



**... Fire Protection by Computer Design**

Regional Fire Services of NC  
3101-310 Poplarwood Ct  
Raleigh, NC 27604  
919-212-2722

Job Name : KRIGEN PHARMA - SYS #1  
Building : FP 2 OF 4  
Location : 800 EDWARDS BROTHERS DRIVE, LILLINGTON, NC 27546  
System : 1  
Contract : 19043  
Data File : SYS #1.WXF

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**HYDRAULIC CALCULATIONS**  
*for*

**Project name:** KRIGEN PHARMACEUTICALS  
**Location:** 800 EDWARDS BROTHERS DRIVE, LILLINGTON, NC 27546  
**Drawing no:** FP 2 OF 4  
**Date:** 1/20/2020

**Design**

**Remote area number:** 1  
**Remote area location:** WATER GENERATION AREA 110  
**Occupancy classification:** ORD. GR-2  
**Density:** .2 - Gpm/SqFt  
**Area of application:** 1500 - SqFt  
**Coverage per sprinkler:** 256 - SqFt  
**Type of sprinklers calculated:** TYCO, TY5237  
**No. of sprinklers calculated:** 10  
**In-rack demand:** - GPM  
**Hose streams:** 250 - GPM  
**Total water required (including hose streams):** 766.98 - GPM @ 66.43 - Psi  
**Type of system:** WET  
**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 9/10/2019  
**Location:** EDWARDS BROTHER DR  
**Source:** LILLINGTON FIRE DEPARTMENT

**Name of contractor:** REGIONAL FIRE SERVICES OF NC LLC  
**Address:** 3101-310 POPLARWOOD COURT, RALEIGH, NC 27604  
**Phone number:** 919-212-2722  
**Name of designer:** AJITH ZACHARIAS  
**Authority having jurisdiction:** HARNETT COUNTY  
**Notes: (Include peaking information or gridded systems here.)**

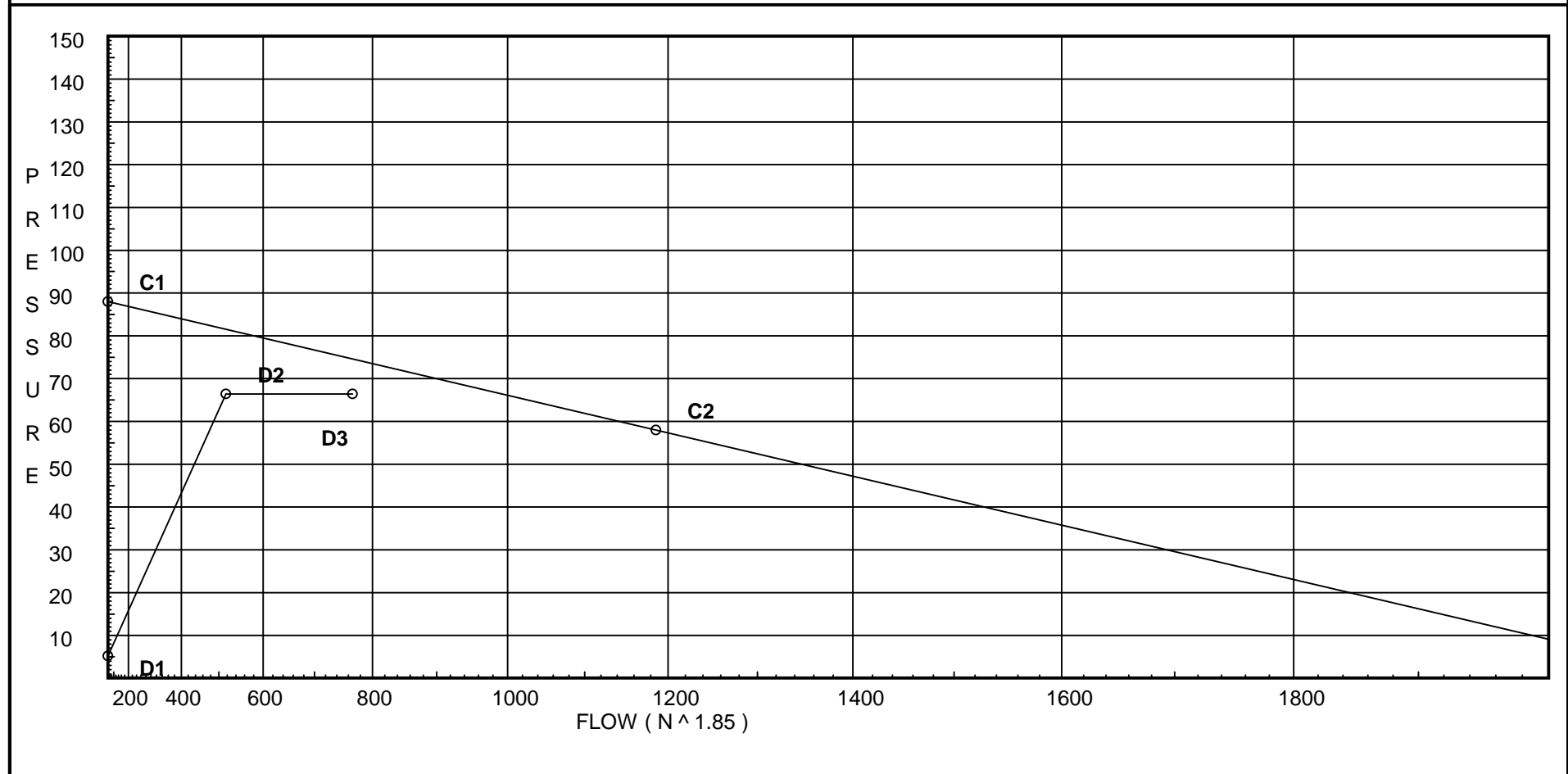
# Water Supply Curve (C)

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City Water Supply:  
C1 - Static Pressure : 88  
C2 - Residual Pressure: 58  
C2 - Residual Flow : 1186

Demand:  
D1 - Elevation : 5.197  
D2 - System Flow : 516.978  
D2 - System Pressure : 66.425  
Hose ( Demand ) : 250  
D3 - System Demand : 766.978  
Safety Margin : 8.181



# Flow Diagram

52  
A1 ← 1  
/ 28.7  
/ 51.9  
A2 ← 2  
↑  
/ 23.2  
52 /  
A3 ← 3

52  
A4 ← 4  
/ 29.4  
/ 51.9  
A5 ← 5  
↑  
/ 22.6  
52 /  
A6 ← 6

51.5  
A7 ← 7  
/ 60.8  
/ 51.2  
A8 ← 8  
/ 9.6  
/ 51.2  
A9 ← 9  
↑  
/ 41.6  
51.3  
A10 ← 10

28.7 75.2  
1 → 2 ← 3 ← 23  
23.2

80.7  
1 ← 11

29.4 74.6  
4 → 5 ← 6 ← 25  
22.6

81.4  
4 ← 13

60.8 41.6  
7 → 8 → 9 ← 10 ← 26  
9.6 92.8

112.3  
7 ← 14

43.4  
12 ← 24

36.7  
15 ← 27  
↑ ↑  
/ 194/4 239.8  
/ 32.6  
16 ← 28  
↑ ↑  
/ 161/8 256  
/ 29.5  
17 ← 29  
↑ ↑  
/ 132/2 268.9  
/ 27.4  
18 ← 30  
↑ ↑  
/ 104/8 279.4

# Flow Diagram

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/ 26.1  
19 ← 31  
↑ ↑  
/ 78.7 287.9  
/ 25.5  
20 ← 32  
↑  
/ 53.2  
/ 26.7  
21 ← 34  
↑ /  
/ 26.6 9.8  
/ 26.6  
22 ← 33

16.6  
23 ← 36  
↑ ↑  
/ 58.6 16.6  
/ 16.6  
24 ← 37  
↑ ↑  
/ 85.4 33.1  
/ 16.6  
25 ← 38  
↑ ↑  
/ 143.4 49.7  
/ 16.6  
26 ← 39  
↑ ↑  
/ 219.6 66.3  
/ 16.5  
27 ← 40  
↑ ↑  
/ 239.8 82.8  
/ 16.5  
28 ← 41  
↑ ↑  
/ 256.7 99.2  
/ 16.6  
29 ← 42  
↑ ↑  
/ 268.9 115.8  
/ 17.1  
30 ← 43  
↑ ↑  
/ 279.4 132.8  
/ 17.5  
31 ← 44  
↑ ↑  
/ 287.9 150.3  
/ 18.4  
32 ← 45

16.7  
33 ← 46  
↑ ↑  
/ 9.8 16.7  
/ 16.7  
34 ← 47

80.7	118.7	194.4	132.2	78.7	26.6					
11 ← 12	← 13	← 14	← 15	← 16	← 17	← 18	← 19	← 20	← 21	← 22
↑ 37.4		231↑	↑ 161.8	↑ 104.8	↑ 53.2					
/ 43.4		/ 36.7	/ 32.6	/ 29.5	/ 27.4	/ 26.1	/ 25.5			
58.6	143.4	239.8	268.9	287.9						
23 ← 24	← 25	← 26	← 27	← 28	← 29	← 30	← 31	← 32	← 35	
85.4	↑ 219.6	↑ 16.6	↑ 16.5	↑ 16.5	↑ 16.6	↑ 17.1	↑ 17.5	↑ 18.4	314.8	
9.8										
33 ← 34	← 35									
19.8										
16.6	49.7	82.6	115.8	150.3						
36 ← 37	← 38	← 39	← 40	← 41	← 42	← 43	← 44	← 45	← 48	
33.1	66.3	99.2	132.8	168.8						
16.7										
46 ← 47	← 48									
↑ 33.5										
/ 33.5	517									

# Flow Diagram

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314/8 / 517 517 517  
35 ← 48 ← TOR ← BOR ← UG1 ← BF ← UG2 ← UG3 ← TEST  
517 517 517 517

# Fittings Used Summary

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## Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24	
Avc	Alarm Vic 751	0	0	0	0	3	9	8	17	0	21	0	22	50	0	0	0	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13	13
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121	121

## Units Summary

Diameter Units           Inches  
 Length Units             Feet  
 Flow Units                US Gallons per Minute  
 Pressure Units           Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with \*. The fittings marked with a \* show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a \* will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA. The diameter modification was turned off by the operator when the job was calculated.

# Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
A1	16.0	11.2	21.54	na	51.98	0.2	256	20.7
A2	16.0	11.2	21.49	na	51.92	0.2	256	20.7
A3	16.0	11.2	21.52	na	51.96	0.2	256	20.7
A4	16.0	11.2	21.57	na	52.02	0.2	256	20.7
A5	16.0	11.2	21.51	na	51.95	0.2	256	20.7
A6	16.0	11.2	21.55	na	51.99	0.2	256	20.7
A7	16.0	11.2	21.13	na	51.48	0.2	256	20.7
A8	16.0	11.2	20.91	na	51.21	0.2	256	20.7
A9	16.0	11.2	20.9	na	51.2	0.2	256	20.7
A10	16.0	11.2	20.95	na	51.27	0.2	256	20.7
1	23.0		45.93	na				
2	23.0		45.81	na				
3	23.0		45.89	na				
4	23.0		46.0	na				
5	23.0		45.87	na				
6	23.0		45.95	na				
7	23.0		45.03	na				
8	23.0		44.55	na				
9	23.0		44.53	na				
10	23.0		44.65	na				
12	23.0		47.34	na				
15	23.0		47.98	na				
16	23.0		48.32	na				
17	23.0		48.57	na				
18	23.0		48.74	na				
19	23.0		48.86	na				
20	23.0		48.92	na				
21	23.0		48.95	na				
22	23.0		48.96	na				
23	23.0		49.63	na				
24	23.0		49.63	na				
25	23.0		49.63	na				
26	23.0		49.64	na				
27	23.0		49.66	na				
28	23.0		49.68	na				
29	23.0		49.7	na				
30	23.0		49.73	na				
31	23.0		49.75	na				
32	23.0		49.78	na				
33	23.0		49.89	na				
34	23.0		49.89	na				
11	23.0		47.27	na				
13	23.0		47.35	na				
14	23.0		47.49	na				
36	23.0		49.93	na				
37	23.0		49.93	na				
38	23.0		49.93	na				
39	23.0		49.94	na				
40	23.0		49.95	na				
41	23.0		49.97	na				
42	23.0		50.0	na				
43	23.0		50.04	na				
44	23.0		50.08	na				
45	23.0		50.14	na				
46	23.0		50.19	na				
47	23.0		50.19	na				
35	23.0		49.89	na				
48	23.0		50.2	na				
TOR	23.0		50.33	na				
BOR	1.0		60.03	na				
UG1	-3.0		61.94	na				
BF	-3.0		62.76	na				



# Flow Summary - Standard

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
UG2	-3.0		68.92	na				
UG3	-3.0		69.19	na				
TEST	4.0		66.42	na	250.0			

The maximum velocity is 19.31 and it occurs in the pipe between nodes A4 and 4

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftnng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
A1 to 1	51.98	1.049 120.0 0.7618	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	21.542 -3.032 27.424			K Factor = 11.20 Vel = 19.30	
	0.0 51.98						45.934		K Factor = 7.67	
A2 to 2	51.92	1.049 120.0 0.7599	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	21.486 -3.032 27.358			K Factor = 11.20 Vel = 19.27	
	0.0 51.92						45.812		K Factor = 7.67	
A3 to 3	51.96	1.049 120.0 0.7612	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	21.524 -3.032 27.402			K Factor = 11.20 Vel = 19.29	
	0.0 51.96						45.894		K Factor = 7.67	
A4 to 4	52.02	1.049 120.0 0.7628	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	21.572 -3.032 27.459			K Factor = 11.20 Vel = 19.31	
	0.0 52.02						45.999		K Factor = 7.67	
A5 to 5	51.95	1.049 120.0 0.7608	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	21.514 -3.032 27.390			K Factor = 11.20 Vel = 19.29	
	0.0 51.95						45.872		K Factor = 7.67	
A6 to 6	51.99	1.049 120.0 0.7620	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	21.550 -3.032 27.432			K Factor = 11.20 Vel = 19.30	
	0.0 51.99						45.950		K Factor = 7.67	
A7 to 7	51.48	1.049 120.0 0.7483	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	21.129 -3.032 26.937			K Factor = 11.20 Vel = 19.11	
	0.0 51.48						45.034		K Factor = 7.67	
A8 to 8	51.21	1.049 120.0 0.7409	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	20.905 -3.032 26.673			K Factor = 11.20 Vel = 19.01	
	0.0 51.21						44.546		K Factor = 7.67	
A9 to 9	51.20	1.049 120.0 0.7407	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	20.898 -3.032 26.664			K Factor = 11.20 Vel = 19.01	
	0.0 51.20						44.530		K Factor = 7.67	
A10 to 10	51.27	1.049 120.0 0.7425	1Eq	34.0 0.0 0.0	2.000 34.000 36.000	20.953 -3.032 26.730			K Factor = 11.20 Vel = 19.03	

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 51.27									
						44.651			K Factor = 7.67	
1 to 2	-28.72	2.157 120.0		0.0	16.000	45.934 0.0				
	-28.72	-0.0076		0.0	16.000	-0.122			Vel = 2.52	
2 to 3	51.91	2.157 120.0		0.0	16.000	45.812 0.0				
	23.19	0.0051		0.0	16.000	0.082			Vel = 2.04	
3 to 23	51.96	2.157 120.0	2T	20.0	63.000	45.894 0.0				
	75.15	0.0450		0.0	83.000	3.736			Vel = 6.60	
	0.0 75.15									
						49.630			K Factor = 10.67	
1 to 11	80.71	2.157 120.0	1E 1T	5.0 10.0	11.000	45.934 0.0				
	80.71	0.0513		0.0	26.000	1.335			Vel = 7.09	
	0.0 80.71									
						47.269			K Factor = 11.74	
4 to 5	-29.35	2.157 120.0		0.0	16.000	45.999 0.0				
	-29.35	-0.0079		0.0	16.000	-0.127			Vel = 2.58	
5 to 6	51.95	2.157 120.0		0.0	16.000	45.872 0.0				
	22.6	0.0049		0.0	16.000	0.078			Vel = 1.98	
6 to 25	51.99	2.157 120.0	2T	20.0	63.000	45.950 0.0				
	74.59	0.0444		0.0	83.000	3.684			Vel = 6.55	
	0.0 74.59									
						49.634			K Factor = 10.59	
4 to 13	81.37	2.157 120.0	1E 1T	5.0 10.0	11.000	45.999 0.0				
	81.37	0.0521		0.0	26.000	1.355			Vel = 7.14	
	0.0 81.37									
						47.354			K Factor = 11.82	
7 to 8	-60.83	2.157 120.0		0.0	16.000	45.034 0.0				
	-60.83	-0.0305		0.0	16.000	-0.488			Vel = 5.34	
8 to 9	51.20	2.157 120.0		0.0	16.000	44.546 0.0				
	-9.63	-0.0010		0.0	16.000	-0.016			Vel = 0.85	
9 to 10	51.20	2.157 120.0		0.0	8.000	44.530 0.0				
	41.57	0.0151		0.0	8.000	0.121			Vel = 3.65	
10 to 26	51.27	2.157 120.0	2T	20.0	55.000	44.651 0.0				
	92.84	0.0665		0.0	75.000	4.991			Vel = 8.15	
	0.0									

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftnng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	92.84					49.642			K Factor = 13.18	
7 to 14	112.32	2.157 120.0	1E 1T	5.0 10.0	11.000 15.000	45.034 0.0				
	112.32	0.0946		0.0	26.000	2.460			Vel = 9.86	
	0.0 112.32					47.494			K Factor = 16.30	
12 to 24	43.35	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	47.338 0.0				
	43.35	0.0163		0.0	141.000	2.293			Vel = 3.81	
	0.0 43.35					49.631			K Factor = 6.15	
15 to 27	36.68	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	47.976 0.0				
	36.68	0.0119		0.0	141.000	1.683			Vel = 3.22	
	0.0 36.68					49.659			K Factor = 5.21	
16 to 28	32.61	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	48.325 0.0				
	32.61	0.0096		0.0	141.000	1.354			Vel = 2.86	
	0.0 32.61					49.679			K Factor = 4.63	
17 to 29	29.54	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	48.574 0.0				
	29.54	0.0080		0.0	141.000	1.127			Vel = 2.59	
	0.0 29.54					49.701			K Factor = 4.19	
18 to 30	27.40	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	48.745 0.0				
	27.4	0.0070		0.0	141.000	0.981			Vel = 2.41	
	0.0 27.40					49.726			K Factor = 3.89	
19 to 31	26.09	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	48.856 0.0				
	26.09	0.0064		0.0	141.000	0.896			Vel = 2.29	
	0.0 26.09					49.752			K Factor = 3.70	
20 to 32	25.49	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	48.922 0.0				
	25.49	0.0061		0.0	141.000	0.858			Vel = 2.24	
	0.0 25.49					49.780			K Factor = 3.61	
21 to 34	26.69	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	48.954 0.0				
	26.69	0.0066		0.0	141.000	0.934			Vel = 2.34	
	0.0 26.69					49.888			K Factor = 3.78	
22 to 33	26.55	2.157 120.0	3T 1E	30.0 5.0	106.000 35.000	48.962 0.0				
	26.55	0.0066		0.0	141.000	0.926			Vel = 2.33	

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 26.55									
						49.888			K Factor =	3.76
23 to 36	16.58	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.630 0.0				
	16.58	0.0027		0.0	109.000	0.299			Vel =	1.46
	0.0 16.58									
						49.929			K Factor =	2.35
24 to 37	16.57	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.631 0.0				
	16.57	0.0027		0.0	109.000	0.299			Vel =	1.45
	0.0 16.57									
						49.930			K Factor =	2.34
25 to 38	16.59	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.634 0.0				
	16.59	0.0028		0.0	109.000	0.300			Vel =	1.46
	0.0 16.59									
						49.934			K Factor =	2.35
26 to 39	16.58	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.642 0.0				
	16.58	0.0028		0.0	109.000	0.300			Vel =	1.46
	0.0 16.58									
						49.942			K Factor =	2.35
27 to 40	16.47	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.659 0.0				
	16.47	0.0027		0.0	109.000	0.296			Vel =	1.45
	0.0 16.47									
						49.955			K Factor =	2.33
28 to 41	16.46	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.679 0.0				
	16.46	0.0027		0.0	109.000	0.295			Vel =	1.45
	0.0 16.46									
						49.974			K Factor =	2.33
29 to 42	16.60	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.701 0.0				
	16.6	0.0028		0.0	109.000	0.301			Vel =	1.46
	0.0 16.60									
						50.002			K Factor =	2.35
30 to 43	16.95	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.726 0.0				
	16.95	0.0029		0.0	109.000	0.312			Vel =	1.49
	0.0 16.95									
						50.038			K Factor =	2.40
31 to 44	17.54	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.752 0.0				
	17.54	0.0031		0.0	109.000	0.333			Vel =	1.54
	0.0 17.54									
						50.085			K Factor =	2.48

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #1

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
32 to 45	18.41	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.780 0.0				
	18.41	0.0033		0.0	109.000	0.364		Vel =	1.62	
	0.0 18.41						50.144	K Factor =	2.60	
33 to 46	16.72	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.888 0.0				
	16.72	0.0028		0.0	109.000	0.305		Vel =	1.47	
	0.0 16.72						50.193	K Factor =	2.36	
34 to 47	16.75	2.157 120.0	1E 1T	5.0 10.0	94.000 15.000	49.888 0.0				
	16.75	0.0028		0.0	109.000	0.306		Vel =	1.47	
	0.0 16.75						50.194	K Factor =	2.36	
11 to 12	80.71	3.26 120.0		0.0 0.0	10.000 0.0	47.269 0.0				
	80.71	0.0069		0.0	10.000	0.069		Vel =	3.10	
12 to 13	-43.36	3.26 120.0		0.0 0.0	10.000 0.0	47.338 0.0				
	37.35	0.0016		0.0	10.000	0.016		Vel =	1.44	
13 to 14	81.37	3.26 120.0		0.0 0.0	10.000 0.0	47.354 0.0				
	118.72	0.0140		0.0	10.000	0.140		Vel =	4.56	
14 to 15	112.32	3.26 120.0		0.0 0.0	10.000 0.0	47.494 0.0				
	231.04	0.0482		0.0	10.000	0.482		Vel =	8.88	
15 to 16	-36.68	3.26 120.0		0.0 0.0	10.000 0.0	47.976 0.0				
	194.36	0.0349		0.0	10.000	0.349		Vel =	7.47	
16 to 17	-32.61	3.26 120.0		0.0 0.0	10.000 0.0	48.325 0.0				
	161.75	0.0249		0.0	10.000	0.249		Vel =	6.22	
17 to 18	-29.54	3.26 120.0		0.0 0.0	10.000 0.0	48.574 0.0				
	132.21	0.0171		0.0	10.000	0.171		Vel =	5.08	
18 to 19	-27.39	3.26 120.0		0.0 0.0	10.000 0.0	48.745 0.0				
	104.82	0.0111		0.0	10.000	0.111		Vel =	4.03	
19 to 20	-26.09	3.26 120.0		0.0 0.0	10.000 0.0	48.856 0.0				
	78.73	0.0066		0.0	10.000	0.066		Vel =	3.03	
20 to 21	-25.49	3.26 120.0		0.0 0.0	10.000 0.0	48.922 0.0				
	53.24	0.0032		0.0	10.000	0.032		Vel =	2.05	
21 to 22	-26.69	3.26 120.0		0.0 0.0	10.000 0.0	48.954 0.0				
	26.55	0.0008		0.0	10.000	0.008		Vel =	1.02	

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #1

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Date 1/20/2020

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 26.55									
						48.962			K Factor =	3.79
23 to 24	58.57	6.357 120.0		0.0	10.000	49.630				
24 to 25	58.57	0.0001		0.0	10.000	0.001			Vel =	0.59
24 to 25	26.79	6.357 120.0		0.0	10.000	49.631				
25 to 26	85.36	0.0003		0.0	10.000	0.003			Vel =	0.86
25 to 26	58.00	6.357 120.0		0.0	10.000	49.634				
26 to 27	143.36	0.0008		0.0	10.000	0.008			Vel =	1.45
26 to 27	76.26	6.357 120.0		0.0	10.000	49.642				
27 to 28	219.62	0.0017		0.0	10.000	0.017			Vel =	2.22
27 to 28	20.21	6.357 120.0		0.0	10.000	49.659				
28 to 29	239.83	0.0020		0.0	10.000	0.020			Vel =	2.42
28 to 29	16.15	6.357 120.0		0.0	10.000	49.679				
29 to 30	255.98	0.0022		0.0	10.000	0.022			Vel =	2.59
29 to 30	12.94	6.357 120.0		0.0	10.000	49.701				
30 to 31	268.92	0.0025		0.0	10.000	0.025			Vel =	2.72
30 to 31	10.45	6.357 120.0		0.0	10.000	49.726				
31 to 32	279.37	0.0026		0.0	10.000	0.026			Vel =	2.82
31 to 32	8.54	6.357 120.0		0.0	10.000	49.752				
32 to 35	287.91	0.0028		0.0	10.000	0.028			Vel =	2.91
32 to 35	7.08	6.357 120.0	1T	30.0	7.000	49.780				
35	294.99	0.0029		0.0	37.000	0.108			Vel =	2.98
	0.0 294.99									
						49.888			K Factor =	41.76
33 to 34	9.83	6.357 120.0		0.0	10.000	49.888				
34 to 35	9.83	0.0		0.0	10.000	0.0			Vel =	0.10
34 to 35	9.94	6.357 120.0		0.0	4.000	49.888				
35	19.77	0.0		0.0	4.000	0.0			Vel =	0.20
	0.0 19.77									
						49.888			K Factor =	2.80
36 to 37	16.58	4.26 120.0		0.0	10.000	49.929				
37 to 38	16.58	0.0001		0.0	10.000	0.001			Vel =	0.37
37 to 38	16.57	4.26 120.0		0.0	10.000	49.930				
38	33.15	0.0004		0.0	10.000	0.004			Vel =	0.75

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #1

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftn'g's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
38 to 39	16.59 49.74	4.26 120.0 0.0008	0.0 0.0 0.0	10.000 0.0 10.000	49.934 0.0 0.008		Vel = 1.12		
39 to 40	16.58 66.32	4.26 120.0 0.0013	0.0 0.0 0.0	10.000 0.0 10.000	49.942 0.0 0.013		Vel = 1.49		
40 to 41	16.47 82.79	4.26 120.0 0.0019	0.0 0.0 0.0	10.000 0.0 10.000	49.955 0.0 0.019		Vel = 1.86		
41 to 42	16.45 99.24	4.26 120.0 0.0028	0.0 0.0 0.0	10.000 0.0 10.000	49.974 0.0 0.028		Vel = 2.23		
42 to 43	16.60 115.84	4.26 120.0 0.0036	0.0 0.0 0.0	10.000 0.0 10.000	50.002 0.0 0.036		Vel = 2.61		
43 to 44	16.95 132.79	4.26 120.0 0.0047	0.0 0.0 0.0	10.000 0.0 10.000	50.038 0.0 0.047		Vel = 2.99		
44 to 45	17.55 150.34	4.26 120.0 0.0059	0.0 0.0 0.0	10.000 0.0 10.000	50.085 0.0 0.059		Vel = 3.38		
45 to 48	18.41 168.75	4.26 120.0 0.0073	0.0 0.0 0.0	7.000 0.0 7.000	50.144 0.0 0.051		Vel = 3.80		
	0.0 168.75				50.195		K Factor = 23.82		
46 to 47	16.72 16.72	4.26 120.0 0.0001	0.0 0.0 0.0	10.000 0.0 10.000	50.193 0.0 0.001		Vel = 0.38		
47 to 48	16.75 33.47	4.26 120.0 0.0002	0.0 0.0 0.0	4.000 0.0 4.000	50.194 0.0 0.001		Vel = 0.75		
	0.0 33.47				50.195		K Factor = 4.72		
35 to 48	314.76 314.76	6.357 120.0 0.0033	0.0 0.0 0.0	93.000 0.0 93.000	49.888 0.0 0.307		Vel = 3.18		
48 to TOR	202.22 516.98	6.357 120.0 0.0082	1E 14.0 0.0 0.0	2.000 14.000 16.000	50.195 0.0 0.132		Vel = 5.23		
TOR to BOR	0.0 516.98	8.249 120.0 0.0023	1Avc 50.0 1G 4.0 0.0	20.000 54.000 74.000	50.327 9.528 0.172		Vel = 3.10		
BOR to UG1	0.0 516.98	8.27 140.0 0.0017	2E 47.88 1T 46.55 0.0	8.000 94.430 102.430	60.027 1.732 0.177		Vel = 3.09		
UG1 to BF	0.0 516.98	8.27 140.0 0.0017	1E 23.94 0.0 0.0	455.000 23.940 478.940	61.936 0.0 0.826		Vel = 3.09		

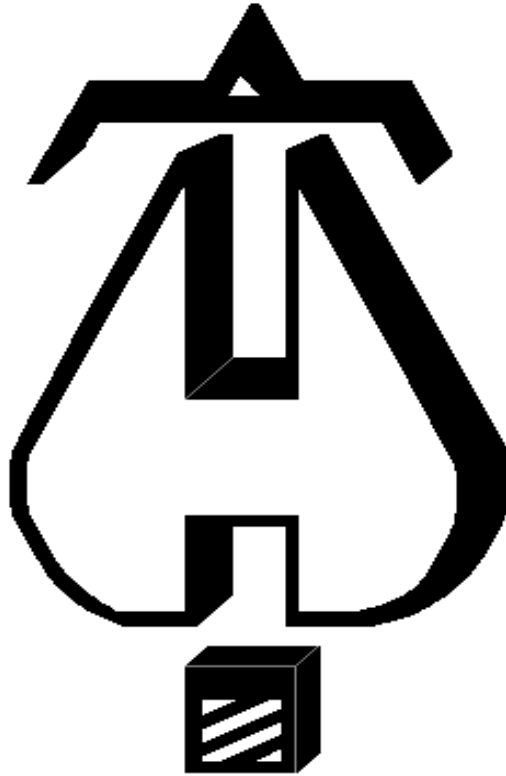


# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #1

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
BF	0.0	8.27	1T	46.55	38.000	62.762			
to		140.0	1G	5.32	51.870	6.000		* Fixed loss = 6	
UG2	516.98	0.0017		0.0	89.870	0.155		Vel = 3.09	
UG2	0.0	8.27	1T	46.55	113.000	68.917			
to		140.0		0.0	46.550	0.0			
UG3	516.98	0.0017		0.0	159.550	0.275		Vel = 3.09	
UG3	0.0	6.16	1E	18.62	14.000	69.192			
to		140.0	1G	3.99	22.610	-3.032			
TEST	516.98	0.0072		0.0	36.610	0.265		Vel = 5.57	
	250.00							Qa = 250.00	
	766.98					66.425		K Factor = 94.11	



**... Fire Protection by Computer Design**

Regional Fire Services of NC  
3101-310 Poplarwood Ct  
Raleigh, NC 27604  
919-212-2722

Job Name : KRIGEN PHARMA - SYS #2  
Building : FP 2 OF 4  
Location : 800 EDWARDS BROTHERS DRIVE, LILLINGTON, NC 27546  
System : 2  
Contract : 19043  
Data File : SYS #2.WXF

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**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** KRIGEN PHARMACEUTICALS  
**Location:** 800 EDWARDS BROTHERS DRIVE, LILLINGTON, NC 27546  
**Drawing no:** FP 2 OF 4  
**Date:** 1/20/2020

**Design**

**Remote area number:** 2  
**Remote area location:** PASSAGE AREA 58  
**Occupancy classification:** LIGHT  
**Density:** .1 - Gpm/SqFt  
**Area of application:** 900 - SqFt  
**Coverage per sprinkler:** 256 - SqFt  
**Type of sprinklers calculated:** TYCO, TY5237, TY3231  
**No. of sprinklers calculated:** 11  
**In-rack demand:** - GPM  
**Hose streams:** 100 - GPM  
**Total water required (including hose streams):** 378.29 - GPM @ 41.99 - Psi  
**Type of system:** WET  
**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 9/10/2019  
**Location:** EDWARDS BROTHER DR  
**Source:** LILLINGTON FIRE DEPARTMENT

**Name of contractor:** REGIONAL FIRE SERVICES OF NC LLC  
**Address:** 3101-310 POPLARWOOD COURT, RALEIGH, NC 27604  
**Phone number:** 919-212-2722  
**Name of designer:** AJITH ZACHARIAS  
**Authority having jurisdiction:** HARNETT COUNTY  
**Notes: (Include peaking information or gridded systems here.)**

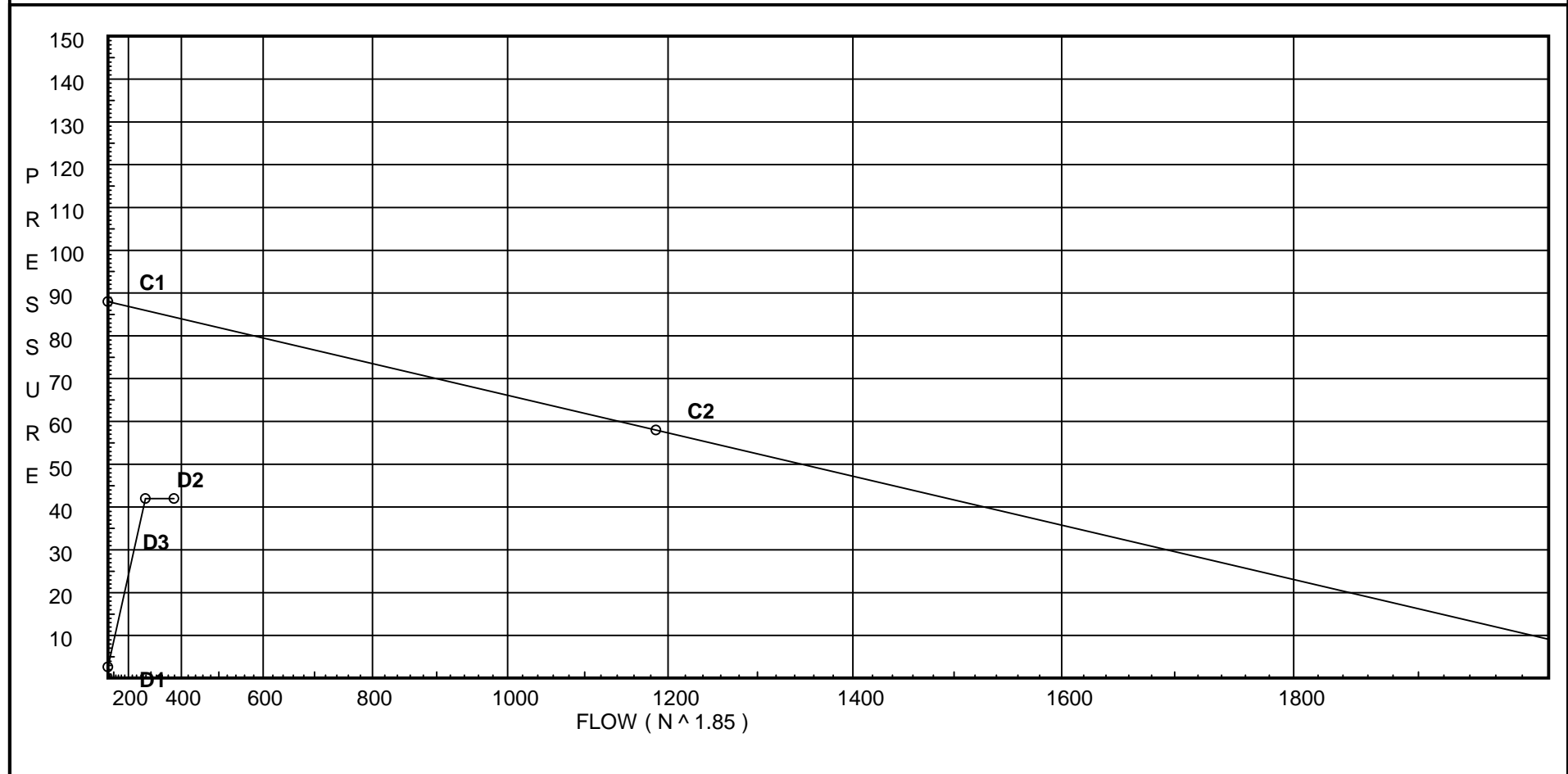
# Water Supply Curve (C)

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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City Water Supply:  
C1 - Static Pressure : 88  
C2 - Residual Pressure: 58  
C2 - Residual Flow : 1186

Demand:  
D1 - Elevation : 2.599  
D2 - System Flow : 278.295  
D2 - System Pressure : 41.989  
Hose ( Demand ) : 100  
D3 - System Demand : 378.295  
Safety Margin : 42.389



# Flow Diagram

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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20.4  
**B1** ← 101

20.3  
**B2** ← 102

30.1  
**B3** ← 103  
↑  
/ 16.3  
30.1  
**B4** ← 104

31.4  
**B5** ← 105

30.7  
**B6** ← 106

21.2  
**B7** ← 107

21.2  
**B8** ← 108  
/ 29.1  
21.1  
**B9** ← 109  
/ 8  
21.1  
**B10** ← 110  
↑ 13  
30.9  
**B11** ← 111

20.4  
**101** ← 112

20.3  
**102** ← 112

30.7  
**106** ← 113

21.2  
**107** ← 113

13.7 46.5  
**112** → 103 ← 104 ← 126  
16.3

54.4  
**112** ← 114

10.2  
**105** → 113 ← 127  
41.6

41.6  
**105** ← 115

29.1 13  
**108** → 109 → 110 ← 111 ← 128  
8 43.9

50.3  
**108** ← 116

# Flow Diagram

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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15.9  
**117** ← **129**  
 ↑     ↑  
 / 130/4 147.9  
 / 14.7  
**118** ← **130**  
 ↑     ↑  
 / 115/7 162.6  
 / 14.1  
**119** ← **131**  
 ↑     ↑  
 / 101/6 176.6  
 / 14 /  
**120** ← **132**  
 ↑     ↑  
 / 87.0 190.7  
 / 14.0  
**121** ← **133**  
 ↑     ↑  
 / 73 / 205.3  
 / 15.7  
**122** ← **134**  
 ↑     ↑  
 / 57.4 220.9  
 / 17.2  
**123** ← **135**  
 ↑     ↑  
 / 40.2 238.1  
 / 19 /  
**124** ← **136**  
 ↑     ↑  
 / 21.2 257.1  
 / 21.2  
**125** ← **137**

54.4     146.3     115.7     87.6     57.4     21.2  
**114** ← **115** ← **116** ← **117** ← **118** ← **119** ← **120** ← **121** ← **122** ← **123** ← **124** ← **125**  
           96           ↑ 130/4    ↑ 101/6    ↑ 73    ↑    ↑ 40.2    ↑  
                   / 15.9   14.7   14.1   14 /   14.0   15.7   17.2   19 /   21.2  
 46.5     132/     / 162/6   / 190/7   / 220/9   / 257/1     278.3     278.3     278.3  
**126** ← **127** ← **128** ← **129** ← **130** ← **131** ← **132** ← **133** ← **134** ← **135** ← **136** ← **137** ← **TOR1** ← **BOR1** ← **UG1** ← **BF** ← **UG2** ← **UG3** ← **TEST**  
           88.1           147.9           176.6           205.3           238.1           278.3           278.3           278.3           278.3

# Fittings Used Summary

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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## Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
Avc	Alarm Vic 751	0	0	0	0	3	9	8	17	0	21	0	22	50	0	0	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121

## Units Summary

Diameter Units           Inches  
Length Units             Feet  
Flow Units                US Gallons per Minute  
Pressure Units           Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with \*. The fittings marked with a \* show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a \* will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA. The diameter modification was turned off by the operator when the job was calculated.

# Pressure / Flow Summary - STANDARD

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
B1	10.0	5.6	13.25	na	20.39	0.1	98	7.0
B2	10.0	5.6	13.16	na	20.31	0.1	60	7.0
B3	10.0	11.2	7.2	na	30.05	0.1	256	7.2
B4	10.0	11.2	7.24	na	30.15	0.1	256	7.2
B5	10.0	11.2	7.84	na	31.37	0.1	256	7.2
B6	10.0	11.2	7.49	na	30.66	0.1	256	7.2
B7	10.0	5.6	14.31	na	21.19	0.1	93	7.0
B8	10.0	5.6	14.32	na	21.19	0.1	120	7.0
B9	10.0	5.6	14.15	na	21.07	0.1	78	7.0
B10	10.0	5.6	14.14	na	21.06	0.1	96	7.0
B11	10.0	11.2	7.6	na	30.87	0.1	256	7.2
101	23.0		13.69	na				
102	23.0		13.56	na				
106	23.0		14.77	na				
107	23.0		15.2	na				
112	23.0		14.09	na				
103	23.0		14.01	na				
104	23.0		14.12	na				
105	23.0		15.68	na				
113	23.0		15.63	na				
108	23.0		15.2	na				
109	23.0		14.97	na				
110	23.0		14.96	na				
111	23.0		15.03	na				
117	23.0		20.53	na				
118	23.0		21.0	na				
119	23.0		21.37	na				
120	23.0		21.67	na				
121	23.0		21.9	na				
122	23.0		22.06	na				
123	23.0		22.16	na				
124	23.0		22.21	na				
125	23.0		22.23	na				
114	23.0		19.58	na				
115	23.0		19.68	na				
116	23.0		19.94	na				
126	23.0		22.14	na				
127	23.0		22.16	na				
128	23.0		22.24	na				
129	23.0		22.42	na				
130	23.0		22.63	na				
131	23.0		22.88	na				
132	23.0		23.17	na				
133	23.0		23.51	na				
134	23.0		23.89	na				
135	23.0		24.34	na				
136	23.0		24.85	na				
137	23.0		25.43	na				
TOR1	23.0		26.43	na				
BOR1	1.0		36.75	na				
UG1	-3.0		38.54	na				
BF	-3.0		38.8	na				
UG2	-3.0		44.85	na				
UG3	-3.0		44.94	na				
TEST	4.0		41.99	na	100.0			

The maximum velocity is 11.65 and it occurs in the pipe between nodes B5 and 105



# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
B1 to 101	20.39 20.39	1.049 120.0 0.1348	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	13.252 -5.630 6.066			K Factor = 5.60 Vel = 7.57	
	0.0 20.39						13.688		K Factor = 5.51	
B2 to 102	20.31 20.31	1.049 120.0 0.1339	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	13.160 -5.630 6.027			K Factor = 5.60 Vel = 7.54	
	0.0 20.31						13.557		K Factor = 5.52	
B3 to 103	30.05 30.05	1.049 120.0 0.2764	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	7.200 -5.630 12.438			K Factor = 11.20 Vel = 11.16	
	0.0 30.05						14.008		K Factor = 8.03	
B4 to 104	30.15 30.15	1.049 120.0 0.2780	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	7.245 -5.630 12.510			K Factor = 11.20 Vel = 11.19	
	0.0 30.15						14.125		K Factor = 8.02	
B5 to 105	31.37 31.37	1.049 120.0 0.2992	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	7.845 -5.630 13.465			K Factor = 11.20 Vel = 11.65	
	0.0 31.37						15.680		K Factor = 7.92	
B6 to 106	30.66 30.66	1.049 120.0 0.2868	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	7.494 -5.630 12.906			K Factor = 11.20 Vel = 11.38	
	0.0 30.66						14.770		K Factor = 7.98	
B7 to 107	21.19 21.19	1.049 120.0 0.1448	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	14.312 -5.630 6.514			K Factor = 5.60 Vel = 7.87	
	0.0 21.19						15.196		K Factor = 5.44	
B8 to 108	21.19 21.19	1.049 120.0 0.1448	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	14.316 -5.630 6.515			K Factor = 5.60 Vel = 7.87	
	0.0 21.19						15.201		K Factor = 5.43	
B9 to 109	21.07 21.07	1.049 120.0 0.1432	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	14.150 -5.630 6.446			K Factor = 5.60 Vel = 7.82	
	0.0 21.07						14.966		K Factor = 5.45	
B10 to 110	21.06 21.06	1.049 120.0 0.1432	1Eq	34.0 0.0 0.0	11.000 34.000 45.000	14.144 -5.630 6.443			K Factor = 5.60 Vel = 7.82	

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 21.06						14.957		K Factor = 5.45	
B11 to 111	30.87	1.049 120.0	1Eq	34.0 0.0	11.000 34.000	7.595 -5.630			K Factor = 11.20	
	30.87	0.2904		0.0	45.000	13.069			Vel = 11.46	
	0.0 30.87						15.034		K Factor = 7.96	
101 to 112	20.39	1.049 120.0		0.0 0.0	3.000 0.0	13.688 0.0				
	20.39	0.1350		0.0	3.000	0.405			Vel = 7.57	
	0.0 20.39						14.093		K Factor = 5.43	
102 to 112	20.31	1.049 120.0		0.0 0.0	4.000 0.0	13.557 0.0				
	20.31	0.1340		0.0	4.000	0.536			Vel = 7.54	
	0.0 20.31						14.093		K Factor = 5.41	
106 to 113	30.66	1.049 120.0		0.0 0.0	3.000 0.0	14.770 0.0				
	30.66	0.2870		0.0	3.000	0.861			Vel = 11.38	
	0.0 30.66						15.631		K Factor = 7.75	
107 to 113	21.19	1.049 120.0		0.0 0.0	3.000 0.0	15.196 0.0				
	21.19	0.1450		0.0	3.000	0.435			Vel = 7.87	
	0.0 21.19						15.631		K Factor = 5.36	
112 to 103	-13.72	1.682 120.0		0.0 0.0	13.000 0.0	14.093 0.0				
	-13.72	-0.0065		0.0	13.000	-0.085			Vel = 1.98	
103 to 104	30.05	1.682 120.0		0.0 0.0	13.000 0.0	14.008 0.0				
	16.33	0.0090		0.0	13.000	0.117			Vel = 2.36	
104 to 126	30.15	1.682 120.0	1E 1T	4.0 8.0	117.000 12.000	14.125 0.0				
	46.48	0.0621		0.0	129.000	8.014			Vel = 6.71	
	0.0 46.48						22.139		K Factor = 9.88	
112 to 114	54.42	1.682 120.0	1E 1T	4.0 8.0	54.000 12.000	14.093 0.0				
	54.42	0.0832		0.0	66.000	5.491			Vel = 7.86	
	0.0 54.42						19.584		K Factor = 12.30	
105 to 113	-10.23	1.682 120.0		0.0 0.0	13.000 0.0	15.680 0.0				
	-10.23	-0.0038		0.0	13.000	-0.049			Vel = 1.48	
113 to 127	51.85	1.682 120.0	1E 1T	4.0 8.0	117.000 12.000	15.631 0.0				
	41.62	0.0506		0.0	129.000	6.533			Vel = 6.01	

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 41.62									
						22.164			K Factor = 8.84	
105 to 115	41.60 41.6	1.682 120.0 0.0506	1E 1T	4.0 8.0 0.0	67.000 12.000 79.000	15.680 0.0 3.997			Vel = 6.01	
	0.0 41.60									
						19.677			K Factor = 9.38	
108 to 109	-29.09 -29.09	1.682 120.0 -0.0261		0.0 0.0 0.0	9.000 0.0 9.000	15.201 0.0 -0.235			Vel = 4.20	
109 to 110	21.06 -8.03	1.682 120.0 -0.0022		0.0 0.0 0.0	4.000 0.0 4.000	14.966 0.0 -0.009			Vel = 1.16	
110 to 111	21.06 13.03	1.682 120.0 0.0059		0.0 0.0 0.0	13.000 0.0 13.000	14.957 0.0 0.077			Vel = 1.88	
111 to 128	30.87 43.9	1.682 120.0 0.0559	1E 1T	4.0 8.0 0.0	117.000 12.000 129.000	15.034 0.0 7.211			Vel = 6.34	
	0.0 43.90									
						22.245			K Factor = 9.31	
108 to 116	50.28 50.28	1.682 120.0 0.0719	1E 1T	4.0 8.0 0.0	54.000 12.000 66.000	15.201 0.0 4.743			Vel = 7.26	
	0.0 50.28									
						19.944			K Factor = 11.26	
117 to 129	15.91 15.91	1.682 120.0 0.0086	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	20.526 0.0 1.890			Vel = 2.30	
	0.0 15.91									
						22.416			K Factor = 3.36	
118 to 130	14.68 14.68	1.682 120.0 0.0074	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	20.997 0.0 1.629			Vel = 2.12	
	0.0 14.68									
						22.626			K Factor = 3.09	
119 to 131	14.06 14.06	1.682 120.0 0.0068	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	21.374 0.0 1.503			Vel = 2.03	
	0.0 14.06									
						22.877			K Factor = 2.94	
120 to 132	14.04 14.04	1.682 120.0 0.0068	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	21.671 0.0 1.499			Vel = 2.03	
	0.0 14.04									
						23.170			K Factor = 2.92	
121 to 133	14.59 14.59	1.682 120.0 0.0073	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	21.897 0.0 1.610			Vel = 2.11	

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 14.59									
						23.507			K Factor =	3.01
122 to 134	15.66	1.682 120.0	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	22.058 0.0 1.836			Vel =	2.26
	0.0 15.66								K Factor =	3.20
123 to 135	17.17	1.682 120.0	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	22.161 0.0 2.176			Vel =	2.48
	0.0 17.17								K Factor =	3.48
124 to 136	19.03	1.682 120.0	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	22.214 0.0 2.631			Vel =	2.75
	0.0 19.03								K Factor =	3.82
125 to 137	21.16	1.682 120.0	2E 2T	8.0 16.0 0.0	197.000 24.000 221.000	22.230 0.0 3.201			Vel =	3.06
	0.0 21.16								K Factor =	4.20
114 to 115	54.42	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	19.584 0.0 0.093			Vel =	3.20
115 to 116	41.60	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	19.677 0.0 0.267			Vel =	5.65
116 to 117	50.28	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	19.944 0.0 0.582			Vel =	8.61
117 to 118	-15.91	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	20.526 0.0 0.471			Vel =	7.67
118 to 119	-14.68	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	20.997 0.0 0.377			Vel =	6.81
119 to 120	-14.06	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	21.374 0.0 0.297			Vel =	5.98
120 to 121	-14.04	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	21.671 0.0 0.226			Vel =	5.15
121 to 122	-14.59	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	21.897 0.0 0.161			Vel =	4.30
122 to 123	-15.67	2.635 120.0		0.0 0.0 0.0	10.000 0.0 10.000	22.058 0.0 0.103			Vel =	3.37

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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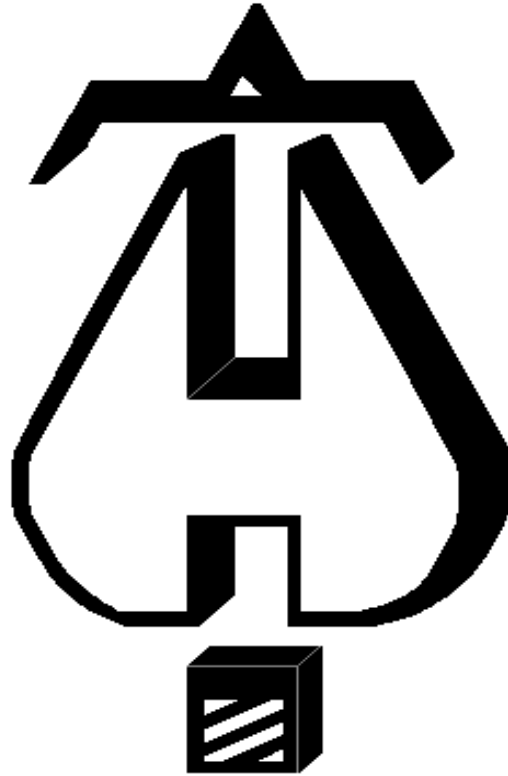
Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
123	-17.17	2.635		0.0	10.000	22.161				
to		120.0		0.0	0.0	0.0				
124	40.18	0.0053		0.0	10.000	0.053		Vel =	2.36	
124	-19.02	2.635		0.0	10.000	22.214				
to		120.0		0.0	0.0	0.0				
125	21.16	0.0016		0.0	10.000	0.016		Vel =	1.24	
	0.0									
	21.16					22.230		K Factor =	4.49	
126	46.48	3.26		0.0	10.000	22.139				
to		120.0		0.0	0.0	0.0				
127	46.48	0.0025		0.0	10.000	0.025		Vel =	1.79	
127	41.62	3.26		0.0	10.000	22.164				
to		120.0		0.0	0.0	0.0				
128	88.1	0.0081		0.0	10.000	0.081		Vel =	3.39	
128	43.89	3.26		0.0	10.000	22.245				
to		120.0		0.0	0.0	0.0				
129	131.99	0.0171		0.0	10.000	0.171		Vel =	5.07	
129	15.91	3.26		0.0	10.000	22.416				
to		120.0		0.0	0.0	0.0				
130	147.9	0.0210		0.0	10.000	0.210		Vel =	5.68	
130	14.69	3.26		0.0	10.000	22.626				
to		120.0		0.0	0.0	0.0				
131	162.59	0.0251		0.0	10.000	0.251		Vel =	6.25	
131	14.06	3.26		0.0	10.000	22.877				
to		120.0		0.0	0.0	0.0				
132	176.65	0.0293		0.0	10.000	0.293		Vel =	6.79	
132	14.03	3.26		0.0	10.000	23.170				
to		120.0		0.0	0.0	0.0				
133	190.68	0.0337		0.0	10.000	0.337		Vel =	7.33	
133	14.60	3.26		0.0	10.000	23.507				
to		120.0		0.0	0.0	0.0				
134	205.28	0.0387		0.0	10.000	0.387		Vel =	7.89	
134	15.66	3.26		0.0	10.000	23.894				
to		120.0		0.0	0.0	0.0				
135	220.94	0.0443		0.0	10.000	0.443		Vel =	8.49	
135	17.17	3.26		0.0	10.000	24.337				
to		120.0		0.0	0.0	0.0				
136	238.11	0.0508		0.0	10.000	0.508		Vel =	9.15	
136	19.03	3.26		0.0	10.000	24.845				
to		120.0		0.0	0.0	0.0				
137	257.14	0.0586		0.0	10.000	0.586		Vel =	9.88	
	0.0									
	257.14					25.431		K Factor =	50.99	
137	278.30	4.26	3E	30.0	24.000	25.431				
to		120.0		0.0	30.000	0.0				
TOR1	278.3	0.0184		0.0	54.000	0.996		Vel =	6.26	
TOR1	0.0	4.26	1Avc	21.0	20.000	26.427				
to		120.0	1G	2.0	23.000	9.528				
BOR1	278.3	0.0184		0.0	43.000	0.793		Vel =	6.26	

# Final Calculations - Hazen-Williams

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #2

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Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
BOR1 to UG1	0.0 278.3	8.27 140.0 0.0006	2E 47.88 1T 46.55 0.0	8.000 94.430 102.430	36.748 1.732 0.057		Vel = 1.66		
UG1 to BF	0.0 278.3	8.27 140.0 0.0005	1E 23.94 0.0 0.0	455.000 23.940 478.940	38.537 0.0 0.262		Vel = 1.66		
BF to UG2	0.0 278.3	8.27 140.0 0.0006	1T 46.55 1G 5.32 0.0	38.000 51.870 89.870	38.799 6.000 0.050		* Fixed loss = 6 Vel = 1.66		
UG2 to UG3	0.0 278.3	8.27 140.0 0.0005	1T 46.55 0.0 0.0	113.000 46.550 159.550	44.849 0.0 0.087		Vel = 1.66		
UG3 to TEST	0.0 278.3	6.16 140.0 0.0023	1E 18.62 1G 3.99 0.0	14.000 22.610 36.610	44.936 -3.032 0.085		Vel = 3.00		
	100.00 378.30						Qa = 100.00 K Factor = 58.38		
					41.989				



**... Fire Protection by Computer Design**

Regional Fire Services of NC  
3101-310 Poplarwood Ct  
Raleigh, NC 27604  
919-212-2722

Job Name : KRIGEN PHARMA - SYS #3  
Building : FP 2 OF 4  
Location : 800 EDWARDS BROTHERS DRIVE, LILLINGTON, NC 27546  
System : 3  
Contract : 19043  
Data File : SYS #3.WXF

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**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** KRIGEN PHARMACEUTICALS  
**Location:** 800 EDWARDS BROTHERS DRIVE, LILLINGTON, NC 27546  
**Drawing no:** FP 2 OF 4  
**Date:** 1/20/2020

**Design**

**Remote area number:** 3  
**Remote area location:** PACKAGING MATERIAL AREA 21  
**Occupancy classification:** ORD. GR-1  
**Density:** .15 - Gpm/SqFt  
**Area of application:** 1500 - SqFt  
**Coverage per sprinkler:** 256 - SqFt  
**Type of sprinklers calculated:** TYCO, TY5237  
**No. of sprinklers calculated:** 10  
**In-rack demand:** - GPM  
**Hose streams:** 250 - GPM  
**Total water required (including hose streams):** 645.73 - GPM @ 52.21 - Psi  
**Type of system:** WET  
**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 9/10/2019  
**Location:** EDWARDS BROTHER DR  
**Source:** LILLINGTON FIRE DEPARTMENT

**Name of contractor:** REGIONAL FIRE SERVICES OF NC LLC  
**Address:** 3101-310 POPLARWOOD COURT, RALEIGH, NC 27604  
**Phone number:** 919-212-2722  
**Name of designer:** AJITH ZACHARIAS  
**Authority having jurisdiction:** HARNETT COUNTY  
**Notes: (Include peaking information or gridded systems here.)**



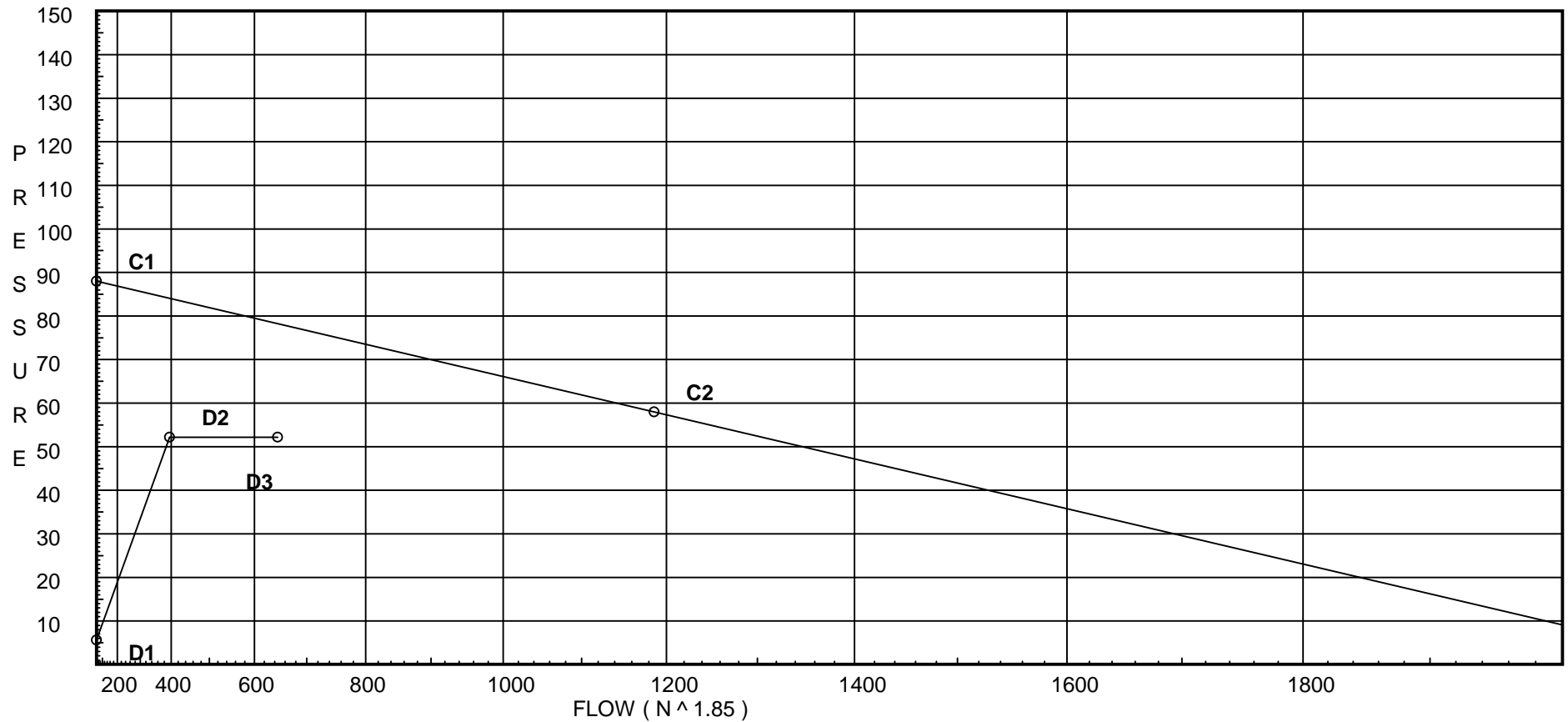
# Water Supply Curve (C)

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #3

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City Water Supply:  
C1 - Static Pressure : 88  
C2 - Residual Pressure: 58  
C2 - Residual Flow : 1186

Demand:  
D1 - Elevation : 5.630  
D2 - System Flow : 395.735  
D2 - System Pressure : 52.214  
Hose ( Demand ) : 250  
D3 - System Demand : 645.735  
Safety Margin : 26.044





# Flow Diagram

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #3

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↓ 6.5/  
117 ← 129  
/ ↑  
/ 25.3 25.3  
↓ 6.8/  
118 ← 130  
/ ↑  
/ 32 / 32  
↓ 7.2/  
119 ← 131

18.8  
124 ← 136  
↑ ↑  
/ 22.9 372.8  
/ 22.9  
125 ← 137

6.2 18.8 32 13.1 15.8 22.9  
114 → 115 → 116 → 117 → 118 → 119 → 120 → 121 → 122 ← 123 ← 124 ← 125  
↑ ↑ 12.4 ↑ 25.3 ↑ 39.3 11.4 41.7 ↑  
/ 6.2/ 6.2/ 6.3/ 6.5/ 6.8/ 7.2 / 18.8 22.9  
/ 6.2/ / 18.8 / 32 / 131.4 261.7 / 372.8 395.7 395.7 395.7  
126 ← 127 ← 128 ← 129 ← 130 ← 131 ← 132 ← 133 ← 134 ← 135 ← 136 ← 137 ← TOR1 BOR1 UG1 ← BF ← UG2 ← UG3 ← TEST  
12.4 25.3 39.3 171.5 354.1 395.7 395.7 395.7 395.7

# Fittings Used Summary

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #3

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## Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24	
Avc	Alarm Vic 751	0	0	0	0	3	9	8	17	0	21	0	22	50	0	0	0	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13	13
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121	121

## Units Summary

Diameter Units           Inches  
Length Units             Feet  
Flow Units                US Gallons per Minute  
Pressure Units           Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with \*. The fittings marked with a \* show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a \* will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA. The diameter modification was turned off by the operator when the job was calculated.

# Pressure / Flow Summary - STANDARD

Regional Fire Services of NC  
KRIGEN PHARMA - SYS #3

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
C1	17.0	11.2	12.22	na	39.16	0.15	256	12.1
C2	17.0	11.2	12.26	na	39.21	0.15	256	12.1
C3	17.0	11.2	12.71	na	39.93	0.15	256	12.1
C4	17.0	11.2	13.95	na	41.83	0.15	256	12.1
C5	17.0	11.2	12.1	na	38.96	0.15	256	12.1
C6	17.0	11.2	12.13	na	39.01	0.15	256	12.1
C7	17.0	11.2	12.39	na	39.43	0.15	256	12.1
C8	17.0	11.2	12.26	na	39.22	0.15	256	12.1
C9	17.0	11.2	12.3	na	39.27	0.15	256	12.1
C10	17.0	11.2	12.58	na	39.72	0.15	256	12.1
201	23.0		25.86	na				
202	23.0		25.94	na				
203	23.0		26.94	na				
204	23.0		29.7	na				
205	23.0		25.59	na				
206	23.0		25.65	na				
207	23.0		26.24	na				
208	23.0		25.94	na				
209	23.0		26.02	na				
210	23.0		26.65	na				
114	23.0		29.86	na				
115	23.0		29.86	na				
116	23.0		29.86	na				
117	23.0		29.84	na				
118	23.0		29.82	na				
119	23.0		29.79	na				
124	23.0		29.79	na				
125	23.0		29.81	na				
120	23.0		29.74	na				
121	23.0		29.73	na				
122	23.0		29.72	na				
123	23.0		29.73	na				
126	23.0		30.2	na				
127	23.0		30.2	na				
128	23.0		30.2	na				
129	23.0		30.2	na				
130	23.0		30.21	na				
131	23.0		30.22	na				
132	23.0		30.24	na				
133	23.0		30.41	na				
134	23.0		30.69	na				
135	23.0		31.29	na				
136	23.0		32.35	na				
137	23.0		33.52	na				
TOR1	23.0		35.43	na				
BOR1	1.0		46.48	na				
UG1	-3.0		48.32	na				
BF	-3.0		48.82	na				
UG2	-3.0		54.92	na				
UG3	-3.0		55.08	na				
TEST	4.0		52.21	na	250.0			

The maximum velocity is 15.53 and it occurs in the pipe between nodes C4 and 204

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
C1 to 201	39.16 39.16	1.049 120.0 0.4511	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.224 -2.599 16.238		K Factor = 11.20 Vel = 14.54		
	0.0 39.16					25.863	K Factor = 7.70		
C2 to 202	39.21 39.21	1.049 120.0 0.4522	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.258 -2.599 16.280		K Factor = 11.20 Vel = 14.56		
	0.0 39.21					25.939	K Factor = 7.70		
C3 to 203	39.93 39.93	1.049 120.0 0.4675	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.708 -2.599 16.830		K Factor = 11.20 Vel = 14.82		
	0.0 39.93					26.939	K Factor = 7.69		
C4 to 204	41.83 41.83	1.049 120.0 0.5097	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	13.951 -2.599 18.348		K Factor = 11.20 Vel = 15.53		
	0.0 41.83					29.700	K Factor = 7.68		
C5 to 205	38.96 38.96	1.049 120.0 0.4468	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.100 -2.599 16.085		K Factor = 11.20 Vel = 14.46		
	0.0 38.96					25.586	K Factor = 7.70		
C6 to 206	39.01 39.01	1.049 120.0 0.4478	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.129 -2.599 16.120		K Factor = 11.20 Vel = 14.48		
	0.0 39.01					25.650	K Factor = 7.70		
C7 to 207	39.43 39.43	1.049 120.0 0.4568	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.392 -2.599 16.443		K Factor = 11.20 Vel = 14.64		
	0.0 39.43					26.236	K Factor = 7.70		
C8 to 208	39.22 39.22	1.049 120.0 0.4523	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.261 -2.599 16.283		K Factor = 11.20 Vel = 14.56		
	0.0 39.22					25.945	K Factor = 7.70		
C9 to 209	39.27 39.27	1.049 120.0 0.4535	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.297 -2.599 16.327		K Factor = 11.20 Vel = 14.58		
	0.0 39.27					26.025	K Factor = 7.70		
C10 to 210	39.72 39.72	1.049 120.0 0.4631	1Eq 34.0 0.0 0.0	2.000 34.000 36.000	12.578 -2.599 16.671		K Factor = 11.20 Vel = 14.75		

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 39.72									
						26.650			K Factor =	7.69
201 to 202	12.96	1.682 120.0		0.0	13.000	25.863				
	12.96	0.0058		0.0	13.000	0.076			Vel =	1.87
202 to 203	39.21	1.682 120.0		0.0	13.000	25.939				
	52.17	0.0769		0.0	13.000	1.000			Vel =	7.53
203 to 132	39.93	1.682 120.0	1E 1T	4.0 8.0	3.000 12.000	26.939 0.0				
	92.1	0.2202		0.0	15.000	3.303			Vel =	13.30
	0.0 92.10									
						30.242			K Factor =	16.75
201 to 120	26.20	1.682 120.0	1E 1T	4.0 8.0	168.000 12.000	25.863 0.0				
	26.2	0.0215		0.0	180.000	3.872			Vel =	3.78
	0.0 26.20									
						29.735			K Factor =	4.80
204 to 133	40.14	1.682 120.0	1E 1T	4.0 8.0	3.000 12.000	29.700 0.0				
	40.14	0.0474		0.0	15.000	0.711			Vel =	5.80
	0.0 40.14									
						30.411			K Factor =	7.28
204 to 121	1.69	1.682 120.0	1E 1T	4.0 8.0	194.000 12.000	29.700 0.0				
	1.69	0.0001		0.0	206.000	0.028			Vel =	0.24
	0.0 1.69									
						29.728			K Factor =	0.31
205 to 206	11.81	1.682 120.0		0.0	13.000	25.586				
	11.81	0.0049		0.0	13.000	0.064			Vel =	1.71
206 to 207	39.00	1.682 120.0		0.0	8.000	25.650				
	50.81	0.0732		0.0	8.000	0.586			Vel =	7.34
207 to 134	39.43	1.682 120.0	1E 1T	4.0 8.0	9.000 12.000	26.236 0.0				
	90.24	0.2120		0.0	21.000	4.452			Vel =	13.03
	0.0 90.24									
						30.688			K Factor =	16.29
205 to 122	27.15	1.682 120.0	1E 1T	4.0 8.0	168.000 12.000	25.586 0.0				
	27.15	0.0230		0.0	180.000	4.137			Vel =	3.92
	0.0 27.15									
						29.723			K Factor =	4.98
208 to 209	13.33	1.682 120.0		0.0	13.000	25.945				
	13.33	0.0062		0.0	13.000	0.080			Vel =	1.92

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
209 to 210	39.27 52.6	1.682 120.0 0.0781	0.0 0.0 0.0	8.000 0.0 8.000	26.025 0.0 0.625			Vel = 7.59	
210 to 135	39.72 92.32	1.682 120.0 0.2211	1E 4.0 1T 8.0 0.0	9.000 12.000 21.000	26.650 0.0 4.644			Vel = 13.33	
	0.0 92.32				31.294			K Factor = 16.50	
208 to 123	25.89 25.89	1.682 120.0 0.0210	1E 4.0 1T 8.0 0.0	168.000 12.000 180.000	25.945 0.0 3.788			Vel = 3.74	
	0.0 25.89				29.733			K Factor = 4.75	
114 to 126	6.21 6.21	1.682 120.0 0.0015	2E 8.0 2T 16.0 0.0	197.000 24.000 221.000	29.864 0.0 0.332			Vel = 0.90	
	0.0 6.21				30.196			K Factor = 1.13	
115 to 127	6.23 6.23	1.682 120.0 0.0015	2E 8.0 2T 16.0 0.0	197.000 24.000 221.000	29.863 0.0 0.334			Vel = 0.90	
	0.0 6.23				30.197			K Factor = 1.13	
116 to 128	6.32 6.32	1.682 120.0 0.0015	2E 8.0 2T 16.0 0.0	197.000 24.000 221.000	29.857 0.0 0.342			Vel = 0.91	
	0.0 6.32				30.199			K Factor = 1.15	
117 to 129	6.49 6.49	1.682 120.0 0.0016	2E 8.0 2T 16.0 0.0	197.000 24.000 221.000	29.844 0.0 0.359			Vel = 0.94	
	0.0 6.49				30.203			K Factor = 1.18	
118 to 130	6.78 6.78	1.682 120.0 0.0018	2E 8.0 2T 16.0 0.0	197.000 24.000 221.000	29.821 0.0 0.390			Vel = 0.98	
	0.0 6.78				30.211			K Factor = 1.23	
119 to 131	7.22 7.22	1.682 120.0 0.0020	2E 8.0 2T 16.0 0.0	197.000 24.000 221.000	29.786 0.0 0.438			Vel = 1.04	
	0.0 7.22				30.224			K Factor = 1.31	
124 to 136	18.76 18.76	1.682 120.0 0.0116	2E 8.0 2T 16.0 0.0	197.000 24.000 221.000	29.790 0.0 2.563			Vel = 2.71	
	0.0								



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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftnng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	18.76				32.353			K Factor = 3.30	
125 to 137	22.91	1.682 120.0	2E 2T 8.0 16.0	197.000 24.000	29.808 0.0			Vel = 3.31	
	0.0 22.91				33.519			K Factor = 3.96	
114 to 115	-6.21	2.635 120.0	0.0 0.0	10.000 0.0	29.864 0.0			Vel = 0.37	
115 to 116	-6.23	2.635 120.0	0.0 0.0	10.000 0.0	29.863 0.0			Vel = 0.73	
116 to 117	-6.32	2.635 120.0	0.0 0.0	10.000 0.0	29.857 0.0			Vel = 1.10	
117 to 118	-18.76	-0.0013	0.0	10.000	-0.013			Vel = 1.49	
117 to 118	-6.49	2.635 120.0	0.0 0.0	10.000 0.0	29.844 0.0			Vel = 1.88	
118 to 119	-25.25	-0.0023	0.0	10.000	-0.023			Vel = 1.88	
118 to 119	-6.78	2.635 120.0	0.0 0.0	10.000 0.0	29.821 0.0			Vel = 2.31	
119 to 120	-7.22	2.635 120.0	0.0 0.0	10.000 0.0	29.786 0.0			Vel = 2.31	
120 to 121	-39.25	-0.0051	0.0	10.000	-0.051			Vel = 0.77	
120 to 121	26.20	2.635 120.0	0.0 0.0	10.000 0.0	29.735 0.0			Vel = 0.77	
121 to 122	-13.05	-0.0007	0.0	10.000	-0.007			Vel = 0.67	
121 to 122	1.69	2.635 120.0	0.0 0.0	10.000 0.0	29.728 0.0			Vel = 0.67	
122 to 123	-11.36	-0.0005	0.0	10.000	-0.005			Vel = 0.93	
122 to 123	27.15	2.635 120.0	0.0 0.0	10.000 0.0	29.723 0.0			Vel = 0.93	
123 to 124	15.79	0.0010	0.0	10.000	0.010			Vel = 2.45	
123 to 124	25.89	2.635 120.0	0.0 0.0	10.000 0.0	29.733 0.0			Vel = 2.45	
124 to 125	41.68	0.0057	0.0	10.000	0.057			Vel = 1.35	
124 to 125	-18.77	2.635 120.0	0.0 0.0	10.000 0.0	29.790 0.0			Vel = 1.35	
	0.0 22.91				29.808			K Factor = 4.20	
126 to 127	6.21	3.26 120.0	0.0 0.0	10.000 0.0	30.196 0.0			Vel = 0.24	
127 to 128	6.21	0.0001	0.0	10.000	0.001			Vel = 0.24	
127 to 128	6.23	3.26 120.0	0.0 0.0	10.000 0.0	30.197 0.0			Vel = 0.48	
128 to 129	12.44	0.0002	0.0	10.000	0.002			Vel = 0.48	
128 to 129	6.32	3.26 120.0	0.0 0.0	10.000 0.0	30.199 0.0			Vel = 0.72	
129	18.76	0.0004	0.0	10.000	0.004			Vel = 0.72	

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
129	6.49	3.26		10.000	30.203				
to		120.0	0.0	0.0	0.0				
130	25.25	0.0008	0.0	10.000	0.008		Vel = 0.97		
130	6.78	3.26		10.000	30.211				
to		120.0	0.0	0.0	0.0				
131	32.03	0.0013	0.0	10.000	0.013		Vel = 1.23		
131	7.22	3.26		10.000	30.224				
to		120.0	0.0	0.0	0.0				
132	39.25	0.0018	0.0	10.000	0.018		Vel = 1.51		
132	92.10	3.26		10.000	30.242				
to		120.0	0.0	0.0	0.0				
133	131.35	0.0169	0.0	10.000	0.169		Vel = 5.05		
133	40.15	3.26		10.000	30.411				
to		120.0	0.0	0.0	0.0				
134	171.5	0.0277	0.0	10.000	0.277		Vel = 6.59		
134	90.23	3.26		10.000	30.688				
to		120.0	0.0	0.0	0.0				
135	261.73	0.0606	0.0	10.000	0.606		Vel = 10.06		
135	92.33	3.26		10.000	31.294				
to		120.0	0.0	0.0	0.0				
136	354.06	0.1059	0.0	10.000	1.059		Vel = 13.61		
136	18.76	3.26		10.000	32.353				
to		120.0	0.0	0.0	0.0				
137	372.82	0.1166	0.0	10.000	1.166		Vel = 14.33		
	0.0								
	372.82				33.519		K Factor = 64.40		
137	395.74	4.26	3E 30.0	24.000	33.519				
to		120.0	0.0	30.000	0.0				
TOR1	395.74	0.0354	0.0	54.000	1.910		Vel = 8.91		
TOR1	0.0	4.26	1Avc 21.0	20.000	35.429				
to		120.0	1G 2.0	23.000	9.528				
BOR1	395.74	0.0354	0.0	43.000	1.521		Vel = 8.91		
BOR1	0.0	8.27	2E 47.88	8.000	46.478				
to		140.0	1T 46.55	94.430	1.732				
UG1	395.74	0.0011	0.0	102.430	0.108		Vel = 2.36		
UG1	0.0	8.27	1E 23.94	455.000	48.318				
to		140.0	0.0	23.940	0.0				
BF	395.74	0.0011	0.0	478.940	0.504		Vel = 2.36		
BF	0.0	8.27	1T 46.55	38.000	48.822				
to		140.0	1G 5.32	51.870	6.000		* Fixed loss = 6		
UG2	395.74	0.0010	0.0	89.870	0.094		Vel = 2.36		
UG2	0.0	8.27	1T 46.55	113.000	54.916				
to		140.0	0.0	46.550	0.0				
UG3	395.74	0.0011	0.0	159.550	0.168		Vel = 2.36		
UG3	0.0	6.16	1E 18.62	14.000	55.084				
to		140.0	1G 3.99	22.610	-3.032				
TEST	395.74	0.0044	0.0	36.610	0.162		Vel = 4.26		
	250.00						Qa = 250.00		

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Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	645.74				52.214		K Factor =	89.36	

Lillington

Hydrant Flow Test By Hydrant

Hydrant Number = "4311 055C "

4311 055C		906 Edwards Brothers DR			MUE	3 Way		
Date	Static	Residual	Pitot	Pitot 2	GPM	20 PSI	10 PSI	0 PSI
09/13/2005	94	62	60.00	0.00	1300	2044	2189	2326
071895	Roberts, James L							
03/24/2008	92	64	54.00	0.00	1233	2053	2203	2344
071895	Roberts, James L							
05/04/2009	86	58	50.00	0.00	1186	1884	2034	2174
071895	Roberts, James L							
09/14/2011	88	64	54.00	0.00	1233	2164	2330	2487
071895	Roberts, James L							
04/23/2013	88	50	50.00	0.00	1186	1624	1749	1866
070257	LaMothe, Michael Alan							
04/29/2015	90	62	50.00	0.00	1186	1945	2091	2228
071895	Roberts, James L							
10/04/2017	84	58	40.00	0.00	1061	1726	1866	1999
077697S	Stephenson, Austin Brooks							
09/10/2019	88	58	50.00	0.00	1186	1845	1987	2121
077697S	Stephenson, Austin Brooks							
<b>Subtotal Flow Tests: 8</b>				<b>Min:</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
				<b>Max:</b>	<b>1300</b>	<b>2164</b>	<b>2330</b>	<b>2487</b>
				<b>Avg:</b>	<b>1196</b>	<b>1910</b>	<b>2056</b>	<b>2193</b>

Total Flow Tests: 8