Sandoval County Fire Department
Fire Pump and Water Shuttle Day
Field Notes

By James Maxon Deputy Fire Chief June 2012

Fire Types and the vehicle for them:

Brush Fire- Brush Truck, Tender, or Engine. (Watch taking the larger vehicles off road because it can bend their frames and get them stuck.)

Vehicle Fire- Engine, Tender (if needed), Make sure that an engine is always the first unit to arrive on scene to a vehicle fire.

Structure Fire- Engine, and Tender. In some cases multiple engines and tenders may be needed. Make sure that an engine is the first unit to a scene.

Miscellaneous Fires- Engine is the best practice provided it can gain access to the scene.

Selection of hose lines for fires:

Standard hose types in Sandoval County:

1”-Forestry hose- Used on brush fires only

1 ½” -Hose (most of this hose has been replaced by 1 ¾” hose) Can be used on a vehicle fire, structural fire, or brush fire.

1 ¾”- Can be used on a vehicle fire, structural fire, or brush fire.

2 ½- Typically used on a larger structure fire. (Must have an adequate water supply)

3”- Supply line that is used to move water from a hydrant to an engine or to relay water from one truck to another.

5” (This hose is carried only on Truck 21 located in Fire District #1)

The above hose guidelines can change based on specific fire suppression needs.

Nozzle types:

Automatic Nozzle- The nozzle pressure remains the same regardless of how many gallons per minute are flowing through it. Supply an automatic nozzle with 100 PSI at the nozzle. This nozzle can produce either a straight stream or a fog stream. (Typically have a blue collar in Sandoval County)

Fixed Gallon age Nozzle- The nozzle pressure and orifice size is controlled by a disk. The nozzle will flow a set number of gallons per minute if it is given the right pressure. (Pressure range is 50-200 PSI at the nozzle depending on what disk is in the nozzle) nozzle can produce either a straight stream or a fog stream. Example Metro 1 Nozzle by Task Force Tips with an orange collar.

Smooth Bore Nozzle- Has smooth barrel and used for either reach or penetration in fire suppression. Smooth nozzles are supplied with a standard 50 PSI at the nozzle.

Sandoval County carries master stream devices on all of its engines and some water tenders. A master stream device is a nozzle that can flow more than 350 gallons per minute. Examples: The deck gun on top of most engines or the blitz fire ground monitor.

The above nozzle types are not all inclusive and there are numerous other nozzle types in use in the fire service. Sandoval County primarily has the above three named nozzle types.

Friction Loss- A fire pump operator needs to account for the friction loss that occurs when the water travel through a hose from the pump to the nozzle. If the pump pressure says 100 PSI you will most likely not have 100 PSI at the nozzle and must add additional pressure to compensate for friction loss.

Sandoval County uses both stationary pumps and pump and roll. It is best to become familiar with each truck in your district and its capacities.

Pressure Relief Valve:

Basic Pump Operation Procedure:

1. Park Fire Engine in appropriate spot to fight the fire.
    - Where port a tanks can be set up
    - Close enough to pull hose lines to the fire
    - Out of the plume of smoke
    - Out from under power lines
    - Out of collapse zone (two times the height of the building)

2. Set the parking brake

3. Place Transmission in Neutral

4. Turn pump switch on

5. After the transfer case shifts, place transmission in road gear

6. Place wheel chocks

7. Open tank to pump valve (provides water to pump)

8. If hose lines are not ready for water open, open tank fill valve
   This should then circulate water and pump pressure gage should register about above 20 PSI

9. Using the hand throttle Raise RPM's to provide 50 PSI on pump gage, if pressure does not increase operate the primer to obtain water. All engines and tenders placed into service since 2007 have a computer that controls the pump pressure. Use either the up and down arrows or the knob to raise the pump pressure or RPM's. Every fire apparatus may be different.

10. When hose line is ready for water (pulled off the engine and ready for water) open appropriate valve for hose line.

11. When flowing water from hose line slowly shut the pump to tank valve

12. Raise RPM's to provide 150 PSI to the hose line.

13. When next hose line is ready for water open the valve for that line slowly

14 Adjust pump RPM to provide the needed pressure to highest pressure needed for the hose lines.

Use pump chart to determine what pressure should be pumped for each hose line

15. Throttle the hose line valves to provide a lower pressure to the other hose.

16. When lines are flowing water turn on Pressure Relief Valve (If Equipped)

17. Set pressure relief valve (Computerized pump panels do not have one)

18. Monitor the gauges for the truck engine and hose lines that everything is appropriate

19. Switch water source when ready (to hydrant or port a tank)
    - Notify personnel on the hose lines that you are switching to different water source
    - If using water from a hydrant bleed air out of incoming line
    - Open valve on pump inlet slowly and ensure that pump does not loose prime
    - Pull primer control if needed
    - Adjust pump pressures to appropriate settings

20. Refill tank by slowly opening tank fill valve.

Basic Drafting Procedure:

Principles of Drafting

A. Based on the principle of creating a negative pressure (vacuum) inside the fire pump and allowing atmospheric pressure on the water surface to force water up the suction tube into the fire pump.
1. Perfect vacuum provides 14.7 psi of negative pressure at sea level or 30 inches of vacuum.
2. A fire apparatus primer must be able to develop 22 inches of vacuum in 30 seconds.
3. 22 inches of vacuum is equivalent to 10.5 psi of negative pressure and will lift water approximately 24 feet.
4. The theoretical maximum lift with a perfect vacuum at sea level is 33.9 feet. The maximum practical lift for fire ground operations is 20 feet.
5. Fire apparatus pumps are designed to supply their rated capacity at a lift of no higher than 10 feet.
6. The size of the suction hose / hard sleeve affects the maximum flow for a given lift.
7. The vacuum reading on the compound gauge is the basis for estimating the ability of the pump to supply additional GPM. Maximum flow from a fire pump at draft would be 22 inches of vacuum.

II. Criteria for a Good Drafting Location (1-2)
A. Amount of Water Available
B. Depth of Water source / Replenishment Rate
C. Site Accessibility (year round)
1. Stability of Ground
2. Height of Lift from Water Surface
D. Quality of Water
1. Sediment
2. Salt Content
3. Debris
4. Chemicals

III. Common Problems Encountered While Drafting (1-3)
A. Watch Your Vacuum Gauge
B. Unable to Obtain a Vacuum / loss of Prime
1. Air Leaks in Pump or Suction Hose
a. Check for loose hose connections
b. Check for open drain valves
C. Cavitation of the Pump / High Vacuum Reading
1. Blockage in the Strainer or Suction Hose
a. Check strainer for debris
b. Strainer in mud
2. Excessive Flow for Height of Lift
a. Reduce flow
b. Reduce amount of hose lines

IV. Basic Operating Practices for Drafting (1-4)
A. Position Pumper as Near as Possible to Water Source

B. Apply Parking Break / Chock Wheels

C. Connect Strainer and Hard Suction Hose(s) with Airtight Connections
1. Barrel Strainer
a. Use ladder and/or rope to keep it off of the bottom and out of the mud
b. Need at least 18" of water above and below strainer to prevent whirl pooling
2. Floating Dock Strainers should be used for Shallow Water Operations

D. Engage Fire Pump / Put Vehicle Transmission in Proper Gear

E. Pumps equipped with a pressure governor computerized control need to be placed into RPM mode and then placed back into pressure mode once water supply draft is successful.

F. Engage Primer Valve until Pump is Full of Water (approximately 15 – 20 seconds)

G. Increase Throttle Slowly until Pressure Gauge Reads at least 50 psi

H. Open Discharge Valve Slowly – Disengage Primer

I. Discharge Water back into Water Source to keep Pump Cool when not flowing Water

J. Set Relief Valve or Pressure Governor if appropriate

K. Watch Vacuum Gauge during Drafting Operation for possible Problems

V. Practical Application

A. Utilizing Apparatus Provided, set up Drafting Evolutions from Various Static Water Sources as Appropriate:
1. Stream
2. Lake
3. Pond
4. Dry Hydrant
5. Portable Tanks
6. Underground Tanks (cisterns)
B. Use Portable Master Stream Device for Fire Flow

Helpful Hints:

When performing interior operations always keep your on board water tank full in case you lose your water supply.

Foam should automatically be used on every fire unless there is a special circumstance. Remember that most Sandoval County Fire Units only carry Class A foam.

When in doubt about what pressure to use, start with 150 PSI and then reduce it if it is too much for the firefighters to handle.

Use the “Preset” pump pressure function on the new engines and tenders when starting pump operations at a scene.

If the fire apparatus you are using has a headset use it and make sure the radio in the cab is placed on the correct channel.

The minimum hose size for vehicle fires and structure fires is a 1 ½” (1 ¾” hose has replaced most the 1 ½” hose in Sandoval County) minimum flow is 120 Gallons per Minute. Do not attempt to attack one of these fires without adequate water flowing from the nozzle. A firefighter could be seriously injured or killed.

The fire pump operator is in a great position to monitor fire ground conditions and should notify the incident commander of any changes they see.

When in doubt about something ask someone for help.

NOTE:

This handout is only a note guide for a fire pump operations orientation course. It does not replace the need for fire pump operators to take the fire pump operators course offered by the Sandoval County Fire Department. The fire pump operations course if 40-hours in length and covers this material in a greater amount of detail and depth.