BALTIMORE COUNTY FIRE DEPARTMENT

PUMP OPERATOR'S FORMULA: EP = NP + FL + APPL +/- ELEV

FRICTION LOSS CHART
NEW TYPE HOSE, PER 100 FT

Gallons Per Minute (GPM)	Hose Diameter		
	1 3/4"	2"	2 1/2"
95	6		
125	11		
150	15	12	
165	18	14	
185/175fog	**23**	17	
200	27	21	6
210	30	23	7
250	42	32	10
265		**35**	**12**
300			**15**
325			**17**
350			20
400			26
450			33
500			41

HIGH-RISE PACKS

(3) - 75' Sections of 2" Hose
1-1/8" Integrated SB Tip Nozzle (265 gpm)

# Sections	Pressure	PUMP FDC AT
1 - (75')	75 psi	**90 PSI + ELEV**
2 - (150')	95 psi	**110 PSI + ELEV**
3 - (225')	120 psi	**135 PSI + ELEV**

FDC Pump Pressure (Do Not Exceed 200 PSI)
FDC Pressure Includes 15 PSI for System Losses

FOAM EDUCTOR

Foam Concentrate Carried = ***15 gallons***

At ***3%*** , 15 Gallons of Foam Concentrate Makes ***500*** Gallons of ***FINISHED FOAM***

RULES FOR FOAM EDUCTOR

1. Must use supplied 95gpm Foam Aspirating Nozzle
2. Pump Foam Eductor at 200-225 psi
3. No more than 200 FT of hose after the Foam Eductor
4. No limit to hose between pump and Foam Eductor as long as eductor can be pumped at correct pressure.
5. DO NOT USE FIXED 175 GPM FOG NOZZLES

SPRINKLER SYSTEMS

Pump FDC at 150 PSI

SMOOTH BORE TIP FLOWS
GPM = 29.72*D2 √P

P = tip pressure (psi)
D = orifice diameter (in)

Nozzle Pressure (PSI)	Tip Size									
	7/8"	15/16"	1"	1-1/8"	1-1/4"	1-3/8"	1-1/2"	1-5/8"	1-3/4"	2"
40	144	165	188	238	293	355	423	496	575	751
42	147	169	192	244	301	364	433	508	589	770
44	151	173	197	249	308	372	443	520	603	788
46	154	177	201	255	315	381	453	532	617	806
48	158	181	206	260	322	389	463	543	630	823
50	161	185	210	266	328	397	473	555	643	840
52	164	188	214	271	335	405	482	566	656	857
54	167	192	218	276	341	413	491	576	668	873
56	170	195	222	281	347	420	500	587	681	889
58	173	199	226	286	353	428	509	597	693	905
60	176	202	230	291	359	435	518	607	705	920
62	179	206	234	296	365	442	526	618	716	935
64	182	209	238	301	371	449	535	627	728	950
66	185	212	241	305	377	456	543	637	739	965
68	188	215	245	310	383	463	551	647	750	980
70	190	218	248	314	388	470	559	656	761	994
72	193	221	252	319	394	476	567	665	772	1008
74	195	225	255	323	399	483	575	675	782	1022
76	198	228	259	328	405	490	583	684	793	1036
78	200	231	262	332	410	496	590	693	803	1049
80	203	233	266	336	415	502	598	701	814	1063
82	207	236	269	340	420	508	605	710	824	1076
84	210	239	272	345	425	515	612	719	834	1089
86	212	242	275	349	430	521	620	727	843	1102
88	214	245	279	353	435	527	627	736	853	1114
90	216	248	282	357	440	533	634	744	863	1127

NOTE: Friction loss will vary based on hose manufacturer. These calculations are meant to be a guideline.

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WARNING: MAX. PRESSURE FOR RUBBER SUPPLY LINE = 200 PSI

FRICTION LOSS CHART
SUPPLY LINES

Gallons Per Minute (GPM)	Hose Diameter							
	3"	3-1/2"	4"	5"	(2) - 3"	(2) - 4"	(1) - 3" (1) - 4"	(1) - 4" (1) - 5"
300	6	3	2	1	2		1	
350	8	4	3	1	3		1	
400	11	5	3	1	3	1	1	
450	12	7	4	2	4	1	2	
500	17	9	5	2	5	1	3	
550	21	10	6	2	6	2	3	
600	25	12	7	3	7	2	4	
650	29	14	8	3	8	2	4	1
700	34	17	10	4	10	3	5	1
750	45	19	11	5	11	3	5	2
800	51	22	13	5	13	3	6	2
850	57	25	14	6	14	4	6	2
900	64	28	16	6	16	4	7	3
950	72	31	18	7	18	5	7	3
1000	80	34	20	8	20	5	8	3
1100		41	24	10	24	6	10	3
1200		49	29	12	29	7	12	4
1300		57	34	14	34	9	14	4
1400		67	39	16	39	10	16	5
1500		77	45	18	45	11	18	6
1600				20		12	20	6
1700				23		12	23	7
1800				26		13	26	8
1900				29		14	29	9
2000				32		15	32	10

NOTE: Friction loss will vary based on hose manufacturer. These calculations are meant to be a guideline.

DRAFTING

Max. Practical Lift
20 ft

Max. Length of Sleeves
Depends on Lift
** Draft is capable of being established with up to 10 or more suction sleeves as long as lift is reasonable. Priming will take longer.

Fire Pump Rated At
10 ft Lift
** Drafting at a Lift of more than 10 ft will reduce your rated pump capacity as Lift increases

LDH RELAY FLOW LIMITS

GPM	4"	5"
500	3400'	7500'
750	1500'	3400'
1000	850'	2100'
1250	550'	1300'
1500	350'	950'
1750		650'
2000		550'

**Chart shows how far each size hose will flow specified GPM, assuming 200 psi max. pressure in LDH, 30 psi residual (intake) pressure, and level ground.

NET PUMP PRESSURE'S EFFECT ON PUMP CAPACITY

Fire Pump Rated At
150 PSI
Net Pump Pressure

Net Pump Pressure (Discharge - Intake)	% of Rated Capacity
150 psi	100%
200 psi	70%
250 psi	50%

Example: A 1500 gpm pump is operating at a net pump pressure of 200 psi. As a result, the pump's capacity is reduced to
(1500 gpm) x (0.70) = **1050 gpm**

CALCULATING AVAILABLE WATER TO SUPPLY ADDITIONAL LINES

0% - 10% DROP FROM STATIC TO RESIDUAL = ADD 3 TIMES CURRENT GPM OUTPUT
11% - 15% DROP FROM STATIC TO RESIDUAL = ADD 2 TIMES CURRENT GPM OUTPUT
16% - 20% DROP FROM STATIC TO RESIDUAL = ADD 1 TIMES CURRENT GPM OUTPUT OVER 20% DROP FROM STATIC TO RESIDUAL = NO WATER REMAINING