

... Fire Protection by Computer Design

COLUMBIA FIRE PROTECTION



Job Name : CASCADE CHRISTIAN SCHOOL CLASSROOM ADDITION
Building : FP2
Location : 815 21ST STREET SE
System : 1
Contract :
Data File : HWY CALC CASCADE CHRIST CLASSROOM ADD.WXF

HYDRAULIC CALCULATIONS
for

Project name: CASCADE CHRISTIAN SCHOOL CLASSROOM ADDITION
Location: 815 21ST STREET SE
Drawing no: FP2
Date: 9/28/21

Design

Remote area number: 1
Remote area location:
Occupancy classification:
Density: .1 - Gpm/SqFt
Area of application: 15100 - SqFt
Coverage per sprinkler: VARIES - SqFt
Type of sprinklers calculated: UPRIGHT K=5.6
No. of sprinklers calculated: 11
In-rack demand: - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 308.633 - GPM @ 41.1643 - Psi
Type of system: WET
Volume of dry or preaction system: - Gal

Water supply information

Date:
Location:
Source:

Name of contractor: COLUMBIA FIRE PROTECTION
Address:
Phone number:
Name of designer:
Authority having jurisdiction:
Notes: (Include peaking information or gridded systems here.)

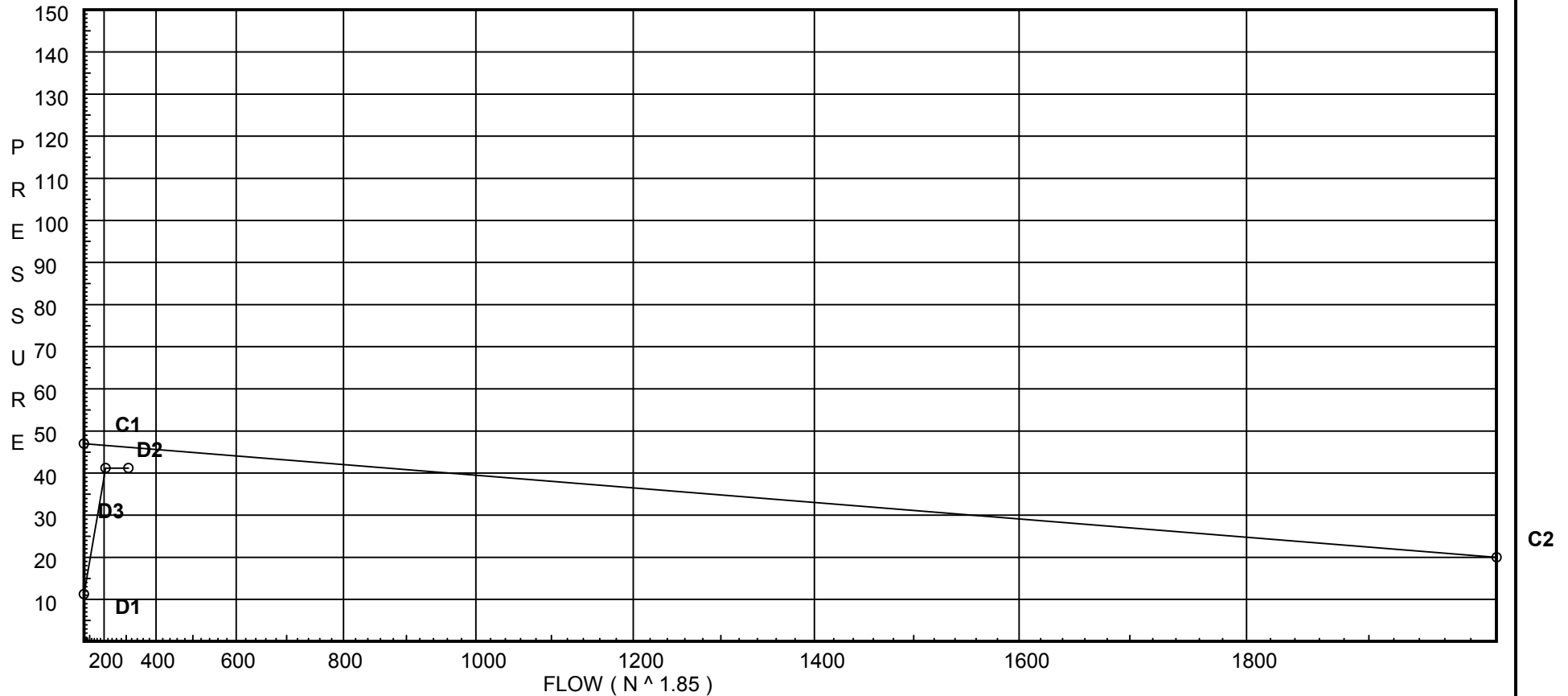
Water Supply Curve (C)

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City Water Supply:
 C1 - Static Pressure : 47
 C2 - Residual Pressure: 20
 C2 - Residual Flow : 2000

Demand:
 D1 - Elevation : 11.261
 D2 - System Flow : 208.633
 D2 - System Pressure : 41.164
 Hose (Adj City) : _____
 Hose (Demand) : 100
 D3 - System Demand : 308.633
 Safety Margin : 4.985



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	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	Generic Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
T	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

Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
1A	26.0	5.6	10.61	na	18.24	0.1	180	7.0
2A	26.0	5.6	10.33	na	18.0	0.1	180	7.0
3A	26.0	5.6	10.46	na	18.12	0.1	180	7.0
4A	26.0	5.6	10.66	na	18.28	0.1	180	7.0
5A	26.0	5.6	10.93	na	18.51	0.1	180	7.0
6A	26.0	5.6	12.37	na	19.69	0.1	180	7.0
7A	26.0	5.6	12.04	na	19.44	0.1	180	7.0
8A	26.0	5.6	12.2	na	19.56	0.1	180	7.0
9A	26.0	5.6	12.41	na	19.73	0.1	180	7.0
10A	26.0	5.6	12.09	na	19.47	0.1	180	7.0
11A	26.0	5.6	12.24	na	19.59	0.1	180	7.0
1	26.0		10.91	na				
2	26.0		10.95	na				
3	26.0		11.09	na				
4	26.0		11.29	na				
5	26.0		11.58	na				
6	26.0		12.71	na				
7	26.0		12.75	na				
8	26.0		12.92	na				
12	26.0		13.97	na				
13	26.0		13.99	na				
9	26.0		12.76	na				
10	26.0		12.8	na				
11	26.0		12.96	na				
14	26.0		14.59	na				
A	26.0		17.63	na				
B	26.0		20.89	na				
C	26.0		24.67	na				
TOR	26.0		25.67	na				
BFP	2.0		40.21	na				
BSR	0.0		41.08	na				
TEST	0.0		41.16	na	100.0			

The maximum velocity is 8.02 and it occurs in the pipe between nodes 13 and 14

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	*****
1A to 1	18.24 18.24	1.049 120.0 0.1095	1E	2.0 0.0 0.0	0.750 2.000 2.750	10.610 0.0 0.301			K Factor = 5.60 Vel = 6.77	
	0.0 18.24						10.911		K Factor = 5.52	
2A to 2	18.00 18.0	1.049 120.0 0.1070	1T	5.0 0.0 0.0	0.750 5.000 5.750	10.332 0.0 0.615			K Factor = 5.60 Vel = 6.68	
	0.0 18.00						10.947		K Factor = 5.44	
3A to 3	18.12 18.12	1.049 120.0 0.1085	1T	5.0 0.0 0.0	0.750 5.000 5.750	10.464 0.0 0.624			K Factor = 5.60 Vel = 6.73	
	0.0 18.12						11.088		K Factor = 5.44	
4A to 4	18.28 18.28	1.049 120.0 0.1101	1T	5.0 0.0 0.0	0.750 5.000 5.750	10.658 0.0 0.633			K Factor = 5.60 Vel = 6.79	
	0.0 18.28						11.291		K Factor = 5.44	
5A to 5	18.51 18.51	1.049 120.0 0.1129	1T	5.0 0.0 0.0	0.750 5.000 5.750	10.928 0.0 0.649			K Factor = 5.60 Vel = 6.87	
	0.0 18.51						11.577		K Factor = 5.44	
6A to 6	19.69 19.69	1.049 120.0 0.1265	1E	2.0 0.0 0.0	0.750 2.000 2.750	12.366 0.0 0.348			K Factor = 5.60 Vel = 7.31	
	0.0 19.69						12.714		K Factor = 5.52	
7A to 7	19.43 19.43	1.049 120.0 0.1233	1T	5.0 0.0 0.0	0.750 5.000 5.750	12.045 0.0 0.709			K Factor = 5.60 Vel = 7.21	
	0.0 19.43						12.754		K Factor = 5.44	
8A to 8	19.56 19.56	1.049 120.0 0.1249	1T	5.0 0.0 0.0	0.750 5.000 5.750	12.204 0.0 0.718			K Factor = 5.60 Vel = 7.26	
	0.0 19.56						12.922		K Factor = 5.44	
9A to 9	19.73 19.73	1.049 120.0 0.1269	1E	2.0 0.0 0.0	0.750 2.000 2.750	12.410 0.0 0.349			K Factor = 5.60 Vel = 7.32	
	0.0 19.73						12.759		K Factor = 5.52	
10A to 10	19.47 19.47	1.049 120.0 0.1238	1T	5.0 0.0 0.0	0.750 5.000 5.750	12.089 0.0 0.712			K Factor = 5.60 Vel = 7.23	

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 19.47						12.801		K Factor = 5.44	
11A to 11	19.59 19.59	1.049 120.0 0.1252	1T	5.0 0.0 0.0	0.750 5.000 5.750	12.243 0.0 0.720			K Factor = 5.60	
	0.0 19.59						12.963		K Factor = 5.44	
1 to 2	18.24 18.24	2.157 120.0 0.0033		0.0 0.0 0.0	11.000 0.0 11.000	10.911 0.0 0.036			Vel = 1.60	
2 to 3	18.00 36.24	2.157 120.0 0.0117		0.0 0.0 0.0	12.000 0.0 12.000	10.947 0.0 0.141			Vel = 3.18	
3 to 4	18.12 54.36	2.157 120.0 0.0246		0.0 0.0 0.0	8.250 0.0 8.250	11.088 0.0 0.203			Vel = 4.77	
4 to 5	18.28 72.64	2.157 120.0 0.0424		0.0 0.0 0.0	6.750 0.0 6.750	11.291 0.0 0.286			Vel = 6.38	
5 to 13	18.51 91.15	2.157 120.0 0.0643	1T	12.307 0.0 0.0	25.200 12.307 37.507	11.577 0.0 2.412			Vel = 8.00	
	0.0 91.15						13.989		K Factor = 24.37	
6 to 7	19.69 19.69	2.157 120.0 0.0037		0.0 0.0 0.0	10.750 0.0 10.750	12.714 0.0 0.040			Vel = 1.73	
7 to 8	19.44 39.13	2.157 120.0 0.0134		0.0 0.0 0.0	12.500 0.0 12.500	12.754 0.0 0.168			Vel = 3.44	
8 to 12	19.56 58.69	2.157 120.0 0.0285	2E 1T	12.307 12.307 0.0	12.000 24.614 36.614	12.922 0.0 1.044			Vel = 5.15	
12 to 13	0.0 58.69	3.26 120.0 0.0037		0.0 0.0 0.0	6.200 0.0 6.200	13.966 0.0 0.023			Vel = 2.26	
13 to 14	149.94 208.63	3.26 120.0 0.0398		0.0 0.0 0.0	15.000 0.0 15.000	13.989 0.0 0.597			Vel = 8.02	
	0.0 208.63						14.586		K Factor = 54.63	
9 to 10	19.73 19.73	2.157 120.0 0.0038		0.0 0.0 0.0	11.000 0.0 11.000	12.759 0.0 0.042			Vel = 1.73	
10 to 11	19.47 39.2	2.157 120.0 0.0135		0.0 0.0 0.0	12.000 0.0 12.000	12.801 0.0 0.162			Vel = 3.44	

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	*****
11 to 13	19.59 58.79	2.157 120.0 0.0286	1T 0.0 0.0	12.307 12.307 35.907	23.600 0.0 1.026	12.963 0.0		Vel = 5.16	
	0.0 58.79					13.989		K Factor = 15.72	
14 to A	208.63 208.63	3.26 120.0 0.0398	1E 0.0 0.0	9.408 9.408 76.408	67.000 0.0 3.043	14.586 0.0		Vel = 8.02	
A to B	0.0 208.63	3.26 120.0 0.0398	1E 0.0 0.0	9.408 9.408 81.908	72.500 0.0 3.262	17.629 0.0		Vel = 8.02	
B to C	0.0 208.63	3.26 120.0 0.0398	2E 1T 0.0	18.815 20.159 0.0	56.000 38.974 94.974	20.891 0.0 3.783		Vel = 8.02	
C to TOR	0.0 208.63	4.26 120.0 0.0108	2T 2E 0.0	52.668 26.334 0.0	13.000 79.002 92.002	24.674 0.0 0.995		Vel = 4.70	
TOR to BFP	0.0 208.63	4.26 120.0 0.0108	1Zce 0.0 0.0	0.0 0.0 0.0	13.000 0.0 13.000	25.669 14.398 0.140		* Fixed loss = 4.003 Vel = 4.70	
BFP to BSR	0.0 208.63	4.26 120.0 0.0117		0.0 0.0 0.0	0.600 0.0 0.600	40.207 0.866 0.007		Vel = 4.70	
BSR to TEST	0.0 208.63	6.16 140.0 0.0013	1T 1G 0.0	43.037 4.304 0.0	15.000 47.341 62.341	41.080 0.0 0.084		Vel = 2.25	
	100.00 308.63					41.164		Qa = 100.00 K Factor = 48.10	