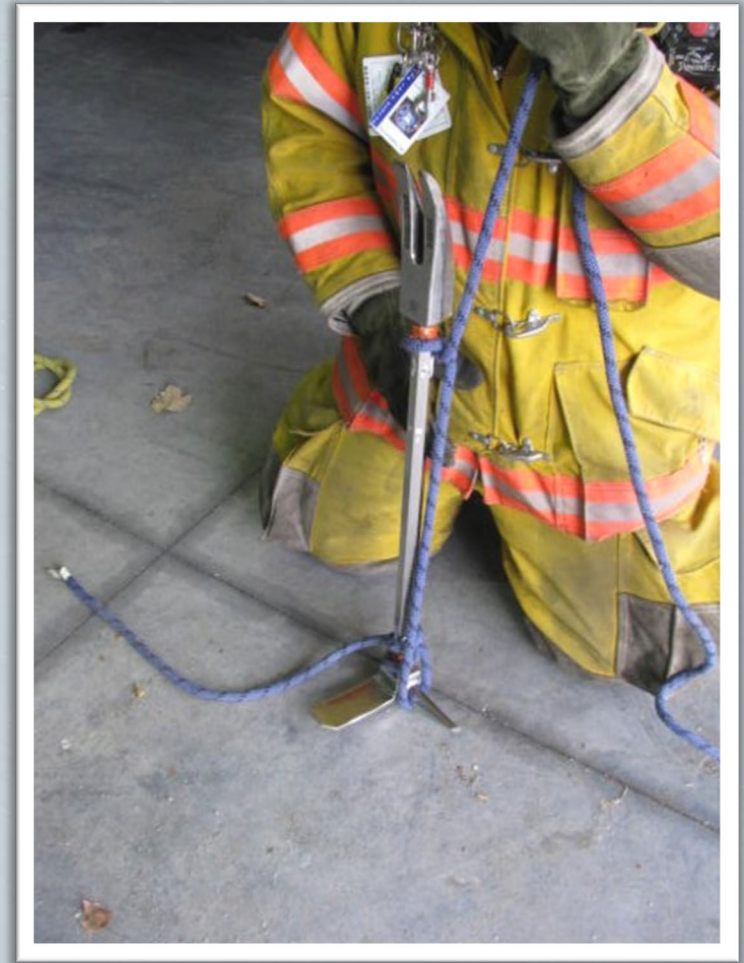


Axe or Halligan Tool

Hoisting Tools and Equipment

A Clove Hitch

and half hitch can be used to raise a Halligan or axe.



Pike Pole

Hoisting Tools and Equipment

A Clove Hitch

and half hitches can be used to raise a pike pole



Charged and Uncharged Hoselines

Hoisting Tools and Equipment

A Clove Hitch

and a half hitch can be used to raise both charged and uncharged hoselines



Ladders

Hoisting Tools and Equipment

A Figure 8

on a bight can be used to raise a ladder

