

HYDRAULIC CALCULATIONS
for

JOB NAME Crash Champions
Location 451 SE Olham Pkwy. Lee's Summit MO.
Drawing # FP1
Contract #
Date 10-19-2023

DESIGN

Remote area # 1
Remote area location Shop
Occupancy classification Ordinary Hazard Group II
Density 0.20 - Gpm/SqFt
Area of application 1542 - SqFt
Coverage/sprinkler 128 - SqFt
Type of sprinkler calculated QR Pendent
Sprinklers calculated 14
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 645.669 - GPM
Type of system Wet
Volume of system (dry or pre-action) N/A - Gal



@ 58.579 - Psi

WATER SUPPLY INFORMATION

Test date 10-10-2023
Location SE Oldham Pkwy.
Source of info Lee's Summit Water Utilities

CONTRACTOR INFO Alpha Fire Protection
Address P.O. Box 50 / Independence, MO. 64051
Phone # 816-257-2260
Name of designer Raul Villarreal
Authority having jurisdiction City of Lee's Summit, MO.
NOTES:

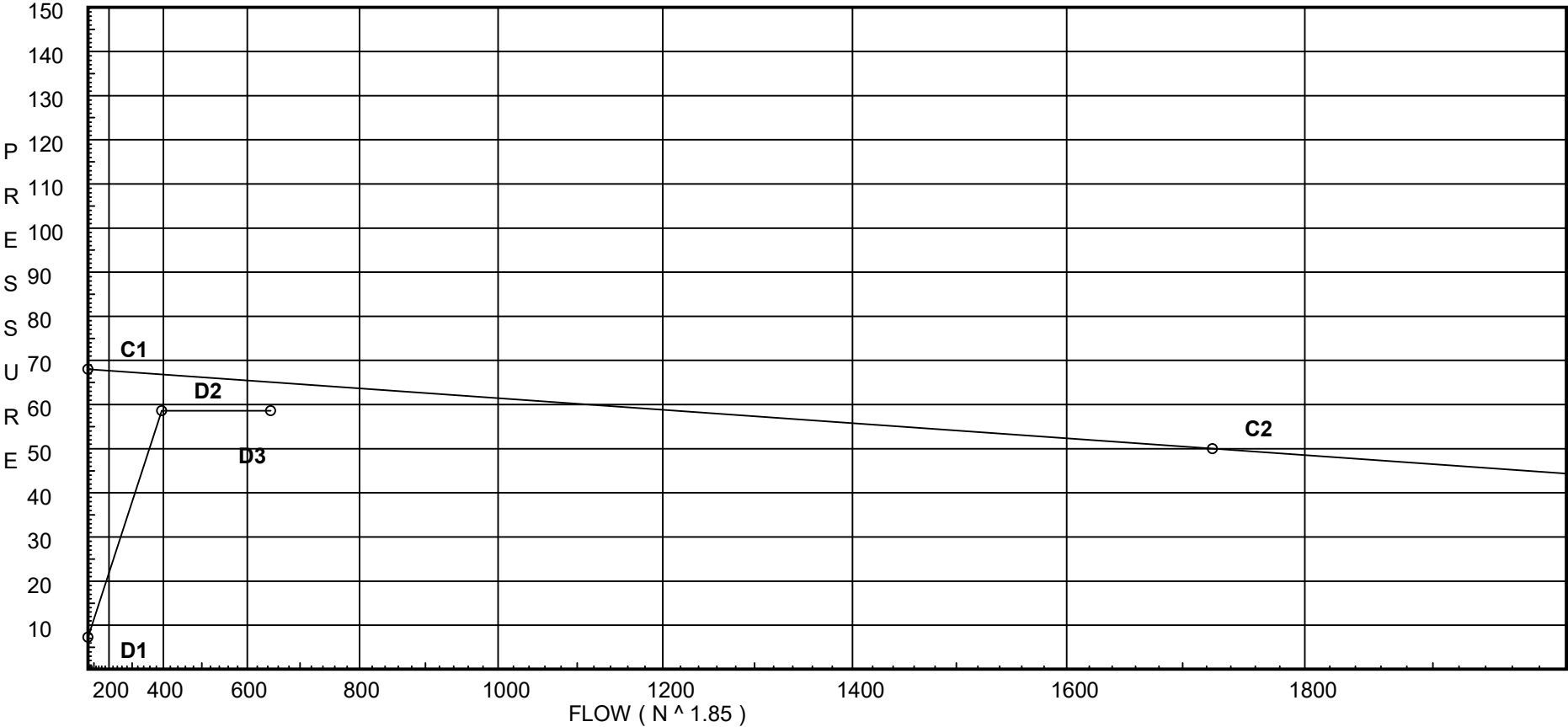
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Water Supply Curve

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City Water Supply:
C1 - Static Pressure : 68
C2 - Residual Pressure: 50
C2 - Residual Flow : 1725

Demand:
D1 - Elevation : 7.254
D2 - System Flow : 395.669
D2 - System Pressure : 58.579
Hose (Demand) : 250
D3 - System Demand : 645.669
Safety Margin : 6.498



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
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
Zce	Colt C300 Vert Butt	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	68.0	50	1725.0	65.078	645.67	58.579

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>	
H100	16.75	5.6	20.9	25.6	0.2	128
H101	16.75	5.6	21.55	25.99	0.2	128
H102	16.75	5.6	23.92	27.39	0.2	128
H103	16.75	5.6	30.76	31.06	0.2	128
1	16.75		31.3			
2	16.08		36.94			
3	16.08		36.98			
4	16.08		37.08			
5	11.5		39.31			
TOR	11.5		44.7			
BOR	0.0		49.92			
BFP	0.0		56.26			
UG	0.0		56.3			
TEST	0.0		58.58	250.0		
H104	16.75	5.6	20.92	25.61	0.2	128
H105	16.75	5.6	21.57	26.01	0.2	128
H106	16.75	5.6	23.94	27.4	0.2	128
H107	16.75	5.6	30.79	31.07	0.2	128
6	16.75		31.33			
H108	16.75	5.6	20.98	25.65	0.2	128
H109	16.75	5.6	21.63	26.04	0.2	128
H110	16.75	5.6	24.01	27.44	0.2	128
H111	16.75	5.6	30.87	31.12	0.2	128
7	16.75		31.42			
H112	16.75	5.6	33.58	32.45	0.2	128
H113	16.75	5.6	34.4	32.85	0.2	128
8	16.75		35.0			

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	*****
H100 to H101	16.75 16.75	5.60	25.60 25.6	1.25 1.38			12.000 12.000	120 0.0540	20.898 0.0 0.648		Vel = 5.49	
H101 to H102	16.75 16.75	5.60	25.99 51.59	1.25 1.38			12.000 12.000	120 0.1976	21.546 0.0 2.371		Vel = 11.07	
H102 to 1	16.75 16.75	5.60	27.39 78.98	1.25 1.38	T	6.0	11.000 6.000 17.000	120 0.4344	23.917 0.0 7.385		Vel = 16.94	
1			0.0 78.98						31.302		K Factor = 14.12	
H103 to 1	16.75 16.75	5.60	31.06 31.06	1.25 1.38	T	6.0	1.000 6.000 7.000	120 0.0773	30.761 0.0 0.541		Vel = 6.66	
1 to 2	16.75 16.08		78.98 110.04	1.25 1.38	T	6.0	0.670 6.000 6.670	120 0.8022	31.302 0.290 5.351		Vel = 23.60	
2 to 3	16.08 16.08		0.0 110.04	4 4.26			10.000 10.000	120 0.0033	36.943 0.0 0.033		Vel = 2.48	
3 to 4	16.08 16.08		110.09 220.13	4 4.26			8.290 8.290	120 0.0119	36.976 0.0 0.099		Vel = 4.96	
4 to 5	16.08 11.500		110.25 330.38	4 4.26			10.000 10.000	120 0.0253	37.075 1.984 0.253		Vel = 7.44	
5 to TOR	11.500 11.500		65.29 395.67	4 4.26	2E T	26.334 26.334	99.800 52.668 152.468	120 0.0354	39.312 0.0 5.391		Vel = 8.91	
TOR to BOR	11.500 0		0.0 395.67	4 4.26			6.750 6.750	120 0.0353	44.703 4.981 0.238		Vel = 8.91	
BOR to BFP	0 0		0.0 395.67	4 4.26	Zce	0.0	3.750 3.750	120 0.0355	49.922 6.206 0.133		* * Fixed Loss = 6.206 Vel = 8.91	
BFP to UG	0 0		0.0 395.67	4 4.26			1.000 1.000	120 0.0350	56.261 0.0 0.035		Vel = 8.91	
UG to TEST	0 0		0.0 395.67	6 6.16	T G E	43.037 4.304 20.084	450.000 67.425 517.425	140 0.0044	56.296 0.0 2.283		Vel = 4.26	
TEST			250.00 645.67						58.579		Qa = 250.00 K Factor = 84.36	
H104 to H105	16.75 16.75	5.60	25.61 25.61	1.25 1.38			12.000 12.000	120 0.0540	20.918 0.0 0.648		Vel = 5.49	
H105 to H106	16.75 16.75	5.60	26.01 51.62	1.25 1.38			12.000 12.000	120 0.1978	21.566 0.0 2.374		Vel = 11.07	

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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	*****
H106 to 6	16.75 16.75	5.60	27.40 79.02	1.25 1.38	T 6.0	11.000 6.000 17.000	120 0.4347	23.940 0.0 7.390		Vel = 16.95	
6			0.0 79.02					31.330		K Factor = 14.12	
H107 to 6	16.75 16.75	5.60	31.07 31.07	1.25 1.38	T 6.0	1.000 6.000 7.000	120 0.0773	30.789 0.0 0.541		Vel = 6.66	
6 to 3	16.75 16.08		79.02 110.09	1.25 1.38	T 6.0	0.670 6.000 6.670	120 0.8030	31.330 0.290 5.356		Vel = 23.61	
3			0.0 110.09					36.976		K Factor = 18.10	
H108 to H109	16.75 16.75	5.60	25.65 25.65	1.25 1.38		12.000 12.000	120 0.0542	20.976 0.0 0.651		Vel = 5.50	
H109 to H110	16.75 16.75	5.60	26.04 51.69	1.25 1.38		12.000 12.000	120 0.1982	21.627 0.0 2.379		Vel = 11.09	
H110 to 7	16.75 16.75	5.60	27.44 79.13	1.25 1.38	T 6.0	11.000 6.000 17.000	120 0.4359	24.006 0.0 7.410		Vel = 16.97	
7			0.0 79.13					31.416		K Factor = 14.12	
H111 to 7	16.75 16.75	5.60	31.12 31.12	1.25 1.38	T 6.0	1.000 6.000 7.000	120 0.0776	30.873 0.0 0.543		Vel = 6.68	
7 to 4	16.75 16.08		79.12 110.24	1.25 1.38	T 6.0	0.670 6.000 6.670	120 0.8049	31.416 0.290 5.369		Vel = 23.65	
4			0.0 110.24					37.075		K Factor = 18.11	
H112 to 8	16.75 16.75	5.60	32.45 32.45	1.25 1.38	T 6.0	11.000 6.000 17.000	120 0.0838	33.576 0.0 1.425		Vel = 6.96	
8			0.0 32.45					35.001		K Factor = 5.48	
H113 to 8	16.75 16.75	5.60	32.85 32.85	1.25 1.38	T 6.0	1.000 6.000 7.000	120 0.0857	34.401 0.0 0.600		Vel = 7.05	
8 to 5	16.75 11.500		32.44 65.29	1.25 1.38	T 6.0	0.670 6.000 6.670	120 0.3054	35.001 2.274 2.037		Vel = 14.00	
5			0.0 65.29					39.312		K Factor = 10.41	