Standardized HVFD Pump Operator Information

The following chart lists the HVFD attack lines and their calculated pump pressures, based on standard equations and actual flow tests performed at the HVFD. Different textbooks and manufacturers equations will vary, based on the specifics of each hose. This chart represents the hose we use.

HVFD Standard Pump Pressures:

Attack Line	GPM	Pump Pressure
150' 1-3/4" w/100 psi fog nozzle	**150**	**140**
250' 1-3/4" w/ 80 psi fog nozzle	**150**	**150**
300' 2" w/ 1" smooth bore	**210**	**155**
400' 1-3/4" w/ 7/8" smooth bore	**160**	**170**
150' 2" standpipe pack w/ 1" smooth bore	**210**	**120 + Elev.**
2-1/2" w/ 1-1/4" smooth bore	**325**	**Varies - based on length**
Pumping sprinkler systems only		**125**
Pumping combination sprinkler/standpipe systems		**Pump for the standpipe**

Frition loss formulas:

The chart below indicates the formula used to calculate friction loss (per 100') in various sizes hose lines, where "Q" is the GPM, in hundreds of gallons per minute. Again, different textbooks may provide different multipliers, especially for 1-3/4" hose. These are the multipliers that work with our hose, and have been verified thru actual flow testing.

Q^2	**3"**
$(2)Q^2$	**2-1/2"**
$(8)Q^2$	**2"**
$(12)Q^2$	**1-3/4"**

Supplying another pumper

As a general rule charge the line(s) with hydrant pressure only, initially. If the wagon driver needs more pressure, he/she will tell you.

Discharge relief valve

The discharge relief valve will only operate and provide any benefit to the pump operator when all of the following conditions exist.

1. There is a difference of at least 50 psi between the intake pressure and the discharge pressure.
2. There are at least two hose lines being pumped with the same discharge pressures.

Attempting to set the discharge relief valve outside of these parameters will usually result in perceived problems, with little advantage provided to the pump operator. FYI, the relief valves used in the Waterous Pumps on both E-11 and 12 are known historically for being temper-mental. Take your time when using them and be patient. Attempting to rush the operation WILL foul the relief valve.

Engine Pressure Calculations

Below are the actual calculations showing how each pump pressure has been determined. Depending on whether you round off or not could cause the final number to vary by as much as 5-10 psi. 5 psi is not a big deal.

150' 1-3/4" w/100 psi fog nozzle (150 GPM)
EP = 100 (NP) + (12)Q^2 (hundreds of feet of hose)
EP = 100 + (12)(2.25)(1.5 hundred feet)
EP = 100 + 27(1.5 hundred feet)
EP = 100 + 40
EP = 140 psi

250' 1-3/4" w/ 80 psi fog nozzle (150 GPM)
EP = 80 (NP) + (12)Q^2 (hundreds of feet of hose)
EP = 80 + (12)(2.25)(2.5 hundred feet)
EP = 80 + 27(2.5 hundred feet)
EP = 80 + 68
EP = 148 (Round up to 150 psi)

300' 2" w/ 1" smooth bore (210 GPM)
EP = 50 (NP) + (8)Q^2 (hundreds of feet of hose)= EP
EP = 50 + (8)(4.41)(3 hundred feet) = EP
EP = 50 + 35(3 hundred feet) = EP
EP = 50 + 105 = EP
EP = 155 psi

400' 1-3/4" w/ 7/8" smooth bore (160 GPM)
EP = 50 (NP) + (12)Q^2 (hundreds of feet)
EP = 50 + (12)(2.56)(4 hundred feet)
EP = 50 + 30(4 hundred feet)
EP = 50 + 120
EP = 170 psi

150' 2" standpipe pack w/ 1" smooth bore
EP = 50 (NP) + (8)Q^2 (hundreds of feet) + (System) + (Elev.) + (Supply Hose)
EP = 50 + (8)(4.41)(1.5 hundred feet) + (System) + (Elev.) + (Supply Hose)
EP = 50 + 35(1.5 hundred feet) + (20) + (Elev.) + (Supply Hose)
EP = 50 + 52 + (20) + (Elev.) + (Supply Hose)
EP = 122 psi + (Elev.) + (Supply Hose)
EP = 120 psi + Elevation (Loss through supply hose is negligible)