Objective:

The student shall have an understanding of the methods, components and equipment common to rural water supply.
This section will give the student an understanding of daily, weekly and annual testing and inspection of apparatus.
### Weekly Inspection

<table>
<thead>
<tr>
<th>Item</th>
<th>Check or Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission Oil Level</td>
<td>Check for Loose Nuts, Pins etc.</td>
</tr>
<tr>
<td>Power Steering Fluid</td>
<td>Start and Run Motor Driven Equipment</td>
</tr>
<tr>
<td>Hydraulic Brake System</td>
<td>Check Operation of Pump</td>
</tr>
<tr>
<td>Air Brake System</td>
<td>Equipment on Apparatus</td>
</tr>
<tr>
<td>Check All Engine Belts</td>
<td>Ladders</td>
</tr>
<tr>
<td>Battery Terminals / Cables</td>
<td>Tests</td>
</tr>
<tr>
<td>Operate Valves in Cooling System</td>
<td>SCBA</td>
</tr>
<tr>
<td>Check Drains and Hose Connections</td>
<td>Salvage Equipment</td>
</tr>
<tr>
<td>Radiator Fluids</td>
<td>Motor Oil (cold)</td>
</tr>
</tbody>
</table>

### Vacuum Test / Dry Pump Test

- All intakes capped
- All discharges closed and uncapped
- Drain water from pump
- Develop minimum of 22 of Hg with primer
- Vacuum should not drop more than 10 inches of Hg in 5 minutes
- Connect hard suction
- Repeat test
Pump Theory

Functions of a Fire Dept. Pumper

- Provides water for firefighting
- Controls water
- Source of water to supply pumper at the proper pressure

Provides Water for Firefighting

- Handlines
- Master stream appliances
- Supplement sprinkler system
- Supplement standpipe system
- Relay pumping to other apparatus
Controls Water

- Friction loss
- Back pressure
- Forward pressure
- Excessive line pressure when other lines shut down
- Increase pressure

Water Sources

- Tank Supply
- Pressure Source
- Hydrants
- Dry Hydrants
- Static Sources
- Cisterns

Rotary Vane

- Used as a priming device
- In a cycle, the rotor turns, and the vanes advance outward
- Space between the rotor and housing is filled with water
- Vanes then force air out the discharge
Centrifugal Pump

- Spinning action creates outward force
- An impeller is used
  - Water enters the eye and is thrown outward

Single Stage Pump

- Has one impeller
  - Total flow and pressure depend on engine speed
- May have a single or double eye in the impeller
- Greatest efficiency is at or near capacity
- More common and simpler to operate, purchase and maintain

Two Stage Pump

- Also known as series/parallel or pressure/volume
- Has two impellers on a single shaft
- Two modes of operation
Series/Parallel
- Water flows through each impeller in series/pressure
- Pressure is increased by each impeller
- Results in higher pressure and lower volume
- Pressure setting is used for flows up to 50% to 70% of pump capacity

Large capacity pumps have a large pump cavity and are better suited for drafting operations

Parallel or Volume
- Both impellers are working, but not in series
- Water passes through either impeller, but not both
- Results in greater volume and lower pressure
- Used for flows greater than 50% to 70% of pump capacity
Class Ratings

- Have a capacity of 750 to 2500 gpm
- Tested to pump:
  - 100% of capacity @ 150 psi net capacity
  - 70% of capacity @ 200 psi net capacity
  - 50% of capacity @ 250 psi net capacity
- Must be capable of pumping at capacity up to 2000 feet of elevation

Powering Pumps

- Front Mounts
- Power Take Off
- Midship
- Rear Mount
- Separate Engine

Front Mount

- Pump is driven through a reduction gear with a clutch on the front of the motor
- Pump is independent of transmission - pump and roll capability
- Location of pump makes it susceptible to freezing and collision damage
- Pump is engaged by a clutch lever most often found at the pump itself
Power Take Off (PTO)

- PTO pumps are smaller (250 – 1500 gpm)
- Driven by gears within the transmission case (shaft)
- Pump is engaged by a PTO control
- Apparatus is normally stopped, but may be moved in a lower gear
Midship

- Split-drive, shaft driven through a transfer case from the road transmission
- Transfer case allows selection of road or pump capability
  - Usually no pump and roll capability
- Allows for full power from engine to the pump
- Pump is engaged by shifting the transfer case lever from road to pump

Rear Mount

- Split-drive, shaft driven through a transfer case from the road transmission
- Transfer case allows selection of road or pump capability
  - Usually no pump and roll capability
- Allows for full power from engine to the pump
- Pump is engaged by shifting the transfer case lever from road to pump
Separate Engine

- Power is independent of the apparatus
- Examples:
  - Skid-mounted
  - Trailer mounted
  - Built into the apparatus
  - Crash truck
Priming Devices

- Rotary Vane
- Exhaust Ejector

The Need for a Priming Device

- Absolute negative pressure is impossible to achieve
- Open waterway found in centrifugal pumps
- Remove air from the pump cavity and suction hose creating a higher outside pressure that pushes water up into the pump

Types of Priming Devices

- Positive Displacement Rotary Vane
- These will expel air with or without a lubricant
  - Dry used on the newer pumps
  - Oil may be used to reduce wear and priming time
  - Oil is no longer recommended
  - Environmentally friendly anti-freeze
Pressure Relief Devices

- Pumps must be equipped with a device to control pressure
- The devices operate in a range of 90 – 300 psi
- When activated, the pressure rise shall not exceed 30 psi

Types of Relief Devices

- Relief valve
- Governor
- Gated incoming relief valve
- Automatic pressure relief devices installed on the pump
- Built into the pump suction tube MIV (Hale)

Pump Panel Components

<table>
<thead>
<tr>
<th>Large Suction Intake</th>
<th>Governor</th>
<th>Throttle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary Intake</td>
<td>Tank Gauge</td>
<td>Transfer Valve</td>
</tr>
<tr>
<td>Discharges</td>
<td>Tank Suction</td>
<td>Drains</td>
</tr>
<tr>
<td>Compound Gauge</td>
<td>Tank Fill</td>
<td>Rating Tag</td>
</tr>
<tr>
<td>Pressure Gauge</td>
<td>Primary Control</td>
<td>Test Plugs</td>
</tr>
<tr>
<td>Line Gauge</td>
<td>Relief Valve</td>
<td>Radios Equipment</td>
</tr>
<tr>
<td>Pump Power Indicator Lights</td>
<td>Engine/Transmission Lights</td>
<td></td>
</tr>
</tbody>
</table>
Engine / Pump Cooling System
Protects the engine from overheating

Methods to Cool the Engine

<table>
<thead>
<tr>
<th>Open Hood</th>
<th>Thermostat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiator</td>
<td>Cooling Coil</td>
</tr>
<tr>
<td>Fan</td>
<td>Radiator Fill</td>
</tr>
<tr>
<td>Auxiliary Cooler</td>
<td>Pump Cooler Valve</td>
</tr>
<tr>
<td>Water Pump</td>
<td>Tank Fill Valve</td>
</tr>
</tbody>
</table>

Where are the controls for these cooling lines?
- Auxiliary cooler
- Cooling coil
- Radiator fill
- Pump cooler
Cold Weather Operations

- Protect from Freezing:
  - Pumps
  - Hoses / Gauges
  - Controls
  - Pump Operator
  - Caps

Speed of freezing depends on:

- Temperature of area where apparatus is stored vs. outside temperature
- Volume of water discharged
- Surface area exposed
- Duration of exposure
- Wind chill affects personnel only

Freezing Prevention

Apparatus

- Do not shut down lines completely
- Moving water does not freeze as quickly
- Drain booster lines, monitors etc.
- Valves should be closed when no hoselines are connected
- Check antifreeze levels
- Circulate water
- All pumps leak – watch for icing
Freezing Prevention
Pump Operator

- Take time to dress properly prior to leaving the station
- Dress in multiple layers
- Move around — standing still slows the body down
- Drink warm fluids
- Use the pull-out platform step

Water Distribution Systems

- Components
  - Supply Sources
    - Reservoirs, tanks, in-ground cisterns
  - Treatment Facility
    - Softens water, fluoride, cleans, removes bacteria and minerals
  - Delivery System
    - Gravity
    - Pump
    - Combination
    - Above Ground Storage Tanks
Dry Barrel

Wet Barrel

Hydrants

East Coast

West Coast

Standard Hydrant Installation

Proper opening of the hydrant requires 18-22 turns of the operating nut.
NFPA Hydrant Color Code

<table>
<thead>
<tr>
<th>Caps and Bonnet Color Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 - 999 GPM</td>
</tr>
<tr>
<td>1000 - 1999 GPM</td>
</tr>
<tr>
<td>2500 - 4999 GPM</td>
</tr>
<tr>
<td>5000 - 9999 GPM</td>
</tr>
</tbody>
</table>

Markings
- Weather
- Time of Day
- Ease of Locating
  - Flags
  - Pole Markings
- Carrying Capacity Varies
  - Diameter
  - Pressure
  - Friction Loss
  - Age of Water System

Water Flow Problems
- Water Hammer
- Nozzle Reaction
- Cavitation
- Dead End Mains
- Incrustation
- Sedimentation
Cavitation of a Pump
("the pump running away from the water")

- Water is discharged from the pump faster than it is coming in
- Air cavities are created in the pump and move from the point of highest vacuum into the pressurized section and collapse
- High velocity causes severe shock to the pump - usually resulting in damage

Water Supply Officer
Hydraulics

Friction Loss is part of the total pressure that is lost while forcing water through pipes, fittings, fire hose, nozzles and adapters. Friction Loss is lost energy.

Quality of Flow

Laminar Flow
Water is moving in a straight line.
TURBULENT FLOW
Water is moving in a swirling motion

- Quality and Age
  - Rougher: more resistance
- Diameter
  - Larger hose: less friction loss for the same gpm

Efficient Carrying Capacity of Hose

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2&quot;</td>
<td>100 gpm</td>
</tr>
<tr>
<td>1-3/4&quot;</td>
<td>150 gpm</td>
</tr>
<tr>
<td>2&quot;</td>
<td>200 gpm</td>
</tr>
<tr>
<td>2-1/2&quot;</td>
<td>300 gpm</td>
</tr>
<tr>
<td>3&quot;</td>
<td>500 gpm</td>
</tr>
<tr>
<td>4&quot;</td>
<td>1000 gpm</td>
</tr>
<tr>
<td>5&quot;</td>
<td>2000 gpm</td>
</tr>
</tbody>
</table>
Appliances

- Varies with type and amount of flow
- Rule of Thumb: add
  - 10 psi for master streams and ladder pipes
  - 5 psi for wyes, siameses etc
  - 25 psi for standpipes

GPM's Delivered

- Varies with type of nozzle
- Combination (fog)
  - Varies with nozzle pressure
- Solid Stream
  - Varies with tip size

<table>
<thead>
<tr>
<th>Tip Size</th>
<th>GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/4&quot;</td>
<td>400 gpm</td>
</tr>
<tr>
<td>1-3/8&quot;</td>
<td>500 gpm</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>600 gpm</td>
</tr>
<tr>
<td>1-3/4&quot;</td>
<td>800 gpm</td>
</tr>
<tr>
<td>2&quot;</td>
<td>1000 gpm</td>
</tr>
<tr>
<td>1-1/8&quot;</td>
<td>250 gpm</td>
</tr>
<tr>
<td>1-1/4&quot;</td>
<td>300 gpm</td>
</tr>
</tbody>
</table>
Types of Pressure

Static Pressure  Nozzle Pressure
Residual Pressure  Net Pump Pressure
Negative Pressure  Flow Pressure
Normal Operating Pressure  Forward Pressure
Line Pressure  Back Pressure
Discharge Pressure

Static Pressure:
- stored energy that is available to move water through pipes, hoses and appliances.
- Shown on compound gauge with no water flowing
- Static pressure remains the same at any point in the closed system if elevation is the same
  - No matter what size hose or piping
Residual Pressure:
kinetic energy that is available perform work. Water pressure that was not used to overcome back pressure due to elevation or friction loss.
  - Incoming pressure shown on compound gauge with water flowing
  - Residual pressure is different at various points in the system due to friction loss and elevation

Negative Pressure:
any pressure created in the fire pump or hard suction hose which is less than atmospheric.
  - Atmospheric pressure is 14.7 psi at sea level

Normal Operating Pressure:
pressure through water distribution system during normal consumption demands.
  - Fluctuates during day and night
  - And also according to time of year
Line Pressure:
pressure needed to provide proper nozzle pressure with a given layout.

Discharge Pressure:
in situations requiring multiple lines, the pump develops pressure for the highest line (greatest pressure).
- Gate back for all others to get the proper line pressure

Nozzle Pressure:
the pressure required at the nozzle to develop a proper fire stream from a nozzle.
- Nozzle pressure and the tip size determine flow capability
- Standard nozzle pressure
  - Combination: 100 – 75 – 50
  - Solid Handline: 50
  - Solid Master Stream: 80
Net Pump Pressure:
combined total pressure (psi) developed by the fire pump.

- Net pump pressure = PSIG pressure + PSIG vacuum (inches of Hg.)

Flow Pressure:
forward velocity pressure at a discharge opening measured with a Pitot Gauge

Forward Pressure:
presure gained by water flowing, when the nozzle is lower than the pump.
Figured at 0.5 psi per foot.

- 5 psi per floor below ground level
**Back Pressure:**
pressure that is must be overcome when
the nozzle is above the pump.
 Figured at 0.5 psi per foot

- 5 psi per floor above ground level

**Nozzle Reaction is equal to half the flow**

![Diagram of Nozzle Reaction]

- 75 psi

**Actual Flow and Reaction Force**

<table>
<thead>
<tr>
<th>Flow Rate</th>
<th>80</th>
<th>95</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>200</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>160</td>
<td>130</td>
<td>100</td>
<td>95</td>
<td>85</td>
<td>55</td>
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<td>100</td>
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<tr>
<td>50</td>
<td>230</td>
<td>210</td>
<td>190</td>
<td>160</td>
<td>130</td>
<td>100</td>
<td>95</td>
</tr>
</tbody>
</table>
## Actual Flow and Reaction Force

**Solid Bore Discharge Table**

<table>
<thead>
<tr>
<th>PSI</th>
<th>3/8&quot;</th>
<th>1/2&quot;</th>
<th>5/8&quot;</th>
<th>3/4&quot;</th>
<th>7/8&quot;</th>
<th>15/16&quot;</th>
<th>1&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>29.5</td>
<td>52</td>
<td>82.5</td>
<td>118</td>
<td>161</td>
<td>182</td>
<td>210</td>
</tr>
<tr>
<td>60</td>
<td>32.5</td>
<td>58</td>
<td>90</td>
<td>129</td>
<td>176</td>
<td>199</td>
<td>230</td>
</tr>
<tr>
<td>70</td>
<td>35</td>
<td>62.1</td>
<td>97.1</td>
<td>140</td>
<td>190</td>
<td>215</td>
<td>248</td>
</tr>
<tr>
<td>80</td>
<td>37.3</td>
<td>66.4</td>
<td>104</td>
<td>149</td>
<td>203</td>
<td>230</td>
<td>268</td>
</tr>
</tbody>
</table>

### Nozzles and Appliances
Solid Stream

- Fixed orifice, smooth bore nozzle which produces an unbroken stream
- Produces a stream that is compact and has little shower or spray
- Has good reach
- Made to operate in a range of 40 – 60 psi with 50 psi being the accepted standard

Solid Stream

- Advantages
  - Greater reach
  - Greater penetration
  - Less likely to disturb normal thermal layering of heat and gases during interior attack
- Disadvantages
  - Set stream pattern
  - May not be used for foam application
  - Less heat absorption per gallon delivered
  - Must be fully opened to get full gpm/psi delivered

Combination Nozzle

- Produces a fog stream of fine water droplets
- Can be adjusted to different patterns
- The fog pattern is good for heat absorption
- Made to operate in a range of 50 – 100 psi
- Fixed gallonage
- Adjustable gallonage
- Automatic
Combination Nozzle

- Advantages
  - Discharge pattern may be adjusted
  - Gallonage may be adjusted

- Disadvantages
  - Does not have the reach or penetration power of solid streams
  - Fog stream is more susceptible to wind current
  - When improperly used during interior attack, can cause the spread of fire, create heat inversion and cause steam burns
  - Need to operate fully open to get full gpm/psi

Automatic Nozzles

- Combination nozzle with a sensing device that maintains a constant 100 psi
- May use slide valve or ball valve
- Automatic adjustable gallonage
- Requires minimum contact with pump operator
- Able to control nozzle reaction at the nozzle
- Handlines: 1-1/2" – 3" hose
  - 50 – 350 gpm (full range)
  - 60 – 200 gpm (mid range)
Automatic Nozzle

- Advantages
  - Nozzle operator has flow control
  - Consistent hard-hitting streams
  - Maintains optimum nozzle pressure at all times
  - Will adjust to the flow available
    - If flow is increased, the gpm's will automatically increase pressure
    - Will maintain maximum reach for available flow

Broken Stream Nozzle

- Produces coarsely divided drops of water
- Good heat absorption
- Examples:
  - Piercing Nozzle
  - Water Curtain Nozzle
  - Breenan Nozzle
  - Cellar Nozzle
  - Chimney Nozzle
  - Navy / Rockwood Nozzle
Master Stream Appliances

- Master streams are discharged from appliances using tips larger than 1-1/4"
- May be either solid stream or fog
- Solid tip master streams should be operated in a range of 60 – 80 psi
- Combination tip master streams are operated at 50 – 100 psi
- Friction loss in master stream appliances starts at 10 psi
- The age of the appliance may require more psi with high flows at the tip

Master Stream Appliances

- Ladder Pipe
- Monitor
- Deck Gun
- Portable Unit
Pressures for Ladder Pipe Operations

- Nozzle Pressure
  - 80 or 100 psi
- Friction Loss in Gun and Siamese
  - 15 psi
- Friction Loss in 3" Hose
  - Based on size of tip or model of combination nozzle
- Friction Loss due to Elevation
- Friction Loss in Supply Line

See manufacturer's recommendations regarding limitations

Check manufacturer's specifications regarding the tip weight capacity of the aerial
NFPA 1901
Section 20.G.2

- Ladder pipe with tip sizes 1-1/4" (400 gpm), 1-3/8" (500 gpm) and 1-1/2" (600 gpm) can be attached to the aerial
- Sufficient lengths of 3" or larger attack hose complying with Standard 1961 to reach between the installed ladder pipe and the ground with at least 10’ of hose available on the ground with the ladder at full extension
- One hose strap for each ladder section
- Halyards to control the ladder pipe from ground level

Ladder Pipe Operation Safety

- 80 – 80 – 80 Rule
- Make sure ladder pipe and handle are securely locked
- No firefighters on the ladder
- Water on and off slowly to prevent water hammer
- Do not use guy wires to avoid twisting
- Never attempt to move the vehicle with the ladder pipe operating
- Watch ground around outriggers
- Check hydraulic system for overheating

Ball Distributor Valve

- Used with Large Diameter Hose
- Also called portable hydrant or manifold
- Principle is same as a wye appliance
- Generally have a 4" or 5" inlet with 2 or more 2-1/2" outlets
- May also be an outlet that is same size as the inlet
Hydrant Assist Valve

- Makes pumping the LDH line accessible and does not require the shutdown of the hydrant in order to set the pump
- With these valves there is no stoppage of water flow
Wyes and Siamese Valves

- Wye
  - Divides one or more lines
  - Has one female and two or more male connections
  - Used to divide a larger line into smaller lines

- Siamese
  - Combines two or more lines into one line
  - Has one male and two or more female connections
  - Used to combine several smaller lines into one larger one to supply a ladder pipe or ground gun

LDH Siamese

2-1/2" Siamese
Gated Incoming Relief Valves

- Designed to release all air coming into the pump from LDH
  - Must be opened manually
- Should be left open when the pumper is put back in service
- Newer type are self-closing
  - Paddle wheel closes the bleeder valve
- Female end comes in 4", 4-1/2", 5" or 6"
- Storz side comes in 4", 5" or 6"
- Older type pressure relief is on the pump side, not the hose side
Relay Valves

- Z-Valve
- LDH inlet and outlet with 1 gated LDH valve and 1 clapper valve
- Used to increase the pressure in a long LDH relay
- Adapter to convert a Harrington hydrant assist valve into a relay valve
**Strainers**

**Adapters**

<table>
<thead>
<tr>
<th>NPT / NST 1-1/2&quot;</th>
<th>2-1/2&quot; Double Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1/2&quot; NST / Storz</td>
<td>2-1/2&quot; Double Female</td>
</tr>
<tr>
<td>4&quot; x 5&quot; Storz</td>
<td>5&quot; Double Female</td>
</tr>
<tr>
<td>6&quot; Female x Storz</td>
<td>6&quot; Double Female</td>
</tr>
<tr>
<td>2-1/2&quot; Female x 1-1/2&quot; Male</td>
<td>5&quot; Female x 2-1/2&quot; NST</td>
</tr>
<tr>
<td>2-1/2&quot; NST to 3&quot; NST</td>
<td>6&quot; Female x 2-1/2&quot; NST</td>
</tr>
<tr>
<td>1-1/2&quot; Double Male</td>
<td>Cam Lock Male / Male NST</td>
</tr>
<tr>
<td>1-1/2&quot; Double Female</td>
<td>Cam Lock Female / Female NST</td>
</tr>
</tbody>
</table>
Drafting

Static Water Sources

- May be limited in total volume
- Limited by pump capacity and lift
- Class A Ratings
  - 100% @ 150 psi
  - 70% @ 200 psi
  - 50% @ 250 psi
  - Test performed at draft with no more than 10' lift
  - Test performed with 20' of hard suction
Limitations in Hard Suction
Flow capability 1000 gpm pumper
20' - 30' suction hose @ 150 psi net

<table>
<thead>
<tr>
<th>Diameter</th>
<th>1160 gpm</th>
<th>1345 gpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10'</td>
<td>1000 gpm</td>
<td>1170 gpm</td>
</tr>
<tr>
<td>16'</td>
<td>790 gpm</td>
<td>960 gpm</td>
</tr>
<tr>
<td>22'</td>
<td>485 gpm</td>
<td>590 gpm</td>
</tr>
</tbody>
</table>

Atmospheric Pressure
- Maximum Theoretical Lift
  - 14.7 psi
  - 2.3 ft/psi
  - 33.9 ft
- Maximum Actual Lift
  - 25 ft

Effect of Altitude

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Lift</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000'</td>
<td>1.22'</td>
</tr>
<tr>
<td>2000'</td>
<td>2.38'</td>
</tr>
<tr>
<td>3000'</td>
<td>3.50'</td>
</tr>
<tr>
<td>4000'</td>
<td>4.75'</td>
</tr>
</tbody>
</table>
Priming Requirements

- Must raise water 10' through 20' of hard suction in not more than 30 seconds
  - 45 seconds for pumps 1500 gpm or larger
- Must develop 22 inches of mercury up to an elevation of 1000' above sea level
- Pump must hold vacuum for at least 10 minutes with a loss of not more than 10 inches of Hg

Types of Priming Devices

- Rotary (Positive Displacement)
- Engine Manifold – Gas Motors
- Exhaust Ejector – Portable Pumps

Drafting Procedure

- Spot the truck
- Connect the hard suction – 12" off the bottom and from the surface
- Close all drains and discharges
- Prime until a steady discharge or constant pressure reading
- If no prime, check drains, discharges and suction hose
- When primed, increase throttle and open discharges slowly
System Check
When Pump Will Not Draft

- Primer Operation
- All Suction Connections
  - Suction
  - Unused Inlets
  - Auxiliary Inlets
  - Tank Suction Valve
- All Discharge Connections
  - 2-1/2" Discharges
  - 1-1/2" Discharges
  - Booster
  - Tank Fill
  - Drains

Rural Water Supply is used in:

- Out of hydrant areas
  - Rural / city areas where there are no domestic supplies
  - Highways
- Water main failure
- Water mains insufficient for required flow
Rural water supply must be planned for:

- Target hazards
- Time of year
- Time of day
- Weather conditions
- Fill station access
- Placement of apparatus for continuous flow of shuttle vehicles

Shuttle Components

- Fire Scene (Dumpsite)
- Water Supply (Fill Station)
- Transportation

Dumping vs. Pumping

Pumping is the least effective method to off-load water due to:

- Piping of pump determines flow
- Friction loss in hose
- Time to set up pump
- Manpower
Way NOT to Fill a Tanker

- Fill crew attaches line to tanker and holds valve on tanker open
- Signal pump operator to fill
- Pump operator throttles up for maximum fill
- When tank is full, pump shuts down first, then tank valve is closed and the line is disconnected
- Fill crew signals for tanker to leave

Apparatus at Draft

- If the pump that is going to the draft site stops at the fire to drop its tanks, it should leave a quarter of a tank on board for priming
- Position apparatus for drafting
- Remember to leave room for traffic flow
- Utilize dry hydrants if known and accessible
- Utilize floating strainers to minimize the whirlpool effect in shallow water
Tankers / Tenders:
- Have large discharge valves (6" – 12")
- Discharge rates of 800 – 1500 gpm
- Average fill time for tanker is 3 minutes
- Most tankers use big lines to fill
- Pressure / vacuum tankers – fill and empty by themselves

Water Hammer
- Open and close all valves S-L-O-W-L-Y
- Fill crew holds intake valve at tanker in the open position and holds it open during filling operations. This valve is not shut down until after the supply pump has shut down
- One pump fills one tanker at a time.
- Multiple stations can be set up

Ways to Fill a Tanker
- Drafting
- Hydrant Direct
- Apparatus at a Hydrant
- Vacuum Tanker
For more information, contact:

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