Hose Operations

Lynbrook Fire Department

Training Committee
Introduction

- Types and sizes of Fire Hose
- Basic Engine Operation
- Hose Evolutions
- Hose Handling
- Water Flow (Volume)
- Reach
Vocabulary

- Volume
- Pressure
- Single Jacket
- Double Jacket
- Operating Pressure
- Reach
- LDH
- Friction Loss
- Solid Bore Nozzle
- Fog Nozzle
Basics of Fire Hose

- **NFPA 1961- Standard on Fire Hose**

- Larger diameter hose can carry more water at lower pressures

- Smaller diameter hose carry less water and require higher pressure
Types and Sizes of Fire Hose

- **Suction Hose**
  - 5” or in some cases 6”

- **Attack Hose**
  - 1” Booster Line
  - 1 3/4”
  - 2 1/2”

- **Supply Hose**
  - 3”
  - 5”
Engine Operations

- Move water through hose lines from a source of supply to the fire
  - Hydrant
  - Another Engine
  - Body of Water
    ✦ Ocean
    ✦ Lakes, Streams
    ✦ Pools

- Increase pressure as necessary to provide proper nozzle pressure to fight the fire
Suction Hose- Hard Suction

Hose that is designed to prevent collapse under vacuum conditions so that it can be used for drafting water from below the pump (lakes, rivers, wells, etc.).
Attack Hose

- Hose designed to be used by trained firefighters and fire brigade members to combat fires beyond the incipient stage

- Attack hose shall have a minimum design operating test pressure of 275 psi
  - 1” Booster Line
  - 1 3/4” hose
  - 2 1/2” hose
Attack Hose- 1” Booster Line

- **Rubber Hose**
  - Used for Rubbish, Brush, Washdowns
  - Requires High Pressure (approx. 200 psi)
  - Delivers low volume (approx. 50 gpm)
  - Highly mobile- can be handled by 1 firefighter
  - Uses a fog type nozzle

Source: Portsmouth, Va. FD
Attack Hose- 1 3/4”

- Primary Attack Line for House Fires and Vehicle Fires
- Double Jacketed-
  - 275 psi max. operating pressure
- Can be operated by 2-3 firefighters
- Can deliver 140- 200 gpm
- Working pressure and volume varies with nozzle type
- Used with both solid bore and fog type nozzles
Attack Hose- 2 1/2”

- Primary attack line in Commercial Buildings
- Used to back up 1 3/4” lines
- Double Jacketed
  - 275 psi max. operating pressure
- Needs 3-4 or more firefighters to operate
- Delivers high volume of water (200- 300 gpm)
- Relatively difficult to operate, especially in tight spaces
- Usually used with a solid bore nozzle
Friction Loss

- "Rule of Thumb" Hydraulics
- 1 3/4" Hose - 15 lbs. friction loss per 50 ft.
- 2 1/2" Hose - 5 lbs. friction loss per 50 ft.
- Optimal Fog Nozzle pressure is 100 PSI
- Optimal Solid bore Nozzle pressure is 60 PSI
Flow Chart-
Automatic Fog Nozzle vs. Solid Bore Nozzle

Nozzle Pressure

<table>
<thead>
<tr>
<th>100 psi</th>
<th>140 gpm</th>
<th>200 gpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 psi</td>
<td>202 gpm</td>
<td>291 gpm</td>
</tr>
</tbody>
</table>

250 ft. 1 ¾” 250 ft. 2 ½”

Source: Task Force Tips, Inc.
Supply Hose

- Used to supply an engine or tower ladder with water from a hydrant or another engine

- Sizes
  - 3"
  - 5"
Supply Hose- 3”

- Double Jacketed-
  - 275 psi max. operating pressure
- Used to supply an Engine from the hydrant
- Used to supply an Engine from another Engine (in-line pumping)
- Can supply up to 600 gpm at 150 psi at a distance of 400 ft.
- Will require a “double lay” for longer distances or greater volumes
Supply Hose- 5”

- Single Jacketed
  - 185 psi max. operating pressure
- Used to supply an Engine from the hydrant
- May be used to supply an Engine from another Engine (in-line pumping)
- Can supply 1000 gpm at 60 psi (hydrant pressure) at distances up to 1000 ft.
- Difficult to move when charged
## Flow Comparison 3” & 5” Hose

<table>
<thead>
<tr>
<th>Hose</th>
<th>Pressure</th>
<th>Volume</th>
<th>Distance</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>3”</td>
<td>60 PSI</td>
<td>350 GPM</td>
<td>400 ft.</td>
<td>(Hydrant Pressure)</td>
</tr>
<tr>
<td>5”</td>
<td>60 PSI</td>
<td>1500 GPM</td>
<td>400 ft.</td>
<td>(Hydrant Pressure)</td>
</tr>
</tbody>
</table>

Source: Angus Fire - Hose Calc
Summary

- Hose diameter is the most important factor in determining volume of water delivered.
- The optimum pressure changes with the diameter of the line - lower pressure is required in larger lines to move a given amount of water.
- Attack lines are Booster Lines, 1 3/4”, 2 1/2”.
- Supply Lines are 3” and 5”.
Sources

- National Fire Protection Association
  - www.nfpa.org

- U.S. Fire Administration
  - www.usfa.fema.gov/

- Task Force Tips, Inc.
  - www.tft.com

- Angus Fire
  - www.angusfire.co.uk/