DEFINITIONS, MEASUREMENTS, AND CHARTS

Gallons per Minute and Friction Loss Tables

FRICTION LOSS RATE (FLR) FOR GPM THROUGH HOSE PER 100' LENGTH HOSE

2 ½"	1"	1 ½"'	1 ¾"	3 ½"	4"	FLR
				200	200	1
					250	1
100	11	28	50	250	400	2
110	12	31	55		450	2
120	13	34	60	300		3
130	14	36	65		500	3
140	15	39	70			4
150	17	42	75		600	5
160	18	45	80	400		5
170	19	48	85			6
180	20	50	90	450	700	6
190	21	53	95		750	7
200	22	56	100	500	800	8
210	23	59	105			9
220	24	62	110			10
230	25	64	115		900	11
240	26	67	120	600		12
250	28	70	125		1000	13
260	29	73	130			14
270	30	76	135			15
280	31	78	140	700	1100	16
290	32	81	145			17
300	33	84	150	750	1200	18
310	34	87	155		1250	19
320	35	90	160	800		20
330	36	92	165		1300	22
340	37	95	170			23
350	39	98	175		1400	25
360	40	101	180	900		26
370	41	104	185			27
380	42	106	190		1500	29
390	43	109	195			30
400	44	112	200	1000		32
410	45	115	205			34
420	46	118	210			35
430	47	120	215			37
440	48	123	220	1100	1750	39

HINT

For rapid calculations of 2 ½" hose FLR.

GPM's between 180 and 320 subtract 12 from the first two numbers.

DEFINITIONS, MEASUREMENTS, AND CHARTS

Gallons per Minute and Friction Loss Tables

FRICTION LOSS RATE (FLR) FOR GPM THROUGH HOSE PER 100' LENGTH HOSE

2 ½"	1"	1 ½"	1 ¾"	3 ½"	4"	FLR
450	50	126	225			41
460	51	129	230			42
470	52	132	235			44
480	53	134	240	1200		46
490	54	137	245			48
500	55	140	250	1250	2000	50
510	56	143	255			52
520	57	143	260	1300		54
530	58	148	265			56
540	59	151	270			58
550	60	154	275			61

¾" gpm	EF to 2 ½"	FLR
5	130	3
10	250	13
20	500	50
24	600	72
40	1000	200

NOTE: Please refer to equivalent flow information.

DEFINITIONS, MEASUREMENTS, AND CHARTS

SMOOTH BORE TIPS - Hand Lines		NP	GPM	
3/16"	TIPS FOR	50 psi	7	When calculating gpm round off to the nearest **1** gpm.
1/4"	WILDLAND	50 psi	13	
3/8"	USE	50 psi	30	
1/2"		50 psi	50	
5/8"		50 psi	80	When calculating gpm round off to the nearest **10** gpm.
3/4"		50 psi	120	
7/8"		50 psi	160	
1"		50 psi	210	
1 1/8"		50 psi	270	

SMOOTH BORE TIPS - Appliances	NP	GPM	
1 1/8"	80 psi	300	
1 1/4"	80 psi	400	When calculating gpm round off to the nearest **100** gpm.
1 3/8"	80 psi	500	
1 1/2"	80 psi	600	
1 3/4"	80 psi	800	
2"	80 psi	1100	

FRICTION LOSS RATE CHART
G.P.M.

2 1/2"	1"	1-1/2"	1-3/4"	3"	FLR
100	11	28	50	150	2
110	12	31	55	160	2
120	13	34	60	180	3
130	14	36	65	200	3
140	15	39	70	210	4
150	17	42	75	230	5
160	18	45	80	240	5
170	19	48	85	250	6
180	20	50	90	270	6
190	21	53	95	280	7
200	22	56	100	300	8
210	23	59	105	310	9
220	24	62	110	330	10
230	25	64	115	340	11
240	26	67	120	360	12
250	28	70	125	370	13
260	29	73	130	390	14
270	30	76	135	400	15
280	31	78	140	420	16
290	32	81	145	430	17
300	33	84	150	450	18
310	34	87	155	460	19
320	35	90	160	480	20
330	36	92	165	490	22
340	37	95	170	510	23
350	39	98	175	520	25
360	40	101	180	540	26
370	41	104	185	550	27
380	42	106	190	570	29
390	43	109	195	580	30
400	44	112	200	600	32
410	45	115	205	610	33
420	46	118	210	630	35
430	47	120	215	640	37
440	48	123	220	660	39
450	50	126	225	680	41
460	51	129	230	690	42
470	52	132	235	710	44
480	53	134	240	720	46
490	54	137	254	740	48
500	55	140	250	750	50
510	56	143	255	770	52
520	57	146	260	780	54
530	58	148	265	800	56
540	59	151	270	810	58
550	61	154	275	830	61

$FLR = 2Q^2$ $Q = GPM/100$

$GPM = 30 \times d^2 \sqrt{NP}$

Hose Size & Starting GPM			
1-1/2"	Hose	125	GPM
1-3/4"	Hose	150	GPM
2-1/2"	Hose	250	GPM

Conversion factors				
4"	Hose	.25	X	GPM
3"	Hose	.67	X	GPM
1-3/4"	Hose	2.0	X	GPM
1-1/2"	Hose	3.6	X	GPM
1"	Hose	9.0	X	GPM
¾"	Hose	25	X	GPM

Smooth bore Tips			GPM
1/2"	Hand	Lines	50
5/8"	Hand	Lines	80
3/4"	Hand	Lines	120
7/8"	Hand	Lines	160
1"	Hand	Lines	210
1-1/8"	Hand	Lines	270
1-1/4"		Master	400
1-1/2"		Master	600
1-3/4"		Master	800
2"		Master	1100

Nozzle	Pressure	
Smooth bore	50 psi	hand
Smooth bore	80 psi	master
Adjustable fog	100 psi	

Appliance Loss	
Gravity gain or loss	.5 psi/ft
Siamese, Wye	5 psi
Monitor	15 psi
Standpipes	25 psi
Sprinkler Sys.	25 psi
Snorkel + GL.	80 psi

Starting Pressures	
Sprinkler System	150 psi

Standpipe System

Nozzle	Fire floor		Pressure
Fog	1st.----	10th	150 psi
Fog	above	10th	200 psi
Straight	1st.----	10th	100 psi
Straight	above	10th	150 psi

2 ½"	1"	1 ½"	1 ¾"	3 ½"	4"	FLR
				200	200	1
					250	1
100	11	28	50	250	400	2
110	12	31	55		450	2
120	13	34	60	300		3
130	14	36	65		500	3
140	15	39	70			4
150	17	42	75		600	5
160	18	45	80	400		5
170	19	48	85			6
180	20	50	90	450	700	6
190	21	53	95		750	7
200	22	56	100	500	800	8
210	23	59	105			9
220	24	62	10			10
230	25	64	115		900	11
240	26	67	120	600		12
250	28	70	125		1000	13
260	29	73	130			14
270	30	76	135			15
280	31	78	140	700	1100	16
290	32	81	145			17
300	33	84	150	750	1200	18
310	34	87	155		1250	19
320	35	90	160	800		20
330	36	92	165		1300	22
340	37	95	170			23
350	39	98	175		1400	25
360	40	101	180	900		26
370	41	104	185			27
380	42	106	190		1500	29
390	43	109	195			30
400	44	112	200	1000		32
410	45	115	205			33
420	46	118	210			35
430	47	120	215			37
440	48	123	220	1100	1750	39
450	50	126	225			41
460	51	129	230			42
470	52	132	235			44
480	53	134	240	1200		46
490	54	137	245			48
500	55	140	250	1250	2000	50
510	56	143	255			52
520	57	143	260	1300		54
530	58	148	265			56
540	59	151	270			58
550	60	154	275			61

Hydraulics Formulas:

PP= NP+TFL TFL= FLR x L FLR= $2Q^2$

Q= GPM/100 GPM=$30d^2\sqrt{NP}$ NR=$1.5d^2NP$

SMOOTH BORE TIPS- HANDLINES		NP	GPM
3/16"	Round to 1 GPM	50psi	7
1/4"		50psi	13
3/8"		50psi	30
1/2 "	Round to 10 GPM	50psi	50
5/8"		50psi	80
3/4"		50psi	120
7/8"		50psi	160
1"		50psi	210
1 1/8"		50psi	270
SMOOTH BORE TIPS- APPLIANCES		**NP**	**GPM**
1 1/4"	Round to 100 GPM +15AL	80psi	400
1 3/8"		80psi	500
1 1/2"		80psi	600
1 3/4"		80psi	800
2"		80psi	1100

GG / GL	+/- .5 /ft or 5psi per floor
AL	15psi
LSL	25psi
SL	25psi
SPR. L	25psi
SPR	30 gpm per sprinkler head
SPRINKLER SYSTEM	25(NP)+ TFL+ 25(SPR. L)+ GL
AERIAL LADDER	NP+ TFL+ 25(LSL)+ GL

Hose	Conversion
¾"	GPM X 25
1"	GPM X 9
1 ½"	GPM X 3.6
1 ¾"	GPM X 2
3 ½"	GPM X .4
4"	GPM X .25

Standpipe	25psi
Nozzle	50psi (160 gpm Slug) or 75psi (30-200 gpm SOF)
Attack	FLR of fire floor attack lines
Gravity	GL= 5psi/floor – 5psi for ground floor
Supply to Bldg.	FLR of 2 ½" supply lines (total gpm flow/2 lines)

1 ¾ HOSE (FLR per L)		100'	150'	200'
30 gpm SOF	(1)	101psi	102psi	102psi
60 gpm SOF	(3)	103psi	105psi	106psi
95 gpm SOF	(7)	107psi	111psi	114psi
125 gpm SOF	(13)	113psi	120psi	126psi
150 gpm SOF	(18)	118psi	127psi	136psi
175 gpm SOF	(25)	125psi	138psi	150psi
200 gpm SOF	(32)	132psi	148psi	164psi

Redline	Brush	Engine
5 gpm	103psi	105psi
10 gpm	108psi	115psi
13 gpm	114psi	127psi
25 gpm	151psi	197psi
40 gpm	226psi	339psi
60 gpm	358psi	400psi

2 ½ HOSE- HANDLINES (FLR per L)		NP	100'	150'	200'
125 gpm SOF	(3)	100psi	103psi	105psi	106psi
150 gpm SOF	(5)	100psi	105psi	108psi	110psi
200 gpm SOF	(8)	100psi	108psi	112psi	116psi
250 gpm SOF	(13)	100psi	113psi	120psi	126psi
1" tip 210 gpm	(9)	50psi	59psi	64psi	68psi
1 1/8 "tip 270 gpm	(15)	50psi	65psi	73psi	80psi
4" HOSE- APPLIANCES (FLR per L)		**NP**	**100'**	**150'**	**200'**
1 1/4" tip 400 gpm +AL	(2)	80psi	97psi	98psi	99psi
1 3/8" tip 500 gpm+AL	(3)	80psi	98psi	100psi	101psi
1 1/2" tip 600 gpm +AL	(5)	80psi	100psi	103psi	105psi
1 3/4" tip 800 gpm +AL	(8)	80psi	103psi	107psi	111psi
2" tip 1100 gpm +AL	(16)	80psi	111psi	119psi	127psi
1000 gpm SOF +AL	(13)	100psi	128psi	135psi	141psi

Immediate PP: Hand Lines= NP +GL or -GG **Elevated Streams=**150psi **Standpipes/Sprinklers=**150psi