



Hydraulic Calculations by HydraCALC

Century Fire Sprinklers, Inc.
1901 Bedford Ave
North Kansas City, MO
816-556-0808

Job Name : LEE'S SUMMIT POLICE RENOVATION
Drawing : 10 NE TUDOR RD
Location : LEE'S SUMMIT, MO 64086
Remote Area : 1
Contract : KC1-1508
Data File : AREA 1.WXF
Date/Time : 04/03/2025 - 01:28 PM



Hydraulic Design Information Sheet

Name - LEE'S SUMMIT POLICE RENOVATION Date - 4-3-2025
Location - LEE'S SUMMIT, MO 64086
Building - 10 NE TUDOR RD System No. - 1
Contractor - Contract No. - KC1-1508
Calculated By - TCL Drawing No. - 2
Construction: () Combustible () Non-Combustible Ceiling Height -
Occupancy -

S (X) NFPA 13 () Lt. Haz. Ord.Haz.Gp. (X) 1 () 2 () 3 () Ex.Haz.
Y () NFPA 231 () NFPA 231C () Figure Curve
S Other
T Specific Ruling Made By Date
E

M	Area of Sprinkler Operation -	System Type	Sprinkler/Nozzle
	Density - .15	() Wet	Make VIKING
D	Area Per Sprinkler - 130	(X) Dry	Model VK3001
E	Elevation at Highest Outlet - 115.335	() Deluge	Size
S	Hose Allowance - Inside -	() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance -	() Other	Temp.Rat.200^
G	Hose Allowance - Outside -		

N Note

Calculation Flow Required - 647.497 Press Required - 68.155 TEST
Summary C-Factor Used: 100 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test -		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 85	@ Press -	
R	Residual Press - 62	Elev. -	Well
	Flow - 2100		Proof Flow
S	Elevation - 95		

U Location -

P Source of Information -

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	Solid Piled %	Palletized % Rack
M			
	() Single Row	() Conven. Pallet	() Auto. Storage () Encap.
S	() Double Row	() Slave Pallet	() Solid Shelf () Non
T	() Mult. Row		() Open Shelf
O			

R	K	Flue Spacing	Clearance:Storage to Ceiling
A		Longitudinal	Transverse

G Horizontal Barriers Provided:

E

Water Supply Curve

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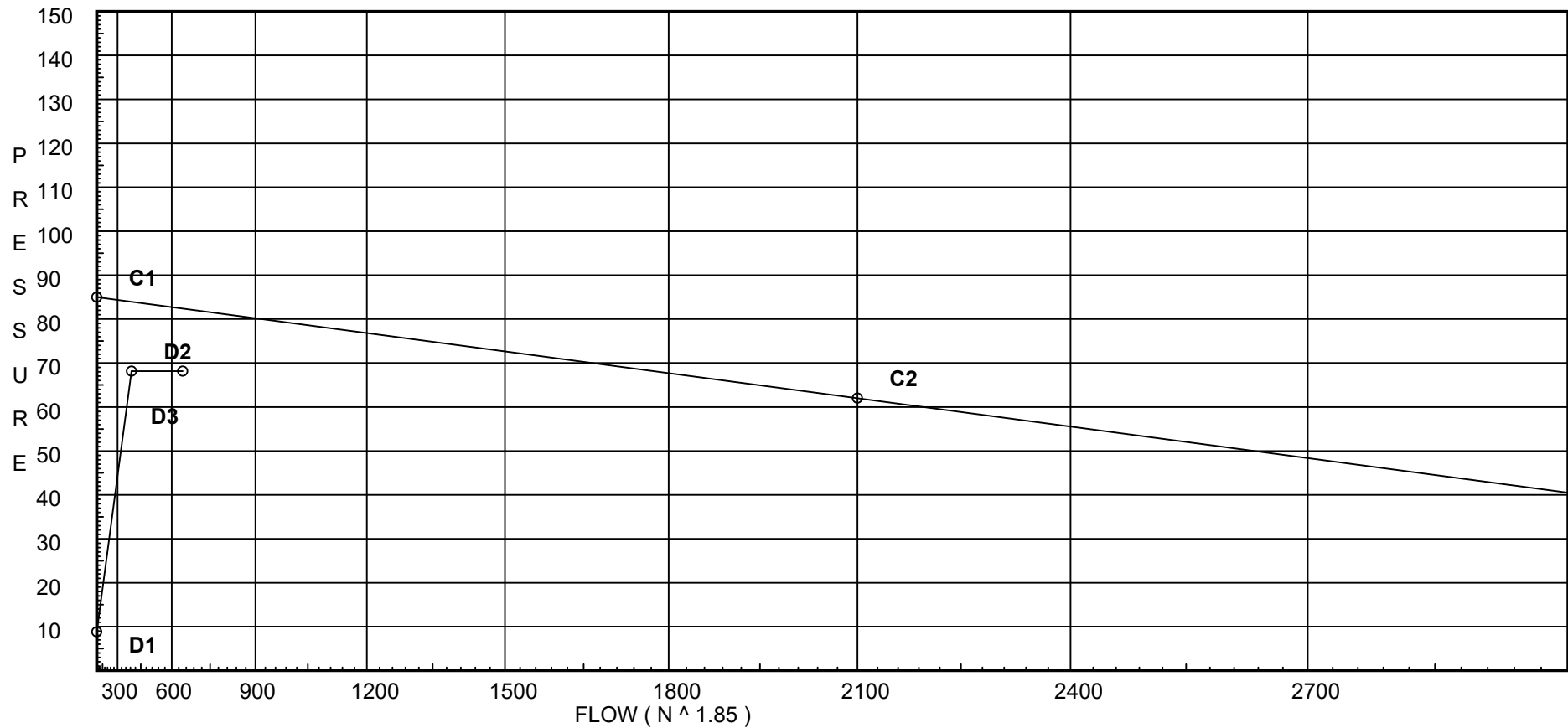
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City Water Supply:

C1 - Static Pressure : 85
C2 - Residual Pressure: 62
C2 - Residual Flow : 2100

Demand:

D1 - Elevation : 8.807
D2 - System Flow : 396.497
D2 - System Pressure : 68.155
Hose (Demand) : 250
D3 - System Demand : 646.497
Safety Margin : 14.244



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
Dvk	Dry Viking F1								3		5		49								
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
I	Vic 90' Grvd Elbow #10	0	1.4	1.7	2.1	2.7	3.6	4.3	5		6.8	8.5	10	13.1	17	20	24.5	28	31	34	42
J	Vic 90' Tee-Branch Grvd #20	0	3.3	4.2	5.3	6.6	8.5	10.8	13		16	21	25	33.1	41	50	70	80	90	100	120
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
V	Vic 90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0
X	Vic 90' Tee-Branch #002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	9.3	11	0	0	0	0	0

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.

Flow Summary - NFPA

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SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
TEST	85.0	62	2100.0	82.399	646.5	68.155

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
Ol?"]]],	0.0		0.0			
10	115.708	5.6	11.82	19.25	0.15	114
11	115.708	5.6	11.86	19.29	0.15	120
12	115.708	5.6	12.08	19.47	0.15	120
14	115.708	5.6	12.17	19.53	0.15	100
15	115.708	5.6	12.22	19.57	0.15	100
16	115.708	5.6	12.41	19.72	0.15	120
13	115.708		12.8			
17	115.479	5.6	12.14	19.52	0.15	114
18	115.479	5.6	12.18	19.54	0.15	120
19	115.479	5.6	12.34	19.67	0.15	120
21	115.479	5.6	12.59	19.87	0.15	100
22	115.479	5.6	12.62	19.9	0.15	100
23	115.479	5.6	12.76	20.01	0.15	120
20	115.479		12.96			
24	115.335	5.6	12.13	19.5	0.15	130
25	115.335	5.6	12.16	19.53	0.15	130
26	115.335	5.6	12.51	19.81	0.15	130
28	115.271	5.6	12.56	19.85	0.15	100
29	115.271	5.6	12.61	19.89	0.15	110
30	115.271	5.6	12.83	20.05	0.15	120
27	115.271		13.19			
31	115.0		14.43			
32	115.0		14.43			
33	115.083		14.4			
34	115.083		14.4			
35	115.083	5.6	14.4	21.25	0.15	117
36	115.083	5.6	14.45	21.29	0.15	108
38	115.083		14.88			
39	115.083		14.88			
40	115.083		14.88			
37	115.083		14.88			
A1	114.542		14.73			
A2	114.313		14.88			
A3	114.104		15.16			
A4	113.917		15.6			
A5	112.0		19.93			
A6	112.0		43.22			
TOR	112.0		47.45			
X1	105.417		50.63			
BOR	103.0		53.06			
UNDG	95.0		57.5			

Flow Summary - NFPA

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NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
TEST	95.0		68.16	250.0	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*LN01												
10 to 11	115.708 115.708	5.60	19.25 19.25	2 2.157			9.167 9.167	100 0.0050	11.818 0.0 0.046		Vel = 1.69	
11 to 12	115.708 115.708	5.60	19.29 38.54	2 2.157			12.000 12.000	100 0.0183	11.864 0.0 0.220		Vel = 3.38	
12 to 13	115.708 115.708	5.60	19.47 58.01	2 2.157	T	8.783	9.583 8.783 18.366	100 0.0391	12.084 0.0 0.718		Vel = 5.09	
13			0.0 58.01						12.802		K Factor = 16.21	
*												
14 to 15	115.708 115.708	5.60	19.53 19.53	2 2.157			10.000 10.000	100 0.0052	12.165 0.0 0.052		Vel = 1.71	
15 to 16	115.708 115.708	5.60	19.58 39.11	2 2.157			10.000 10.000	100 0.0189	12.217 0.0 0.189		Vel = 3.43	
16 to 13	115.708 115.708	5.60	19.72 58.83	2 2.157	J	7.466	2.417 7.465 9.882	100 0.0401	12.406 0.0 0.396		Vel = 5.17	
13 to A1	115.708 114.542		58.01 116.84	2 2.157	T	8.783	1.167 8.783 9.950	100 0.1426	12.802 0.505 1.419		Vel = 10.26	
A1			0.0 116.84						14.726		K Factor = 30.45	
*LN02												
17 to 18	115.479 115.479	5.60	19.52 19.52	2 2.157			9.167 9.167	120 0.0037	12.145 0.0 0.034		Vel = 1.71	
18 to 19	115.479 115.479	5.60	19.54 39.06	2 2.157			12.000 12.000	120 0.0134	12.179 0.0 0.161		Vel = 3.43	
19 to 20	115.479 115.479	5.60	19.67 58.73	2 2.157	T	12.307	9.583 12.307 21.890	120 0.0285	12.340 0.0 0.624		Vel = 5.16	
20			0.0 58.73						12.964		K Factor = 16.31	
*												
21 to 22	115.479 115.479	5.60	19.87 19.87	2 2.157			10.000 10.000	120 0.0038	12.586 0.0 0.038		Vel = 1.74	
22 to 23	115.479 115.479	5.60	19.89 39.76	2 2.157			10.000 10.000	120 0.0138	12.624 0.0 0.138		Vel = 3.49	
23 to 20	115.479 115.479	5.60	20.01 59.77	2 2.157	I	4.43	2.417 4.430 6.847	120 0.0295	12.762 0.0 0.202		Vel = 5.25	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
20 to A2	115.479 114.313		58.73 118.5	2 2.157	T 12.307	1.167 12.307 13.474	120 0.1046	12.964 0.505 1.409		Vel = 10.40	
A2			0.0 118.50					14.878		K Factor = 30.72	
*LN03											
24 to 25	115.335 115.335	5.60	19.50 19.5	2 2.157		10.000 10.000	120 0.0037	12.125 0.0 0.037		Vel = 1.71	
25 to 26	115.335 115.335	5.60	19.53 39.03	2 2.157	2I 8.861	17.041 8.861 25.902	120 0.0134	12.162 0.0 0.347		Vel = 3.43	
26 to 27	115.335 115.271	5.60	19.81 58.84	2 2.157	T 12.307	10.583 12.307 22.890	120 0.0286	12.509 0.028 0.655		Vel = 5.17	
27 *			0.0 58.84					13.192		K Factor = 16.20	
28 to 29	115.271 115.271	5.60	19.84 19.84	2 2.157		10.000 10.000	100 0.0054	12.558 0.0 0.054		Vel = 1.74	
29 to 30	115.271 115.271	5.60	19.89 39.73	2 2.157		11.000 11.000	100 0.0194	12.612 0.0 0.213		Vel = 3.49	
30 to 27	115.271 115.271	5.60	20.06 59.79	2 2.157	J 7.466	1.417 7.465 8.882	100 0.0413	12.825 0.0 0.367		Vel = 5.25	
27 to A3	115.271 114.104		58.83 118.62	2 2.157	T 8.783	1.167 8.783 9.950	100 0.1468	13.192 0.505 1.461		Vel = 10.41	
A3			0.0 118.62					15.158		K Factor = 30.47	
*LN04											
31 to 33	115 115.083		0.0 0.0	2 2.157	E T 4.392 8.783	6.667 13.174 19.841	100 0	14.432 -0.036 0.0		Vel = 0	
33			0.0 0.0					14.396		K Factor = 0	
32 to 33	115 115.083		0.0 0.0	2 2.157	E T 4.392 8.783	5.958 13.174 19.132	100 0	14.432 -0.036 0.0		Vel = 0	
33 to 34	115.083 115.083		0.0 0.0	2 2.157		2.400 2.400	100 0	14.396 0.0 0.0		Vel = 0	
34 to 35	115.083 115.083		0.0 0.0	2 2.157		6.000 6.000	100 0	14.396 0.0 0.0		Vel = 0	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
35 to 36	115.083 115.083	5.60	21.25 21.25	2 2.157		9.000 9.000	100 0.0061	14.396 0.0 0.055			
36 to 37	115.083 115.083	5.60	21.29 42.54	2 2.157	T 8.783	10.583 8.783 19.366	100 0.0220	14.451 0.0 0.426	Vel =	1.87	
37 *			0.0 42.54					14.877	K Factor =	11.03	
38 to 39	115.083 115.083		0.0 0.0	2 2.157		10.000 10.000	100 0	14.877 0.0 0.0	Vel =	0	
39 to 40	115.083 115.083		0.0 0.0	2 2.157		11.000 11.000	100 0	14.877 0.0 0.0	Vel =	0	
40 to 37	115.083 115.083		0.0 0.0	2 2.157	J 7.466	1.417 7.465 8.882	100 0	14.877 0.0 0.0	Vel =	0	
37 to A4	115.083 113.917		42.54 42.54	2 2.157	T 8.783	1.167 8.783 9.950	100 0.0220	14.877 0.505 0.219	Vel =	3.73	
A4 *A MAIN			0.0 42.54					15.601	K Factor =	10.77	
A1 to A2	114.542 114.313		116.84 116.84	4 4.26		10.000 10.000	100 0.0053	14.726 0.099 0.053	Vel =	2.63	
A2 to A3	114.313 114.104		118.50 235.34	4 4.26		10.000 10.000	100 0.0189	14.878 0.091 0.189	Vel =	5.30	
A3 to A4	114.104 113.917		118.62 353.96	4 4.26		9.000 9.000	100 0.0402	15.158 0.081 0.362	Vel =	7.97	
A4 to A5	113.917 112		42.54 396.5	4 4.26	5V 31.951	38.417 31.951 70.368	100 0.0497	15.601 0.830 3.500	Vel =	8.93	
A5 to A6	112 112		0.0 396.5	3 3.26	4V X 19.184 12.469	95.604 31.653 127.257	100 0.1830	19.931 0.0 23.292	Vel =	15.24	
A6 to TOR	112 112		0.0 396.5	4 4.26	V 6.39	78.625 6.390 85.015	100 0.0497	43.223 0.0 4.228	Vel =	8.93	
TOR to X1	112 105.417		0.0 396.5	4 4.26		6.583 6.583	100 0.0497	47.451 2.851 0.327	Vel =	8.93	
X1 to BOR	105.417 103		0.0 396.5	4 4.26	G Dvk T 1.879 4.699 18.795	2.417 25.372 27.789	100 0.0497	50.629 1.047 1.382	Vel =	8.93	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
BOR to UNDG	103 95		0.0 396.5	4 4.26	X 21.067	6.500 21.067 27.567	120 0.0355	53.058 3.465 0.979		Vel = 8.93	
UNDG to TEST	95 95		0.0 396.5	6 6.16		256.000 256.000	140 0.0044	57.502 9.520 1.133		* * Fixed Loss = 9.52 Vel = 4.27	
TEST			250.00 646.50					68.155		Qa = 250.00 K Factor = 78.31	