HOSE

7 . HOSE

7.1 Developing an effective fire stream is one of the most basic fundamentals of any fire fighting operation. Hose is the primary tool for the application of water. The proper selection, use, care and maintenance of hose will determine if an effective fire stream can be delivered.

7.2 HOSE SPECIFICATION

7.2.1 The most common sizes of hose carried by engine companies are:

DIAMETER	COUPLING	LENGTH	MAX. WORKING PRESSURE
1 3/4”	**1 1/2”**	**50’**	**250 PSI**
2 1/2”	**2 1/2”**	**50’**	**250 PSI**
3 1/2”	**3”**	**50’**	**250 PSI**

7.2.2 Marine companies have 3 1/2 inch hose with 3 1/2 inch couplings.

7.2.3 High pressure engine companies carry 3 inch high pressure hose with 3 inch couplings. This hose has a maximum working pressure of 600 psi. High pressure hose couplings and fittings are painted white for identification and are noticeably heavier than standard couplings and fittings.

7.2.4 The Satellite Water System uses 5 inch large diameter hose (LDH) with 4 1/2 inch couplings.

7.2.5 Pursuant to the requirements determined by the Bureau of Operations, each engine company should maintain a minimum of (20) twenty lengths of 1 3/4 inch, (30) thirty lengths of 2 1/2 inch and (10) ten lengths of 3 1/2 inch hose. This includes hose for winter operations, standpipe operations and replacement lengths stored in quarters as well as that which is carried in the apparatus hose beds. Greater amounts of hose may be carried by specific units depending upon the individual units requirements.

7.3 HOSE IDENTIFICATION

7.3.1 Each length of hose is marked as follows:

Marking	Location
Hose manufacturer’s name or trademark	Both ends of hose, not less
Date of manufacture	than 4 feet from couplings
Coupling manufacturer’s name or trademark	Female coupling
Date of Issuance to unit	
Company and registry numbers	Male coupling

7.3.2 The date of issuance is to be entered in the Office Record Journal as required by Sections 13.2.5 and 15.3.1 of the Regulations.

7.3.3 The date of issuance is also the date to be referred to in Department correspondence.

7.4. IDENTIFICATION OF HOSE AT FIRES

7.4.1 Units should consider the use of chalk or a grease pencil to identify hose lines. Some units maintain small chalkboards at the pump panel for this purpose. ECC's from other units simply mark the hose attached to the discharge elbow or the discharge gauge with a grease pencil. Color coded pump panels on all engines purchased after 12/01/92 should also help to eliminate confusion in identifying hoselines.

7.5 HOSE PRESSURE

7.5.1 **The maximum pressure in hose lines should be limited to 250 psi.** Only emergency needs which allow for no other corrective action permit the use of higher pump pressures. Pressures in excess of 250 psi can only be ordered by the IC.

7.5.2 Hose line pressure should approach as nearly as possible the ideal pressure required for the stretch. The ideal pressure is a function of:

- Friction loss in the hose, fittings, and appliances.
- Required nozzle pressure.
- Head loss or gain.

7.5.3 Excessive pressure in a hoseline wastes engine power, may cause a burst length, may result in an ineffective stream, and may endanger personnel if control of the line is lost.

7.5.4 In order to supply the correct pressure in a hoseline, the following information must be known:

- Type of nozzle and/or size of nozzle tip.
- Number of lengths of hose in the stretch and its size.
  Ex: 6 lengths of 1 3/4 inch hose
  3 lengths of 2 1/2 inch hose
- Number of floors or stories above or below grade where nozzle is operating.

7.5.5 To reduce friction loss, keep hoselines as straight, as short, and as free of kinks as possible. Kinks in hoselines can significantly reduce required flows and must be removed as soon as possible.

7.5.6 Kinks should be removed manually. Attempting to straighten kinks hydraulically by use of unwarranted pressures is not good practice.

7.6 HOSE USE AT FIRES

7.6.1 The 1 3/4 inch handline is the primary attack line used at structural fires. This hose when used in conjunction with the 15/16 inch MST and controlling nozzle, provides an adequate fire stream and has better maneuverability and easier handling than the larger 2 1/2 inch handline. At a nozzle pressure of 50 psi, the 1 3/4 inch handline will flow approximately 180 gpm.

7.6.2 Company officers may order the stretching of 1 3/4 inch hose at fires as the initial line if its use is compatible with fire conditions and the extinguishing capability of the 1 3/4 inch hose is weighed against:

- The fire's magnitude, location and potential for spread.
- The occupancy of the structure and possible life hazard.
- The advantages to be gained by an increased speed in stretching and the increased mobility of the line, versus the need for a greater water delivery rate to control the fire.

7.6.3 The use of 1 3/4 inch hose would be inappropriate and a company officer should not order it stretched if any of the following conditions exist:

- The line is expected to be used from a purely defensive position.
- An advanced fire on arrival.
- A large volume of water is required to cool a superheated fire area.
- A large body of fire in a large uncompartmented area.
- When the officer cannot determine the size or extent of the fire or fire area.

7.6.4 Officers in command at fires may order 1 3/4 inch hose stretched as the second or third line when in their judgment it is compatible with fire conditions and their strategy of extinguishment/containment and/or exposure protection.

7.6.5 Officers in command at fires may order several 1 3/4 inch hose stretched into exposures when it is compatible with fire conditions and their strategy of extinguishment/containment and/or exposure protection.

7.6.6 All hoselines stretched from standpipes shall be 2 1/2-inch diameter hose with controlling nozzle and 1 1/8 inch MST tip. All hoselines lines stretched from standpipes shall be connected to outlets on floors below the fire floor.

7.6.7 The use of 2 1/2-inch hose line at standpipe operations is required due to the large volumes of water it can deliver with low friction loss per length. The 1 1/8-inch MST will produce a fire stream at extremely low pressure and is difficult to clog. (DO 116/99)

7.6.8 3 1/2 inch hose is used to provide greater water flows with less friction loss. This hose should be used to:

- Supply standpipe and sprinkler systems.
- Supply large caliber streams.
- Relay water to other engine companies.
- In-line supply for the first due engine company.

7.7 COUPLING HOSE

7.7.1 Coupling hose with two firefighters

- One firefighter holds the hose under the right arm, near the male coupling.
- The male coupling is extended, held with two hands about belt high. The male coupling is held steady.
- The second firefighter holds the second length under the right arm, close to the female coupling.
- The female coupling is extended to the male, a quarter turn is taken to the left, to seat the coupling, then it is swiveled to the right.
    a. The first thread of both couplings is blunted with a Higbie cut. This serves a dual purpose; it protects the threads and also makes coupling easy.
    b. One lug, on each coupling, male and female, has a cut in it. If the two cuts are lined up, the hose is in position for coupling. In this case the quarter turn mentioned above is not required.

7.7.2 Coupling hose with one firefighter - Method A

- Step on the male end of the hose directly behind the coupling. This raises the coupling off the ground.
- Take the female coupling of the second length and seat it by taking a quarter turn to the left. Then turn to the right to tighten it.

7.7.3 Coupling hose with one firefighter - Method B

- Hold the male butt up between your two feet
- Take the female coupling of the second length and seat it by taking a quarter turn to the left. Then turn the female swivel to the right to tighten.

7.7.4 The hose is uncoupled by reversing any of the foregoing procedures.

7.7.5 Couplings are made up right-threaded. To tighten they are turned to the right (as you work behind them), and to the left to loosen.

7.7.6 Couplings are made up hand tight. Use a spanner if couplings leak.

7.7.7 Direction of male threads: Normally point in the direction of water flow.

7.7.8 Basic coupling situations and solutions:

Situation		Adjustment		Fittings Needed
Sex	Size	Sex	Size	
Different	Same	No	No	None

Fig. 7-1

Situation		Adjustment		Fittings Needed
Sex	Size	Sex	Size	
Same	Same	Yes	No	Double male connection or double female connection

Fig. 7-2

Fig. 7-3

Situation		Adjustment		Fittings Needed
Sex	Size	Sex	Size	
Different	Different	No	Yes	Reducer or Increaser

Fig. 7-4

Fig. 7-5

7.8 HOSE CARE

7.8.1 While operating at fires, frequent checks should be made of the hose line to assure that it is not in danger of being burned. Particular attention should be paid to this under the following conditions:

- When the hose is stretched through scuttles to the roof to fight a cockloft fire or as a protection line.
- When the hose is laid on combustible flooring on the floor above the fire.
- When the hose is stretched at large area brush or rubbish fires.
- When the hose is stretched above or past the main body of fire to cover rescue efforts.

7.8.2 When stretching hose to the fire building, be aware of falling glass, it can cut the hose as well as injure members.

7.8.3 During overhauling, particular care must be exercised to keep hose out of hot beds of ashes and away from concealed fires.

7.8.4 If possible, the hose shall be kept out of contact with acids, chemicals, gasoline, oils, paints, etc.

A. If possible, the hose shall not be dragged through debris or water contaminated with any of these materials.

7.8.5 Hose butts and couplings should not be dropped or dragged on the ground unnecessarily.

- During overhauling, when taking up from operations, and at drills, there is no valid reason for dragging butts.
- To avoid dragging when moving uncoupled hose, carry the butts and pull the hose. If sufficient manpower is available, carry the hose clear of the ground.

7.8.6 Apparatus shall not be driven over hose lines unless absolutely necessary. When it is necessary to drive over hose lines, the following precautions should be taken:

- Charge the line if possible. Hose is more susceptible to damage when it is uncharged than when it is charged because the wheels tend to separate the jacket from the rubber lining of dry hose.
- Running over couplings should be avoided.
- To prevent the hose from bursting, speed should be reduced to a minimum.
- 5-inch hose should not be driven over unless properly bridged.

7.8.7 Before stretching hose lines through windows or through broken glass doors, trim off all shards of glass to prevent the hose from being cut.

7.8.8 Use hose rollers and ropes where the situation calls for it.

7.8.9 Hose stretched on the outside of buildings, via fire escapes and in stairwells should be secured with hose straps or rope to remove the water weight from the couplings.

7.9 RESULTS OF IMPROPER CARE AT FIRES

7.9.1 Fires and hot embers in contact with hose can damage the jacket and cause burst lengths and ultimately the destruction of the hose.

7.9.2 Heat in contact with the hose will cause hardening and cracking of the rubber lining.

7.9.3 Acids and some other chemicals in contact with hose will attack and weaken the jacket.

7.9.4 Oils, paints and gasoline, if left in contact with hose, will seep through the jacket and cause deterioration of the rubber lining.

7.9.5 Dropping or dragging butts and couplings can burr threads, sharpen lug edges and wear out identifying numbers. It could also lead to couplings becoming out of round or cracked.

7.10 FROZEN HOSE

7.10.1 The following methods should be considered to free hose from ice:

- Chop the ice away carefully so as not to cut the hose jacket.
- Use the thawing apparatus.

7.10.2 The following methods should be considered to free frozen couplings:

- Use the thawing apparatus.
- Heat from the exhaust pipe of the apparatus.

7.10.3 Transporting frozen hose to Quarters:

- Frozen hose may be transported on pumpers, provided long round turns are made when placing it on the apparatus.
- Frozen hose shall be handled and bent as little as possible.
- If the hose is frozen solid, consideration should be given to transporting it on aerial apparatus. The hose can be laid out straight, which will avoid damage through bending.

7.10.4 Upon return to quarters, the frozen hose should be allowed to thaw out naturally before any maintenance is performed on the hose.

7.11 HOSE REMOVAL AND HOSE MAINTENANCE

7.11.1 Hose on the apparatus is removed and cleaned in the Spring and Fall of each year in accordance with Section 13.3.24 of the Regulations.

- Periodic removal of the hose is required in order to prevent permanent creases from developing and for necessary servicing.
- Officers on duty shall remain in apparatus quarters to supervise hose changes.
- Hose shall be removed from the apparatus, cleaned if necessary, inspected, and repacked.
- Hose with aluminum alloy couplings should be uncoupled monthly and the threads greased to prevent seizing.
- Dirty threads should be brushed clean in a pail of soapy water and then rinsed.
- Female couplings should turn freely. The collar in the back of the swivel should be cleared of dirt and residue in order to prevent binding. Spinning the coupling in soapy water will assist in cleaning the threads and the swivel.
- Hose that has been used at a fire, emergency or drill should be drained and cleaned if necessary.
- Hose exposed to chemicals, oils, acid, etc., must be properly decontaminated and should not be repacked on the apparatus. Assistance from the Hazardous Materials Unit should be requested for proper treatment of the hose.
- Hose that has been used to carry salt water should be flushed thoroughly with fresh water.
- Hose may be exposed to salt used for snow removal or may be covered with salt water during operations at waterfront fires. Hose so exposed should be thoroughly scrubbed and rinsed off in order to remove salt deposits.

7.11.2 Hose should be inspected before being placed on the apparatus.

- Do not place a length of hose in service which is of doubtful strength because of cuts, chafed areas or other noticeable defects.
- If the serviceability of a length of hose is in doubt, test it to 250 psi.(see Sec.7.14, “Hose Test Procedures”).
- Before connecting lengths of hose, the couplings should be checked for cracks, out of round, burred threads, and the presence of a washer in the female coupling.
- Washers should be resilient, not dried out or cracked. To test the resiliency of a washer, remove it from the coupling and fold it between your thumb and forefinger. If it does not crack and returns to shape quickly, it may be returned to the coupling. If it cracks or shows sign of deterioration, replace it. Engine companies should maintain spare washers for each size hose carried, both in quarters and on the apparatus. Spare washers may be requested from the Division of Technical Services.

- The proper sized washer should be used and it should not protrude into the water way.
- If couplings are cracked, out of round, have burred threads or bound swivels, the hose must be sent to Division of Technical Services for repair or replacement.

7.12 HOSE LOADING

7.12.1 Conditions vary in individual response areas throughout the city. Division, battalion and company commanders shall consult and agree on the hose loading method and the number of lengths that will best suit the needs of each response district.

7.12.2 The typical hose load has:

- One bed of 3 1/2 inch hose.
- One bed of 2 1/2 inch hose.
- Two beds with lead lengths of 1 3/4 inch hose coupled to 2 1/2 inch hose to finish out the load.

7.12.3 No more than six lengths of 1 3/4 inch hose shall be used as lead lengths in any hose stretch. Greater friction loss in 1 3/4 inch hose precludes the use of more lengths without the danger of exceeding the maximum permissible working pressure of 250 psi.

7.12.4 When loading hose, fold it neatly, compactly and uniformly. Loading hose correctly allows the hose to play out properly and at the same time indicates to the public and to the Department, the state of supervision and spirit of the company.

7.12.5 When folding hose, avoid old bends since repeated bending in the same spot leads to kinking and to cracking of the rubber lining.

7.12.6 Do not permit the hose to lie over on its edge.

7.12.7 Loading the hose in the hose bed (see Fig. 7-6):

A. Load hose from left to right.

B. Start hose loading with the coupling extended beyond the hose bed.

C. Lay the hose straight back to the left rear of the compartment.

D. Fold the hose at the rear and bring it about halfway forward on top of itself.

E. At this halfway point, veer the hose slightly to the right so as to come alongside of the first fold.

F. Repeat the movement back and forth moving from left to right. Upon completing the first layer, fold the hose at the right rear side and cross diagonally to the left front side, and repeat until the hose loading is complete.

G. Hose folds are made several inches beyond the edge of the hose bed for ease in grasping and removing. Keep folded ends even.

H. Avoid folding hose too close to the coupling.

I. To insure the hose lies flat on the bed, avoid twisting the hose when coupling it.

J. Do not force extra fold across the width, since this will interfere with removal.

7.12.8 Some companies load one or more lengths of 1 3/4 inch hose in a horseshoe. This is formed by placing the hose on edge and folding the hose back and forth in the shape of a horseshoe (see Fig. 7-7). The horseshoe permits ease in grasping and stretching and ensures exactly one length of hose is removed

7.12.9 Company commanders shall establish a method whereby a length of 3 1/2 inch hose can be stretched from either side of the apparatus in the event a hydrant hookup with a standard hydrant connection is not feasible.

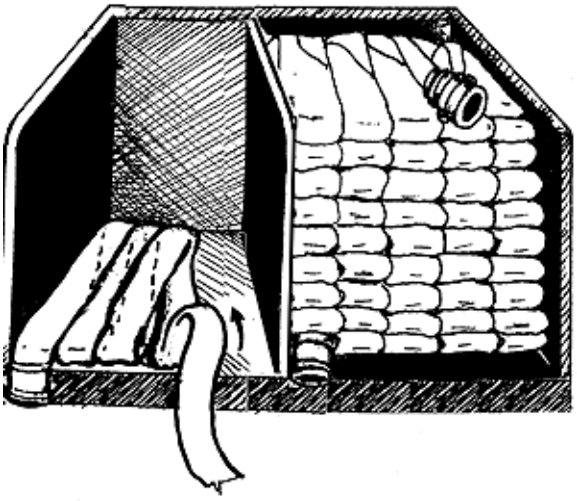


Fig. 7-6

Fig. 7-7

7.13 ROLLED AND FOLDED HOSE

7.13.1 As required by Section 13.2.8 of the Regulations, engine companies shall carry not less than three lengths of 2 1/2 inch and not less than three lengths of 1 3/4 inch hose (rolled or folded) and the necessary fittings to place a line into operation including, but not limited to, appropriate hydrant wrenches, reducers, nozzles, etc.

7.13.2 Rolled Length

A. Lay the hose out flat and straight for its full length.

B. Take the male end and double it back on itself.

C. Place the male butt about 3 feet from the female coupling (see Fig. 7-8)

D. Beginning at the folded end, roll the doubled hose tightly toward the couplings (allow a hand hole about the size of a fist at the doubled end for carrying the hose).

E. One member rolls the hose while a second member keeps the hose straight and removes slack.

F. Secure the rolled up length with a short piece of rope (see Figs. 7-9 and 7-10)

G. Hose which is to be sent to the Division of Technical Services shall be single rolled with the male butt inside.

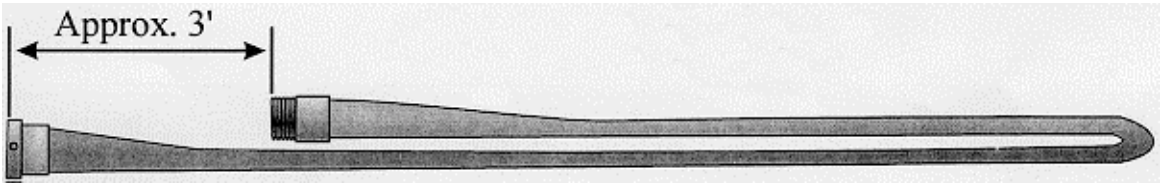


Fig. 7-8

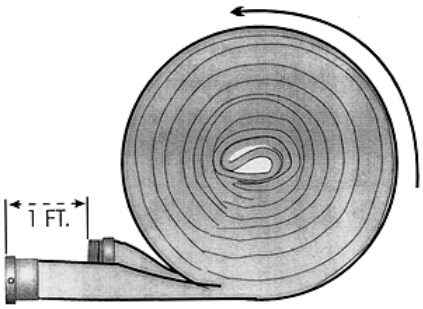
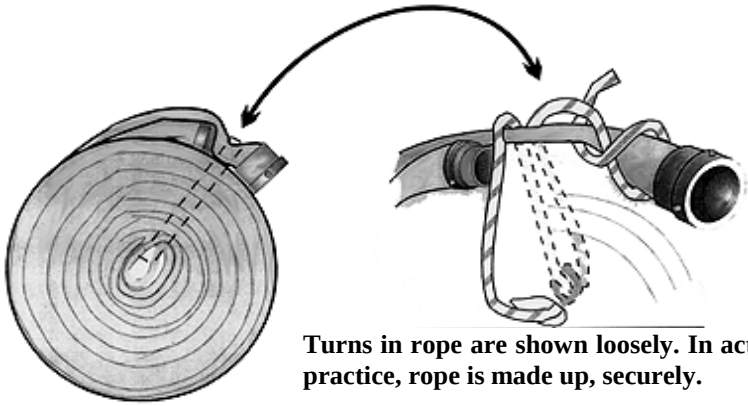


Fig. 7-9



Turns in rope are shown loosely. In actual practice, rope is made up, securely.

Fig. 7-10

7.13.3 Folded length - Short Fold

A. Lay one length of hose folded halfway with the 2 butts side by side.

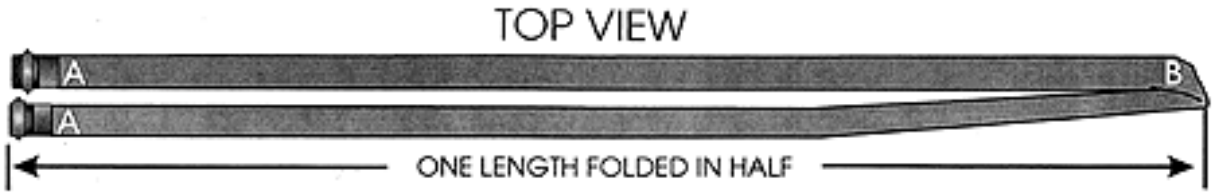


Fig. 7-11

B. Fold ends A (2 butts) back on the hose to the center.

Fig. 7-12

C. Bring end B to a point 9 inches away from butts A

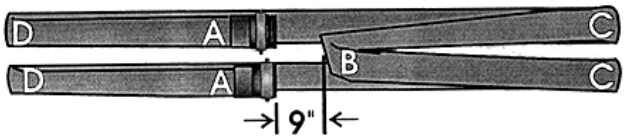


Fig. 7-13

D. Bring fold C over and on top of fold B, then bring folds D over and on top of butts A. This tends to lock butts more securely when fold is completed, preventing them from slipping out the side where they might cause injury or be subject to damage.

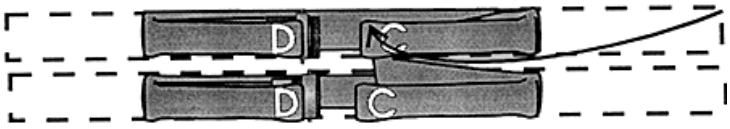


Fig. 7-14

E. Bring folds F up and over to folds E, entrapping butts A securely in folds.

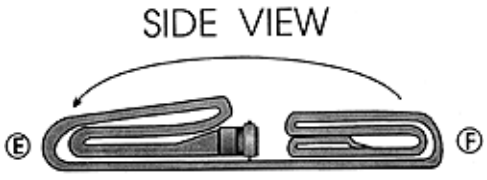


Fig. 7-15

F. Secure the completed folds as indicated by dotted lines

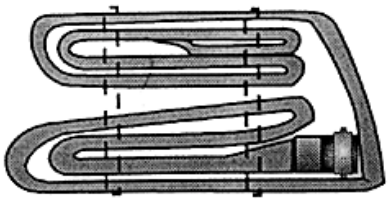


Fig. 7-16

7.13.4 Folded Length - Long Fold

A. Lay one length of hose folded halfway with the 2 butts side by side.

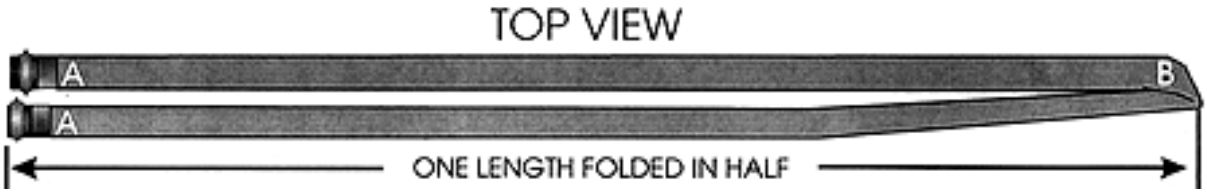


Fig. 7-17

B. Fold ends A (2 butts) back on the hose to the center.

Fig. 7-18

C. Bring end B to a point 9 inches away from butts A

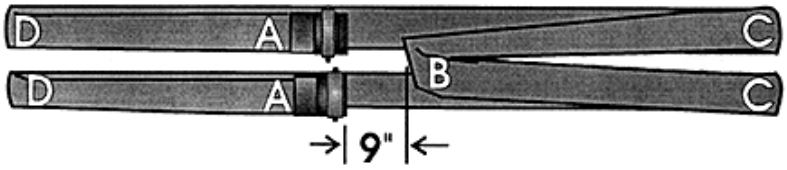


Fig. 8-19

D. Bring fold C over and on top of folds D. At the same time fold B is held secured and brought over and in back of butts A holding butts in place. Secure the completed fold at the places indicated by dotted lines.

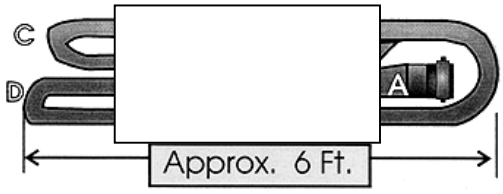


Fig. 7-20

7.14 HOSE TEST PROCEDURES

A. All hose and butts must be free of dirt and debris before testing.

B. Conduct a visual inspection of hose while preparing it for test and prior to charging with water. The following defects noted during the inspection would exclude the hose from being tested.

- Abrasions.
- Mildew or rot.
- Burnt hose jacket.
- Worn hose jacket, be sure to inspect area immediately behind couplings for this condition.
- Dried, cracked or broken gaskets.
- Damaged couplings; e.g., out of round.

C. Test Procedure:

1. Choose a remote or protected area.
2. Connect pumper to hydrant using inlet on side of apparatus opposite the control panel.
3. All connections are to be spanner tight.
4. Attach one way gate to pumper outlet.
5. Attach 4 1/2 inch to 2 1/2 inch reducer to 6 way manifold (see Fig. 7-21).
6. Attach the in-line hose test gauge to reducer (see Fig. 7-21).

Note: Before starting any operation, units shall check the tightness of the set screw of the in-line gauge.

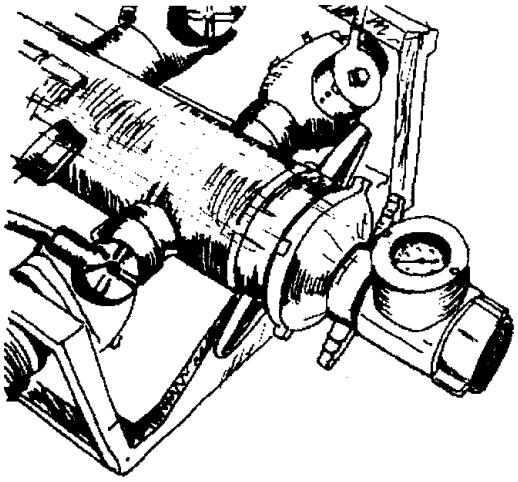


Fig. 7-21

7. Stretch a maximum of two lengths of hose from one way gate to hose test gauge. Hose must be stretched from an outlet which is on the side of apparatus opposite the control panel. This hose is also being tested. Replace it if more hose is to be tested.

   Note: Only 2 1/2 inch hose shall be used to supply the manifold during hose testing operations.

8. If manifold is equipped with a relief valve, the 2 1/2 inch relief valve discharge must be capped and the valve kept in the fully closed position. This relief valve is not to be used during the test.

9. Attach hose to outlets of manifold. Up to 6 lengths of hose (300 feet) may be stretched from each of the 2 1/2 inch gated outlets (see Fig. 7-22).

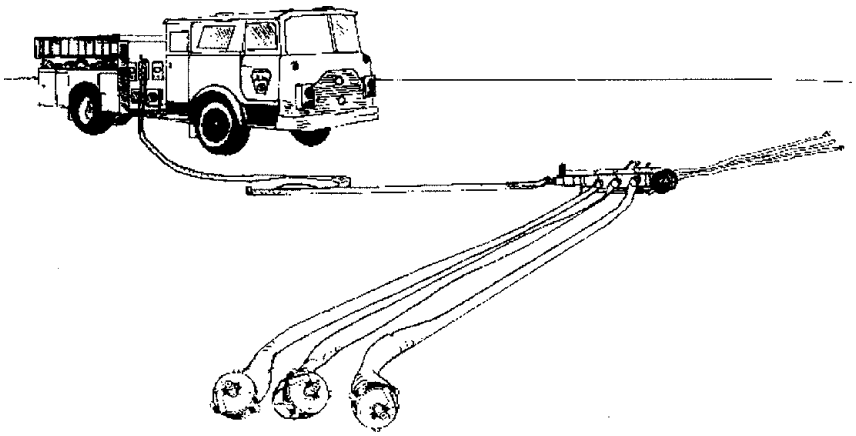


Fig. 7-22

10. Attach drain valve cap to male coupling of last length (see Fig. 7-23 & 7- 24).

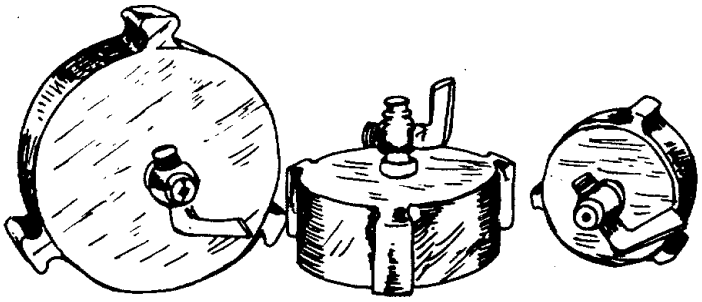


Fig. 7-23

Fig. 7-24

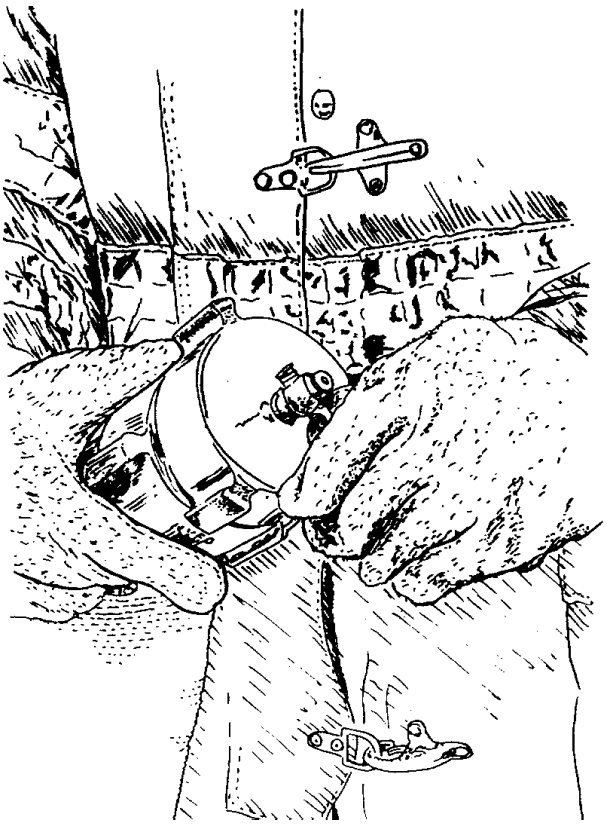
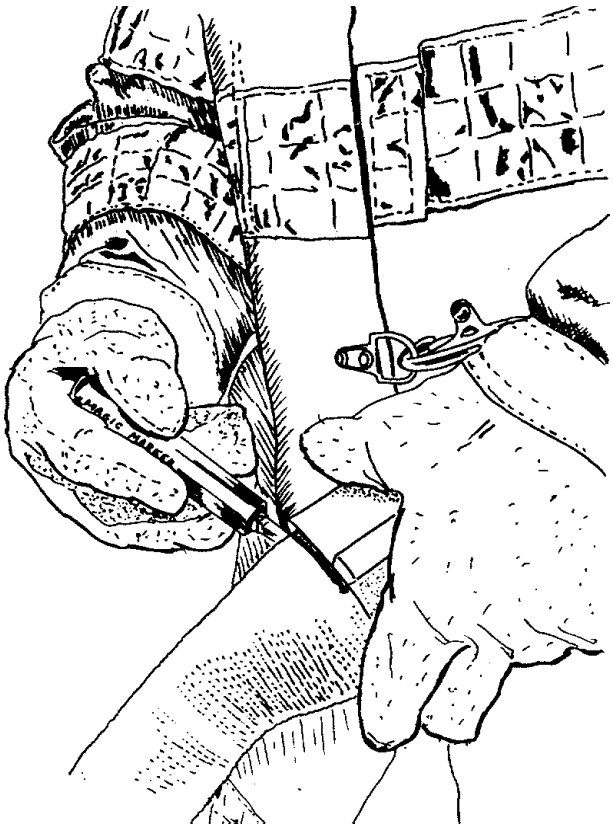


Fig. 7-25



11. A water soluble marker is used to mark and draw a line around the circumference of the hose (see Fig. 7-25). It should be as close as possible to the male butt at each coupling. A movement of 1/8 inch or more during the pressure test would indicate the male butt and hose are separating. If this happens, place length OOS.
12. Close the 6 outlets and 6 drain valves on the manifold (see Fig. 7-26).
13. Charge pumper.
14. Open the one way gate fully.
15. Charge the manifold with hydrant pressure.
16. Open gates on the 6 way manifold and charge all hose lines.
17. Raise the end of each length so that the drain valve is above the discharge gate. Bleed air from line by opening the spigot on the cap. Air is drained when water flows freely. If air is not drained, a greater reaction will occur if the hose bursts. After bleeding the line, close the spigot (see Fig. 7-27).

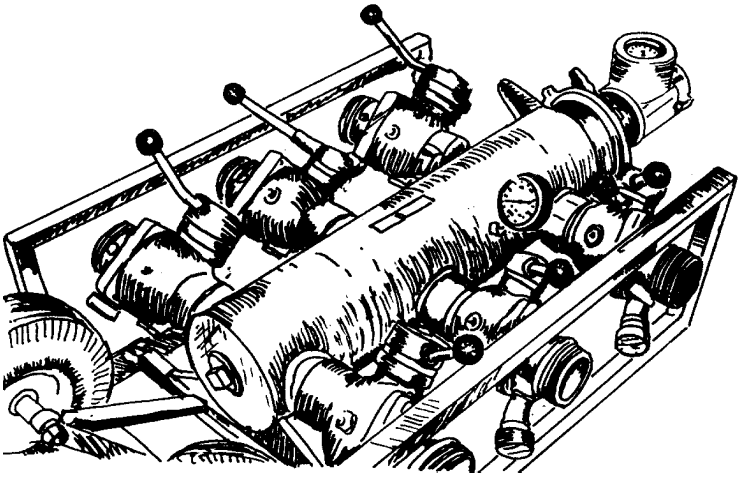


Fig. 7-26

Fig. 7-27

18. When all lines have been bled of air, fully close the one way gate (see note 3).
19. Place one firefighter on the left side of manifold facing the hose at a distance of 15 feet from the hose (see note 2).
20. Officer should assure that all other members are positioned a safe distance away. These members are to be used to secure the area during the test.
21. Officer is to make an inspection of the setup before commencing the test.
22. Officer orders ECC to gradually increase pressure, until 250 psi is noted on the hose test gauge (see note 4).
23. Officer makes a final visual inspection of entire hose test system. If all parts are operational, the officer moves to a safe position to observe hose test and insures the safety of the members.
24. 250 psi shall be maintained for five minutes and then gradually reduced to hydrant pressure.
25. Pumper outlet is then closed.
26. Drains on apparatus and 6 way manifold are opened to relieve any remaining pressure.

27. Hose is examined for:

    a. Damage to hose jacket

    b. Hose separating from butt

    c. Other damage

28. Defective hose must be reported as per Manual of Requisitions and Payroll.

D. Chauffeurs must be aware that during the 5 minute test there is no movement of water in the pumps. They must check for over heating of the pumps while test pressure is being applied. This is done by placing a hand on the 4 1/2 inch inlet on the control panel side of the apparatus. (NOTE: This is the inlet not being used to supply water). When heat is noted the following steps must be taken to avoid possible damage to the pumps. The step(s) taken will depend on the type of apparatus used.

   If any of the below options DO NOT correct the heat buildup, shut the pumper down and discontinue the test. The Fleet Maintenance Division must be notified if this problem cannot be corrected.

   1. The booster tank fill valve should be partially opened with water showing at the fill pipe in the booster tank. Fully open the tank to pump valve. This will guarantee a circulation of water around the pumps. Water will also be relieving from the overflow in the booster tank.

   2. Another option is to fully open the bypass cooling valve during the test.

   3. A 3rd choice is to open a drain valve on an unused gate and partially open that gate.

Chauffeurs must monitor the affects of the above procedures on the heat buildup.

NOTES:

1. Test kit contains 6 way manifold one way 2 1/2 inch gate, 2 1/2 inch gauge, 4 1/2 inch to 2 1/2 inch reducer, drain valve caps, various size fittings for 1 3/4, 2 1/2 and 3 1/2 inch hose.

2. The firefighter's assignment is to visually inspect the hose during the test phase. Placing the member to the left of the line enables the firefighter to monitor the test while maintaining a safe position. A burst in the line will force the hose to move to the right. Member must immediately signal for a shutdown when a problem is discovered.

3. The one way gate has a small opening in the gate (see Fig. 7-28). This opening permits the pressure to build while using a minimum amount of water. This feature will minimize the reaction if a length should burst.

4. The hose test gauge, not the manifold gauge, shall be used to monitor hose pressure (see Fig. 7-21).

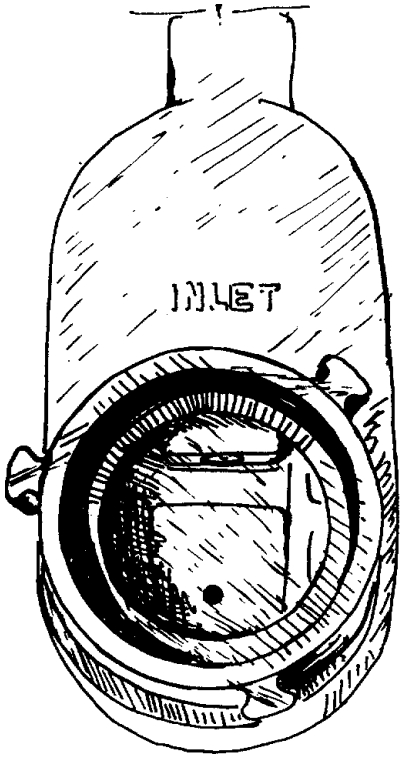


Fig. 7-28