

HYDRAULIC CALCULATIONS
for

Project name: Caliber Collision
Location: 710 SE Blue Parkway Lee's Summit, MO. 64063
Drawing no: FP1 of 1
Date: 04-18-2022

Design

Remote area number: 1
Remote area location: Work Shop
Occupancy classification: Ordinary Hazard Group II
Density: .20 - Gpm/SqFt
Area of application: 1528 - SqFt
Coverage per sprinkler: 130 - SqFt
Type of sprinklers calculated: QR Upright
No. of sprinklers calculated: 12
In-rack demand: N/A - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 569.783 - GPM @ 48.133 - Psi
Type of system: Wet
Volume of dry or preaction system: N/A - Gal

Water supply information

Date: 03-29-2022
Location: SE 7th Ter
Source: City of Lee's Summit

Name of contractor: Falcon Fire Sprinkler
Address: 1239A Clay Street / / North Kansas City, Mo. 64116
Phone number: 816-734-0018
Name of designer: Raul Villarreal
Authority having jurisdiction: City of Lee's Summit
Notes:



Water Supply Curve C

Falcon Fire Sprinkler
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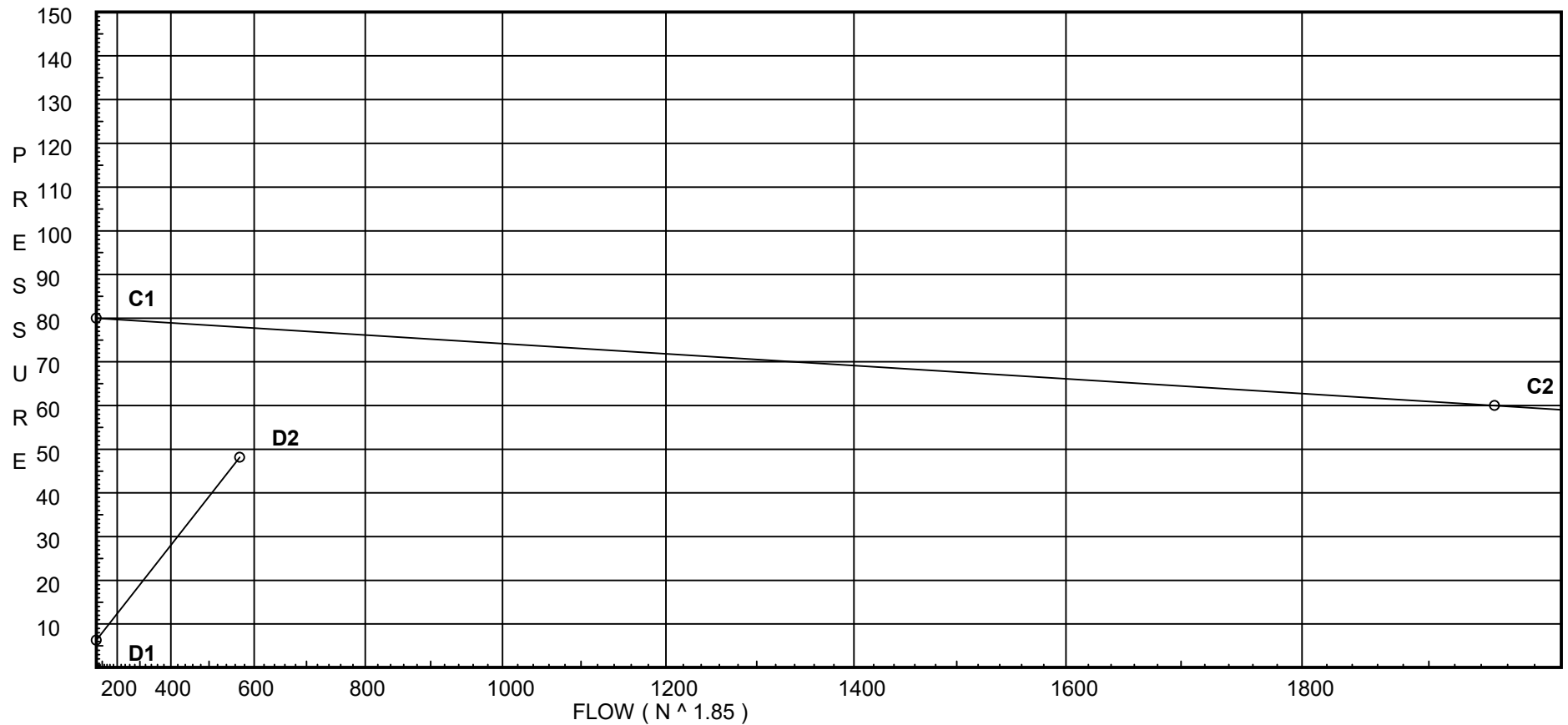
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City Water Supply:

C1 - Static Pressure : 80
C2 - Residual Pressure: 60
C2 - Residual Flow : 1950

Demand:

D1 - Elevation : 6.302
D2 - System Flow : 569.783
D2 - System Pressure : 48.132
Hose (Demand) :
D3 - System Demand : 569.783
Safety Margin : 29.814



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
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	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
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
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	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
Zac	Ames 2000SS	Fitting generates a Fixed Loss Based on Flow																			

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	80.0	60	1950.0	77.946	569.78	48.132

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>
1	14.55	5.6	21.56	26.0	
2	14.92	5.6	21.61	26.03	
3	15.15		23.08		
4	13.08		26.7		
5	13.08		26.78		
6	13.08		27.05		
7	13.08		27.37		
8	13.08		27.63		
9	13.08		27.82		
10	13.08		27.97		
11	13.08		28.07		
12	13.08		28.12		
13	13.08		28.14		
14	13.08		28.15		
15	10.67		32.04		
TOR	10.67		32.59		
BOR	0.0		40.72		
UG	0.0		41.51	250.0	
BFP	0.0		47.38		
TEST	0.0		48.13		
16	14.18	5.6	21.76	26.12	
17	13.81	5.6	22.58	26.61	
18	13.3		27.05		
19	10.67		30.33		
20	10.67		30.35		
21	10.67		30.4		
22	10.67		30.49		
23	10.67		30.6		
24	10.67		30.74		
25	10.67		30.9		
26	10.67		31.09		
27	10.67		31.24		
28	10.67		31.81		
29	15.29	5.6	22.51	26.57	
30	15.29	5.6	22.57	26.6	
31	15.15		23.14		
32	14.92	5.6	21.65	26.06	
33	14.55	5.6	21.6	26.03	
34	14.18	5.6	21.8	26.15	
35	13.81	5.6	22.61	26.63	
36	13.3		27.07		
37	15.15		25.96		

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>
38	14.18	5.6	25.77	28.43	
39	13.81	5.6	26.02	28.57	
40	13.3		28.25		
41	15.15		26.72		
42	13.3		29.09		
43	15.15		26.96		
44	13.3		29.22		
45	15.15		27.15		
46	13.3		29.36		
47	15.15		27.3		
48	13.3		29.52		
49	15.15		27.41		
50	13.3		29.7		
51	15.15		27.48		
52	13.3		29.83		

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	*****
1 to 2	14.55 14.92	5.60	18.32	1.25		0.0 0.0 0.0	9.010 0.0 9.010	120	21.556 -0.160 0.212			
										Vel =	3.60	
2 to 3	14.92 15.15	5.60	26.03	1.25	T	7.432 0.0 0.0	5.580 7.432 13.012	120	21.608 -0.100 1.569			
										Vel =	8.71	
3 to 4	15.15 13.08		26.57	1.25	T	7.432 0.0 0.0	2.060 7.432 9.492	120	23.077 0.897 2.727			
										Vel =	13.93	
4 to 5	13.08 13.08		0.0	3		0.0 0.0 0.0	14.000 0.0 14.000	120	26.701 0.0 0.076			
										Vel =	2.73	
5 to 6	13.08 13.08		71.16	3		0.0 0.0 0.0	13.750 0.0 13.750	120	26.777 0.0 0.269			
										Vel =	5.46	
6 to 7	13.08 13.08		16.71	3		0.0 0.0 0.0	13.500 0.0 13.500	120	27.046 0.0 0.324			
										Vel =	6.10	
7 to 8	13.08 13.08		-19.42	3		0.0 0.0 0.0	13.500 0.0 13.500	120	27.370 0.0 0.255			
										Vel =	5.36	
8 to 9	13.08 13.08		-18.68	3		0.0 0.0 0.0	13.500 0.0 13.500	120	27.625 0.0 0.196			
										Vel =	4.64	
9 to 10	13.08 13.08		-18.35	3		0.0 0.0 0.0	14.000 0.0 14.000	120	27.821 0.0 0.149			
										Vel =	3.93	
10 to 11	13.08 13.08		-18.44	3		0.0 0.0 0.0	14.000 0.0 14.000	120	27.970 0.0 0.103			
										Vel =	3.22	
11 to 12	13.08 13.08		-18.88	3		0.0 0.0 0.0	9.600 0.0 9.600	120	28.073 0.0 0.044			
										Vel =	2.50	
12 to 13	13.08 13.08		-19.94	3		0.0 0.0 0.0	9.730 0.0 9.730	120	28.117 0.0 0.023			
										Vel =	1.73	
13 to 14	13.08 13.08		-22.05	3		0.0 0.0 0.0	8.950 0.0 8.950	120	28.140 0.0 0.006			
										Vel =	0.89	
14 to 15	13.08 10.67		0.0	1.25	2T 3E	14.864 11.148 0.0	53.410 26.012 79.422	120	28.146 1.044 2.849			
										Vel =	4.52	
15 to TOR	10.67 10.670		296.75	4	V	8.954 0.0 0.0	14.220 8.954 23.174	120	32.039 0.0 0.553			
										Vel =	7.20	
TOR to BOR	10.670 0		0.0	4	B Fsp	15.8 0.0 0.0	5.667 15.800 21.467	120	32.592 7.621 0.512			
										* * Fixed Loss = 3		
										Vel =	7.20	

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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 UG	0 0		0.0 319.78	4 4.26	S	28.968 0.0 0.0	4.000 28.968 32.968	120 0.0238	40.725 0.0 0.786			
UG to BFP	0 0	+ 250.00	250.00 569.78	6 6.16	Zac T 2F	0.0 43.037 20.084	275.000 63.121 338.121	140 0.0087	41.511 2.936 2.928		* * Fixed Loss = 2.936 Vel = 6.13	
BFP to TEST	0 0		0.0 569.78	6 6.16	T G E	43.037 4.304 20.084	20.000 67.425 87.425	140 0.0087	47.375 0.0 0.757		Vel = 6.13	
TEST			0.0 569.78						48.132		K Factor = 82.13	
1 to 16	14.55 14.18		7.68 7.68	1.25 1.442		0.0 0.0 0.0	9.010 0.0 9.010	120 0.0048	21.556 0.160 0.043		Vel = 1.51	
16 to 17	14.18 13.81	5.60	26.12 33.8	1.25 1.442		0.0 0.0 0.0	9.010 0.0 9.010	120 0.0729	21.759 0.160 0.657		Vel = 6.64	
17 to 18	13.81 13.3	5.60	26.61 60.41	1.25 1.442	T	7.432 0.0 0.0	12.460 7.432 19.892	120 0.2136	22.576 0.221 4.248		Vel = 11.87	
18 to 19	13.3 10.67		0.0 60.41	1.25 1.442	T	7.432 0.0 0.0	2.630 7.432 10.062	120 0.2136	27.045 1.139 2.149		Vel = 11.87	
19 to 20	10.67 10.67		0.0 60.41	4 4.26		0.0 0.0 0.0	14.000 0.0 14.000	120 0.0011	30.333 0.0 0.015		Vel = 1.36	
20 to 21	10.67 10.67		60.30 120.71	4 4.26		0.0 0.0 0.0	13.750 0.0 13.750	120 0.0039	30.348 0.0 0.054		Vel = 2.72	
21 to 22	10.67 10.67		40.29 161.0	4 4.26		0.0 0.0 0.0	13.500 0.0 13.500	120 0.0067	30.402 0.0 0.091		Vel = 3.62	
22 to 23	10.67 10.67		19.41 180.41	4 4.26		0.0 0.0 0.0	13.500 0.0 13.500	120 0.0083	30.493 0.0 0.112		Vel = 4.06	
23 to 24	10.67 10.67		18.68 199.09	4 4.26		0.0 0.0 0.0	13.500 0.0 13.500	120 0.0099	30.605 0.0 0.133		Vel = 4.48	
24 to 25	10.67 10.67		18.36 217.45	4 4.26		0.0 0.0 0.0	14.000 0.0 14.000	120 0.0117	30.738 0.0 0.164		Vel = 4.89	
25 to 26	10.67 10.67		18.43 235.88	4 4.26		0.0 0.0 0.0	14.000 0.0 14.000	120 0.0136	30.902 0.0 0.190		Vel = 5.31	
26 to 27	10.67 10.67		18.88 254.76	4 4.26		0.0 0.0 0.0	9.640 0.0 9.640	120 0.0157	31.092 0.0 0.151		Vel = 5.73	
27 to 28	10.67 10.67		19.94 274.7	4 4.26	2V	17.907 0.0 0.0	13.690 17.907 31.597	120 0.0180	31.243 0.0 0.569		Vel = 6.18	

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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	*****
28 to 15	10.67 10.67		22.05 296.75	4 4.26		0.0 0.0 0.0	10.940 0.0 10.940	120 0.0207	31.812 0.0 0.227			
			0.0							Vel =	6.68	
15			296.75						32.039		K Factor =	52.43
29 to 3	15.29 15.15	5.60	26.57 26.57	1.25 1.442	T	7.432 0.0 0.0	3.420 7.432 10.852	120 0.0467	22.509 0.061 0.507			
			0.0							Vel =	5.22	
3			26.57						23.077		K Factor =	5.53
30 to 31	15.29 15.15	5.60	26.60 26.6	1.25 1.442	T	7.432 0.0 0.0	3.420 7.432 10.852	120 0.0468	22.567 0.061 0.508			
										Vel =	5.23	
31 to 5	15.15 13.08		44.56 71.16	1.25 1.442	T	7.432 0.0 0.0	2.060 7.432 9.492	120 0.2891	23.136 0.897 2.744			
			0.0							Vel =	13.98	
5			71.16						26.777		K Factor =	13.75
31 to 32	15.15 14.92		-44.56 -44.56	1.25 1.442	T	7.432 0.0 0.0	5.580 7.432 13.012	120 -0.1217	23.136 0.100 -1.583			
										Vel =	8.75	
32 to 33	14.92 14.55	5.60	26.06 -18.5	1.25 1.442		0.0 0.0 0.0	9.010 0.0 9.010	120 -0.0239	21.653 0.160 -0.215			
										Vel =	3.63	
33 to 34	14.55 14.18	5.60	26.03 7.53	1.25 1.442		0.0 0.0 0.0	9.010 0.0 9.010	120 0.0046	21.598 0.160 0.041			
										Vel =	1.48	
34 to 35	14.18 13.81	5.60	26.14 33.67	1.25 1.442		0.0 0.0 0.0	9.010 0.0 9.010	120 0.0725	21.799 0.160 0.653			
										Vel =	6.61	
35 to 36	13.81 13.3	5.60	26.63 60.3	1.25 1.442	T	7.432 0.0 0.0	12.460 7.432 19.892	120 0.2128	22.612 0.221 4.234			
										Vel =	11.85	
36 to 20	13.3 10.67		0.0 60.3	1.25 1.442	T	7.432 0.0 0.0	2.630 7.432 10.062	120 0.2129	27.067 1.139 2.142			
			0.0							Vel =	11.85	
20			60.30						30.348		K Factor =	10.95
6 to 37	13.08 15.15		-16.71 -16.71	1.25 1.442	T	7.432 0.0 0.0	2.060 7.432 9.492	120 -0.0198	27.046 -0.897 -0.188			
										Vel =	3.28	
37 to 38	15.15 14.18		0.0 -16.71	1.25 1.442	T	7.432 0.0 0.0	23.600 7.432 31.032	120 -0.0198	25.961 0.420 -0.614			
										Vel =	3.28	
38 to 39	14.18 13.81	5.60	28.43 11.72	1.25 1.442		0.0 0.0 0.0	9.010 0.0 9.010	120 0.0103	25.767 0.160 0.093			
										Vel =	2.30	

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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	*****
39 to 40	13.81 13.3	5.60	28.56 40.28	1.25 1.442	T	7.432 0.0	12.460 7.432	120	26.020 0.221			
						0.0	19.892	0.1009	2.007	Vel =	7.91	
40 to 21	13.3 10.67		0.0 40.28	1.25 1.442	T	7.432 0.0	2.630 7.432	120	28.248 1.139			
						0.0	10.062	0.1009	1.015	Vel =	7.91	
21			0.0 40.28						30.402	K Factor =	7.31	
7 to 41	13.08 15.15		19.41 19.41	1.25 1.442	T	7.432 0.0	2.060 7.432	120	27.370 -0.897			
						0.0	9.492	0.0262	0.249	Vel =	3.81	
41 to 42	15.15 13.3		0.0 19.41	1.25 1.442	2T	14.864 0.0	45.070 14.864	120	26.722 0.801			
						0.0	59.934	0.0262	1.568	Vel =	3.81	
42 to 22	13.3 10.67		0.0 19.41	1.25 1.442	T	7.432 0.0	2.630 7.432	120	29.091 1.139			
						0.0	10.062	0.0261	0.263	Vel =	3.81	
22			0.0 19.41						30.493	K Factor =	3.52	
8 to 43	13.08 15.15		18.68 18.68	1.25 1.442	T	7.432 0.0	2.060 7.432	120	27.625 -0.897			
						0.0	9.492	0.0244	0.232	Vel =	3.67	
43 to 44	15.15 13.3		0.0 18.68	1.25 1.442	2T	14.864 0.0	45.070 14.864	120	26.960 0.801			
						0.0	59.934	0.0243	1.459	Vel =	3.67	
44 to 23	13.3 10.67		0.0 18.68	1.25 1.442	T	7.432 0.0	2.630 7.432	120	29.220 1.139			
						0.0	10.062	0.0244	0.246	Vel =	3.67	
23			0.0 18.68						30.605	K Factor =	3.38	
9 to 45	13.08 15.15		18.36 18.36	1.25 1.442	T	7.432 0.0	2.060 7.432	120	27.821 -0.897			
						0.0	9.492	0.0236	0.224	Vel =	3.61	
45 to 46	15.15 13.3		0.0 18.36	1.25 1.442	2T	14.864 0.0	45.070 14.864	120	27.148 0.801			
						0.0	59.934	0.0236	1.413	Vel =	3.61	
46 to 24	13.3 10.67		0.0 18.36	1.25 1.442	T	7.432 0.0	2.630 7.432	120	29.362 1.139			
						0.0	10.062	0.0236	0.237	Vel =	3.61	
24			0.0 18.36						30.738	K Factor =	3.31	
10 to 47	13.08 15.15		18.43 18.43	1.25 1.442	T	7.432 0.0	2.060 7.432	120	27.970 -0.897			
						0.0	9.492	0.0238	0.226	Vel =	3.62	
47 to 48	15.15 13.3		0.0 18.43	1.25 1.442	2T	14.864 0.0	45.070 14.864	120	27.299 0.801			
						0.0	59.934	0.0238	1.424	Vel =	3.62	
48 to 25	13.3 10.67		0.0 18.43	1.25 1.442	T	7.432 0.0	2.630 7.432	120	29.524 1.139			
						0.0	10.062	0.0238	0.239	Vel =	3.62	

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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	*****
25			0.0 18.43					30.902		K Factor = 3.32	
11 to 49	13.08 15.15		18.89	1.25	T 7.432	2.060 7.432	120	28.073 -0.897			
49	15.15		18.89	1.442	0.0	9.492	0.0250	0.237		Vel = 3.71	
49 to 50	15.15 13.3		0.0	1.25	2T 14.864	45.070 14.864	120	27.413 0.801			
50	13.3		18.89	1.442	0.0	59.934	0.0248	1.489		Vel = 3.71	
50 to 26	13.3 10.67		0.0	1.25	T 7.432	2.630 7.432	120	29.703 1.139			
26	10.67		18.89	1.442	0.0	10.062	0.0248	0.250		Vel = 3.71	
26			0.0 18.89					31.092		K Factor = 3.39	
12 to 51	13.08 15.15		19.94	1.25	T 7.432	2.060 7.432	120	28.117 -0.897			
51	15.15		19.94	1.442	0.0	9.492	0.0276	0.262		Vel = 3.92	
51 to 52	15.15 13.3		0.0	1.25	T 7.432	45.070 11.148	120	27.482 0.801			
52	13.3		19.94	1.442	E 3.716	56.218	0.0275	1.545		Vel = 3.92	
52 to 27	13.3 10.67		0.0	1.25	T 7.432	2.630 7.432	120	29.828 1.139			
27	10.67		19.94	1.442	0.0	10.062	0.0274	0.276		Vel = 3.92	
27			0.0 19.94					31.243		K Factor = 3.57	
13 to 28	13.08 10.67		22.05	1.25	2T 14.864	53.400 26.012	120	28.140 1.044			
28	10.67		22.05	1.442	3E 11.148	79.412	0.0331	2.628		Vel = 4.33	
28			0.0 22.05					31.812		K Factor = 3.91	

HYDRAULIC CALCULATIONS
for

Project name: Caliber Collision
Location: 710 SE Blue Parkway Lee's Summit, MO. 64063
Drawing no: FP1 of 1
Date: 04-18-2022

Design

Remote area number: 2
Remote area location: Paint Booth
Occupancy classification: Extra Hazard Group II
Density: .40 - Gpm/SqFt
Area of application: Entire Booth - SqFt
Coverage per sprinkler: 100 - SqFt
Type of sprinklers calculated: ELO Upright/Pendent - QR Dry Sidewall
No. of sprinklers calculated: 8
In-rack demand: N/A - GPM
Hose streams: 500 - GPM
Total water required (including hose streams): 848.459 - GPM @ 68.828 - Psi
Type of system: Wet
Volume of dry or preaction system: N/A - Gal

Water supply information

Date: 03-29-2022
Location: SE 7th Ter
Source: City of Lee's Summit

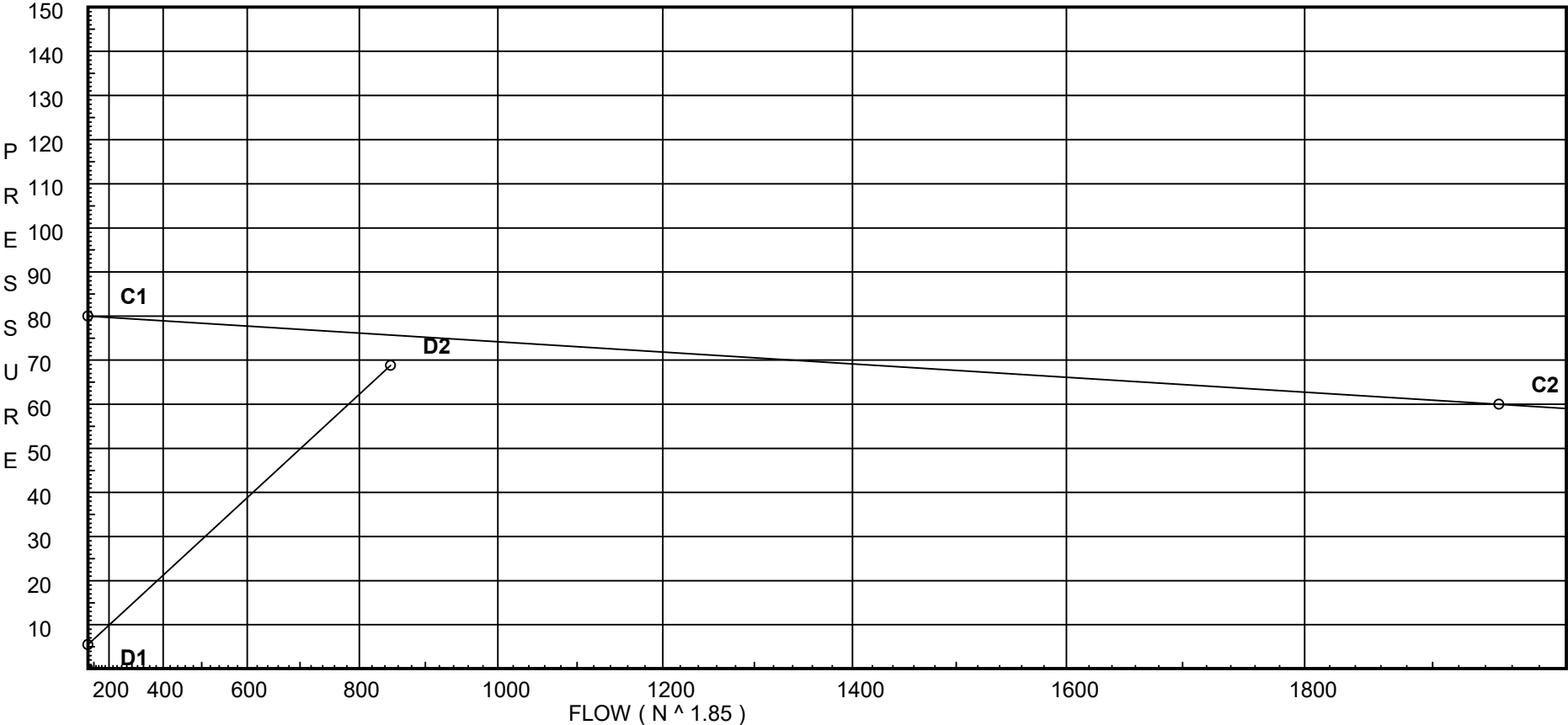
Name of contractor: Falcon Fire Sprinkler
Address: 1239A Clay Street / / North Kansas City, Mo. 64116
Phone number: 816-734-0018
Name of designer: Raul Villarreal
Authority having jurisdiction: City of Lee's Summit
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve C

Falcon Fire Sprinkler
Caliber Collision

City Water Supply:
C1 - Static Pressure : 80
C2 - Residual Pressure: 60
C2 - Residual Flow : 1950

Demand:
D1 - Elevation : 5.487
D2 - System Flow : 848.459
D2 - System Pressure : 68.828
Hose (Demand) :
D3 - System Demand : 848.459
Safety Margin : 6.883



Fittings Used Summary

Falcon Fire Sprinkler
Caliber Collision

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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
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	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
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
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	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	90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	9.3	11	0	0	0	0	0
Zac	Ames 2000SS	Fitting generates a Fixed Loss Based on Flow																			

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

Falcon Fire Sprinkler
Caliber Collision

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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	80.0	60	1950.0	75.71	848.46	68.828

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>
DP03	9.0	11.2	11.76	38.4	
EQ03	12.67		12.63		
DP01	9.0	11.2	11.76	38.4	
EQ01	9.5		12.63		
DP02	9.0	11.2	11.76	38.4	
EQ02	9.5		13.93		
53	12.5	8	21.55	37.14	
54	12.5		22.47		
55	9.5		27.04		
A	9.5		28.11		
56	13.08		39.33		
8	13.08		39.67		
9	13.08		40.11		
10	13.08		40.44		
11	13.08		40.66		
12	13.08		40.75		
13	13.08		40.8		
14	13.08		40.81		
15	10.67		47.39		
TOR	10.67		48.04		
BOR	0.0		56.26		
UG	0.0		57.18	500.0	
BFP	0.0		67.25		
TEST	0.0		68.83		
57	-1.5	11.2	12.9	40.23	
58	-1.5	11.2	14.11	42.07	
59	9.5		25.62		
60	9.5		25.69		
61	9.5		25.52		
63	12.67	10.8	12.63	38.4	K=K @ EQ03
64	12.67		20.59		
65	9.5	10.81	19.54	47.77	K=K @ EQ01
66	9.5	10.29	21.2	47.37	K=K @ EQ02
67	9.5	10.81	19.68	47.94	K=K @ EQ01
68	9.5	10.29	21.35	47.54	K=K @ EQ02
7	13.08		39.43		
6	13.08		39.55		
5	13.08		39.62		
4	13.08		39.63		
3	15.15		39.36		
2	14.92		40.31		
1	14.55		41.06		

Flow Summary - NFPA

Falcon Fire Sprinkler
Caliber Collision

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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>
16	14.18		41.81		
17	13.81		42.56		
18	13.3		44.08		
19	10.67		45.88		
20	10.67		45.88		
21	10.67		45.9		
22	10.67		45.93		
23	10.67		45.99		
24	10.67		46.08		
25	10.67		46.21		
26	10.67		46.38		
27	10.67		46.53		
28	10.67		47.13		
41	15.15		39.18		
42	13.3		44.1		
37	15.15		39.29		
38	14.18		41.78		
39	13.81		42.54		
40	13.3		44.09		
31	15.15		39.34		
32	14.92		40.3		
33	14.55		41.05		
34	14.18		41.8		
35	13.81		42.55		
36	13.3		44.08		
43	15.15		39.41		
44	13.3		44.19		
45	15.15		39.81		
46	13.3		44.32		
47	15.15		40.11		
48	13.3		44.48		
49	15.15		40.32		
50	13.3		44.65		
51	15.15		40.45		
52	13.3		44.76		

Final Calculations : Hazen-Williams

Falcon Fire Sprinkler
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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	*****
DP03 to EQ03	9 12.67	11.20	38.40 38.4	1 1.049	E	2.0 0.0 0.0	3.670 2.000 5.670	120 0.4349	11.755 -1.589 2.466		Vel = 14.26	
EQ03			0.0 38.40						12.632		K Factor = 10.80	
DP01 to EQ01	9 9.5	11.20	38.40 38.4	1 1.049	E	2.0 0.0 0.0	0.500 2.000 2.500	120 0.4352	11.755 -0.217 1.088		Vel = 14.26	
EQ01			0.0 38.40						12.626		K Factor = 10.81	
DP02 to EQ02	9 9.5	11.20	38.40 38.4	1 1.049	T	5.0 0.0 0.0	0.500 5.000 5.500	120 0.4351	11.755 -0.217 2.393		Vel = 14.26	
EQ02			0.0 38.40						13.931		K Factor = 10.29	
53 to 54	12.5 12.5	8.00	37.14 37.14	1 1.049	E	2.0 0.0 0.0	0.250 2.000 2.250	120 0.4089	21.550 0.0 0.920		Vel = 13.79	
54 to 55	12.5 9.5		0.0 37.14	1 1.049	T	5.0 0.0 0.0	3.000 5.000 8.000	120 0.4089	22.470 1.299 3.271		Vel = 13.79	
55 to A	9.5 9.5		311.32 348.46	3 3.26	E	9.408 0.0 0.0	1.000 9.408 10.408	120 0.1029	27.040 0.0 1.071		Vel = 13.39	
A to 56	9.5 13.08		0.0 348.46	3 3.26	4V X B Fsp	26.879 17.471 13.44 0.0	37.210 57.790 95.000	120 0.1029	28.111 1.450 9.771		* * Fixed Loss = 3 Vel = 13.39	
56 to 8	13.08 13.08		-128.76 219.7	3 3.26		0.0 0.0 0.0	7.750 0.0 7.750	120 0.0439	39.332 0.0 0.340		Vel = 8.44	
8 to 9	13.08 13.08		-32.12 187.58	3 3.26		0.0 0.0 0.0	13.500 0.0 13.500	120 0.0327	39.672 0.0 0.442		Vel = 7.21	
9 to 10	13.08 13.08		-30.96 156.62	3 3.26		0.0 0.0 0.0	14.000 0.0 14.000	120 0.0234	40.114 0.0 0.328		Vel = 6.02	
10 to 11	13.08 13.08		-30.27 126.35	3 3.26		0.0 0.0 0.0	14.000 0.0 14.000	120 0.0157	40.442 0.0 0.220		Vel = 4.86	
11 to 12	13.08 13.08		-30.10 96.25	3 3.26		0.0 0.0 0.0	9.600 0.0 9.600	120 0.0095	40.662 0.0 0.091		Vel = 3.70	
12 to 13	13.08 13.08		-31.08 65.17	3 3.26		0.0 0.0 0.0	9.730 0.0 9.730	120 0.0046	40.753 0.0 0.045		Vel = 2.50	
13 to 14	13.08 13.08		-32.19 32.98	3 3.26		0.0 0.0 0.0	8.950 0.0 8.950	120 0.0013	40.798 0.0 0.012		Vel = 1.27	

Final Calculations : Hazen-Williams

Falcon Fire Sprinkler
Caliber Collision

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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	*****
14 to 15	13.08 10.67		0.0 32.98	1.25 1.442	2T 3E 11.148	14.864 26.012 79.422	120 0.0697	40.810 1.044 5.535			
15 to TOR	10.67 10.670		315.48 348.46	4 4.26	V 8.954 0.0	14.220 8.954 23.174	120 0.0279	47.389 0.0 0.647		Vel = 6.48	
TOR to BOR	10.670 0		0.0 348.46	4 4.26	B Fsp 15.8 0.0	5.667 15.800 21.467	120 0.0280	48.036 7.621 0.601		* * Fixed Loss = 3	
BOR to UG	0 0		0.0 348.46	4 4.26	S 28.968 0.0	4.000 28.968 32.968	120 0.0279	56.258 0.0 0.921		Vel = 7.84	
UG to BFP	0 0	+ 500.00	500.00 848.46	6 6.16	Zac T 2F 20.084	0.0 43.037 63.121 338.121	140 0.0181	57.179 3.949 6.118		* * Fixed Loss = 3.949	
BFP to TEST	0 0		0.0 848.46	6 6.16	T G E 4.304 20.084	20.000 67.425 87.425	140 0.0181	67.246 0.0 1.582		Vel = 9.13	
TEST			0.0 848.46					68.828		K Factor = 102.27	
57 to 58	-1.5 -1.5	11.20	40.23 40.23	1.25 1.442		0.0 0.0 12.040	120 0.1007	12.900 0.0 1.212		Vel = 7.90	
58 to 59	-1.5 9.5	11.20	42.07 82.3	1.25 1.442	3E T 11.148 7.432	24.430 18.580 43.010	120 0.3784	14.112 -4.764 16.277		Vel = 16.17	
59 to 60	9.5 9.5		133.55 215.85	3 3.26		0.0 0.0 1.450	120 0.0421	25.625 0.0 0.061		Vel = 8.30	
60 to 55	9.5 9.5		95.47 311.32	3 3.26	V 6.72 0.0	9.490 6.720 16.210	120 0.0835	25.686 0.0 1.354		Vel = 11.97	
55			0.0 311.32					27.040		K Factor = 59.87	
59 to 61	9.5 9.5		-133.55 -133.55	3 3.26		0.0 0.0 6.050	120 -0.0174	25.625 0.0 -0.105		Vel = 5.13	
61 to 62	9.5 0		38.40 -95.15	3 3.26		0.0 0.0 0.500	120 -0.0100	25.520 4.114 -0.005		Vel = 3.66	
62			0.0 -95.15					29.629		K Factor = -17.48	
63 to 64	12.67 12.67	10.8	38.40 38.4	1 1.049	3E 0.0	12.300 6.000	120 0.4350	12.632 0.0 7.961		K = K @ EQ03	
64 to 61	12.67 9.5		0.0 38.4	1 1.049	T 5.0 0.0	3.170 5.000 8.170	120 0.4350	20.593 1.373 3.554		Vel = 14.26	

Final Calculations : Hazen-Williams

Falcon Fire Sprinkler
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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	*****
61			0.0 38.40					25.520		K Factor = 7.60	
65 to 66	9.5 9.5	10.81	47.77	1.25	0.0 0.0	12.000 0.0	120	19.543 0.0		K = K @ EQ01	
66 to 62	9.5 0	10.29	47.77 47.38	1.442 1.25	0.0 T 7.432	12.000 1.280 7.432	0.1383 120	1.660 21.203 4.114		Vel = 9.38 K = K @ EQ02	
			95.15	1.442	0.0	8.712	0.4949	4.312		Vel = 18.69	
62			0.0 95.15					29.629		K Factor = 17.48	
67 to 68	9.5 9.5	10.81	47.94	1.25	0.0 0.0	12.000 0.0	120	19.677 0.0		K = K @ EQ01	
68 to 60	9.5 9.5	10.29	47.94 47.53	1.442 1.25	0.0 T 7.432	12.000 1.280 7.432	0.1393 120	1.671 21.348 0.0		Vel = 9.42 K = K @ EQ02	
			95.47	1.442	0.0	8.712	0.4979	4.338		Vel = 18.76	
60			0.0 95.47					25.686		K Factor = 18.84	
56 to 7	13.08 13.08		128.76	3	0.0 0.0	5.750 0.0	120	39.332 0.0			
7 to 6	13.08 13.08		128.76	3.26	0.0	5.750	0.0163	0.094		Vel = 4.95	
6 to 5	13.08 13.08		-32.74	3	0.0 0.0	13.500 0.0	120	39.426 0.0			
5 to 4	13.08 13.08		96.02	3.26	0.0	13.500	0.0095	0.128		Vel = 3.69	
4 to 3	13.08 15.15		-32.20	3	0.0 0.0	13.750 0.0	120	39.554 0.0			
3 to 2	13.08 15.15		63.82	3.26	0.0	13.750	0.0044	0.061		Vel = 2.45	
2 to 1	13.08 14.55		-31.95	3	0.0 0.0	14.000 0.0	120	39.615 0.0			
1 to 16	13.08 14.55		31.87	3.26	0.0	14.000	0.0012	0.017		Vel = 1.23	
16 to 17	13.08 14.55		0.0	1.25	T 7.432	2.060 7.432	120	39.632 -0.897			
			31.87	1.442	0.0	9.492	0.0655	0.622		Vel = 6.26	
3 to 2	15.15 14.92		0.0	1.25	T 7.432	5.580 7.432	120	39.357 0.100			
2 to 1	14.92 14.55		31.87	1.442	0.0	13.012	0.0654	0.851		Vel = 6.26	
1 to 16	14.92 14.55		0.0	1.25	0.0 0.0	9.010 0.0	120	40.308 0.160			
			31.87	1.442	0.0	9.010	0.0655	0.590		Vel = 6.26	
16 to 17	14.55 14.18		0.0	1.25	0.0 0.0	9.010 0.0	120	41.058 0.160			
			31.87	1.442	0.0	9.010	0.0655	0.590		Vel = 6.26	
17 to 18	14.18 13.81		0.0	1.25	T 7.432	12.460 7.432	120	42.558 0.221			
			31.87	1.442	0.0	19.892	0.0654	1.301		Vel = 6.26	

Final Calculations : Hazen-Williams

Falcon Fire Sprinkler
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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	*****
18 to 19	13.3 10.67		0.0 31.87	1.25 1.442	T	7.432 0.0	2.630 7.432	120	44.080 1.139			
19 to 20	10.67 10.67		0.0 31.87	4 4.26		0.0 0.0	14.000 14.000	120	45.878 0.005	Vel =	6.26	
20 to 21	10.67 10.67		31.95 63.82	4 4.26		0.0 0.0	13.750 13.750	120	45.883 0.016	Vel =	1.44	
21 to 22	10.67 10.67		32.20 96.02	4 4.26		0.0 0.0	13.500 13.500	120	45.899 0.035	Vel =	2.16	
22 to 23	10.67 10.67		32.74 128.76	4 4.26		0.0 0.0	13.500 13.500	120	45.934 0.060	Vel =	2.90	
23 to 24	10.67 10.67		32.12 160.88	4 4.26		0.0 0.0	13.500 13.500	120	45.994 0.090	Vel =	3.62	
24 to 25	10.67 10.67		30.96 191.84	4 4.26		0.0 0.0	14.000 14.000	120	46.084 0.130	Vel =	4.32	
25 to 26	10.67 10.67		30.27 222.11	4 4.26		0.0 0.0	14.000 14.000	120	46.214 0.170	Vel =	5.00	
26 to 27	10.67 10.67		30.09 252.2	4 4.26		0.0 0.0	9.640 9.640	120	46.384 0.148	Vel =	5.68	
27 to 28	10.67 10.67		31.09 283.29	4 4.26	2V	17.907 0.0	13.690 31.597	120	46.532 0.602	Vel =	6.38	
28 to 15	10.67 10.67		32.19 315.48	4 4.26		0.0 0.0	10.940 10.940	120	47.134 0.255	Vel =	7.10	
15			0.0 315.48						47.389	K Factor =	45.83	
7 to 41	13.08 15.15		32.73 32.73	1.25 1.442	T	7.432 0.0	2.060 7.432	120	39.426 -0.897	Vel =	6.43	
41 to 42	15.15 13.3		0.0 32.73	1.25 1.442	2T	14.864 0.0	45.070 59.934	120	39.182 0.801	Vel =	6.43	
42 to 22	13.3 10.67		0.0 32.73	1.25 1.442	T	7.432 0.0	2.630 7.432	120	44.103 1.139	Vel =	6.43	
22			0.0 32.73						45.934	K Factor =	4.83	
6 to 37	13.08 15.15		32.20 32.2	1.25 1.442	T	7.432 0.0	2.060 9.492	120	39.554 -0.897	Vel =	6.33	

Final Calculations : Hazen-Williams

Falcon Fire Sprinkler
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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	*****
37 to 38	15.15 14.18		0.0 32.2	1.25 1.442	T 0.0	7.432 7.432	23.600 31.032	120 0.0667	39.291 0.420 2.069	Vel = 6.33	
38 to 39	14.18 13.81		0.0 32.2	1.25 1.442	0.0 0.0	9.010 0.0	120 0.0668	41.780 0.160 0.602	Vel = 6.33		
39 to 40	13.81 13.3		0.0 32.2	1.25 1.442	T 0.0	7.432 7.432	12.460 19.892	120 0.0667	42.542 0.221 1.326	Vel = 6.33	
40 to 21	13.3 10.67		0.0 32.2	1.25 1.442	T 0.0	7.432 7.432	2.630 10.062	120 0.0667	44.089 1.139 0.671	Vel = 6.33	
21			0.0 32.20						45.899	K Factor = 4.75	
5 to 31	13.08 15.15		31.95 31.95	1.25 1.442	T 0.0	7.432 7.432	2.060 9.492	120 0.0657	39.615 -0.897 0.624	Vel = 6.28	
31 to 32	15.15 14.92		0.0 31.95	1.25 1.442	T 0.0	7.432 7.432	5.580 13.012	120 0.0657	39.342 0.100 0.855	Vel = 6.28	
32 to 33	14.92 14.55		0.0 31.95	1.25 1.442	0.0 0.0	9.010 0.0	120 0.0658	40.297 0.160 0.593	Vel = 6.28		
33 to 34	14.55 14.18		0.0 31.95	1.25 1.442	0.0 0.0	9.010 9.010	120 0.0657	41.050 0.160 0.592	Vel = 6.28		
34 to 35	14.18 13.81		0.0 31.95	1.25 1.442	0.0 0.0	9.010 9.010	120 0.0657	41.802 0.160 0.592	Vel = 6.28		
35 to 36	13.81 13.3		0.0 31.95	1.25 1.442	T 0.0	7.432 7.432	12.460 19.892	120 0.0657	42.554 0.221 1.307	Vel = 6.28	
36 to 20	13.3 10.67		0.0 31.95	1.25 1.442	T 0.0	7.432 7.432	2.630 10.062	120 0.0658	44.082 1.139 0.662	Vel = 6.28	
20			0.0 31.95						45.883	K Factor = 4.72	
8 to 43	13.08 15.15		32.13 32.13	1.25 1.442	T 0.0	7.432 7.432	2.060 9.492	120 0.0665	39.672 -0.897 0.631	Vel = 6.31	
43 to 44	15.15 13.3		0.0 32.13	1.25 1.442	2T 0.0	14.864 14.864	45.070 59.934	120 0.0664	39.406 0.801 3.980	Vel = 6.31	
44 to 23	13.3 10.67		0.0 32.13	1.25 1.442	T 0.0	7.432 7.432	2.630 10.062	120 0.0664	44.187 1.139 0.668	Vel = 6.31	
23			0.0 32.13						45.994	K Factor = 4.74	

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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	*****
9 to 45	13.08 15.15		30.95 30.95	1.25 1.442	T	7.432 0.0 0.0	2.060 7.432 9.492	120 0.0619	40.114 -0.897 0.588		Vel = 6.08	
45 to 46	15.15 13.3		0.0 30.95	1.25 1.442	2T	14.864 0.0 0.0	45.070 14.864 59.934	120 0.0620	39.805 0.801 3.716		Vel = 6.08	
46 to 24	13.3 10.67		0.0 30.95	1.25 1.442	T	7.432 0.0 0.0	2.630 7.432 10.062	120 0.0619	44.322 1.139 0.623		Vel = 6.08	
24			0.0 30.95						46.084		K Factor = 4.56	
10 to 47	13.08 15.15		30.27 30.27	1.25 1.442	T	7.432 0.0 0.0	2.060 7.432 9.492	120 0.0595	40.442 -0.897 0.565		Vel = 5.95	
47 to 48	15.15 13.3		0.0 30.27	1.25 1.442	2T	14.864 0.0 0.0	45.070 14.864 59.934	120 0.0595	40.110 0.801 3.565		Vel = 5.95	
48 to 25	13.3 10.67		0.0 30.27	1.25 1.442	T	7.432 0.0 0.0	2.630 7.432 10.062	120 0.0595	44.476 1.139 0.599		Vel = 5.95	
25			0.0 30.27						46.214		K Factor = 4.45	
11 to 49	13.08 15.15		30.10 30.1	1.25 1.442	T	7.432 0.0 0.0	2.060 7.432 9.492	120 0.0589	40.662 -0.897 0.559		Vel = 5.91	
49 to 50	15.15 13.3		0.0 30.1	1.25 1.442	2T	14.864 0.0 0.0	45.070 14.864 59.934	120 0.0589	40.324 0.801 3.528		Vel = 5.91	
50 to 26	13.3 10.67		0.0 30.1	1.25 1.442	T	7.432 0.0 0.0	2.630 7.432 10.062	120 0.0588	44.653 1.139 0.592		Vel = 5.91	
26			0.0 30.10						46.384		K Factor = 4.42	
12 to 51	13.08 15.15		31.09 31.09	1.25 1.442	T	7.432 0.0 0.0	2.060 7.432 9.492	120 0.0626	40.753 -0.897 0.594		Vel = 6.11	
51 to 52	15.15 13.3		0.0 31.09	1.25 1.442	T E	7.432 3.716 0.0	45.070 11.148 56.218	120 0.0625	40.450 0.801 3.513		Vel = 6.11	
52 to 27	13.3 10.67		0.0 31.09	1.25 1.442	T	7.432 0.0 0.0	2.630 7.432 10.062	120 0.0625	44.764 1.139 0.629		Vel = 6.11	
27			0.0 31.09						46.532		K Factor = 4.56	
13 to 28	13.08 10.67		32.19 32.19	1.25 1.442	2T 3E	14.864 11.148 0.0	53.400 26.012 79.412	120 0.0666	40.798 1.044 5.292		Vel = 6.32	

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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	*****
28			0.0 32.19						47.134		K Factor =	4.69

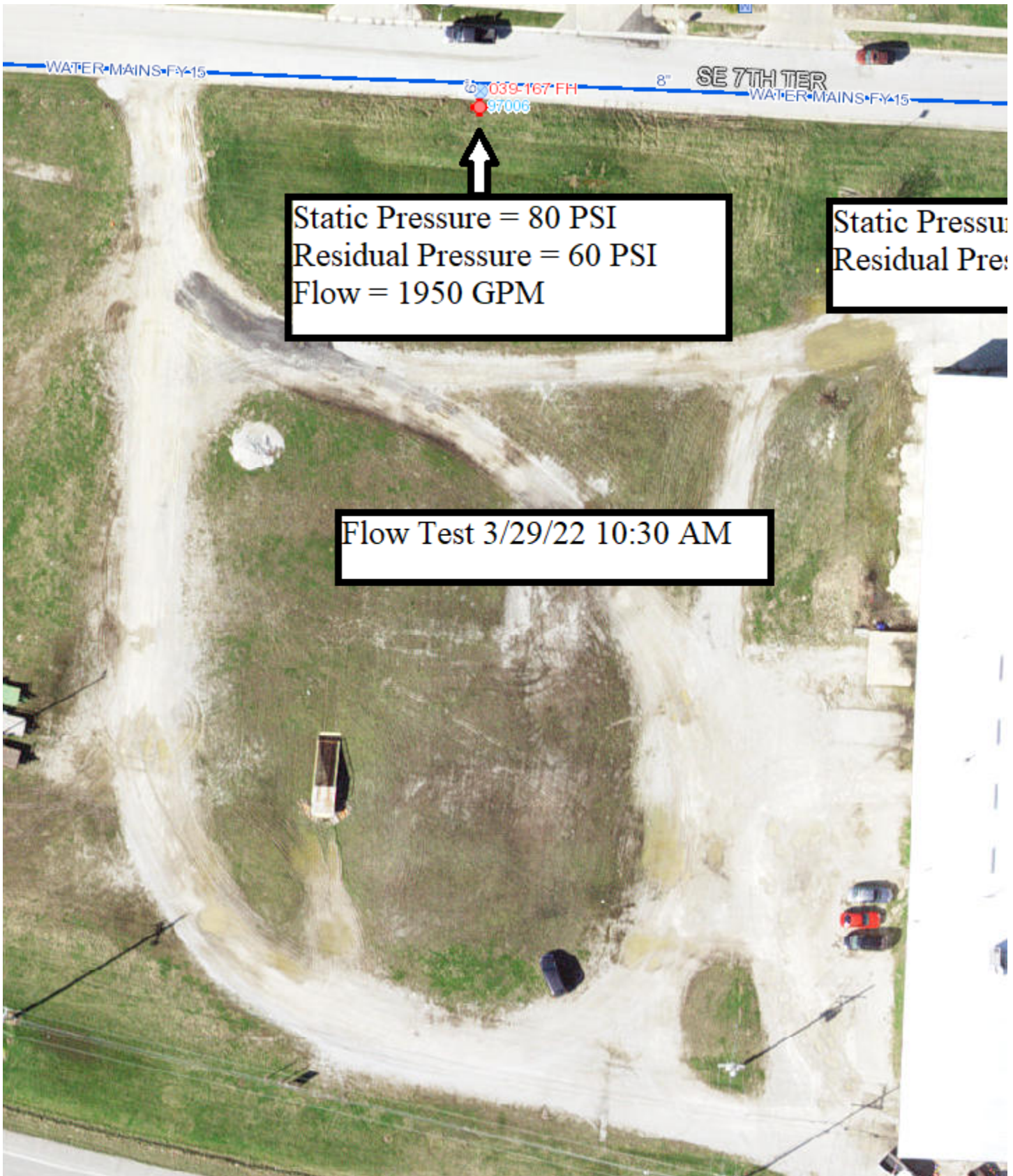
Daniel Smith

From: bjm@falconfiresprinkler.com
Sent: Thursday, March 31, 2022 8:29 AM
To: Daniel Smith; Raul Villarreal
Subject: Caliber Collision Requested Flow Data - Lee's Summit MO

Brian J Messenger
Falcon Fire Protection, Inc.
1239A Clay Street, N. Kansas City, MO 64116
O: 816-734-0018 – C: 816-935-1327

From: Ryan McCormick <Ryan.McCormick@cityofls.net>
Sent: Thursday, March 31, 2022 8:22 AM
To: bjm@falconfiresprinkler.com
Subject: Requested Flow Data - Lee's Summit MO

Brian, here's the requested flow data.



Yours Truly,

Ryan McCormick | Operations Technician

1200 SE Hamblen Road | Lee's Summit, MO 64081
816.969.1900 | lswater.net | Ryan.McCormick@cityofls.net



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