Contract no. ____________________ Sheet no. 1 of 1

Name and location LAANG. 4th Floor Light Hazard

Reference	K=5.6 Nozzle type and location	Flow in gpm (L/min)	Pipe size (in.)	Fitting and devices		Pipe equivalent length	Friction loss psi/ft (bar/m)	Required psi (bar)	Normal Pressure	Notes
1	16.9	q	1	2 1¼ L	length fitting total	2 2 4	.15	P_t .6 P_f 9.1 P_e	P_t P_v P_n 9.7	$q = 13 \times 13 \times 0.1$ $= 16.9$ gpm
	16.9	Q								
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n	K for spkr. on drop nipple $= \frac{16.9}{\sqrt{9.7}} = 5.4$
1A	16.9	q	1¼	13	length fitting total	13 13	.04	P_t .52 P_f 9.7 P_e	P_t P_v P_n 10.2	
	16.9	Q								
2	17.3	q	1½	13	length fitting total	13 13	.055	P_t .72 P_f 10.2 P_e	P_t P_v P_n 10.9	$q = 5.42\sqrt{10.2}$ $= 17.3$
	34.2	Q								
3	17.9	q	1½	6.5	length fitting total	6.5 6.5	.13	P_t .85 P_f 10.9 P_e	P_t P_v P_n 11.8	$q = 5.42\sqrt{10.9}$ $= 17.9$
	52.1	Q								
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n	K for b.L. $= 51.9\sqrt{11.8} = 15.1$
4	104	q	2	13 1½ T	length fitting total	13 8 21	.13	P_t 2.7 P_f 11.8 P_e	P_t P_v P_n 14.5	$q = 2 \times 52.1$ $= 104$
	104	Q								
5		q	2½	13 2T	length fitting total	13 11 24	.25	P_t 6 P_f 14.5 P_e	P_t P_v P_n 20.5	$Q = 104 + 2(15.1\sqrt{14.5})$ $= 219$
	219	Q								
6		q	3	13 2½ T	length fitting total	13 13 26	.2	P_t 5.4 P_f 20.5 P_e	P_t P_v P_n 25.9	$Q = 219 + 2(15.1\sqrt{20.5})$ $= 356$
	356	Q								
7		q	4	166 3-L, GV, CV	length fitting total	166 42 208	.1	P_t 20.8 P_f 25.9 P_e	P_t P_v P_n 46.7	$Q = 356 + 2(15.1\sqrt{25.9})$ $= 510$
	510	Q								
8		q	6	79 T, 3-L, 2-CV, 2-GV	length fitting total	79 277 356		P_t 5.7 P_f 46.7 P_e	P_t P_v P_n 52.4	$Q = 510 + 250$ $= 760$
	760	Q								
		q Q			length fitting total			P_t P_f P_e 26.9	P_t 52.4 P_v P_n 79	$P_e = 62 \times .433$ $= 26.9$
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n 84	Add 5 psi F.O.S. $5 + 79 = 84$
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n	
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n	
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n	
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n	
		q Q			length fitting total			P_t P_f P_e	P_t P_v P_n	

P_t = total pressure; P_f = friction loss pressure; P_v = velocity pressure; P_e = elevation pressure

Contract no. _____ Sheet no. 1 of 2

Name and location LAANG 1st Floor Ordinary Hazard Group 2

Reference	K=5.6 Nozzle type and location	Flow in gpm (L/min)	Pipe size (in.)	Fitting and devices		Pipe equivalent length	Friction loss psi/ft (bar/m)	Required psi (bar)	Normal Pressure	Notes
1	22 q			2	length	2		P_t 6	P_t	$q = 1.5 \times 8 \times 4 \times 2$
	22 Q		1	L	fitting	2	.16	P_f 1.6	P_v	$= 22$
	q				total	4		P_e	P_n 16	
	Q				length			P_t	P_t	K for Apkr. on
					fitting			P_f	P_v	drop $= 22/\sqrt{16} = 5.5$
					total			P_e	P_n	
1A	22 q		1¼	8.4	length	8.4		P_t .3	P_t	
	22 Q				fitting		.04	P_f 16	P_v	
					total	8.4		P_e	P_n 16.3	
2	q		1¼	8.4	length	8.4		P_t 1.3	P_t	$Q = 22 + 5.5\sqrt{16.3}$
	44 Q				fitting		.15	P_f 16.3	P_v	$= 44$
					total	8.4		P_e	P_n 17.6	
3	q		1¼	4	length	4		P_t 2.2	P_t	$Q = 44 + 5.5\sqrt{17.4}$
	67 Q			L	fitting	3	.32	P_f 17.6	P_v	$= 67$
					total	7		P_e	P_n 19.8	
	q				length			P_t	P_t	K for b.L. $= 67/\sqrt{19.8}$
	Q				fitting			P_f	P_v	$= 15.1$
					total			P_e	P_n	
3A	q			13	length	13		P_t 1	P_t	
	67 Q		2	T	fitting	10	.045	P_f 19.8	P_v	
					total	23		P_e	P_n 19.9	
4	q			10.4	length	10.4		P_t 2.5	P_t	$Q = 67 + 15.1\sqrt{19.9}$
	134 Q		2	L	fitting	5	.16	P_f	P_v	$= 134$
					total	15.4		P_e 19.9	P_n 22.4	
5	q			8.4	length	8.4		P_t 1.9	P_t	$Q = 134 + 5.5\sqrt{22.4}$
	Q		2		fitting		.22	P_f 22.4	P_v	$= 160$
					total			P_e	P_n 24.3	
6	q			4.2	length	4.2		P_t 4.3	P_t	$Q = 160 + 5.5\sqrt{24.3}$
	187 Q		2	T	fitting	10	.5	P_f 24.3	P_v	$= 187$
					total	14.2		P_e	P_n 28.6	
7	22 q	(say)	1½	11.2	length	11.2		P_t .3	P_t	$P = \left(\frac{22}{5.5}\right)^2 + .3 = 16.3$
	Q			L	fitting	4	.019	P_f	P_v	
					total	15.2		P_e	P_n 16.3	
8	q			15.4	length	15.4		P_t 1.6	P_t	$Q = 22 + 5.5\sqrt{16.3}$
	44 Q		1½	2-L	fitting	8	.07	P_f 16.3	P_v	$= 44$
					total	23.4		P_e	P_n 17.9	
9	q			8.4	length	8.4		P_t .4	P_t	$Q = 44 + 5.5\sqrt{17.9}$
	67 Q		2		fitting		.045	P_f 17.9	P_v	$= 67$
					total			P_e	P_n 18.3	
10	q			4.2	length	4.2		P_t 1.3	P_t	$Q = 67 + 5.5\sqrt{18.3}$
	91 Q		2		fitting		.079	P_f	P_v	$= 91$
					total	4.2		P_e 18.3	P_n 18.6	
	q				length			P_t	P_t	K for b.L.
	Q				fitting			P_f	P_v	$= 9\sqrt{18.6} = 20.9$
					total			P_e	P_n	
	q				length			P_t	P_t	q for b.L.
	Q				fitting			P_f	P_v	$= 20.9\sqrt{28.4} = 111$
					total			P_e	P_n	
11	q			13	length	13		P_t 2.9	P_t	$Q = 111 + 187 = 298$
	298 Q		2½		fitting		.3	P_f 28.4	P_v	
					total			P_e	P_n 28.3	
16	229 q	(say)	1¼	8.4	length	8.4		P_t .3	P_t	
	Q		1¼		fitting		.041	P_f 16	P_v	
					total			P_e	P_n 16.3	

P_t = total pressure; P_f = friction loss pressure; P_v = velocity pressure; P_e = elevation pressure

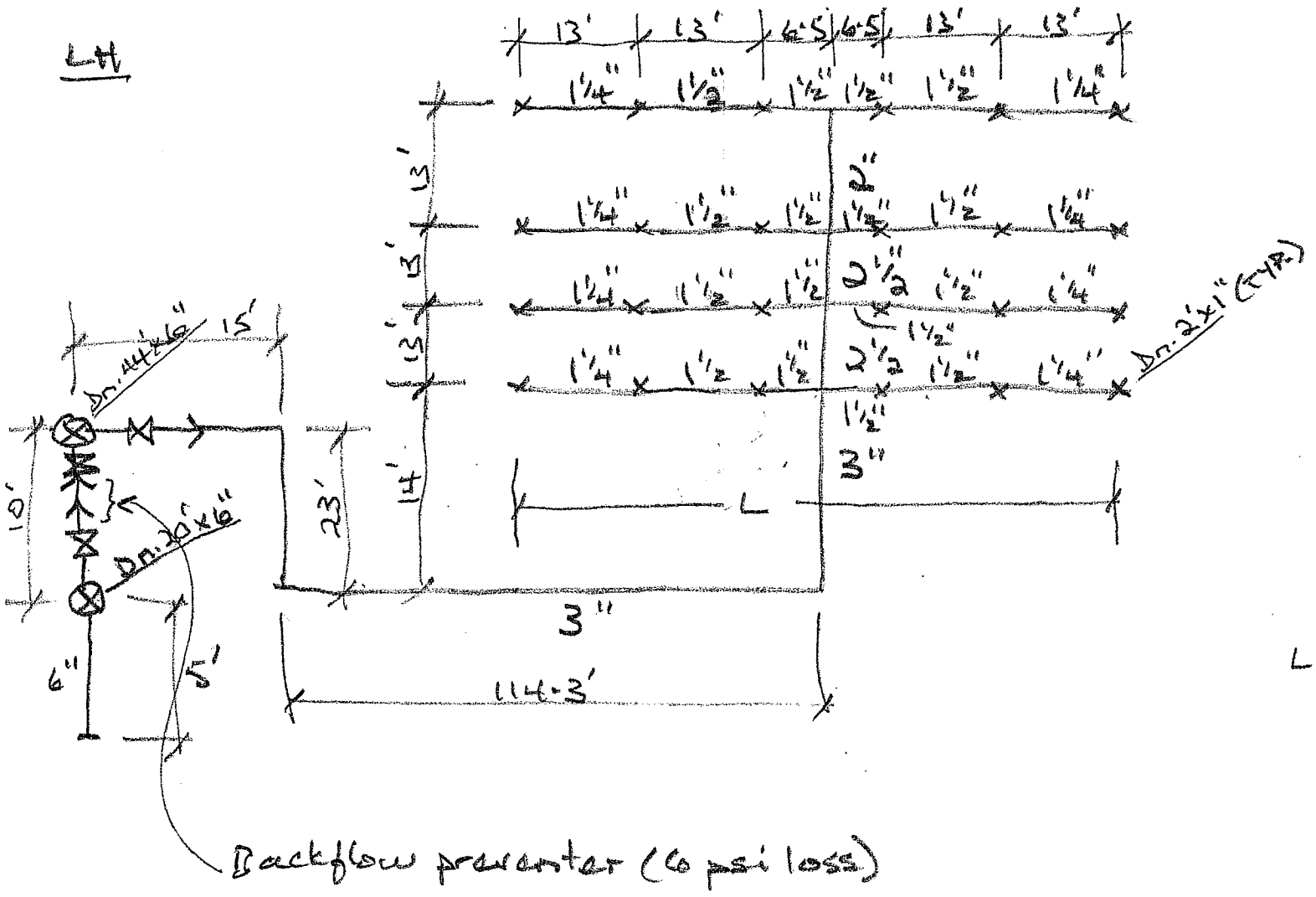
Contract no. _____ Sheet no. 2 of 2

Name and location _____

Reference	Nozzle type and location	Flow in gpm (L/min)	Pipe size (in.)	Fitting and devices		Pipe equivalent length	Friction loss psi/ft (bar/m)	Required psi (bar)	Normal Pressure	Notes
17		q		8.4	length	8.4		P_t 1.3 P_t		$Q = 22 + 5.5\sqrt{16.3}$
	44	Q	1¼		fitting		.15	P_f 16.3 P_v		$= 44$
					total	8.4		P_e P_n 17.6		
18		q		8.4	length	8.4		P_t 2.7 P_t		$Q = 44 + 5.5\sqrt{17.6}$
	67	Q	1¼		fitting		.32	P_f 17.6 P_v		$= 67$
					total	8.4		P_e P_n 20.3		
19		q		8.4	length	8.4		P_t 2.3 P_t		$Q = 67 + 5.5\sqrt{20.3}$
	92	Q	1½		fitting		.27	P_f 20.3 P_v		$= 92$
					total	8.4		P_e P_n 22.6		
20		q		4.2	length	4.2		P_t 1.8 P_t		$Q = 92 + 5.5\sqrt{22.6}$
	118	Q	1½		fitting		.43	P_f 22.6 P_v		$= 118$
					total	4.2		P_e P_n 24.4		
		q			length			P_t P_t		K for s.l. $= 118/\sqrt{24.4}$
		Q			fitting			P_f P_v		$= 23.9$
					total			P_e P_n		
13	22	q (5GPM)	1½	8.4	length	8.4		P_t .16 P_t		$P = \left(\frac{22}{23.9}\right)^2 + .16 = 16.2$
		Q			fitting		.019	P_f 16 P_v		
					total	8.4		P_e P_n 16.2		
14		q		16.8	length	16.8		P_t .35 P_t		$Q = 22 + 5.5\sqrt{16.2}$
	44	Q	2		fitting		.021	P_f 16.2 P_v		$= 44$
					total	16.8		P_e P_n 16.6		
15		q		4.2	length	4.2		P_t .7 P_t		$Q = 44 + 5.5\sqrt{16.6}$
	66	Q	2	T	fitting	10	.046	P_f 16.6 P_v		$= 66$
					total	14.2		P_e P_n 17.3		
		q			length			P_t P_t		K for s.l. $= 66/\sqrt{17.3} = 15.9$
		Q			fitting			P_f P_v		q " " $= 15.9\sqrt{24.4} = 78.5$
					total			P_e P_n		
		q			length			P_t P_t		q for both s.l. $= 111 + 78.5$
		Q			fitting			P_f P_v		$= 189.5$
					total			P_e P_n		$K = 190/\sqrt{24.4} = 38.5$ $= 190$
		q			length			P_t P_t		Adjusted $q = 38.5\sqrt{32.3}$
		Q			fitting			P_f P_v		$= 219$
					total			P_e P_n		
12		q		13	length	13		P_t 2.8 P_t		$Q = 298 + 219 = 517$
	517	Q	3		fitting		.29	P_f 32.3 P_v		
					total	13		P_e P_n 36.1		
21		q		13	length	13		P_t 1.9 P_t		$Q = 517 + 38.5\sqrt{36.1}$
	748	Q	4		fitting		.15	P_f 36.1 P_v		$= 748$
					total	13		P_e P_n 38.1		
22		q		28	length	28		P_t 7.3 P_t		$Q = 748 + 38.5\sqrt{38.1}$
	986	Q	4		fitting		.26	P_f 38.1 P_v		$= 986$
					total	28		P_e P_n 45.4		
		q		220	length	220		P_t 15.3 P_t		
		Q	6	3GV, 3CV, 4L	fitting	161	.035	P_f 45.4 P_v		
					total	381		P_e P_n 58.7		
		q		35	length	35		P_t 2.5 P_t		$Q = 986 + 500$ (hose)
	1486	Q	6		fitting		.072	P_f 58.7 P_v		$= 1486$
					total			P_e P_n 61.2		
		q			length			P_t 61.2 P_t		$P_e = 20 \times .433 = 8.7$
		Q			fitting			P_f P_v		
					total			P_e 8.7 P_n 70		
		q			length			P_t 5 P_t		Add 5 psi F.O.S.
		Q			fitting			P_f 70 P_v		
					total			P_e P_n 75		

P_t = total pressure; P_f = friction loss pressure; P_v = velocity pressure; P_e = elevation pressure

LH

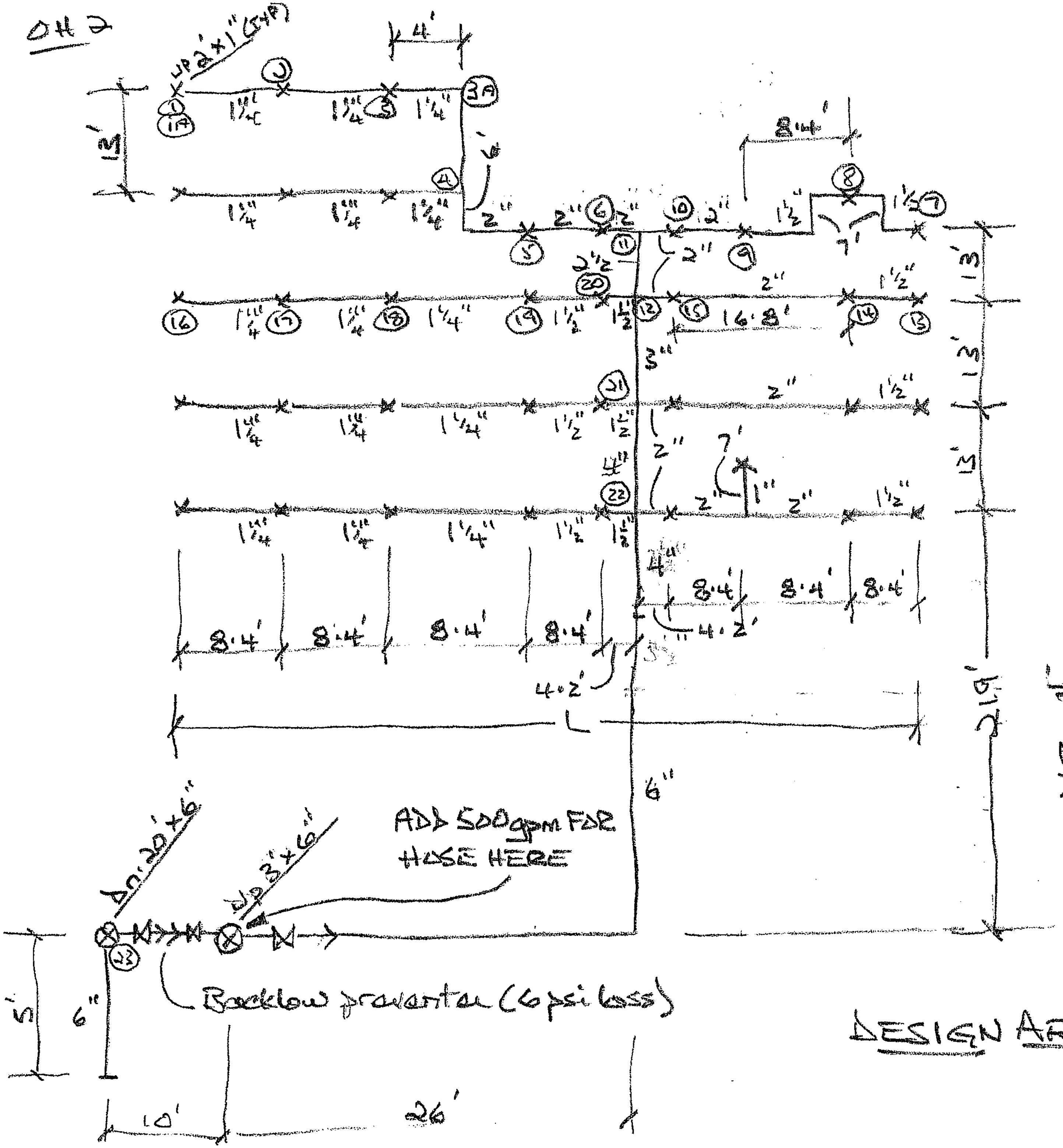


Wet system
Density = 0.10
"C" = 120
Sched. 40 pipe
K = 5.60

Legend
⋈ = gate valve
> = swing check
x = pendent sprk.

$L = 1.2\sqrt{A}$
$= 1.2\sqrt{3000}$
$= 66'$

DESIGN AREA



Wet system
"C" = 120
Sched. 40 pipe
Density = 0.20
K = 5.60

Legend
x = upright sprinkler
⋈ = gate valve
> = check valve