# Hose/Fire Streams

## Module 6

# Why Use Water?

Introduction

## Most Common

extinguishing agent used by the fire service

- Plentiful
- Absorbs a great amount of heat
- Easily transported
- Known characteristics

*Photo courtesy of Charles Miller, Sr.*



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# Movement and Use of Water

Basic Water Characteristics & Terms

## Flow

is the volume of water being moved, expressed in gallons per minute (GPM)

## Pressure

is force applied over a given area, expressed in pounds per square inch (psi)



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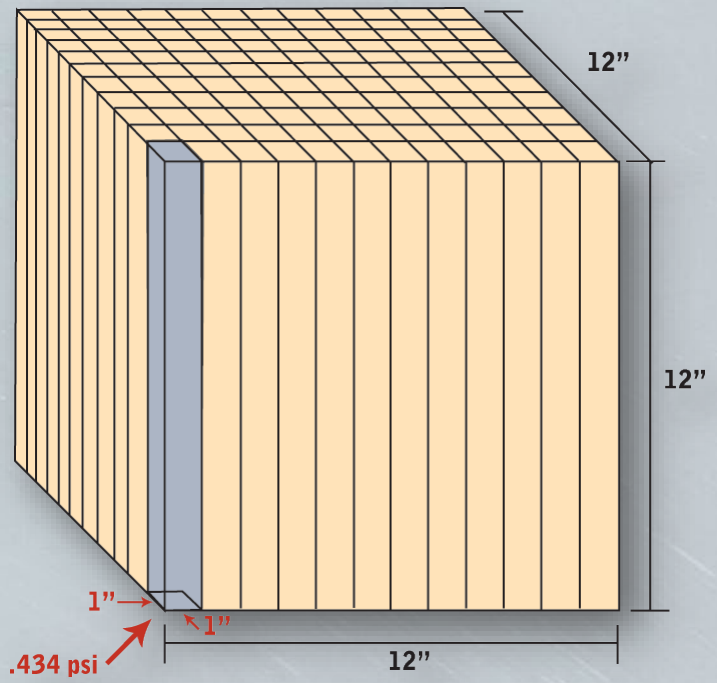
# Water Properties

Basic Water Characteristics & Terms

## Weighs

8.33 pounds per gallon

*Photo courtesy of Mark Moran*




## One

cubic foot of water
holds 7.48 gallons



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## Pressure

generated by gravity, pumping, or both





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## Pressure

is lost due to water rubbing against the inside of the hose

## Loss

decreases if the hose diameter is increased

## Higher

flows generate higher friction loss in the same size hose


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# Water Main System

Municipal Water Systems

**Designed**

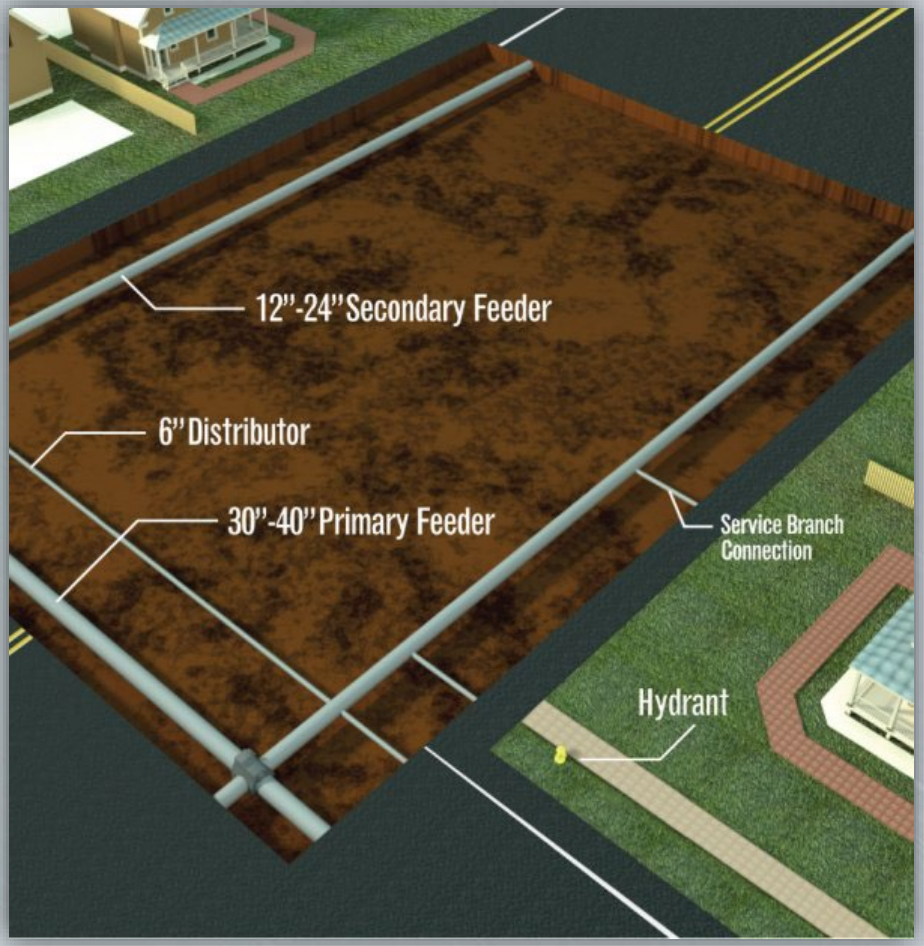
to have low friction loss and good residual pressure

**Large**

diameter pipes supply medium and small pipes

**Grid Layouts**

allow water to be received from multiple directions



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# FFD Hydrants

- Fire Hydrant Color Coding
  - Green
    - 8 Inches or Greater
  - Yellow
    - 6 Inches
  - Red
    - 4 Inches or Smaller
    - Wharf hydrants



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## Modern

fire engines carry 1,000 gallons of water or less

*Photo courtesy of Charles Miller, Sr.*

## Water Tenders

have tanks that can hold up to 4,500 gallons of water




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## Hose

is specifically designed for the fire service

## Characteristics

- Low friction loss
- Durability
- Lightweight
- Ease of coupling




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# FFD Types of Hose

T&E Manual 301.003

- Handlines
  - 1” Forestry hose (single jacket)
  - 1” “Red Line”, “Reel Line”, “Booster Line”
  - Preconnected 1 ½” “Hotline”
  - Preconnected 1 ¾” “Pre-connect”
  - 2 ½”, No. 1(with 1 ¾” bundle or No. 2 line (with SM-30 nozzle.
  - 2” high rise hose



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# FFD Types of Hose

T&E Manual 301.003

- Supply Line
  - “Feeder”, “LDH”
  - 5” with 4 ½” couplings
  - Front or Soft suction
    - 4.5” couplings



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# FFD Hose Inventory

- Standard engine inventory
  - One or two 200’ reel lines
  - 200’ 1 ½” pre-connected “hotlines”
  - One 200’ 1 ¾” pre-connected
  - Two compartments each with 300’ or 500’ of 2 ½”
  - One hose compartment with 1000’ of 5”
  - Two 100’ 1 ¾” hose bundles, (50’ sections).


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# FFD Hose Inventory

- Standard engine inventory cont.
  - Two 10’ sections of hard-suction hose
  - One 50’ section of rolled 5”
  - One 50’ section of rolled 2 ½”
  - One 2 ½” 10’ section coupled with two 2 ½” female couplings
  - 200’ of 1 ½” wildland hose
  - 200’ of 1” wildland hose.


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# Hose Size and Typical Flows



| Size | Typical flows (gpm) | Type | Weight per 100 ft empty (lb) | Weight per 100 ft full (lb) | Typical length (ft) |
|---|---|---|---|---|---|
| 1½-in. | 60–150 | Attack/hand line | 30 | 107 | 50 |
| 1¾-in. | 95–200 | Attack/hand line | 32 | 152 | 50 |
| 2–in. | 150–250 | Attack/hand line | 40 | 176 | 50 |
| 2½-in. | 200–325 | Attack/hand line | 52 | 264 | 50 |
| 3–in. | 0–500 | MDH/supply | 68 | 375 | 50 |
| 3½-in. | 0–800 | MDH/supply | 78 | 493 | 50 |
| 4–in. | 0–1,200 | LDH/supply | 88 | 631 | 50 or 100 |
| 4½-in. | 0–1,500 | LDH/supply | 100 | 787 | 50 or 100 |
| 5–in. | 0–2,000 | LDH/supply | 110 | 958 | 50 or 100 |



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# Hose Couplings



**Key**

component in fire hose

- Join and break apart hoses rapidly
- Threaded (NST) or Storz (sexless)
- Handle pressure and stress well
- Older couplings were made of brass, modern ones are hardened aluminum



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# Coupling Fire Hose



## Joining

hose lengths is similar to tightening a nut and bolt

## Locating

the higbee cut allows for faster coupling



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# An understanding of how fire streams operate is vital to extinguishment operations

## Water

Expands 1,700 times its original volume when turned to steam

*Photo courtesy of M. Musicant*

## Steam

Can be useful in unoccupied spaces

## Large

Quantities of steam can burn occupants and firefighters




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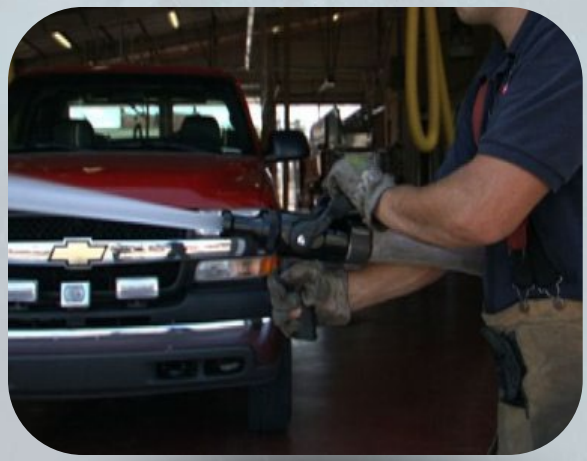
# Three Main Types of Fire Stream



Solid



Straight

**All**

will extinguish a fire if applied long enough with sufficient volume

Fog

**Some**

can make conditions in the fire compartment worse



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## SM-3 or SM-3F

- Designed for use on 1” reel lines
- Rated at 30 gpm at 100 psi nozzle pressure
- Flows range from 10 to 30 gpm at nozzle pressures above 50 psi
- The letter “F” designates “flush”.


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## SM-10 or SM-10F

- Designed for use on 1 ½” and is rated at 100 gpm at 100 psi nozzle pressure
- Flows range from 60 to 125 gpm at nozzle pressures above 80 psi
- Suitable for use with the Elkhart in-line eductor.


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## SM-20 or SM-20F

- Designed for use on 1 ¾" hose bundles and is rated at 200 gpm at 100 psi nozzle pressure
- Flows range from 60 to 200 gpm at nozzle pressures above 70 psi.


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# SM-30 or SM-30F

- Designed for use on 2 ½" and is rated at 300 gpm at 100 psi nozzle pressure
- Flows range from 75 to 325 gpm at nozzle pressures of 100 psi.


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# SM-100 or SM-100F

- Designed for use with master stream devices and is rated at 1000 gpm at 100 psi nozzle pressure
- Flows range from 300 to 1000 gpm at nozzle pressures above 85 psi.


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# Hand Lines

## Flow

Less than 350 GPM

## Typical Sizes

¾″ – 2 ½″



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# Master Stream

## Flow

greater than 350 GPM or having a nozzle diameter greater than 1 ¼" (Per FFD)

## Fixed or Portable

Consumes a Large amounts of water on the fire

*Photo courtesy of Johnny Knots*



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# Fire extinguishers are the first line of defense

# Types of Fires – Class A

Classification of Fires

**Ordinary**

combustibles

- Wood
- Rubber
- Fabrics
- Paper
- Many plastics



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# Types of Fires – Class B

Classification of Fires

**Flammable**

liquids & gases


- Gasoline
- Oils
- Paint
- Tar



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# Energized

electrical

- Electrical motor
- Computers
- Fax machines


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# Combustible

metals

- Titanium
- Magnesium
- Titanium


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# Types of Fires – Class K

Classification of Fires

## Combustible

cooking media

- Vegetable oils and fats
- Animal oils and fats



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# Method of Operation

Types of Extinguishers

**All**

portable extinguishers use pressure to expel their agents

**Stored-Pressure**

**Cartridge-Operated**

**Pressurized Agent**


**Hand-Operated Pump**



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