Pump Hydraulics

Theoretical and Rule Of Thumb

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FL= C X Q2 X L   Coefficients →

1½	24
1¾ with 1½-inch couplings	15.5
2	8
2½	2
3 with 2½-inch couplings	0.8
3 with 3-inch couplings	0.677
3½	0.34
4	0.2
4½	0.1
5	0.08

FL check list   FL= NP + FL (+-) EFL + AFL

GPM for smooth bore   29.7 X D2 X SR/ np

(H) Hand line 7.07 Square root of NP (50)

(M) Master stream 8.94 Square root of NP (80)

PDP = NP + TPL

PDP = Pump Discharge Pressure in pounds per square inch (psi) NP = Nozzle Pressure in pounds per square inch (psi)

TPL = Total Pressure Loss in pounds per square inch (psi) (TPL accounts for pressure loss due to friction, elevation, and appliances)

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Smooth Bore Calculations →

Tip Size	D2 DiameterSQ	Handline or MasterStream	GPM	Rule of Thumb
15/16"	.878	H	184.55	175
1"	1	H	209.97	200
1 1/8"	1.265	H	265.75	250
1 ¼"	1.562	H M	328.09 414.87	300 400
1 3/8"	1.890	M	501.99	500
1 ½"	2.25	M	597.41	600
1 5/8"	2.640	M	701.13	700
1 3/4"	3.0625	M	813.14	800
1 7/8"	3.515	M	933.46	900
2"	4	M	1062.07	1000

Fire Hydrant GPM's

"ROGB" Acronym

Blue	1,500 or >
Green	1,000-1,499
Orange	500-999
Red	499 or <

Rule of Thumb

(ROT) for 1 ¾" hose line	(QX4)2 (per 100')
Drop 10 method for 2 1/2" hose line	Drop 10 (per 100')
Q squared method for 3" hose line	Q2 (per 100')
Q squared Divided by 15 for 5" hose line	Q2/15= ___ (per 100')

10 of friction loss is only added to **wyes** if **<350** gpm.

25 is added to **monitors** if **>350** gpm

Elevation, down hill Subtract, uphill Add

FDC= **minimum PDP is 150 psi**

Nozzle Reaction:

(Fog Stream) NR= 0.0505 x Q x √NP

(Solid Stream) NR = 1.57 x d2 x NP

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