Chapter 1

Equipment

EQUIPMENT AND TOOLS

Overview

Without the appropriate equipment and tools, it would be impossible for firefighters to accomplish their assigned tasks. Equipment and tools must be located and placed in service without delay. Furthermore, they must be maintained clean and in good working order.

This section is intended to give the firefighter a cursory overview of the basic equipment and tools used by the Seattle Fire Department. While not providing detailed information on each piece of equipment or specific methods of placing it into operation, this section does contain limited information on specifications, uses, maintenance and safety, where applicable.

It is also the intent to assist new members recognize and understand the purpose of these fire service tools. Knowledge and proficiency of equipment and tools will be essential for success in recruit school and throughout their career.

Reducer Coupling

A Reducer is a coupling that reduces the size of male threads, so that female threads of a corresponding smaller size may be attached.

4" to 2 ½" Reducer

Increaser Coupling

An Increaser is a coupling that increases the size of male threads, so that female threads of a corresponding larger size may be attached.

2 ½" to 4" Increaser

NOTE: Couplings are always identified from the female side to the male side. Female refers to internal threads. Male refers to external threads

Double Female Coupling

A Double Female Coupling has female threads of equal size on both ends. It is used to connect two male ends.

2 ½" Double Female

Double Male Coupling

A Double Male Coupling has male threads of equal size on both ends. It is used to connect two female ends.

2 ½" Double Male

Cap

A Cap is a way to temporarily or permanently prevent the flow of water from the apparatus, hose or appliance. A Cap has female threads. It is intended to cap a male coupling or fitting.

2 ½" Cap

Plug

A Plug is a way to temporarily or permanently prevent the flow of water from the apparatus, hose or appliance. A Plug has male threads. It is intended to plug a female coupling or fitting.

2 ½" Plug

Sister Coupling

A Sister Coupling is similar to a Double Female. However, the female threads are of differing sizes to connect two unequal male ends.

2 ½" to 4" Sister

Brother Coupling

A Brother Coupling is similar to a Double Male. However, the male threads are of differing sizes. It is used to connect two unequal female ends.

2 ½" to 4" Brother

Storz Adaptor Coupling

A Storz Adaptor Coupling has male NST threads which connect to a “sexless” coupling that uses a quick connect fitting. It is used to couple SFD hose to hydrants or appliances of neighboring fire departments. To release coupled hose, the rocker buttons need to be depressed. They are used in several of our surrounding cities on mutual aid.

NOTE: The SFD does not routinely use Storz fittings.

Storz Connection side.

Rocker buttons shown.

Wye

A Wye is an appliance designed to branch a singular water source into two or more hose lines. It has a female threaded inlet and male threaded outlets. Wyes are equipped with quarter-turn-ball or gated valves to control the flow of water.

2 ½" to 1 ½" Wye

Siamese

A Siamese fitting is an appliance designed to connect two or more lines into one line or two lines into an engine or appliance. It has female threaded inlet swivels and a male threaded outlet. It is equipped with a clapper valve to prevent the backflow of water through the unused intakes.

2 ½" to 2 ½" Siamese

Tri-Gated Wye

The Tri-Gated Wye, also known as a “Manifold”, is an appliance used to deliver water to the incident. The Tri-Gated Wye is attached to the engine’s large diameter hose (LDH) and carried so that a “Manifold Reverse” lay may be easily implemented.

As with other wyes, the Tri-Gated Wye splits a singular source of water into multiple lines. A difference from all other wyes is that on the tri-gated wye there are male threads on both sides of the appliance. This is due to the way LDH hose is stored on SFD engines and the fact that LDH is used for both supply hose (between the hydrant and the engine) and hose to supply attack lines (between the engine and the nozzle).

It is carried on Engine Companies and has a 4” male inlet that branches off to three 2 ½” male threads. Each outlet has a separate gated valve.

Tri-Gated Wye

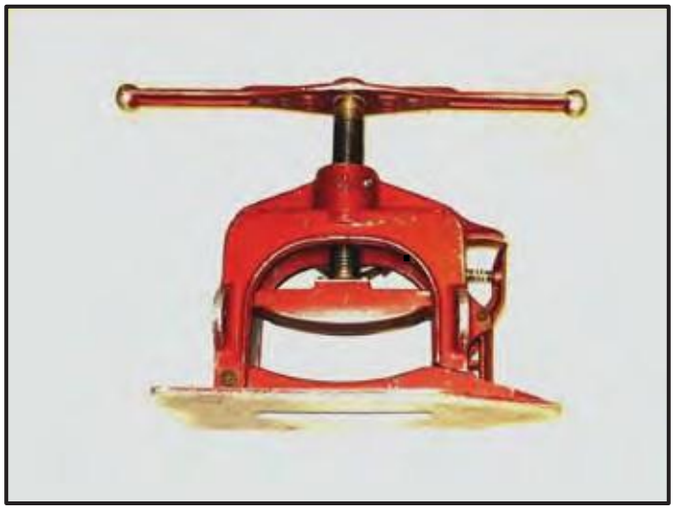
Hydrant Gate

A Hydrant Gate is a gated valve fitting that controls the flow of water from a 2 ½" hose port of a fire hydrant. It consists of a female inlet, a gate valve with a handle, and male outlet threads. It is typically kept with a 2 ½" to 4" Increaser attached to the male threads.

Hydrant Gate

Hose Clamp

The Hose Clamp is a device used to compress fire hose in order to shut off the flow of water while in operation. It can also be applied to an uncharged line to prevent flow.



Hose Clamp

NOTE: Always face the flow (source) of water when clamping. Face the direction of the flow (destination) when releasing the clamp.

Portable Ground Monitor

Specifications

- Ground mounted.
- Flow rates depend on nozzle size (see Smooth Bore Nozzles)

Uses

- Monitors are used to deliver powerful streams of water over long distances.

Maintenance

- Keep lubricated and check for loose tips.

Safety

- Ensure that the Monitor is footed or anchored to counteract the strong nozzle reaction.

Portable Ground Monitor

Smooth Bore Nozzle Tips

Specifications

- Nozzle pressure is 50 PSI at the tip for handlines:

SIZE	GPM
15/16”	180
1 ⅛”	265

- for use on 1 ¾” handlines.
- for use on 2 ½” handlines.

- Nozzle pressure is 80 PSI at the tip for monitors:

SIZE	GPM
1 ⅜”	500
1 ½”	600
1 ¾"	800
2”	1000
2 ¼”	1350
2 ½”	1650

Uses

- Fire attack, when deeper penetration is needed.

Safety

- Ensure portable monitors are properly footed.
- Use care when operating smoothbore hand lines.

Left to Right: 15/16” tip, 1 ⅛” tip Stream Straightener, Portable Monitor Tip Stack

Task Force Tip (TFT®) Midmatic Nozzle

Specifications

- Appropriate for 1 ¾" handlines only.
- Automatic Gallonage operation.
- 75 PSI required at the tip to operate properly.
- Integrated 15/16" smooth bore tip.
- Ball-type valve.
- 70 - 200 GPM
- Removable tip for extending the line (1 ½" male threads).

Uses

- Fire attack – offensive
- Hydraulic Ventilation
- Exposure protection - defensive
- Washdowns
- Overhaul

Maintenance

- Lubricate moving parts with "Break Free" (available through the Services Division).
- Do not use WD-40.
- Can be flushed, inspected. Rubber bumper kept in forward position.

Safety

- Open slowly to prevent a water surge or water hammer.

TFT® Midmatic Nozzle

Task Force Tip (TFT®) Handline Nozzle

Specifications

- Appropriate for 1 ¾" or 2 ½" handlines.
- Automatic Gallonage operation.
- 100 PSI required at the tip to operate properly.
- Ball-type valve
- 50 - 350 GPM
- Removable tip for extending the line (1 ½" male threads).

Uses

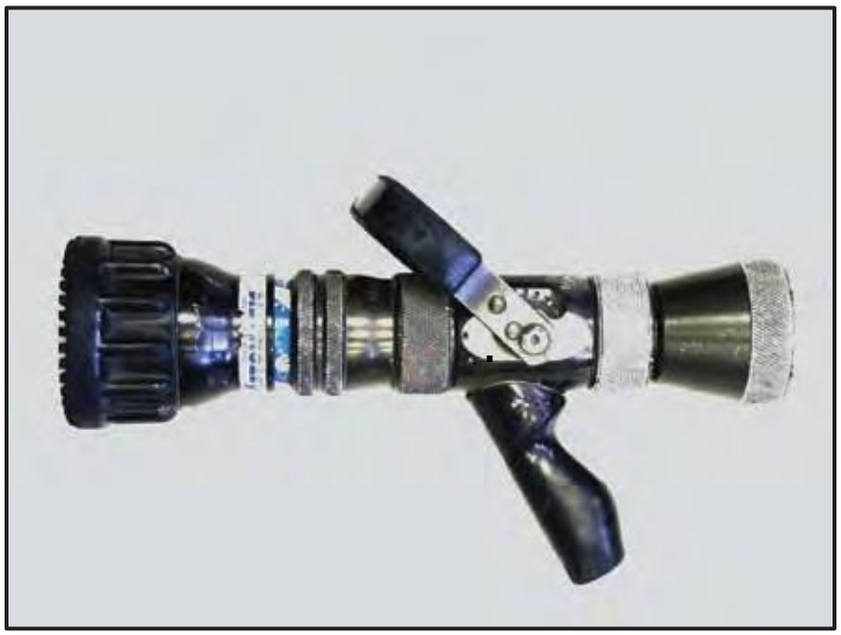
- Fire attack – offensive
- Hydraulic Ventilation
- Exposure protection - defensive
- Washdowns
- Overhaul

Maintenance

- Lubricate moving parts with "Break Free" (available through the Services Division) .
- Do not use WD-40.
- Can be flushed, inspected. Rubber bumper kept in forward position.

Safety

- Open slowly to prevent a water surge or water hammer.



TFT® Handline Nozzle

Distributor Nozzle

The Distributor Nozzle, otherwise known as a "Bulldozer" or “Bresnan” Distributor, is designed to throw a heavy spray of water over an area 30 feet in diameter. It is placed in operation by lowering through an opening in a floor, decking, or roof, to the involved space below.

Specifications

- Rotating head
- 270 GPM at 100 PSI
- Weighs 3-1/2 pounds
- 2 1/2" female swivel inlet

Uses

- Ship fires
- Basement fires

Maintenance

- Lubricate moving parts

Safety

- The nozzle does not have a shutoff. Ensure one is placed along the supply line or a hose clamp is available.

Distributor Nozzle

Fog Applicator

Specifications

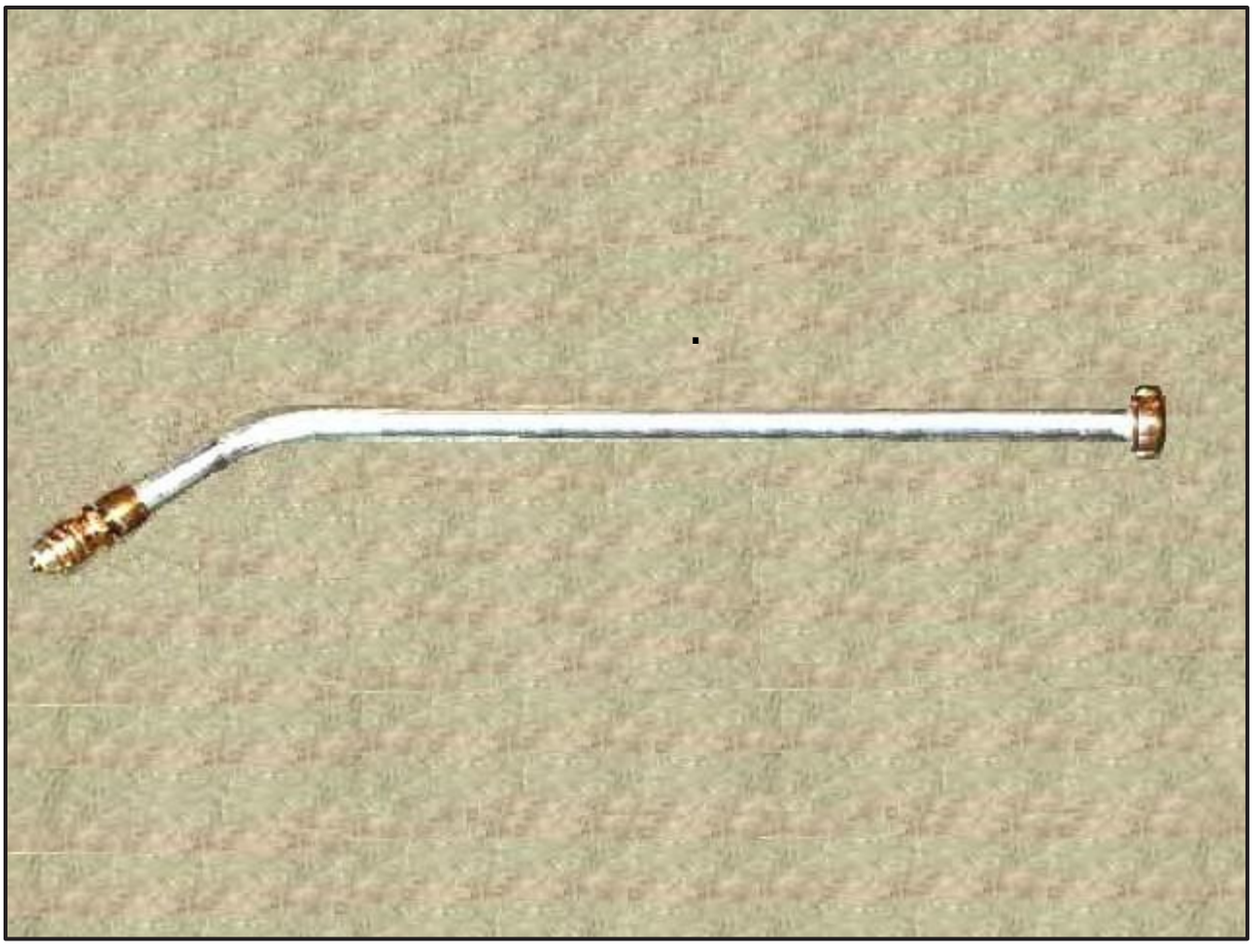
- Sizes: varying from 48 to 112 inches long.

Uses

- Fire extinguishment, when a small amount of water is indicated.
- Small space fires, attic, wall, etc.

Safety

- Must be used with a nozzle shut off.



Fog Applicator

Bolt Cutters

Uses

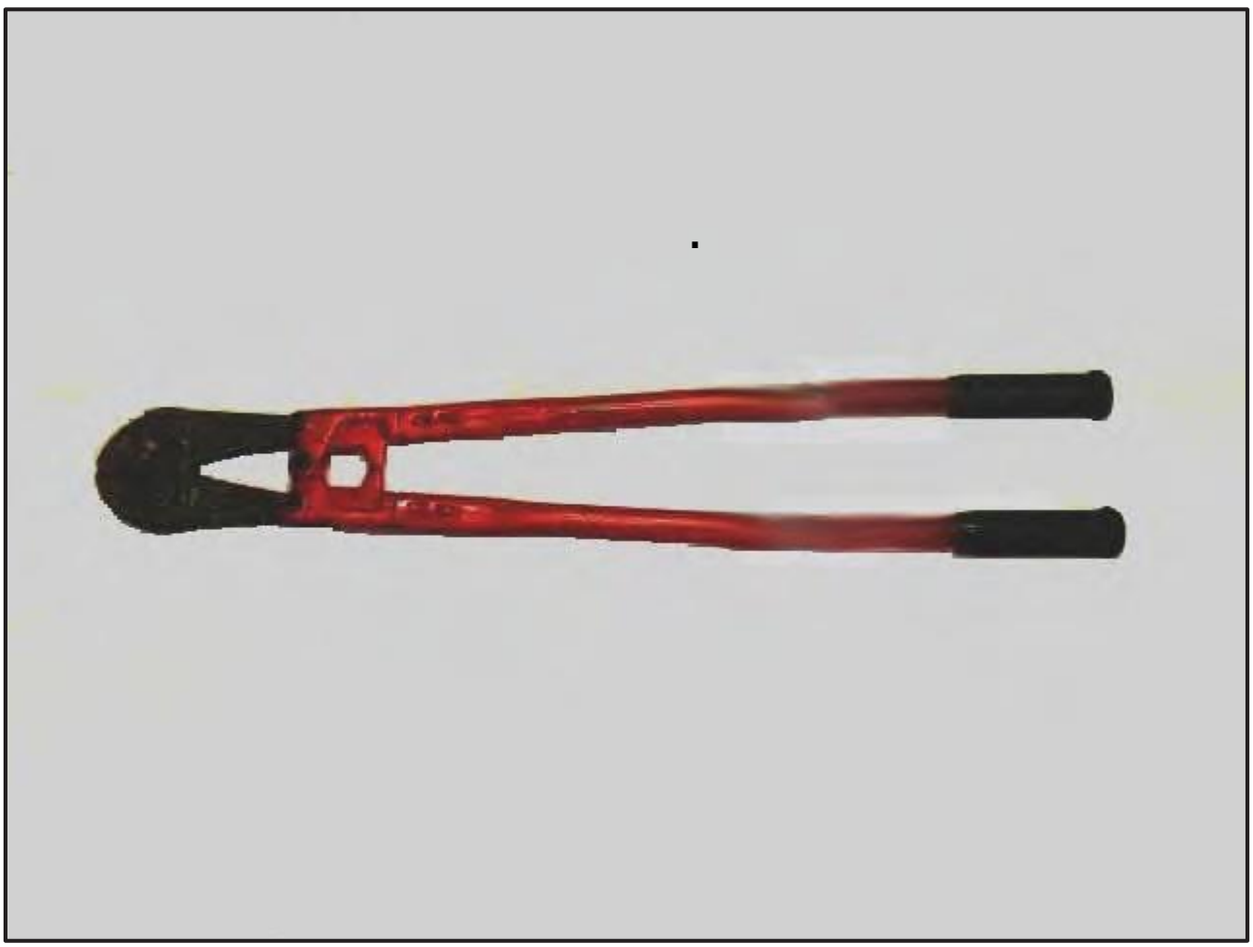
- Forcible entry

Maintenance

- Wipe clean
- Keep cutter gaps tight by using adjustment screws

Safety

- Use proper safety gear (gloves and eye protection)



Bolt Cutter

Pike Pole

The Pike Pole has a head that is designed with a point and a hook. The point allows the pole to penetrate materials and the hook allows them to be pulled or moved.

Specifications

- Sizes range from 4 feet to 16 feet.
- Fiberglass handles (straight and “D” styles).
- Steel head

Uses

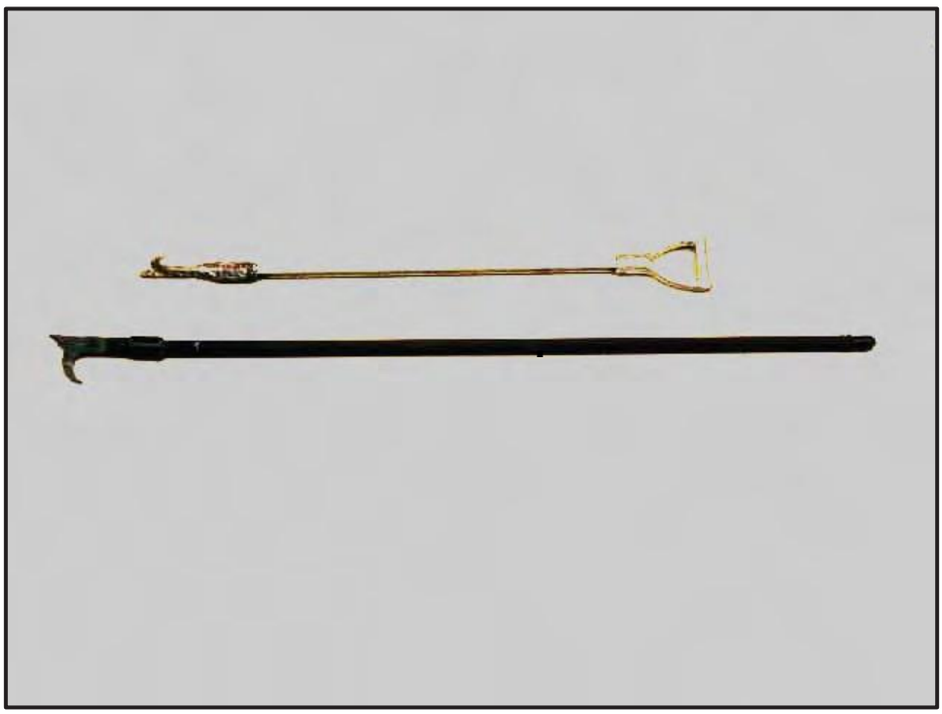
- Pulling ceilings
- Overhaul
- Ventilation
- Water rescue (reaching tool)

Maintenance

- Keep handles free of paint. Heads may be painted to prevent rust.

Safety

- Wear proper safety gear (full PPE).
- Be alert to large sections of ceiling falling while being pulled.



D-Handle and Straight Handle Pike Poles

Spanner Wrench

The Spanner is a straight, forged or folding-type wrench device used for tightening/loosening couplings, appliances or hydrant port caps. It can be used by itself or tandem in opposing movement.

Straight, forged spanners are located on all engines and folding-type are issued to each Firefighter. They are made from plastic or aluminum.

Spanner Wrenches

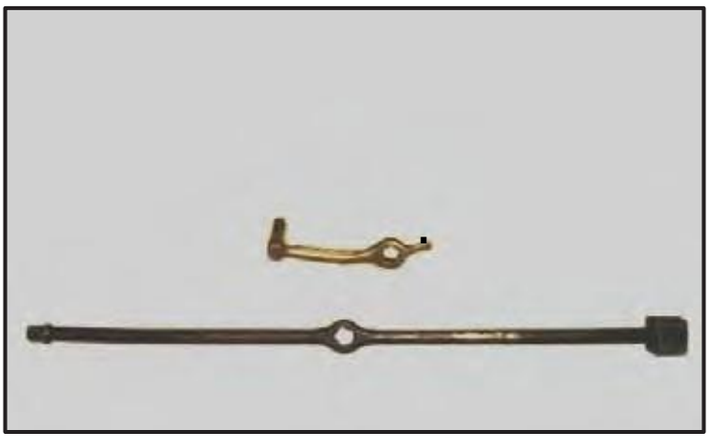
OCD Wrench

An OCD (Office of Civil Defense) Wrench is a tool designed to open or close the main stem of fire hydrant or to remove and replace the hose port caps.

The wrench adjusts to varying nut sizes by screwing the handle in or out. It is normally carried in the hydrant bag and can be particularly useful for worn down nuts that will not allow the normal use of a galvin and/or corey. It may also be used when a galvin wrench will not make a complete turn due to obstacles.

OCD Wrench

Hydrant Wrench Set



Hydrant Wrench Set

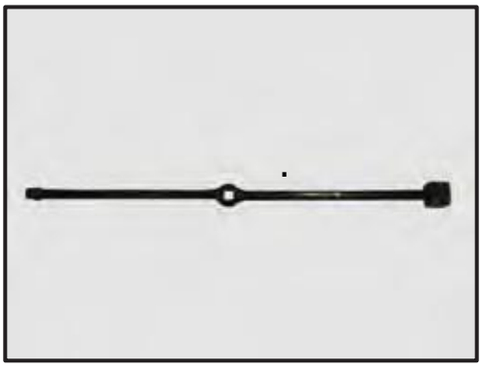
Corey Wrench (bottom left)

The Corey Wrench is used to remove and replace the fire hydrant caps. It can also be used to open a hydrant's main stem if there is an obstruction that will not allow the Galvin wrench to spin completely. There is less available mechanical advantage with this shorter wrench, however. The five-sided hole in the wrench corresponds with the shape of the cap nut.

Galvin Wrench (bottom right)

The Galvin Wrench is designed to be used to open or close the main stem of a fire hydrant. The long handles provide leverage so that water may flow quickly. The five-sided hole in the middle of the wrench corresponds with the shape of the hydrant main stem nut. The box end may be used, in conjunction with the Corey Wrench, to open or close the "foot valve" of a hydrant.

Corey Wrench



Galvin Wrench

Bars

Bars are designed to be carried and used by a single firefighter. However, some require a second operator equipped with a striking tool to accomplish the task. Truck companies have a wide assortment of bars.

Specifications

- Constructed of steel
- Various lengths, weights and configurations.

Uses

- Forcible entry, heavy rescue
- Prying, breaking, ramming, clawing, pulling, moving and lifting.

Maintenance

- Clean and inspect after use. Use a file to remove nicks.
- Can be painted or left bare with light coat of oil.

Safety

- Wear proper safety gear (helmet, gloves, eye and boots)
- Choose the appropriate tool for the job. Allow the mechanical advantage of the tool do the work, not brute strength.

Left to Right: Heavy Duty Bar, Medium Duty Bar, Burke Bar, Light Duty Bar, Extrication Bar, Lock Breaker, Trumpet Bar, Haligan, Wrecking Bar

Axes

The Axe is a fundamental tool of a firefighter. Although the uses of an axe are varied, it is primarily used for forcible entry and ventilation. Scabbard axes are intended for personal carry on the waist. The flathead axe may be used as a striking tool. The pickhead axe may be used for ripping, digging, and piercing.

Specifications

- Forged steel, heat treated heads
- Heavy duty axes are 36 inches and weigh 8 pounds.
- Service axes are shorter (typically 28 inches) and weigh 6 pounds.
- Handle length is 27 - 36 inches long, wood or fiberglass.
- Fiberglass is 50 times stronger than wood and does not rot.

Uses

- Forcible entry and ventilation
- Search and rescue, windshield removal

Maintenance

- Clean and inspect after use. Use steel wool and oil on head
- Wood handles are lightly sanded and oiled. No paint or varnish.
- Small nicks may be removed with a file.
- Avoid painting to aid in maintenance and inspection.

Safety

- Wear proper safety gear (full bunkers, eye protection).
- Allow for the arc of the swing. Avoid "round house" swings.

Top to bottom: HD Flat Head axe, HD Pick Head axe, Service axe, Service axe in belt scabbard

Roof Hook

Originally designed for overhauling dumpster fires, the Roof Hook has become a favorite rooftop ventilation tool. The manufacture's original name of the product was "Rubbish Hook". They now recognize that the majority of the tools use in the fire service is on the rooftop and has changed their original name of the product to reflect that fact. They now call this hook the "Roof Hook."

When the tool is turned with the hooks facing up, the head makes solid contact with roofing materials, allowing vent crews to hear and feel roof support members. The Roof Hook can also be used to pull back roofing materials, break ceramic roof tiles, and to "louver" the vent cuts.

Specifications

- 6 feet long
- Fiberglass shaft with "D" handle
- Two-pronged steel hooks

Uses

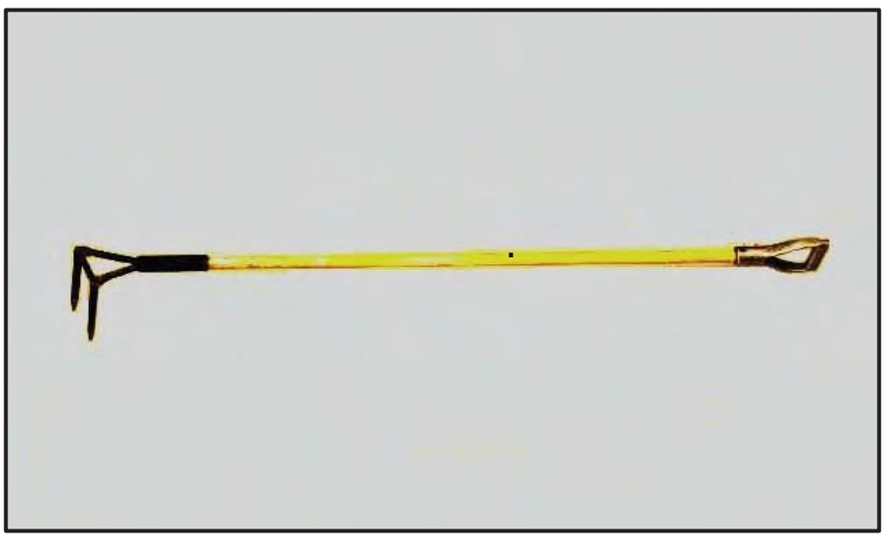
- Roof sounding and ventilation
- Overhaul, pulling ceilings where large areas need to be opened.

Maintenance

- Heads may be painted but keep handles free of paint.

Safety

- Wear proper safety gear (full protective clothing).
- Be alert - large sections may fall when pulling ceilings.



Roof Hook

Salvage and Overhaul Tools

Salvage and overhaul tools are essential for post-fire operations. They are often common household tools such as shovels, rakes and hoes.

A specialty tool includes the wall scraper (middle in below photo). Truck Companies carry an extensive complement of tools. Engine Companies are equipped with a more limited supply of tools.

Specifications

- Shovels include scoop, folding, square, roof and round point.
- Wood or fiberglass shafts
- Aluminum or steel heads

Uses

- Digging, trenching, scraping, salvage and overhaul

Maintenance

- Inspect heads for loose handles.
- Heads should be painted or oiled to prevent rust.

Safety

- Wear appropriate safety gear.

Top to bottom: square shovel, wall scraper, garden rake

Portable Electrical Generator

Specifications

- 5 HP Honda engine
- Uses unleaded fuel (white stripe)
- 120 volts, 19.2 amp AC
- 12 volts, 8.3 amp DC
- 112 pounds

Uses

- Portable source of electricity.
- Power for operating lights, power tools, submersible pumps, etc.

Maintenance

- Keep unit clean.
- Refuel after use and store in ready condition.
- Send to Services for engine repair and servicing.

Safety

- Use proper lifting and carrying techniques.
- Use a circuit tester and GFCI, in accordance with SFD Dispatch # 12-08.

Generator

NOTE: Use caution when operating in an enclosed area. Carbon Monoxide contained in the exhaust fumes may reach dangerous levels. Also, use cautiously in wet conditions. Rain/snow and/or wet hands may present an electrical hazard.

Positive Pressure Ventilation (PPV) Fan

The Positive Pressure Ventilation Fan is an efficient mechanical method of removing heat, smoke and fire gases. If used properly, it dramatically enhances the fire operation, and the safety of Firefighters and occupants.

Specifications

- 5 to 6 HP depending on model
- Multiple blades delivering approximately 15,000 CFM.
- Direct drive, 4 cycle using unleaded (white stripe) fuel.
- Adjustable tilt.

Uses

- Positive pressure ventilation of structural spaces.

Maintenance

- Refuel after each use.
- Keep unit clean and store in ready condition.
- Send to Services for engine work.

Safety

- Use proper lifting and carrying techniques.

PPV Fan

NOTE: Use caution when operating in an enclosed area. Carbon Monoxide Contained in the exhaust fumes may reach dangerous levels.

Chainsaw

The chainsaw is considered the best saw for ventilation. Unlike the Rotary Saw, the chainsaw can be used to "feel" the structural members beneath the roofing materials. Even though the cutting speed is great, the operator can safely work without unnecessary damage to the rafters and/or joists. The chainsaws light weight also makes it easy to work from ladders and in places where heavier saws would not be safe.

Specifications

- 2 stroke, single cylinder uses mixed fuel (yellow striped can).
- Approximately 15 pounds.
- Automatic and manual chain brake.
- 20-inch bar

Uses

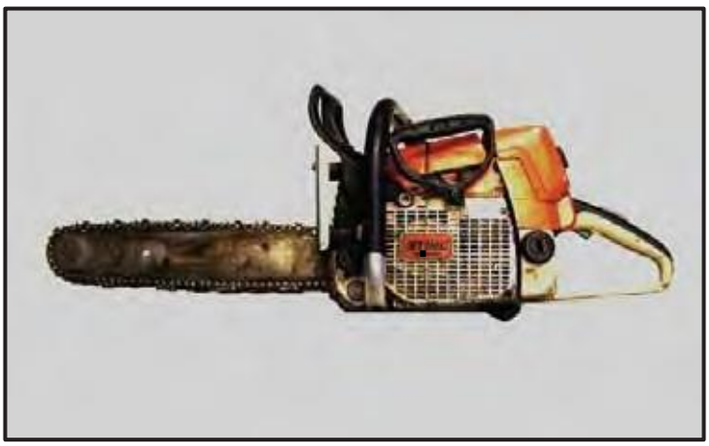
- Ventilation
- Heavy Rescue
- Structural protection by removing brush during urban interface

Maintenance

- Refuel and check oil after each use.
- Thoroughly clean after each use.
- Adjust chain tension.
- Replace chain if 3 (or more) teeth are damaged or missing.
- Send to Services for engine work.

Safety

- Wear proper safety gear (full PPE). Chaps are required for use during training but are not required during emergency use.
- Use only enough bar as needed. (Do not over plunge bar during use.)
- Be aware of other operations around you.



Chainsaw

Rotary Saw (Rescue Saw)

The rotary saw is a power saw that is carried on Seattle Fire Department truck companies. It has three different blades that allow it to be used for a variety of objectives. The metal-cutting blade may be used for forcible entry or other metal cutting. The masonry-cutting blade is ideal for stucco, brick or concrete block. The wood-cutting blade may be used for ventilation as a backup for the chain saw. The Rotary Saw is very effective on hardwood flooring.

Specifications

- 2 stroke engine uses mixed fuel (yellow striped can)
- 24 pounds
- Belt driven
- Adjustable blade guard

Uses

- Forcible entry, heavy rescue, ventilation.

Maintenance

- Refuel after each use.
- Adjust belt tension.
- Replace blade if smaller than 9 inches.
- Forward to Services for engine work.

Safety

- Wear proper safety gear (full PPE).
- If cutting near flammable liquids, a hose-line and dry chemical extinguisher is required. It is common for the saw to produce sparks while in operation.

Rotary Saw

Reciprocating Saw (Sawzall)

The reciprocating saw is a portable saw that is carried on all Seattle Fire Department truck companies and some engine companies. The SFD carries both corded and cordless models. Reciprocating saws are quite mobile and easy to use. This saw has proven to be an excellent auto extrication tool. It can be operated simultaneously with the hydraulic rescue tools. It is often able to cut some portions of the auto easier and more quickly than the hydraulic cutters.

Specifications

- Reciprocating blade
- Some are battery operated
- Some require an electrical power source.

Uses

- Auto extrication
- Heavy rescue
- Forcible entry

Maintenance

- Keep unit clean.
- Replace the blades as needed.
- Store saw in ready condition.

Safety

- Wear proper safety gear (gloves, eye protection, and boots).
- Blade continues to move after trigger is released.
- If cutting near flammable liquids, ensure a charged handline and dry chemical extinguisher is readily available.

Reciprocating Saw

Circular Saw

The circular saw is a portable saw carried on Truck Companies. It requires a power source but is mobile and easy to use. It is designed to cut or rip wood materials.

Specifications

- Requires electrical power.

Uses

- Construction—boarding up buildings
- Shoring

Maintenance

- Keep unit clean.
- Replace blade as needed.
- Store in ready condition.

Safety

- Wear proper safety gear (gloves, eye protection, and boots).
- Blade continues to rotate after trigger is released.

Circular Saw

Rope Rescue Equipment

Truck Companies carry an array of Rope Rescue Equipment designed to assist in the rescue of persons trapped in low or high angle situations. When properly applied, the gear will provide a safe and efficient mechanical advantage to evacuate the victim to safety.

Specifications

- Materials include nylon webbing, kernmantle rope, steel and aluminum

Uses

- Low and high angle rescue, cave - in

Maintenance

- Clean and inspect after each use.
- Rescue rope must be replaced after use in actual rescue incident.

Safety

- Wear appropriate safety gear.
-

(See next page for item identification)

Specific Rope Rescue Equipment

A. **Class 3 Harness** – worn by the firefighter in rescue applications.

B. **12 mm Rescue Rope** – low-stretch braided kernmantle rope used for main, belay, and accessory lines in rope rescue applications.

C. **Locking Steel Carabiner** – used to connect components in rope systems.

D. **Prussik-Minding Pulley** – used in rope systems to create directional changes and mechanical advantages.

E. **1" Tubular Nylon Webbing**, various lengths - used to create anchors for rope systems.

Green – 5'
Blue – 10'
Yellow – 15'
Orange – 20'
Purple – 25'

F. **Brake Rack** – frictioning device used in lowering systems.

G. **Pickoff Strap** – nylon strap with adjustable buckle used for patient attachment in rope rescue systems.

H. **Patient Harness** – quick harness for creating positive attachment to patient in rope rescue systems.

I. **Load Releasing Hitch** – the LRH is tied using a 30' 8mm cord and two locking steel carabiners. It allows the user to extend a loaded rope system under control.

J. **Anchor Strap** – Nylon strap with 2 "D" rings used to create anchors for rope systems.

K. **Long Prussik Sling** – 8mm cord tied into a sling with a double fisherman's bend. The prussik sling is tied into a prussik hitch around a larger diameter line in order to grab hold of the larger line. It can be used to build a tandem prussik belay system, to attach a pulley to a line, or as a progress capturing device.

L. **Short Prussik Sling** – see *K – Long Prussik Sling*

M. **Petzel 540** – Mechanical belay device, used as an alternative to the Tandem Prussik Belay system.

Portable Air Monitor

The portable air monitor is a gas monitor that allows the user to continuously monitor 4 atmospheric conditions:

- Carbon Monoxide (CO)
- Oxygen (O_2)
- Hydrogen Sulfide (H_2S)
- Lower Explosive Limit (LEL) – of combustible gasses

Specifications

- Approximately 30 ounces.
- Rechargeable batteries.
- Replaceable sensors and filters.

Uses

- Confined space rescue, overhaul atmospheric concerns, carbon monoxide alarms, cave-in rescue, flammable liquids, etc.

Maintenance

- Perform daily checks.
- Change filters as necessary (one in unit, one in wand sensor).
- Use respiratory protection until atmosphere proven safe.

Air Monitor

Holmatro Hydraulic Power Unit (DPU 30)

Specifications

- Weight: 58 lbs.
- Honda GX100 3HP 4 stroke engine.
- Two Stage Pump with dual power outlets.

Uses

- Powers hydraulic rescue tools.

Maintenance

- Clean and refuel after use.
- Inspect hoses and couplings after use.
- Check engine oil and hydraulic fluid.

Safety

- Use proper lifting and carrying technique.
- Use appropriate safety gear to include eye protection.
- Spilled or mishandled hydraulic fluid may create a slip hazard.

(Holmatro Power Unit)

Holmatro Rescue Tools

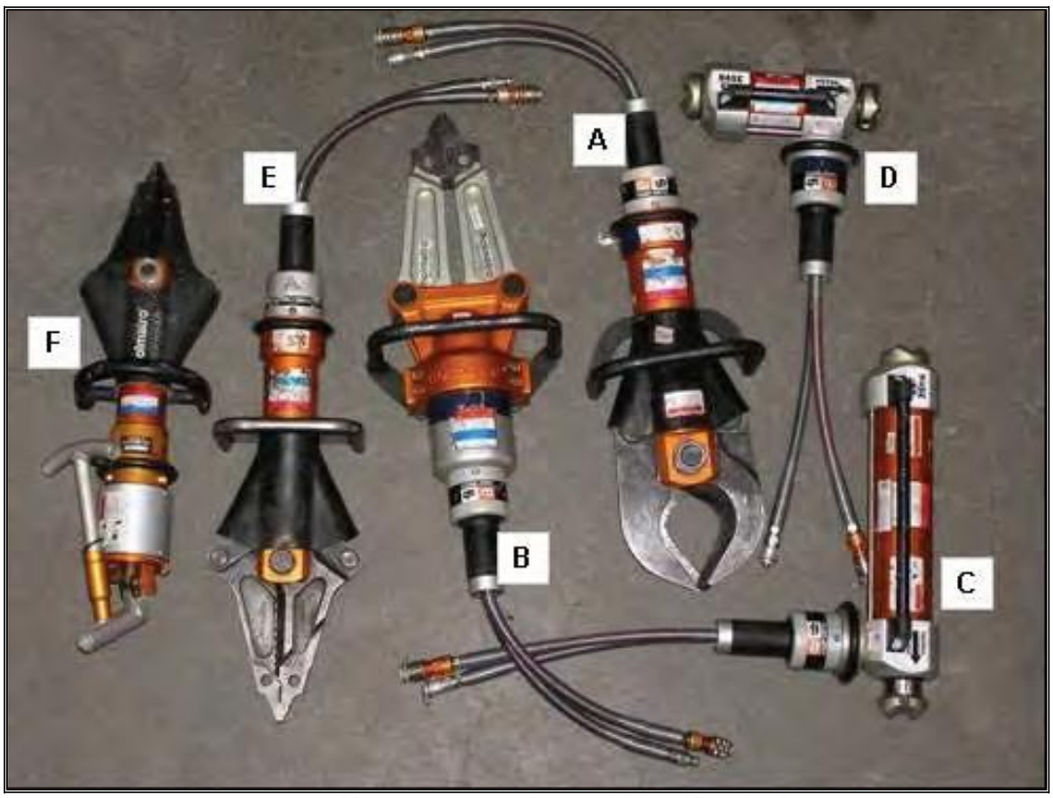
These tools are hydraulically driven tools that are used for heavy rescue and auto extrication. They are designed to lift, spread, push, pull, hold, and cut. The Holmatro Double Power Unit (DPU30) supplies the power. The DPU30 and Rescue Tools are standard equipment on all Truck Companies.

Maintenance

- Keep Tool and Quick Connects clean.
- Use torque wrench set at 75 ft-lb. to tighten the jaws on the Cutter and the "Combi" tool after every use.

Safety

- Wear proper safety gear (full protective clothing) and eye protection.



(See next page for tool identification)

Tool Specifications

A. CUTTER

- Weight: 42.5 lbs.
- Maximum Cutting Force: 55,100 lbs.

B. SPREADER

- Weight: 42.5 lbs.
- Maximum Spreading force: 19,595 lbs.
- Maximum Pulling force: 11,200 lbs.
- Maximum Spreading Travel: 27 ¼”

C. TELESCOPIC RAM

- Weight: 40 lbs.
- Maximum Length Extended: 50 ¼”
- Max. Spread Force 1st Section: 49,145 lbs.
- Max. Spread Force 2nd Section: 18,210 lbs.

D. TELESCOPIC MINI RAM

- Weight: 27 lbs.
- Maximum Length Extended: 23”
- Max. Spread Force 1st Section: 49,145 lbs.
- Max. Spread Force 2nd Section: 18,210 lbs.

E. COMBINATION TOOL

- Weight: 35 lbs.
- Max. Cutting Force: 28,300 lbs. (center of blade)
- Maximum Spreading Force: 16,166 lbs.
- Maximum Pulling Force: 14,358 lbs.
- Maximum Spreading Travel: 14 ¼”

F. HAND OPERATED COMBINATION TOOL

- Weight: 23 lbs.
- Max. Cutting Force: 18,660 lbs. (center of blade)
- Maximum Spreading Force: 11,690 lbs.
- Maximum Pulling Force: 6,590 lbs.
- Maximum Spreading Travel: 10 ½”

Portable Fire Extinguishers

Specifications

- Varying, depending on size and type.

Maintenance

- Inspect for damage.
- Check gauge for adequate pressure
- Tag and send to Services after use.
- Ensure lever locking pin is in place.

Safety

- Choose the proper type of extinguisher for the fuel to be extinguished.

Extinguishers - Left to Right: Dry Chemical, Pressurized Water, CO2

TYPE	DRY CHEM	PRESSURIZED H_2O (Pump Can)	CO_2
RATING	10 BC 2A 10BC 20A 120BC	2A	10BC
AGENT	SODIUM BICARB AMMONIUM BICARB AMMONIUM PHOSPHATE	WATER	CO_2
PROPELLENT	NITROGEN	AIR	SELF
WEIGHT	4 LBS 9 LBS 38 LBS	28 LBS	34 LBS

Water Vacuum (Water Vac)

The water vac is an indispensable tool for the removal of water during salvage operations. Water vacuums are only carried on truck companies; it is designed to be worn on a firefighter's back and requires an electrical power source. It is best used on bare or carpeted floors. If the water is deeper than the head of the wand, a Prosser pump may be required prior to the beginning of water vac use.

Specifications

- Tank capacity: 6 gallons
- Weight full: 73 pounds
- 50-foot power cord

Uses

- Salvage

Maintenance

- Wipe down unit after use.
- Empty tank completely before storage

Safety

- Use a circuit tester and GFCI, in accordance with SFD Dispatch # 12-08.

Water Vac and Wand

Prosser Pump

The Prosser pump is an ideal tool for the removal of water when water depth is 2" or deeper. The pump has 1 ½" male threads so that a section of hose may be attached to evacuate the water from the occupancy.

Specifications

- Max. effective lift of a single pump is 37 ft (74 feet in tandem).
- 120 Max. GPM, at 0 feet elevation (130 GPM, at 0 feet, in tandem)
- 25-foot electrical cord and 35-foot handling cord.
- Strainer to keep debris out.

Uses

- Dewatering

Maintenance

- Wipe down unit after use.
- Inspect power cord for damage.
- Ensure that rope is secured to the pump.

Safety

- Pump heats up during use. Allow to cool before handling.
- Use a circuit tester and GFCI, in accordance with SFD Dispatch # 12-08.
- Power off before handling.

Prosser Pump

Thermal Imager Camera (TIC)

The Thermal Imager Camera (TIC) represents a huge leap in firefighting technology. It is a tool, similar to a camera that allows the Firefighter to "see" through smoke. Using thermographic technology, the TIC detects thermal (infrared) radiation from fire and trapped victims. In addition to smoke, the TIC will recognize a significant heat signature through sheet rock, lathe and plaster, and acoustic ceiling tile. It is standard equipment on Truck Companies and Battalion Chiefs' vehicles and select engine companies.

Specifications (many TIC variations are currently in use)

- Water resistant
- Rechargeable batteries
- Weights and sizes vary.

Uses

- Search and rescue
- Detecting hidden fire in walls, ceilings, etc.
- Detecting other heat signatures.

Maintenance

- Inspect and clean after use.
- Rotate battery as directed.

Thermal Imager

Chapter 2

SCBA

SELF CONTAINED BREATHING APPARATUS

Description

The SCOTT Air-Pak X3® Snap-Change Self-Contained Breathing Apparatus (SCBA) is a respirator intended to provide respiratory protection to an individual when entering, working in, and exiting an objectionable, oxygen deficient, and/or unbreathable (toxic) atmosphere. This equipment is designed to withstand exposure to certain environmental conditions as defined by the applicable approvals. The Air-Pak X3® consists of the following major sub-assemblies

Major Sub-Assemblies

- Back frame and Harness Assembly
- Dual Path Pressure Reducing Assembly (PRA)
- Snap-Change Air Cylinder and Valve Assembly
- E-Z Flo+ Facepiece Mounted Regulator (FMR)
- AV3000 HT Facepiece
- Pak-Alert SE7 (Integrated PASS Device)

Back frame and Harness Assembly

The back frame consists of a Kevlar cylinder retention band and latch assembly, connected to an aluminum frame. The Snap-Change Pressure Reducing Assembly, integrated PASS device, and battery compartment are attached to the back frame. The harness consists of adjustable shoulder straps, facepiece clip, regulator cup, drag loop, waist pad, and Class 1 rated waist strap. Because the waist strap buckle can only be connected one way, care must be used when slinging the Air-Pak to avoid twists in the straps.

The Dual Emergency Breathing Support System “Buddy Breathing” hose is mounted in a pouch on the user’s right waist pad. The standard SFD drop bag is located on the user’s left side.

Dual Path Pressure Reducing Assembly

The Air-Pak X3® features a redundant, "Dual Path" Pressure Reducing Assembly (PRA). It was originally developed with NASA in 1976 with no reported complete failures. The assembly incorporates two inter-connected, redundant pressure reducers. The PRA converts cylinder pressure in the primary reducer to 125 psig. When the cylinder pressure drops to approximately 33%, it triggers an automatic transfer to the secondary reducer, set at 150 psig. This change in pressure activates the Vibralert in the Facepiece Mounted Regulator. If the primary air path of the PRA becomes blocked or should fail closed, the secondary air path will automatically begin supplying air to the Facepiece Mounted Regulator and the Vibralert alarm will be actuated to warn the user of malfunction. If this occurs, the SCBA should be placed out of service and sent in for repair.

The PRA incorporates SCOTT's proprietary "Snap-Change" cylinder connection. When attaching an air cylinder, the user must ensure both Snap-Change locks "click" into place. No orange should show around the lock rings. Do not attempt to release a cylinder while the system is still pressurized.

Snap-Change Air Cylinder and Valve Assembly

The cylinder valve includes a valve body, Snap-Change nipple, threaded fill connection with dust cap, tri-lobe ratcheting hand wheel, safety disc (burst disc), and pressure gauge. The pressure gauge continuously shows the air pressure in the cylinder. The gauge is calibrated in 100 psig increments. For example, a gauge reading of 20 is read as 20 x 100 or 2,000 psig. A hand wheel is used to open and close the cylinder valve.

The cylinder valve is designed to freely open. However, it has a ratcheting style closing mechanism designed to limit the possibility of accidently closing the cylinder valve once open. In order to close the valve, the hand wheel needs to be pushed in as the user closes the valve.

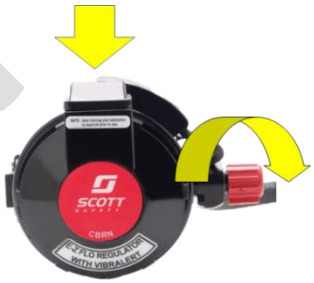
The standard cylinder used in our SCBA is the Scott 5.5 Snap-Change by Luxfer. The 5500 psig design allows up to 11% reduction in cylinder weight and 8% reduction in cylinder diameter. Our SCBA cylinders have a service life of 15 years. Every five years they are required to pass hydrostatic testing. The following chart shows cylinders at full pressure:

Rating	Pressure	Capacity	Weight
Model 5.5 45 min	5500 psig	66 cu. ft./ 1841 L	13 lb. 9 oz.
Model 5.5 60 min	5500 psig	87 cu. ft./ 3464 L	17 lb. 6 oz.

Care should be taken when carrying cylinders. Do not pick up or carry SCBA cylinders by the valve handle. Use the body of the valve assembly to pick up, carry, and set down the cylinders.

The threaded connection on the cylinder valve assembly is used for filling. It incorporates a one-way valve that allows air to enter the cylinder, but not escape. DO NOT open the hand wheel during filling. Opening the hand wheel will cause air to discharge through the Snap-Change nipple.

E-Z Flo+ Facepiece Mounted Regulator



This is a pressure-demand regulator, which keeps a positive pressure in the facepiece at all times. The E-Z Flo+ Facepiece Mounted Regulator features:

- One gloved hand operation
- Redundant locking system
- Easy inhalation/exhalation
- Vibralert primary End of Service Time Indicator (EOSTI)
- Heads-Up Display (HUD) secondary End of Service Time Indicator (EOSTI)
- Chemical, Biological, Radiological, Nuclear approved
- Easy cleaning

The design of the Facepiece Mounted Regulator separates the air being inhaled from the exhaled air. This design limits the possibility of cross contamination between users. Upon inhalation, the air enters the facepiece through 9 small holes on top of the Facepiece Mounted Regulator. This assembly is called the spray bar. The air flows across the facepiece lens, cooling and removing any condensation that is built up. Next, the air flows through the red inhalation valves in the nose cup and into the user's respiratory tract. When the user exhales, the air is directed through the hole in the facepiece and corresponding exhalation port on the regulator. Finally, the exhaled air is vented through the regulator cover into the atmosphere.

Because of this separated flow path design, the regulator does not need to be cleaned or disinfected between users.

AV3000 HT FACEPIECE

The Scott AV3000 HT facepieces are available in three sizes (small, medium, and large). High performance materials in the lens and bezel meet the rigorous requirements laid out in NFPA 1981, 2013 Edition. These new materials enhance wearer safety by ensuring the facepiece maintains positive pressure when exposed to high heat and flame loads

The Kevlar harness has a reduced profile to eliminate bunching and discomfort under helmets.

The SCOTT AV3000 HT is equipped with Voicemitters. The Voicemitters are a mechanical voice amplification system that increases the clarity of communication between users. There are two Voicemitters, one on each side of the facepiece. The Voicemitter cover on the right side of the facepiece incorporates a mounting bracket for the SCOTT Epic 3 voice amplifier. The Epic 3 is a battery-powered voice amplification device. The presence of the bracket allows for future use of the Epic 3, should testing prove it to be more effective than the current passive system.

The most effective technique for communicating into a portable radio is to place the remote microphone directly over either of the Voicemitters.

NOTE: The issued Scott Facepiece meets ANSI 287 + D3 for impact resistance and splash / droplet

PAK-ALERT SE7 (Integrated PASS Device)

SCOTT's integrated PASS device, the Pak-Alert SE7, is mounted on the back frame. It incorporates all of the NFPA 1982, 2013 edition requirements; universal PASS sound, more consistent alarm sounds on the fire ground, and 33% End of Service Time Indicator (EOSTI).

Operation

The Pak-Alert has two components. The Remote Pressure Gauge assembly and the Back frame Mounted Sensor module.

The Remote Pressure Gauge is located on the user's right side. It has two function buttons, an LED backlit analog pressure gauge, LED indicator lights and a photo sensing diode for the Heads-Up Display's intensity. The sensor module assembly contains the motion sensor, two speakers, battery power source for the PASS and Heads-Up Display, built in LEDs for alarms, 1/3-cylinder End of Service Time Indicator (ESOTI), and the external Heads-Up Display module. Power comes from 6 AA batteries. Batteries will be changed twice a year.

Remote Pressure Gauge

Warning: ALWAYS BE SURE THAT THE CYLINDER VALVE IS OFF AND THE PASS ALARM IS COMPLETELY INACTIVE BEFORE CHANGING BATTERIES. NEVER REMOVE OR REPLACE BATTERIES WITH SYSTEM PRESSURIZED OR DAMAGE MAY OCCUR TO ELECTRONIC COMPONENTS.

Use a Phillips screwdriver to remove the battery housing cover. Carefully remove and set aside. Slide the used batteries out and replace with new AA batteries of the same type. To maintain a watertight seal to the battery compartment, ensure there is no debris or damage to the cover or gasket. Align the three groves and hand-tighten.

Back frame Mounted Sensor

The system is activated by a pressure switch when the cylinder valve is opened. The system will chirp 3 times to indicate activation. If no motion is detected in 20 seconds, a pre-alarm consisting of ascending/descending tones is heard from the sensor module on the back frame. The console assembly and back frame LEDs will flash red. Full alarm is reached 12 seconds after pre-alarm. The Pak-Alert will sound a continuous, 3-tone chirp. The console and back frame LED's will continue to flash red.

The Remote Pressure Gauge buttons are RED and YELLOW. The buttons are designed large enough to be easily manipulated by a gloved hand, but slightly recessed as to limit accidental activation. Pressing the RED button will place the PASS into full alarm mode. This can be done with or without air in the system. The YELLOW button is used to reset the PASS in "pre-alarm" by clicking the button once. If the PASS is in full alarm, pressing the YELLOW button twice will reset the system. The YELLOW button is also used to shut off the integrated PASS after doffing and bleeding all air from the system. Two clicks will deactivate the integrated PASS.

This is confirmed by a 2-tone beep from the sensor module and no flashing LEDs. If you attempt to deactivate the PASS with a pressurized system, you will hear single “chirps” every second for approximately 15 seconds. At the end of the 15 seconds the chirps will stop, this DOES NOT indicate the PASS has been de-activated. The integrated PASS will continue to sense motion and go into pre-alarm until all air has been removed, the YELLOW button has been depressed twice and a two-tone shut off tone has been heard.

PAK-ALERT

The Pak-Alert distress alarm includes on-board electronics which maintain a running log of event data including start-up, shut-down, and PASS activation.

ANALOG AIR PRESSURE

The Remote Pressure Gauge assembly incorporates an analog display. It is built at an angle to allow for easier viewing. It is backlit by an LED to assist in low light visibility.

Pak-Alert Visible Indicators

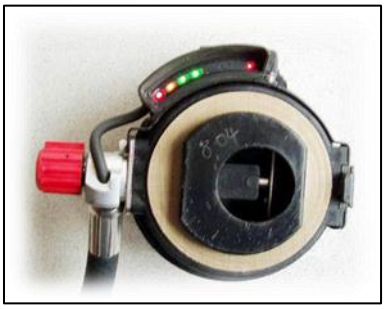
ACTION	SENSOR MODULE LIGHTS
Startup Pak-Alert (open cylinder)	Bright light, then flashes GREEN
Normal Operation	Flashes GREEN
Low Air (1/3 cylinder)	Flashes ORANGE (alternately)
Low Battery while ON	Flashes ORANGE once every two (2) seconds
Shut Down	Lights off
Press RESET w/unit OFF (BATTERY TEST)	Bright light, then flashes GREEN if Good / flashes RED if Low
Press MANUAL ALARM with unit OFF	Flashes GREEN, then flashes RED
Press RESET from manual alarm	Returns to flashing GREEN
PASS Pre-Alarm	Flashes RED (alternately)
PASS Full Alarm	Flashes RED (simultaneously)

NOTE: THE ORANGE LIGHT IS A COMBINATION OF THE RED, GREEN, AND WHITE LIGHTS THAT APPEARS ORANGE FROM A DISTANCE. AT CLOSE RANGE THE INDIVIDUAL LIGHTS MAYBE

HEADS-UP DISPLAY

Operation

The Heads-Up Display provides a visual monitor of the air supply in the cylinder and valve assembly. The display is fitted to the Facepiece Mounted Regulator and appears across the bottom of the user's field of view through the lens. The Heads-Up Display consists of four rectangular LEDs to represent the cylinder pressure at FULL, THREE-QUARTERS, ONE-HALF, and ONE-THIRD. A fifth red round light indicates LOW BATTERY.



When the air cylinder valve is opened, the Heads-Up Display will initialize and illuminate all five lights for twenty seconds. Operation of all five lights must be verified every time the respirator is used and during the Daily Function Check. After initialization, the rectangular indicator lights will show the level of the air supply in the cylinder. If the lights do not operate as described, DO NOT USE THE RESPIRATOR. Remove from service, Form 15, and send in for repair.

The integrated Pak-Alert alarm will cause the Heads-Up Display lights to flash in an alternating pattern when in pre-alarm. In addition, the color of the Remote Pressure Gauge light will be the same as the current cylinder level light showing on the Heads-Up Display. The Heads-Up Display has an automatic brightness control that dims the display in low light and returns the display to full brightness in bright light situations.

When the batteries require changing, the round LOW BATTERY indicator to the right of the display will stay illuminated for twenty seconds. After twenty seconds, it will flash slowly (once per second). When the LOW BATTERY indicator activates, there is still sufficient power to operate the Heads-Up Display for the duration of the cylinder. However, the batteries must be changed immediately upon terminating use of the SCBA before re-entry into an IDLH.

Heads-Up Display Light Indicators

	HUD in initialization mode
	Cylinder above ¾ full
	Cylinder ½ to ¾ full
	Cylinder ⅓ to ½ full
	Cylinder less than ⅓ full
	Pak-Alert in Pre-Alarm (alternating pattern)

DUAL EMERGENCY BREATHING SUPPORT SYSTEM "BUDDY BREATHING" SYSTEM

Description

The Scott Air-Pak X3® is equipped with a Dual Emergency Breathing Support System "Buddy Breathing" accessory hose. One end is permanently connected to the low-pressure side of the SCBA's Pressure Reducing Assembly (PRA).
The other end is fitted with both male and female quick disconnect couplings.

A belt mounted carrying pouch with a snap opening is used to store the Dual Emergency Breathing Support System when not in use.

The pouch is mounted on the right side of the waist pad.

The Emergency Breathing Support System is not a transfill system. Transfill systems move air from one cylinder to another on the high-pressure side of the PRA. The Emergency Breathing Support System "Buddy Breathing" system allows users to share air on the low-pressure side of the PRA.

When used for emergency escape, the Emergency Breathing Support System must remain connected and used to supply breathing support air to ONLY ONE other user.

Function

There are two ways to share air using the Emergency Breathing Support System "Buddy Breathing" system:

Emergency Breathing Support System connection to Emergency Breathing Support System connection.

Two SCBA users can connect their "Buddy Breathing" hoses together. The remaining air capacity of both cylinders is available to both SCBA users, so long as they stay connected.

Emergency Breathing Support System connection to Facepiece Mounted Regulator quick disconnect.

The air from only one SCBA cylinder is used to support two users. The “receiving” member detaches the Facepiece Mounted Regulator from their SCBA by separating the quick disconnect coupling. The “donating” member connects their “Buddy Breathing” hose to the receiver’s Facepiece Mounted Regulator quick disconnect coupling.

If a situation arises that requires the use of the Emergency Breathing Support System, the following points shall be followed:

1. Declare a Mayday and plan your escape route.
2. The donor should have enough air in their cylinder to support two people to make it to an area of refuge.
3. The donor’s Vibralert should not be activated.
4. Each user’s Remote Pressure Gauge will continue to display their individual cylinder pressure, not the average pressure between the two users.
5. Users must be aware of the importance of maintaining a secure face to facepiece seal.
6. Donating user must ensure the receiver’s facepiece and regulator are properly donned, connected, and secure prior to connecting the Emergency Breathing Support System.
7. REGARDLESS OF THE CIRCUMSTANCES, THE USERS ENGAGED IN EMERGENCY BREATHING SUPPORT WITH AN EMERGENCY BREATHING SUPPORT SYSTEM MUST IMMEDIATELY EXIT THE IDLH.
   When the SCBA is pressurized, the Emergency Breathing Support System hose is also pressurized. This is due to the Emergency Breathing Support System being on the low-pressure side of the PRA. The male side of the Emergency Breathing Support System manifold can release air at up to 150 psig when the check valve sleeve is pulled back. DO NOT pull the check valve sleeve and point the male end toward anyone. Care must also be taken to keep the Emergency Breathing Support System hose from becoming entangled.

Damage to the hose may result in partial or complete loss of air. **If damage occurs when connected and in use by two persons for emergency breathing support, the air loss will be from both cylinders.** Good practice dictates that one user always maintain control of the connected manifolds. This is especially true when performing any Fire Ground Survival techniques.

Only through practice and proper training can users become familiar enough to safely perform the procedures required in an emergency or stressful situation. The following procedures list contains the steps required to familiarize the user with the connect and disconnect features. Users should feel comfortable with these procedures in limited visibility while wearing firefighting gloves. The procedures are:

1. Declare a Mayday and plan your escape route.
2. Determine whether or not there is sufficient air remaining in the donating member's cylinder to support two users.
3. Open the snaps on the pouch and extend the Emergency Breathing Support System hose.
4. Remove the dust cap from the manifold
5. Determine which method of connection is most appropriate:

a. If the person requiring support DOES NOT have a matching Emergency Breathing Support System connection, or that connection is not accessible, they must hold their breath and separate the QD on the regulator hose and connect it to the female side of the manifold. Push until a sharp "click" is felt or heard.
b. If the Emergency Breathing Support System hose on the person requiring support is accessible, the two manifolds may be joined either male-to-female or female-to-male.

6. Test for positive connection by tugging on the couplings.
7. When operating with mutual aid companies, remember that the person requiring support must have either a regulator hose with a male quick disconnect or a matching Emergency Breathing Support System hose. The person giving support must have the Emergency Breathing Support System on their SCBA.

Influence of the Pressure Reducing Assembly

The Emergency Breathing Support System "Buddy Breathing" system, Facepiece Mounted Regulator, and Remote Pressure Gauge are all located on the "low pressure" side of the Pressure Reducing Assembly (PRA). Under normal operation, the PRA reduces SCBA cylinder pressure to 125 psig. At this pressure, the Vibralert alarm is silent. When cylinder pressure drops to ~1833 psig (⅓ capacity), the PRA switches air flow to a secondary pathway. Air exits the secondary PRA pathway at a higher pressure (150 psig). This higher pressure causes the Vibralert alarm to sound.

An alarming Vibralert is a very important indicator during "Buddy Breathing" operations. Air exiting the Emergency Breathing Support System connection from an SCBA in alarm does so at a higher pressure (25 psig higher) than air leaving an SCBA that is not in alarm. Member's sharing air in this way (one SCBA above 1/3, the other in alarm) will ALWAYS consume the "low" member's cylinder first, because that system is discharging air at a higher pressure. If both SCBA are operating at the same pressure (both above 1/3 or both in alarm), the cylinders will be consumed at more or less the same rate.

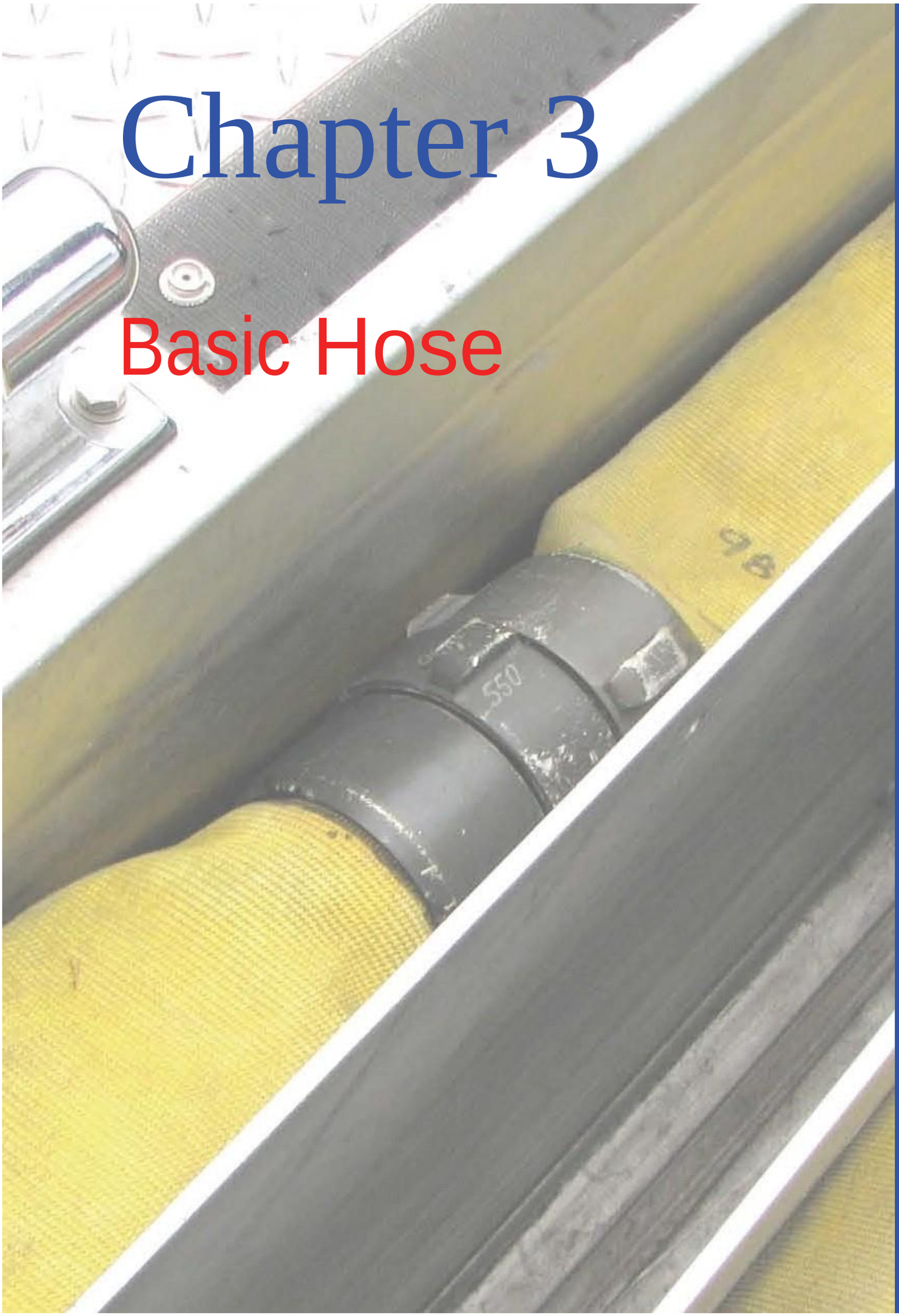
When an SCBA that is not in alarm is connected to one that is, both Vibralerts will sound. This is due to the higher pressure from the "low" SCBA overcoming the lower pressure from the "full" SCBA.

End of Use

When both users have exited the IDLH, Emergency Breathing Support System function can be terminated. Remove the facepiece and regulator from the user requiring support first. Separate the regulator or manifolds from each other. Replace the dust caps on the Emergency Breathing Support System manifolds. Coil the hose neatly and return to the carry pouch.

Chapter 3

Basic Hose



BASIC HOSE INTRODUCTION

Simply stated, the mission of our organization is to save lives and protect property. The application of water on fire is a direct action that allows us to meet our goals and produce a successful outcome for those in danger during a fire.

A competent and well-organized deployment of fire hose is essential.

Any number of firefighters, in any combination, must be able to work in concert to make the appropriate hose lays quickly. Every second counts at a fire scene. There is no substitute for teamwork and there's nothing worse than a mistake in execution. The hose laying operation is often the most visible part of our job at a fire. Effective and coordinated execution gives the public a positive perception of our department and its members.

This section contains the information and techniques necessary for the loading and deployment of both supply and attack lines used in the Seattle Fire Department. These are among the most basic of firefighting skills and the foundation upon which all hose operations are built. A diligent study of these concepts will aid in the development of the necessary confidence needed to work with a first-line team.

BASIC HOSE GLOSSARY

AERATION-
A process by which air is introduced into a liquid, either by bubbling the air through it or by spraying the liquid into the air at normal pressures.

APPLIANCE-
Any variety of tools or devices carried on an engine that connect hoses or stream devices together.

APPARATUS-
A fire engine or ladder truck of any variety used in the fire service.

ATTACK LINES-
Hose lines or fire streams used to attack, contain, or prevent the spread of fire.

BALE-
The lever shut-off device on nozzles.

BIGHT-
Refers to a bend or a fold in a hose or a rope.

BODY LOOP-
A one-inch piece of nylon sewn into a 51-inch continuous loop with all safe working loads computed at a 5:1 design failure. The vertical weight load limit is 300 pounds, choke weight load limit is 225 pounds and basket weight load limit is 600 pounds.

BOOSTER TANK-
An engine mounted water storage tank, with a minimum of 500 gallons. Same as “water tank.”

BRASS-
A copper-zinc alloy. Also, a term used to describe hose couplings, whether or not they are made of brass or the lighter and stronger composite material, pyrolite.

BUNKER GEAR-
An entire set of firefighter’s protective clothing that includes helmet, coat, pants, boots, and gloves. Same as “turnouts.”

CENTRIFUGAL PUMP-
Pump with one or more impellers that utilizes centrifugal force to move the water. Most modern fire pumps are of this type.

CHARGE-
To pressurize a fire hose or fire extinguisher.

COMPOUND GAUGE-
A pressure gauge that can measure positive and negative pressures.

CROSS LOT-
An individual or group technique used to deploy hose over distance from the engine to an objective.

DUTCHMAN-
A short fold or reverse bend used to allow couplings to pay out without them turning over. Same as a "dog-leg."

ENGINE PORT-
The largest discharge opening on a fire hydrant. Same as "steamer port."

FLAKES-
Each single fold in a hose load.

FLOW-
The motion characteristics of water.

FORWARD LAY-
Hose laid from the water source to the fire.

G.P.M.-
Gallons per minute. A measurement used to describe the rate of flow.

GASKET-
A thin rubber O-ring that allows couplings and appliance to seat firmly and prevent leakage.

GATED WYE-
An appliance, equipped with manual valves, that allows a single hose to be split into two hoses.

HIGBEE CUT-
A machined 45-degree angle cut into the threaded portion of couplings that allows for quick and easy threading.

HIGBEE MARKER/NOTCH-
An indentation in the rocker lug of a coupling that indicates the location of the Higbee cut.

HOSE PORT-
The smaller (2 ½") discharge openings on a fire hydrant.

HOSE BED-
The main hose-carrying area of a fire engine.

IDLH-
Immediately Dangerous to Life and Health.

KEYSTONE-
The main intake valve located midship on both sides of a fire engine that may be manually or mechanically operated.

LDH-
Large Diameter Hose.

MARKER BIGHT-
A bight that extends four inches beyond the 2 ½" accordion hose load to serve as a reference for locating the couplings.

MASTER STREAM DEVICE-
An appliance that delivers a large quantity of water (at least 500 GPM) such as a deck gun, ground monitor, or ladder pipe.

OVERHAUL-
When referring to hose, means to carry or drag supply hose to a specific location.

P.T.O.-
Power take-off. Rotating shaft that transfers power from the engine to auxiliary equipment (fire pump).

PRESSURE GAUGE-
A gauge that measures the fire pump discharge pressure.

PRESSURE RELIEF VALVE (PRV)-
A device designed to release excess pressure from the fire pump.

PRIMING PUMP-
A small positive-displacement pump used to evacuate air from a centrifugal pump housing and hard suction hose.

P.S.I.-
Pound(s) per square inch. A measurement of pressure used in pumping, hydraulics, pneumatics, and operating hose streams.

REVERSE LAY-
Hose laid from the fire to the water source.

ROSS DUMP VALVE-
An adjustable valve plumbed into the intake side of the fire pump to mitigate any excess intake water pressure.

SEXLESS COUPLING-
Coupling with no distinct male or female components. Same as "Storz."

SHAPER-
The front (rubber bumper) part of a nozzle that rotates and determines the shape and pattern of a water stream. Turn clockwise for a straight stream and counter-clockwise for a fog stream.

SHOULDER-LOAD-
A stack of hose flakes carried on the right shoulder.

SIAMESE-
An appliance that makes two hose lines into one.

SPANNER WRENCH-
A rigid or folding wrench used to tighten or loosen couplings.

STORTZ COUPLING-
A sexless coupling.

SUCTION-
Refers to an intake port or the intake side of an appliance.

TAILBOARD-
Back step of fire engine.

TRI-GATE-
Hose appliance that divides one larger hose line into three or more smaller hose lines. Same as a "tri-gated wye."

WATER HAMMER-
Force created by the rapid deceleration of water.

ROLLING AND UNROLLING HOSE

Seattle Fire Department hose is rolled into a single roll for storage and into a double roll to transport for repair. Hose is also rolled, when necessary, to purge the air so that the hose will load more compactly. The single and double rolls are to be done with the hose stretched straight, without turns or twists, and laid flat on the ground. Hose rolling is usually a one-person operation and best performed from the highest grade of land to the lowest to facilitate water drainage. A second member, when available, can expedite the operation by assisting with stretching and laying the hose.

Rolling Hose

The Single Roll - Storage

Figure 3.1 – Facing the open end of the male coupling, grasp the coupling with both hands and roll it away from the body and tightly into the hose.

Figure 3.2 – Continue to roll the hose until the roll reaches the female coupling, making an effort to keep the edges even, and to keep the roll tight.

Figure 3.3 – Roll until the female coupling is reached, lay the roll on its side and stamp out any protruding coils down into the roll. Carry the rolled hose on the shoulder, in both arms, or by inserting the fingers of one hand into the center of the roll, near the male coupling.

Figure 3.1

Figure 3.2

Figure 3.3

NOTE: Hose must be cleaned and thoroughly dried before single rolling the hose and placing into storage.

The Double Roll - Transport for Repairs

Figure 3.4 – Beginning with the hose stretched flat, grasp the male coupling and carry it back toward the female coupling. Lay the male coupling on top of the hose about six feet from the female coupling; then walk back to the bend (bight) in the hose, centering the top layer of hose over the bottom layer.

Figure 3.5 – Straddle the hose at the bight, facing the couplings. Pick up the bight of the hose with both hands and fold it over and away from the body. Keep the two layers in line and on top of one another, and continue to roll toward the couplings.

Figure 3.4

Figure 3.5

Figure 3.6 – The top layer of hose will move forward as the roll progresses toward the couplings, moving the male coupling closer to the female coupling. When the roll reaches the male coupling, stop. The female coupling should be sticking out a foot or two beyond the male coupling at the base of the roll.

Figure 3.7 – Next, lay the roll on its side and connect the two couplings. A layer of hose should now protect the couplings.

Figure 3.6

Figure 3.7

Figure 3.8 – The double roll should be secured with three lengths of heavy-duty twine. Begin by threading one length down through the center of the roll and out to the side, coming back up between the couplings and the bight and between the two outermost layers of hose.

Figure 3.9 – Finish securing the roll by running two more lengths through the center and back around the outermost layers of hose. The three lengths should be evenly spaced about the circumference of the roll.

Figure 3.8

Figure 3.9

NOTE: If the hose has been damaged, a rag should be tied around the hose at the point of damage. Information should be written on the repair tag (F14) and attached to the hose. The damaged area should be indicated on the repair tag by noting the number of feet from the male coupling.

Unrolling Hose

Traditional method

The traditional method to unroll hose is to grasp the outside coupling and to push the rest of the roll away, allowing the roll's own inertia to unwind it. However, the problem with this method is that the male coupling at the other end could become damaged as it snaps downward against the ground from the momentum of the unrolling action. When couplings are not "coupled" they can become "out of round" when violently handled. The following method avoids this problem and works especially well when space is limited.

Butterfly Method

Figure 3.10 – Begin by unwinding one layer of hose and standing the roll on edge. Next, grasp the first layer of hose on the roll, lift it enough to create some slack, and move it to one side of the roll.

Figure 3.11 – Grasp the next layer (now the top layer) in the same manner and move it to the opposite side. Continue pulling successive layers to alternate sides until the roll is deployed.

Figure 3.12 – Finally, grasp the male coupling from the center of the roll and walk away, stretching the hose out on the ground.

Figure 3.10

Figure 3.11

Figure 3.12

MAKING AND BREAKING COUPLINGS

The following instructions include directions for making and breaking hose using one and two person methods. Couplings are normally made (coupled) hand-tight against the gasket. Over-tightening of a connection by two members should be avoided since the connection may have to be broken (uncoupled) by one member. With couplings and gaskets in good repair, a hand-tight connection is enough to prevent leakage under pressure.

Before connections are started, the female coupling should be checked to ensure the gasket is in place.

The general rule is that couplings are made or broken while facing the male coupling and turning the female swivel.

From the perspective of "looking at the male coupling", the female swivel is turned right (clockwise) to make, and turned left (counter-clockwise) to break connections. By keeping the crease of the female end of the hose slightly out of line counter-clockwise from the crease on the male end, you can turn the swivel of the female coupling in a clockwise direction until seated and finish the tightening by grasping both the female swivel and bowl firmly and turning clockwise to align the creases on both sections of coupled hose.

The exceptions to this rule occur when attaching lines to fixed appliances with swivels (building FDC's), to portable appliances, and female engine connections. In this case, the swivel must be faced and will be operated from the opposite side of the swivel.

***NOTE*:** Start couplings quickly, and easily, by aligning the Higbee markers. The Higbee marker identifies a point on the coupling where the first full thread starts. When coupling hose without the Higbee marker, turn the female swivel counter-clockwise against the male coupling until a slight click is felt between the two couplings. At that point, the threads of both couplings are aligned.

One Member (Standing Method)

Figure 3.13 – Begin by holding the hose between the legs, near the female coupling. (An acceptable change would be to hold the hose at the female coupling slightly below the waist.) Grasp the bowl of the male coupling with the left hand, palm up, with the left elbow resting against the left thigh.

Figure 3.14 – To make the coupling, grasp the swivel of the female coupling with the right hand and align the two couplings in the same plane. The swivel should be turned clockwise. To break the coupling, the swivel should be turned counter-clockwise.

Figure 3.13

Figure 3.14

One Member (Stepping on Hose Method)

Figure 3.15 – With the hose on the ground, face the male coupling and place one foot directly behind the bowl of the male coupling. The action of stepping in this location should change the angle of the coupling with relation to the ground making the connection easier.

Figure 3.16 – To make the coupling, grasp the swivel of the female coupling with both hands, align with the male coupling, and turn in a clockwise direction. To break the coupling, turn the swivel in a counter-clockwise direction.

Figure 3.15

Figure 3.16

One Member (Alternate Stepping on Hose Method)

Figure 3.17 – Place the coupling on the end of a short double fold to aid in tilting it upward. Step on the short double fold with the left foot (or knee) and rotate the coupling with both hands.

Figure 3.18 – To make the coupling, grasp the swivel of the female coupling with both hands, align with the male coupling, and turn in a clockwise direction. To break the coupling, turn the swivel in a counter-clockwise direction.

Figure 3.17

Figure 3.18

Two Members

Figure 3.19 – To make the coupling, begin with one member holding the male coupling and the second member holding the female coupling. The member with the male coupling grasps it with both hands around the bowl and holds it in a horizontal plane allowing the other member to align the couplings. It is important that the member with the male coupling look completely away to eliminate the tendency to assist.

Figure 3.20 – The member with the female coupling then grasps the bowl with the left hand and the swivel with the right hand, aligning the female coupling with the male coupling. This member then turns the female swivel in a clockwise direction with the right hand until the couplings are seated. Finish by grasping both the swivel and bowl with both hands and turning clockwise, aligning the creases.

To break the coupling, the member with the male coupling grasps it firmly while the other member turns the swivel counter-clockwise until the coupling is broken.

Figure 3.19

Figure 3.2

Two Members Un-Coupling Hose (Spanner Wrenches)

Figure 3.21 – The two members begin by facing each other with the member on the side of the male coupling positioning a spanner wrench on the lug of the bowl, applying force in a counter-clockwise direction.

The member on the female coupling side then positions a spanner wrench on the lug of the female swivel and turns in a counter-clockwise direction until the connection is broken.

Figure 3.21

A single member can complete this by kneeling at the hose and alternating the spanner wrenches in the same fashion as described above.

ATTACHING AND REMOVING NOZZLES

One Member (Standing Method)

Figure 3.22 – To attach the nozzle, face the male coupling and grasp the bowl of the coupling with the left-hand palm up while bracing the left forearm against the left thigh. Grasp the nozzle by the barrel with the right hand at a point where the nozzle is in balance.

Figure 3.23 – Align the couplings and turn the nozzle in a clockwise direction to start the connection. Continue to rotate the nozzle until the coupling is seated and hand tight.

To remove the nozzle, rotate the nozzle counter-clockwise while bracing the male coupling with the left hand.

Figure 3.22

Figure 3.23

One Member – (Stepping on Hose Method)

Figure 3.24 – To attach the nozzle, fold two short double flakes ending with the male coupling on top.

Figure 3.25 – Step on the folds, just behind the male coupling, with the left foot. Align and attach the nozzle with both hands rotating clockwise. Continue to rotate the nozzle until the coupling is seated and hand tight.

To remove the nozzle, rotate the nozzle counter-clockwise with the left foot stepping on the hose, just behind the male coupling.

Figure 3.24

Figure 3.25

NOTE: If the female coupling of the nozzle has a moveable swivel (like the TFT© Midmatic or Handline nozzles), grasp the barrel with the left hand and turn the swivel with the right hand.

Two Members

Figure 3.26 – The two members begin by facing each other, one member with the male hose coupling and the other member with the nozzle. The member with the male coupling grasps the bowl with both hands, holding the coupling in a horizontal plane. This member makes no attempt to align the couplings and needs to look away completely to avoid the tendency to assist. The member with the nozzle then grasps the barrel of the nozzle with both hands, aligning the coupling of the nozzle with the coupling on the hose. Turn the nozzle in a clockwise direction until seated hand tight. If the female coupling of the nozzle has a movable swivel, grasp the barrel with the left hand and turn the swivel with the right hand in a clockwise direction until tightly seated.

Figure 3.26

STRETCHING AND CARRYING HOSE

A shoulder-load is a method of carrying hose to an objective. Remember to pull and lift the shoulder-load with the arm and leg muscles, not the back muscles. Maintain the flakes of the shoulder-load in an upright position with the arms and hands providing support. The flakes should be positioned with one-third of the length in front of the body and two-thirds in back with the nozzle or coupling at slightly above the waist.

Adjust the load, if necessary, to prevent the hose from dragging on the ground. Always exercise caution when stepping away from the tailboard with a shoulder-load of hose.

Shoulder-loading Hose from the Ground After Use

Shoulder-loading Stretched Hose

Figure 3.27 – After the hydrant has been shut down, pressure has been released, and all couplings have been broken, straighten the hose line and eliminate all kinks to allow drainage. When the hose is laid out on level ground, start with the coupling farthest from the engine.

NOTE: Consider starting with the coupling at the highest elevation when shoulder-loading on a grade.

To begin, face the hose and place the initial coupling against the front of the body about chest high. The hose should then be passed over the right shoulder with the hose lying flat on the shoulder. This will form a flake with the bight behind the knee joint.

Figure 3.28 – Form another flake in front of the body with the bight slightly above the waist.

Figure 3.29 – Continue to form flakes in the same manner while keeping each flake flat, the same length, and on top of the previous flake. When the other coupling is reached, lift it from the ground and press it onto the top of the shoulder-load at chest height. Carry the shoulder-load to the engine and lay it on the ground in position for loading, parallel to the tailboard and three feet away.


Figure 3.27


Figure 3.28


Figure 3.29

Shoulder-loading a Flaked Bundle

Figure 3.30 – "Dress" the hose on the ground so that the flakes are parallel and free of entanglement. Stand alongside the hose, adjacent to the nozzle, or the male coupling, or the last flake to be extended, whichever is appropriate.

NOTE: If the bundle is significantly "messy" and you are in a hurry to accomplish a hose lay, the front third of the bundle is the most important part of the bundle to "dress" prior to attempting to shoulder-load the bundle.


Figure 3.30

Figure 3.31 – Kneel down next to the hose while facing the nozzle or the front of the hose bundle. Using both hands, gather and squeeze the flakes together, lifting the forward bights from the ground.

Figure 3.32 – Lift the bundle and place it flat on the shoulder with the other flakes stacked vertically on top of it. Then stand, taking care to use the leg muscles and to avoid twisting the back. All hose will be shoulder-loaded in this manner, regardless of diameter.

Figure 3.31

Figure 3.32

Shoulder-loading hose from the Engine

1 ¾" Pre-connect Shoulder-load

Figure 3.33 – Begin by facing the open end of the hose slot. When necessary, stand on the tailboard to reach the hose with good body mechanics. Grasp the entire bundle with both hands and pull it one-third of the way out of the slot.

Figure 3.34 – Pivot toward the hose, turning the back toward the hose slot, and placing the bottom flake of the bundle on the right shoulder. The nozzle and front flakes should be at the belt line.

Figure 3.33

Figure 3.34

Figure 3.35 – Hold the bundle tightly in front of the body with both hands. Step away from the engine in a straight line and pull the remainder of the bundle completely out of the slot. Continue to move away from the engine stretching out the slack behind the shoulder-load. The hands should grip the hose flakes so as to allow the hose to pay out gradually from the top, one flake at a time.

Figure 3.35

Continue in this manner until the objective is reached. The tie-rope will have to be removed once about 25 feet away from the tailboard. Any excess working line is then arranged so as to be free of kinks and is placed into a configuration (large flakes) that will allow for easy advancement.

1 ¾" Apartment Bundle Shoulder-load

Figure 3.37 – **One person carry.** Begin by facing the open end of the hose slot. When necessary, stand on the tailboard to reach the hose conveniently. Grasp the entire bundle (consisting of 200 feet of hose, 1 3/4" nozzle, and 2 1/2" to 1 1/2" Bell Reducer) and pull it one-third of the way out of the slot.

Figure 3.38 – One person carry. Pivot toward the hose; the nozzle and front flakes should be at the belt line. Pull both bundles partially out of slot and shoulder-load. Hold the bundles tightly in front of the body with both hands. Step away from the engine in a straight line and pull the remainder of the bundles completely out of the slot.

Figure 3.37

Figure 3.38

Figure 3.39 – Two Person Carry. Begin by facing the open end of the hose slot. When necessary, stand on the tailboard to reach the hose conveniently. Grasp the top bundle (consisting of 100 feet of hose and bell reducer) and pull it 1/3 the way out the slot.

Pivot toward the hose, turning one's back toward the hose slot, and place the bottom flake of the top bundle on the right shoulder. First firefighter (Heel) shoulder-loads the top 100' section and steps away from the tailboard. Second firefighter (Nozzle) shoulder-loads the bottom section and steps off tailboard. Both firefighters proceed to the water source, taking care not to drag the length of hose between them on the ground.

Figure 3.39

Figure 3.40 – Once the connection is made between the bell reducer and the water source, the team will advance together to their objective. The rear member grips the hose flakes to allow the hose to pay out gradually from the top, one flake at a time. As the rear member notices the last flake of the shoulder- load is about to pull off, he/she shouts for the member ahead to "**stretch**" and allows the last flake to drop from the shoulder. The forward member then stretches the shoulder load in an identical manner until the objective is reached. Any excess working line is then arranged so as to be free of kinks and into a configuration which allows for easy advancement.

Figure 3.40

2 1/2" Hose Shoulder-load from 2 1/2" Bulk Bed

Figure 3.41 – Begin by facing 2 ½" bulk bed from the tailboard. When necessary, stand on the tailboard to reach the hose conveniently. Grasp the leftmost bundle (the first 100 feet tied together with the nozzle attached) with the right hand just under the nozzle and the left hand on top of the bundle. Lift the bights slightly and pull the shoulder-load about one-third of the way out of the bed.

Figure 3.42 – Pivot toward the hose turning your back toward the hose bed and placing the bottom flake flat on the right shoulder; the nozzle and front flakes should be at the belt line. Pull the bundle partially out of slot and shoulder-load. Hold the bundle tightly in front of the body with both hands. Step away from the engine in a straight line and pull the remainder of the bundle completely out of the slot.

Figure 3.43 – Additional shoulder-loads, if necessary, are removed in a similar manner by other firefighters. The hose should not be broken until it is determined that the amount removed is sufficient, until the stretch has been completed, or if the hose is to be connected to a water source separate from the engine.

Figure 3.41

Figure 3.42

Figure 3.43

Additional 100-foot Section of 2 ½" (single firefighter operation)

Figure 3.44, 3.45 & 3.46 –
If a second firefighter is not readily available or if additional hose is required to reach the objective, firefighters may shoulder load a second bundle on the left shoulder or drag an additional 100' of hose. The firefighter shoulder-loads the nozzle bundle on their right shoulder as previously discussed, then turns back left toward the engine and grasps the bottom of the next bundle, pulls out approximately one third way, and shoulder-loads the second section on the left shoulder, stepping away from apparatus with a bundle on each shoulder until the second bundle is completely removed from the apparatus. Firefighters advance toward the objective, releasing bundle ties as the prior section plays out.

Figure 3.44

Figure 3.45

Figure 3.46

Large Diameter Hose Shoulder-load

Figure 3.47 – Begin by uncoupling the large diameter hose (LDH) from the tri- gate. While facing the LDH bed, place the coupling against the front of the body just above the waistline.

Figure 3.48 – The hose should then be passed over the right shoulder with the hose lying flat on the shoulder. This will form a flake with the bight behind the knee joint.

Figure 3.47

Figure 3.48

Figure 3.51 – Continue to form flakes, keeping the bights in front of the body above the waist. Each flake should be flat, the same length, and on top of the previous flake.

Figure 3.52 – When the first section (50 feet) has been shoulder-loaded and is within 10 feet of the coupling, move back several steps to allow a second member to shoulder-load the next section.

Figure 3.51

Figure 3.52

Figure 3.53 – The second member takes a position facing the hose bed, the coupling in front of him/her, with the hose lead running alongside his/her left side.

Figure 3.54 – The member picks up and passes the hose coupling across the body (from the left foot and over the right shoulder) and shoulder-loads the hose as the previously described. The coupling should now be at the small of the back.

Figure 3.53

Figure 3.54

Figure 3.55 – Additional members continue shoulder-loading hose in this manner until the designated amount has been acquired and the final coupling has been broken. The members then turn away from the hose load (a counter-clockwise pivot 180 degrees to the left), allowing the top flake to drop from their shoulder- loads. The rear-most member should be holding the final coupling in front of the body at about chest-level.

The members should then be facing away from the engine with the hose running continuously between the members and flaked on the members' right shoulders. Keep the slack between the members off of the ground.

Figure 3.55

Overhauling Large Diameter Hose (LDH)

Crosslotting LDH

Figure 3.56 – Uncouple the large diameter hose from the tri-gate. Grasp the female coupling with both hands and pull about ten feet of hose from the bed.

Figure 3.57 – While turning away from the engine, form a bight in the hose about four feet behind the coupling. Place the newly formed flake flat on the right shoulder with the bight in front of the body and the coupling against the back.

Figure 3.56

Figure 3.57

NOTE: It is unsafe to place an arm through the bight formed in front of the body.

Figure 3.58 – The member then moves quickly away from the engine, pulling the hose from the hose bed. The member should look backward frequently and should pause slightly when the next coupling emerges from the hose bed.

Figure 3.59 – As the coupling emerges, a second member, facing away from the engine, grasps the hose and places it flat on their shoulder with the coupling along their back. Additional hose is removed in the same manner until the objective is reached. With limited staffing, each member may stretch two sections, with members spaced at every other coupling.

Figure 3.58

Figure 3.59

Crosslotting LDH with the Tri-Gate Attached

Figure 3.60 – Two members begin by picking the tri-gate up by the handles and advancing toward the objective. As the coupling emerges from the hose bed, the two members pause slightly. Another member, facing away from the engine, then places the hose flat on their right shoulder with the coupling to the rear. Additional hose is removed in the same manner until the objective is reached. With limited staffing, two sections may be stretched by each member, with members spaced at every other coupling.

Figure 3.60

LOADING HOSE ONTO THE ENGINE

Loading 500' 2 1/2" Bulk Bed

Figure 3.61 – Begin preparing the hose for loading by arranging it in flakes near the rear of the engine. The flakes should run parallel to the tailboard with the male coupling nearest the engine. Neatly arrange each additional section against the previous section and progressively away from the engine, keeping them free from twists and entanglements. Do not make any coupling connections at this time.

Figure 3.62 – Place the first male coupling hanging 4" past the end of the bed at the far-right side of the open end of the 2 ½" hose bed. Hold the coupling in place and pass the hose, flat, toward the closed end of the compartment and near the closed end of the bed, make a bight in the hose to form a flake of the desired length (about eight feet). Build a vertical stack with bights even with the rear of the hose bed. Leave the first female coupling at the top of the stack flush with the bights at the open end. Tie with a bundle tie around all but the top flake; tie about 18" back from the bights.

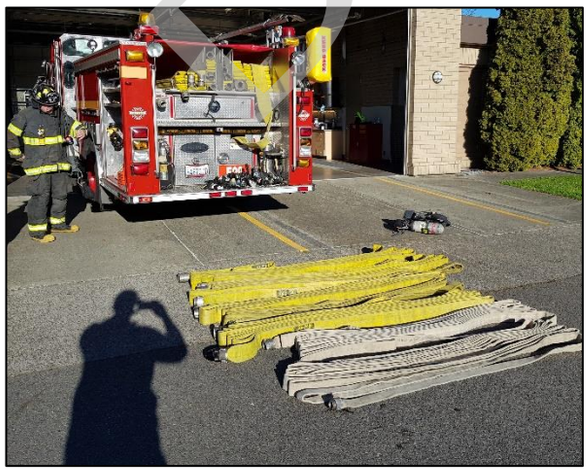


Figure 3.61

Figure 3.62

Figure 3.62 & 3.63 – Take the next 100' of hose and place the male at the bottom, 4" past the end of the bed. Build a second vertical stack similar to, and just left of the first one. Ensure a full flake on the top and tuck the female back under the top flake (to prevent twists in the hose) and connect to the male in the first (right) stack. Repeat and build 4 stacks. All bundles should be tied about 18" back from the bights with the top flake left free.

Figure 3.64 – The last bundle in the bed is the nozzle bundle. Attach a nozzle to the last section of hose. Place the nozzle on the bottom of the hose bed (left side) with the pistol grip up and the bale closed and down. The tip of the nozzle should be even with the bights of prior bundles. Build a vertical stack in the same fashion as prior stacks. All bights in the nozzle bundle should pass over the pistol grip and be even with the tip of the nozzle. Ensure a full flake on the top and tuck the female back under the top flake (to prevent twists in the hose) and connect to the male in the prior stack. Tie about 18" back from the bights with the top flake left free.

Figure 3.63 Showing the tuck on the top stack

Figure 3.64

Some fire apparatus have a hose bed configuration that will not support five vertical stacks of hose. These apparatus will use a "Plan B" Bulk load consisting of a flat load for the bottom 200' of 2 1/2" hose (similar to the 4" bed) with three vertical stacks of 100' instead of 5 (Figure 3.65)

Figure 3.65

Loading LDH (Flat Load)

Figure 3.72 – Begin by placing the male LDH coupling, with a 4" to 2½" reducer coupling attached, on the right side of the hose bed, just past the open end of the hose bed. Pass the hose straight back into the bed, lying flat, all the way down to the closed end of the compartment.

Figure 3.73 – At the closed end of the bed a bight will be formed in the hose and lead the hose back up toward the open end. Keep the hose directly on top of the first flake for about half the distance to the open end and then adjust it so that it runs against and parallel to the first flake for the remainder of the distance to the open end.

Figure 3.72

Figure 3.73

Figure 3.74 – Form a bight in the hose and keep it even with the open end of the hose bed. Then pass the hose back toward the closed end with the hose running against and parallel to the initial flake, once again forming a bight at the closed end.

Figure 3.75 – Continue to form flakes in this manner, moving over one hose width at the halfway point when returning to the open end. Upon reaching the left side of the bed, form flakes in the opposite direction back toward the right side. When the next coupling is reached, connect the next section of hose and position the coupling within three feet of the open end. Form additional layers in the same manner, keeping the couplings within three feet of the open end, until the full complement of hose has been loaded.

Figure 3.74

Figure 3.75

Loading the 1 ¾” Apartment Bundle (Slot Load)

Begin preparing the hose for loading by arranging the two unconnected bundles of 1 ¾” hose at the rear of the engine. The flakes should run parallel to the tailboard with the male coupling of the first bundle nearest the tailboard.

Figure 3.77 – Place the 1 ¾” nozzle on the hose and build a flat loaded vertical stack with the first section with the bale down and closed and the pistol grip up. Tie the bundle but leave the last flake out of the tied bundle.

Figure 3.77

Figure 3.78 & 3.79 – Attach the male of the second bundle and continue to build a vertical stack with the second 100' of 1 3/4" hose. Attach a 2 ½” to 1 ½” Bell reducer to the female on the top bundle and tie the top bundle leaving 1 loose flake between the two tied bundles. Tie ropes should be tied tight and with a quick release knot positioned at the top of the bundle.

Figure 3.78

Figure 3.79

Loading the 1 ¾” Pre-connect (Slot Load)

Figure 3.87 – Begin preparing the hose for loading by arranging the two unconnected bundles in flakes at the rear of the engine. The flakes should run parallel to the tailboard with the male coupling of the first bundle nearest the tailboard. Attach the nozzle to that first coupling.

Figure 3.88 – Start the load by placing the nozzle in the slot and allow it to extend 6 to 9 inches out from the open end of the slot. (Different brands of nozzles may need to extend slightly farther.)

Figure 3.87

Figure 3.88

Figure 3.89 – Pass the hose toward the back of the slot and form a series of vertically stacked flakes until the first 100-foot section is loaded. The folds at the open end should be aligned with each other, 6 to 9 inches from the slot opening.

Figure 3.90 – Connect the male coupling from the second bundle to the female coupling on top of the first bundle. Continue to flake the second bundle in a vertical stack on top of the first bundle until the full 200 feet have been loaded.

Figure 3.89

Figure 3.90

Figure 3.91 – Finish the load by connecting the final female coupling to the pre-connect discharge outlet. Then tie the 200-foot load and nozzle with a tie rope at the slot opening. Leave the top three bights untied to allow for slack while shoulder-loading and advancing the line.

Tuck the hose, leading from the discharge outlet, between the hose bundle and the left side wall of the slot (driver's side of the engine). Wedge just the top few inches to keep the top flakes securely in position.

Figure 3.91

Loading the 2 ½" Pre-connect ("Blitz Line" - Slot Load)

Figure 3.92 – Begin preparing the hose for loading by arranging the two unconnected bundles in flakes at the rear of the engine. The flakes should run parallel to the tailboard with the female coupling of the first bundle nearest the tailboard.

Connect the female end of the 2 ½" hose to the appropriate discharge port. Load the hose into the hose slot in a vertical stack.

Figure 3.92

Figure 3.94 – The flakes at the open end of the slot should extend 6 to 9 inches from the slot opening. The bottom and/or middle flake, of the bottom 100 feet, may be kept intentionally long to facilitate a single member reaching back to stretch the entire 200 feet.

Figure 3.95 – Continue loading the hose in this manner until there is 10 feet or less remaining when measured from the open end of the hose bed. This hose and the male coupling are passed on top of the previously loaded hose and out of the closed end of the hose bed.

Figure 3.94

Figure 3.95

Attach the nozzle to the second bundle and begin loading the second 100 feet by placing the nozzle bale down and pistol grip up in the slot with the tip even with the protruding folds of the first bundle.

Figure 3.96 – The hose of the second bundle is then passed back into the hose slot and flaked in vertical stacks. The flakes will continue to extend 6 to 9 inches from the open end of the slot, over the pistol grip, flush with the nozzle tip.

Figure 3.96

Figure 3.98 – The male end of the first section of hose and the remaining female coupling from the second section are connected and placed on top of the hose bundle.

Figure 3.99 – The bundle is now correctly loaded and ready for deployment.

Figure 3.98

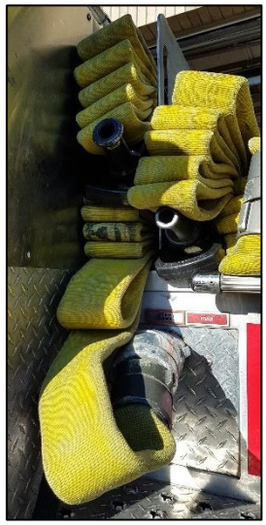


Figure 3.99

ATTACK LINES PRACTICES

A fire stream emerging under pressure from a nozzle always exerts force in the opposite direction of the water flow. The greater the pressure and the larger the nozzle's tip, the more severe the nozzle reaction will be. The member on the nozzle, along with any back-up members, must be prepared to control this nozzle reaction before opening the bale of any nozzle. They must also be prepared for the reaction caused by changing the direction of the stream. Always carry the bale in the closed position and operate it gradually to prevent surges of pressure in the line and damage to equipment. A 2 ½" attack line requires a minimum of two members to operate, but for increased safety and mobility, three or four members are recommended.

Regardless of whether the attack line connection is being made from an engine, a tri-gate, a standpipe, or a 2 ½" supply line, there are a few rules which always apply:

- Do not release the bundle tie ropes until you are ready to either make the connection or stretch the line.
- After making a connection, check the valves or gates to be sure that they are either open or closed, whichever is required.
- As soon as the line has been connected or anchored, and the valves checked, carry and stretch the shoulder-load to the objective.

After the stretch has been completed, the necessary valves or gates should be opened. Members following the line to the nozzle should check the position of the valves or gates to be sure they are open or they should be prepared to open them at the proper time. Lines should be free of kinks and arranged for easy advancement.

Stretching from a Tri-gate

The gate on the tri-gate connected to the attack line may be left either open or closed, depending on the officer's decision. The decision will depend on the type of evolution being performed.

Stretching from a Standpipe Outlet

With two members present, the bell reducer and the top two flakes of the apartment bundle are dropped at the interior standpipe connection. The line is stretched to the objective and then a member returns to make the connection. With three members present, the third member anchors the line and makes the connection to the standpipe while the other two members make the stretch. The member making the connection to the standpipe connects a pressure gauge, the bell reducer, and then opens the standpipe valve at the call for water gating up to the desired pressure.

Stretching from the Engine

The pump operator will open the appropriate discharge valves at the call for water, or as directed by the officer.

Operating a single Person 2 ½" line

Figure 3.104 – Begin by stretching the 2 ½" attack line to the objective. Form a loop in the nozzle end of the line approximately 18 feet in diameter, bringing the nozzle back around to a point where it is once again aimed toward the objective. Then cross the nozzle under the hose allowing it to extend approximately 30 inches beyond the loop. The hose behind the crossing point should be running in a straight line from the nozzle for at least 10 feet. The hose should then be secured to itself at the crossing point with a body loop using a round turn and two half-hitches. The operator then sits on the hose at the crossing point. The operator's weight and the secured body loop will hold the nozzle in place. While operating the attack line in this configuration, the operator must never remove his/her hands from the bale.

Single person 2 ½" line

ADVANCING ATTACK LINES

Regardless of whether the line being advanced is charged or uncharged, or being advanced to an upper, main, or lower floor, there are three rules that always apply:

- A minimum of two members shall be assigned to any hose line entering a building.
- Upon arrival at the objective, any remaining hose line must be arranged to be free of kinks and easily advanced - stacked into coils or flaked out.
- Control of the nozzle must be maintained at all times.

Flaking Hose

If there are no obstacles or the attack line is being charged outside a building, the most efficient way to deploy the final sections of hose, prior to charging the hose with water, is to create large flakes.

Begin by laying down the excess hose that is intended to enter the structure or be used outside in a neat bundle. Grab one, or two, center flakes from the neat bundle (depending on how much hose is remaining). Stretch the hose straight back from the intended objective. When the hose charges, it will be in an orientation that will allow easy deployment.

Be mindful of equipment and personnel that will need to use the entrance. Considering this, it is usually a best practice to avoid setting down a hose bundle directly in front of the entry point. Try to prepare and charge your hose 10 or more feet away from the front door and to one side or another when possible. Pay attention to the building you are entering and orient your long flakes to ensure that the front door is not the first “pinch” point that will create excess friction.

Coiling Hose

There are situations that will require a neat and compact charged handline (high-rise, numerous obstacles present, etc.). A coil will allow the nozzle (and subsequent hose) to "pay off" the top of the bundle and easily be deployed to a desired location. Stairwells and tight hallways will make good use of this technique. Coils will also allow the firefighter to carry a charged coil on their shoulder for a period, until stretching is required.

Figure 3.105 - Lay the excess hose down on the ground in a neat bundle. The bundle should remain tied, if possible, until it is on the ground. This will help with keeping the hose as orderly as possible.

Figure 3.105

Figure 3.106 - Kneel at the bundle and untie it, if necessary. Slide the nozzle close to your knees. Beginning with the second flake of hose, pick up every other flake until the last flake is reached.

Figure 3.106

Figure 3.106 (cont.)

Figure 3.107 - When every other flake has been gathered, lift and separate them from the rest of the bundle.

Figure 3.107

Figure 3.108 - Place the hose gathered in your arms away and to the front of the rest of the hose to create a coil. The nozzle end of the hose must be coming off the top of the coil.

Figure 3.108

Charge the line.

Advancing Uncharged Attack Lines

Figures 3.109 and 3.110 – Avoid pinch points. An uncharged line may fit through places which will restrict or halt the flow of water when the line is charged (i.e., under doors, between heavy furniture, etc.). Make sure that every door passed through is securely wedged into an open position. When located in close proximity, man doors are preferred over roll up doors for hose line access.

Figure 3.109

Figure 3.110

Advancing Charged Attack Lines

Using either an arm lock or a body loop can be effective in advancing a charged line.

Position members at areas that make it difficult to advance the hose line. These areas include corners, stairways, and other friction points. The strategically positioned members can assist with the advancement by “shuffling” the hose past these areas greatly accelerating the attack.

Advancing Attack Lines – Up or Down Stairs

If possible, advance the line on the stairwell before it is charged. The line should be laid against the outside wall to avoid sharp bends and pinch points on the landings.

In buildings with no wall separating the staircases, it is sometimes more effective to run the hose straight up or down the well opening. If this method is used, be sure to anchor the line to the railing on the appropriate landing, using a body loop. This method can only be used for short distances (100 feet or less), because of the weight of the water and hose.

Advancing Charged Attack Lines – From a Stairway Landing

The hose is connected to the standpipe on the floor below the fire then laid to the fire floor. After reaching the fire objective, it may be desirable to coil the excess hose remaining in the shoulder-load. Once charged with water, these coils may be easily leaned against a hallway wall to conserve space. If this is done, ensure that the hose is leaned against the wall so that the hose will advance easily.

Extending Charged Attack Lines

If advancing the charged line becomes impossible due to obstacles or a lack of hose, the stretched and charged hose line must be extended. Most SFD nozzles provide a 1 ½" male coupling after the shaper tip is removed from the nozzle. The extension hose and nozzle can be attached directly to the nozzle's bale after the tip is removed. It is essential that the bale be tied in the open position if this type of hose line extension is performed.

If extending 2 ½" hose, extending the line should be done using a hose clamp behind the nozzle. The hose line will be clamped off, the nozzle unattached, and a new section of hose and a nozzle added to the existing attack line. The hose clamp may then be opened.

Hoisting or Lowering a Hose Line using a Rope

Figure 3.111 – Tie the end of the roof (or utility) rope to the hose four feet behind the nozzle using a hose knot, then place a half-hitch on both sides of the shutoff. Shoulder-load the hose as it comes up (or down). If the hose is being hoisted, tie the roof rope off inside the window (or on the roof). Remove the half-hitches and spread the hose knot while the line is fed through it and to the objective.

Allow the hose knot to tighten and hold the attack line in place. This procedure is reversed for lowering.

Figure 3.111

Carrying a Hose Line Up or Down a Ladder

Uncharged Line up a Ladder - With Body Loops

Figure 3.112 – Begin by placing the shoulder-loads of hose on the ground near the right beam of the ladder. The nozzle will be next to the ladder and each bundle placed progressively to the right and slightly behind.

Figure 3.112

Figure 3.113 – The first member grasps the nozzle and, facing the ladder, places the nozzle over the left shoulder with the hose crossing the front of the body to the right side. The member then secures a body loop to the hose, using a hose knot at about knee height. The member places the other end of the body loop over the right shoulder and immediately begins to climb.

Figure 3.113

Figure 3.114 – The second member secures a body loop to the hose at either a 50 or 100 foot interval (depending on the staffing and the amount of hose). The member then places the body loop over the right shoulder and begins climbing.

Figure 3.114

Figure 3.115 – Additional members then proceed in an identical manner.
If there is a coupling at the designated interval, fasten the hose knot just behind the coupling to support it while climbing.

Figure 3.116 – When the first member reaches the top of the ladder, the member steps over the hose and the sill with the right foot. The member tests the floor for structural integrity by stomping the floor with his foot. The member then steps into the room.

Figure 3.117 – The first member steps on the hose to counteract the weight of the line while removing the body loop from the line. The nozzle is moved from the back to the chest, and the foot is removed from the hose as the member faces the ladder and begins to shoulder-load the first section.

Figure 3.115

Figure 3.116

Figure 3.117

Figure 3.118 – The second member continues to climb, keeping the hose in a loop at the right side of the ladder. Upon reaching the top of the ladder, the member stops and grasps the hose leading up to the first member with the left arm between the rungs and passes the line hand over hand to the first member.

Figure 3.119 – When the first bundle has been shoulder-loaded, the second member steps in off the ladder into the room. The member crosses over the hose, turns to face the ladder, and brings the incoming hose across the chest from the left hip to the right shoulder. The second member then shoulder-loads the hose on the right shoulder as it comes in the window (or onto the roof).

Figure 3.118

Figure 3.119

Figure 3.120 – The third and any additional members follow the same procedures until the required amount of hose has been carried up and shoulder-loaded. The last member uses a body loop and secures the hose to the ladder with a clove hitch on the first rung above the windowsill.

Figure 3.120

Figure 3.121 – The members then start the stretch by turning to the left and dropping off the top flake. This will allow proper spacing and will result in the hose running from right shoulder-load to right shoulder-load in a continuous line as the members face into the building and advance toward the objective.

Figure 3.121

Uncharged Line up a Ladder – Without Body Loops

Figure 3.122 – The hose is carried up the ladder or the straight ladder fire escape in the same manner as with a body loop, with the following exceptions: The first member places the nozzle over the left shoulder onto the back, with the lead running across the chest from the left shoulder to the right hip.

The second, third, and any additional members place the hose on their right shoulder(s), at designated intervals.

Figure 3.122

Uncharged Line up a Fire Escape

Figure 3.123 – Begin by placing the initial shoulder-load of hose to the right of the fire escape, with all remaining shoulder-loads placed progressively to the right and slightly behind the first.

Figure 3.124 – The first member secures a body loop to the nozzle, using a hose knot directly behind the nozzle shut off, places the body loop over the right shoulder, and immediately begins to climb with both hands on the beams of the fire escape ladder.

Figure 3.125 – The second member, standing to the left of the hose and facing the ladder, secures a body loop 15 feet behind the first member.

Additional members, also standing to the left of the hose, attach their body loops to the hose at appropriate intervals (which will depend upon the length of the lay and the available staffing).

NOTE: If a roof ladder is used in this evolution to gain access to the fire escape ladder, set the hooks, if possible, over a rung on the fire escape.

Figure 3.123

Figure 3.124

Figure 3.125

Figure 3.126 – After stepping onto the fire escape landing the first member steps on the hose while removing their body loop and preparing to shoulder-load.

Figure 3.127 – The second member then passes the hose hand over hand to the first member, who places the nozzle on the chest and shoulder-loads the hose onto the right shoulder.

Figure 3.128 – After the first member has shoulder-loaded the first bundle, the second member steps into the building and, if necessary, stands facing the landing with the hose to his/her left, bringing the hose across the chest from the left hip to the right shoulder, and begins shoulder-loading.

The third and any additional members follow the same procedure until the required amount has been shoulder-loaded. The last member ties the hose to the rung of the ladder above the landing, using a clove hitch around the rung, and all members pivot to the left, dropping a flake, and stretching the hose to the objective.


Figure 3.126


Figure 3.127


Figure 3.128

Uncharged Line down a Ladder (or Fire Escape)

Figure 3.129 – After the hose in the building is shoulder-loaded and carried to the window (or to the fire escape opening), the body loop is released from the ladder and the member climbs down the ladder. The member then breaks the hose at the first coupling on the ground.

Figure 3.130 – The member at the top then lays the shoulder-load on the floor next to the opening and feeds one section to the member on the ground, who shoulder-loads it at the base of the ladder.

This continues until the nozzle reaches the top of the ladder. The last member then secures a body loop to the nozzle behind the shut off or places the nozzle over the shoulder with the lead across the chest. He then climbs down.


Figure 3.129


Figure 3.130

Carrying and Operating a Charged Line from a Ladder

Figure 3.131 – The first member attaches a body loop to the line with a hose knot 12 inches behind the coupling to which the nozzle is attached. The second and third members attach their loops at 10-foot intervals behind the first member.

Figure 3.131

Figure 3.132 – After placing the body loops over their right shoulders, the members approach the ladder at a 45-degree angle and start climbing.

The second and third members keep the hose clear of the ladder and to the right side.

Figure 3.132

Figure 3.133 – The first member stops when the head is even with the first opening above the windowsill. The first member then grasps the beam of the ladder with the left hand and guides the nozzle over the first rung above the sill with the right hand and slips out of the body loop allowing the weight of the hose

to rest on the second and third members. The members below, upon the command of the first member assist in the placing of the nozzle by lifting on the hose. Ensure the ladder tip is secured to the building.

Figure 3.134 – The first member then secures the line to the ladder, using a clove hitch around the rung above the hose. The slack is adjusted out of the body loop so that it can compensate for the nozzle reaction. This leaves the first member free to manipulate the hose and nozzle.

Figure 3.133

Figure 3.134

Figure 3.135 – The first member then straddles the line and reaches through the rungs with both hands, placing one hand on the shut off and the other hand on the barrel. At the first member's command, the second and third members climb down one rung and tie their body loops to the ladder, adjusting them so as to take a strain on the line.

Figure 3.136 – The second member then climbs up the ladder to a position one rung below the first member, reaching around the body of the first member and grasps the beams with both hands to hold both members safely on the ladder.

The third member climbs down and foots the ladder.

Figure 3.135

Figure 3.136

Charged Line down a Ladder

NOTE: For safety, both the bale and the shaper of the nozzle should be closed while climbing a ladder. When drilling, only operate the nozzle bale at one-quarter of its open position.

Figure 3.137 – Lowering a charged line down a ladder is accomplished in the same way that the charged line was taken up the ladder, except in reverse order.

Figure 3.137

OPERATING HYDRANTS

Safety Practices

Always operate the hydrant in a fully opened or fully closed position.

Always open and close hydrants slowly. Fast operation causes water hammer and could result in a broken water main, broken water meter, etc. Do not over tighten while closing hydrants, it may contribute to breaking the main stem of the hydrant.

Stand behind the hydrant when opening the main stem. Always stand clear of the caps because water pressure in hydrants can be as high as 150 psi. Caps have been known to blown off during the operation of the main stem.

Use caution and common sense when operating the main stem. It can be broken by rough usage and over exertion.

Figure 3.138 – Don't be alarmed by water coming up from the base when the main stem is operated. Hydrants must be opened approximately three to five turns before the drain valve closes. If the hydrant is left to drain out from the base for a length of time with the drain valve running, it may damage the drip valve rubber and necessitate valve replacement.

Figure 3.138

CLEANING AND INSPECTING

Cleaning and Inspecting Equipment

Hose

Seattle Fire Department hose is removed from the engine and dried after it is has been charged and is cleaned and changed whenever it becomes soiled. Mild soap or detergent may be used for hose that has been in contact with oils, tars, or chemicals. Hose that has been used to pump saltwater shall be thoroughly washed and flushed with water before drying. Before flushing, the couplings should be left loosened with the gaskets removed to allow for complete flushing. Any hose not used for thirty days shall be rotated. Complete instructions for the testing of fire hose and appliances are included in the SFD Policy and Operating Guidelines.

Couplings

The female hose couplings should be checked for gaskets after each use and before loading on the engine. Files are stored in engine toolboxes for removing burrs from coupling threads. Support Services provides the only lubricant to be applied to these couplings and swivels.

Nozzles

Nozzles should be visually inspected after each use to be sure that the molded rubber fog teeth are undamaged. The rubber bumper is screwed forward to protect the tip and to avoid dirt and grime accumulation inside the shaper. As always, the coupling gasket must be present.

The bale should be manipulated to test for smooth operation of the ball valve (or slide valve.) On nozzles, the screen (Gasket Grabber) inside the barrel should be checked and any trapped particles and debris should be removed.

BASIC COUPLINGS

Hose and couplings get their name based on the inner diameter of the hose. In the Seattle Fire Department, we carry 4", 2 1/2", and 1 3/4" hose.

The following pictures show many of the common hose couplings you will use. *In general*, we refer to them as couplings, not adapters.

2 ½" Double Male

2 ½" Double Female

4" Double Male

4" Double Female

2 ½" to 4" Increaser

4" to 2 ½" Reducer

2 ½" to 1 ½" Reducer

2 ½" to ¾" Reducer (for 'Jiffy-hose')

'Brother Coupling' (2 ½" to 4")

'Sister Coupling' (2 ½" to 4")

Storz to 4" (NST) Adapter

4" NST to 4" ST Double Female

Hydrant Adapter (4" ST to 4" NST)

'Red Dot Coupling' (4" NST to 4" ST)

If a coupling has the same thread, orientation (i.e. male or female), and size on both ends, we refer to it as a double female or a double male. If a coupling has the same thread and orientation on both ends but they are of unequal size (i.e. 2 ½" female on one end and 4" female on the other end) we refer to it as either a sister coupling or brother coupling.

When a coupling is described, it is referred to from the female end to the male end. It is also indicated whether the coupling is reducing or increasing the size of the hose/connection. An example would be a 2 ½" to 4" increaser. This coupling is named this way because the female end is 2 ½" and the male end is 4". In most of the engine evolutions water flows from the female end to the male end. So, if water flows from the female end to the male end through this coupling, the size of the hose is increased. Therefore, we refer to this coupling as an increaser.

Hydrant Adapter

Notice the hydrant adapter in the picture above. This coupling is used to connect the 4" hose to a hydrant. Seattle hydrants have a 4" port that has ST threads. All 50-foot sections of 4" hose carried on Seattle fire engines have 4" NST threads. Therefore, this coupling is used to adapt the male ST threads from the hydrant to the female NST threads of the hose. The reverse is also true. There are some situations where it is necessary to adapt male NST threads to female ST threads. This is where the "soft suction adapter" (aka 'Red Dot Coupling') is used.

Chapter 4

Engine Evolutions

ENGINE COMPANY INTRODUCTION

Overview

Engine company hose evolutions will follow a department-wide standard. The goal is to provide the most efficient methods of performing fire ground operations.

All members shall possess a solid understanding of the operations described within this section, as they will serve as the basis for engine company fire ground operations. These evolutions will be used to evaluate Recruit Firefighters during drill school and Operations Division members throughout their careers.

In some instances, emergency situations may not be satisfactorily resolved by utilizing only these basic evolutions. The company Officer maintains the ability to alter these standard methods when necessary.

It should be noted that the Seattle Fire Department Basic Skills Manual is not a tactics textbook. The knowledge and decision-making skills must be learned and practiced using approved curriculum and methods.

Introduction

Stretching and operating hose lines is the primary function of the engine company. All members must realize the importance of the initial line stretched at a structural fire. More lives are saved at fire operations by the proper positioning and operating of hose lines than by all other life-saving techniques available to firefighting forces. The majority of structural fires are controlled and extinguished by this initial line.

The first hose line is placed between the fire and any persons endangered by it. Often this is accomplished by stretching the line via the primary means of egress, usually the main entrance or stairway. The purpose of this line is to:

- Allow occupants to evacuate
- Allow members to proceed to the floors above the fire for search
- Confine and extinguish the fire

If it is determined there is no life hazard in the building, the first line is positioned between the fire and the most severe exposure. This will likely be an internal exposure (within the fire building) in the case of an offensive fire attack or an adjacent building in the event of a defensive fire attack.

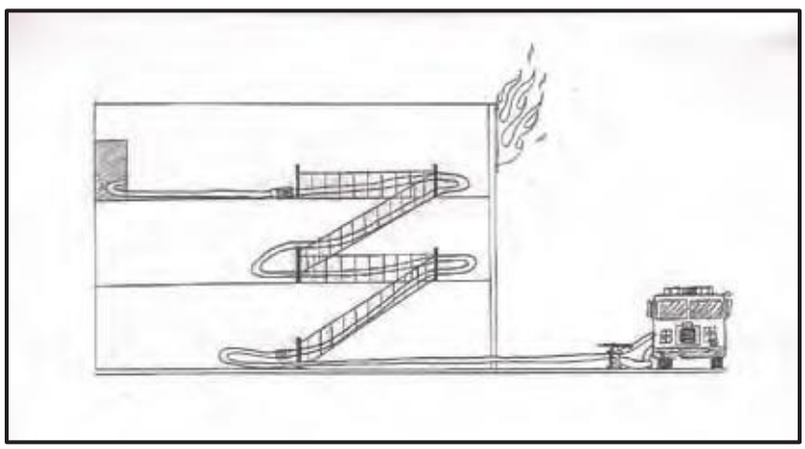
The engine company may be confronted with life-saving operations upon arrival. Life-saving operations are placed ahead of firefighting when sufficient firefighters are not available to do both. Judgment is the key factor when confronted with this situation. The best life-saving measure may be a prompt attack on the fire, which, if allowed to spread, would trap occupants. Immediate rescue attempts by the first arriving engine company without simultaneously stretching and positioning a hose line should be attempted only in **extreme** situations.

BASIC ENGINE COMPANY OPERATIONS

The specific evolution and the size of attack line to be utilized will depend on the following:

- Location of fire
- Severity of fire
- Type of occupancy
- Type of construction

When estimating the length of the attack line, consider the distance from the engine or manifold to the entrance door. In some cases, several lengths of hose may be required to reach the entrance. For upper floor fires, the distance from the entrance door to the stairway must also be considered. This is in addition to the amount of hose required to advance up the stairs (typically one length per two floors for a standard return-type stairway). A minimum of one length of hose should be allocated to the fire floor. Some buildings may require more than one section of hose on the fire floor itself.



As shown above, one length of hose is required to reach the stairs, one length to reach floor three, and an additional length to reach the fire on the fire floor. The total hose stretch in this case is three lengths, or 300 feet. The distance of the lay must be appropriately estimated before the stretch begins.

To minimize the number of lengths of hose required and to provide rapid hose line positioning, consideration must be given to the following possible options:

- Stretching hose up the open well of a stairway
- Utilization of standpipe systems
- Hoisting a hose line with utility rope or drop bag line via the exterior of the building
- Stretching hose up a fire escape

The charging of the line must be done in a safe area. The firefighter assigned to the nozzle position should never enter the immediate fire area without water. Call for water outside of private dwellings or other small buildings. In large buildings, the line should be charged in the stairwell on the floor below the fire, or in a remote smoke-free location protected from the fire area by fire doors. In the case of an exterior fire, charge the line a safe distance away (a minimum of 30 feet).

No matter which evolution the engine Officer chooses to perform, hose lines will not be operated in opposition to each other. Likewise, offensive and defensive attack methods will not be combined. In addition, immediate notification must be given to the incident commander when a situation is discovered that requires the positioning of an additional hose line, or if any line is determined to be ineffective. Injury to firefighters is likely to occur if these rules are not followed.

Company Officer Responsibilities

When arriving first, the engine company Officer may well have more influence on the outcome of a fire operation than any other member on scene. Sound decision-making skills regarding incident strategy and tactics are extremely important. The choices made by this Officer will dictate the mode and method of fire attack. The impact that fire department operations will have on the incident will often be a direct result of these initial actions.

The company Officer must continually supervise the operation to ensure the evolution and individual assignments are completed safely and efficiently. The Officer should be alert to direct and/or immediately correct any condition that may affect the safety, speed, or satisfactory completion of the evolution.

Engine Placement

The Officer will decide where to position the engine once the fire location has been determined. This decision must be based on several factors, including overall objectives, water source, fire conditions, and the type of

evolution to be performed. Every effort must be made to have the hydrant to engine connection to be within **100 feet**. If this cannot be accomplished by the initial engine company, the next engine should position their engine at the hydrant to supply the first engine.

The engine Officer must also allow for the placement of the ladder company for optimum use of the aerial ladder. ***The final positioning of the engine company must not impede the incoming ladder companies from the fire building***.

The engine company positioned for proper ladder company access.

Orders

The manner in which orders are given and assignments made will set the tone for the entire operation. Orders must be given clearly and concisely so that all members are aware of the evolution to be performed. The specific evolution and where the hose line is to be stretched must be indicated. In addition, the length of the attack line must be specified if longer than what is standard for a particular evolution. Some examples are listed below:

- "**Pre-connect to the basement door**."
- "**1¾" manifold to the front entrance**."
- "**2½" manifold, 300 feet, to the delta side exposure**."
- "**500' Extended Attack line to floor two**."

Driver Responsibilities

The primary responsibility of the engine company engine driver is the safe delivery of personnel to a reported fire or emergency, and to provide a continuous supply of water to the operating firefighting force. Drivers will maneuver and position the engine as directed by the Officer.

If the engine will be used for pumping, the engine must be placed into pump gear before the driver exits the cab. The sequence is referred to as the driver's "In-Cab Procedure." The steps for performing this and subsequent related tasks are as follows:

1. Set the parking brake.
2. Honk horn once (signaling to the crewmembers that the engine is completely stopped).
3. Shift the transmission into "neutral."
4. Shift the Power Take-off (PTO) from road to pump.
5. Shift the transmission into "drive."
6. Check the speedometer for a change in reading. A difference indicates that the pump is engaged. An audible change in engine RPMs will also occur. The "OK to Pump" light must also be illuminated.

The engine is now in pump gear.

1. Release the seat belt and exit the cab. Close the door after exiting.
2. Immediately set the wheel blocks.
3. Provide water to attack lines.

Drivers must also recognize the need for and initiate supply line operations. Upon completion of the primary supply, the driver will don SCBA to a stand-by position and act as a member of the Firefighter Stand- by Rescue Team, until a Rapid Intervention Team has been assigned.

Driver donning SCBA.

Driver standing by as part of the Stand-by Rescue Team ("two-out").

Position traffic cones to protect personnel, the engine, and hose lines from approaching vehicles. The driver will then obtain a second water supply. Once a second supply has been established, refill any water already used from the engine's booster tank. Ensure remaining equipment and hose loads are ready for use.

Position traffic cones to increase safety for equipment and operating personnel.

When not arriving first, the engine company driver must remain aware of water supply needs of the engine companies already on scene.

Firefighter Responsibilities

The position #3 firefighter will be seated on the engine behind the Officer, with the position #4 firefighter seated behind the driver. The member riding in the position #3 seat will act as the nozzle person, while the position #4 firefighter will serve as the back-up person on the hose line with few exceptions.

Standard evolutions dictate that each member exiting the rear crew cab will have SCBA donned in the stand-by position. The position #4 firefighter will also be responsible to bring appropriate tools to the fire building. Most often, this tool assignment will be a Halligan married to a HD Flathead axe, hereafter referred to as "the irons." After forcible entry has been accomplished, the position # 4 firefighter will assist the firefighter assigned to the nozzle in advancing the line to the fire. While advancing, all members must watch carefully for changing conditions and for any victims as you advance into the fire building.

Positions #3 and #4 will exit the crew cab with SCBA in the stand-by position.

Once the fire is under control, firefighters should begin a primary search of the fire room and attempt to locate windows as they search. Establishing a ventilation opening as soon as possible is a priority. When ventilation has been established and the primary search of the immediate fire area is complete, begin overhaul as necessary to locate any hidden fire.

As the above tasks are accomplished (typically by position #4 firefighter and/or the company Officer), it is important to note that the position #3 firefighter will maintain control of the nozzle. In addition, this firefighter does not turn their back on the fire area until overhaul is complete and the fire is declared “tapped.” Until this occurs, the firefighter assigned to the nozzle is providing protection to all other members operating on or above the fire floor. Should a large body of hidden fire be discovered, or a flare up occurs, the nozzle firefighter must be in a position to operate the nozzle immediately.

If the company Officer is not present inside the fire building, the position #4 firefighter will serve as the “team B” leader. Therefore, it is this member’s responsibility to radio the completion of the tactical benchmarks to the incident commander as appropriate.

All members will maintain contact with all others assigned to the team via sight, sound (voice), or touch while operating in a hazardous atmosphere.

ATTACK LINES

1¾" Pre-connect

The 1¾" Pre-connect evolution will result in the deployment of a 200 foot 1¾" hose bundle that is already connected to the engine. The intention of this lay is to use tank water to initiate the fire attack as quickly as possible.

Pre-connect

Officer - Direct the driver where to position the engine. Give verbal directions to the crew designating the evolution to be performed, and the destination of the hose line.

Sling the SCBA to the stand-by position as a member of the Firefighter Stand-by Rescue Team or supervise and assist the company in fire suppression and rescue activities as outlined in the POG.

Driver - Position the engine as directed by the company Officer. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks.

Open the tank-to-pump valve and increase engine speed to between 800 - 1000 RPMs. Prime the pump until the pressure gauge rises and a full stream of water is flowing out the prime pump discharge.

Increase the throttle to bring the discharge pressure between 50-75 PSI. When members on the attack line call for water, slowly open the pre-connect discharge valve. Maintain 50-75 PSI while the hose is being filled by manipulating the throttle as needed.

Open the discharge slowly, and maintain 50-75 PSI as the hose fills with water.

***NOTE*:** Do not charge the attack line with a pressure of greater than 75 PSI until the hose is full of water. This will avoid damaging the inner lining of the hose.

When the hose is filled, increase the discharge pressure to the desired setting.

To set your discharge pressure relief valve (PRV), you must turn the PRV operating handle counter-clockwise until the valve opens. This will be known by 3 indicators: the engine RPM's will begin to drop, the indicated discharge pressure will also drop, and the PRV indicator light will illuminate. Once these occur, turn the operating handle the other direction (clockwise) one-half turn. Pause, and then turn the handle clockwise an additional one-half turn. Continue this procedure until the discharge pressure returns to the desired setting and the PRV indicator light turns off. Establish a water supply.

Setting the pressure relief valve.

Position #3 Firefighter - Shoulder-load the 1¾" preconnected hose load and stretch the line to the location designated by the Officer. Coil or flake the hose, as appropriate, and call for water. Cover with the SCBA. Bleed the air from the charged hose line, assess the fire stream for an appropriate volume of water flow (GPM), and check the fire stream for the appropriate pattern. (**AVP**)

Shoulder-loading the 1 ¾" pre-connect.

When joined by the back-up member, advance the attack line into a position to begin the fire attack.

Position #4 Firefighter - Procure the irons and meet the position #3 firefighter at the nozzle. Provide forcible entry as required. Cover with the SCBA. Assist in advancing and operating the hose line.

Position #3 and #4 firefighter advancing to the fire location

2½" Attack Line

The 2½" Attack Line evolution will result in 2½" hose being deployed from the bulk bed for fire attack.

2 ½" Bulk Bed

NOTE: If more than 200 feet of attack line will be needed to reach the objective, members will work together to remove additional 2½" hose from the engine as needed. The Officer must indicate the length of the stretch to the company members if longer than 200 feet is desired. Example: "2½" Attack Line – 400 feet."

Officer - Direct the driver where to position the engine. Give verbal directions to the crew designating the evolution to be performed, and the destination of the hose line.

Sling the SCBA to the stand-by position as a member of the Firefighter Stand-by Rescue Team or supervise and assist the company in fire suppression and rescue activities as outlined in the POG.

Driver - Position the engine as directed by the company Officer. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks. Go to the tailboard and break the 2½" coupling that will reach the desired discharge port. Connect the 2½" line to the appropriate discharge port.

Driver breaks the 2 ½" coupling.

Making the connection to the discharge port.

Open the tank-to-pump valve, and increase engine speed to 800-1000 RPMs. Prime the pump until the pressure gauge rises and a full stream of water is flowing out the prime pump discharge.

Increase the throttle to bring the discharge pressure between 50-75 PSI. When the members on the attack line call for water, slowly open the appropriate discharge valve. Maintain 50-75 PSI while the hose is being filled by manipulating the throttle as needed.

***NOTE*:** Do not charge the attack line with a pressure of greater than 75 PSI until the hose is full of water. This will avoid damaging the inner lining of the hose.

When the hose is filled, increase the discharge pressure to the desired setting.

To set your discharge pressure relief valve (PRV), you must turn the PRV operating handle counter-clockwise until the valve opens. This will be known by 3 indicators: the engine RPM's will begin to drop, the indicated discharge pressure will also drop, and the PRV indicator light will illuminate. Once these occur, turn the operating handle the other direction (clockwise) one-half turn. Pause, and then turn the handle clockwise an additional one-half turn. Continue this procedure until the discharge pressure returns to the desired setting and the PRV indicator light turns off. Establish a water supply.

Position #3 Firefighter - Shoulder-load the first length of 2 ½" hose. Step away from the tailboard until the next coupling clears the hose bed. Once this occurs, pause so the position #4 firefighter shoulder-loads the second 100-foot section of hose. Once the position #4 firefighter is ready, begin the stretch to the desired location. Coil or flake the hose, as appropriate, and call for water. Cover with the SCBA. Bleed the air from the charged hose line, assess the fire stream for an appropriate volume of water flow (GPM), and check the fire stream for the appropriate pattern. (AVP) Advance the attack line into a position to begin fire attack.

Position #3 member shouldering the first length of 2 ½" hose.

Position #3 waiting, while position #4 shoulder-loads the second section.

Position #4 Firefighter - Procure the irons and place them next to the tailboard. Shoulder-load the second 100-foot section of hose. Once the shoulder-load is in place, drop some additional hose (1 or 2 flakes) near the tailboard so the desired discharge can be reached. Pick up the irons and begin to stretch the line to the desired location. Be sure the #3 firefighter does not stretch their hose until the #4 firefighter has stretched theirs completely off their shoulder first. Provide forcible entry as required. Cover with the SCBA. Assist in advancing and operating the hose line.

2 ½" Pre-connect (2 ½" "Blitz" Line)

2 1/2" Pre-connect "Blitz" Line (Slot Load)

The 2½" Blitz Line evolution will result in the deployment of a 200 foot 2½" hose bundle that is already connected to the engine.

Officer - Direct the driver where to position the engine. Give verbal directions to the crew designating the evolution to be performed, and the destination of the hose line.

Sling the SCBA to the stand-by position as a member of the Firefighter Stand-by Rescue Team or supervise and assist the company in fire suppression and rescue activities as outlined in the POG.

Driver - Position the engine as directed by the company Officer. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks.

Open the tank-to-pump valve, and increase engine speed to 800-1000 RPMs. Prime the pump until the pressure gauge rises and a full stream of water is flowing out the prime pump discharge.

Increase the throttle to bring the discharge pressure between 50-75 PSI. When members on the attack line call for water, slowly open the appropriate discharge valve. Maintain 50-75 PSI while the hose is being filled by manipulating the throttle as needed. When the hose is filled, increase the discharge pressure to the desired setting.

***NOTE*:** Do not charge the attack line with a pressure of greater than 75 PSI until the hose is full of water. This will avoid damaging the inner lining of the hose.

To set your discharge pressure relief valve (PRV), you must turn the PRV operating handle counter-clockwise until the valve opens. This will be known by 3 indicators: the engine RPM's will begin to drop, the indicated discharge pressure will also drop, and the PRV indicator light will illuminate. Once these occur, turn the operating handle the other direction (clockwise) one-half turn. Pause, and then turn the handle clockwise an additional one-half turn. Continue this procedure until the discharge pressure returns to the desired setting and the PRV indicator light turns off. Establish a water supply.

Position #3 Firefighter - Shoulder-load the first 100-foot section of the 2½" pre-connect line. Step away from the tailboard until this section pulls clear of the hose bed. Once this occurs, grasp the bottom or middle bight in the second length of 2½" hose with the left hand. Pull the bight, or bights, until the second 100-foot section is clear of the hose bed. Stretch the line to the location designated by the Officer. Do not drop any portion of the first section (shoulder-load) until all of the second section has been stretched out. Coil or flake the hose, as appropriate, and call for water. Cover with the SCBA. Bleed the air from the charged hose line, assess the fire stream for an appropriate volume of water flow (GPM), and check the fire stream for the appropriate pattern. (**AVP**)

Member shoulder-loading first section of 2 1/2"

Member reaching back for the second section of 2 1/2" and pulling completely from slot.

When joined by the back-up member, advance the attack line into a position to begin the fire attack.

Position #4 Firefighter - Procure the irons. Assist the position #3 firefighter with stretching the second section of the blitz line, as necessary. Provide forcible entry as required. Cover with the SCBA. Assist in advancing and operating the hose line.

Extended Attack

The definition of an “Extended Attack” will be 200’ of 1 ¾” hose extended from 200’ of 2 ½” hose. The “Best Practice” will be to use the 2 ½” pre-connected “Blitz line” and the "Apartment bundle". Using the Blitz line will allow for foam use.

If greater than 400' of hose is needed to reach the objective, the 2 1/2" Bulk Bed shall be used instead of the "Blitz line" for the 2 1/2" hose. The maximum overall length of this hose lay should not exceed 700 feet; 500 hundred feet of 2 1/2" (the entire 2 1/2" “Bulk bed”) with the 200 foot 1 ¾” “Apartment bundle”. Limiting the length of the lay will ensure manageable pump pressures and volume.

Any change to the length of the “Extended Attack” must be verbalized via radio. Example: “500’ Extended Attack” means using 300’ of 2 ½” from the 2 1/2" Bulk Bed with the 200’ 1 ¾” Apartment bundle.

Officer - Direct the driver where to position the engine. Give verbal directions to the crew designating the evolution to be performed, and the destination of the hose line.

Sling the SCBA to the stand-by position as a member of the Firefighter Stand-by Rescue Team or supervise and assist the company in fire suppression and rescue activities as outlined in the POG.

Driver - Position the engine as directed by the company Officer. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks.

Shoulder-load the first 100-foot section of the 2 1/2" "Blitz Line" (this task can be accomplished by the Officer, if they are available). Step away from the tailboard until this section pulls clear of the hose bed. Once this occurs, grasp the bottom or middle bight in the second length of 2 1/2” hose with the left hand. Pull the bight, or bights, until the second 100-foot section is clear of the hose bed. Stretch the line to the location designated by the Officer. Do not drop any portion of the first section (shoulder-load) until all of the second section has been stretched out.

If all of the 2 ½” will be used outside of the fire building, stretch the line all the way out. If a portion of the 2 ½” is to be utilized inside the fire building, lay the remainder of the bundle on the ground near the entrance.

Driver stretching the 2-1/2”

Remove the nozzle and return it to the engine.

Open the tank-to-pump valve, and increase engine speed to 800-1000 RPMs. Prime the pump until the pressure gauge rises and a full stream of water is flowing out the prime pump discharge.

Increase the throttle to bring the discharge pressure between 50-75 PSI. Slowly open the appropriate discharge valve when the firefighters on the attack line call for water.

NOTE: For this extended lay, recognize that a nozzle must be removed from the 2 ½” hose and be replaced by the 2 ½” to 1 ½” bell reducer. If water is sent to the firefighting team before they are ready, a dangerous condition will result.

Maintain 50-75 PSI while the hose is being filled by manipulating the throttle as needed.

***NOTE*:** Do not charge the attack line with a pressure of greater than 75 PSI until the hose is full of water. This will avoid damaging the inner lining of the hose.

When the hose is filled, increase the discharge pressure to the desired setting.

To set your discharge pressure relief valve (PRV), you must turn the PRV operating handle counter-clockwise until the valve opens. This will be known by 3 indicators: the engine RPM's will begin to drop, the indicated discharge pressure will also drop, and the PRV indicator light will illuminate. Once these occur, turn the operating handle the other direction (clockwise) one-half turn. Pause, and then turn the handle clockwise an additional one-half turn. Continue this procedure until the discharge pressure returns to the desired setting and the PRV indicator light turns off. Establish a water supply.

Position #3 Firefighter - Shoulder-load the first section of the 1¾" apartment bundle. Step clear of the tailboard and then pause as the position #4 firefighter shoulder-loads the second section of hose. Once the position #4 firefighter is ready, proceed to the end of the stretched 2½" hose. Wait as the position #4 firefighter attaches the bell reducer to the 2½" line. Upon instructions from the position #4 firefighter, advance to the location designated by the Officer. Do not allow any hose to flake from the #3 firefighter's shoulder-load until the position #4 firefighter gives the order to "**stretch**."

Position #3 shoulder-loading the first section of the apartment bundle.

Position #3 pauses as position #4 shoulder-loads the second section of the apartment bundle.

Coil or flake the hose, as appropriate, and ask the driver to send water. Bleed the air from the charged hose line, assess the fire stream for an appropriate volume of water flow (GPM, and check the fire stream for the appropriate pattern. (**AVP,** Advance the attack line into a position to begin fire attack.

Position #4 Firefighter - Procure the irons and place them next to the tailboard. Shoulder-load the second section of the 1¾" apartment bundle. Pick up the irons and proceed to the end of the 2½" line with the position #3 firefighter. Place the irons and your section of the apartment bundle on the ground at the end of the 2½" hose. Untie the bundle and connect the bell reducer to the 2½" line. Begin the stretch of the dry 1 ¾" hose to the desired location. Call for water from the driver when the stretch is completed.

Position #4 connecting the bell reducer to the 2 ½" hose.

If there are no obstacles, the #3 firefighter may be able to simply grab the center bight of the bundle on the ground and complete the stretch themselves (see Options for Stretching the Extended 1 ¾" Attack, in the next section). If there are obstacles (furniture, stairs, etc.), it may be necessary for the #4 firefighter to re-shoulder-load the remainder of the 1¾" hose. Assist in advancing and operating the hose line. Cover with the SCBA.

Position #3 and #4 advancing with the apartment bundle.

Single member stretch of the apartment bundle.

Options for Stretching the Extended Attack

All 1¾" hose to be used outside:

Upon reaching the end of the 2½" line, the position #4 firefighter places the second section of the apartment bundle neatly on the ground and unties the bundle. This firefighter then connects the bell reducer to the 2½" hose.

The position #3 firefighter grasps the center bight of the second section (on the ground) with the left hand while keeping the first section shoulder-loaded. The position #3 firefighter will then proceed to stretch all 200 feet of 1¾" hose. This firefighter should not drop any portion of the first section (shoulder-load) until all of the second section has been stretched out.

After connecting the bell reducer to the 2½" line, position #4 firefighter meets the other member at the nozzle.

If some of the 2 ½" hose will be used inside of the structure:

Upon reaching the end of the 2½" bundle (left bundled by the driver), the position #3 and #4 firefighters each grab two or three bights of 2½" hose with the left hand while retaining their apartment bundle sections on their shoulder. The position #3 firefighter should grasp the bights most near to the 2½" male coupling (as well as the coupling itself), while position #4 firefighter grasps the remaining bights. As both members begin advancing the hose line to the objective, the position #4 firefighter will drop off flakes of 2½" hose first. When this firefighter drops the last flake, they should instruct the position #3 firefighter to "**stretch the 2½**." The position #3 firefighter will then begin to drop flakes of 2½".

Position #3 and #4 members stretching additional 2 ½" into the building.

Once all of the 2½" hose is deployed, the position #4 firefighter will connect the bell reducer to the 2½" hose and the stretch will proceed as previously described.

OVERHAULING LDH SUPPLY LINES

Large Diameter Hose (LDH) is the best option when supplying an engine from a hydrant source. LDH is capable of delivering a very high volume of flow with little reduction in pressure due to friction loss.

However, there are times when it is impractical to utilize LDH in this manner. A single member can only be expected to overhaul LDH approximately 150 feet without assistance. When it is not possible to utilize LDH for the water supply, and an additional company will be delayed, 2½" hose may be used.

When a single member is overhauling hose to the hydrant, one of the two following methods shall be used:

Stretching Supply Hose a Short Distance:

Grasp hose just behind the coupling and run toward the hydrant. Always keep the coupling behind you as you go.

Method for overhauling hose a short distance.

Stretching Supply Hose a Long Distance:

Face the hose bed and create a bight in the hose approximately four feet from the coupling. Place the bight over the right shoulder as you turn away from the engine, holding it with both hands. This will place the coupling at the small of the back. Lean forward and run towards the hydrant.

Method for overhauling hose a longer distance.

***NOTE*:** At no time should the coupling be placed in front of the body while overhauling hose to the hydrant. In addition, never place your arm or shoulder through a loop in the hose while overhauling hose. If the hose snags on an object you may become injured.

Improper methods for overhauling hose.

Each Engine Company carries the following equipment to make connections to a hydrant in a dedicated hydrant bag. As a minimum, the hydrant bag will contain the following:

- Hydrant adapter (1)
- Body loop (1)
- Spanner wrench (2)
- 2½" to 4" Increaser (1) – (typically kept attached to the hydrant gate)
- 2 ½" double female (1)
- OCD wrench (1)
- Hydrant gate (1)

Hydrant Bag contents.

LDH Supply to the Rear of the Engine

If the nearest hydrant is to the rear of the engine, shoulder-load the 15-foot section tied with a body loop and overhaul the hose directly to the hydrant. Proceed approximately 6 feet past the hydrant to allow enough hose for an easy connection. Leave the female coupling at the hydrant and return to the engine.

Driver pulling hose straight back

Pulling until enough hose to reach the side intake is removed.

Grasp the LDH where it comes down from the hose bed. Turn and run out the hose at a slight angle until a coupling, that will reach the desired pump intake, drops to the ground

Return to that coupling, break the connection, and place the female end of the unused hose under the tailboard to minimize the tripping hazard.

Breaking the connection of LDH that will reach the side intake.

Placing the unused end of the LDH under the tailboard.

Attach the male end of the LDH to the desired pump intake using a 4" double female. (If the soft suction hose is connected to the intake, remove it to allow for this connection to be made).

Making the connection to the intake with a 4" double female coupling.

Procure the hydrant bag and hydrant wrenches and return to the hydrant.

Returning to the hydrant with the hydrant bag and wrenches.

Remove the 4” engine port cap and a 2½” port cap of the hydrant with a corey wrench. Attach the hydrant adapter to the engine port and the LDH to the hydrant adapter. Attach the hydrant gate to the 2½” port and ensure that the gate is in the closed position.

Hydrant Adaptor used to connect LDH to the hydrant.

Step behind the hydrant and open it fully using the Galvin wrench.

Stand behind the hydrant when opening whenever possible.

Return to the engine's pump panel, removing significant kinks along the way.

NOTE: If kinks are present but it appears that sufficient water is entering the intake, disregard them at this time. Such kinks will be addressed at a later point.

Close the tank-to-pump valve. Reduce the throttle to return the discharge pressure back to the desired pressure. If the PRV was properly set, it will likely not require any adjustment.

Upon completion of the primary supply, the driver will don their SCBA in a stand-by position and act as a member of the Firefighter Stand-by Rescue Team until the Rapid Intervention Team is assigned.

Position traffic cones to protect personnel, the engine, and hose lines from approaching vehicles. While placing the cones, remove any remaining kinks remaining in the supply line. The driver will then obtain a second water supply. Once a second supply has been established, refill any water already used from the engine's booster tank by opening the tank fill valve. Ensure remaining equipment and hose loads are ready for use.

Monitor the pump panel and the radio for further instructions.

LDH Supply to the Front of the Engine

If the nearest hydrant is in front of the engine and within 100 feet, grab the 15-foot LDH bundle tied with a body loop and the bight of the 50-foot section of LDH next to it. Pull both 50-foot sections down to the ground making sure the last coupling is completely out of the hose bed and positioned on ground next to the tailboard. Angle both sections of LDH to the side of the apparatus that the hydrant is on.

Driver pulls down two 50-foot sections of LDH

Proceed to the hydrant holding a bight of each 50-foot section in each hand. Towards the front of the Apparatus, drop the bight of LDH in left hand and continue to the hydrant holding the 15-foot LDH bundle.

Driver advances both sections of LDH

Dropping bight in left hand

Leave the 15-foot LDH bundle at the hydrant and return to the engine. Break the coupling on the ground and place the female end of the unused hose under the tailboard to minimize the tripping hazard.

The male coupling is connected to the desired pump intake using a 4" double female. (If the soft suction is connected to the intake valve, remove it to allow for this connection to be made).

Connect the LDH to the main side intake.

Do **not** open the intake valve at this time.

Procure the hydrant bag and the hydrant wrenches and return to hydrant.

Returning to the hydrant with the hydrant bag and wrenches

Remove the 4” engine port cap and a 2½” port cap of the hydrant with a corey wrench. Attach the hydrant adapter to the engine port and the LDH to the adapter.

Hydrant Adaptor used to connect LDH to the hydrant.

Attach the hydrant gate to the 2½” port and ensure that the gate is in the closed position. Step behind the hydrant and open it fully using the Galvin wrench.

Opening the hydrant.

Return to the engine's pump if a significant kink is found while returning to the pump panel remove it immediately. If kinks are present but it remains evident that sufficient water will enter the intake, disregard them at this time. Such kinks will be addressed at a later point. Once at the pump panel, open the intake valve. Close the tank-to-pump valve. Adjust the throttle to return the discharge pressure back to the desired operating pressure. If the PRV was properly set, it will likely not require any adjustment.

Upon completion of the primary supply, the driver will don SCBA to a stand-by position and act as a member of the Firefighter Stand-by Rescue Team if one is not already in place and a Rapid Intervention Team has not yet been assigned.

Position traffic cones to protect personnel, the engine, and hose lines from approaching vehicles. While placing the cones, remove any remaining kinks in the supply line. The driver will then obtain a second water supply. Once a second supply has been established, refill any water already used from the engine's booster tank by opening the tank fill valve. Ensure remaining equipment and hose loads are ready for use.

Monitor the pump panel and the radio for further information.

Obtaining a Redundant Supply

A second supply line from a different hydrant is required when any of the following apply:

- If supplying a 2½" attack line
- If pumping 300 gallons per minute or more
- While pumping at any multiple alarm fire

It should be noted that a redundant supply is highly recommended whenever operating at a working fire or other hazardous environment even if the above rules do not apply. A greater margin of safety is provided with redundant supply lines.

Similar to the primary supply line, redundant supplies will utilize the largest diameter hose available. In addition, the methods for obtaining the second supply will be the same as for the primary supply line. The specific procedures will vary only slightly, as indicated below:

- Do not open the intake valve for the redundant supply until that line has been connected to the hydrant and charged.

NOTE: If the intake is opened before the hydrant connection is made, water will abruptly backfill the hose making your connection to the hydrant impossible.

- If using 2 ½" as the second supply, remove the 2 ½" to 4" increaser from the hydrant gate and connect the female end of the 2 ½" hose to the hydrant gate. (LDH is always preferred for a second supply)

- Remove all kinks in the second supply line as the hose is followed back to the engine from the hydrant.

REVERSE LAY VARIATIONS

For a reverse lay, a large compliment of hose and equipment must be removed from the engine at the fire scene. This task must be completed before the engine can proceed to the hydrant. Because of this, the removal of hose and equipment from the engine must be accomplished as quickly and as efficiently as possible. Therefore, **the positional assignments regarding the removal of specific hose bundles are only *recommendations***. Members should always work together to remove the required hose compliment in the manner most efficient for the situation at hand.

Removing and Anchoring the Tri-Gate Manifold

Begin by removing the tri-gate out of the manifold compartment by grasping the straps, if provided, or the gate valve handles.

***NOTE*:** If there is a tri-gate compartment door, close it after removal as it will interfere with LDH hose deployment.

Removing and positioning the tri-gate is normally a one member operation, but if the tri-gate must be positioned at some distance from the engine, two members should be used to overhaul it and stretch sufficient LDH hose to position the tri-gate in the desired location.

Foot either the tri-gate or a bight of LDH hose (in the case of the tri-gate being overhauled a distance away from the street), in a location where you are visible to the driver in the rear view mirror.

The person designated, usually the Officer, then kneels behind the tri-gate, hangs onto the straps or gate valve handles, braces one foot against the tri-gate, and sends the engine to the hydrant. The member footing the tri-gate or LDH should be positioned on the fire side, in a location clearly visible to the driver in the rear view mirror. When all equipment that is needed and the tri-gate or LDH is properly footed, the command "**Go ahead**" is made both verbally and visually. Do not release the straps, or remove your hands from the handles, until the engine is at least 150 feet from the tri-gate.

NOTE: Be aware that if the LDH lay snags a coupling while the lay is being preformed it may abruptly move the tri-gated wye and/or hose. Members should not be between the LDH hose and/or tri-gate while the engine is moving.

Shout "Go ahead" with visual cue.

The valves on the tri-gate should be checked to be sure they are all closed.

2½" Manifold

The 2½" Manifold evolution will result in members removing 200 feet of 2½" attack line, the tri-gate with LDH attached, and appropriate tools from the engine at the fire location. The engine will then perform a reverse lay to the hydrant.

Officer - Direct the driver where to position the engine. Give verbal directions to the crew designating the evolution to be performed and the destination of the hose line (e.g. "**2½ Manifold to the Bravo side**").

Remove the Officer's SCBA and appropriate tools from the engine and place these items on the ground. Remove the tri-gated wye, with LDH attached, and position it between the unloaded hose and the engine. Ensure that all required hose and equipment for the evolution has been removed from the engine. Kneel at the tri-gate and send the engine to the hydrant. This signal should be both audible and visual, by pointing forward while shouting "**Go ahead**." Foot the tri-gate until the engine is at least 150 feet away. (The removal of the tri-gate and it's footing may be assigned to the position #4 firefighter if the Officer has command duties to attend to). When safe to do so, attach the 2½" hose to the tri-gate.
Sling the SCBA to the stand-by position as a member of the Firefighter Stand-by Rescue Team. Open the appropriate valve of the tri-gate at the call for water.

Supervise and assist the company in fire suppression and rescue activities as outlined in the POG.

Officer opens the gate at the call for water

Driver - See instructions for the Reverse Pump Hook-up.

Position #3 Firefighter - Remove the first section of 2½" hose from the bulk
bed. Place the bundle on the ground and to the fire side of the
engine. Assist the other members in removing the appropriate hose and equipment as necessary.
allow any hose to flake from the shoulder-load until position #4 gives the order to "**stretch**."

Single member stretching 200 feet of 2 ½" hose.

Remove the second bundle from the 2 1/2" Bulk bed and Break the 2 ½" hose at 200 feet.

Remove the second section of 2½" hose from the bed and place it on the ground next to the nozzle bundle. The nozzle bundle should be positioned nearest to the fire. If the Officer is unavailable, remove the tri-gate and position it between the unloaded 2½" bundles and the engine. Foot the tri- gate and ensure that all required hose and equipment has been removed from the engine.

When directed by the Officer, signal the driver to proceed to the hydrant. This signal should be both audible and visual, by pointing forward while shouting "**Go ahead**."

***NOTE*:** If the Officer is unable to foot the tri-gate or LDH because of incident command responsibilities, the position #4 firefighter will have sole responsibility of ensuring that all required hose and equipment has been removed from the engine. After completing this task, position #4 firefighter will then direct the driver to proceed to the hydrant without instructions from the Officer.

Look to see that all equipment and hose has been removed.

When safe to do so, connect the 2½" female coupling to the tri-gated wye. Do not open the gate valve at this time.

Position #4 connecting the 2 ½" hose to the tri-gate.

Both members making the stretch

Shoulder-load the second section of the 2½" hose and pick up the irons. Begin to stretch the hose to the location indicated by the Officer. As you throw the last flake of hose from your shoulder, instruct the position #3 firefighter to "**stretch**." Provide forcible entry as required. Cover with the SCBA at the appropriate time. Assist in advancing and operating the hose line.

2½" Manifold - More than 200 feet of attack line required

Members will work together to remove sufficient 2½" hose from the bulk bed before the engine proceeds to the hydrant. Before removing the final section of 2½" hose from the bed, break the appropriate coupling. All of the hose should be placed on the fire side of the engine, and in sequential order – the nozzle section being closest to the fire.

Monitor Manifold

The Monitor Manifold evolution will begin with 200 feet of 2½" hose, 200 feet of 1¾" hose, the tri-gate with LDH attached, a portable monitor appliance with base, and appropriate tools being removed from the engine at the fire location. The engine will then perform a Reverse Lay to the hydrant.

Monitor Manifold, before the lay.

Charged Monitor Manifold.

***NOTE*:** If the monitor will be put into operation in a location away from where the engine was able to stop, ensure sufficient LDH is removed from the engine prior to the reverse lay begins.

Officer - Direct the driver where to position the engine. Give verbal directions to the crew designating the evolution to be performed, and the destination of the hose line (e.g. "**Monitor Manifold on the Alpha side of the warehouse**").

Remove the Officer's SCBA and appropriate tools from the engine and place these items on the ground. Receive the monitor and the monitor base from the position #3 firefighter if these items are kept in a compartment on top of the engine.

Attach the monitor to the base and position it at the desired place of operation. Remove the tri-gated wye, with LDH attached, and position it between the unloaded hose and the engine. Ensure that all required hose and equipment for the evolution has been removed from the engine.

Kneel at the tri-gate and send the engine to the hydrant. This signal should be both audible and visual, by pointing forward while shouting "**Go ahead**." Foot the tri-gate until the engine is at least 150 feet away. (The removal of the tri-gate and it's footing may be assigned to the position #4 firefighter if the Officer has command duties to attend to.)

Look to ensure that all needed equipment and hose has been removed

Ensure all three tri-gate valves are closed. Sling the SCBA to the stand-by position. Communicate to the driver which monitor tip is in use so the driver can correctly account for friction loss in the hose lay. Direct the monitor operation.

Driver - Position the engine where the Officer instructs. Honk the engine's horn once to signal to the members that it is safe to exit the cab. Set the parking brake. Exit the engine and set the wheel blocks. Remove both sections of the 1¾" apartment bundle and place them to the non-fire side of the engine.

***NOTE*:** If the apartment bundle is properly tied, it is possible to remove the entire bundle like a pre-connect. If this does not seem possible, remove one section at a time, attempting to keep the individual bundles intact.

The nozzle section should be nearest to the fire. Remove the wheel blocks and return to the driver's seat. Prepare to initiate the reverse lay upon receiving direction from the Officer or position #4 firefighter. Once at the hydrant, spot the engine to perform a Reverse Pump Hook-up using the soft suction. See instructions for the reverse pump hookup.

Position #3 Firefighter - Procure the monitor and it's base from the engine. If it is located in a compartment on top of the hose bed, pass this equipment to the Officer. Assist the #4 firefighter in removing 2½" hose from the bulk bed or removing the apartment bundle, as needed.

When all hose and equipment has been removed from the engine, break the 200 feet of 2½" hose into two separate sections. Hand the female couplings off to the position #4 firefighter at the tri-gate. With a male coupling in each hand, simultaneously stretch the 2½" hose lines approximately 50 feet beyond the monitor (one hose on each side of the appliance).

Both 2 ½" lines are stretched 50 feet beyond the monitor.

With the couplings still in hand, turn to face the monitor. Proceed back to a point approximately 20 feet behind the monitor.

Lines are brought back 20 feet behind the monitor.

Turn again towards the monitor, while still holding each coupling, and connect each of the 2½" lines to the monitor.

Connections to the monitor are made.

Spread out the 2½" hose lines into position for monitor operation. Secure the monitor's anchor chain to the 2½" hose lines at the point where they cross in **front** of the monitor. Tie a body loop around the 2½" hose lines at the point where they cross **behind** the monitor.

The monitor is ready for operation.

Position #4 Firefighter - Procure the irons and place them on the ground and to the fire side of the engine. Remove the first section of 2½" hose from the bulk bed and place it on the fire side of the engine. Break the 2½" at the 200-foot mark and remove the second section, placing it on the ground next to the first. If not yet done by the Officer, remove the tri-gate and position it between the unloaded hose and the engine.

If directed by the Officer, foot the tri-gate and signal the driver to proceed to the hydrant. This signal should be both audible and visual, by pointing forward while shouting "**Go ahead**."

***NOTE*:** If the Officer is unable to foot the tri-gate or LDH because of incident command responsibilities, the position #4 firefighter will have sole responsibility of ensuring that all required hose and equipment has been removed from the engine. After completing this task, position #4 firefighter will then direct the driver to proceed to the hydrant without instructions from the Officer.

When safe to do so, connect both 2½" female couplings to the tri-gate. Once the position #3 firefighter has completely positioned the 2½" hose, assist the position #3 firefighter in securing the monitor for safe operation. Select proper tip size, as directed by the Officer. Open the appropriate tri- gate valves at the call for water. Direct the operation of the monitor if the Officer is not present.

Finished Monitor Manifold.

REVERSE LAY SUPPLY LINES

Reverse Pump Hook-up Using the Soft Suction

Driver - Position the engine at the fire location as directed by the company Officer. Honk the horn a single time, indicating that it is safe for the members to exit the cab. Remain seated in the engine while all other members remove the necessary hose and equipment. Watch for the signal to proceed to the hydrant. The Officer **or** the position #4 firefighter will give this order.

When signaled to do so, drive to the hydrant making the reverse lay. After positioning the engine properly at the hydrant, the driver performs the in- cab pump procedures and exits the cab and sets the wheel chocks.

NOTE: When positioning the engine at the hydrant, consider which soft suction intake will be utilized and the length of the soft suction hose. (Standard soft suction length is 24 feet.) Position the **intake** as follows:

- Not less than one-third the length of the suction hose laterally
- Not more than two-thirds forward (or short) of the hydrant

Grasp the LDH where it comes down from the hose bed. Overhaul the hose at a slight angle until the next coupling drops to the ground. Return to that coupling, break the connection, and place the female end under the tailboard for safety. Connect the male end of the LDH to the 4” rear discharge port.

Connecting the LDH to the 4" rear discharge port.

Go to the pump panel and open the rear discharge port.

Opening the rear discharge valve.

Deploy the soft suction hose and connect to the side intake, if it is not already connected. Open the intake valve fully. Proceed to the hydrant with the hydrant bag, the hydrant wrenches and the hydrant coupling of the soft suction hose.

Going to the hydrant with a hydrant bag, wrenches, and the soft suction.

Open the Hydrant Fully.

Remove engine port and a 2½" port (away from the fire) using the Corey wrench. Attach the soft suction hose and a hydrant gate. Ensure that the gate is in the closed position. Step behind the hydrant and open it fully using the Galvin wrench.

Return to the engine's pump panel. While returning to the panel remove any significant kinks immediately. If kinks are present but it remains evident that sufficient water is entering the intake and being discharged to the tri-gate, disregard them at this time. Such kinks will be addressed at a later point.

Using the throttle, increase the discharge pressure until the desired operating pressure is reached. To set your discharge pressure relief valve (PRV), you must turn the PRV operating handle counter-clockwise until the valve opens. This will be known by 3 indicators: the engine RPM's will begin to drop, the indicated discharge pressure will also drop, and the PRV indicator light will illuminate. Once these occur, turn the operating handle the other direction (clockwise) one-half turn. Pause, and then turn the handle clockwise an additional one-half turn. Continue this procedure until the discharge pressure returns to the desired setting and the PRV indicator light turns off.

Position traffic cones to protect personnel, the engine, and hose lines from approaching vehicles. While placing the cones, remove any remaining kinks in the supply line. Obtain a second water supply.

Once a second supply has been established, ensure remaining equipment and hose loads are ready for use. Monitor the pump panel and the radio for further instructions.

If two members are available - The pump and hydrant operations for two members are the same as those for the driver (alone), except that a hydrant member (the driver of the second-in engine or another assigned member) removes the hydrant wrenches and hydrant bag and makes the soft suction connection to the hydrant. Meanwhile, the driver will perform the necessary pump panel procedures. After the hydrant is opened, the member will assist the driver, if necessary, and then dons an SCBA and follows the lines to the fire operation, removing all kinks while proceeding. The hydrant member shall then report to the Officer for further assignment.

Hydrant member makes supply connections and opens the hydrant.

Second Supply for a Reverse Pump Hook-up

To obtain a second supply for a reverse pump hook up, move to the rear of the engine and remove the female coupling of the LDH from under the tailboard. Overhaul the LDH to the rear of the engine until the next coupling drops to the ground. Proceed to the hydrant with female coupling. Leave the female coupling at the hydrant and return to the tailboard.

Once at the tailboard, break the LDH coupling, and place the female end under the tailboard to minimize the tripping hazard. Connect the male end of the LDH to the unused side pump intake using a 4" double female. Do **NOT** open the intake valve until the hydrant connection is made.

Return to the hydrant and attach the female end of the LDH to the hydrant gate. Open the gate fully. Move back to the pump panel, removing all kinks in the hose as you proceed. Once at the panel, open the intake valve fully.

Supply Options for a Reverse Pump Hook-up

Using LDH instead of the Soft Suction (Preferred option)

If soft suction hose will not reach the hydrant when attempting to make a Reverse Pump Hook-up, LDH should be utilized in its place.

(See evolution instructions for the “LDH Supply to the Rear” and the “LDH Supply to the Front” evolutions.)

LDH connected to the main side intake using a 4” double female.

Hydrant Adaptor used to connect LDH to the hydrant.

Extending the soft suction using LDH

Begin by stretching the LDH supply line from the engine to the hydrant. Break the LDH from the bed and connect it directly to the soft suction after opening the keystone, using a soft suction adapter (“red dot.”)

Using the hydrant adapter, connect the LDH supply line to the engine port on the hydrant and open the hydrant.

Soft suction extended with a section of LDH using the soft suction adaptor (red marking).

Hydrant Adaptor used to connect LDH to the hydrant.

FORWARD LAYS

Forward Lay refers to the engine stopping at the water source to drop off a supply line and then advancing to the location of the fire. Forward hose lays may be made "dry" or "wet." When performed "wet," the hydrant person stays at the hydrant, makes up the hydrant connection, charges the line, and then proceeds, on foot, to the fire. When performed "dry," all members will remove the appropriate equipment from the engine, secure the hose to the hydrant, and then get back onto the engine and proceed to the fire location as a crew of four. Another member or company will be directed to make the hydrant connection and charge the supply line. In most circumstances, a second engine should connect to the hydrant, using a soft suction reverse pump hook-up, and pump into the LDH line laid forward (dry) to increase the pressure received by the engine that is pumping at the fire.

NOTE: A forward lay is not advised to proceed "wet" if the engine will be more than **100 feet** of the hydrant. Friction loss and/or elevation gain will significantly reduce the incoming pump pressure at the pumping engine.

The engine is stopped at the direction of the Officer. The desired location is to stop with the tailboard 10 feet past the hydrant (or engine). After allowing the removal of the hose and equipment, drive without undue haste to the objective and make the necessary hose connections.

Forward Lay with LDH (Dry)

The order "**Forward Lay with LDH–Dry**" will indicate that the position #4 firefighter will **not** remain at the hydrant to make connections while the engine performs the forward lay.

Officer - Direct the driver to position the engine near the hydrant for a Forward Lay. Give verbal directions to the crew indicating a "**Forward Lay with LDH–Dry**". Remain seated in the engine until the Forward Lay is completed. At the fire scene, don the SCBA. Supervise and assist the company in fire suppression and rescue activities as outlined in the POG.

Driver - Position the engine so that the tailboard is approximately 10 feet past the hydrant. When safe to do so, sound a single horn honk so that the position #3 and #4 firefighters know it is safe to exit the engine. Once the position #3 and #4 firefighters have returned to the cab and are seated, begin the Forward Lay.

Position the engine as directed by the company Officer at the fire scene. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks.

Procure a hose clamp and immediately place it on the LDH leading from the engine to the hydrant. Face the direction of the hydrant during the application of the clamp.

Driver applying the hose clamp.

NOTE: Face the source of the supply when applying hose clamp. The clamp must be placed a minimum of 20 feet from the tailboard of the engine, and not less than 3 feet from any coupling on the supply side of the hose.

Return to the engine and begin the procedures necessary to charge the appropriate attack line.

(See Driver Responsibilities for the 1¾" Preconnect, 2½" Attack Line, or the Extended 1¾" Attack Line as applicable.)

To finish obtaining the supply, move to the tailboard of the engine and grasp the LDH where it comes down from the hose bed. Turn and run out the hose at a slight angle until the next coupling that will reach the desired pump intake drops to the ground.

Return to that coupling, break the connection, and place the female end under the tailboard to minimize the tripping hazard. Connect the male end of the LDH to the desired pump intake using a 4" double female. Open the intake valve.

Return to the hose clamp, face the engine (the direction of water flow), and open the clamp. The first one to two turns of the clamp will be made in a rapid manner. Then continue to open the clamp with slow turns to prevent water hammer. Once fully open, remove the clamp and return it to the engine.

NOTE: If the hydrant has not yet been opened, you may simply remove the hose clamp.

Return to the engine's pump panel. If a significant kink is discovered while returning to the pump panel, remove it immediately. If kinks are present but it remains evident that water is entering the intake, disregard them at this time. Such kinks will be addressed at a later point.

Close the tank-to-pump valve. Reduce the throttle to return the discharge pressure to the desired operating pressure. If the PRV was properly set, it will likely not require any adjustment.

Upon completion of the primary supply, the driver will don the SCBA to a stand-by position and act as a member of the Firefighter Stand-by Rescue Team, if one is not already in place.

Position traffic cones to protect personnel, the engine, and hose lines from approaching vehicles. While placing the cones, remove any remaining kinks in the supply line. If necessary, recommend to the incident commander that a second supply be laid by another engine company. Refill any water already used from the engine's booster tank by opening the tank fill valve. Ensure remaining equipment and hose loads are ready for use.

Monitor the pump panel and the radio for further instructions.

Position #3 Firefighter - When the engine comes to a stop at the hydrant location, and the proper horn signal has been sounded, exit the cab. Procure the hydrant bag and hydrant wrenches. Place these items near the base of the hydrant.

Return to the engine. Remain seated while the engine is making the forward lay. Once at the fire location, carry out the instructions of the company Officer.

Position #4 Firefighter - When the engine comes to a stop at the hydrant location, and the proper horn signal has been sounded, exit the engine. Proceed to the tailboard and disconnect the LDH from the tri-gate. Overhaul the hose to a point approximately six feet beyond the hydrant. Bring the female coupling back towards the engine to form a six-foot bight even with the barrel of the hydrant. Using a body loop, tie a

hose knot around the bight in the hose. Place the remainder of the body loop over the hydrant, so that hydrant is encircled and the loop comes to rest at the hydrant's base.

Hydrant tools and LDH waiting for the second engine to make the connection.

Return to the engine. Remain seated while the engine is making the forward lay. Once at the fire location, carry out the instructions of the company Officer.

***NOTE*:** A later arriving company will be directed to make the hydrant connections in the "Forward Lay – Dry" evolution. No hydrant connections are made by the members of the first due company.

Forward Lay with LDH (Wet)

Officer - Direct the driver to position the engine near the hydrant for a Forward Lay. Give verbal directions to the crew indicating a "**Forward Lay - Wet**". Remain seated in the engine until the Forward Lay is completed. At the fire scene, don the SCBA. Supervise and assist the company in fire suppression and rescue activities as outlined in the POG.

Driver - Position the engine so that the tailboard is approximately 10 feet past the hydrant. When safe to do so, sound a single horn honk so that the position #3 and #4 firefighters know it is safe to exit the engine. Once the position #3 firefighter has returned to the cab and is seated **and** the position #4 firefighter has given the signal to proceed, begin the Forward Lay.

Position the engine as directed by the company Officer at the fire scene. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks.

Procure a hose clamp and immediately place it on the LDH leading from the engine to the hydrant. Face the direction of the hydrant during the application of the clamp.

NOTE: Face the source of the supply when applying hose clamp. The clamp must be placed a minimum of 20 feet from the tailboard of the engine, and not less than 3 feet from any coupling.

Driver applying the hose clamp.

Return to the engine and begin the procedures necessary to charge the appropriate attack line.

(See Driver Responsibilities for the 1¾" Pre-connect, 2½" Attack Line, or the Extended 1¾" Attack Line as applicable.)

To finish obtaining the supply, move to the tailboard of the engine and grasp the LDH where it comes down from the hose bed. Turn and run out the hose at a slight angle until the next coupling that will reach the desired pump intake drops to the ground.

Return to that coupling, break the connection, and place the female end under the tailboard to minimize the tripping hazard. Connect the male end of the LDH to the desired pump intake using a 4" double female. Open the intake valve.

Return to the hose clamp, face the engine (the direction of water flow), and open the clamp. The first one to two turns of the clamp will be made

in a rapid manner. Then continue to open the clamp with slow turns to prevent water hammer. Once fully open, remove the clamp and return it to the engine.

Face the direction of the flow when opening the hose clamp.

Return to the engine's pump panel. If a significant kink is discovered while returning to the pump panel, remove it immediately. If kinks are present but it remains evident that water is entering the intake, disregard them at this time. Such kinks will be addressed at a later point.

Close the tank-to-pump valve. Reduce the throttle to return the discharge pressure to the desired operating pressure. If the PRV was properly set, it will likely not require any adjustment.

Upon completion of the primary supply, the driver will don the SCBA to a stand-by position and act as a member of the Firefighter Stand-by Rescue Team, if one is not already in place.

Position traffic cones to protect personnel, the engine, and hose lines from approaching vehicles. While placing the cones, remove any remaining kinks in the supply line. If necessary, recommend to the incident commander that a second supply be laid by another engine company. Refill any water already used from the engine's booster tank by opening the tank fill valve. Ensure remaining equipment and hose loads are ready for use.

Monitor the pump panel and the radio for further instructions.

Position #3 Firefighter - When the engine comes to a stop at the hydrant location, and the proper horn signal has been sounded, exit the

engine. Procure the hydrant bag and hydrant wrenches. Place these items near the base of the hydrant.

Return to the engine. Remain seated while the engine is making the forward lay. Once at the fire location, carry out the instructions of the company Officer.

Position #4 Firefighter - When the engine comes to a stop at the hydrant location, and the proper horn signal has been sounded, exit the engine. Proceed to the tailboard and disconnect the LDH from the tri-gate. Overhaul the hose to a point approximately six feet beyond the hydrant. Bring the female coupling back towards the engine to form a six foot bight even with the barrel of the hydrant. Use a body loop to form a hose knot at the bight in the hose and place the other end of the body loop over the barrel of the hydrant to its base.

The body loop placed around the hydrant.

Alternate method: Secure the LDH by wrapping the hose around the hydrant. Step on the LDH at the point where the hose crosses itself.

NOTE: Be certain that no part of the body is placed between the LDH and the hydrant. If the hose snags during the forward lay, an injury may occur.

Correct positioning for securing the hose using the alternative method.

Stand behind the hydrant, establish positive visual contact with the driver and signal the driver to proceed to the hydrant. This signal should be both audible and visual, by pointing forward while shouting "**Go ahead**." Make the hydrant connections by attaching the LDH to the steamer port using a hydrant adaptor (yellow marking), and a hydrant gate on a 2 ½" port. Once you are certain that the driver has come to a stop and a hose gate has been placed, open the hydrant fully. If the position #4 firefighter's vision is obstructed, use the radio to confirm the hose has been clamped.

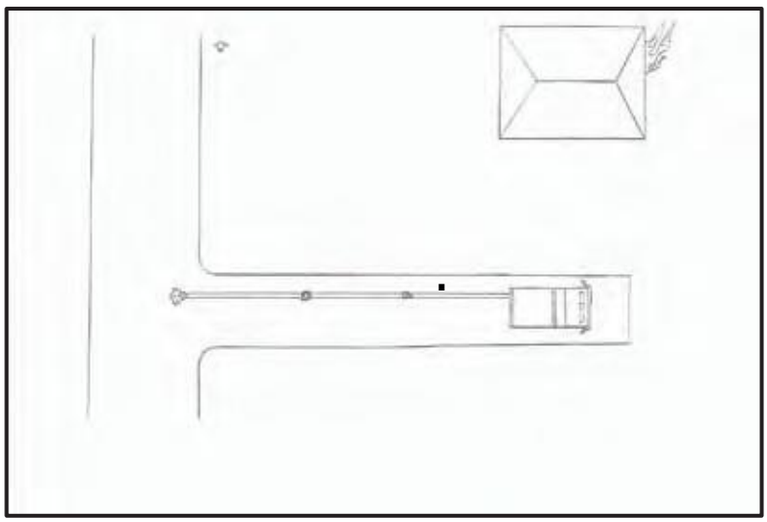
NOTE: The use of the body loop allows the hydrant connections to be started before the engine has stopped at the fire, but members must stay clear of the utility strap while the engine is making the lay. The body loop must not be removed until the engine has stopped at the fire. Ensure that it is removed from the hydrant before the line is charged, however, in order to avoid a severe kink as the hose is filled.

While returning to the engine, remove any major kinks in the LDH to ensure a good supply is received at the engine's intake. If the other members of the company have not yet entered the fire building, procure appropriate tools and assist in stretching the attack line. If the members are already inside the building, assist the driver as necessary, then report to the incident command for other instructions.

Blind Alley Lay

The Blind Alley Lay is a split lay that is accomplished with two engine companies. This lay may be utilized when a forward lay is required down an alley, private drive, or other limited access road.

The first engine will drop the tri-gate at the entrance of the alley or private drive. This engine company will then perform the first half of the split lay. The LDH can be secured to a substantial object (e.g. mail box, fence post) with a body loop so that a member is not required to foot the tri-gate.



Initial engine company lays forward to the fire

Once at the fire location, an attack line will be stretched and fire suppression activities will begin with tank water, as described in the forward lay-dry section. The driver must place a hose clamp on the LDH immediately after setting the wheel blocks. After the designated attack line has been charged, the LDH will be broken and connected to the pump intake and the intake valve can be opened.

The second engine to arrive will basically perform a Reverse Lay evolution from the location of the tri-gate initially dropped by the first engine.

Officer (1st engine) - Upon determining that the fire is in a location away from the main roadway and that a narrow alley or access road must be used, direct the driver to position the engine at the beginning of the alley or narrow roadway. Give verbal directions to the crew indicating a "**Blind Alley Lay - Dry**". Remain seated in the engine until the Blind Alley Lay is completed. At the fire scene, indicate to the #3 and #4 firefighters the fire attack to perform. Don the SCBA, supervise, and assist the company in fire suppression and rescue activities.

Driver (1st engine) - Stop the engine as directed by the Officer. Sound a single horn honk so that the position #4 firefighter knows it is safe to exit the engine. Remain in the cab and wait for the position #4 firefighter to return to the engine. Once the position #4 firefighter is secured in the engine, continue to the fire location as directed by the Officer.

Position the engine as directed by the company Officer at the fire scene. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks.

Procure a hose clamp and immediately place it on the LDH leading from the engine.

NOTE: Face the source of the supply when applying hose clamp. The clamp must be placed a minimum of 20 feet from the tailboard of the engine, and not less than 3 feet from any coupling.

Return to the engine and begin the procedures necessary to charge the appropriate attack line.

(See Driver Responsibilities for the 1¾" Pre-connect, 2½" Attack Line, or the Extended 1¾" Attack Line as applicable.)

To finish obtaining the supply, move to the tailboard of the engine and grasp the LDH where it comes down from the hose bed. Turn and run out the hose at a slight angle until the next coupling that will reach the desired pump intake drops to the ground.

Return to that coupling, break the connection, and place the female end under the tailboard to minimize the tripping hazard. Connect the male end of the LDH to the desired pump intake using a 4" double female. Open the intake valve.

Return to the hose clamp, face the engine (the direction of water flow), and open the clamp. The first one to two turns of the clamp will be made in a rapid manner. Then continue to open the clamp with slow turns to prevent water hammer. Once fully open, remove the clamp and return it to the engine.

NOTE: Face the direction of water flow when opening a hose clamp. Ensure the hose is ready to receive the water supply and announce "water coming" in a loud voice.

Return to the engine's pump panel. If a significant kink is discovered while returning to the pump panel, remove it immediately. If kinks are present but it remains evident that water is entering the intake, disregard them at this time. Such kinks will be addressed at a later point.

Close the tank-to-pump valve. Reduce the throttle to return the discharge pressure to the desired operating pressure. If the PRV was properly set, it will likely not require any adjustment.

Upon completion of the primary supply, the driver will don the SCBA to a stand-by position and act as a member of the Firefighter Stand-by Rescue Team, if one is not already in place.

Position traffic cones to protect personnel, the engine, and hose lines from approaching vehicles. While placing the cones, remove any remaining kinks in the supply line. If necessary, recommend to the incident commander that a second supply be laid by another engine company. Refill any water already used from the engine's booster tank by opening the tank fill valve. Ensure remaining equipment and hose loads are ready for use.

Monitor the pump panel and the radio for further instructions.

Position #3 Firefighter (1st engine) - Remain on the engine until it reaches the fire location. Once at the fire location, carry out the instructions of the company Officer.

Position #4 Firefighter (1st engine) - When the engine comes to a stop at the hydrant location and the horn signal has been sounded, exit the engine. Remove the tri-gate with LDH attached and lay in the driveway, alley, or narrow roadway. If possible, secure the LDH to a substantial object (e.g. mail box, fence post) with a body loop.

Return to the engine. Remain seated while the engine is making the forward lay. Once at the fire location, carry out the instructions of the company Officer

Officer (2nd engine) - Direct the driver to a location near the dropped tri-gate of the initial engine. Consider sending the position #3 firefighter with the driver to facilitate a more rapid water supply connection. Instruct the crew to "**Finish the "Blind Alley Lay**." Exit the cab after the driver sounds the proper horn signal. Remove the Officer's SCBA and appropriate tools from the engine and place these items on the ground.
Ensure that the amount of LDH hose removed from the 2nd engine is enough to make the connection to the initial engine's LDH hose lay. Direct the position #4 firefighter to send the engine to the hydrant.

Driver (2nd engine) - Position the engine as directed by the Officer. Sound a single horn honk so that the Officer and position #4 firefighter know that it is safe to exit the engine. Remain in the cab and look for the signal to proceed from the position #4 firefighter.

When signaled to do so, perform the reverse lay to the nearest hydrant. Position the engine at the hydrant for a Reverse Pump Hook-up using the soft suction. Perform the in-cab procedures to place the engine into pump. Exit the cab and place the wheel blocks.

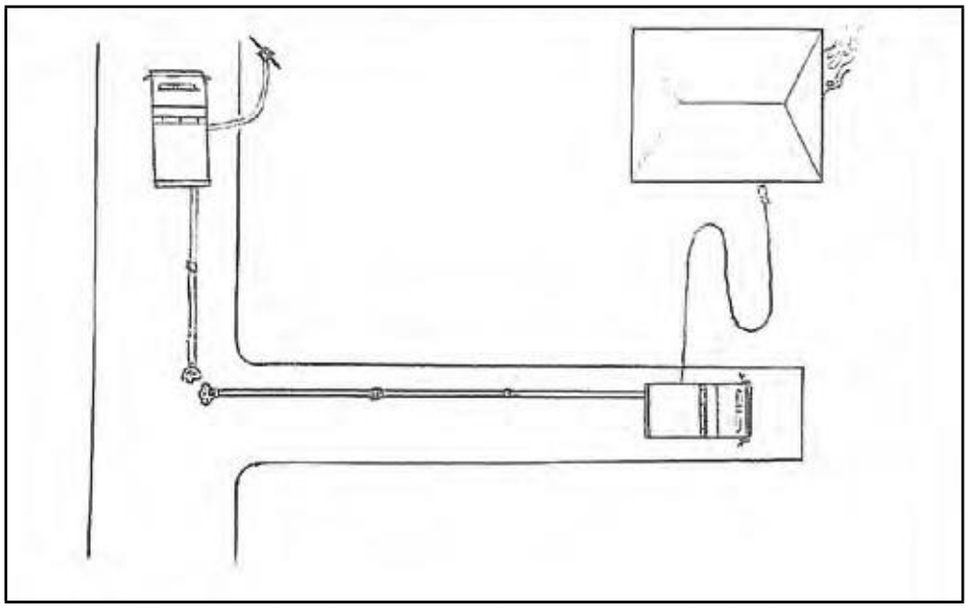
(See the instructions for the "Reverse Pump Hook-up using the Soft Suction")

Position #3 Firefighter (2nd engine) - Follow directions of the Officer. If directed to the hydrant with the driver, remain in the cab while the engine makes its first stop, then proceed to the hydrant with the driver and assist with the reverse pump hook-up.

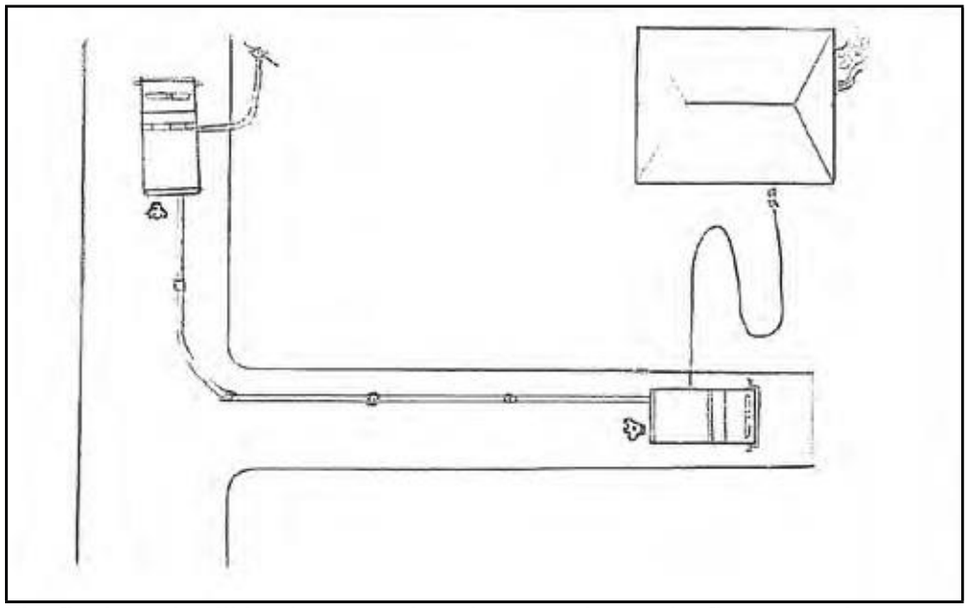
Position #4 Firefighter (2nd engine) - Exit the cab after the driver sounds the proper horn signal. Procure a 4" double male and the tri-gate, with LDH attached, from their compartments. The position #4 firefighter will then foot the tri-gate and an additional amount of LDH to ensure that both lengths of LDH can be connected. On the Officer's command, signal the driver to proceed to the hydrant. This signal should be both audible and visual, by pointing forward while shouting "**Go ahead**".

Connect the hose together using a 4" double male. The

position #4 will then report to their company Officer for further assignment.



The second engine company lays reverse to the hydrant.



The final result will be the second engine pumping to the first as a relay pumping evolution.

Unusual Situations

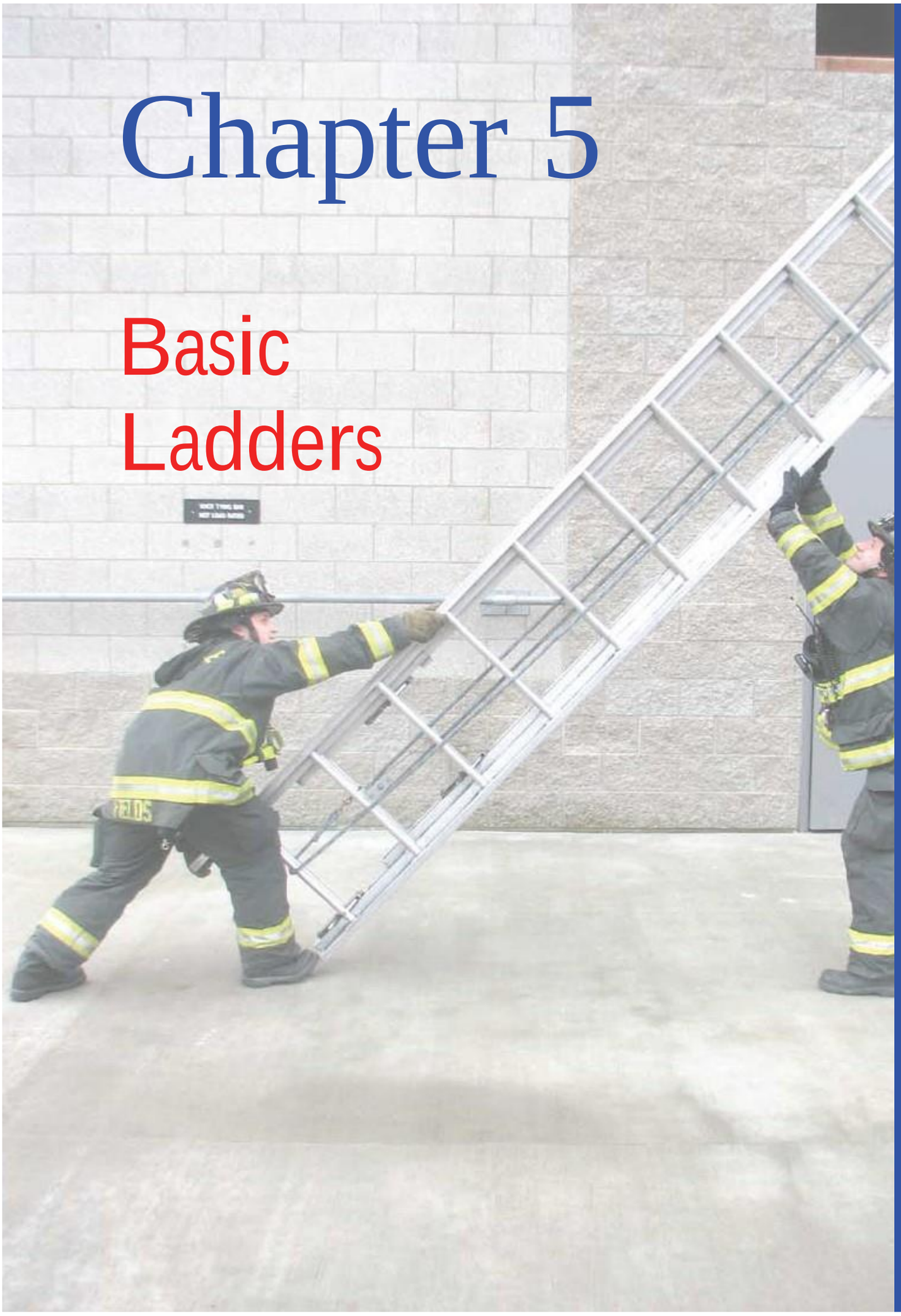
Members must be alert for unusual situations where hydrants are poorly located (up a bank, in brush, etc.) and adapt these procedures accordingly.

For "dry" hose lays, it may be necessary to remove enough hose from the engine to reach the poorly located hydrant, anchor it to another object near the street (fence, utility pole, etc.), and then proceed with the lay. When it can be done quickly, "dry" hose lays with difficult hydrant situations will have the female end of the large diameter hose, the hydrant wrenches and hydrant bag overhauled to the hydrant before the lay is made. This will assist the directed company or member that will be making the connections and charging the line, by allowing them to follow the hose when they arrive and quickly locate the difficult hydrant.

If the utility strap cannot be slipped over the top of the anchoring object, the free end of the utility strap will be tied to the object using a round turn and two half hitches. More than one utility strap can be looped together if greater length is needed. If the equipment and hose cannot be overhauled quickly to the hydrant, do not proceed with the lay until it is assured that sufficient hose has been provided to reach the hydrant from the street. The hydrant wrenches and hydrant bag will be left with the additional hose that was removed

Chapter 5

Basic Ladders



BASIC GROUND LADDERS

Overview

Ladders have a major role in the fire service. A member must be able to ascend and descend from one level to another when performing emergency operations.

Stairways are ordinarily accessible, but sometimes they may be involved in fire or other hazards. Members must therefore need to provide their own means of ascent or descent to upper floors. Rescue, roof top operations, ventilation, and fire stream operation may also require the extension and proper placement of fire service ladders.

Fire service ladders demand close and coordinated teamwork. The safety of citizens and members depends on the member's ability to perform all operations quickly, using established and proper techniques.

GENERAL LADDER INFORMATION

Ladder Uses

RESCUE - The principle use of fire service ladders is for rescue work. .

ACCESS - Fire service ladders are used to gain access to attics, upper floors, or to the roof of a structure as well as spaces that may be difficult to access otherwise.

VENTILATION – Windows may be vented from the exterior using ground ladders.

FIRE STREAMS - Ladders provide a means of access for hose lines from the ground level. Fire streams can be operated directly off of properly supported ladders.

BRACING - Ladders can be used as braces and as shoring in many applications.

SALVAGE - Ladders can be used to effect efficient salvage operations; forming catch-all basins, providing a means of attaching tarps, etc.

Ladder Nomenclature and Definitions

Members must be able to identify the parts of a ladder so they can understand ladder commands and be able to inspect the ladder.

BABY LADDER – A small extension ladder that is carried on all ladder trucks and engine companies. They vary in length from 10 to 14 feet.

BED - The main section of an extension ladder from which the fly is extended.

BEAM - The principle structural member of the ladder where the rungs are secured. Beams may be solid or trussed.

BUTT - The bottom end of the ladder opposite the tip.

CABLE - Used in multiple-fly extension ladders to extend fly sections in addition to the halyard.

CABLE ANCHOR - Used to anchor the end of the cable to the fly section.

FOLDING LADDER – The folding attic ladder has hinged rungs whereby the two beams can be folded together.

DOGS - The mechanism that keeps the fly(s) from retracting once they are properly set on the desired rung. These are also referred to as "Pawls" or "Locks".

EXTENSION LADDER - Extension ladders are ladders with two or more sections, and with the exception of baby ladders, are extended with a halyard. In Seattle, they vary in length from 10 to 45 feet.

FLY - The extendable and retractable section or sections of an extension ladder.

GUIDES - The metal strips on an extension ladder which guide the fly section or sections while being extended or retracted.

HALYARD - The rope used to extend or retract the fly.

HALYARD ANCHOR - The device used to anchor the halyard line to the fly section.

HOOKS - The curved metal hooks at the tip end of a roof ladder.

LADDER ANCHOR - A metal hook and rope device used to secure the tip of a ladder to its objective to prevent tipping

PULLEY - The grooved metal wheel over which the halyard or cable is drawn when extending or retracting the flies.

ROOF LADDER - A straight ladder with folding hooks at the tip end used for maintaining secure footing when operating on a pitched roof.

RUNGS - Horizontal cross members of the ladder, used when climbing. Rungs on fire service ladders are usually round and spaced 14 inches apart.

RUNG PLATES - The metal plate where the rungs are set in the beam.

SPIKE - The metal point at the butt end of a tormentor pole.

SPURS - Protrusions at the butt of a ladder to prevent slipping when in the raised position, and to protect the end of the beams.

STOPS - Prevents the extension of a fly section out of the top of the bed.

SWIVEL - Attaches the tormentor pole to the right and left beams on the bed section of a 40 foot or longer ladder.

TIP - The uppermost end of the ladder (opposite the butt).

TORMENTOR POLES - The poles attached to the upper bed section of a 40' or larger extension ladder. They are used to assist in raising, lowering, pivoting, and stabilizing of the ladder.

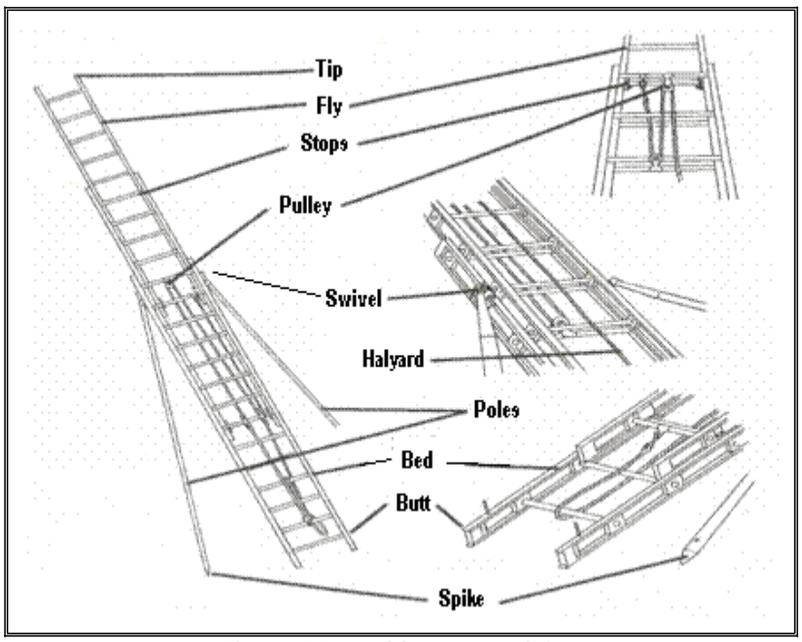


Figure 5.1 - Ladder nomenclature

LADDER CONSTRUCTION

Solid and Trussed Beam Ladder Construction

Ladders are designed with solid or trussed beams. The solid beam is a solid piece of material of the shape and size to provide the maximum strength for fire service work.

Trussed ladders are designed to increase strength in relation to weight. When using longer ladders, trussed beam ladders are often used rather than solid beam because the weight of the trussed beam ladder will be less, although just as strong. Trussed ladders come in several designs. Although trussed beamed ladders are used in the fire service, Seattle uses them for certain roof ladders and those too, will soon be phased out.

NOTE: It is good practice to write the measured length (of the ladder when the fly(s) are retracted) on the inside of each beam near the butt. This allows members to better judge the distance in which they must extend the fly(s) to the desired target height.

A typical solid beam ladder

TYPES OF LADDERS

Baby Ladder

The baby ladder is a small extension ladder carried on both ladder trucks and engine companies. They vary in length when extended from 10' to 14'. Baby ladders are primarily used in gaining access to lower elevations on the exterior of buildings, salvage work, and gaining access to scuttles inside buildings.

Roof Ladder

The **primary purpose** of the roof ladder **is to establish secure footing on a pitched roof** (Fig. 5.3). The hooks provide a means of anchoring the ladder over the roof ridge or some other roof part and a working member can then use the ladder for support while removing shingles, cutting holes, and performing other ventilation and fire fighting operations.

Additionally, a roof ladder can allow easier access to the bottom of a fire escape by using the hooks over the rungs and the spurs on the ground.

Roof ladders vary in length from ten to twenty feet. Twelve to fourteen being the most common size carried.

Members standing on and working from a roof ladder

Folding Ladder

This ladder is constructed so that when folded, it measures approximately 4 inches in width. It is usually 10 feet in length and cannot be extended. Since it can be difficult to maneuver an extension or straight ladder around corners, in hallways, and in stairwells, this ladder proves itself very useful. It is also commonly called an “attic” ladder.

Folding or Attic Ladder

Extension Ladder

Extension ladders have two or more sections and are extended with a halyard. The only exception to this is a baby ladder, which does not have a halyard due to its height. In Seattle, extension ladders vary in measured length from 10 to 45 feet. A bangor ladder is pictured in Fig. 5.6 next page

They are adjustable in height and their size is designated by the length of the ladder measured when the ladder is fully extended. Ladders 40 feet or longer are equipped with poles to assist in handling and placement. These poles are called “tormentor” poles. The following table of weight comparison is a source of Duo-Safety ladder company maufacturer.

Fire Service Ladder	Approximate Weight
24’ Extension Ladder	72 lbs
26’ Extension Ladder	92 lbs
35’ Extension Ladder	129 lbs
40’ Extension Ladder	215 lbs
45’ Extension Ladder	240 lbs
12’ Roof Ladder	24 lbs
14’ Roof Ladder	28 lbs
18’ Roof Ladder	44 lbs

SAFETY PRECAUTIONS

- Use extreme caution when reaching arms through the rungs of extended ladders, making sure that all dogs are locked and that the halyard is secured.
- Do not adjust the butt of an extended ladder until the tip is against the building and the fly is properly secured with the halyard or body loop.
- Keep hands, fingers, and feet clear of the fly sections and rungs of extension ladders when extending or retracting the fly.
- Use approved safety gear while manipulating ladders. At a minimum, wear gloves, helmets, and steel toed shoes.
- Avoid walking backward while carrying ladders.
- Attempt to maintain as many points of contact with the ladder to safely complete the required task, unless you are locked in on the ladder.
- **Never** lock in on a non secured ladder.
- **Never** lock in on an aerial ladder.
- Check overhead for wires or obstructions prior to raising and lowering ladders.
- Always watch the tip of the ladder whenever it is in the vertical position, when lowering the ladder into the building, and when pivoting.
- Do not walk backwards when maneuvering tormentor poles.
- Do not step over ladders lying on the ground, walk around instead.

Ground Ladder Safety Standards for Members

WAC 296-305-06005

This section establishes the minimum requirements for the construction, care and use of the common types of ladders used in fire operations.

(1) Ladder locks or pawls on extension ladders shall be so fastened or secured to the beams that vibration and use will not cause loosening of bolts and nuts.

(a) Pawls or ladder locks shall be so constructed that the hook portion of the pawl that engages the rung shall have sufficient bearing surface or area to prevent the hook from cutting into rungs when engaged.

(b) Such hooks shall be properly finished to eliminate sharp edges and points.

(2) Staypoles or tormentors shall be furnished on all extension ladders over forty feet. Staypole or tormentors spikes shall not project beyond the butt of the ladders when nested.

(3) All ladders shall be stored in a manner to provide ease of access for inspection, and to prevent danger of accident when withdrawing them for use.

(4) Members shall climb and descend ground ladders with the fly out, for safety purposes, when not in conflict with the manufacturer's recommendations. Even when ladders are routinely used in the fly out configuration, in adverse conditions members shall be permitted to climb and descend ground ladders with the fly in to assure secure footing.

(5) All ladders regardless of type shall be inspected thoroughly after each use. Records shall be kept of the inspections and repairs.

(6) The following metal ladder components shall be checked:

(a) Rungs for welds, damage or weakness caused by overloading or bumping against other objects, looseness and cracks, etc.

(b) Beams for welds, rivets and bolts, signs of strain or metal fatigue, and deformation from heat or overloading.

(c) Bolts and rivets for tightness.

(d) Butt spurs for excessive wear or other defects.

(e) Halyards for the same defects listed for wood ladder halyards and cables halyards, for fraying or breaking.

(f) Heat sensor label, when provided, for change indicating heat exposure.

(6) **Not applicable for Seattle Fire Department**. This deals with wooden ladders.

(7) Methods of fastening ladder halyards, either of wire or fibrous material, shall be in a manner that the connection is stronger than the halyard.

(8) Any defect noted in the above visual inspection shall be corrected prior to testing.

Lifting Ladders

Lifting should be done with the knees bent in a squatting position, with the back straight. This places the load on the heavy muscles in the thighs and not on the back. Lift with the legs and keep the load close into the body.

Do not lift by stooping over with the legs straight. This places the load on the sensitive back and abdominal muscles.

Keeping the toes pointed slightly inward rather than spread out lessens the chance of abdominal injury.

Ensure good footing before lifting and that the hand grip is firm and substantial. When two or more members lift together, their actions should be in unison.

The use of preparatory commands, such as "Prepare to lift, ---Lift," will ensure that all members are in unison.

If in doubt or a member is not ready, early communication from members is vital to preventing unnecessary injuries.

LADDER OPERATION PROCEDURES

Members must know what action to take when the ladder command is given to ensure a smooth, coordinated movement in lifting, carrying, spotting, raising, pivoting, extending, retracting and lowering a ladder.

Commands shall be given by the member in charge in a loud, clear, and concise voice: prompt and exact response is required.

Members will be able to take charge of a ladder and issue all the commands and directions necessary to accomplish needed movements of a ladder.

When using tormentor poles, the member in charge will be on the right pole.

When two or more members are carrying a ladder, the member in charge shall be in the position noted below for correct spotting of the ladder:

1. On the right beam, at the center, for a cradle carry.
2. On the right beam, at the center or butt, for a 3 member flat carry.
3. At the right butt on a 4 or 5 member flat carry.
4. At the butt for all beam carries.

***NOTE*:** If a sufficient number of members are available to carry the ladder, the officer may opt to stand out and give commands.

PROPER LADDER AND CLIMBING ANGLES

When sizing-up a situation; decide the use for the ladder, type of ladder needed, and the length of ladder most suitable to the situation. Ladders have their greatest strength when in a vertical position and their least strength in a horizontal position.

To ensure safety, ease of climbing, and to support the greatest weight, ladders should be placed at the proper angle. This is considered to be about 70 degrees (from horizontal.) To achieve this angle, the butt of the ladder should be a fixed distance out from the surface supporting the top of the ladder. This is generally accepted as one quarter of the height from the ground to the point where the ladder rests against the objective. All extension ladders are raised with the fly section(s) toward the building.

A simple and effective way to determine if a ladder is set at the proper angle for climbing is to take a standing position with your toes against the ladder spurs, extend your arms straight out, and your fingers should fall on the rung at about shoulder level (Fig. 5.7).

Checking for Proper Climbing Angle

WORKING LOAD LIMITS

For safety, there are a maximum number of people permitted on a ground ladder at one time. These recommendations are from the ladder manufacturer.

Length or Type of Ladder	Maximum Load
Less than 30 feet	2
30 feet or longer	3

The maximum number of people listed above includes anyone being rescued or carried down the ladder and should not be exceeded. Loads exerted on these ladders for drill purposes or normal fire ground operations should not exceed 750lbs.

***NOTE*:** NFPA requires that ALL fire service ground extension and roof ladders have a 4:1 safety factor designed into the working load limits.

When a member is working on a ladder, the fly section(s) shall be properly secured using the halyard or a body loop, so that the fly(s) cannot retract.

Refer to the manufacturer's manual for the maximum load specifications for aerial ladder apparatus.

LADDER COMMANDS

The importance of proper and adequate communication between members that are handling ladders cannot be over emphasized. Ladder commands must be spoken clearly and loud enough to be heard by all members of the ladder team. During fire operations, there is often a great deal of noise - members must hear the commands.

Commands will normally be given by the member in charge of the operation. The officer, or member in charge, should be positioned on the right beam of the ladder during the removal and carrying of ladders. When poles are used, the member in charge will be positioned at the right pole. When the ladder is in position, the member on the right beam (or right pole when applicable) will give the commands to complete the raise and placement of the ladder into the objective. If additional personnel are available, the member in charge may stand out, achieving a better vantage point to give commands. Members shall be alert to warn others of danger, or to inform the member in charge of unsafe conditions.

LADDER COMMANDS – ALPHEBETICAL

"ADJUST THE BUTT" - The command given to adjust the butt of the ladder (to the right, left, in or out) to the proper climbing angle or squaring it to the building.

"ALL DOGS ARE LOCKED" - Statement made by members after checking to ensure that the dogs are secured properly to the desired rung after extending the flies.

Dogs between rungs during extension of the fl

Correctly locked dog

The dog on the right is NOT locked

"EXTEND THE FLY" - The fly section of the ladder is extended to the desired height by pulling down on the halyard.

"FLY SIDE AROUND" - A command given by the member on the tormentor poles to the member on the fly side of the ladder to come and take the left tormentor pole once the ladder has come to the vertical and is stabilized.

"GROUND THE BUTT" - A command given to lower the butt end of the ladder prior to raising it to the vertical. (Used in cradle and beam carries).

NOTE: During a cradle carry, cradle raise, this command would order the members to place the butt on the ground and raise the ladder all in one motion.

"HALT" (pause) "LOWER" - The member shifting the ladder stops and lowers the butt to the ground.

"HIGH" - The command issued when the fly is at the desired height. The fly is then locked at the next highest rung. Care must be taken to ensure that **all the dogs** are locked.

"INTO THE BUILDING" - The member(s) on the bed side of the ladder, with the member on the fly side assisting them, lower the ladder into the building. When lowering a ladder into a building, the members on the bed side of the ladder (during a 3 person evolution) must ensure that their inside foot is placed on the bottom rung, to keep the butt of the ladder from moving. If one member is on the bed side, both hands should grasp the fourth rung and the left foot would be on the bottom rung in the center. If two members are on the bed side, their inside hands should grasp the fourth rung and their outside hands would grasp the respective beams.

"LADDER COMING THROUGH" - Warning statement called out to advise others that a ladder is being carried through their area.

"LEFT POLE AROUND" - The left pole member gives their pole to the right pole member and moves to the fly side of the ladder.

"LIFT" (pause) "SHIFT" - The member lifts the ladder and moves in the direction indicated.

"LOWER THE FLY" - The member on the right beam lowers the fly section(s). It is necessary for the member on the right beam to lower the fly, due to the fact that the halyard, as it goes through the upper pulley, is angled to the right side. If a ladder were ever to have the halyard come from the left side of the pulley on a 3 person evolution the member on the left would lower the fly.

"LOWER THE LADDER" - Lower the ladder to the ground.

"MOVING" - The member gives this command when they start moving with the tormentor pole to get in position before and after the pivot a 40' or greater extension ladder. Only one pole can be moving at a time.

"ON THE (RIGHT OR LEFT) BEAM, PIVOT IN" - The ladder is pivoted toward the flies on the designated beam. (Ladders are pivoted 1/4 turn unless directed otherwise.)

"ON THE (RIGHT OR LEFT) BEAM, PIVOT OUT" - The ladder is pivoted toward the bed on the designated beam. (Ladders are pivoted 1/4 turn unless directed otherwise.)

"ONCE AROUND" - All members working with the ladder, move one position clockwise. (This command is generally used only for training purposes to ensure that all members get an equal chance to practice in each position.)

"OUT FROM THE BUILDING" - The tip of the ladder is pulled away from the building to a vertical position.

"OUT WITH THE POLES" – The command given by the person in charge to move the poles from the set position into position to pull the ladder "out from the building".

"OVERHEAD CLEAR" - The statement issued prior to raising, or prior to passing the poles on a tormentor ladder, to indicate that the area above the ladder is clear of wires or obstructions. Announce before lowering the ladder if it is lowered in a different direction than it was raised or lowered by different personnel. Also used prior to shifting a ladder.

"PASS THE POLES" - The command given by the member in charge to the member(s) who will be footing the ladder on the raise, to unseat the tormentors and pick them straight up so the two members on the beams can continue the movement of the poles to the member in charge.

"PREPARE TO RAISE" - The preparatory command which precedes the next command, "RAISE."

"PREPARE TO SHIFT (RIGHT/LEFT)" – The preparatory command to cue the member(s) to move into position to perform the lift/shift.

"READY" (pause one step) "HALT" - A preparatory command for spotting given when bringing in a ladder to raise it. When it is given the personnel carrying the ladder will take one more step before stopping forward motion.

"RAISE" - Indicates that the members should now begin to raise the ladder toward the vertical position.

NOTE: This shouldn't be confused with the command "LIFT", which is the command for the ladder coming horizontally off the ground into the member's hands or to the shoulders.

"RELEASE THE HALYARD" - The halyard is untied by the member on the right beam. This accomplished all while the left foot is on the bottom rung near the center.

"RELEASE THE TIP" - Remove the ladder anchor from the fly or tip.

"SECURE THE HALYARD" - The member on the right beam places their left foot on the bottom rung, in the center. The member then pulls the slack rope through the second and third rung space, wraps the excess slack around the third rung, then ties a round turn and two half-hitches around the halyard above the third rung. The bight or slack on the last half-hitch should be moved to the objective side of the ladder so that it will be out of the way of the climbing member(s). (Fig's 5.54-5.60)

"SECURE THE TIP" - The tip of the ladder (fly section) will be secured to the building with a ladder anchor.

"SET" - The command given when the member moving with a tormentor pole has reached their ready position and is prepared for the next action.

"SET THE POLES" - When the ladder is in the proper position for climbing, the poles are moved from the butt to a position parallel to the objective and the spike is allowed to *rest* on the ground.

"SHIFT" - start moving the ladder in the indicated direction while it is in the raised position.

"STOW THE LADDER" - Return the ladder to the apparatus or storage area, tip first.

"TO THE SHOULDER" – An optional statement given after "PREPARE TO LIFT" that alerts members of the intent to lift the ladder to the shoulder

LADDER CARRIES

Members should know the exact location of each ladder on the apparatus and how it is secured. This memorization ensures that any ladder can be located and placed into operation without delay.

Generally, ladders are carried in the same manner in which they are nested on the apparatus. Ladders nested flat on the apparatus are carried flat. Ladders nested on the beams are beam carried.

Ladders are usually carried butt end first when removing ladders from the apparatus and tip end first when returning them to the apparatus. Members shall avoid walking backward while carrying ladders.

The nesting process may sometimes make it necessary to remove more than one ladder for an operation. Unused ladders must be removed from the apparatus and placed in a safe position if it is not possible for them to be left on the apparatus in a locked position.

Exercise caution when carrying ladders. More accidents occur while handling ladders than while climbing them. Many of these occur at night when there is inadequate light, especially if there is smoke in the air or uneven terrain.

Beam Carry

One Member - From the Ground 28' Extension Ladder or Less

Ladder is lying flat on ground with fly section(s) on top.

OPTION ONE: Low Shoulder Beam Carry

Identify the center of the ladder. Position yourself at the center of the ladder and face it.

Squat down and grasp hold of the closest beam with both hands.

Lift the beam from the ground and allow it to rest on its outside beam so the bed of the ladder is next to you. Simultaneously, step in toward the ladder.

Place your body in a semi-squat position. The tip of the ladder is picked up and the ladder is placed on the inside thigh while keeping the butt of the ladder resting on the ground.

Place the inside arm between the rungs, by or at the center (balance point), and grasp the upper beam of the ladder in front of the rung so the rung will rest against the arm to keep it from twisting.

Rise to a standing position with the ladder resting on the shoulder. The outside hand takes hold of the most comfortable rung in front of the chest for stabilization and balance.

The butt end of the ladder should be tilted slightly downward to allow for clear forward vision. (Fig. 5.11)

Low shoulder beam-carry

OPTION TWO: High Shoulder Beam Carry

Identify the center of the ladder. Position yourself at the top 1/3 of the ladder and face it.

Squat down and grasp hold of the closest beam with both hands.

Lift the beam from the ground and step in toward the ladder allowing it to rest on its outside beam so the bed of the ladder is now next to you. Lift the tip of the ladder leaving the spur on the ground as you come to a standing position. Move toward the butt raising the tip until you can step under the lower beam with your shoulder at the center of the ladder. Lift the butt end off the ground.

The inside hand takes hold of the bottom beam to secure the ladder to the shoulder. The outside hand grasps the upper beam for the best stabilization and balance. (Fig. 5.12 next page)

High shoulder beam-carry

Beam Carry

One Member – (LADDER TRUCK) 28' or Less Extension Ladder

OPTION ONE: Low Shoulder Beam Carry

Unlock ladders. Pull the ladder straight back and when the ladder is free of the ladder rack, set the butt end on the ground. Face the butt while standing at the center of the ladder. With your inside hand grasp the closest beam and rotate it up so the bed section is toward you. It is then carried the same as a side mounted ladder.

OPTION TWO: High Shoulder Beam Carry

Same as above, but use the high shoulder carry.

Beam Carry

One Member – (ENGINE) 26' or Less Ground Extension Ladder

OPTION ONE: Low Shoulder Beam Carry

Remove the locking devices which secure the ladder. (Fig. 5.13) Identify the center of the ladder. Remove the ladder from the apparatus and place the butt of the ladder on the ground while supporting the tip of the ladder.

Place the inside arm through the rungs near the center, and grasp the upper beam of the ladder in front of the rung so the rung will rest against the arm to keep it from twisting.

OPTION TWO: High Shoulder Beam Carry

Unlock the ladder. Step to the center of the ladder so that the lower beam is resting on the shoulder. The inside hand takes hold of the lower beam to secure the ladder to the shoulder. The outside hand grasps the upper beam for the best stabilization and balance. (Fig. 5.14)

Unlock the two ladder locks ensuring that the halyard and cable do not get hung up on the lock handles

Placing the butt on the ground then removing the tip before placing the ladder on the shoulder can make this easier on the member

Beam Carry

Two Members – From the Ground 35' or Less Ground Extension Ladder

(Steps outlined are for carrying a ladder to the objective.)

The member in charge will be at the butt.

The members approach the ladder and position themselves between the 2nd and 3rd rungs from the tip and the butt of the ladder. (Figure 2.16)

They lift the inside beam from the ground and step in toward the ladder rolling the ladder away from themselves so that the bed section is toward them.

The members then face the butt, kneel down with their inside knee up. Lift the ladder up onto their inside leg. Place the inside arm between the 2nd and 3rd rung from the ends. (Figure 2.17)

While still in the kneeling position, the members will grasp the nearest rung on the fly side with the inside hand. They place the outside hand on the most comfortable rung on the bed side.

The members stand up, lifting the ladder to the shoulder with inside hand. (Figure 2.18)

The members take proper position at the beamed ladder.

Members assume the "PREPARE TO LIFT" position

The members then beam carry the ladder to the objective

Beam Carry

Two Members – (ENGINE) 26' or Less Ground Extension Ladder

The member in charge will be at the butt.

Unlock the ladders. Facing the butt, with their outside hand on the upper beam and the inside hand between the 2nd and 3rd rungs from the ends, the members remove the ladder from the side of the apparatus.

When the ladder is clear, they place their inside hand through the rungs and carry the ladder to the objective.

Two members removing the ladder from the apparatus

Two members advance the ladder to the objective using a beam carry

Cradle Carry

Two Members, (LADDER TRUCK) 35' or Less Ground Extension Ladder

One member is positioned on each side of the ladder.

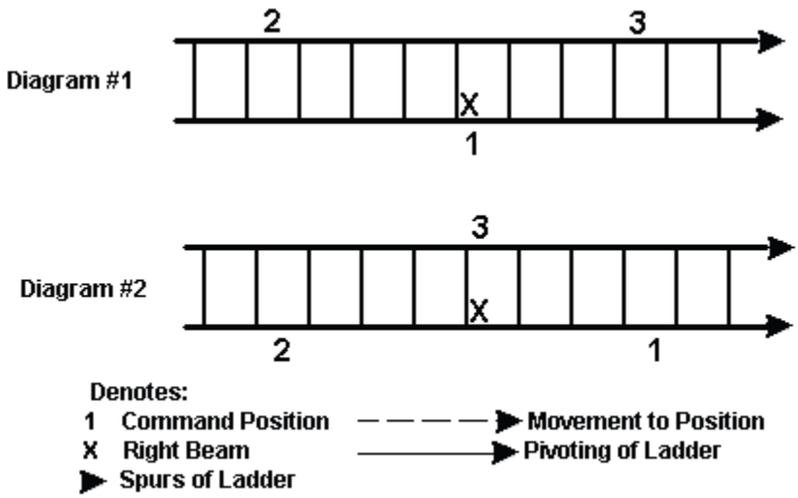
They release the ladder locks and begin to pull the ladder out of the rack. When they have removed the ladder approximately halfway, they face the ladder and spread their arms a comfortable distance on the beams, continuing to pull the ladder out until it is free of the ladder rack. The ladder is then carried to the objective.

Two members directly opposite each other "PREPARE TO LIFT" for a cradle carry

Flat Carry (LADDER TRUCK)

Three Members – 35' or Less Ground Extension Ladder

The member in charge will be in the center on the right beam (see Diagram # 1 below) or at the right butt position (see Diagram # 2 below).



When removing the ladder from the apparatus, two of the members grasp the ladder and begin to pull it from the ladder rack. The member on the side of the ladder with two members will continue out with the butt of the ladder.

When the ladder is sufficiently removed from the rack, the single member will grasp the beam in the center of the ladder, while the other two members, on the opposite side of the ladder, will grasp the beam between the 2nd and 3rd rungs from the ends.

Once the ladder has been removed from the rack it will be raised with the command "TO THE SHOULDER" and carried to the objective.

Flat Carry

Three Members – From the Ground 35' Ground Extension Ladder or Less

Certain scenarios arise where the ladder is found already removed from the apparatus, and on the ground. An array of equipment, including ground ladders, may be found in the staging area.

Note the placement of members in the two options between Figures 5.21 & 5.23 . The team gets into position and kneels facing the tip with their inside knee down. On the command, “Lift”, the members stand up and pivot in toward the ladder and end up facing the butt end with the ladder on their shoulder. The ladder can then be carried to the objective.

The member in charge is on the right beam. This is the “PREPARE TO LIFT” position

“LIFT” All members stand and lift to the left shoulder as they turn 180 degrees to face the other direction which will be the butt end.

The member in charge is at the right butt. This is the “PREPARE TO LIFT” position

Flat Carry (LADDER TRUCK)

Four or Five Members – (LADDER TRUCK) 40' or Longer, Ground Extension Ladder

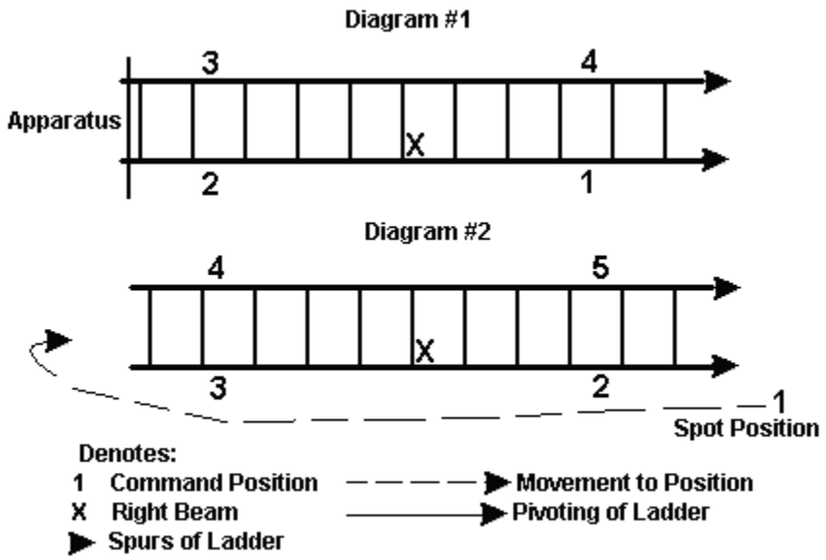
Two members are positioned on each side of the ladder rack at the rear of the apparatus.

One member on each side pulls the ladder out of the rack until they have positioned themselves between the second and third rungs. The two members continue pulling until the ladder is almost free of the ladder rack (use caution so that the ladder is not pulled completely out of the rack and falls to the ground).

The two remaining members, positioned on each side of the beams, grasp the ladder between the second and third rungs from the tip just before it is free of the ladder rack (see Diagram #1.)

When the ladder is free of the ladder rack and the member at the right butt position gives the command "To the shoulder," the ladder is lifted to the shoulder and carried to the objective.

When five members are available, the ladder is carried with four, allowing the member in charge to stand out and spot the ladder, then step in to receive the poles (see Diagram #2.)



Ladder Control

LADDER CONTROL & POSITIONING

Spotting and Positioning Ladders

WAC - NFPA 1932/ SFD L&I Variance

When positioning a ladder for raising, approach the building at a 90 degree angle whenever possible. If a beam raise is used, pivot the ladder so that the bed is away from the building before extending the fly. For safety purposes, approach parallel to the building only if space does not allow a perpendicular access. On a beam raise parallel to the building, raise the ladder with the fly toward the objective when possible. Ladders are normally positioned into the left side of the window or opening when ready for climbing so that the ladder can be exited on the member's right. The ultimate factor governing the final position of the ladder will be dependent on fire conditions, anticipated future conditions and wind. **Generally, SFD ladders will be utilized in the fly "IN" configuration.**

Tip Positions for Different Uses

- **ACCESS** If the window or opening is too small to accommodate the width of the ladder and allow people to climb on or off, place the ladder tip below the opening as one would for rescue. Use extreme caution in this type of placement because the tip of the ladder may not be mechanically held from falling such as being inside of a window opening. It this situation exists there is the possibility of a ladder slipping to one side or the other on the face of the building.

- **RESCUE** Place the tip of the ladder immediately below the lower edge or sill of the opening and remove people over the sill and down the ladder.

NOTE: It is important, during a rescue, that the fly is extended to the proper distance and the dogs are locked before the ladder is placed into the building or within the victims reach. Victims can/will jump or grab at the ladder tip before it is set against the objective.

- **WORKED FROM** The best place is along side the window or opening on the windward side if possible. Examples of this would be the need for elevated exterior ventilation efforts from a ground ladder.

- **FIRE STREAMS** Fire streams that are to be operated from a ground ladder should have the ladder tip placed just above the top of the opening (header). This will allow the hose line to be placed away from the window opening while still giving the hose team members the best vantage point for defensive operations into the desired area.

NOTE: It is not advisable to place ladders in this position or subject them to visible flames or elevated temperatures for any amount of time should these conditions be present at the window or opening of the desired hose stream placement.

Other Ladder Spotting Considerations

- When spotting a ladder, avoid setting it in front of windows and doorways which may become involved in fire. Ladders should be placed at the corners of the structure if conditions permit.

- Determining the correct amount of extension prior to lowering the ladder into the building will result in correct tip placement. Bear in mind the relationship between the length of halyard pulled, and the number of sections the ladder has. When extending the fly of a two section ladder, each click of the dogs results in 14 inches of extension. When extending the fly of a three section ladder, each click of the dogs results in 28 inches of extension.

- When extending a ladder to a roof, when possible, place at least 5 rungs of the ladder above the parapet or gutter line. This allows for an easier and safer transition from the ladder to the roof and back again. It will also provide a landmark for members on the roof. They will be able to easily locate the ladder in case a rapid evacuation of the roof is necessary.

- When a window or opening is tall and wide enough for the ladder tip to be placed inside the opening, ensure that 2 to 3 rungs are placed above the sill line. This ensures that hands can be used to grip the

ladder once the member is above the sill level and while transitioning into the building.

Heeling Ground Extension Ladders

The purpose of heeling a ladder is to keep the butt under control and prevent it from shifting or moving. This is accomplished by applying body weight to the ladder through placement of feet on the bottom rung or spurs.

Heeling the Ladder – Flat Raise

- One member at the butt: The member at the butt of the ladder steps up onto the bottom rung, grasps the halyard bundle with either hand and allows their weight to hang back. The other hand is rested on the beam to maintain balance. (Figure 5.28)

- With most ladders, the halyard is grasped between the 2nd and 3rd rungs; however, on some ladders it may be necessary to grasp the halyard between the 1st and 2nd rungs.

- The member footing will step off the rung just prior to the ladder coming to the vertical position.

- Just before the ladder has come to the vertical, step down, grasp the outside of each beam of the bed section with both hands at shoulder level keeping the back leg locked.

Member at the butt, preparing to heel the ladder after the "PREPARE TO RAISE" command

Member at the butt healing the same ladder during a flat rais

Heeling the Ladder – Lowering to the Ground

One member at the butt: As the ladder leaves the vertical position, the member will step on the bottom rung with both feet, at the same time grasp all the ropes of the halyard in either hand and allow the body weight to hang back. Use the other hand to maintain balance. (Figure 5.29)

Member at the butt, on the fly side in the "PREPARE TO LOWER" position

Heeling the Ladder – Beam Raise and Lower

Raising

With the ladder on its beam, the member heeling the ladder stands facing the tip at the butt on the bed side, and checks the direction in which the ladder will be raised for obstructions and personnel, then states, "Overhead Clear." The member will place the appropriate foot on the spur of the beam that is on the ground. (Example: when raising on the right beam, the right foot is used for footing. When raising on the left beam, the left foot is used). The other foot drops back a step. In this position, the outside shoulder is slightly ahead; as the ladder is raised, the outside hand reaches out to grasp the bed side beam and the other hand is placed on the fly side beam.

Members sit in a "PREPARE TO RAISE" position during a beam raise

After "RAISE" the member on the beams walks the ladder up with a hand-over-hand motion

Lowering

While the ladder is in the vertical position, the member in charge will designate the beam on which the ladder will be lowered. The member on the bed side will place the appropriate foot on the inside portion of the spur of the designated beam (example: right spur right foot, left spur left foot). The other foot will be placed one foot out away from the ladder, both feet will be approximately shoulder width apart. The hands will be placed on the opposite beam designated. The hand that is placed on the bed section beam will be at approximately at shoulder height; the hand on the beam of the fly section will be placed below the other. The member footing the ladder will check the direction in which the ladder will be lowered for obstructions and personnel, and state "Overhead clear, clear behind, ladder coming down." (Fig. 5.32, next page)

NOTE: To prevent injury, at no time should the groin, rear leg, or knee be In line with the spur of the ladder.

"PREPARE TO LOWER" during a beam lower

Footing the Ladder – Vertical Position

A ladder will be **footed** any time it is shifted, pivoted, or brought to the vertical as well as any other time it is unsteady while in the vertical position. The main purpose being that it prevents the ladder from rocking left and right. If ever the ladder is starting to tip left or right, early footing will prevent the member's loss of control. (Fig. 5.33 & 5.34)

One member on the bed side "footing" the ladder

Two members on the bed side "footing" the ladder in unison

Bed Side Responsibilities

One member: As a ladder comes to vertical and is pivoted or shifted, the member will grasp the bed section beams, step up on the first rung with their left foot, and heel the ladder with their weight until it is steady. Once the ladder is stable, the member steps down with the right foot following the beam so that the right toe of the boot ends up against the spur. The left foot then steps down and back, ending up approximately two to three feet from the butt of the ladder.

Two member: With two members footing the ladder on the bed side, both members step up on the rung with their inside foot applying their full weight to stabilize the ladder. When steady, they both step down with the outside foot to the spur, and then the inside foot back approximately two feet.

Fly Side Responsibilities

After the ladder has come to the vertical, the member on the fly side will step back from the spurs with both hands grasping the outside of each bed section beam. The member then steps back, into a comfortable staggered foot position, allowing for good balance and stability. The feet should be placed approximately one to two feet back from each other, and about shoulder width apart. Once the member has obtained the desired foot position, the member should then allow the ladder to lean in slightly toward the objective, to assist in the extension of the ladder.

Heeling the Ladder – Lowering Into the Objective

One Member Facing the Objective – Bed Side:

When the command "INTO THE BUILDING" is given, the member on the bed side will place their left foot on the center of the bottom rung keeping the other foot off the ground and back for counterbalance. Grasp the 4th rung from the spur and using the weight of their body to prevent the base of the ladder from sliding out, lower the ladder to the objective. The member on the fly side will assist this movement with their hands on the beams.

Two Members Facing the Objective – Bed Side:

When the command "INTO THE BUILDING" is given, the members on the bed side will place their inside foot on the bottom rung of the ladder keeping the other foot on the ground. Using the inside hand

to grasp the 4th rung from the spur, and the outside hand on the appropriate beam, they use the weight of their bodies to prevent the base of the ladder from sliding out as they lower the ladder to the objective. The member on the fly side will assist this movement with their hands on the beams.

One member on the bed side going "INTO THE BUILDING"

Two members on the bed side going "INTO THE BUILDING"

One Member With Back to the Objective – Fly Side:

When the command "INTO THE BUILDING" is given, the member on the fly side of the ladder will have both hands grasping the outside of each beam of the bed section. The member then steps back, into a comfortable staggered foot position, allowing for good balance and stability. The feet should be placed approximately one to two feet back from each other, and about shoulder width apart. Once the member has achieved the desired foot position, the member should then bring the ladder into the objective. This is to be accomplished in unison with the member(s) on the bed side of the ladder.

Heeling the Ladder – Out From the Objective

One Member Facing the Objective – Bed Side:

When the command "OUT FROM THE BUILDING" is given, the member on the bed side places their left foot on the center of the bottom rung, keeping the other foot on the ground. Grasp the 4th rung from the spur and using the weight of their body to prevent the base of the ladder from sliding, slowly pulls the ladder out from the objective. After the ladder has come to the vertical position, the

member will place the right foot on the right spur when stepping down from the rung. The member on the fly side will assist this movement with their hands on the beams.

Two Members Facing the Objective – Bed Side:

When the command "OUT FROM THE BUILDING" is given, the members on the bed side place their inside foot on the bottom rung of the ladder keeping the other foot on the ground and grasp the 4th rung from the spur using the weight of their bodies to prevent the base of the ladder from sliding. Slowly pull the ladder out from the objective and to a vertical position. The member on the fly side will assist this movement with their hands on the beams. After the ladder has come to the vertical position, the members will place their outside foot on the spur while stepping down from the rung.

One Member With Back to the Objective – Fly Side:

When the command "OUT FROM THE BUILDING" is given, the member on the fly side of the ladder will have both hands grasping the outside of each beam of the bed section. The member then steps back, into a comfortable staggered foot position, allowing for good balance and stability. The feet should be placed approximately one to two feet back from each other, and about shoulder width apart. Once the member has obtained the desired foot position, slowly push the ladder out away from the objective to a position just short of vertical. This is to be accomplished in unison with the member(s) on the bed side of the ladder.

PIVOTING LADDERS

Less than 40’ in length

Pivoting is defined as the turning of the ladder in the appropriate direction on a designated spur while it is in the vertical position.

The member giving the commands will first designate the beam on which the pivot will be made. Then, as part of the same command, will designate the direction of the pivot (in or out).

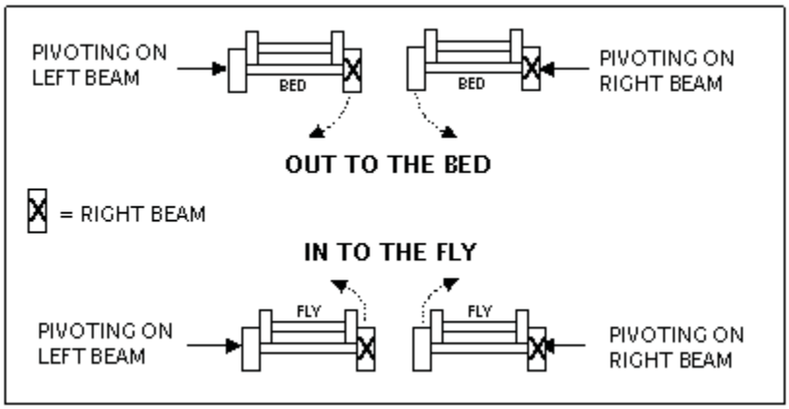
- Example: "**ON THE RIGHT BEAM, PIVOT IN**."

To help avoid confusion for members on the fly side, member(s) **on the bed side** will slap the beam that is designated for the pivot.

The term "IN" means the ladder will be pivoted on the designated beam toward the fly side of the ladder.
The term "OUT" means the ladder will be pivoted on the designated beam toward the bed side of the ladder.

- Example: Command - "**ON THE LEFT BEAM, PIVOT OUT**" The ladder is tipped slightly onto the left beam then rotated one quarter turn toward the bed side.

(Every pivot command assumes a 1/4 turn unless directed otherwise in the command. Example: "On the right beam, pivot 1/8 turn out.")



The members on the bed section of the ladder will foot the ladder after each pivot.

Example: Command - "**ON THE LEFT BEAM, PIVOT IN**" The ladder is tipped slightly onto the left beam then rotated one quarter turn toward the fly side.

One member in the ready position for a pivot command

One member beginning "ON THE LEFT BEAM PIVOT IN"

Members on the bed side

When the order is given to pivot, place hands on both bed side beams and push the ladder onto the designated beam and pivot the ladder in or out to the appropriate place. Set the ladder and foot it.

Member on the fly side

When the order is given to pivot, place your hands on both fly side beams, push the ladder onto the designated beam and pivot the ladder in or out to the appropriate place. Help steady the ladder. The member(s) on the bed side will foot the ladder.

PIVOTING LADDERS

40’ or Greater in Length

When the ladder is stabilized in the raised position, both members on the poles stand facing each other approximately 10 feet apart on the bed side.

Right pole position: With the right pole crossing the front of the body the member has the right hand extended up the pole as far as possible and their left hand near their left hip on the spike.

Left pole position: With the left pole crossing the front of the body the member has the left hand as far up the pole as possible and the right hand near their right hip on the spike.

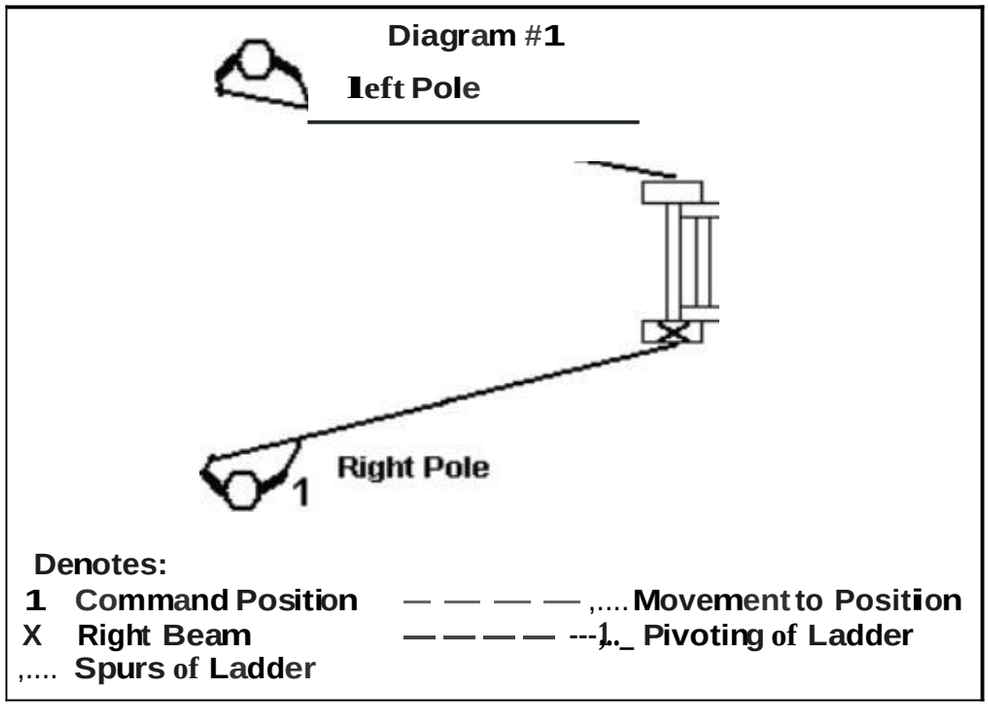
Rules for the Pole Positions:

1. **Always** watch the tip of the ladder, glancing down when needed
2. Never walk backwards.
3. Only one member on the poles moves at a time.
4. Ensure the stability of the ladder prior to moving the poles to a new position.

- To move correctly on command, the member pays attention to their hand position.

Example: Rightpoleposition: Facing the other pole member, your left hand is on the spike and your arms are spread out. Your **left hand is IN** closest to your body, and your **right hand is OUT** away from your body. (see Diagram #1)

Left pole position Facing the other pole member, your right hand is on the spike and your arms are spread out Your **right hand is IN** closest to your body, and your **left hand is OUT** away from your body (see Diagram #1 below)

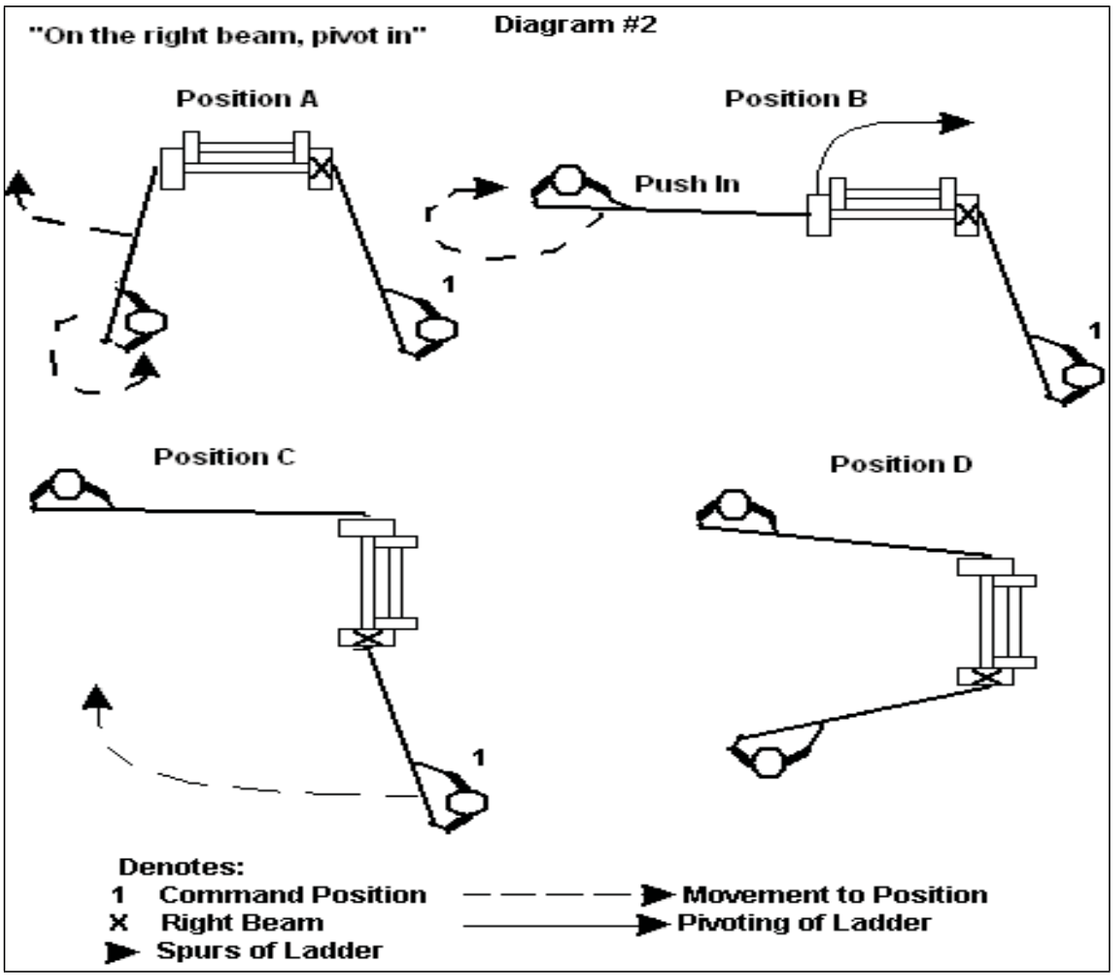


Pivots of a bangor ladder begin and end in this position

Commands: "**ON THE RIGHT BEAM, PIVOT** (IN OR OUT)"
"**ON THE LEFT BEAM, PIVOT** (IN OR OUT)"

The member on the right pole will move on the command, "On the right beam, pivot out" because their right hand is out, and will also move for the command "On the left beam, pivot in" because their left hand is in.

The member on the left pole will move on the command "On the left beam, pivot out" because their left hand is out and "On the right beam, pivot in" because their right hand is in (see Diagram #2 below).



When the pivot command is given, the member on the designated pole will move to the other side of the pole around the end so that it can be moved without walking backward. The member will then walk forward until the pole is 2 feet past being in line with both beams. The member will again move to the other side of the pole while still holding onto it so that both pole members are again facing each other.

The next step is to lean the ladder onto the designated beam for the pivot. To accomplish this correctly do the following:

- If the command is IN, push IN on the ladder with the pole so the beam closest to you comes off the ground slightly and the ladder is able to be pivoted on the designated beam.

- If the command is OUT, pull OUT from the ladder with the pole so the beam furthest away from you comes off the ground slightly and the ladder is able to be pivoted on the designated beam.

    - Example: "**ON THE LEFT BEAM, PIVOT OUT**"

The member in charge gives the command "ON THE LEFT BEAM, PIVOT OUT"

The member on the left pole moves to a position just past parallel with the left beam, then slightly pulls the ladder on to its left beam

The members at the butt pivot the ladder out on the left beam, then foot the ladder. The member in charge moves into original position

When the command is given to pivot the ladder, the member on the bed side, on the respective beam, will first designate the beam that the ladder will be pivoted on by slapping it twice.

When the ladder is pivoted to the desired position it is set and footed, each and every time.

The member on the pole that has not moved will then move back to the appropriate position when the ladder is steady. Any further movement by the pole position that moved first may now be executed to ensure proper distance and placement between the two pole members.

Strong and clear team communication is critical. Members on the poles shall talk to one another using simple commands such as "Push" or "Pull." As an example, if the ladder was leaning toward the member on the left pole after a pivot, the member on the right pole would loudly state "Push." The left pole member would then push in on the ladder with the pole until the ladder was vertical.

NOTE: Any member of the team may request that a pole member “Pushes” or “Pulls” if the safety of the team or stability of the ladder is in question.

All members should develop the habit of watching the tip of the ladder, glancing at other positions when needed.

SHIFTING LADDERS

One Member

26’ or Less Ground Extension Ladder

This operation is performed so that a ladder can be moved parallel to a building or object while in the vertical position, and can be accomplished by a command or on an individual basis.

If the member is given the command to shift, they will be first given a preparatory command of "prepare to shift" and then the direction in which the ladder is to be shifted.

- Example: Command - "**PREPARE TO SHIFT-RIGHT**"

The member will be on the bed side of the ladder when the command is given and move to the opposite beam called for. Example: "Prepare to

shift right," the member will move to the left beam. The member will at the same time reach down and grasp the 2nd rung of the bed section with the right hand and reach around to the fly of the ladder with the left hand and grasp the right beam. When shifting to the left reverse the procedure. If you are shifting right, your right hand will be lifting the ladder on the bed section. If you are shifting left, your left hand will be lifting the ladder on the bed section.

The next action is to state "OVERHEAD CLEAR"; the path that the ladder will take is checked to assure that there are no overhead obstructions.

The next command will be "**LIFT**", the member will lift the ladder off the ground using the leg muscles (not the back) and allow the ladder to balance on the shoulder and slightly across the front of the body.

The next command is "**SHIFT**"; the ladder will be moved in the direction ordered. Move forward in the direction of travel and monitor the position of the ladder being carried. Also watch for overhead obstructions.

The next command is "**HALT - LOWER**", the member will take one additional step forward then bring the feet together and come to a stop, set the ladder to the ground, and then foot the ladder.

Ready position, waiting for commands

“PREPARE TO SHIFT LEFT” position

“LIFT” position, awaiting the “SHIFT” command

“PREPARE TO SHIFT RIGHT” position

Two Members

35’ or Less Ground Extension Ladder

- Example: Command - "**PREPARE TO SHIFT-RIGHT**"

The member on the bed side of the ladder will slap the right beam when the command is given. The member on the fly side faces the right beam, reaches through the fly sections between the 2nd and 3rd rungs with the right hand and grasps the 2nd rung of the bed section near the right beam. Their left hand grasps the fly section(s) of the right beam about shoulder height. The member on the bed side faces the right beam and grasps the 2nd rung of the bed section near the left beam with their left hand. The right hand grasps the right beam of the bed section. Both members should be squatting so the lifting will be done with the legs.

The next action is to state "OVERHEAD CLEAR"; the path that the ladder will take is checked to assure that there are no overhead obstructions.

The next command will be "**LIFT**”, the members will lift the ladder off the ground in unison using the leg muscles (not the back) and balance the ladder tilting the tip slightly back.

The next command is "**SHIFT**"; the ladder will be moved in the direction ordered. Move forward in the direction of travel and monitor the position of the ladder being carried. The bed side member watches the ground and the fly side member watches the tip for obstructions

The next command is "**HALT - LOWER**", the members will take one additional step forward then bring the feet together and come to a stop, set the ladder to the ground, and then foot the ladder.

“LIFT” position

EXTENDING / LOWERING THE FLY

One Member Fly Extension

Place the inside of the right foot to the back of the right spur of the ladder. (Fig. 5.51) Be sure the toe is not in a position where the fly section could drop. Position the knee of the same leg on the bed side of the right beam. The opposite foot should be a comfortable distance in back to help keep the balance of the ladder. Reach up using a hand-over-hand motion to extend the halyard. (Fig. 5.49 & Fig. 5.50)

NOTE: While extending the fly section keep the ladder balanced by using your right shin to "push" against the right beam. That will assist in keeping the ladder away from you. If the ladder begins to lean away from you too far, pull back on the halyard until you regain control. Again, the shin and halyard should be used to control the "too close and too far away".

When the command "HIGH" is given the fly is locked at the next highest rung. Ensure that the dogs are locked. Do not put hands or feet in position where they can be injured by the movement of the fly section(s).

NOTE: At no time shall any member reach through a rung space or touch a rung with the hands or feet until all dogs are locked.

Member using the right shin to "push" the ladder away

Member using the halyard to "pull" the ladder back

Using the inside of the right foot around the right spur

Two Member Fly Extension

One member is on the fly side and one on the bed. The member on the bed side will place their right toe against the right spur of the ladder, extends the flies to the desired height. The opposite foot should be a comfortable distance in back to help keep the balance of the ladder. Reach up using a hand-over-hand motion to extend the halyard. While extending the fly section keep the ladder balanced by pulling straight down and inline with the center of the ladder as much as possible.

The member on the fly side will place both hands on the beams of the bed section and maintain the balance of the ladder with the ladder slightly tilted toward the objective.

When the command "**HIGH**" is given the fly(s) is/are locked at the next highest rung. Ensure that the dogs are locked. Do not put hands or feet in position where they can be injured by the movement of the fly section(s).

NOTE: At no time shall any member reach through a rung space or touch a rung with the hands or feet until all dogs are locked.

Two member “EXTEND THE FLY”

Three Member Fly Extension

There are two members on the bed side, and one on the fly side.

- Command "**EXTEND THE FLY**"

The two members on the bed side both reach for the halyard with their **inside** hand. The taller member (or member on the right beam, if the members are the same height) calls "**HIGH**" and takes the higher hand position on the halyard, during extension, until the fly is extended to the proper height. The second member will take hold of the halyard with their inside hand just below the other member’s hand during extension. Both members on the bed side will have their outside toe in front and against their respective bed side spurs.

- Care must be taken to maintain the proper hand placement for both members and to establish a smooth rhythm while extending the fly. When the ladder is extended to the desired height the command "**HIGH**" is given. This is the signal to lock the dogs on the next highest rung.

The member on the fly side will place both hands on the beams of the bed section, at shoulder height and maintain the balance of the ladder with the ladder titled slightly in to the objective. The feet are placed shoulder width apart, one foot ahead of the other. The foot closest to the ladder will be about one to one and a half feet away from the butt of the ladder, hands at shoulder level. The fly-side member should be using body weight to manipulate the ladder in or out. This is accomplished by locking the back leg, getting a good stance, and locking the arms. (Fig. 5.53)

Three member "EXTEND THE FLY"

- Command "**LOWER THE FLY**"
    - When lowering the flies on any ladder only the member on the right beam manipulates the halyard. If the member on the right beam is having difficulty getting the fly(s) in motion, the other member may assist in that process then turn the halyard over to the member at the right beam.

NOTE: It is important to lower the flies of the ladder using a hand-over-hand method. Do not let the halyard slide through your hands.

SECURING THE HALYARD

2 Section Ladder

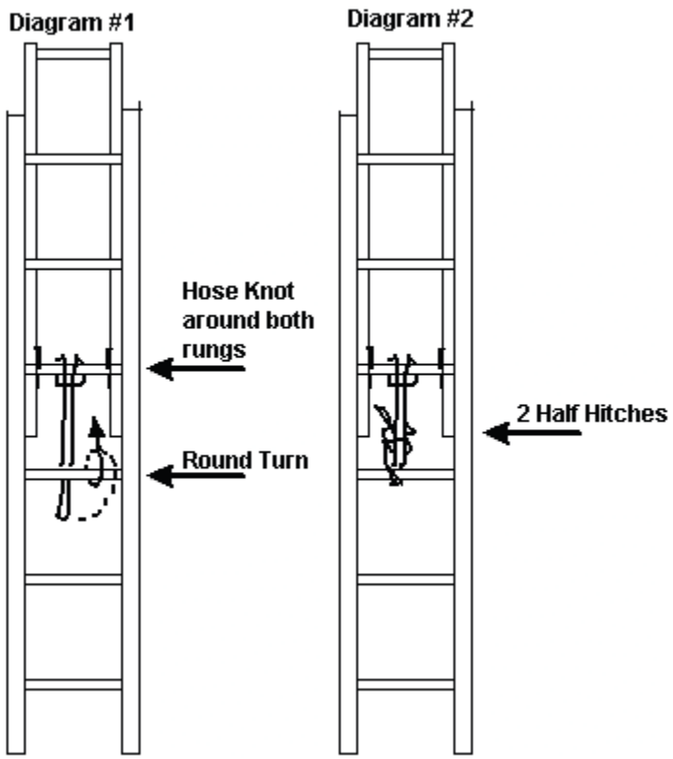
After the fly is extended, the dogs are locked, and the ladder is into the building, the fly section must be secured. Tying the halyard is the primary method to accomplish this requirement. When sufficient halyard is available, the excess is pushed from the bed side of the ladder between rungs 3 and 4, then pulled back toward the member between 3 and 2. (This is best remembered as "Push 4/3, Pull 3/2"). A round turn is made around rung 3 and two half-hitches are placed above the rung around the halyard.

3 Section Ladder

This process is the same as above with one difference. When sufficient halyard is available, the excess is pulled from the fly side of the ladder between rungs 2 and 3. A round turn is made around rung 3 and two half-hitches are placed above the rung around the halyard.

Insufficient Halyard Length

If an insufficient length of halyard is available due to minimum extension of the ladder, the fly must be secured by using a utility strap (See Diagram #1 and #2 below). A hose knot is formed around the lowest set of double rungs, then a round turn is made on the rung below by passing the tail end behind and under the rung. Tie two half hitches on the vertical part of the utility strap. Another option would be to extend the halyard using a hose knot with the utility strap on the halyard between rungs 2 and 3 then tying a round turn and two half hitches on the third rung.



The member securing the fly shall have the left foot on the bottom rung of the ladder to keep the butt from sliding out when pulling on the halyard. Any excess halyard that is left after tying will be pushed through to the fly side of the ladder.

Member with left leg on bottom rung in the center

(3 section ladder) Reaching between rungs 2 and 3, grab the halyard slack on the fly side

(2 section ladder) Push halyard from bed side through rungs 3 and 4, then back through 2 and 3. This is known as "push 4-3 and pull 3-2"

Pull the recently grabbed slack toward you between rungs 2 and 3

Tie a round-turn around rung three

Tie a half-hitch around the halyard above rung 3

Tie a second half-hitch directly above the first with the final bight of halyar pushed to the fly side

ADJUSTING THE BUTT OF A LADDER

This operation is performed while the ladder is in the vertical position and against the objective with the halyard secured. Use good lifting technique to avoid injuring the back.

One Member on the bed side (Fig. 5.61)

Reach down with either hand and grasp the 1st or 2nd rung from the spur, and with the other hand grasp the 4th or 5th rung, and lift the butt of the ladder up off the ground and while looking up adjust the ladder as needed.

Two Members on the bed side (Fig. 5.62)

The member on the right beam will reach down with the left hand and grasp the 1st or 2nd rung from the spur, and with the right hand grasp the 4th or 5th rung. The member on the left beam will reach down with the right hand and grasp the 1st or 2nd rung from the spur, and with the left hand grasp the 4th or 5th rung. Together both members will lift the butt of the ladder up off the ground and adjust the ladder as needed.

One member "ADJUST THE BUTT" for climbing or lowering

Two member "ADJUST THE BUTT" for climbing or lowering

CLIMBING

Proper climbing methods should always be employed in ascending and descending ladders. The following safety items are to be checked before climbing:

1. Ladder spurs are secure and will not slip.

2. Wedge the ladder on uneven ground.

3. The ladder is resting firmly on the objective.

4. Ladder locks are secured on all flies and the bed section.

5. The tip is properly secured with a ladder anchor or the ladder is footed at the butt. Members facing the objective will look up when heeling a ladder.

6. The fly has been properly secured with the halyard or body loop.

7. Verify proper climbing angle (approximately 70 degrees).

8. If the ladder is equipped with tormentor poles, ensure that they are properly set. The poles should be parallel to the building whenever possible.

9. When climbing a ground extension ladder place your hands on the rungs **or slide them up the beams**. On an aerial ladder, use the trussed hand rail. When on a straight ladder fire escape, always climb with your hands on the beams, not on the rungs.

Ladder climbing should be done smoothly and rhythmically in order to minimize bouncing and swaying. In ascending or descending a ladder, climb near the center of the rungs on the arch of the foot.

While climbing, the back should be near perpendicular with the ground and the climber's arms almost fully extended. The hands should be grasping the rungs palms down and one hand should be grasping a rung at all times while climbing (or sliding up/down a beam). It is also acceptable to use the beams to climb. The hands should run behind the beams for increased safety to the climber.

Securing the Ladder

Ladder tips (or fly section rungs) will sometimes need to be secured with a ladder anchor. For example in extended operations, operating fire streams or working from a ladder while locked in, all require the tip to be secured. In some situations it may be necessary to have a member stabilize (foot the ladder) and control the butt of the ladder.

Using a Ladder Anchor

The ladder anchor should be brought to the tip or fly section being secured by the safest means possible. Two common methods taught are holding it in a hand while sliding that hand along a beam or simply placing it in a pocket while climbing.

When you reach the window sill, balcony, railing, or parapet edge, secure the hook over the object (attempt to sink the hook into drywall to hook the actual sill or structural member of a parapet wall). Make a loop starting with going **over the 1st rung below the sill/edge**, then take the rope behind and under the 2nd rung and make a round-turn. Next, tie two half hitches to the rope that extends from the 1st to 2nd rung (Fig. 5.63 & 5.64)

Maintain three points of contact with the ladder using your feet and at least one hand or one arm when working on the ladder.

The hook is placed over the parapet or sill and a loop is made with the rope, start over the top of the 1st rung below the sill/top of wall or roof line

The rope is then brought behind the second rung below the sill/wall/roof line

Bring the end up to form a round turn on rung 2

Tie two half-hitches above rung 2 onto the rope between the two rungs

Leg-Locking In

Members performing work while on a ladder should be locked-in so that both hands are free for use. (Fig. 5.67)

The procedure for locking-in is to climb one rung above the height at which you desire to work. Using the leg opposite the side on which you wish to work, circle the leg over and back under the rung above the one on which you are standing. Step down one rung, locking in with the leg.

It is necessary to adjust this operation as all members are not the same height. Some lock their toe under the next rung down, while others lock it on the beam. Shorter members may find it comfortable not to step down after locking-in. The overall goal is to establish a secure position.

NOTE: Members shall not lock in (leg-lock) on any ladder that is not secured at the tip or any type of aerial ladder device.

Member shown locked-in to work off of the right (left leg-lock)

UNEVEN TERRAIN

Wedging is a technique used to stabilize the butt of a ladder when the terrain at the spurs is uneven.

All ladder companies carry wooden wedges. A member can use these wedges one at a time or two wedges opposing each other. Other materials that are available at the scene may also be used to even up the base of the ladder, such as tarps.

If a spur is not touching the ground after the ladder is placed into the climbing position, it is steadied by placing the wedge or tarp between the spur and the ground making positive contact with both. (Fig. 5.69 & 5.70)

LADDER RAISES

The Seattle Fire Department uses three different ladder raises:

- Cradle raise.
- Beam raise.
- Flat raise.

General Rules

- Raise the ladder perpendicular to the building if possible.
- On flat raises, ladders are placed so that when raised to a vertical position, the fly side of the ladder is toward the building.
- Members should watch the tip of the ladder when raising, lowering, extending or retracting the fly, and when pivoting or shifting a ladder.

There are many reasons for watching the tip of a ladder:

- First and foremost, above the tip is where the action is. Jumpers, falling debris and fire conditions are in this area
- To determine if the ladder is tipping, leaning or beginning to fall
- To watch for falling material from the objective
- To consistently watch for overhead obstructions

Beam Raise

One Member

26’ or Less Ground Extension or Straight Ladder

To raise the ladder: From the beam carry position, (one member low or high shoulder beam carry) bring the ladder to the desired location and check the overhead area for obstructions.

The member places the bottom spur of the ladder to the ground

Low Shoulder Carry

Grasp the top beam with the outside hand while removing the inside hand from between the rungs to grasp the lower beam. To help support the weight and keep the balance of the ladder during the movement of the hands, lift the inside knee up to support the lower beam. If necessary, raise

the ladder up on its lower beam, and when almost to vertical pivot the ladder 1/4 turn so that the fly is closest to the building. When the ladder has come to a vertical position it shall be footed.

This technique to raise a ladder is to be completed in a quick and smooth manner to keep the butt of the ladder from sliding out.

High Shoulder Carry

Raise the ladder up on its lower beam, when it's almost to the vertical, pivot the ladder 1/4 turn so that the fly is closest to the building. Again, when the ladder has come to a vertical position, foot it.

- Extend the fly to the desired height and verify that the dogs are locked.
- Lower into the building by placing the left foot on the bottom rung while holding onto the fourth rung up from the butt with both hands.
- Secure the halyard.
- Adjust the butt if necessary.

To lower the ladder

- Release the halyard.
- Place left foot on the bottom rung, and with the hands on the fourth rung, pull the ladder tip out from the building.
- Lower the fly.
- Once the fly is lowered and the ladder locks are set, prepare to lower the ladder to the ground. If needed, shift the butt of the ladder to the building and prepare to lower.
- Turn your head and look in the direction to which the ladder will be lowered to ensure that there are no obstacles in your path, including the overhead. State in a loud clear voice "**OVERHEAD CLEAR, CLEAR BEHIND, LADDER COMING DOWN**." This will alert personnel in the area that a ladder is about to be lowered.
- With hands on the beams, using a sliding hand on the beams, or hand-over-hand technique on the rungs, lower the ladder to the ground.

Beam Raise

Two Members

35' or Less Ground Extension or Straight Ladder

This method is most commonly used for raising the ladder when it is beam carried to the objective. Beam carries can be accomplished on either shoulder as long as both members are on the bed side. Typically, if taken from an apparatus, beam carries will be on the right shoulder.

From the beam carry position, bring the ladder to the desired location. The member in charge (the member at the butt) will check the overhead area for obstructions and state "OVERHEAD CLEAR." It is the responsibility of all personnel to survey the area where a ladder is to be raised.

- Command - "**GROUND THE BUTT**" (Fig. 5.71)

The member on the butt will lower the butt of the ladder so that the spur of the lower beam will be grounded at the desired point.

- Command "**PREPARE TO RAISE**"
- Response: Check overhead for wires & obstructions then "**OVERHEAD CLEAR**" (Fig. 5.72)

Members have just "GROUND THE BUTT" for a beam raise

Members have now moved to the "PREPARE TO RAISE" position

The member at the tip (# 2) will then remove the ladder from the shoulder and prepare to raise the ladder on its beam.

If a beam raise parallel to the objective is necessary and the butt has been grounded with the bed toward the objective, the member at the tip can quickly roll the ladder over their head. This will properly place the fly toward the objective, avoiding the necessity to pivot the ladder 180 degrees when vertical.

The member at the butt (#1) will heel the ladder on the bed side for a beam raise.

- Command "**RAISE**"

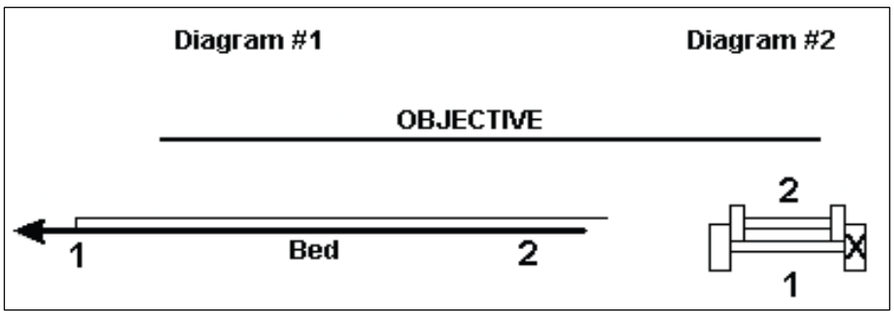
Two members performing a beam "RAISE"

The bed-side member completes the raise by footing the ladder while the fly side member temporarily pulls slightly to counteract the bed side weight

The member at the tip (#2) will raise the ladder by moving toward the butt with a hand-over-hand motion on the beam. (Fig. 5.73)

When the ladder reaches the vertical position, member (#1) will foot the ladder from the bed side. The member on the fly side (#2) maintains the balance of the ladder in a vertical position by placing both hands on beams. (Fig. 5.74)

Right shoulder carry with objective on fly side of ladder.



- Command "**EXTEND THE FLY**"

The member on the bed side will place their right toe against the right beam of the ladder. With a hand-over-hand technique on the halyard, extend the fly to the desired height. The member on the fly side will place both hands on the beams and maintain the balance of the ladder, with the ladder slightly tilted to the objective. The feet are placed shoulder width apart one foot ahead of the other. The foot closest to the ladder will be about one to one and a half feet away from the butt of the ladder.

- Command "**HIGH**"

The fly is extended to the next rung and checked to see that the dogs are locked.

- Command "**INTO THE BUILDING**"

The members on both sides of the ladder lower the ladder into the building. The member facing the objective (bed side) will foot the ladder by placing a foot on the bottom rung while holding onto the fourth rung up from the spur with both hands. The member on the fly side will assist lowering the ladder into the building.

The member on the bed side will secure the halyard and both members will then adjust the butt if needed.

- Command "**SECURE THE TIP**."

The member that was on the fly side as it was lowered into the building will secure the tip with a ladder anchor.

To lower the ladder

- Command "**RELEASE THE TIP**"

The member that was on the fly side as it was lowered into the building will release the tip.

The member on the bed side will release the halyard.

- Command "**OUT FROM THE BUILDING**"

The members on both sides of the ladder bring the ladder out from the building. The member facing the objective (bed side) will foot the ladder by placing a foot on the bottom rung while holding onto the fourth rung up from the butt with both hands. The member on the fly side will assist bringing the tip out from the building with hands on the beams.

- Command "**LOWER THE FLY**"

The member on the bed side will lower the fly hand-over-hand.

- Command "**PREPARE TO LOWER ON THE** (RIGHT or LEFT) **BEAM**"

The member on the bed side will foot the ladder.

The member on the fly side of the ladder will step to the designated beam and grasp the beam with both hands.

The member footing the ladder on the bed side will check the direction in which the ladder will be lowered for obstructions and personnel and state "OVERHEAD CLEAR, CLEAR BEHIND, LADDER COMING DOWN."

- Command "**LOWER**"

The fly side member (# 2) will slowly walk backward while grasping the beam of the ladder with a hand-over-hand motion and lower it to the ground.

- Command "**PREPARE TO LIFT**"

The members will go to the positions needed for the carry (cradle or beam) and prepare to lift.

- Command "**LIFT**"

The ladder is lifted.

- Command "**STOW THE LADDER**"

The members will return the ladder tip first to the apparatus.

Beam Raise

Three Members

35' or Less Ground Extension Ladders

This raise is accomplished the same as a two member beam raise with the exception that after spotting the ladder to the correct location, and after it has come to the vertical position, the member in charge (#1) will step in at the right beam.

Two members performing a beam “RAISE”

From the beam carry position, bring the ladder to the desired location. The member in charge (the member standing out) will check the overhead area for obstructions and state "OVERHEAD CLEAR." It is the responsibility of all personnel to survey the area where a ladder is to be raised.

- Command - "**GROUND THE BUTT**"

The member on the butt (# 2) at this time, will lower the butt of the ladder so that the spur of the lower beam will be grounded at the desired point.

- Command "**PREPARE TO RAISE**"
- Response: Check overhead for wires & obstructions then "**OVERHEAD CLEAR**"

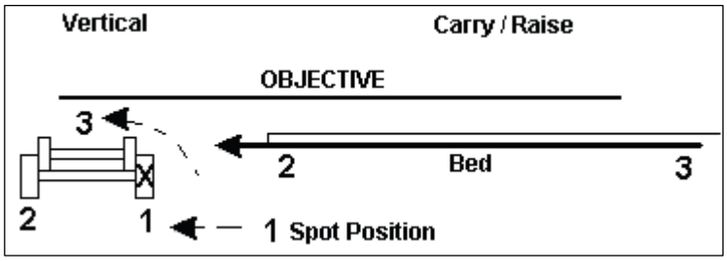
The member at the tip (#3) will then remove the ladder from their shoulder and get set to raise the ladder on its beam.

If a beam raise parallel to the objective is necessary and the butt has been grounded with the bed toward the objective, the member at the tip can quickly roll the ladder over their head. This will properly place the fly toward the objective, thereby avoiding the necessity to pivot the ladder 180 degrees when vertical.

- Command "**RAISE**"

The member at the tip (# 3) will raise the ladder by moving toward the butt with a hand-over-hand motion on the beam.

When the ladder reaches the vertical position, member #2 will foot the ladder from the bed side, member #3 will assist in stabilizing the ladder on the fly side. When it is secure, #2 moves to the left beam, bed side, and #1 steps in at the right beam, bed side. (See Diagram below on this page).



The member in charge steps back in (on the right beam) after the ladder comes to the vertical position and foots the ladder with the other member

- Command "**EXTEND THE FLY**"

The two members on the bed side both reach for the halyard with their inside hand. The taller member (or member on the right beam, if the members are the same height) calls "HIGH" and takes the higher hand position on the halyard until the fly is extended to the proper height. The second member will take hold of the halyard with their inside hand just below the other members hand. Both members on the bed side will have their outside toe in front and against the bed side spurs.

- Command "**HIGH**"

When the ladder has reached the desired height, the member in charge will call out "HIGH". Both members on the bed side will extend the fly section of the ladder up to the next rung and check to see that the dogs are locked.

- Command "**INTO THE BUILDING**"

The members on both sides of the ladder lower the ladder into the building. The members on the bed side will foot the ladder with their inside foot on the bottom rung, while holding onto the fourth rung up from the spur with the inside hand and the beam with the outside hand. The member on the fly side will assist bringing the ladder into the building with hands on the beams.

- Command "**SECURE THE HALYARD**"

The member on the right beam, bed side, will secure the halyard.

- Command "**ADJUST THE BUTT**" (if applicable).

The butt is then adjusted, if needed; by members #1 and #2 then will again be footed.

- Command "**SECURE THE TIP**"

The member on the fly side as it was lowered into the building will secure the tip with a ladder anchor.

To lower the ladder

- Command "**RELEASE THE TIP**"

The member on the fly side as it was lowered into the building will release the ladder anchor from the tip.

- Command "**RELEASE THE HALYARD**"

The member on the right beam bed side, will release the halyard.

- Command "**OUT FROM THE BUILDING**"

The members on both sides of the ladder bring the ladder out from the building. The members on the bed side will foot the ladder with their inside foot on the bottom rung while holding onto the fourth rung up from the spur with the inside hand on the rung and the outside hand on the beam. The member on the fly side will assist bringing the tip out from the building with hands on the beams.

- Command "**LOWER THE FLY**"

The member on the bed side right beam will lower the flys hand-over- hand. Both members will have their outside toe on the bed side spur.

- Command "**PREPARE TO LOWER ON THE (RIGHT or LEFT) BEAM**"

At this time, the member in charge on the right beam (#1) will step out to a position to observe the direction in which the ladder will be lowered and check for obstructions and personnel before stating "OVERHEAD CLEAR, CLEAR BEHIND, LADDER COMING DOWN."

The member on the bed side will heel the ladder.

The member on the fly side of the ladder (#3), will step to the designated beam and grasp the beam with both hands.

- Command "**LOWER**"

The member on the designated beam will slowly walk backward while grasping the beam of the ladder with a hand-over-hand motion and lower it to the ground.

- Command "**PREPARE TO LIFT**"

The members will proceed to the positions needed for the carry (flat, beam) and prepare to lift.

- Command "**LIFT**"

The ladder is lifted.

- Command "**STOW THE LADDER**"

The members will return the ladder tip first to the apparatus.

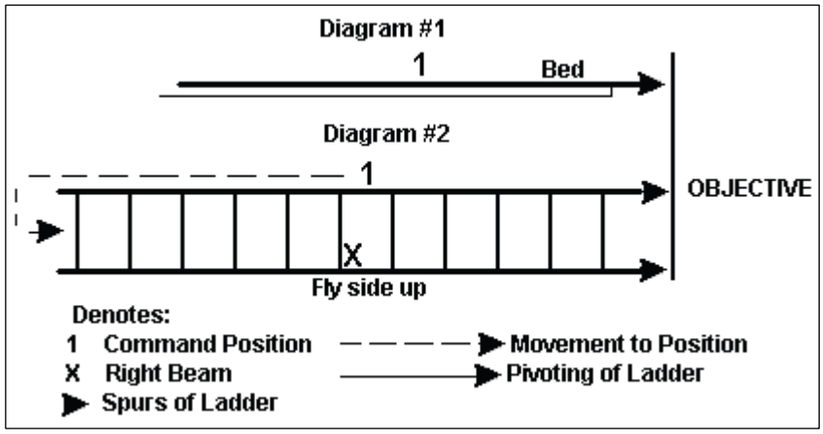
Flat Raises

One Member

26' or Less Ground Extension or Straight Ladder

Carry the ladder into the desired location. Check the overhead area for obstructions and place the butt of the ladder against the building with the fly side up. Lay the ladder on the ground (see Diagram #1 below.)

Position your body so that you are at the tip looking down the ladder toward the butt and the objective (see Diagram #2, inside Diagram 1 Box.) Crouch down, grasp the tip of the ladder and lift, keeping the back straight and lifting with the legs.



When the ladder reaches shoulder height, step under the ladder and walk the ladder hand-over-hand using the center of the rungs or slide your hands along the beams until the ladder is in the vertical position and flat against the building.

Member reaching the wall and rotates the ladder above the head walking up the rungs or sliding the hands up the beams

Member has walked ladder to the vertical, against the objective

Member adjusts the butt for climbing or to prepare for extension of the fl

- Pull the butt out from the building by grasping the first and fourth or the second and fifth rungs and adjust the butt. (Fig. 5.79)
- Placing the left foot on the bottom rung and grasping the fourth rung from the spurs pull the tip out from the building. Step down with the right foot to the right spur.
- Extend the fly to the desired height and ensure the dogs are locked.
- Lower into the building. The member will foot the ladder with the left foot on the bottom rung while holding onto the fourth rung up from the spur with both hands.
- Secure the halyard.
- Adjust the butt if applicable.

To lower the ladder

- Reverse the process.

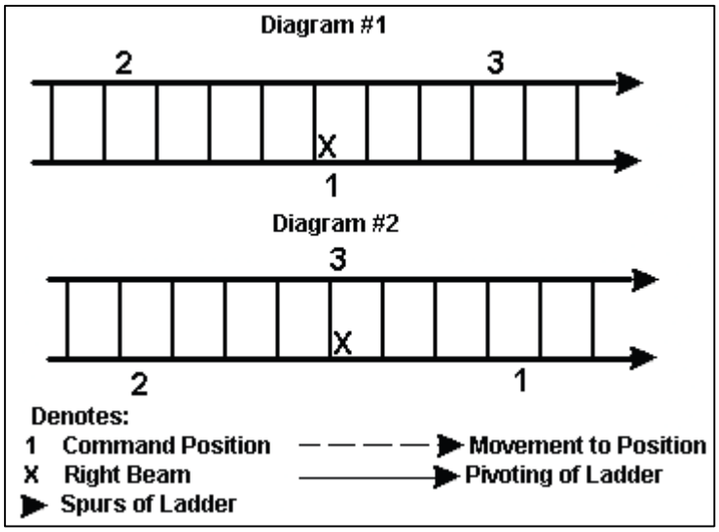
Flat Raise

Three Member

35’ or Less Ground Extension Ladder

From a flat carry, bring the ladder to the objective and properly position. The member in charge, the member on the right beam or right butt (see Diagram #1 and 2, next page) will check the overhead area for obstructions and state "OVERHEAD CLEAR." It is the responsibility of all personnel survey of the area where a ladder is to be raised.

- Command "**READY HALT**"
- Command "**LOWER THE LADDER**"



Place the ladder on the ground, fly side up.

- Command "**PREPARE TO RAISE"**
- Response: Check overhead for wires & obstructions then "**OVERHEAD CLEAR**"

"PREPARE TO RAISE" position

"RAISE" the two bed-side members will lift the tip off the ground and walk up the beams hand-over-hand

Both bed-side members foot the ladder in unison

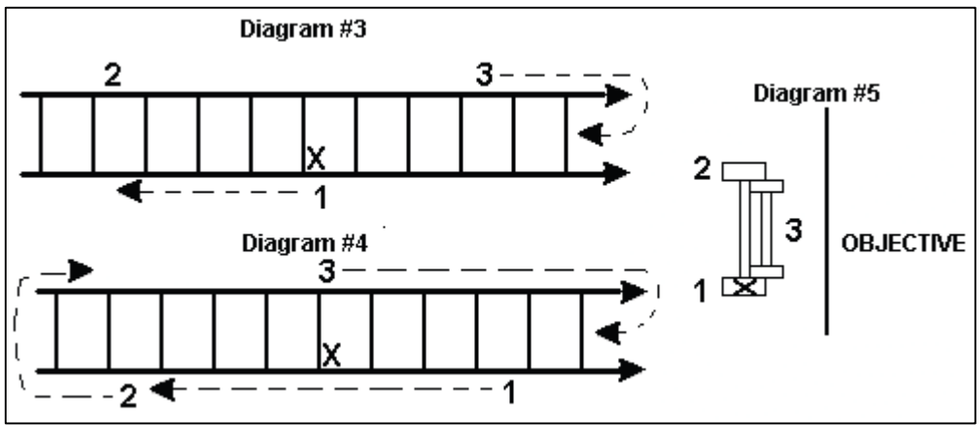
Each member slides their outside foot down the beam to the ground and step back with the inside leaving the tip of the boot in contact with the beam

One member on the right beam and two members on the left

The personnel will rotate clockwise. The member in charge (#1) will move up the right beam toward the tip and stop between rungs 2 and 3. The member on the left beam tip (#2) will move to a position opposite #1 on the left. The member on the left beam butt (#3) will rotate to the butt of the ladder and heel it. This will be accomplished by standing on the bottom rung, crouching down and grasping the halyard bundle. (Diag. 3 below)

Two members on the right beam and one member on the left

Personnel will rotate clockwise. The member in charge (#1) will move up the right beam toward the tip to approximately 1/3 of the length of the ladder from the tip. The member on the right beam tip (#2) will move around the tip of the ladder to approximately 1/3 of the length of the ladder from the tip on the left beam. The member on the left beam (#3) will rotate to the butt of the ladder and heel it. This will be accomplished by standing on the bottom rung, crouching down and gripping the halyards. (Diag. 4)



- Command "**RAISE**"

The ladder is raised to the vertical position by the two members on the beams. Using a hand-over-hand motion with both hands on the beam. When the ladder comes to a vertical position the members on the bed side will foot the ladder, then place their outside toe in front and against the bed side spurs. The member at the butt will step up onto the bottom rung, and grasp the halyard ropes in both hands. When the ladder comes to a vertical position the member on the butt will step back off the ladder and place both hands on the beams and their feet are placed shoulder width apart, one foot ahead of the other to maintain the balance of the ladder. The ladder will be slightly tilted towards the objective.

The remainder of the evolution has been covered.

Flat Raise

Four Member

40' Tormentor Ground Extension Ladder or Greater

Carry the ladder to the objective and properly position. The member in charge (the member on the right beam at the butt) will check the overhead area for obstructions and state "**OVERHEAD CLEAR**." It is the responsibility of all personnel to survey the area where a ladder is to be raised.

Members in the "PREPARE TO LIFT" position

The command "LIFT" has been given and executed

- Command "**READY HALT**"
- Command "**LOWER THE LADDER**"

Place the ladder on the ground, fly side up.

- Command "**PREPARE TO RAISE - PASS THE POLES**"

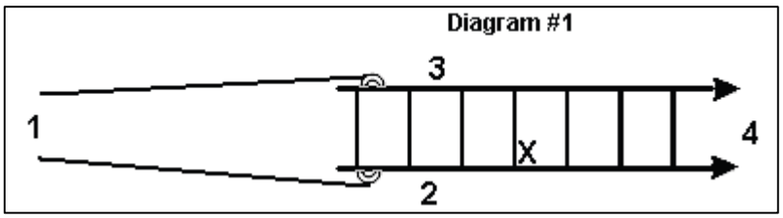
The member in charge (#1) will begin to move to a position to receive the poles. The member on the left beam at the butt (#4) will move to the butt of the ladder between the spurs and prepare to pass the poles. The two members at the tip will stay in their positions to help pass the poles (Diagram #1)

“PREPARE TO RAISE – PASS THE POLES”

Overhead clear is stated and officer receives the poles

The member in charge will again check the overhead area for obstructions and state "**OVERHEAD CLEAR**." It is the responsibility of all personnel to survey the area where the poles are to be passed.

The member in charge (#1), has moved to a position facing the tip of the ladder and prepares to receive the spikes of the poles. The member on the butt (#4) will release the poles and pass them to the members on the beams. The members on the beams (#2 and #3) will continue passing the poles to the member in charge.



The member on the poles (#1) grasps a pole in each hand with arms on the outside of the poles while standing between the poles. The poles also may be held with the spikes between the middle and ring fingers with palms up and both arms on the outside of the poles while standing between the poles.

- Command "**RAISE**"

The member in charge of the poles must take care that the swivels are rotated outward and to hold the poles outward from the body when the ladder first lifts off the ground. The poles are pulled back in once they have passed the beams. (Fig. 5.89 & 5.90)

Poles held wide for the tip to clear

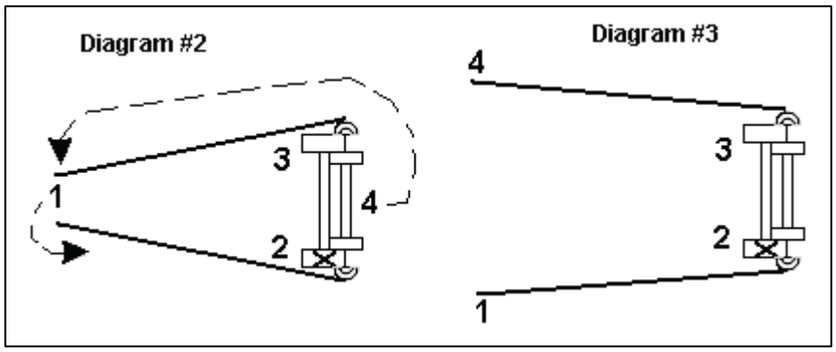
Poles brought back in tight with body after tip has cleared

The ladder is raised to the vertical position by the two members on the beams, using a hand-over-hand motion with both hands on their respective beam. When the ladder comes to a vertical position the members on the bed side will foot the ladder, then place their outside toe in front and against the bed side spurs. The member at the butt will step up onto the bottom rung, and grasp the halyard ropes in both hands as the ladder is raised. When the ladder comes to a vertical position the member on the butt will step back off the ladder and place both hands on the beams at shoulder height and their feet are placed shoulder width apart, one foot ahead of the other to maintain the balance of the ladder. The foot closest to the ladder will be about one to one and a half feet away from the butt of the ladder. The ladder will be slightly tilted to the objective. The member on the poles will assist in pushing the ladder to the vertical position. Note: The poles must be kept low to the ground during the initial stages of the raise and the member on the poles must not push too soon, wait until the ladder is over the head of the members on the beam.

When the pole member is certain that the ladder is stable in the vertical position, that member will give the command: "**FLY SIDE AROUND**." The member on the fly side of the ladder (#4), will move to receive the left tormentor pole from the member in charge and will turn, walk out laterally to the pole position, then move around to the outside of the pole so that #1 is in view (see Diagrams #2 and #3 below.) When #4 is in control of the

ladder, #1 makes the same movements on the right side. The members are then in a position on the outside of the poles facing each other. The member on the right pole will have the pole crossing the front of their body with their right hand extended to the pole at shoulder height, with the elbow slightly bent. The left hand will be holding the spike of the pole near the side of the left hip. The member on the left pole will have the pole crossing the body with their left hand extended to the pole at shoulder height, with the elbow slightly bent. The right hand will be holding the spike of the pole near the side of the right hip. Never allow the spike of the pole to point into your body.

Both members on the poles will be standing at an angle **outside the beams** by approximately four feet (see Diagram #3).



"FLY SIDE AROUND" fly member takes control of the left pole. Pole members move into proper position. Fly extension or pivoting can now begin.

- Command "**EXTEND THE FLY**"

The two members on the bed side both reach for the halyard with their inside hand. The taller member (or member on the right beam, if the members are the same height) calls "HIGH" and takes the higher hand position on the halyard until the fly is extended to the proper height. The

second member will take hold of the halyard with their inside hand just below the other member's hand. Both members outside toes are placed in front and against the bed side spur.

Care must be taken to maintain the proper hand placement for both members and to establish a smooth rhythm while extending the fly.

“EXTEND THE FLY” The taller member calls out “high” once. Extension of the fly immediately begins afterwar

- Command "**HIGH**"

The members on the bed side that are raising the flies will lock the dogs at the next highest rung. The member in charge (#1) will check that the dogs are locked and state "ALL FOUR DOGS ARE LOCKED." It is the responsibility of all personnel to be aware that all the dogs are locked.

- Command "**INTO THE BUILDING**"

The members on the bed side will heel the ladder with their inside foot on the bottom rung, while holding onto the fourth rung up from the spur with the inside hand and the beam with the outside hand. The members on the poles will lower the ladder into the objective using the poles to guide the tip to the proper placement.

- Command "**SECURE THE HALYARD**"

The member on the right beam will secure the halyard.

- Command "**ADJUST THE BUTT**" (if applicable).

The butt is then adjusted by the Members who extended the fly.

- Command "**SET THE POLES**"

The poles are moved from the butt to a position parallel to the objective and the spike is allowed to rest on the ground.

- Command "**SECURE THE TIP**"

The member at the left butt when lowering in will secure the tip with a ladder anchor.

To lower the ladder

- Command "**RELEASE THE TIP**"

The member that was at the left butt when lowering in will release the ladder anchor from the tip.

- Command "**OUT WITH THE POLES**"

The pole members move to the position for lowering the ladder.

- Command "**RELEASE THE HALYARD**"

The member on the right beam bed side will release the halyard.

- Command "**OUT FROM THE BUILDING**"

The members on the bed side at the butt will foot the ladder and assist the pole members in bringing the tip out from the building.

- Command "**LOWER THE FLY**"

The member on the right beam bed side will lower the fly hand-over-hand.

- Command "**PREPARE TO LOWER, LEFT POLE AROUND**"

The member on the left pole (#4) will give it to the right pole member (#1) and move to the fly side of the ladder and prepare to foot it. The member in charge (#1) on the poles will check the direction in which the ladder will be lowered for obstructions and state "OVERHEAD CLEAR, CLEAR BEHIND, LADDER COMING DOWN." It is the responsibility of all personnel to survey the area where the ladder will be lowered.

- Command "**LOWER**"

The member on the fly side will step up onto the bottom rung and grasp the halyard tightly with the hands.

The members on the bed side will slowly walk backward while grasping the beam with a hand-over-hand motion until they are just short of the pole swivels. They will then turn out from each other and lower the ladder to the ground.

- Command "**PASS THE POLES**"

The member in charge will again check the overhead area for obstructions and state "OVERHEAD CLEAR." It is the responsibility of all personnel to be observant of the area where the poles are to be passed.

The member in charge passes both poles to the members on the beams and moves to the right butt of the ladder. The members on the beams will swing the poles over head and pass them to the member at the butt of the ladder. The member at the butt will set the poles on the ladder and move to the left beam at the butt.

- Command "**PREPARE TO LIFT**"

The members will prepare to lift the ladder with a flat carry.

- Command "**LIFT**"

The ladder is lifted to the shoulder in unison

- Command "**STOW THE LADDER**"

The members will return the ladder tip first to the apparatus.

Cradle Raise

Two Member

35' or Less Ground Extension or Straight Ladder

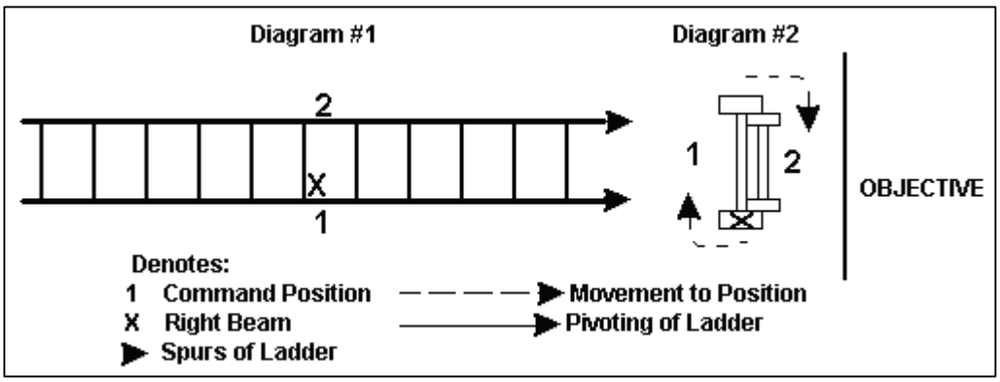
This method is used following the cradle carry when the two members are directly across from each other on the beams of the ladder (Diagram #1)

The member in charge (on the right beam) checks the overhead for obstructions and says "OVERHEAD CLEAR." It is the responsibility of all personnel to survey the area where a ladder is to be raised.

- Command "**GROUND THE BUTT**"

Both members put weight on the butt end of the ladder forcing it to the ground.

Both members continue to place weight on the butt with the lower hand while raising the ladder with the upper hand until the ladder is in the vertical position. The member on the right beam (#1) will move to the bed side of the ladder and foot the ladder. The member on the left beam (#2) will move to the fly side of the ladder to hold the ladder in a vertical position, tilted slightly into the objective.



"GROUND THE BUTT" All in one motion, members ground the butt and begin raising the ladder to the vertical

Member on left beam moves clockwise to the fly side just before vertical position is reached

The ladder is footed and ready for extension or pivoting

From this point on, the evolution has been covered in detail in the previous sections. The positions, commands and executions do not change.

Flat lower

The member on the fly side will heel the ladder.

The member on the bed side will slowly walk backward while grasping the center of the rungs with a hand-over-hand motion to the end of the ladder and lower it to the ground.

Cradle lower

Both members will move to the beams and with a hand-over-hand motion down the beams move toward the tip. At the mid-section or balance point of the ladder they will turn to face each other and assume the cradle carry

stance allowing the tip of the ladder to move down. Do not allow the tip to hit the ground.

Cradle Carry, Flat Raise

Two Member

35' or Less Ground Extension Ladder

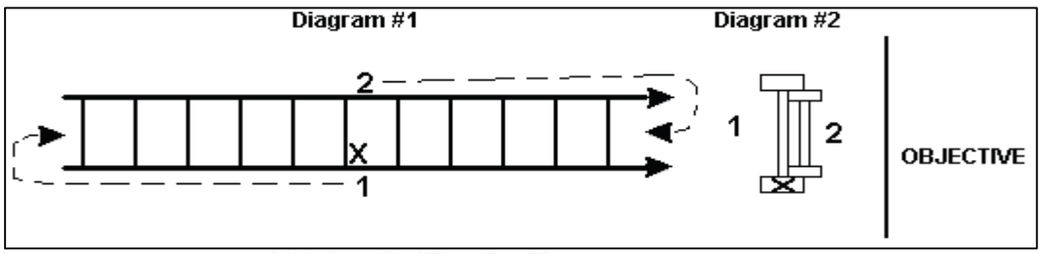
From the cradle carry position bring the ladder to the desired location. The member in charge (the member on the right beam #1) will check the overhead area for obstructions and state "OVERHEAD CLEAR." It is the responsibility of all personnel to survey the area where a ladder is to be raised.

- Command "**READY HALT**"
- Command "**LOWER THE LADDER**"

Place the ladder on the ground, fly side up.

- Command "**PREPARE TO RAISE**"
- Response: Check overhead for wires & obstructions then "**OVERHEAD CLEAR**" (Fig. 5.96)

Member #1 moves to the tip to lift the ladder, and #2 moves to the butt to foot the ladder. (Diagrams 1 and 2 below.)



- Command "**RAISE**" (Fig. 5.97)

The ladder is raised to the vertical position by #1 with a hand-over-hand motion on the center of the rungs. The member at the butt will grasp the halyards tightly, and step up on the bottom rung with both feet as the ladder is raised. The ladder is then footed by the member on the bed side.

"PREPARE TO RAISE" position

"RAISE" shown at midpoint during the raise

The rest of this evolution, including a flat, beam or cradle lower has been covered.

SUPLEMENTAL BASIC LADDER SKILLS

Roof Ladder Up a Ground Extension Ladder

No commands are needed to perform this operation.

Carry the roof ladder from the apparatus to the location at the base of the ground extension ladder.

Place the roof ladder on the ground with the beams straddling the same beam (of the ground extension ladder) that you expect to work off of. The extension ladder must be properly placed and footed for climbing and perpendicular to the objective. This will keep the butt of the roof ladder from lifting off the ground when the ladder is raised to the vertical position.

Move to the tip of the roof ladder. Pick up the tip and open the hooks of the ladder to the upward positions. Make certain that the hooks are in the lockedposition.

Roof ladder placed against the respective beam on the side the task will be performed on the roof

Open the hooks on the roof ladder so they face up (ensure locking)

Facing the tip of the roof ladder, raise the ladder to the vertical position, hand-over-hand on the rungs.

Turn the roof ladder so that the hooks are to the outside, facing away from the extension ladder. Lay the roof ladder beam on the rungs and against the chosen beam of the ground extension ladder. The hooks of the roof ladder are now facing out away from the ground ladder.

Climb the ground ladder with the chosen arm over the beam of the roof ladder to balance it. The opposite hand will grasp a rung or the respective beam of the ground ladder. Climb the ladder to a position to reach between rungs 2 and 3 **or** 3 and 4 from the tip of the roof ladder (first rung at the tip doesn't constitue a rung). Put the arm that is closest to the roof ladder through this rung space and pull the roof ladder onto the shoulder.

Raise the roofer to the ground ladder and rotate the roofer so that the hooks point away from the ground ladder.

Another option is to raise the roofer and leave it flat against the ground ladder, leaving room for the member to climb

Member puts arm through rung 2 or rung 3 on their shoulder and climbs

Member reaches a point where their waist level is just above the roof line and places the roof ladder onto the roof.

Using the foot nearest the roof ladder, push the butt of the roof ladder off the ground ladder so that it hangs to the side, clearing the ground ladder. Begin to climb the ground ladder as seen in (Fig. 5.102), using the rungs **or** beams. Keep the hand and arm that is carrying the roof ladder high when climbing to help prevent the roof ladder from sliding off the shoulder.

Climb the ladder to the position where the roof ladder is to be used.

If the ground ladder has been secured, the member can lock in below the roof gutter, sill, or parapet, which will free up both hands to lift the roof ladder into position.

If the ground ladder is not anchored the member can take a position with their body half way above the roof gutter, sill, or parapet. Reach through the rungs of the extension ladder with one hand, and with a hand-over- hand motion on the rungs of the roof ladder, lift it into the desired position on the objective.

<<NEVER LEG-LOCK ON AN UNSECURED LADDER>>

- After the roof ladder has been lifted to its mid-point, position the ladder so its hooks are facing down, and lower them to the roof. Push the ladder toward the peak until the hooks pass over the peak of the roof.

- When properly placed, the roof ladder beam will be directly in line with the outside of the extension ladder beam, and be perpendicular to the roof eaves.

- Test the hooks by pulling downward on the ladder to ensure the hooks are set properly.

Removing the Roof Ladder

- Climb the ground ladder to the position of the roof ladder.

- If the ground ladder has a ladder anchor, the member can lock in on the ground ladder below the roof gutter, sill, or parapet, which will free up both hands to lower the roof ladder.

- If the ground ladder is not anchored the member can take a position with their body half way above the roof gutter, sill, or parapet. Reach through the rungs of the extension ladder with one hand, and with a hand-over- hand motion on the rungs, lower the roof ladder.

- Rotate the roof ladder so the hooks are away from the ground ladder. Slide the ladder down on the beam to a position where the member can place the same arm between the 2nd and 3rd rung. Unlock if applicable.

- Descend the ground ladder until the spurs of the roof ladder come in contact with the ground. Lay the beam of the roof ladder on the rungs and against the same beam of the ground extension ladder. The hooks of the roof ladder are now facing out from the ground ladder.

- Climb down the ground ladder with the same arm as was used to deploy the ladder over the beam of the roof ladder to balance it. The practice of hand placement is the same as ascending the ladder. When the Member has reached the ground, pull the roof ladder out to the vertical position and rotate it so that the hooks face the extension ladder.

- Ensure the beams of the roof ladder are straddling the chosen beam of the ground extension ladder. This will keep the butt of the roof ladder from lifting off the ground when the ladder is being lowered.

- Lower the ladder to the ground, secure the hooks, and stow the ladder.

Ground Ladder (26’ or less) Up an Extension Ladder – With and Without a Body Loop

- A ladder is placed into the building and the ladder anchor is secured. The ladder must be extended far enough beyond the roof, sill or parapet to allow the member to lock in above it.

- The 26' ladder is laid on the ground at the base of the ground ladder with the left spur of the 26' ladder next to the right beam of the extended ground extension ladder. If the members use body loops to carry the 26' ladder up the ground extension ladder, they would use a hose knot, and place two body loops around the right beam of the 26' ladder at this time. One body loop would be placed between the 2nd and 3rd rung from the butt and the other between the 2nd and 3rd rung from the tip.

- The 26' ladder is raised to the vertical position and pivoted out on the left beam so that it can be laid onto the rungs next to the right beam of the extended ground ladder.

- While one member steadies the 26' ladder, the other climbs the extended ground extension ladder and passes the right arm between the 2nd and 3rd rungs from the tip (or through the body loop if used) of the 26' ladder and rests it on the shoulder.

- When the first member is in position, the second member takes their position in the same manner between the 2nd and 3rd rung from the butt.

- Lifting together, the members begin to climb with their right arms held high while climbing the ground extension ladder with their hands on the rungs.

- The member on the bottom will coordinate the climbing by saying "STEP" when each rung is to be climbed.

- The member at the tip will lock-in above the roof, parapet or sill and withdraw the arm from between the rungs or body loop while setting the tip of the 26' ladder onto the edge of objective.

Two members begin to carry a ladder up a ground extesnion ladder

The tip member locks in, then guides the ladder while the butt member keeps stepping

- The member on the bottom will then continue to climb until the 26' ladder reaches the balance point on the objective. The member that is locked in will assist by keeping the ladder balanced on its beam.

- The member on the bottom will withdraw the arm from between the rungs or body loop so that the member on top can tip the ladder into the room or onto the roof.

- The member at the top unlocks, steps over the 26' ladder onto the objective and pulls the ladder in while the other member steadies it on its beam.

At the fulcrum point, the butt member releases his shoulder and holds the ladder in place

The tip member steps onto the objective and pulls the ladder onto the deck

- The member on the bottom then climbs the ladder and steps onto the roof or into the building.
- The 26' ladder is then carried to the objective.
- This operation is reversed to bring the ladder down.

Hoisting a Ladder With a Rope

- The ladder is placed at the proper climbing angle, unextended, with the fly toward the building, directly below the spot where it is to be hoisted.
- The end of a roof rope is secured to a fixed object at the desired upper location and dropped to the ground.
- A member on the ground grasps the rope and takes a bight of the line at the spur of the ladder. The member climbs the ladder and passes the bight from the bed side to the fly side through the first full rung space above the center of the ladder. The bight passes behind the left beam, then around to the front side of the bed section. Continue with the bight past the right beam and then around and behind it pulling the slack back through the same rung space from the fly side to the bed side. Use the slack to tie a bowline on the line leading to the upper level. The knot is adjusted to the lateral center of the ladder. (Figs 5.108 – 5.111)

The rope runs down the bed side from the destination above

A bight is made and passed through to the fly side and around the left beam

The bight then passes over the bed section and around the right beam and through the rung space back to the bed section

A bowline with a bight is tied where the bight crosses the rope that leads to the destination

The member on the ladder will climb to the ground and direct the members hoisting it to take a strain (load the rope). The ladder is pivoted 180 degrees as the ladder begins to leave the ground so the fly side is out. This will keep the tip of the ladder out from the building and the butt against the building, helping to prevent the tip from getting caught on objects as it goes up. At this time a half hitch can be tied to one spur to help control the ladder from the ground if enough rope is available.

- Command "**HOIST AWAY**"

The member on the ground steadies the ladder and assists in guiding it while being hoisted, with the remaining tail line of the rope.

Pivot the ladder so that the bed side is toward the building before hoisting

The members hoisting the ladder will pull the rope in a hand-over-hand manner until the ladder and knot come up to the sill or parapet.

Grasping the tip of the ladder, the members hoisting will turn the ladder on its beam and pull the remaining portion into the objective.

To lower the ladder

The procedure is reversed.

The ladder is lowered bed side out with the knot on the outside of the ladder. This places the butt of the ladder out from the building and the tip of the ladder against the building.

Lowering a Ground Extension Ladder From an Overpass or a Parapet Wall

Drop a rope or line to measure the distance from the bottom of the pit or well to the edge, rail or wall at your elevation and add six feet to that length. Tie a marker knot in the rope at the desired length. The six feet will allow enough to extend over the wall once the ladder is in its final climbing position.

Lay the ladder down and turn it up on a beam. Utilizing the halyard, extend the flies of the ladder out to equal the length of the measured rope,

including the extra six feet (Fig. 5.113). Secure the halyard (Fig. 5.114). Make sure the dogs are locked, then using body loops, tie the rungs of the fly and bed section together in two places. If applicable, tie the first fly section to the second fly section in the same way. Use the same knot that is used for securing the fly for climbing when there is insufficient halyard (Fig. 5.115).

Lay the ladder on its beam, extend the fly to the length of rope to the knot

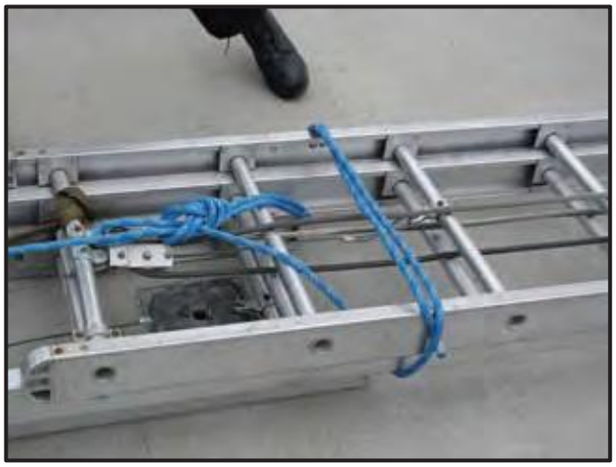
Secure the Halyard

Lay the ladder down on its fly side. Place the rope on top of the bed section.

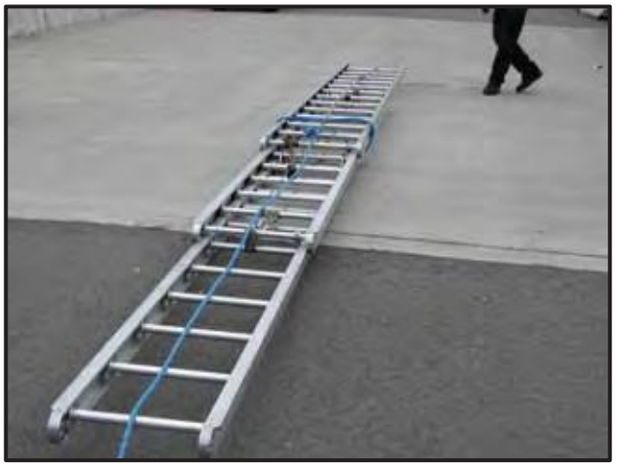
Starting with the tail end of the rope at the butt, begin tying a bowline with a bight from the bed side at the next rung space below the center point of the ladder (Fig. 5.116).

Secure all fly section

Tie the hoisting knot one rung space below the center point



Finished hoisting knot



Ensure that the rope is headed toward the tip

Place the ladder bed side down with the spurs hanging over the objective, and the rope laying straight under the ladder toward the tip (Fig. 5.119).

Four mebers carry the ladder (2 at the edge)

Three to four members will position themselves (depending on the size of the ladder) along the ladder, one on the right beam and one on the left beam at the center of the ladder. Depending on the size of the ladder, one or two members will work the rope (Fig. 5.120).

2 members at the tip with the rope

The two members at the center of the beams will begin to push the ladder over the edge of the rail or parapet. As the ladder passes the mid-point the tip will come to a vertical position. The ladder is held in the vertical position as it is lowered. The one or two members on the rope will allow the ladder to slide down while keeping tension on the rope (Fig. 5.121).

As the ladder reaches its fulcrum, assist the ladder from not slamming into the wall/building

Once the ladder has reached the bottom it is adjusted to the proper climbing angle and flipped over so that the bed is out and the fly in (Fig. 5.122)

Rotate the ladder so that the fly sections are "in" and adjust for climbing

One member will support the tip of the ladder while it is being climbed.

Lowering a Ladder Into a Pit or Well

Drop a rope or line to measure the distance from the bottom of the pit or well to the edge, rail or wall at your elevation and add six feet to that length. Tie a marker knot in the rope at the desired length. The six feet will allow enough to extend over the wall once the ladder is in its final climbing position.

Lay the ladder down and turn it up on a beam. Utilizing the halyard, extend the flies of the ladder out to equal the length of the measured rope, including the extra six feet. Make sure the dogs are locked, then using body loops, tie the rungs of the fly and bed section together in two places. If applicable tie the first fly section to the second fly section in the same way. Use the same knot that is used for securing the fly for climbing when there is insufficient halyard.

Tie the "hoisting knot" at the butt of the ladder from the bed side between the 2nd and 3rd rungs.

Place the ladder bed side down with the spurs hanging over the objective and the rope laying straight under the ladder toward the tip.

Three to four members will position themselves (depending on the size of the ladder) along the ladder. One on the right beam and one on the left beam, both at the tip of the ladder. Depending on the size of the ladder, one or two members will work the rope.

The two members on the tip of the ladder will begin to raise it to a vertical position hand-over-hand on the beams, moving toward the butt. The one or two members on the rope will allow the ladder to slide into the pit or well only after it has been raised sufficiently to slide down into the pit or well opening.

Once the ladder has reached the bottom it is adjusted to the proper climbing angle and flipped so that the bed section is out and the fly in.

One member will support the tip of the ladder while it is being climbed.

Exterior Venting of Windows With a Ground Ladder

Procure a ladder that will reach the objective from the ground, and position it to the left or right of the window to be ventilated. Extend the fly so that the tip will be as close to the top of the window as possible. Lower it into the building next to the window to be ventilated, using standard ladder techniques.

- Command "**SECURE THE HALYARD**"

With the halyard secured and the fly toward the building, shift the butt of the ladder over to the center of the window to be ventilated.

- Command "**OUT FROM THE BUILDING**"

With goggles or facepiece in place, bring the ladder out from the building to the vertical position and pivot it to the center of the window to be ventilated.

- Command "**PREPARE TO VENTILATE**"

The member on the fly side of the ladder now leaves their position and moves to a safe place away from the base of the ladder to avoid falling glass.

- Command "**VENTILATE**"

If one member is on the bed side of the ladder, they will place either foot on the bottom rung and forcefully push the ladder into the window. At impact, the member on the bed side will step back to a safe place. All members should be aware of falling glass.

If two members are on the bed side of the ladder they will place their inside foot on the bottom rung and push the ladder into the window. At impact, the members on the bed side will step back to a safe place. All members should be aware of falling glass.

When the ladder hits the window, whether the glass breaks or not, the butt of the ladder may slide out.

- Command "**OUT FROM THE BUILDING**"

Ensure that no additional glass will fall before a member is positioned under the ladder on the bed side to bring the ladder out from the building.

All members now return to the ladder and bring it out from the building to the vertical position by the standard method, then pivot and lower it into the building on the opposite side of the vented window. Now shift the butt

over four feet and the tip over two feet. Continue the procedure shifting the butt and tip in equal amounts until the next window is reached.

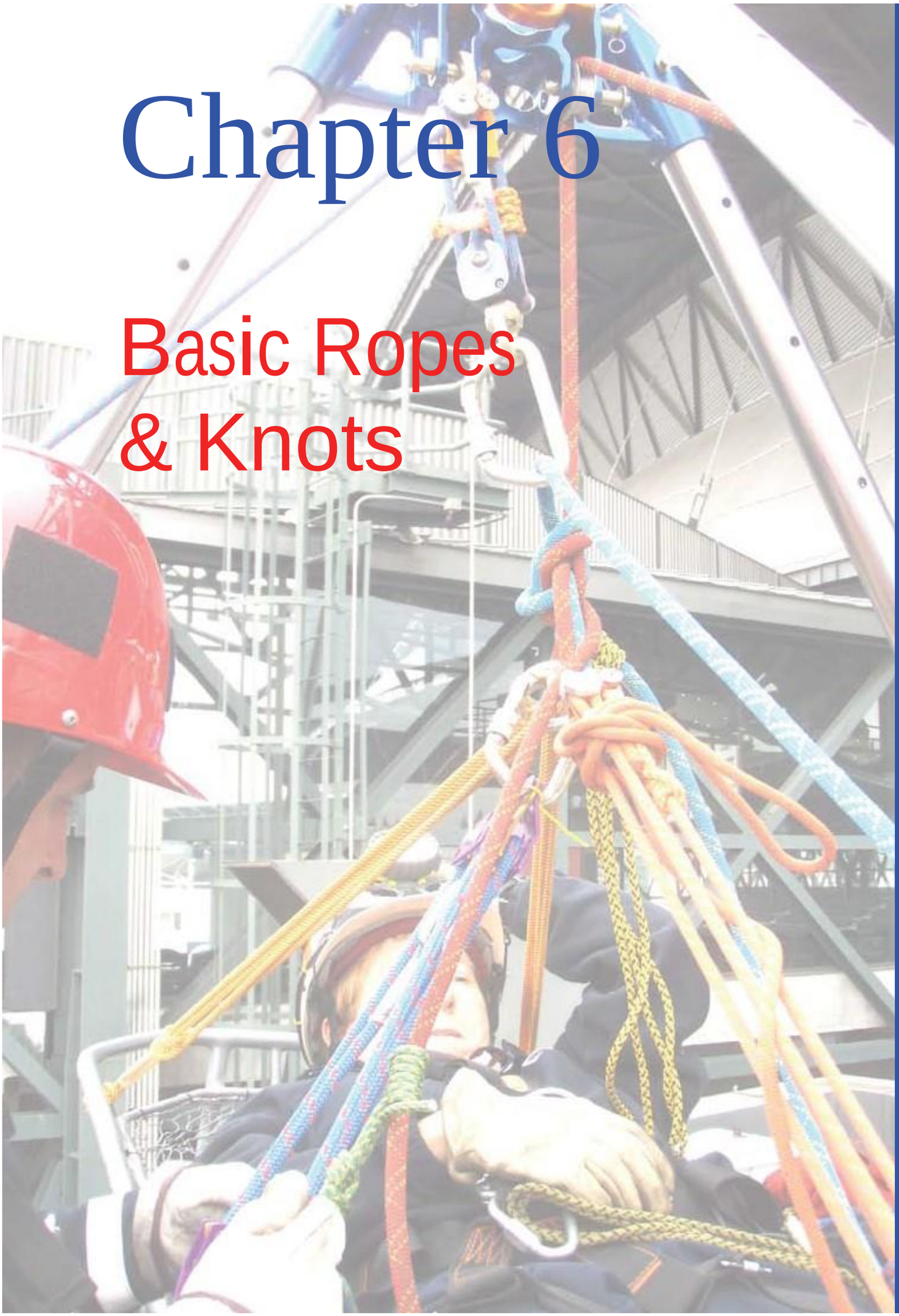
Repeat the above ventilation process until the task is completed. If the windows are a significant distance apart, lower the ladder, and carry it to the next location.

NOTE: Falling glass is an extreme hazard. Additionally, often times ventilating with the tip of the ladder is difficult using the "fly-in" method, meaning it is lowered into the window with both beam sections striking the panes simultaneously. To concentrate more of the force of the ladder in one spot consider beam lowering the ladder into the window. The guides and concentrated forces of just one beam will provide better striking power.

Newer energy efficient windows (EEW) may have multiple panes (sometimes up to 3). These windows can be very difficult to vent from an exterior position even when using the ladder in a beam configuration to break the glass (especially if they are not weakened by heat from the fire). The corners of glass are the weakest points. Aiming for the center of the window is the least effective method. Instead, aim as close to the corners as possible.

Chapter 6

Basic Ropes & Knots



ROPE

Introduction

In the Fire Service, the knowledge of how to tie and use knots is essential. While there are many knots available, the following knots described in this section should be adequate to meet the needs of Seattle firefighters in most situations

Keep in mind that it is more important to be able to tie these standard knots automatically, while under the stress of an emergency, than to know a greater number of knots and yet have failed to acquire skill in their use.

The ropes used on operation companies range in size from 1/4" woven cotton tie ropes to ½"" kernmantle nylon life safety rescue ropes. They can vary in length from just a few feet to 300 foot lengths. Ropes and knots are used daily in securing equipment, fire suppression, rescue work, and emergency medical applications.

Whether working with rope or knots in an emergency or training, SAFETY should be on the mind of all involved.

Rope Usage

The Seattle Fire Department separates the use of ropes into two categories: Utility and Life Safety.

Utility

A utility rope is a rope that is used for any function other than that of life safety. Tie ropes, practice ropes, RIG ropes, roof ropes and other ropes that are marked as such all fall under the umbrella of utility rope.

Life Safety

Life Safety rope is defined as any rope used to support the weight of members or other persons during rescue, fire fighting, other emergency operations, or during training evolutions. Operations companies use ½" static kernmantle life safety rope for all operations level rescues. In addition, some accessory cord such as 8mm guide sling for the Load Releasing Hitch and prussik loops are used in life safety applications.

Common ***Breaking*** Strengths of Rescue Rope:

- 8mm – 3,100 lbf (Accessory Cord)
- 1/2" – 9,000 lbf

Rope Characteristics

A point to remember is that the words "static" and "dynamic" are misleading. Static means non-moving. There is no such thing as a static rope system, for example, even steel is not considered to be static. Low- stretch and high-stretch more accurately describe and identify real world conditions.

Low Stretch (Static)

Operations life safety ropes have a relatively low stretch ratio, (usually between 10 and 20 percent till failure) due to a non-spiral constructed core bundle. Two to five percent elongation will occur with a working load (200 lbs.). Low stretch ropes are called "static".

High Stretch (Dynamic)

High stretch or "dynamic" ropes have a relatively high stretch ratio, (usually between 20 and 50 percent till failure) due to a spiral constructed core bundle. Operations utility ropes are "dynamic" high stretch.

ROPE SAFETY

- Avoid walking or standing on the rope
- Do not drag the rope. Added abrasion leads to less sheath life
- Do not leave a rope under tension for any extended period of time unless necessary
- Remove all knots as soon as possible
- If rope cleaning is needed, clean by rinsing with clean fresh water
- Dry wet rope (**hang dry**) before bagging
- Exposure to the sun's ultraviolet radiation will damage the rope, keep exposure to a minimum
- Nylon moving across nylon can melt through the stationary piece. Be careful when running nylon over nylon, for example moving rope over stationary webbing
- Be sure to pad sharp edges
- Avoid adding twists and kinks when bagging/coiling the ropes

TYPES OF ROPE

1/2” (Low-Stretch) Static Kernmantle Rescue Rope

All operations ladder companies carry 3 bags of life safety rope. These ropes may vary in color as well as length. Typically, most ladder companies will carry (1) 150’ and (2) 300’ life safety ropes. This is a life safety rescue rope that is rated at 9000 lbs. breaking strength, in slow pull tests. A rescue load is considered to be 600 lbs. In order to meet NFPA certifications, the rope has a 15:1 safety factor (600 lbs. x 15 = 9,000 lbs.)

Accessory Cord

Guide-Slings – One of the primary uses for 8mm Accessory Cord is the prusik loop and the 25-30 foot guide-sling. The guide sling is used primarily for tying a load releasing hitch, however, the guide sling can also be used for any accessory rigging need (anchors, fall restraints, etc.).

System Prussik Loops – The short prusik loop is 57” and the long prusik loop is 71”. They are tied (created) with a double overhand bend and are tightened down using a compound 9:1 pulley system until 2 inches of tail remains protruding from the bend. The strength of 8mm material is (3630 lbf) according to the manufacturer.

Utility Rope

Any rope that is not classified as “life safety” rope will fall under the category of “utility” Utility ropes have multiple uses such as hoisting equipment, stabilizing vehicles, medical calls, salvage, etc. They are usually made of manila, nylon or other synthetic materials.

BREAKING STRENGTHS

To achieve a functional breaking strength, the rope or other material is placed in the position of function and slow pulled to failure. A rope can stand more force in a shock load situation than in a slow pull test. The reason, according to one theory, is slow pull testing allows fibers to change alignment and move in relation to each other. In testing that involves shock loading, the shock occurs in less than .5 seconds and the fibers do not have time to realign.

Dynamic Forces

Dynamic energy may be explained as the energy generated by movement (for example, a falling object). If a rope was attached to this falling object and used to arrest its fall, then the energy of the object would be transferred to the rope. In effect, this transference would be dynamic tensioning of the rope.

Residual Strength

Residual strength is the remaining strength in a rope that has been used for a period of time. As a rope is used; high load forces, abrasion and other factors combine to reduce the strength of the rope. Factors that affect the residual strength are: arresting falls, corrosive chemicals, sunlight, abrasion, etc.

Resistance to Cutting (Life Safety)

Demonstrations have shown modern rescue ropes are capable of sustaining considerable damage, without failure. One experiment showed a 13mm low-stretch rope sawed 88% through, was able to statically hold a 600 lb. rescue load. This was repeated over a 90 degree edge and the same 12% remaining material was able to hold the same 600 lb. rescue load without failure. Failure did not occur until the utility knife was used to saw through the balance of the material. But still, care should be taken to protect ropes from sharp objects!

ROPE CARE

Life Safety Rope

Rope Markings (Life Safety)

Low stretch life-safety ropes are marked on each end with a number for inventory and the date the rope was placed in service. Each rope end is also marked with either ‘End A’ or ‘End B’. To evenly distribute wear along the length of the rope over the life of the rope, alternate ends after each use. Mark the middle as recommended by the manufacturer.

Rope History Log (Life Safety)

Washington State Law requires members to record what the rope was used for after every use. The rope's history is one of the elements that will contribute to the decision of when to retire a rope from service. In the rope log, note the date, the use, condition, which end and length used, followed by the recorder's name.

Cleaning (Life Safety)

Should life safety rope become dirty, washing with clean water and allowing to "air" dry. A mild detergent may be used if the rope is extremely dirty and water alone will not remove the dirt/debris. Questions regarding which detergent to use should be directed to on duty personnel at Rescue 1 at Station 14.

Cleaning a rope is done by brushing the dirt off with a nylon brush, while rinsing with lots of clean fresh water. Do not use water hotter than 110˚ F. The rope is dried away from direct sunlight in a hose tower or heated room. Finally inspect the rope prior to bagging and record the washing in the rope log.

Service Life (Life Safety)

A block of raw nylon will last many years on the shelf, however, in rope making the manufacturers add a lubricating compound that leads to nylon degradation. This lubricant is an aid in manufacturing, but leads to "programmed obsolesce"; the ropes become weaker over time. While no conclusive evidence has been presented concerning the optimal service life of rescue ropes, the conservative side is the safer side.

Washington State mandates that life safety ropes be removed from service as a life safety rope after 6-years of service.

Utility Rope

Utility ropes do not have either end marked. Also, they do not have a dedicated service life either. Utility ropes are cared for based on the material in which they are made from. For instance an old manila roof rope (still carried by some ladder companies) should never be put away wet and is acceptable to be daisy chained for storage whereas a nylon rope is usually bagged for storage. Additionally, utility ropes do not require a rope history log that tracks its use.

WEBBING

1” ~~Tubular~~ Webbing

Webbing is the primary material used for rigging anchors in operations. It is light, can be used for most rigging situations, and it is strong. Since tight radius bends cause larger diameter materials to lose strength, the 1mm diameter of 1” ~~tubular~~ webbing makes this material an excellent choice in rigging for rescue.

Pick-Off Straps

The pick-off strap is a general purpose utility strap made of 1-3/4” flat webbing. Though the webbing is rated at 10,000 lbs., when tested for breaking strength in a slow pull test, the buckle slips at 4500 lbs. Uses for this strap range from clipping an attendant into the litter for high/low angle evacuations (clip doubled end to the load and obtain a 2:1 mechanical advantage), to an adjustable attachment point for the edge attendant. The buckle could be tied off with a double overhand, to achieve a strength closer to that of the webbing if needed.

Anchor Straps

Anchor straps are 2” high strength nylon straps. They have link connection points at both ends to receive carabiners. When used in the “basket U” configuration as in operations, they are rated at 12,500 lbf.

TERMS

Running End – (Working End) The end of a rope that you will manipulate the most to actively tie a knot.

Bitter End – (Standing End) The end of the rope not being used in the knot you are tying. The opposite end to the “running end”.

Bight – Any rope that doubles back on itself without actually crossing over.

Loop – Created when a bight crosses itself.

Knot – An intertwined loop of rope, used to fasten two such ropes to one another or to another object. A knot, even when not in use, will hold its shape or form.

Bend or Hitch – Ways of fastening or tying ropes together. A hitch will not hold its form when not in use or “wrapped” around something.

Splice – Made by untwisting two rope ends and weaving them together.

Kernmantle – (literally “core–sheath”) rope is a balanced construction consisting of continuous filament polyester cover braided over a unidirectional nylon core. It is designed to meet the rigorous requirements associated with rescue and rappelling operations.

HARDWARE

Carabiners

Carabiners are central to rigging for rescue. Each type has advantages and is useful in different situations. It is important to know and understand the uses and differences for each. All carabiners should be loaded along the spine, that is, from end to end.

Additionally, use caution with the squarish Rescue Carabiners, like many carabiners, they tend to rotate the load on the opposite side of the spine causing incorrect loading. Incorrect loading greatly reduces the carabiner's strength by as much as 50%. One test found a 10,000 lb. steel carabiner broke at 4700 lbs. as a result of three-way loading. See illustrations below for examples of incorrect loading.

Off Axis Loading – Caution!

Three Way Loading – Caution!

Locking "D" Rescue Carabiner

This carabiner is the preferred link in our rigging systems. It is very strong: 9000 lb. breaking strength. The large gate opening allows it to fit over litter rails.

Always:

- Lock the gate for maximum strength;
- Use extreme caution to load the carabiner along the spine; never load a carabiner from side to side or across axis;
- These carabiners are prone toward off axis loading, (see Figure 6.1 above). Use caution to avoid the use of rigging material more than two fingers wide or distributed from two different directions on the same end (see illustration 6.2 above). Three way loading can reduce the strength of a carabiner by as much as 47%

KNOTS, HITCHES AND BENDS

Knots must be tied, dressed (cleaned up so there are no twists, and the knot flows correctly with the tension on the correct strand) and set (tensioned to remove any slack in the knot).

Do not fall into the trap of "the myth of knot strength." While it is of interest to be aware of how strong one knot is in relation to another; it is imperative to note that knots do not break in the field. People are not found at the bottom of a fall with a broken knot coming from their harnesses. The criteria for knot selection is:

- The ability to tie
- The ability to inspect
- The ability to adjust
- The ability to untie
- The last is the strength of the knot

Touch Check

Check your teammate's knots with the "touch" method to be sure they are dressed and set. The touch method is a tactile review of each element. If the component hasn't been touched by the reviewer, then it hasn't been checked.

Dressing the Knot, Hitch, or Bend

Dressing is the process of cleaning up the knot, bend, or hitch so that the rope flows smoothly through the many turns and bights. **Setting the knot** refers to putting a strain on each leg of the knot. One theory suggests that failure to dress and set the knot, bend, or hitch reduces its strength. However, drop tests have shown that the knot, bend, or hitch actually ends up in a contorted configuration that has little resemblance to the original. Without dressing and setting the knot, they are difficult to inspect, and there is little way to determine how the resulting configuration will react once shock loaded. At least with a dressed and set knot we have some data on their performance in a given position of function.

Relative Strengths of "Knots" for Single Kernmantle Rope

No Knot	100%
Figure 8	75-80%
Bowline	70-75%
Double Overhand Bend	65-70%
Ring Bend	60-70%
Clove Hitch	60-65%
Overhand	60-65%
Two Half Hitches (tested over 16mm diameter ring)	60-70%
Square Knot	43-70%

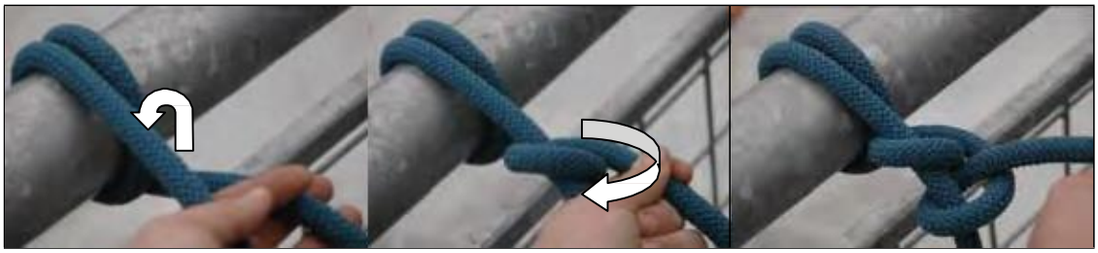
Microys, Helmut; "Climbing Ropes;" AmericanAlpineJournal 51 (1977) p. 140
2 "Rope Technical Data;" brochure by the Cordage Group, Division of Columbian Rope Company; Auburn, New York (March, 1977)

KNOTS

Aknot is a rope intertwined with itself, e.g. bowline, and figure 8. Abight is a "U" shape in the rope. A loop is the rope forming a loop and continuing on. Running end describes the end actively being tied. Standingend describes the non-moving part.

Round Turn with Two Half Hitches

A utility knot used in many applications where a quick non-slip attachment is required in non-life safety situations.



The Round Turn **One Half Hitch** **Second Half Hitch**

Bowline with a Yosemite Finish

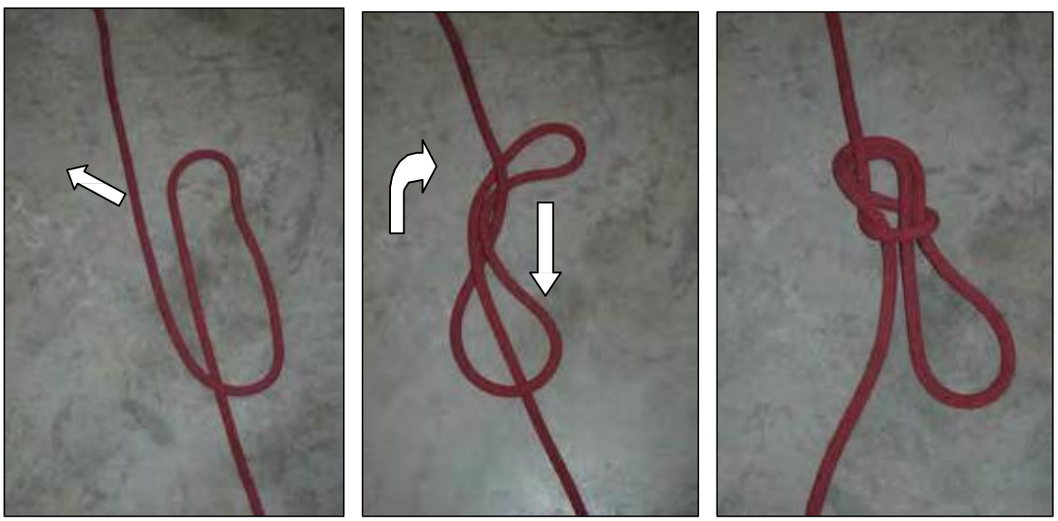
Used because of its adjustability, ease of inspection, and ability to be untied after being loaded. The bowline must be backed-up with a Yosemite Finish or a double overhand. The longtail bowline doesn't require a back up knot. The end of the bowline must be secured. The Yosemite Finish is an easy way to tie off the bowline and is less bulky than a double overhand. Essentially, the tail is rewoven thought the knot until it surfaces in parallel with the standing end.

Figure-Eight Follow Through

Double Figure Eight is used as an end knot to form a loop to connect the rope to an anchor or harness. Generally, the Double Figure 8 is an easy knot to tie, inspect, and untie. This is one of two tie-in knots recommended for tie-in to a single person belay line. It may also be used to tie off the running end of a rappel rope so the person is not able to slide off the end of the rope.

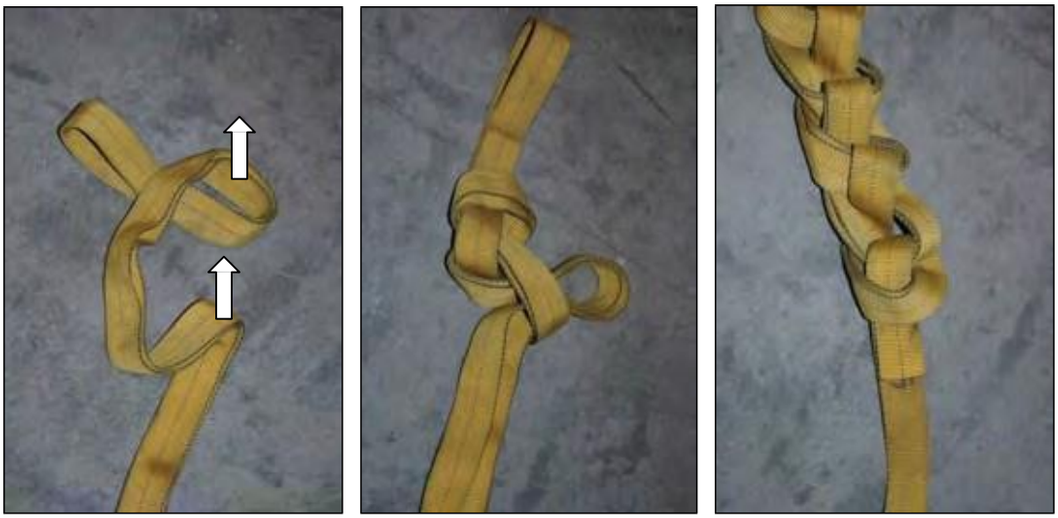
In-Line Figure Eight

A mid-line attachment point that can be used for rescue systems and life safety or any place where a midline loop may be of use.



Chain Stitch with Webbing

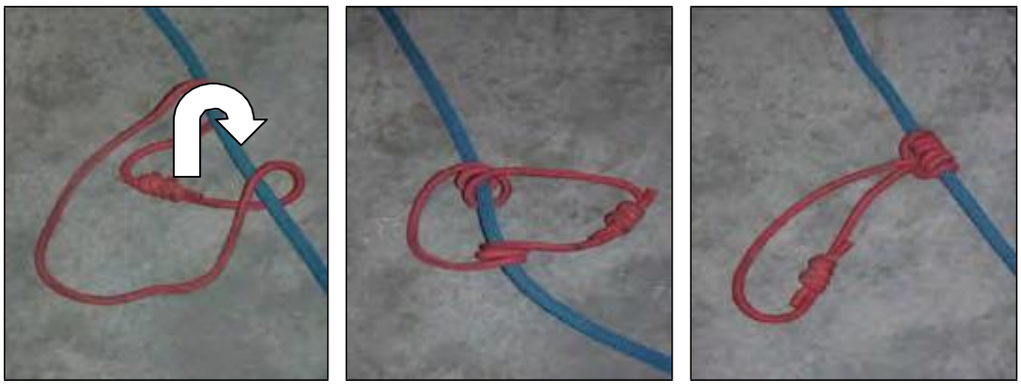
The preferred method of storing webbing. Start with an overhand slip knot and stitch back through the eye of the slip knot. Repeat with each successive loop.



A hitch incorporates something within it to maintain shape, if the center element is removed, the hitch will fall apart (e.g. Prusik and Clove Hitch are tied around another rope or object).

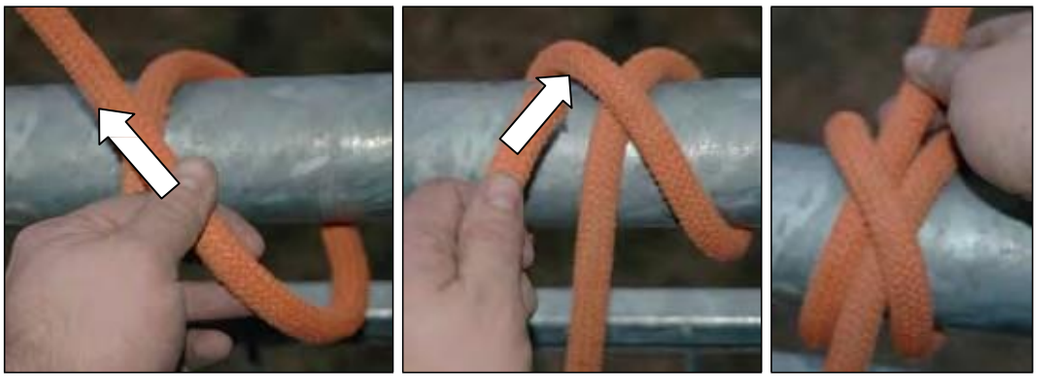
Prusik Hitch

The prussik hitch or “prussik” is formed from pre-tied 8mm accessory cord. Operations company members should only use the three-wrap prussik. The three wrap Prusik Hitch is for rescue loads up to 600 lbs.



Clove Hitch

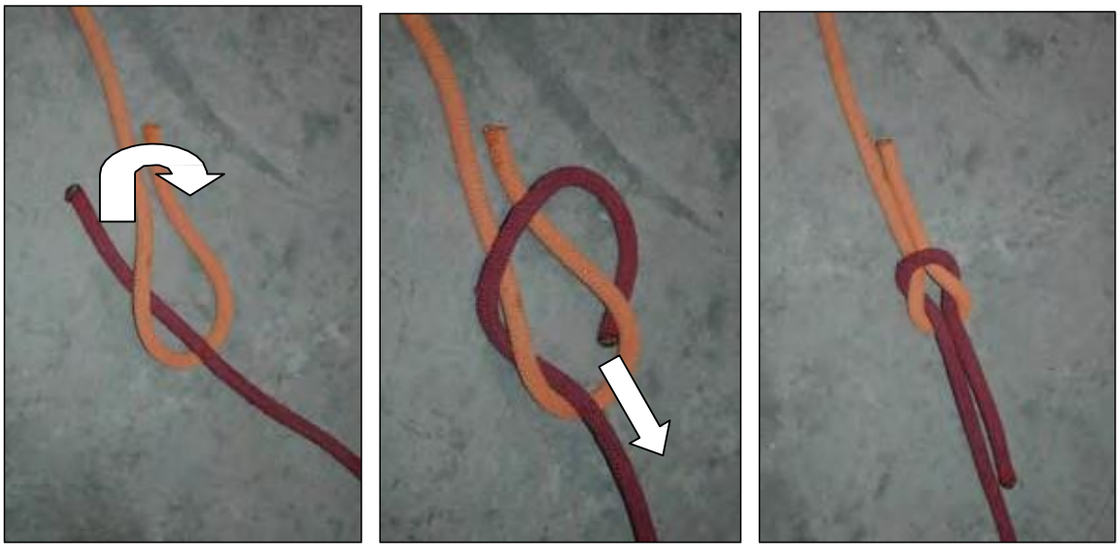
It is useful to quickly tie-off the end of a rope so it will not fall out of your reach, and still easily adjustable. Also, it is a good beginning for wrapping and frapping. However, the clove hitch has been known to slip and untie. It is not used as a tie-off, or in place of an anchor knot, like the Figure Eight.



BENDS

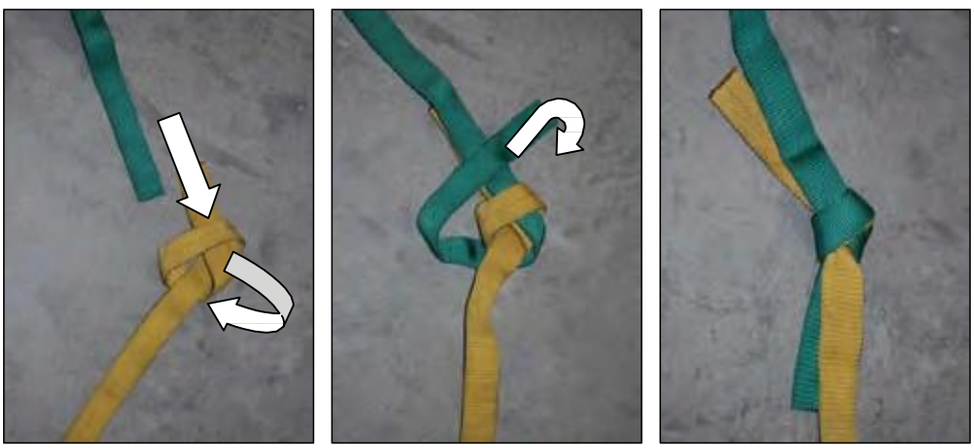
Square Bend

While historically called a knot, this bend is used to tie two strands together. Used primarily for non-life safety situations.



Overhand Follow-Through Bend

Used to tie two webbing ends together to form a “runner,” tie a multipoint anchor together, etc. Tubular webbing is slippery so leave a hand width, or two inches of tail as a minimum. Also, because of the slippery material, dressing and setting this bend is very important.



Double Overhand Bend

This bend is used to tie two ropes together. For the fire service, it is primarily for prusik loops, it can also be used to tie high/low-stretch materials together. It is preferred for use with single person loads. Because of the tight arcs within the bend, it is very difficult to untie once loaded.

However, if the Double Overhand Bend is used for rescue loads, a prusik by-pass is recommended. Otherwise, you may need to cut this bend out of the rope once it is set with a rescue load.

Double Becket Bend

Used for joining two unequal sized diameter material together. It is easy to tie, inspect, and untie after weighting with a rescue load. One may wish to backup the Double Sheet Bend with Double Overhands on the two tails.

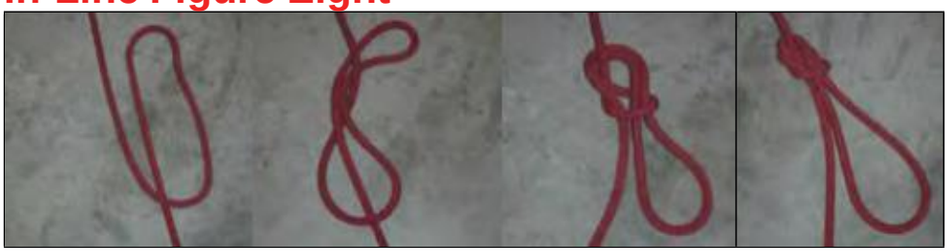
STEP BY STEP PICTURE GLOSSARY

Round Turn with Two Half Hitches

Bowline with a Yosemite Finish

Figure-Eight Follow Through

In-Line Figure Eight



Chain Stitch with Webbing

STEP BY STEP PICTURE GLOSSARY

Prussik Hitch

Clove Hitch

STEP BY STEP PICTURE GLOSSARY

Square Bend

Overhand Follow-Through Bend

Double Overhand Bend

Double Becket

Chapter 7

Salvage

SALVAGE OPERATIONS

Overview

Salvage is the protection of buildings and their contents from unnecessary damage due to water, smoke, and other elements, both during and after a fire.

Efficiently performed salvage work can allow families to continue living in their homes within a few hours after a fire has occurred, with irreplaceable personal effects and property intact. It can ensure continued operations in an affected business, preserving jobs. This in turn promotes community good will toward the fire department, and fosters civic appreciation for a job done well under adverse conditions.

Good common sense, in combination with a thorough working knowledge of the available tools, will dictate your actions. Ask yourself, “If this were my home or business, what could I do to protect it from unnecessary damage?"

Don't allow a limited amount of fire damage to disintegrate into a large amount of water damage and peripheral destruction. Salvage considerations should be present during every stage of fire fighting operations.

PERFORMANCE GOALS

Firefighters shall be able to:

- Identify the purpose of salvage, and it's value to the public and the Department.
- Demonstrate proper tarp folding, rolling, throwing, and deployment.
- Demonstrate inspecting, cleaning and maintenance of salvage equipment.
- Construct and use water chutes and catchalls.
- Demonstrate covering windows, doors, and ventilation openings.

TARPS

Sizes and Dimensions

Seattle Fire Department tarps are treated to be water and mildew resistant and extremely pliable. There are 3 tarp sizes in use.

- **Standard tarp : 12’ x 18’**
- **Hall runner : 3’ x 18’**
- **Visqueen (Plastic) section : 14’ x 20’** (Must be cut to size)

Each tarp has canvas loops that are fastened to two corners and are referred to as "**ears**." Metal grommet holes are spaced at 16" intervals along the reinforced outside edges. The "SFD" stenciled logo is located in the center of the tarp, on one side only, and generally indicates the side of the tarp that is kept clean, for use on upholstered furniture. The side of the tarp with the logo is referred to as the "clean" side.

Canvas tarp inventories are maintained in the stations by the Ladder Company Captains. Some older tarps may have a lot and section number stenciled on them. However, tarp inventory is no longer tracked by the Services Division, rendering the lot and section numbers useless.

Tarps are carried on all ladder trucks and engines, on some aid cars, and on various other special purpose apparatus. Standard tarps are accordion folded and held ready with two rubber bands per tarp. The folded dimensions are three feet long by (8-12) inches wide. Hall runners are carried on all ladder trucks, and are stored accordion folded. Hall runners, when folded, have the same dimensions as a standard tarp.

Two tarps and a hall runner lashed together are called a "**bed fire bundle**." It is common practice for ladder companies to store a bed fire bundle ready for immediate deployment.

Tarps are most often utilized as covers, for the protection of furniture, business equipment, warehouse stock, carpeting, or anything else which needs shielding from water or debris. They are also necessary for the construction of water chutes, dikes, and diverters. Occasionally, tarps are useful in first aid applications as blankets, padding, or ground covers.

Soiled tarps can be easily cleaned with water and a scrub brush. Use mild detergent if necessary. Hang tarps completely dry before folding or storing them.

If it is necessary to nail canvas tarps, nail through the grommet holes and bend the nails over. Avoid dragging them over sharp or jagged objects. Small holes or tears in canvas tarps are generally repaired by the Fire Fighters on duty in the stations.

Plastic tarps are purchased in large, pleated rolls which layout to 14 feet by 100 feet. They are cut into 14 X 20 foot sections, **rolled**, taped and stored on the ladder truck in a duffle bag near other salvage and overhaul equipment.

Plastic tarps are exceptionally water tight and are relatively inexpensive. Because they can be left at an incident site, they are especially practical for long term uses. Plastic tarps tear easily and are prone to slip off of the objects they are meant to protect.

Plastic tarps are carried on ladder trucks, in individually rolled 14 feet by 20 ft sizes, bound with a single wrap of tape. Large quantities of them are usually contained together in a duffel bag.

Although plastic tarps have some uses in common with canvas tarps, they are used almost exclusively as protection from environmental elements for roof or window covers. They are also left in place over debris piles to protect neighbors or passers-by from hazardous dust in a post fire situation.

FOLDING & ROLLING TARPS

The Accordion Fold

Figure 7.2 - Begin with two members facing each other at opposite ends of the tarp. The tarp should be held lengthwise between the members, with the clean side up. The Firefighters pull against each other slightly

Figure 7.3 - Both members grasp the tarp with their left hand one quarter distance in from the left edge and their right hand one quarter distance in from the right edge.

While pulling against each other, the members flip the outside folds up and into the center.

Figure 7.4 -The person with the tarp's "ears" to their right, kneels at the end of the tarp, facing the long way, and grasps the tarp about 8" to 12" from their knee, pulling it toward them to make an 8" to 12" fold. (Fig 7.4 & 7.5)

Forming pleats

Figure 7.5 to 7.5.3 Continue grasping and pulling the tarp, stacking and creasing the pleats until the end of the tarp is reached. The pop flake should be facing the same direction as the bottom flake.

When made up properly, the ears will always be contained in the top and bottom flakes, and will both be pointing in the same direction. The location of the ears will indicate the center of the tarp.

Rubber bands (inner tube cross sections) are then placed over the ends of the folded tarp to hold it ready on the apparatus. Always remember, when holding the accordion folded tarp for use, "Ears towards you, and towards your work."

THE DOUGHNUT ROLL

Figure 7.6 - Two members begin by un-pleating a tarp and laying it, still folded, on the floor. Next, they unfold one half of the tarp.

Figure 7.7 - The members each grasp a corner on the long side of the unfolded half of the tarp and, while pulling tension against each other, roll the tarp to the center. Both members then move around to the opposite side, unfold the other half of the tarp, and then roll again so that both sides are rolled to the center.

Figure 7.8 - The two members kneel at the ends of the tarp and pull against each other to straighten the rolls.

Figure 7.9 - The tarp is then rolled lengthwise, much the same as single rolling a length of hose.

LAYING TARPS

Figure 7.10 - One member holds the tarp across both arms with the ears towards his/her body and toward the object to be covered. The bottom flake is gripped with both hands. The forearms are elevated to hold tension on the tarp. A second member then grasps the top fold with both hands and walks backward until the tarp is stretched taut.

Place the center of the tarp (marked by the ears) alongside the centerline of the object to be covered. The tarp is then opened and the excess on the floor, if any, is tucked under.

A piece of lath or scrap wood laid parallel over the tarp indicates glass or fragile objects have been covered.

If more than one tarp is required to cover an object, overlap the edges of the tarps by one foot and roll them together in the same direction as the water will flow.

THROWING TARPS

Figure 7.11 - Two members take positions on opposite sides of the object to be covered. The member throwing the tarp holds it in the left hand with the ears towards him/her and at the center of the target object. The member then grips the bottom quarter of the flakes with the left hand and picks up the top half of he flakes with the right hand.

Figure 7.12 - Spread the tarp and cock the right arm.

Figure 7.13 - With a shot put motion, heave the flakes in the right hand up and over the object to be covered. The tarp is then spread open. If more than one tarp is required to cover an object, a second tarp is thrown alongside the edge of the first tarp and five feet away from it, leaving one foot of overlap when opened.

If more than one tarp is used, make a water tight roll in the same direction the water will flow. Excess tarp, if any, is tucked under. Use pieces of wood to indicate glass where required.

THE STAIRWELL WATER CHUTE

Begin by constructing enough doughnut rolls to accomplish the necessary distance of water at approximately **seventeen feet per roll**. This will allow for one foot overlap at the roll ends. **Beginning at the point where the water will be released**, and working back up the stairwell toward the water source, position the doughnut rolls at the seventeen foot intervals.

Figure 7.14 - **Unroll the bottom tarp first**, spreading the doughnut roll out on the stairs. Leave at least a one-foot aisle way on the inside of the stairwell.

Figure 7.15 - Unroll the next highest tarp, overlapping it one foot past the top of the lower chute. Spread it out across the stairs and roll the outside edges together, keeping the upper chute within the lower chute. Maintain the inner aisle way.

Continue up the stairwell in the same manner until the source of the water is reached and water flow is established. Additional tarps, still folded, should be used to bank the chutes around the turns to prevent overflow.

THE CATCHALL

Figure 7.16 - Two members begin by unpleating a tarp, laying it on the floor, and unfolding one half.

The members then grasp the corners on the long side of the unfolded half of the tarp and, while pulling against each other, roll the tarp into a point one foot short of the first crease (two feet in.)

Cross over to the opposite long side, unfold it, and repeat the operation.

Figure 7.17 - The members then move clockwise to the short edge and roll that side in three feet.

Figure 7.18 – Both members lock the corners by lifting the top roll with one hand, then raising the bottom roll with the other hand to form a pocket for the top roll.

Figure 7.19 - Tuck the top roll into the pocket and square the corner.

Repeat the operation on the opposite short side. The resulting catchall measures 8' x 12'. Similar catchalls can be constructed and placed with their edges overlapping so that one large floor is formed. Every 8' x 12' foot catchall will hold approximately 60 gallons of water for each inch of depth.

NOTE: Consider requesting the Marine Unit for larger water jobs. They carry specialized de-watering equipment, capable of removing large quantities of water quickly.

THE BABY LADDER CATCHALL

Figure 7.20 -To construct a baby ladder catchall, the following equipment is required: one canvas tarp, a pike pole (12 ft or longer), a baby ladder, and utility rope or several utility straps.

Figure 7.21 - Begin by setting the baby ladder on the edge and removing the top of the fly section from the guides. Dog the fly on the bottom rung again and spread the top ends to make a triangle of the ladder. Using either the utility rope or a utility strap, tie the rungs together with a clove hitch to form a closed end.

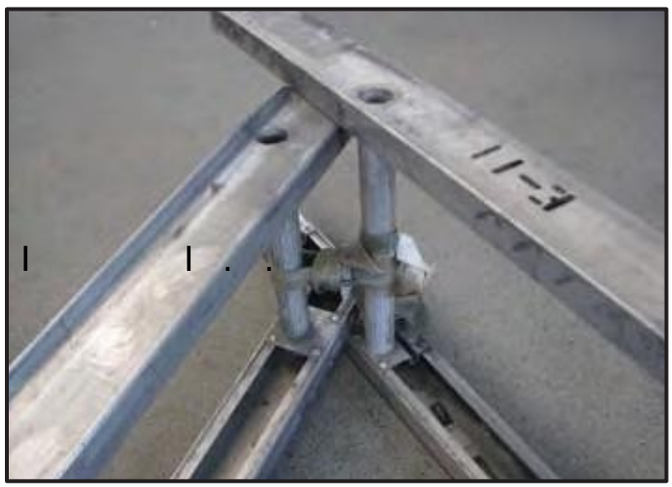


Figure 7.22 - Place a 12 feet (or longer) pike pole along the edge of the tarp at the base of the ladder triangle. Roll the pike pole into the tarp, keeping the pike end outside of the roll to prevent tearing. Roll it into the bottom of the base of the triangle.

Figure 7.23 - Lift the rolled pike pole and tie it in place across the top of the spread end of the ladder. Use a clove hitch around the pole and the beams of the ladder at the point above the top rung, to secure the tarp and pole to the ladder. The loops of the clove hitch should straddle the rungs. Tie the tarp to the ladder at the apex of the triangle. Lift the catchall and tuck the tarp edges under the ladder.

BED FIRE BUNDLE

Bed fires are a common occurrence that can generate a lot of smoke. Locating the mattress, extinguishing it, wrapping it and removing from the structure rapidly will produce the best outcome with the respect to life safety and property conservation.

This evolution is included to illustrate the procedure for removing a smoldering or freshly extinguished mattress to the outside of a building for overhaul. It must always be assumed that the mattress is still smoldering, and the introduction of enough oxygen will cause to re-ignite. Related rescue, ventilation, extinguishment, salvage, etc. should be carried out as usual for any fire.

After extinguishment, begin by rolling the mattress up to one end of the bed. Two members, then unpleat a tarp across the open end of the bed, atop the springs and perpendicular to the mattress.

The members unfold the tarp and spread it out, as much as possible, between the rolled up mattress and the end of the bed, then wet the tarp thoroughly with the pump can to protect it from being burned or scorched.

Roll the rolled mattress onto the center of the wetted tarp, spread the tarp completely, and stretch the long edges of the tarp up over the mattress. The long edges are then rolled together across the full length of the tarp.

Facing each other, the two members on the tarp then twist the loose ends tight to the mattress. Both members twist in clockwise direction so that the tarp will not unwind when the mattress is picked up.

Holding the twisted ends, the two members carry the tarp and mattress from the building, followed by a third member with a pump can. Don't use the elevator. Don't throw it out a window, or off the fire escape. Use the stairs.

Once the mattress had been safely removed from the building, unroll it from the tarp and overhaul it as quickly as possible

COVERING WINDOWS - ROOF OPENINGS

This evolution is included to illustrate the method used for covering unwanted openings in buildings or residences, utilizing plastic tarp and lath. Although this method works extremely well in most circumstances, and has the benefit of being water tight, it is not the only means available to the fire fighter. If security is a primary concern, for instance, an appropriately sized piece of wood nailed over the opening might be more practical. If the surface surrounding the hold will not take a nail, the use of duct tape on one or more sides, or covering the hole from the inside of the building, may be acceptable substitutes.

Common sense and a thorough working knowledge of the available tools and materials will guide you to an approach which fits each unique circumstance.

Begin by assembling plastic tarp, several strips of lath, two hammers, and two nail bags. When the equipment is assembled, cut a piece of plastic to the appropriate size. Cut it two feet wider then the width of the hole and two feet longer then the length of the hole. This will result in a uniform 12 inch overlap on all four sides when the plastic is centered over the hole. These measurements are approximate. When covering windows, it is more effective to roll the edges clear into the window frame. When covering a hole in a roof err on the side of too much overlap rather then too little. Next, secure enough lath to span the width of the hole plus one foot (except when nailing to the window frame.) If more then one piece of lath is used, always overlap the ends of the lath, one on top of the other by
3 or 4 inches.

Center the plastic over the hole. Then center the lath across the top edge of the piece of plastic. The lath should span the width of the hole with six inches of excess on each side.

Move to the bottom of the piece of plastic and roll the lath under the plastic, rolling to a point six inches below the hole. Pull down while rolling, keeping tension on the plastic. This will ensure a tight roll and a taut surface across the face of the hole. Nail the lath into the place while maintaining as much tautness as possible.

Secure enough lath to run the length of the hole plus one foot. Position the lath on the left side of the hole, between the previously nailed sections of lath. This will indicate the exact length needed to span the length of the hole. Then move the lath out to the edge of the plastic on the left side of the hole.

Before rolling the lath into the plastic, fold the top and bottom of the left side plastic in at a slight angle.

Roll the lath into the plastic, keeping tension on the plastic to eliminate wrinkles and to maintain tautness. Roll in to the ends of the previously nailed lath, then nail in place. Move around to the remaining side of the hole and repeat the operation used on the third side. It is especially important to maintain tautness while rolling the final side. Roll to the ends of the top and bottom lath, then nail.