



# Fresno Fire Department Hose Practices Guide





# Fresno Fire Department

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## CHAPTER 1: HOSE COMPLIMENTS

### Jump Lines

- Used primarily for a quick attack on small fires, grass fires, or engine protection.
  - Not found on all engine companies.
- Usually consist of 100 feet of pre-connected 1-1/2-inch hose.
  - Located in wells of the front bumper (**Figure 1**).

**Figure 1**



### Reel Lines

- Engine companies carry two, 200-foot-long, pre-connected reels of 1-inch hose.
  - Non-collapsible.
    - Rubber liner inside a reinforced woven layer protected by an outer rubber core.
  - Located on top of engine, above pump panel.

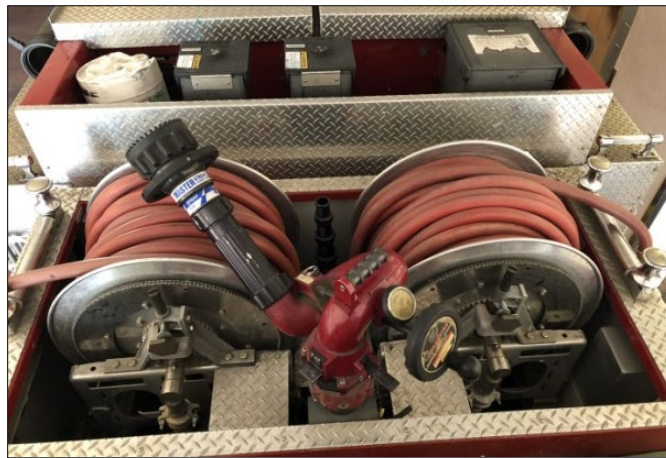


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- FFD Patrols equipped with one, ¾-inch reel line.
- Do not need to be fully deployed prior to charging.
- Referred to as “reel” or “red” lines (**Figure 2**).

**Figure 2**



## Crosslay Hose Bed

- Crosslay hose bed located on top of fire engine, behind cab, above pump.
- Hose lines accessible from either side of apparatus.
- Hinged cover and buckled restraining straps.
- Typical Crosslay Hose Bed Configuration
  1. 200-foot pre-connected hose lines (**Figure 3**)
    - a. Two, 1-1/2-inch.
    - b. One, 1-3/4-inch.
  2. Double Jacket.





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- a. Constructed with two woven outer jackets made of synthetic fabrics and a rubber lining.
- b. National Standard Thread (NST) couplings.

**Figure 3**



## Rear Hose Bed

- Rear hose bed is located on top of fire engine, behind pump, above water tank.
- Front is portion closest to front of apparatus; rear is portion closest to rear of apparatus.
- All hose accessed from rear of bed.
- Hinged cover and buckled restraining straps.
- Typical Rear Hose Bed Configuration
  1. Two compartments of 2-1/2-inch hose; Line No.1 and Line No. 2 (**Figure 4**) below.
    - a. Line No. 1 is located on far-left side of hose bed.



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- i. 400 feet of flat loaded 2-1/2-inch static hose with a pre-connected 100-foot 1-3/4-inch hose bundle with nozzle attached to a gated wye.
    - ii. Commonly referred to as the “Apartment Lay”.
  - b. Line No. 2 is located on the far-right side of the hose bed.
    - i. 350 feet of flat loaded 2-1/2-inch static hose with two 24-inch loops and a pre-connected 50 foot 2-1/2-inch bundle with nozzle for rapid deployment.
2. Center compartment with 800 feet of 5-inch large diameter hose (LDH) made up of eight, 100-foot sections of hose, coupled together.
  - a. Loaded so female coupling deploys first.
  - b. Some engines equipped with additional compartments, used to carry items such as backboards 1-3/4-inch or 2-inch hose bundles.

**Figure 4**



## Wildland Hose

- 1 and 1-1/2-inch single jacketed hose used exclusively for wildland operations.
  - Carried in hose packs containing three one-hundred-foot length rolls.



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- Hose packs have one 1-inch and two 1-1/2-inch 100-foot-long hose bundles.
- Threads and fittings compatible with local agencies.
  - Threads and fittings for 1-1/2-inch hose is National Hose (NH) thread.
  - Threads and fittings for 1-inch hose are National Pipe Straight Hose (NPSH).
- An adapter is carried with wildland hose packs if non-compatible couplings are encountered.

## Hard Suction

- Designed to prevent collapse of hose when drafting water
  - Rubber lined, fabric layered hose, reinforced with spiraled wire.
- Two 10-foot sections of hard-suction hose for drafting purposes.
  - Includes strainer and rope.
  - Multiple sizes including:
    - 6" (Fire Engines)
    - 4 1/2" (Patrols and Brush Rigs)
    - 1 1/2" (Trash pump)

## Additional Hose Carried on Apparatus

- 50-foot roll of 5-inch LDH.
  - Some apparatus also equipped with 25-foot length of 5-inch LDH.
- 50-foot roll of 2-1/2-inch hose.
- 100-foot long 1-3/4-inch hose bundle (two 50-foot sections coupled together) with a 2-1/2 x 1-1/2 adapter, commonly referred to as an "Apartment Bundle".
- Two 50-foot bundles of 2-inch high rise hose.



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- One red bundle (no nozzle) and one yellow bundle (with nozzle).
- 17-foot section of 2-1/2-inch hose with standard male and female couplings.
  - Used for supplying the Bresnan distributor and refilling water tank from a hydrant.

## Truck Companies

- Some trucks, known as “quints,” are equipped with a pump, water, and hose. Typically, quints have two mid-ship mounted 1-1/2-inch and one 1-3/4-inch pre-connected cross-lay. These cross-lays are identical in nature to the ones carried on engine companies.
- All trucks carry:
  - 300 feet of 2-1/2-inch hose
  - Two (2) 100-foot long 1-3/4-inch hose Apartment Bundles.
  - One (1) 17-foot section of 2-1/2-inch hose with standard male and female couplings.
    - Used for supplying the Bresnan distributor nozzle and refilling water tank from a hydrant.



## CHAPTER 2: HANDLING HOSE

### Draining Hose

- Drain hose prior to rolling or loading.
- Uncouple hose before draining.

### Instructions:

1. Uncouple the hose.
2. Lay hose out flat.
3. Grasp hose at either coupling and lift it over shoulder.
4. Walk slowly toward the other end of hose while feeding hose over shoulder (**Figure 5**).

**Figure 5**





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## Carrying Drained Hose

- Carried over shoulder after being drained to protect:
  - Hose from being damaged by unnecessary exposure to sharp objects or rough surfaces
  - Couplings and nozzles from dragging on ground
- Carried in single lengths.

### Instructions:

1. Grasp hose at nozzle/coupling and lift it over shoulder.
2. Let hose hang down to lower back.
3. Walk slowly toward other end of hose loading hose onto shoulder, forming folds near waist (**Figure 6**).
4. Continue until 50-foot section is loaded on shoulder.

**Note:** On average, one firefighter can carry one 50-foot length of 2-1/2-inch hose.

**Figure 6**





## Coupling Hose and Nozzles

- Couplings enable the hose to be connected to:
  - Nozzles
  - Fire hydrants
  - Master stream appliances
  - Sprinkler systems, etc.
- The following chart (**Figure 7**) illustrates the sizes of couplings in use by the Department.

**Figure 7**

Hose	Couplings
1 inch	1 inch
1 ½ inch	1 ½ inch
1 ¾ inch	1 ½ inch
2 inch	1 ½ inch
2 ½ inch	2 ½ inch
4 inch	4 ½ inch
4 ½ inch	4 ½ inch
5 inch	4 ½ inch
6 inch	6 inch

- Female coupling swivels and contains a gasket.
- When hose is being coupled together, the female coupling should be checked to ensure the gasket is in place.
- The female swivel will contain shorter lugs than the male “shank” (if rocker lugs are used).
- Male couplings consist of a threaded shank with lugs around the outer edge.
  - These lugs are utilized to tighten the couplings together utilizing spanner wrenches (**Figure 8**) below.



**Figure 8**



- Use care when handling couplings to avoid damage or injury.
- Hose can be coupled and uncoupled by one or two firefighters.
- Tighten couplings securely to prevent water from leaking (hand tight is usually enough).
  - Hard- and soft-suction hoses have couplings with extended lugs (**Figure 9**), while reel lines have recessed lugs (**Figure 10**).

**Figure 9**



**Figure 10**



Instructions (One Firefighter):





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## 1. Coupling Hose

- a. Check nozzles for gaskets and proper operation prior to coupling to fire hose.
- b. Place foot on hose next to male coupling (**Figure 11**).

**Figure 11**



- c. Grasp female coupling and place it against male coupling.
  - d. Turn female swivel counterclockwise until threads align, then turn swivel clockwise until coupling is tight.
- ## 2. Uncoupling Hose
- a. Place foot on hose next to male coupling.
  - b. Turn the female swivel counterclockwise until coupling is disconnected (**Figure 12**).



**Figure 12**



### 3. Connecting a Nozzle

- a. Place foot on hose next to male coupling.
- b. With both hands, place nozzle against male coupling.
- c. Turn nozzle counterclockwise until threads align, turn nozzle clockwise until it is tight. Close the nozzle control.

### Instructions (Two Firefighters):

#### 1. Coupling Hose:

- a. First firefighter: Grasp male coupling with both hands and hold it waist high.
- b. Second firefighter: Grasp female coupling with both hands and place it against male coupling (**Figure 13**).



**Figure 13**



- c. Turn the female swivel counterclockwise until the threads align, then turn the swivel clockwise until the coupling is tight.
2. Uncoupling Hose:
    - a. First firefighter: Grasp male coupling with both hands and hold it waist high.
    - b. Second firefighter: Grasp female coupling and turn female swivel counterclockwise until hose is uncoupled.
  3. Connecting a Nozzle:
    - a. First firefighter: Grasp male coupling with both hands and hold it waist high.
    - b. Second firefighter: Grasp the nozzle with both hands and place it against the male coupling.
    - c. Turn nozzle counterclockwise until threads align, then turn nozzle clockwise until nozzle is tight. Close the bail.
  4. Disconnecting a Nozzle:
    - a. First firefighter: Grasp male coupling with both hands and hold it waist high.
    - b. Second firefighter: Grasp nozzle with both hands and turn it counterclockwise.



## Hose Clamps

**Figure 14**



- Used (**Figure 14**) to stop flow of water through 2-1/2" or LDH fire hose when:
  - Draining and reposition hand lines.
  - Uncoupling and draining hose.
  - Replacing broken lengths of hose.
  - Controlling flow of water when a reverse lay is used.
  - Controlling flow of water when using portable monitors.
  - At the discretion of the Company Officer.
- Equipped with a handle to tighten clamp.
- Equipped with a latching device that secures hose clamp over hose.
- Stored with clamp open enough for a dry hose line to fit in clamp when latched.

**Note:** Forestry hose clamps are not discussed in this section.



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## Instructions:

1. Release latching device.
2. Place hose in hose clamp approximately eight to ten inches from coupling on side of the coupling from which the water is flowing. Be careful to center hose in the clamp so hose is not pinched.
3. Close latching device.
4. Place one foot on base of hose clamp and turn handle clockwise to tighten clamp on the hose (**Figure 15**) below.
5. Place handle 90 degrees (perpendicular) to hose to protect latch from being opened if clamp turns over as hose fills.
6. To release the hose clamp, place both feet on base of hose clamp and turn handle counterclockwise. If hose is under pressure, this may prove difficult.

**Caution:** Hose clamps secured to charged hose lines react violently when opened if water pressure has not been equalized by raising clamp prior to opening latching device.

7. Release latching device and remove hose clamp.

**Figure 15**





## CHAPTER 3: ROLLING HOSE

### Rolling Hose

- Drain hose before rolling.
- Roll hose prior to storage or transport.
- Department utilizes four methods of rolling hose:
  - Straight roll
  - Reverse straight roll
  - Donut roll
  - Wildland donut roll (**NOTE:** See wildland hose section for information)

### Straight Roll

- Most common method.
- Used when rolling hose after a fire.
- Used when transporting hose for repairs (except for 5-inch LDH).

### Instructions:

1. Drain the hose.
2. Lay hose out flat.
3. Face hose and grasp male coupling with both hands.
4. Roll hose by bending the male coupling forward (**Figure 16**) below.



**Figure 16**



5. Complete roll by walking forward and continually rolling hose until a completed roll is formed (**Figure 17**).

**Figure 17**



6. If the edges of roll are uneven, lay on side and press edges even by stepping on the hose roll.

## Reverse Straight Roll

- 5-inch LDH 100-foot lengths stored in reverse straight rolls.



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- The female coupling is rolled on the inside of the hose roll and the male coupling is on the outside.
- Facilitates reloading hose onto apparatus.

## Instructions:

1. Reverse straight roll is identical to straight roll, except it begins with the female coupling.

## Donut Roll

- Used for rolling lengths of LDH and 2-1/2-inch hose from 25 to 50 feet long.
- Allows rapid deployment while retaining both couplings.
- Used primarily for hose carried inside compartments of apparatus for water supply.

## Instructions:

1. Drain the hose.
2. Lay hose out flat
3. Fold hose, placing male coupling on top of hose approximately 36 inches from female coupling (**Figure 18**)

**Figure 18**







4. Roll folded end of hose towards couplings (**Figure 19**) below.

**Figure 19**



5. Complete roll by walking forward while snugly forming the balance of the hose roll. Use second firefighter to apply tension to top layer of hose (**Figure 20**). Pulling slightly on hose will keep top layer in line with the bottom layer and allow hose to be rolled without crimping.

**Figure 20**



6. When donut roll is completed, the female coupling extends past the male coupling. The male threads are protected by the hose and can be unrolled with both couplings available for immediate use (**Figure 21**) below.



**Figure 21**





## CHAPTER 4: LOADING HOSE

### Loading Hose

- Hose changes are made with as much speed as is consistent with safety. It is not necessary to go out of service for routine hose changes. Changes are made in one hose compartment at a time.
- Clean and inspect hose and nozzles prior to loading onto apparatus.
- Inspect couplings for damage and replace worn or missing gaskets prior to coupling hose together.
- Load clean hose onto apparatus at fire scenes.
- Do not keep excessively wet hose on an apparatus for more than 24 hours.
- Load hose so couplings deploy without flipping over.
- Record hose loads into the *Apparatus Primary Inventory (API)* stored in the *Apparatus Information Book*.

### Loading Jump Lines

- Hose length and size may vary.

### Instructions:

1. Place hose into well beginning with the end of hose attached to pump discharge. Start hose load on side closest to well.
2. Load hose flat into well, downside, across bottom, and up opposite side.
3. Fold hose back across hose well and inside the first loop.
4. Fold remaining hose back and forth across hose well.
5. Rest nozzle on top of hose load (**Figure 22**) below.



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6. Secure with strap or compartment lid.

**Figure 22**



## Loading Reel Lines

- Typical reel line configuration (**Figure 23**).

**Figure 23**



## Instructions:

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1. Grasp reel line and apply slight tension.
2. Activate power rewind switch.

**Note:** All engines are equipped with manual rewind reels in case of failure of power rewind switch.

3. Guide reel line evenly, layer by layer.
4. Clean reel line as it is loaded using red rag. Watch out for couplings as hose is wound up (**Figure 24**).

**Figure 24**



5. Secure reel and the nozzle (**Figure 25**) below.



**Figure 25**



Loading 1-1/2-inch and 1-3/4-Inch Pre-Connected Crosslays

- Loaded using the 3/8 flat hose load with 24-inch loops.
- Load is identical for 1-1/2-inch and 1-3/4-inch hose.

Instructions:

1. Connect female coupling to the 1-1/2-inch outlet.
2. Start first layer of hose load against rear of hose compartment (**Figure 26**).

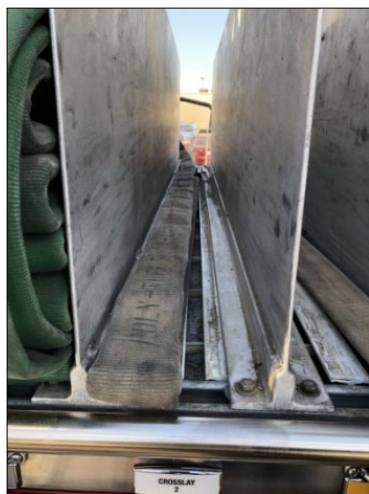


**Figure 26**



3. Fold hose even with end of compartment (**Figure 27**). Use a “Dutchman” if coupling is positioned at end of the compartment (**Figure 28**).

**Figure 27**



**Figure 28**



4. Load hose towards front of hose compartment. Fold hose even with end of compartment.



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5. Begin second layer at front of hose bed, on top of first layer. Place a 24-inch loop beyond edge of hose compartment.
6. Continue loading hose, making folds at edge of compartment, until the eight-fold is reached.
7. Make a 24-inch loop and continue loading remainder of hose in same fashion (**Figure 29** and **Figure 30**).

**Figure 29**



**Figure 30**

11	12
10	9
7	8
6	5
3	4
2	1

3/8 Load

8. Attach nozzle and place at edge of compartment (**Figure 31**).

**Figure 31**







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9. Fold 24-inch loops up and over hose in compartment and replace hose cover (**Figure 32**).

**Figure 32**



## Loading 2-1/2-Inch Hose

- Each bed has a total of 400' of 2-1/2" hose
  - Line No. 1 located on left side of hose bed
  - Line No. 2 located on right side of hose bed

## Instructions (Line No. 1 – Apartment Lay):

1. Place female coupling of first length on left side of compartment three inches past rear of hose compartment.
2. Lay hose flat to front of hose compartment. Fold and lay hose back on itself to rear of compartment (**Figure 33**) below.



**Figure 33**



3. Fold and double hose back on itself even with rear of compartment, keeping female coupling clear.
4. Lay hose off to the right of first tier halfway to front of compartment and continue loading to front of compartment.
5. Fold and double hose back on itself to rear of hose compartment. **(Figure 34).**

**Figure 34**





6. After reaching rear of the right side of compartment, load hose back towards left side. Continue loading hose until six lengths are loaded, ending in two tiers of equal height (**Figure 35**).

**Figure 35**



7. Load last 100 feet of hose in a flat load on outside tier of hose only.
8. Approximately two-thirds of the way to the front of the hose bed, finish load by laying last section of hose down onto inside tier. Fold it at front of hose bed and back toward rear of hose bed.
9. Extend male coupling 24 inches past rear of hose bed on inside tier (**Figure 36**) below. This will facilitate loading pre-connected 1-3/4-inch hose bundle
10. Using two firefighters, lift pre-made 1-3/4-inch hose bundle, with 2-1/2-inch x 1-1/2-inch gated wye attached on bottom of bundle, onto lower inside tier of hose load. Connect wye to 2-1/2-inch hose load (**Figure 37** and **Figure 38**) below.



Figure 36



Figure 37



Figure 38



Instructions (Line No. 2):

1. Place female coupling of first length on left side of compartment three inches past rear of hose compartment.
2. Continue loading hose, identical to Line No. 1, until five lengths are loaded, ending in two tiers of equal height.
3. Make 24-inch loop on outside tier and load next two 50-foot sections of hose in a flat load on outside tier only. Before reaching male coupling of the second 50-foot section, fold hose and lay it into lower inside tier.
4. Extend male coupling 24 inches past rear of bed on inside tier. This will facilitate loading 50-foot pre-connected 2-1/2-inch hose bundle (**Figure 39**).

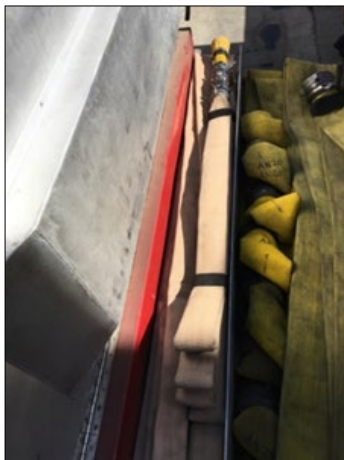


**Figure 39**



- Using two firefighters, lift pre-made 2-1/2-inch hose bundle onto lower inside tier of hose load. Couple hose together forming a 24" loop. Keep couplings exposed to allow bundle to be disconnected easily (**Figure 40**, **Figure 41**, and **Figure 42**).

**Figure 40**



**Figure 41**



**Figure 42**



## Loading 5-Inch Hose

### Instructions:



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1. Place male coupling of first length at front of hose compartment on right side. Lay hose flat to rear of compartment (**Figure 43**).

**Figure 43**



2. Fold hose even with rear of hose compartment. Lay hose back on itself and place it to the left of the first tier approximately halfway to the front of the compartment.
3. Using flat-load technique, continue to load LDH from end-to-end and side-to-side, saving far right-side of hose bed for placement of couplings.
4. When a coupling is loaded, regardless of where the hose is in the bed, place it directly behind the previous coupling along right side of hose bed.
5. Place couplings as close together as possible (in some cases riding up on each other), so all couplings line up in a row along right side (**Figure 44**).

**Figure 44**





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6. Fold front and rear folds of second layer and every alternate layer approximately six inches shorter than previous layer to allow hose to load more flatly.
7. Finish load by forming a Dutchman, if needed, placing last female coupling at rear of hose bed. Attach hose strap using lark's foot and hang it in plain sight for easy deployment (**Figure 45**) below.

**Figure 45**





## CHAPTER 5: BUILDING HOSE BUNDLES

### Hose Bundles

- 100-foot 1-3/4-inch hose bundles.
- 50-foot 2-1/2-inch hose bundle.
- 50-foot 2-inch high rise hose bundles (NOTE: See high rise section for information)

### Building 1-3/4-Inch Hose Bundles

#### Instructions:

1. In large clear area, lay out 50 feet of 1-3/4-inch hose with male coupling near firefighter. Attach nozzle.
2. Kneeling on ground, form a six-foot straight section of hose. Pull additional hose on edge, wrapping hose around 6-foot section and nozzle (**Figure 46**).

**Figure 46**



3. Attach second 50-foot section of hose to female coupling and continue wrapping until end of hose is reached (**Figure 47**) below.





**Figure 47**



4. When bundle is complete, place female coupling six inches past edge of hose bundle on nozzle side. If needed, fold hose back upon itself until female coupling is in correct position. (**Figure 48**, **Figure 49**, and **Figure 50**).

**Figure 48**





**Figure 49**



**Figure 50**



5. Attach the 2-1/2-inch by 1-1/2-inch gated wye on one bundle and the 2-1/2-inch by 1-1/2-inch reducer on the other bundle. Secure the completed bundle with three Velcro straps. (**Figure 51**).

**Figure 51**

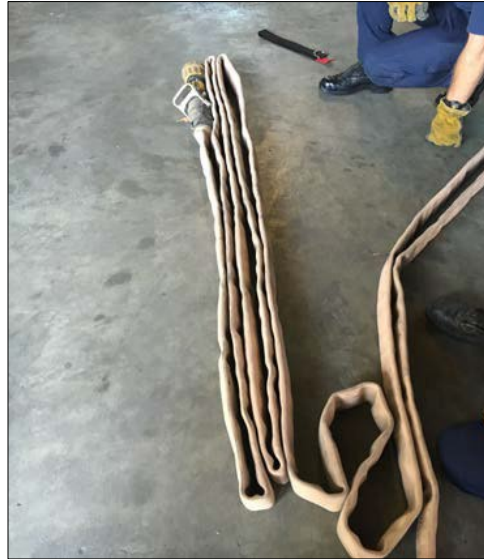


## Building 2 ½ -Inch Hose Bundle

1. In large clear area lay out 50 feet of 2-1/2-inch hose. Attach nozzle.
2. Make a fold approximately 6 feet from male coupling. Continue folding hose on edge in an accordion load (**Figure 52**).



**Figure 52**



3. Finish load with nozzle and female coupling on the same side of the bundle. Extend female coupling past the nozzle. This assists in connecting and disconnecting bundle at rear of the hose bed if needed.
4. Place two straps on the hose and leave the nozzle free to be removed easily (**Figure 53**).

**Figure 53**





## CHAPTER 6: DEPLOYING HOSE LINES

### Deploying Reel Lines

#### Instructions:

1. Grasp hose behind nozzle or use pistol grip if equipped (**Figure 54**)
2. Turn and advance reel line to the desired location (**Figure 55**).
3. Reel line does not need to be fully deployed prior to charging line.

**Figure 54**



**Figure 55**



### Deploying 1-1/2-Inch and 1-3/4-Inch Pre-Connected Crosslays

- 1-1/2-Inch.
- 1-3/4-Inch.
- Minimum of two firefighters used to advance and operate hose during interior firefighting operations.
- Three standard deployment options:



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- Standard pull
- Split pull
- 2 Firefighter alley pull

## Instructions:

**Video link:** [IPE 316.002 Deploy a Preconnected Hose Line](#)

### Standard Pull

1. Flip 24-inch loops out of hose compartment.
2. Facing loops, grasp nozzle with hand closest to front of apparatus.
3. Using other arm, place forearm through loops, from rear to front, grasping front loop. Pull hose out of compartment (**Figure 56** and **Figure 57**).

**Figure 56**



**Figure 57**



4. Turn and advance hose line in desired direction.



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5. As hose is advanced, drop loops as tension is increased. Drop loop held in hand first.
6. Drop the rear loop last or retain it to the desired location (**Figure 58**).
7. Remove kinks and charge hose line.

**Figure 58**



## Split Pull

1. Flip 24-inch loops out of hose compartment.
2. Facing loops, grasp nozzle and back (top) loop.



**Figure 59**



3. Pull hose (Figure 59) above out of compartment and advance to desired location. Place nozzle and hose at desired location.
4. Return to apparatus and grab front (bottom) loop.
5. Pull hose out of compartment and advanced adjacent to nozzle.
  - a. All hose should be lined up with desired entry point.
6. Remove kinks and charge hose line.

## 2 Firefighter Alley Pull

1. Firefighter #1 flips 24-inch loops out of hose compartment (**Figure 60**).
2. Firefighter #1 grasps nozzle and back (top) loop.
3. Firefighter #2 grasps front (bottom) loop.



**Figure 60**



1. Both firefighters pull hose out of compartment, parallel to apparatus, in opposite direction, until hose is fully deployed from bed.
2. Bring nozzle to desired location. Adjust hose as needed, remove kinks and charge hose line.

## Deploying 2-1/2-Inch Hose Lines

- Line No. 1 - Apartment Lay (**Figure 61**).
- Line No. 2 – 2-1/2-inch hose line with 50-foot 2-1/2-inch bundle (**Figure 62**).
  - Largest hand line used by Department.
  - Can be advanced dry into position by one or more firefighters
  - Three firefighters required to advance and operate efficiently once charged.
  - Can be used as supply line/secondary supply line for:
    - Apparatus
    - Sprinkler systems
    - Standpipes





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- Special streams
- Auxiliary appliances

**Figure 61**



**Figure 62**



Deploying Line No. 1: Apartment Lay

**Video link:** [IPE 316.006 Advance an Apartment Lay](#)

- Can be charged in tight quarters.
- One or two bundles can be attached.

Instructions:

1. Face rear of hose bed and step onto tailboard if needed.
2. Grasp 2-1/2-inch hose just behind wye with one hand and pre-connected hose bundle with other.
3. Pull bundle with attached 2-1/2-inch hose partially out of hose compartment.



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4. Step off tailboard and rotate under bundle with bundle and 2-1/2-inch hose aligned with right shoulder (**Figure 63** and **Figure 64**).
5. Secure bundle and advance to the desired location (**Figure 65**).

**Figure 63**



**Figure 64**



**Figure 65**



6. Lay bundle down at desired location making sure there are no kinks near wye.
7. Confirm wye is closed and call for water. While 2-1/2-inch supply line is charging, remove hose straps, spread out bundle, and secure nozzle (**Figure 66**) below.

**Figure 66**





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8. Charge bundle (**Figure 67**).
9. Have subsequent firefighter attach second bundle to wye if needed.

**Figure 67**



Deploying Line No. 2: 2-1/2-Inch Hose Line with 2-1/2-Inch Bundle

**Video link:** [2-1/2-Inch #2 New Deployment](#)

- Primary line used for 2-1/2-inch hand line operations.

Instructions:

1. Face rear of hose bed and step onto tailboard if needed.
2. Grasp inside loop formed by connection of bundle and flat loaded 2-1/2-inch bundle.

**Note:** Bundle can be disconnected and removed while in hose bed if not needed for an evolution.

3. Pull bundle with attached 2-1/2-inch hose partially out of hose compartment (**Figure 68**).
4. Step off tailboard and rotate under the bundle, with bundle aligned with right shoulder (**Figure 69**).

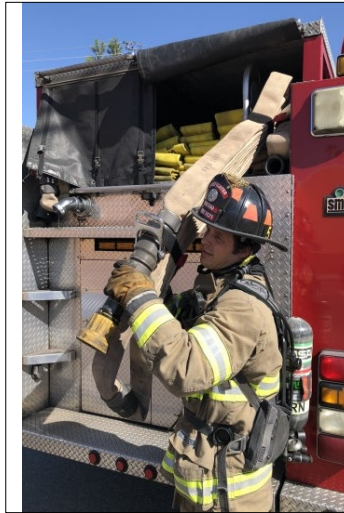


5. Secure bundle and advance to the desired location (**Figure 70**).

**Figure 68**



**Figure 69**



**Figure 70**



6. Additional firefighters can use the remaining loop to assist in advancing hose.
7. Once at desired location, place bundle on ground, remove straps and flake out hose.
8. Secure nozzle and charge hose line.

## Two or More Firefighters Advancing 2-1/2-Inch Hose Line

### Instructions:

1. First firefighter secures 2-1/2-inch bundle and begins to deploy hose from hose bed as previously described.
2. Second and consecutive firefighters grasp hose at a coupling (second firefighter can use 24" loop) and place hose over left shoulder or flake extra hose onto left shoulder and advance to desired location (**Figure 71** and **Figure 72**).



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**Note:** Engineer can be used to assist firefighters with loading hose on their shoulder.

Figure 71



Figure 72



## Operating 2-1/2-Inch Hose Lines

- Three firefighters are recommended to safely operate the 2-1/2- inch hose line from a standing position.

### Instructions:

1. Firefighter at nozzle: Grasp hose behind nozzle (**Figure 73**) below.



**Figure 73**



2. Second firefighter: Grasp hose with both hands behind firefighter at nozzle and on opposite side of hose.
3. Third firefighter: Grasp hose with both hands behind second firefighter and on same side of hose as the firefighter at nozzle.
4. All three firefighters need to work together to secure the hose in preparation of directing the fire stream from a standing position.
5. For maximum stability, the firefighter at the nozzle and second firefighter stand with feet apart and with back foot of nozzle firefighter secured against front foot of second firefighter. Secure front foot of third firefighter against back foot of second firefighter (**Figure 74**).

**Figure 74**





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6. To operate nozzle in a sweeping motion, second firefighter grasps hose approximately three feet behind the nozzle firefighter. The third firefighter grasps hose where hose meets the ground by placing both hands and one knee on hose securing hose to the ground (**Figure 75**).

**Figure 75**



**Note:** Attack crews can use the building layout to their advantage by bracing hose against walls or other substantial objects to offset nozzle reaction (**Figure 76**).

**Figure 76**





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- A hose strap may be used to assist firefighters when operating 2-1/2-inch handline nozzles (**Figure 77**). The strap loops over the shoulder furthest from the hose by either crossing over the chest or over the back.

**Figure 77**



## Packing House Loop

**Video link:** [IPE 316.009 Deploy a Packing House Loop](#)

- Allows single firefighter to operate 2-1/2-inch hose line.

## Instructions

1. Place 50 foot 2-1/2-inch hose bundle from Line No. 2 at desired packing house nozzle location. Remove straps.
2. Grasp nozzle and form large loop, at least 50 feet in length. Make sure the last ten feet of hose leading to nozzle is straight, in line with the nozzle and target.
3. Place nozzle under hose line near coupling and approximately two feet past the hose. Maintain control of nozzle and charge hose line.
4. Sit on hose where the hose crosses itself and operate nozzle (**Figure 78**) below.





**Figure 78**



Deploying 5-Inch Hose

**Video link:** [IPE 316.008 Deploy a Large Diameter Hose Supply Line](#)

Instructions:

1. First firefighter: Grasp female coupling and place it under an arm and over the opposite shoulder so that coupling rests just above waist height at the middle of back (Error! Reference source not found.).

**Figure 79**





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2. Advance toward desired location.
3. Successive firefighters: Grasp hose at a coupling and advance toward desired location. Place coupling over back at hip level (**Figure 80**).

**Note:** If additional firefighters are available, the hose can be advanced by grasping the hose at each coupling and halfway between couplings.

**Figure 80**



## Advancing Hose Lines Up a Ladder

- Advance hose up ladder with dry line whenever possible.
- Avoid charging line prematurely.
- Use one 50-foot length of hose for every three floors.
- At least one length of hose needed for fire attack on fire floor.

## Instructions:

1. Firefighter at nozzle: Place hose and nozzle under left armpit and over right shoulder and advance up ladder (**Figure 48**) below.



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**Figure 81**



**Figure 82**



2. Other firefighters: Place hose on left shoulder at each coupling and half the distance between couplings. Place coupling over back at hip level (**Figure 82**) above.
3. All firefighters: Proceed up the ladder about 15 feet apart allowing slack hose to form a loop off left side of ladder. Maintain proper spacing so hose will remain balanced on shoulder (Figure 83).

**Note:** When advancing hand lines up aerial ladders, loops remain on the ladder.

**Figure 83**





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4. Firefighter at nozzle: Stop at top of ladder and place nozzle over top rung (**Figure 84**).

**Figure 84**



5. Firefighter at nozzle: Dismount ladder and pull slack hose over top rung (**Figure 85**).

**Figure 85**



6. Next firefighter: Dismount ladder and pull slack hose over top rung while first firefighter returns to nozzle and proceeds toward desired location.
7. Successive firefighters: Dismount ladder and pull up slack hose. Help advance hose into position.



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8. When hose has been advanced to desired location, firefighter at top of ladder secures hose to ladder with a hose strap.
  - a. Place hose strap below a coupling, when possible, to relieve strain on coupling. Use a lark's foot around hose and loop strap around top of left beam (**Figure 86**).

**Figure 86**



9. Prior to charging, place hose onto ladder to support the weight of hose line when it is charged. Move hose off the top rung to left side of ladder.

- a. On aerial ladders, hose should remain on ladder at the top.

## Removing Hose Lines Down a Ladder

### Instructions:

Firefighter at bottom:

1. Place a hose clamp on ground between ladder and nearest coupling.
2. Uncouple hose and open hose clamp to drain hose (**Figure 87**) below.



Figure 87



Firefighter at top:

1. Place hose over top rung of ladder.
2. Lock-in at top of ladder and remove hose strap, then exit ladder at the top.

**Note:** Never use a leg lock to lock-in on an aerial ladder.

3. Slide hose down the ladder until all slack hose is removed from structure. Both firefighters at top of ladder and at bottom of ladder aid. Leave nozzle draped over top rung.
4. Mount ladder and place nozzle and hose under left armpit and over right shoulder.
5. Climb down ladder keeping hose off to left side of ladder. Firefighter at the bottom of ladder removes slack hose away from bottom of ladder.

**Note:** When removing hand lines on aerial ladders, the hose loop remains on the ladder.

Advancing Hose Lines Up Stairways

- Use dry hose line whenever possible.



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- Work as a team using good communication to accomplish task in a timely manner.
- Typically, requires one 50-foot length of hose per floor.
- One or more lengths of hose on fire floor are needed for fire attack.

## Instructions:

1. Firefighter at nozzle: Grasp nozzle and hose. Advance up stairway, placing hose to outside of stairway turn (**Figure 88**).

**Figure 88**



2. Other firefighters: On same side as nozzle firefighter, grasp hose at each coupling and halfway between couplings. Advance up stairway.
3. Charged hand lines can be advanced up stairways by following above procedures or by placing stationary firefighters on each landing to assist with maneuvering hose up stairwell.

**Note:** For advancement of a substantial amount of hose up a stairwell, consider a shoulder carry.

## Removing Hose Lines Down Stairways

### Instructions:

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Effective Date: January 2021  
Current Revision Date: 01/15/2023  
Next Revision (1) Date: 01/15/2026

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1. Place hose clamp on hose line outside building, uncouple and drain hose.

**Note:** It may not be possible to drain hose outside the building when connected to a standpipe. Avoid unnecessary water damage when draining hose inside buildings.

2. Grasp hose (at same positions used when advancing hose up stairways) and proceed down the stairway.
3. Charged hand lines can be backed down a stairway, if necessary, by reversing above procedure.

## Advancing Hose Line from an Aerial Device

- Extended from aerial ladders for operations on upper floors of buildings.
- Can be connected to a ladder pipe by:
  - Removing nozzle and connecting appropriate adaptor.
  - On aerial ladders with elevating platforms, connected to 1-1/2- or 2-1/2-inch gated outlets on bottom of platform.





## CHAPTER 7: USING HOSE BUNDLES

### Using Hose Bundles

- Assists with suppression efforts at fires out of reach of pre-connected hose lines.

### 1-3/4 Inch Hose Bundles

- Two 100 foot 1-3/4-inch hose bundles carried on each engine and truck company.
- One bundle pre-connected to 2-1/2-inch hose (Line No. 1- Apartment Lay).
- One bundle carried in compartment on apparatus.

### Advancing 1-3/4-Inch Hose Bundles

#### Instructions:

1. Carry bundle with pre-connected 2-1/2-inch hose to desired location.
2. Remove hose straps, spread out bundle, and secure nozzle.
3. Charge line and fight fire (**Figure 89**).

**Figure 89**





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4. Connect second bundle to gated wye, if needed.

## 2-1/2-Inch Hose Bundle

- One 50 foot 2-1/2-inch hose bundle carried on each engine company.
- Pre-connected to 2-1/2-inch hose (Line No. 2).

## Advancing 2-1/2-inch Hose Bundle

### Instructions:

1. Carry bundle with pre-connected 2-1/2-inch hose to desired location (**Figure 90**).

**Figure 90**



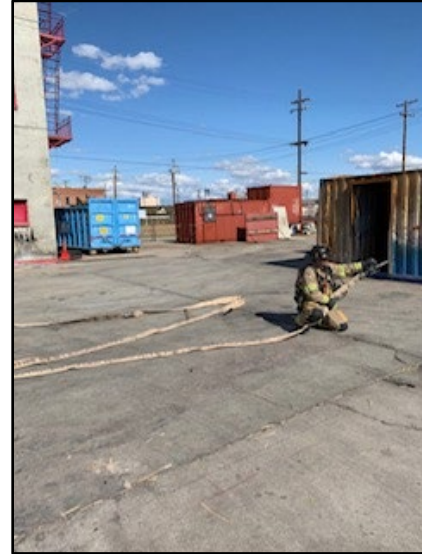
2. Remove hose straps (Figure 91) below, flake hose or form packing house loop.



**Figure 91**



**Figure 92**



3. Secure nozzle, charge line and fight fire (**Figure 92**).



## CHAPTER 8: SUPPLY LINES

### Supply Lines

- Hose lines used to supply water from a water source to an apparatus.
- 5-Inch large diameter hose (LDH) is primary supply line utilized by the Department.
- Supply line can be manually advanced from hose bed to water source (hand jacking) or deployed from hose bed while apparatus drives to location (forward or reverse lay).

### Manually Advancing (Hand Jacking) 5-Inch Supply Lines

- Typically used when hydrant is near pumping apparatus.

### Instructions:

1. One or more firefighters advance LDH from apparatus to a water supply.
  - a. Bring appropriate hydrant wrench.
    - i. If unknown what type of wrench is needed, bring both.
2. Firefighter at hydrant flushes hydrant and connects LDH.
3. Once hose has been extended to hydrant, firefighter at apparatus uncouples hose from remaining hose in hose bed and connects to 4-1/2-inch gated inlet valve on apparatus.
4. Firefighter at hydrant contacts firefighter at apparatus and confirms readiness to charge supply line.
5. If communication is poor between firefighter at hydrant and firefighter at apparatus, a hose clamp can be used to prevent hose bed from being charged.

### Laying 5-Inch Supply Lines:

- Deployed in one of three ways:



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- Forward lay.
- Reverse lay.
- Split lay.

## Forward Lay

- Hose deployed from fire hydrant to fire.

### Instructions:

1. Stop apparatus near fire hydrant.
2. Remove appropriate hydrant wrench.
3. Grasp coupling and/or LDH strap and advance 5-inch hose to hydrant.
4. Make one complete loop around hydrant with hose. Hold hose tightly while apparatus proceeds to desired location (**Figure 93**).

**Figure 93**



5. Remove hose from around hydrant, flush hydrant, connect hose to hydrant, and open hydrant when directed to do so.



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6. Take hydrant wrench and proceed to apparatus. Remove any kinks in hose. Leave hydrant wrench with pump operator.

**Note:** At times, Company performing a forward lay may elect to only wrap the hydrant and direct another company to make hydrant connection while it proceeds to desired location with a full complement of members. If this direction is made, leave hydrant wrench at hydrant.

7. When apparatus reaches desired location, uncouple hose from remaining hose in hose bed and connect it to 4-1/2-inch gated inlet valve on apparatus (Figure 94).

**Figure 94**



**Note:** Supply line may be connected to another engine already pumping.

8. If communication is poor between firefighter at hydrant and firefighter at apparatus, a hose clamp can be used to prevent hose bed from being charged.

## Reverse Lay

- Hose deployed from fire to hydrant.

## Instructions:

1. Pull up next to apparatus in need of supply line.
  2. Grasp coupling and/or LDH strap and advance 5-inch hose to 4-1/2-inch gated inlet of receiving engine (**Figure 95**).
-



**Figure 95**



3. Go back to hose bed and pull a few folds of LDH onto the ground.
4. Grasp hose where it comes out of hose bed, step to the outside of apparatus and make visual contact with apparatus operator (**Figure 96**).

**Figure 96**



5. Apparatus proceeds towards water supply with supply hose deploying from hose bed.
6. Attach 4-1/2-inch double-male coupling from receiving apparatus to 4-1/2-inch hose coupling.



7. Connect hose and double-male coupling to gated inlet valve (**Figure 97**).

**Figure 97**



8. When apparatus laying hose reaches desired hydrant, uncouple appropriate amount of hose needed to reach hydrant.
9. Attach 4-1/2-inch, double-female coupling to hose.
10. Flush hydrant and connect hose and double-female coupling to hydrant (**Figure 98**).

**Figure 98**



11. Open hydrant when directed to do so.





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## Split Lay

- A combination of a forward lay and a reverse lay.
- Utilized in areas where access to, or anticipated access to, fire scene is limited, such as:
  - Long driveways.
  - Locations where lying in directly from a hydrant would block future apparatus access.

### Instructions:

1. Pumping apparatus performs a forward lay, deploying hose from a specific location (i.e., driveway, intersection, etc.) to the fire.
2. Subsequent apparatus connects to female end of deployed hose and performs a reverse lay from this location to water source.
  - a. 4-1/2-inch double male needed at hose connection.
  - b. 4-1/2-inch double female needed at hydrant connection.

## Deploying 5-Inch Hose Rolls

- Used to connect apparatus to water source.
- Come in varying lengths.
- Can be used in lieu of 100-foot section of hose, reducing excessive hose near apparatus or hydrant.

### Instructions:

1. Remove 5-inch hose roll from compartment.
2. Place hose roll on ground in an upright position.
3. Grasp both couplings.



4. Rapidly lift both couplings allowing hose to unroll (**Figure 99**).

**Figure 99**



5. Attach male coupling to pump inlet valve.
6. Attach female coupling to hydrant (after flushing) or to supply line.

## Relay Operations

- Used to pump water over long distances using two or more apparatus.
- Objective is to supply an adequate volume of water at appropriate pressure required for effective fire streams over distances beyond which a single apparatus can efficiently operate.
- Can be deployed from either the fire pumper to the source pumper (reverse lay) or from the source pumper to the fire pumper (forward lay).
- Intermediate pumpers used to span distance between fire and water source.
- Intermediate pumpers deploy their LDH until all their hose is deployed or they reach their target.
- Intermediate pumpers hose hook ups are different when doing a reverse or forward lay.



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## Instructions (Reverse Lay):

1. Connect female coupling of LDH to fire pumper's inlet valve.
  - a. Use 4-1/2-inch double male.
2. Deploy LDH in direction of water supply.
3. Connect male coupling at end of LDH to your discharge valve.
  - a. Use 4-1/2-inch double female.
4. Subsequent intermediate pumpers follow these same procedures.

## Instructions (Forward Lay):

1. Connect female coupling of LDH to source pumper's discharge valve.
2. Deploy LDH in direction of fire.
3. Connect male coupling at end of LDH to your inlet valve.
4. Subsequent intermediate pumpers follow these same procedures.

## Drafting Operations

- Provides means of taking water from a static water source such as a canal or portable water tank.
- Many apparatuses are equipped with hard suction hose for drafting operations.
- Two 10-foot lengths of hard suction hose with strainers to prevent foreign materials from entering pump.

## Instructions:

1. Remove hard-suction hoses from apparatus.
2. Check for gaskets and connect suction hoses together (**Figure 100**) below.



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3. Connect strainer and rope to hard-suction hose (**Figure 101**) below.

**Figure 100**



**Figure 101**



4. After hoses and strainer are assembled, connect suction hose to desired suction inlet.
5. Tighten all couplings with a rubber mallet and confirm all by-passes and bleeders are fully closed.
6. Lower hose and strainer into water.
  - a. Place strainer at least two feet below surface of water with enough clearance below strainer to prevent foreign material from clogging hose.
7. Tie rope to hold the strainer in desired position.

See *Training and Equipment Manual, Section 313.014, Drafting*, for details on drafting procedures.

## Portable Water Tanks

- Used to establish a static water source for drafting operations.
- Carried on water tenders.
- Utilized for long-duration fire suppression efforts when no other reasonable water supply is available.



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- Best supported by two or more water tenders engaged in a water shuttle supply operation.
- Can also be utilized in case of a multi-system failure within the water tender pump delivery system.

See *Training and Equipment Manual 310.010, Water Tenders*, for details on deployment of portable water tanks.

## Water Shuttle Operations

- Involve moving large quantities of water between a dumpsite and a fill site.
- Recommended for distances greater than one-half mile or greater than the Department's capability of laying supply hose lines.
- Two procedures:
  - Shuttling from a hydrant
  - Shuttling from a static water supply (e.g., ponds, pools, portable water tank, canals).
    - Choosing the appropriate procedure will be at the discretion of the officer in charge.

**Note:** The use of water tenders and portable water tanks is optimal for water shuttle operations, but flexibility in developing the plan can be allowed (e.g. fire engines instead of water tenders or ladders and a tarp used to build a tub when portable water tanks are not available).

## Water Shuttle from a Hydrant

### Instructions:

1. First-arriving water tender arrives and deploys a portable water tank in a position that provides room for subsequent apparatus to perform drafting operations.
2. First-arriving water tender fills portable tank and proceeds to nearest (or designated) hydrant.



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3. Use LDH and direct fill inlet (if equipped) to fill tender.
4. Once full, disconnect LDH and leave hose and hydrant wrench attached to hydrant so can be used by the next arriving apparatus.
5. Proceed back to fire scene and repeat shuttling procedure as needed.

## Water Shuttle from a Static Water Supply

### Instructions:

1. First-arriving water tender arrives and deploys a portable water tank in a position that provides room for subsequent apparatus to perform drafting operations.
2. First-arriving water tender fills portable tank and proceeds to location of drafting apparatus assigned to water supply (i.e., lake, pond, canal, etc.).
3. Once at draft site, drafting apparatus fills water tender using LDH and direct fill inlet (if equipped).
4. Once full, disconnect the fill line and return to fire scene.
5. Repeat shuttle procedures as needed.

## Estimating Effectiveness of Water Shuttle Operations

- In order to estimate the effectiveness of a water shuttle the IC or water supply officer can use the following formula:

$$\text{GPM} = \frac{\text{Tank Size} - 10\%}{\text{Trip Time}}$$

- Trip time: Trip time is = travel time + handling time.
- Travel time can be estimated using the following formula:
  - Travel time in minutes =  $0.65 + (1.7) (\text{distance in miles})$ .



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- This is dependent on the type and capacity of the water tender.

**Note:** The above formula assumes an average travel speed of 35 mph and a built-in constant for acceleration and deceleration at the fill/dump site.

## I.S.O. Drill

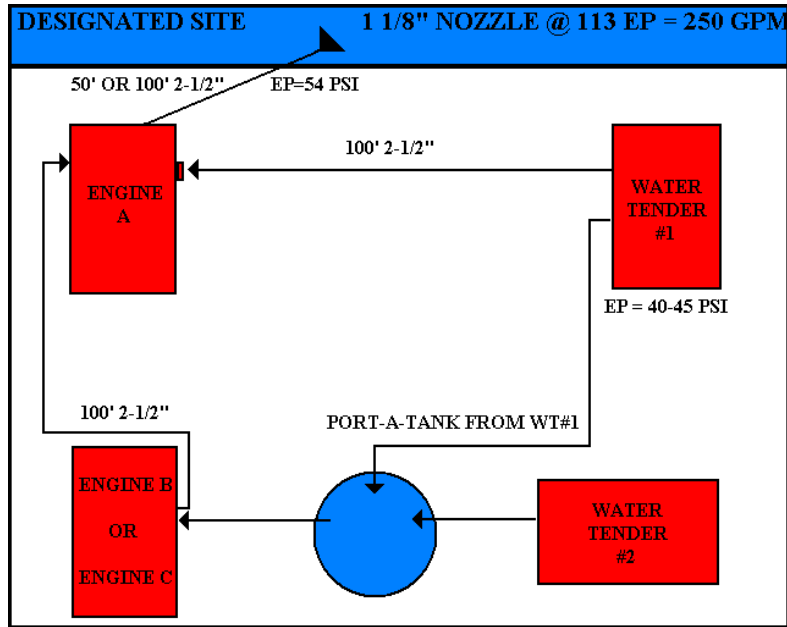
- Used to evaluate the ability of a fire department to set up a continuous water supply of at least 250 GPM for a minimum of two hours at any area within their covered district(s).

## Instructions:

1. Engine A has five minutes from arrival to set up discharge and supply lines and begin pumping.
2. The first water tender on scene ties into Engine A's supply line and supplies Engine A.
3. The second engine (Engine B or Engine C) sets up to draft from the portable water tank off Water Tender 1's supply and ties into Engine A's second supply line at 40-45 EP.
4. Water Tender 2 fills the portable water tank and departs to the nearest water supply.
5. The third engine can be on scene for support or can go to the water source to set up supply hose.
6. When empty, Water Tender 1 (supply) disconnects and goes to the water source to fill. The drafting engine should begin to supply Engine A before the water tender disconnects.
7. The best scenario for the water tender/portable water tank shuttle operation would be to stagger the water tenders (i.e., one water tender filling the portable water tank while the other is refilling at the source).
8. See example of water shuttle operation below (**Figure 102**) below.



Figure 102







## CHAPTER 9: MASTER STREAMS

### Master Streams

- Any fire stream exceeding 350 GPM or having a nozzle diameter greater than 1-1/4 inches.
- The Department utilizes three different types of master streams:
  - Deck guns.
  - Portable monitors.
  - Ladder pipes.
- Five-inch large diameter hose (LDH) is used to supply these streams.

### Deck Gun

- A portable monitor, master-stream appliance, connected to a pre-plumbed waterway on a fire engine.
- Located on top of apparatus, above the pump.
- Carried in deck-mounted position allowing for rapid use with minimal setup.
  - Can be removed and used as a portable monitor.

### Deck Gun Specifications

- Portable Monitor Parts List:
  - 4-1/2-inch female swivel inlet.
  - Hand wheel for vertical control.
  - Horizontal safety lock (knob/latch).
  - Low-angle override pin.



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- Twist handle lock pin or locking latch at base of unit.
- Barrel.
- Stream straightener.
- Liquid-filled pressure gauge.
- Fog nozzle.
- Assortment of smooth bore nozzle tips.
- Rated at flows up to 1,250 GPM.
- Maximum recommended inlet pressure 200 psi.
  - Most nozzles designed to operate at:
    - 80 psi with smoothbore tip (105 psi at monitor pressure gauge).
    - 75 psi with fog nozzle (100 psi at monitor pressure gauge).
  - See *Pump Operators Guide* for additional pressures on older nozzles.
- Monitor can be elevated approximately two feet by using telescoping feature with telescopic locking device (Error! Reference source not found. and Error! Reference source not found.).

**Figure 103**



**Figure 104**





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- Can be rotated 360 degrees by loosening horizontal safety lock and moving barrel to desired location (**Figure 105**) and (**Figure 106**) below.

**Figure 105**



**Figure 106**



- Stream elevation controlled by hand-wheel that operates a fully enclosed worm gear (**Figure 107**).
  - Can be operated at any angle. For angles below 25 degrees, pull low-angle override pin at bottom of unit.

**Figure 107**





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## Deck Gun Operations

### Instructions:

1. Drive engine to desired location.
2. Set brake and engage pump.
3. Access deck gun and ensure desired nozzle/tip is in place.
4. Raise deck gun using telescoping feature.
  - a. Release lock.
  - b. Pull up on deck gun using telescoping feature.
  - c. Engage lock.
5. Rotate monitor in line with target.
  - a. Tighten horizontal safety lock.
6. Adjust nozzle elevation.
  - a. Can operate at 0-degree elevation by releasing low-angle override pin.
7. Open deck gun valve.
8. Adjust pressure, location and stream as desired.
9. Secure continuous water supply.
  - a. Depending on tank size, tank water will only support about 20-30 seconds of operation.

### Portable Monitor

- A portable monitor, master stream appliance, operated from ground level.
  - Department portable monitors are dual-function appliances designed to be operated as deck guns or portable monitors.



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- Portable monitor removed from deck mounted position; base carried in apparatus compartment.
- Supplied by 5-inch LDH.
  - 4-1/2-inch double male needed.
- Can be placed in areas not accessible by apparatus.
- Stream easily directed into second or third floor of building.
  - May reach fourth floor, however, effectiveness of stream must be evaluated.

## Portable Monitor Specifications

- See *Portable Monitor Parts List* identified in deck gun section.
- Portable monitor connects to portable base.
  - Spring-loaded pin-and-hole locking mechanisms on each folding leg.
  - 10-foot strap (chain or webbing).
- Rated at flows up to 1,000 GPM.
- Most portable monitor nozzles designed to operate at:
  - 80 psi with smoothbore tip (105 psi at monitor pressure gauge).
  - 75 psi with fog nozzle (100 psi at monitor pressure gauge).
    - See *Pump Operator's Guide* for additional pressures on older nozzles.

## Caution:

- Do not operate portable monitor at angles below 25 degrees.
- Do not rotate portable monitor more than 45 degrees off center (90 degrees total).



Figure 108



## Portable Monitor Set Up Considerations

- Ensure portable monitor and portable base are firmly connected.
- Fully engage folding pin-and-hole locking mechanisms on spring loaded legs before appliance is used (**Figure 108**) above.
- Aim front leg of monitor at fire target.
- Ensure correct nozzle/tip is in place.
  - Standard smooth-bore tip is 1-3/4-inch.
- Use 10-foot strap for additional stabilization.
- Extreme barrel angles (very low or very high) can cause portable monitor to move or slide.
  - Whenever possible, place legs of portable monitor in cracks or grooves to help stabilize unit.
  - Have firefighter operating portable monitor place body weight on appliance to assist with stabilization.
- Optimum attack angle of stream is 30 degrees from horizontal.



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- With appliance 40 feet from building and stream directed through third-story window, an angle of approximately 30 degrees is formed.
- 50 degrees maximum attack angle.
  - Do not place portable monitor closer to building than height of opening into which stream is directed.
    - Forms an angle of approximately 45 degrees.
- Make stream adjustments as conditions change.
  - Position firefighter 50 feet to side of portable monitor to assist firefighter operating portable monitor with stream accuracy.
- Portable monitor positioned as an unstaffed unit can be stabilized by placing hose bundles or other appropriate items on it.

**Caution:** If portable monitor starts to move or slide, immediately shut down water flow and reposition hose lines before flowing water again.

**Note:** Quickly adjusting stream to a wide fog pattern will reduce nozzle reaction and allow time for pump operator to shut down operations.

## Portable Monitor Operations

### Instructions:

1. Fully release horizontal safety lock (**Figure 109**).



**Figure 109**



2. Release locking latch at base of unit or twist handle lock pin (**Figure 110**).

**Figure 110**



3. While pulling out on lock pin, rotate handle to release position with twisting action (**Figure 111**).
4. While holding, twist handle in release position, using other hand to support nozzle and lift monitor off base (**Figure 112**).





**Figure 111**



**Figure 112**



5. Lower monitor to waiting member on ground (**Figure 113**) below.

**Figure 113**



6. Remove portable base and strap from compartment (**Figure 114**).
-



Figure 114



7. Fully extend legs.
8. Slide monitor onto base.
  - a. Secure/lock monitor to base. Manually attempt to lift monitor up from base to ensure it has seated properly.

**Caution:** Failure to do so could result in injury.

9. Attach 4-1/2-inch double male, spanner tight, to base inlet.
10. Advance five-inch LDH at least 50 feet past desired monitor location and make a large loop.
11. Ensure last section of loop is straight for at least ten feet, ending at desired location of monitor (**Figure 115**).



**Figure 115**



12. Carry monitor to end of LDH and connect, spanner tight.

**Note:** Firefighter may opt to place monitor with base in position first and then deploy LDH to its location.

13. Attach strap around hose and back to monitor (**Figure 116**) below.

**Figure 116**



14. Use body to weight monitor.

15. Aim nozzle at target. Adjust fog nozzle (if equipped) to wide fog to reduce initial nozzle reaction. Call for water.



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16. Adjust stream width and direction.

**Note:** Use LDH hose clamp at discretion of company officer to assist with controlling water flow.

## Ladder Pipes

- Master-stream appliance attached to the tip of an aerial ladder.
- Equipped with fixed waterways.
- Capable of flowing over 1000 GPM.
  - Equipped with fog nozzles.
    - Smooth-bore tips available.
- Aerial ladder must be stabilized and properly positioned (spotted) for ladder pipe operations.
  - Proper location for spotting aerial ladder is based on the specific task to be accomplished:
    - Exposure protection.
    - Disruption of thermal column.
    - Preventing fire extension.
    - Fire control.
    - Extinguishment.

## Aerial Ladder Set Up Instructions:

1. Spot apparatus in appropriate location based on task.
  2. Stabilize aerial.
  3. Ensure nozzle is in appropriate position (ladder pipe vs. rescue).
-



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4. Advance 5-inch LDH to inlet, either at rear of apparatus or at pump panel.
5. Connect LDH to 4-1/2-inch inlet.
  - a. Valves located at pump panel or on waterway allow ladder pipe operator to control flow of water at platform.
6. Use hose clamp at discretion of company officer.

**Note:** See *Pump Operator's Guide* for standard nozzle flows.

## CHAPTER 10: SPECIAL STREAMS

### Special Streams

- Department utilizes two types of special streams:
  - Elkhart in-line educator.
  - Bresnan distributor.

### Elkhart In-Line Educator

**Video link:** [IPE 316.010 Deploy an Inline Educator](#)

- Carried on all Department engine companies.
- Used to introduce any standard liquid extinguishing agent into a fire stream.
  - Operates on the Venturi effect.
- Used primarily for Aqueous Film Forming Foam (AFFF) on Class B fires.
  - Extinguish fire or blanket flammable liquid spills to suppress flammable vapors.
- Can be used to apply Class A foam to Class A fires.



## Operating Principles of Eductors

- Elkhart eductors are calibrated to flow rated capacity at 200 psi inlet pressure.
  - At 200 psi inlet pressure, eductor will flow rated capacity, even with different nozzles and hose lays
- Most non-aspirating combination nozzles achieve rated flow at 100 psi.
  - The nozzle must, as a minimum, match the flow rate of the eductor.
- The eductor controls the flow through the entire system.
  - If inlet pressure is increased, flow of water will increase.
  - If inlet pressure is decreased, flow of water will decrease.
    - Exception to above-mentioned principle is if a nozzle with a lesser flow than eductor is used.
    - Nozzle will be the limiting factor in the system and will not allow proper proportioning of foam through eductor.
- Friction loss through the eductor is not fixed.
- Friction loss through the eductor can be calculated by subtracting the following three factors from the inlet pressure:
  - Nozzle pressure.
  - Hose friction loss between eductor and nozzle.
  - Any pressure changes due to a difference in elevation between eductor and nozzle.
- The eductor will pick up concentrate whenever the outlet pressure is less than 65 percent of the inlet pressure.

## Troubleshooting

### Screen Plugged

Check screen at end of pickup hose.



<b>Ball Check Stuck</b>	Tap metering valve lightly to free ball or remove hose fitting at eductor and check end to see that ball floats freely.
<b>Mismatched Nozzle</b>	Nozzle must be able to discharge at least 95 GPM at 100 psi for the eductor to function. Nozzles with shutoffs must be fully opened.
<b>Metering Valve</b>	Be sure metering valve has not been closed by mistake.
<b>Too Much Back Pressure</b>	Hose too long between eductor and nozzle.  Hose elevated too far above eductor.
<b>Other Factors Causing Malfunctions</b>	Kink in hose. Partially clogged nozzle.  Partially closed nozzle (now flowing 95 GPM).

## Specifications

- 13 inches long.
- Weighs approximately ten pounds.
- 52-inch pick-up tube.
- 2-1/2-inch female inlet.
- Adjustable metering valve.
- 1-1/2-inch male outlet.

## Set Up Considerations

- Ensure enough foam concentrate on hand to mitigate problem prior to starting suppression efforts.



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- Part of size-up of the incident includes foam source availability.
- Water supplied to educator by either:
  - Attaching educator directly to pump panel discharge.
  - Utilizing 2-1/2-inch hose with Camcone or Big Boy shutoff.
- Requires 200 psi at educator inlet for proper operation.
- Foam applied from educator using either 1-1/2-inch or 1-3/4-inch hose line.
  - 1-1/2-inch hose:
    - Up to 200 feet of hose when using TFT nozzle.
  - 1-3/4-inch hose:
    - Up to 500 feet of hose when using TFT nozzle.
- Foam percentage indicators located on metering valve.
  - Capable of flows from 0.5 percent to 6 percent (Error! Reference source not found.).
    - AFFF: 3 or 6 percent.
    - Class A foam: .5 or 1 percent.

**Figure 117**







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## Instructions:

1. Obtain educator and foam concentrate from apparatus (**Figure 118**).

**Figure 118**



2. Determine whether educator will be connected directly to pump panel discharge or to 2-1/2-inch hose.
3. If using 2-1/2-inch hose, determine amount of hose needed and remove nozzle tip, leaving shut off valve.
4. Attach appropriate amount of 1-1/2-inch or 1-3/4-inch hose to educator discharge for foam application (**Figure 119**).
5. Establish cache of foam from responding apparatus.
6. Cut lid off one foam bucket and use as a fill bucket.
7. Pour additional foam buckets into fill bucket.



**Figure 119**



8. Insert pick-up tube into fill bucket and set metering valve.
9. Move working line into position (from upwind side, if possible) and charge the line.
10. Apply foam as gently as possible onto surface of flammable liquid.
11. Nozzle completely open during application.
12. Avoid disturbance or dilution of the foam blanket by other streams.
13. Flush all lines and appliances thoroughly with clear water after use of any agent.

## Class B Foam Application

- Utilize 3 or 6 percent foam concentration dependent on type of fuel involved.
  - Polar solvent (alcohol based):
    - Use a 6 percent concentration for fire and vapor suppression.
  - Nonpolar solvent:
    - Use a 3 percent concentration to provide a sufficient blanket for extinguishment or vapor suppression.



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- The following methods can be used to apply a foam blanket to a spill (vapor suppression) or a flammable liquid fire:
  - Sweep Method.
  - Bank Down Method.
  - Rain Down Method.

## Sweep Method

- Use on an uncontained flammable liquid pool on a flat surface.

### Instructions:

1. Apply foam in a sweeping motion just in front of spill.
  - a. The building foam blanket floats across pool until complete coverage is achieved.
  - b. If pool is large, a firefighter may have to move around perimeter as blanket is applied (**Figure 120**) below.

**Figure 120**





## Bank Down Method

- Use in locations where an object is adjacent to the spill.

### Instructions:

1. Apply foam stream towards object and deflected off of it, allowing foam to fall down and build up a blanket that extends outward as it builds up (**Figure 121**).

**Figure 121**



## Rain Down Method

- Easiest method of application.
- Can be done from a distance if needed.

### Instructions:

1. Loft foam stream into air over spill.
  - a. As broken stream falls it generates a blanket over the liquid.
2. Take care to avoid splashing foam into liquid (**Figure 122**).



**Figure 122**



## Bresnan Distributor

- Carried on engine and truck companies.
  - Equipped with either a 1-1/2-inch or a 2-1/2-inch distributor.
- Primary objective of Bresnan distributor is to place an effective fire stream at a point where firefighters cannot operate.
- The most common application is basement fire.
  - Can also be used to assist in silo fires or any fire in densely packed material within a container that could be suppressed with copious amounts of water.
- Distributor generally placed through a hole cut in floor above basement.

## Specifications

- 1-1/2-inch or 2-1/2-inch.
- Equipped with either nine 3/8-inch or six 3/4-inch orifices (**Figure 123**).



Figure 123



- As water flows through the distributor, the distributor rotates.
- The maximum range is 15 feet in any direction, provided no obstacles are present.

## Set Up Considerations

- Placed in proper position by lowering distributor through opening in floor until it touches floor or other obstacles and then withdrawing distributor about halfway.
- Continuous lowering and raising of distributor is advisable to ensure complete coverage.
- Only 2-1/2-inch hose should be used to deliver water to the Bresnan distributor.
- Use 2-1/2-inch by 1-1/2-inch reducer when using 1-1/2-inch distributor.
- Place hose clamp 50 feet back of the 17-foot section of hose anytime a reverse lay is used to supply distributor.
  - Hose clamp may be used at discretion of the company officer when a forward lay is used.

## Instructions:

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1. Remove distributor, 17-foot section of 2-1/2" hose, hose strap and necessary equipment for cutting hole and at place at desired location.
  - a. Sound floor and use TIC to monitor floor stability.
2. Advance 2-1/2-inch line from hose bed to the distributor.
3. Remove nozzle assembly leaving bail in place. Ensure bail is shut.
4. Connect 17-foot section of hose to 2-1/2-inch hose line.
5. Attach distributor to 17-foot section of hose (**Figure 124**).
  - a. Use the 2-1/2-inch by 1-1/2-inch adaptor when using the 1-1/2-inch distributor.

**Figure 124**



6. Cut small triangle hole in floor at desired location.
7. Charge hose line, controlling flow with bail, and lower distributor into the opening simultaneously.
  - a. Maintain 70 psi at distributor for effective stream.
8. Raise and lower distributor, using hose strap as needed.



## CHAPTER 11: SUPPLYING AUXILIARY SYSTEMS

### Auxiliary Appliances

- Fire sprinkler systems.
- Standpipe systems.
- Refrigerant diffusion systems.

### Supplying Auxiliary Appliances

- When supplying auxiliary appliances, consider the status of system components to ensure adequate water flow is being delivered:
  - Post indicator valves (PIV).
  - Outside screw and yoke (OS&Y) valve.
  - Area control valves.
  - Fire pump.
  - Open/damaged discharges.
  - Sprinkler head flow.

### Instructions:

1. Establish a continuous water supply.
  - a. Place hose clamps on hose lines anytime a reverse lay is used to supply a system.
2. Do not supply additional hand lines or support supplemental firefighting efforts.
3. When firefighting operations have finished, attempt to restore auxiliary systems to full service.
  - a. Drain dry standpipes.





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- b. Open gated outlet valve at the highest outlet to allow air to enter.
- c. Open lowest outlet to drain standpipe.
  - i. If necessary, attach a hose line to the outlet to avoid unnecessary water damage.
- d. Close all gated outlet valves and replace caps.
4. Replace activated sprinkler heads using spare, on-site heads.
  - a. Request sprinkler and/or alarm technician to confirm that system is functioning properly.
5. Notify building owners/representative/occupants of condition of auxiliary appliances and of any actions necessary to fully restore or repair systems.
  - a. If needed, place auxiliary appliance out of service and:
    - i. Notify Communications Center.
    - ii. Notify Fire Prevention and Support Services Division
    - iii. Issue Notice of Correction form (FD-4) to building representative.

## Sprinkler Systems

- A system of water pipes and spaced sprinkler heads installed in a structure to control and extinguish fires.
- Considered one of the first lines of defense against spread of fire.
- Supplied by a suitable water supply, such as:
  - Gravity tank (water storage tank).
  - Fire pump.
  - Reservoir.
  - Pressure tank.



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- City water main.
- Sprinkler systems are equipped with:
  - Control valves.
  - Activation alarm.
  - Fire Department Connection (FDC) into which hose lines from a pumper are used to increase water pressure in the system.
    - Inlets typically equipped with two 2-1/2-inch, swivel, female connections protected by screw-type or breakable caps covering the inlet (**Figure 125**).
    - Some newer systems are equipped with 4-1/2-inch inlets.

**Figure 125**



## Standpipe Systems

- A vertical and/or horizontal, wet or dry water pipe used to deliver water to hand lines for firefighting operations in building complexes.
- Standpipe outlets used primarily for supplying 2-inch hose lines.
  - Use 2-1/2-inch by 1-1/2-inch reducer or a 2-1/2-inch by 1-1/2-inch gated wye.



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- The *Uniform Building Code* requires buildings four or more stories in height to be equipped with one or more wet or dry standpipes.
  - Standpipe inlet connections may be found on buildings, adjacent to buildings, in alleys, or near street at remote location from building.
  - Usually installed adjacent to fire escapes or smoke towers.
  - Standpipe outlets typically located on every floor and roof.
  - Equipped with two or more inlet connections.
    - 2-1/2-inch, swivel, female connections protected by screw-type or breakable caps.
- Outlets are gated with 2-1/2-inch male connection protected by threaded cap.

## Supplying Sprinkler or Standpipe Systems

### Instructions:

1. Spot engine at desired location near fire department connection.
2. Determine supply line to be used: 5-inch, 2-1/2-inch, or a combination of both.
  - a. 5-inch is preferable. Can be supplemented with 2-1/2-inch (**Figure 126**).



**Figure 126**



- b. If using 5-inch hose, connect 4-1/2-inch male by 2-1/2-inch male adapter (**Figure 127**) below.
- c. If using 2-1/2-inch hose, remove complete nozzle assembly from hose (**Figure 128**).

**Figure 127**





Figure 128



3. Advance line(s) to FDC.
4. Remove protective caps.
5. Evaluate functionality of FDC:
  - a. Confirm female swivel is operable
  - b. Remove any noted debris from connection
  - c. Check functionality of clapper valve
6. Connect hose to FDC.

**Note:** For multiple inlets arranged vertically, connect hose lines from the bottom to the top. For multiple inlets arranged horizontally, connect hose lines from right to left.

## Refrigerant Diffusers

- Certain types of refrigeration systems are equipped with a safety device to diffuse refrigerant into the air or into a sewage system.



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- Ammonia is the most common refrigerant in use in refrigerant systems equipped with diffusers.
- Control valves, labeled “FOR FIRE DEPARTMENT USE ONLY,” direct refrigerant into diffuser.
- Some refrigeration systems are equipped with diffusers consisting of a mixing chamber in which the refrigerant is absorbed by water and released into a sewage system.
  - Mixing chamber equipped with 1-1/2-inch or 2-1/2-inch female swivel, fire department inlet connection. Control valves, labeled “FOR FIRE DEPARTMENT USE ONLY”, direct refrigerant into diffuser.
- Smaller refrigerant systems are sometimes permitted to diffuse refrigerant to open air through manual control valves, labeled “FIRE DEPARTMENT RELIEF VALVE”
  - A diffusing fire pipe, fitted with a diffuser head, channels refrigerant to open air.

**Note:** Persons familiar with the refrigerant system may provide instructions for diffusing the system. If persons familiar with the refrigerant system are not available to provide instructions during refrigerant system emergencies, open all control valves labeled “FOR FIRE DEPARTMENT USE ONLY”.

## Supplying Refrigerant Diffusers

### Instructions:

1. Spot engine at desired location near refrigerant system inlet connection.
2. Remove nozzle or bundle and advance one 2-1/2-inch line to inlet connection.

**Note:** Use only 2-1/2-inch hose to supply diffuser.

3. Connect hose to inlet, using 2-1/2-inch by 1-1/2-inch reducer if needed.
4. Charge line and open refrigerant diffuser control valves.
5. Supply system with 500 GPM.



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- a. Calculate friction loss of 1-1/2-inch connection at 56 psi flowing 500 GPM and 2-1/2-inch connection at 9 psi flowing 500 GPM.
- b. Calculate friction loss in 2-1/2-inch hose at 50 psi per 100 feet at 500 GPM.

## Safety Considerations

- Operate control valves of refrigerant diffusers slowly to prevent liquid refrigerant from escaping from diffuser.
- Ladders may be needed to provide access to control valves of some refrigerant diffusers.
- Hose lines may be needed to protect firefighters operating control valves.



## CHAPTER 12: WILDLAND HOSE OPERATIONS

### Wildland Donut Roll

- Used exclusively for rolling wildland hose.
- Requires use of a specialized hose roller.

### Wildland Hose Roller

- The single jacket hose roller consists of a stand attachment, hose roller, metal hose removal sleeve, and a 1-inch cap (**Figure 129**).

**Figure 129**



- Typically, strike team engines, brush engines, patrols, and the OES have hose rolling capabilities (**Figure 130**) below.





**Figure 130**



Instructions (Installing the Hose Roller):

1. Place stand into receiver (**Figure 131**) below.

**Figure 131**



2. Remove 1-inch cap and place hose roller onto stand (**Figure 132**) below. Replace 1-inch cap to secure hose roller (**Figure 133**) below.



**Figure 132**



**Figure 133**

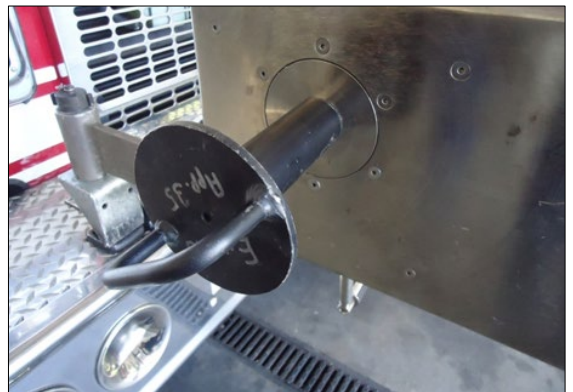


3. Slide metal sleeve onto hose roller and ensure it is flush with base of the hose roller (**Figure 134** and **Figure 135**).

**Figure 134**



**Figure 135**



## Instructions (Rolling Forestry Hose):

1. Lay hose out flat. Fold hose and place both couplings away from hose roller. This will leave a bend in the hose at the hose roller.
2. Place female coupling on bottom of the two hose layers, 36 inches from in-line T and/or male coupling. Over-lap layers of hose smoothly, aligned, and without kinks (**Figure 136**) below.



**Figure 136**



3. Once hose is set up, place fold onto pin of hose roller (**Figure 137**).

**Figure 137**



4. Take positions: One firefighter at hose roller facing turn handle and second firefighter in front of hose roller. Firefighter facing handle turns handle in direction indicated on hose roller. Second firefighter guides hose hand-over-hand, keeping outer edges even. Remove slack and keep hose straight during rolling. Ensure hose is rolled tight (**Figure 138** and **Figure 139**) below.



**Figure 138**



**Figure 139**



5. Complete wildland donut roll. Wrap female end of hose around roll, securing in-line T and/or male coupling. Secure rolled hose with rubber band or another restraining device. Pull metal hose sleeve off hose roller and remove sleeve from hose. Repeat steps 1 through 5 for additional hose rolls (**Figure 140** and **Figure 141**).

**Figure 140**



**Figure 141**





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## Wildland Hose Packs

- Each front-line engine has two wildland hose packs
- Securely fastens wildland hose in a single pack with two pouches utilizing a strap system.
- Reducing likelihood of hose self-deploying while wearing the pack.
- Hose packs contain:
  - Two 100-foot 1-1/2-inch hose rolls
    - Both 1-1/2-inch hose rolls have a 1-1/2-inch to 1-inch in-line T attached to the male coupling
  - One 100-foot 1-inch hose roll
    - 1-inch hose roll is located in the middle of the pack, on top of 1-1/2-inch hose closest to the firefighter's back.
    - 1-inch hose rolls have a 1-inch forestry nozzle attached to the male coupling.
  - In the storage pouch of one of the hose packs it should have
    - a 1-1/2-inch to 1-inch reducer (used to extend the end of the 1 1/2" hose with 1" hose for mop-up and overhaul)
    - A 1-1/2-inch forestry nozzle with a ball gate valve bale

## Building Wildland Hose Packs

### Instructions:

1. Lay out empty hose pack shoulder straps down, and hose pack straps up (**Figure 142**).
2. Place 1-1/2-inch x 100-foot hose roll (in-line T attached to male coupling) in the inside pouch of the hose pack and connect inside straps, tightening securely (**Figure 143**).

**Caution:** Failure to properly tighten straps can result in hose falling from pack.



**Figure 142**



**Figure 143**



Place the 1-inch x 100-foot hose roll with nozzle in the outside pouch of the pack. Place the second 1-1/2-inch x 100-foot hose roll (in-line T attached to male coupling) on top of the 1-inch hose roll in hose pack and connect outermost straps, tightening securely (**Figure 144**).



**Figure 144**



## Progressive Hose Lay Equipment

**Note:** Brush rigs, patrols, OES and strike team engines may have additional wildland hose and equipment (**Figure 145**).

**Figure 145**



## Progressive Hose Lay

- Intended for wildland fires that can be controlled with small-diameter hose lines.



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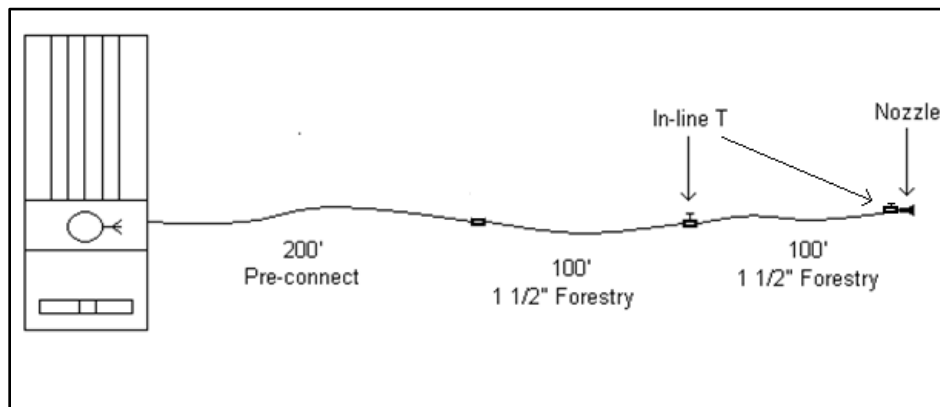
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- Utilize 1-1/2-inch and 1-inch forestry hose, variable gallon per minute nozzles, 1-1/2-inch ball valve and 1-1/2-inch to 1-inch in-line Ts
  - 1-1/2-inch hose used for primary attack
  - 1-inch hose used for mop up
- 1-1/2-inch hose lines are laid in 100 foot increments with an in-line T connected every 100 feet (**Figure 146**).

**Note:** The first in-line T is placed 300 feet from the apparatus and every 100 feet thereafter. The purpose of spacing the in-line T in this sequence is it allows for more flexibility when using 1-inch laterals to secure control line

- Threads on the 1-1/2-inch and 1-inch hose and fittings are compatible with local agencies. Threads and fittings for 1-1/2-inch hose are NH (National Hose) thread. Threads and fittings for 1-inch hose are NPSH (National Pipe Straight Hose).
  - An adapter is required if couplings are not compatible.

**Figure 146**



Instructions:

**Video link:** [IPE 316.035 Deploy a Progressive Hose Lay](#)





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The company officer designates a nozzle firefighter and a hose firefighter. Additional “hose firefighters” may be assigned as equipment, personnel and/or needs dictate. The engineer remains with the apparatus.

1. Wearing full wildland PPE, including web gear with fire shelters and hose clamp, both nozzle and hose firefighters don wildland hose packs (**Figure 147**).

**Figure 147**



2. Hose firefighter obtains 1-1/2-inch forestry nozzle with ball valve (nozzle assembly) from hose pack pouch. Engineer removes 1-1/2-inch pre-connect crosslay nozzle and replaces it with forestry nozzle assembly (**Figure 148**).

**Note:** This procedure may be performed after the 1-1/2-inch cross-lay has been deployed, based on company officer discretion.



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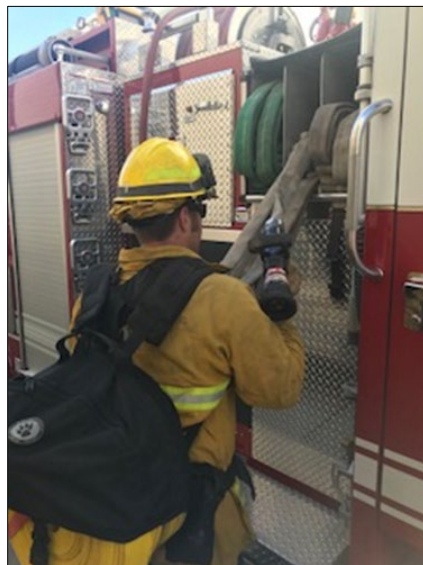
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**Figure 148**



3. The nozzle and/or hose firefighter deploy 200-foot pre-connect 1-1/2-inch crosslay and extend it to an anchor point, typically adjacent to the engine (**Figure 149**).

**Figure 149**



4. The nozzle firefighter states, “ready for water” (**Figure 150**).



**Figure 150**



5. Engineer charges hose line.
6. Nozzle firefighter adjusts the nozzle pattern to fit the type of fuel (**Figure 151**).

**Figure 151**





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7. Hose firefighter takes a position approximately 10 feet behind the nozzle firefighter to assist in advancing the hose. The Engineer may need to assist in hose advancement depending on terrain, fuel, and/or environment. (**Figure 152**).

**Figure 152**



8. Firefighters advance hose line, making a continuous wet line from the anchor point, taking advantage of natural and/or man-made barriers. A straight stream is used to knock down hot spots (**Figure 153**).

**Figure 153**





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9. While advancing the hose line, hose firefighter looks behind him/her to ensure the fire line is secure and the hose line is not in danger of burning. Additionally, hose firefighter looks for any spot fires across the fire line.
10. Hose firefighter loudly verbalizes “hose” when ten feet of slack exists in the current section of hose. This slack will facilitate in replacing a section of hose should it fail.
11. Nozzle firefighter, upon hearing “hose,” stops the advance of the line and knocks down the fire in front using a straight stream pattern (**Figure 154**).

**Figure 154**



12. Hose firefighter removes the first 1-1/2-inch hose roll from the pack of the nozzle firefighter (**Figure 155**) and unrolls it either parallel to the fire or towards the advancing hose lay (**Figure 156**).
13. The nozzle firefighter closes the nozzle and lowers the hose to the ground in preparation of adding 100 feet of 1-1/2-inch wildland hose.



**Figure 155**



**Figure 156**



14. The hose firefighter clamps use a hose clamp to shut off the flow of water to the nozzle assembly. The nozzle firefighter removes the forestry nozzle assembly.

**Note:** The engineer may have to reduce pressure or close the discharge valve to stop the flow of water to the nozzle assembly during this initial nozzle removal from the 1-1/2-inch pre-connected cross lay.

15. The hose firefighter hands the male end of the 1-1/2-inch hose roll (with attached in-line T) to nozzle firefighter. The nozzle firefighter connects the nozzle assembly to the male end of the in-line T. The hose firefighter connects the male end of the charged line to the female of the uncharged hose roll.

16. Once connections have been made, the nozzle firefighter states, “ready for water” at which time the hose firefighter slowly removes the clamp and states “water coming.”

**Note:** Engineer may need to be notified to re-establish water pressure to the hose lay.

17. Continue extinguishing fire by advancing charged hose in previous manner until hose firefighter calls out “hose”.

18. The nozzle firefighter stops the advance and knocks down the fire down in front of them. The hose firefighter removes remaining hose rolls, placing the 1-inch roll on the ground and unrolling the 1-1/2-inch roll parallel to the fire or towards the hose lay (**Figure 157**).

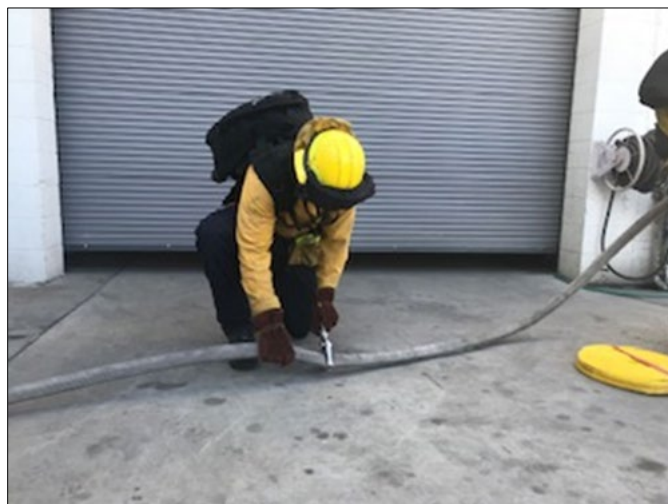


Figure 157



19. The hose firefighter clamps the 1-1/2-inch hose a minimum 18 inches behind the male coupling, rolling the hose to the center of the clamp to avoid pinching the hose (**Figure 158**) below. Pinching the hose can lead to hose failure. Should the hose clamp fail, a field clamp may be used (**Figure 159**) below.

Figure 158





**Figure 159**



20. The nozzle firefighter bleeds off the pressure and removes the nozzle assembly from the in-line T. The nozzle firefighter gives the male coupling w/ in-line T (charged line) to the hose firefighter. The hose firefighter gives the male coupling w/ in line T (uncharged line) to the nozzle firefighter. The nozzle firefighter connects the nozzle assembly and the hose firefighter connects the female coupling of the uncharged hose line to the male end of the in-line T on the charged hose line.
21. Once connections have been made, the nozzle firefighter states, “ready for water,” at which time the hose firefighter releases the hose clamp slowly and states “water coming.” The hose firefighter will take the hose clamp with him/her.
22. Repeat steps 16 through 20 as needed.
23. One-inch hose may be connected to the in-line T. This line is used for hot spots and mop-up operations.
24. Additional engine companies may extend the progressive hose lay with their equipment.

The policy outlined above may be modified at the company officer’s discretion. Modification may be most appropriate during out-of-county wildland incidents when it is more advantageous to start the progressive hose lay without the use of pre-connect handlines. Removal of the ball valve from the nozzle assembly is also at the company officer’s discretion.





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## Mop-Up Kit Pack and Equipment Inventory

Mop-up kits are carried on Fresno Fire Department Brush Engines, Patrols, 300 Series Engines and OES-314. These kits are to be used during mop-up operations on wildland fires. Members should be reminded if any of the items are left on the fireline at a major incident; an ICS-213 form should be completed and turned into supply for restocking. If not available at the incident, obtain an “S” number for reimbursement.

One Carrying Pack containing the following:

- 5 1-inch National Pipe Straight Hose (F) x Garden Hose (M)
- 2 Garden Hose Wye
- 5 Garden Hose Brass Nozzle
- 1 1-1/2-inch National Hose (F) x Garden Hose (M)
- 1 500 foot, 3/4-inch Mop-up Hose

## CHAPTER 13: HIGH RISE HOSE OPERATIONS

### 2 Inch High-Rise Hose

1. Used in conjunction with standpipe operations.
2. Primary hose used for mid-rise and high-rise firefighting

### Building 2-Inch High-Rise Hose Bundles

**Video link:** [Building the FFD High Rise Hose Pack](#)

#### Instructions:

1. In large clear area lay out 50 feet of 2-inch hose with the female coupling near the firefighter.
2. Begin first fold at black stripe located 32-inches from the female coupling. Stop the fold approximately 3-inches short of the coupling. (**Figure 160** and **Figure 161**).



**Figure 160**



**Figure 161**



3. Continue folding the hose using the horseshoe method. Alternate location of folds from short too long to keep bundle compact.
4. When completed, the male coupling should end up on the outside of the pack, on the opposite side of the female coupling. This may require some adjustments in fold (**Figure 162**).

**Figure 162**





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5. Yellow hose nozzle pack: Connect the nozzle to the male end and adjust the hose to allow the pistol grip the tuck against the folds.
6. Secure with three Velcro straps, two on the male side and one on the female side, as shown. (Figure 163 and Figure 164).

**Figure 163**



**Figure 164**



7. Red hose pack: No nozzle is attached. When pack is completed, connect the female and male coupling together (Figure 165).

**Figure 165**





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8. If couplings do not end up on opposite sides of the bundle, adjust length of folds and/or work hose back from male coupling, forming a fold that can be tucked into a pack on opposite side of male coupling (**Figure 166** and **Figure 167**).

**Figure 166**



**Figure 167**



9. Secure with 3 Velcro straps, two on the male side and one on the female side, as shown (**Figure 168** and **Figure 169**).

**Figure 168**



**Figure 169**





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## Utilizing 2-Inch High-Rise Hose Bundles

- Two 50 foot 2-inch high rise hose bundles carried on each engine company.
- One red bundle, one yellow bundle (with nozzle).

## Advancing 2-Inch High Rise Hose Bundles

- Type of hose stretch used and number of 50-foot bundles needed to access and extinguish fire is considered prior to committing to IDLH.
- Typically deployed in one of two methods:
  - Stairwell Stretch
  - Hallway Stretch

## Instructions (Stairwell and Hallway Stretch):

**Video link:** [FFD High Rise Hose Deployments Stairwell and Hallway Deployment \(July 2016\)](#)

1. Both stretches start with a minimum of three 50-foot bundles, all the same color.
2. Bundles are lined up next to each other in hallway on floor below fire (**Figure 170**) below.
  - a. Male couplings (side with two Velcro straps) facing point of entry.
  - b. Nozzle bundle closest to stairwell door.



**Figure 170**



3. Remove Velcro straps and connect bundles together.
4. Standpipe control firefighter takes high rise equipment bag to standpipe connection (specific duties described later in this document).
5. Company officer determines if Stairwell or Hallway Stretch is to be used.
6. Back-up firefighter secures middle (identified by a thick black line) of last hose bundle.
7. Captain or second firefighter secures female coupling of last hose bundle.
8. The back-up firefighter stretches middle of last hose bundle down hallway, away from stairwell.
9. Captain or second firefighter advances female coupling to standpipe. This forms a large “U” shape with no kinks in the hose line (**Figure 171**) below.

**Note:** 2-Out line is set up the same for both Stairwell and Hallway Stretch.



**Figure 171**



## Stairwell Stretch

- Hose line is deployed and charged in relative safety of stairwell.
- Can be used for center hall or center core construction buildings.
- Must be used if:
  - Fire floor hallway has been compromised by smoke or fire.
  - Crews are unable to control door to fire room.
  - Center core construction building.

## Instructions:

1. Nozzle firefighter places nozzle hose pack on shoulder while back-up firefighter moves second bundle (still in a horseshoe load, lying on the floor) to stairwell entrance (**Figure 172**) below



Figure 172



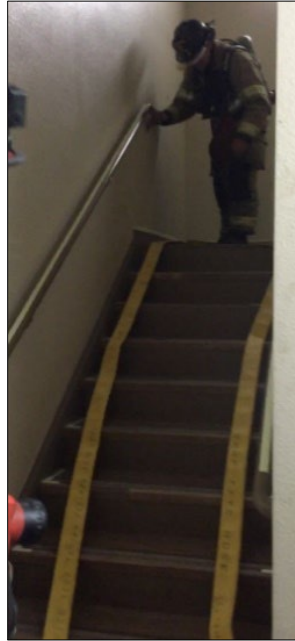
2. Nozzle firefighter advances upstairs and places shoulder loaded hose bundle on landing of fire floor. Hose from second bundle with self-deploy as nozzle firefighter advances up stairwell.
3. Back-up firefighter goes to landing and grasps middle of nozzle bundle and advances it up next flight of stairs. The back-up firefighter secures hose and stays at top of stairs until line has been charged (**Figure 173**).

**Note:** Do not advance hose around the stairway corner.





**Figure 173**



4. Captain advises members to take up slack.
  - a. Members back hose down stairwell and into hallway below fire floor until all kinks have been removed.
5. Once all kinks have been removed, the line is charged.
6. Nozzle firefighter position themselves three feet from fire floor door. Back-up firefighter secures hose from sliding down stairwell by kneeling on hose.
7. Once hose has been charged, nozzle firefighter bleeds air and checks flow prior to entry.
8. All crew members (with exception of standpipe control firefighter) assist in advancing hose to fire.
  - a. Members located at pinch points or tight bends



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## Hallway Stretch

- Allows firefighters to advance dry hose directly to fire room door.
- Used in center hallway construction where there is no smoke or fire in hallway and where door to fire room is closed and can be controlled.

### Instructions:

1. Nozzle firefighter and back-up firefighter place first two bundles on their shoulders.
2. The firefighters advance up stairwell to fire floor door.
3. Captain re-confirms that fire floor hallway does not have an IDLH prior to crews entering hallway.
4. Once in hallway, back-up firefighter places second hose bundle on hallway floor, near stairwell door.
5. Nozzle firefighter, with nozzle bundle on shoulder, advances to closed fire room door. Once at door, nozzle firefighter places bundle on floor, outside fire room door (**Figure 174**) below.

**Figure 174**





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6. Back-up firefighter secures middle of nozzle bundle and stretches it away from fire room door, forming a large U (**Figure 175**).
  - a. Nozzle firefighter secures nozzle.

**Figure 175**



7. Captain gives order to take up slack and then contacts standpipe control firefighter to charge line.

## 2-Out Line

- If there are no known rescues in fire building, second hose line is set up as a 2-Out line.
- If there are known rescues, 2-Out line can be used as a secondary attack line.

## Instructions:

1. Enter floor below fire and proceed down hallway, moving well past fire attack crew.
2. Make initial hose set up in a portion of the hallway that minimally affects fire attack crews set up.



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3. Connect a minimum of three high rise hose bundles, all the same color, together in same manner as previously described (**Figure 176**).

**Figure 176**



4. Back-up firefighter secures middle (identified by thick black line) of second hose bundle.
5. Captain or second firefighter secures female coupling of last hose bundle.
6. Back-up firefighter stretches middle of hose down hallway, away from stairwell.
7. Captain or second firefighter advances female coupling to standpipe. This forms a large “U” shape utilizing all hose bundles, with no kinks in the hose line (**Figure 177**).



**Figure 177**



- a. If hallway is not long enough to fully stretch hose out without kinks, open a door to adjacent room near end of hallway and continue extending hose into room.
8. Extend uncharged 2-Out line up stairwell to safe spot in stairwell, out of IDLH.
9. Confirm kinks are out of hose line and charge line.

## Standpipe Control

- Engineer on fire attack crew typically assigned to position.
- Stays and monitors standpipe for duration of event.
- Communicates with both pumping apparatus and Fire Attack and 2-Out Crew

## Instructions:

1. Standpipe control firefighter brings high rise equipment bag to standpipe connection.
  - a. Chocks stairwell door.
2. Removes standpipe cap and checks functionality.



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3. Flushes system and connects:
  - a. In-line pressure gauge.
  - b. 60-degree elbow.
  - c. 2-1/2-inch gated wye.
4. Connects Fire Attack and 2-Out line to gated wye (**Figure 178**).

**Figure 178**



5. Assist crews with taking up slack when directed.
6. Charges lines when directed.
  - a. With one line flowing, set pressure to 95 psi.
  - b. Monitor pressure gauge/water flow for issues.
7. If attack crews relate water pressure issues:
  - a. Check pressure gauge.
    - i. If gauge shows low pressure, issue is between pumping apparatus and standpipe discharge.



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- ii. If pressure gauge shows enough pressure, issue is between standpipe discharge and nozzles.
  - 1. Check/advise crews to check for kinks.



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## CROSS REFERENCES

### *Training and Equipment Manual*

[Section 301.010 - Annual Service Test for Fire Hose](#)

[Section 301.011 - Hose Maintenance and Repair](#)

[Section 316.002 - Deploy a Pre-Connected Hose Line](#)

[Section 316.006 - Advance an Apartment Lay \(Line 1\)](#)

[Section 316.008 - Deploy a Large Diameter Hose Supply Line](#)

[Section 316.009 - Deploy a Packing House Loop \(Line 2\)](#)

[Section 316.010 - Deploy an In-line Eductor](#)

[Section 316.035 - Deploy a Progressive Hose Lay \(2 Person\)](#)





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