



... Fire Protection by Computer Design

Dean and Allyn Inc
116 Lewiston Road
Gray ME, 04039
(207)657-5646

Job Name : Cash Star
Building : 25 PEARL STREET
Location : 2ND FLOOR
System : 1
Contract : C141216
Data File : C1216_2ND.WXF

Hydraulic Design Information Sheet

Name - CASH STAR Date - 7/21/14
 Location - 2ND FLOOR
 Building - 25 PEARL STREET System No. - 1
 Contractor - DEAN AND ALLYN INC Contract No. - C141216
 Calculated By - S. COTE Drawing No. - 1 OF 1
 Construction: () Combustible (X) Non-Combustible Ceiling Height - VARIES
 Occupancy - OFFICE

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. () 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 - 1500 System Type Sprinkler/Nozzle
 Density - .10 (X) Wet Make RELIABLE
 D Area Per Sprinkler - VARIES () Dry Model F1FR-56
 E Elevation at Highest Outlet - 118.041 () Deluge Size 1/2"
 S Hose Allowance - Inside - () Preaction K-Factor 5.6
 I Rack Sprinkler Allowance - () Other Temp.Rat.155
 G Hose Allowance - Outside - 250

N Note

Calculation Flow Required - 375.998 Press Required - 87.161
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:
 A Date of Test - 7/2/14 Cap. -
 T Time of Test - 6:45A.M. Rated Cap.- Elev.-
 E Static Press - 105 @ Press -
 R Residual Press - 90 Elev. - Well
 Flow - 1591 Proof Flow
 S Elevation -

U Location - FRANKLIN/FORE

P Source of Information - PORTALND WATER DISTRICT

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 R () Double Row () Slave Pallet () Solid Shelf () Non
 T A () Mult. Row () Open Shelf

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

G
 E Horizontal Barriers Provided:

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	
A	Alarm Rel E1 & E3							7.7	21.5		17		27	29								
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	1	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.

Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
200B	116.541	8	14.89	na	30.87	0.1	215	10.6
200C	118.041		17.07	na				
218B	116.541	5.6	18.18	na	23.88	0.1	144	7.0
218C	118.041		19.15	na				
200	118.041		19.33	na				
201B	118.041	5.6	19.95	na	25.01	0.1	91	7.0
218	118.041		20.34	na				
202B	116.541	5.6	23.77	na	27.3	0.1	79	7.0
201	118.041		22.4	na				
202	118.041		25.51	na				
208	118.041	5.6	10.33	na	18.0	0.1	64	10.33
207	118.041	5.6	11.72	na	19.17	0.1	77	10.33
206	118.041	5.6	16.23	na	22.56	0.1	94	10.33
216	118.041	5.6	10.44	na	18.09	0.1	14	10.33
215	118.041	5.6	11.84	na	19.27	0.1	18	10.33
214	118.041	5.6	16.39	na	22.67	0.1	18	10.33
209	117.333		22.44	na				
217	117.333		25.65	na				
203B	116.541	8	14.79	na	30.76	0.1	254	10.6
204B	116.541	8	14.79	na	30.77	0.1	215	10.6
204C	117.541		18.46	na				
204D	117.541		20.26	na				
203	118.041		17.41	na				
205B	116.541	8	18.51	na	34.42	0.1	215	10.6
205C	116.541		23.07	na				
204	118.041		20.88	na				
210	117.541	5.6	22.92	na	26.81	0.1	102	10.33
212	117.541	5.6	22.24	na	26.41	0.1	74	10.33
211	117.541		24.21	na				
205	118.041		23.44	na				
213	118.041		25.55	na				
19	117.333		51.01	na				
20	117.333		51.02	na				
21	117.333		52.23	na				
22	117.333		67.14	na				
23	117.333		70.47	na				
24	105.75		76.28	na				
25	105.75		77.72	na				
26	104.25		79.0	na				
TOR	101.25		80.42	na				
BOR	92.083		84.58	na				
27	92.083		86.81	na				
TEST	92.083		87.16	na	250.0			

The maximum velocity is 25.69 and it occurs in the pipe between nodes 217 and 20

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	*****
200B to 200C	30.87	1.049 120.0	3E	6.0 0.0	3.750 6.000	14.887 -0.650			K Factor = 8.00	
	30.87	0.2905		0.0	9.750	2.832			Vel = 11.46	
200C to 200	0.0	1.104 120.0		0.0 0.0	10.000 0.0	17.069 0.0				
	30.87	0.2264		0.0	10.000	2.264			Vel = 10.35	
	0.0 30.87					19.333			K Factor = 7.02	
218B to 218C	23.88	1.049 120.0	3E	6.0 0.0	2.958 6.000	18.184 -0.650			K Factor = 5.60	
	23.88	0.1806		0.0	8.958	1.618			Vel = 8.86	
218C to 218	0.0	1.104 120.0	T	6.413 0.0	2.000 6.413	19.152 0.0				
	23.88	0.1409		0.0	8.413	1.185			Vel = 8.00	
	0.0 23.88					20.337			K Factor = 5.30	
200 to 218	30.87	1.452 120.0	E	3.843 0.0	13.000 3.843	19.333 0.0				
	30.87	0.0596		0.0	16.843	1.004			Vel = 5.98	
	0.0 30.87					20.337			K Factor = 6.85	
201B to 201	25.01	1.049 120.0	2E T	4.0 5.0	3.458 9.000	19.951 0.0			K Factor = 5.60	
	25.01	0.1968		0.0	12.458	2.452			Vel = 9.28	
	0.0 25.01					22.403			K Factor = 5.28	
218 to 201	54.75	1.452 120.0		0.0 0.0	12.000 0.0	20.337 0.0				
	54.75	0.1722		0.0	12.000	2.066			Vel = 10.61	
	0.0 54.75					22.403			K Factor = 11.57	
202B to 202	27.30	1.049 120.0	E T	2.0 5.0	3.330 7.000	23.769 -0.650			K Factor = 5.60	
	27.3	0.2315		0.0	10.330	2.391			Vel = 10.13	
	0.0 27.30					25.510			K Factor = 5.41	
201 to 202	79.76	1.452 120.0		0.0 0.0	9.000 0.0	22.403 0.0				
	79.76	0.3452		0.0	9.000	3.107			Vel = 15.45	
202 to 19	27.30	1.452 120.0	E T	3.843 7.686	30.791 11.529	25.510 0.307				
	107.06	0.5953		0.0	42.320	25.191			Vel = 20.74	
	0.0 107.06					51.008			K Factor = 14.99	
208 to 207	18.00	1.049 120.0	E T	2.0 5.0	6.000 7.000	10.330 0.0			K Factor = 5.60	
	18.0	0.1071		0.0	13.000	1.392			Vel = 6.68	

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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	*****
207 to 206	19.17 37.17	1.049 120.0 0.4096	T	5.0 0.0 0.0	6.000 5.000 11.000	11.722 0.0 4.506			K Factor = 5.60 Vel = 13.80	
206 to 209	22.56 59.73	1.049 120.0 0.9848	E	2.0 0.0 0.0	4.000 2.000 6.000	16.228 0.307 5.909			K Factor = 5.60 Vel = 22.17	
	0.0 59.73					22.444			K Factor = 12.61	
216 to 215	18.09 18.09	1.049 120.0 0.1081	E T	2.0 5.0 0.0	6.000 7.000 13.000	10.439 0.0 1.405			K Factor = 5.60 Vel = 6.72	
215 to 214	19.28 37.37	1.049 120.0 0.4135	T	5.0 0.0 0.0	6.000 5.000 11.000	11.844 0.0 4.549			K Factor = 5.60 Vel = 13.87	
214 to 217	22.67 60.04	1.049 120.0 0.9944	T	5.0 0.0 0.0	4.000 5.000 9.000	16.393 0.307 8.950			K Factor = 5.60 Vel = 22.29	
	0.0 60.04					25.650			K Factor = 11.85	
209 to 217	59.73 59.73	1.38 120.0 0.2591		0.0 0.0 0.0	12.375 0.0 12.375	22.444 0.0 3.206			Vel = 12.81	
217 to 20	60.04 119.77	1.38 120.0 0.9384	T	6.0 0.0 0.0	21.041 6.000 27.041	25.650 0.0 25.375			Vel = 25.69	
	0.0 119.77					51.025			K Factor = 16.77	
203B to 203	30.76 30.76	1.049 120.0 0.2886	3E	6.0 0.0 0.0	5.333 6.000 11.333	14.787 -0.650 3.271			K Factor = 8.00 Vel = 11.42	
	0.0 30.76					17.408			K Factor = 7.37	
204B to 204C	30.77 30.77	1.049 120.0 0.2887	3E	6.0 0.0 0.0	8.208 6.000 14.208	14.792 -0.433 4.102			K Factor = 8.00 Vel = 11.42	
204C to 204D	0.0 30.77	1.104 120.0 0.2251		0.0 0.0 0.0	8.000 0.0 8.000	18.461 0.0 1.801			Vel = 10.31	
204D to 204	0.0 30.77	1.452 120.0 0.0593	E T	3.843 7.686 0.0	2.500 11.529 14.029	20.262 -0.217 0.832			Vel = 5.96	
	0.0 30.77					20.877			K Factor = 6.73	
203 to 204	30.76 30.76	1.104 120.0 0.2251	T	6.413 0.0 0.0	9.000 6.413 15.413	17.408 0.0 3.469			Vel = 10.31	
	0.0 30.76					20.877			K Factor = 6.73	

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	*****
205B to 205C	34.42 34.42	1.049 120.0 0.3553	3E	6.0 0.0 0.0	6.833 6.000 12.833	18.508 0.0 4.559			K Factor = 8.00	
205C to 205	0.0 34.42	1.452 120.0 0.0729	E T	3.843 7.686 0.0	2.500 11.529 14.029	23.067 -0.650 1.023			Vel = 12.78	
	0.0 34.42					23.440			K Factor = 7.11	
204 to 205	61.53 61.53	1.452 120.0 0.2136		0.0 0.0 0.0	12.000 0.0 12.000	20.877 0.0 2.563			Vel = 11.92	
	0.0 61.53					23.440			K Factor = 12.71	
210 to 211	26.81 26.81	1.049 120.0 0.2238	T	5.0 0.0 0.0	0.791 5.000 5.791	22.916 0.0 1.296			K Factor = 5.60	
	0.0 26.81					24.212			K Factor = 5.45	
212 to 211	26.41 26.41	1.049 120.0 0.2177	T	5.0 0.0 0.0	4.041 5.000 9.041	22.244 0.0 1.968			K Factor = 5.60	
211 to 213	26.81 53.22	1.38 120.0 0.2093	T	6.0 0.0 0.0	1.416 6.000 7.416	24.212 -0.217 1.552			Vel = 9.80	
	0.0 53.22					25.547			K Factor = 10.53	
205 to 213	95.95 95.95	1.687 120.0 0.2341		0.0 0.0 0.0	9.000 0.0 9.000	23.440 0.0 2.107			Vel = 13.77	
213 to 21	53.22 149.17	1.687 120.0 0.5295	E T	5.022 10.044 0.0	34.750 15.066 49.816	25.547 0.307 26.380			Vel = 21.41	
	0.0 149.17					52.234			K Factor = 20.64	
19 to 20	107.06 107.06	3.26 120.0 0.0113		0.0 0.0 0.0	1.500 0.0 1.500	51.008 0.0 0.017			Vel = 4.12	
20 to 21	119.77 226.83	3.26 120.0 0.0465		0.0 0.0 0.0	26.000 0.0 26.000	51.025 0.0 1.209			Vel = 8.72	
21 to 22	149.17 376.0	3.26 120.0 0.1184	T	20.159 0.0 0.0	105.708 20.159 125.867	52.234 0.0 14.903			Vel = 14.45	
22 to 23	0.0 376.0	3.26 120.0 0.1184	2E	18.815 0.0 0.0	9.291 18.815 28.106	67.137 0.0 3.328			Vel = 14.45	
23 to 24	0.0 376.0	4.26 120.0 0.0322	E	13.167 0.0 0.0	11.583 13.167 24.750	70.465 5.017 0.796			Vel = 8.46	

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	*****
24 to 25	0.0 376.0	4.26 120.0 0.0322	T	26.334 0.0 44.834	18.500 26.334 1.443	76.278 0.0		Vel = 8.46	
25 to 26	0.0 376.0	6.357 120.0 0.0046	T E	37.72 17.603 0.0	82.000 55.323 137.323	77.721 0.650 0.628		Vel = 3.80	
26 to TOR	0.0 376.0	6.357 120.0 0.0046	E	17.603 0.0 27.603	10.000 17.603 27.603	78.999 1.299 0.127		Vel = 3.80	
TOR to BOR	0.0 376.0	6.357 120.0 0.0046	G A	3.772 33.948 0.0	3.000 37.720 40.720	80.425 3.970 0.187		Vel = 3.80	
BOR to 27	0.0 376.0	6.16 140.0 0.0040	4E	80.336 0.0 0.0	475.000 80.336 555.336	84.582 0.0 2.229		Vel = 4.05	
27 to TEST	0.0 376.0	8.27 140.0 0.0010	3E T	85.404 55.354 0.0	225.000 140.758 365.758	86.811 0.0 0.350		Vel = 2.25	
	250.00 626.00					87.161		Qa = 250.00 K Factor = 67.05	

Water Supply Curve C

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City Water Supply:
C1 - Static Pressure : 105
C2 - Residual Pressure: 90
C2 - Residual Flow : 1591

Demand:
D1 - Elevation : 11.242
D2 - System Flow : 375.998
D2 - System Pressure : 87.161
Hose (Demand) : 250
D3 - System Demand : 625.998
Safety Margin : 15.168

