

... Fire Protection by Computer Design

Hampshire Fire Protection
8 North Wentworth Ave
Londonderry NH, 03053
432-8221

Job Name : EVOLUTION ROCKS PORTLAND
Building : 1
Location : HIGH ROOF
System : 1
Contract : 4480 CME
Data File : 4480 CME - HIGH ROOF.WXF

Hydraulic Design Information Sheet

Name - EVOLUTION ROCKS PORTLAND Date - 6/9/2014
 Location - HIGH ROOF
 Building - 1 System No. - 1
 Contractor - FLYNN CONSTRUCTION Contract No. - 4480 CME
 Calculated By - CRAIG SIDER Drawing No. - 2
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 42'-2"
 Occupancy - LIGHT HAZARD

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 - 0.1 (X) Wet Make RELIABLE
 D Area Per Sprinkler - 158 () Dry Model F1FR56
 E Elevation at Highest Outlet - 41.167 () 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 - 100

N Note

Calculation Flow Required - 286.1 Press Required - 58.1
 Summary C-Factor Used: 120 Overhead 120 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:
 A Date of Test - 5/2/2013 Cap. -
 T Time of Test - N/A Rated Cap.- Elev.-
 E Static Press - 72 @ Press -
 R Residual Press - 70 Elev. - Well
 Flow - 1255 Proof Flow
 S Elevation - -5

U Location - HYDRANT 01318

P Source of Information - PORTLAND WATER DEPARTMENT

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:

Water Supply Curve C

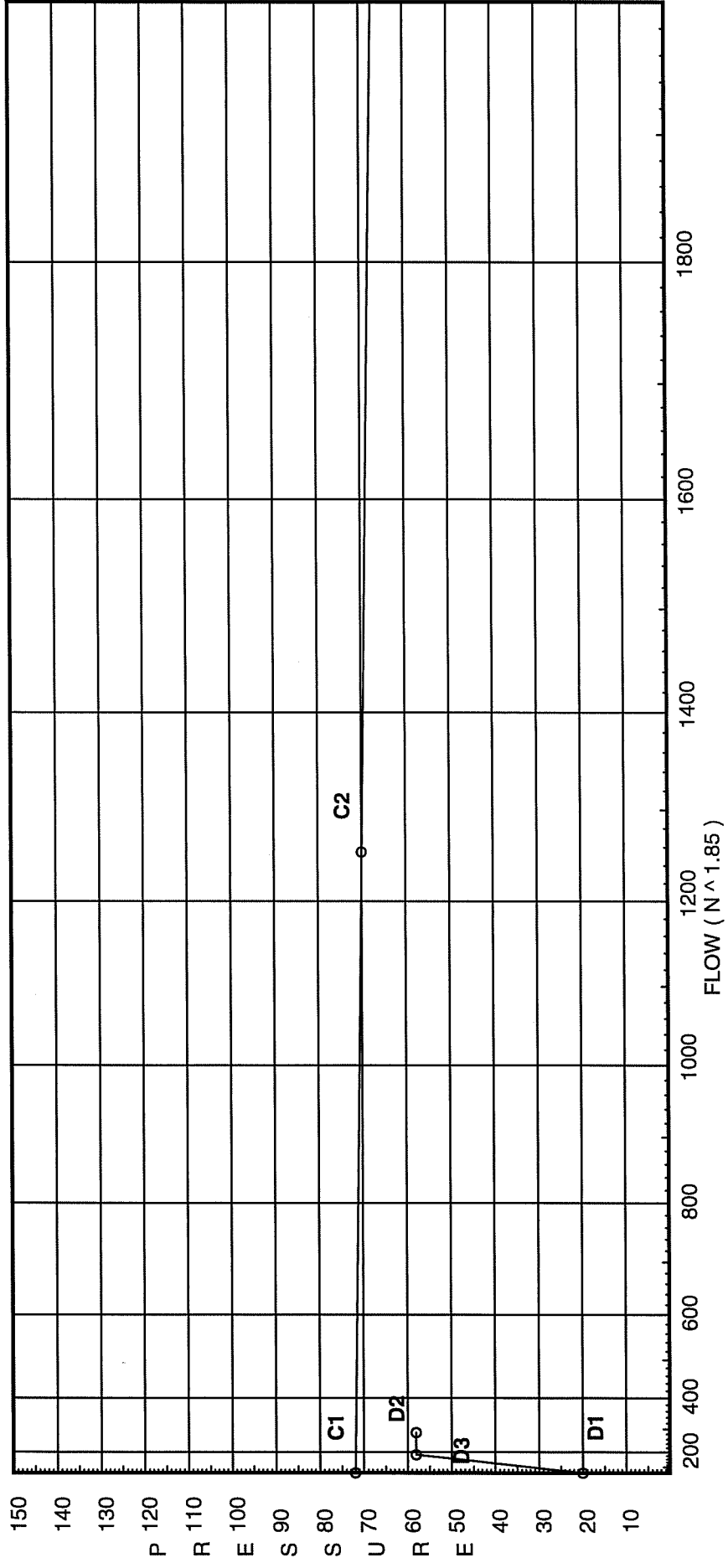
Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

City Water Supply:

C1 - Static Pressure : 72
C2 - Residual Pressure: 70
C2 - Residual Flow : 1255

Demand:

D1 - Elevation : 19.995
D2 - System Flow : 186.094
D2 - System Pressure : 58.112
Hose (Demand) : 100
D3 - System Demand : 286.094
Safety Margin : 13.759



Fittings Used Summary

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

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
H 45' Grvd-Vic Elbow #11	0	0	1	1.5	2	2	3	3	3.5	5	4.5	5	6.5	8.5	10	18	20	23	25	30
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	3	4	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X 90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zca Colt C200 Horz 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 NFFPA.

Pressure / Flow Summary - STANDARD

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 4
Date 6/9/2014

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
H201	41.167	5.6	7.0	na	14.82	0.1	71	7.0
H202	41.167	5.6	7.12	na	14.94	0.1	133	7.0
H203	41.167	5.6	7.93	na	15.77	0.1	133	7.0
H204	41.167	5.6	9.7	na	17.44	0.1	133	7.0
H205	41.167		12.93	na				
201	41.167		14.62	na				
H206	41.167	5.6	7.05	na	14.87	0.1	71	7.0
H207	41.167	5.6	7.17	na	14.99	0.1	133	7.0
H208	41.167	5.6	7.98	na	15.82	0.1	133	7.0
H209	41.167	5.6	9.76	na	17.5	0.1	133	7.0
H210	41.167		13.01	na				
202	41.167		14.72	na				
H211	41.167	5.6	12.01	na	19.4	0.1	137	7.0
H212	41.167	5.6	12.4	na	19.72	0.1	137	7.0
H213	41.167	5.6	13.83	na	20.83	0.1	162	7.0
203	41.167		15.38	na				
A2	34.5		20.26	na				
B2	34.5		20.37	na				
C2	34.5		20.78	na				
K	34.5		34.83	na				
TOR	34.5		35.1	na				
BOR	3.0		49.24	na				
FLG	-5.0		57.05	na				
TEST	-5.0		58.11	na	100.0			

The maximum velocity is 12.41 and it occurs in the pipe between nodes H209 and H210

Final Calculations - Hazen-Williams - 2007

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 5
Date 6/9/2014

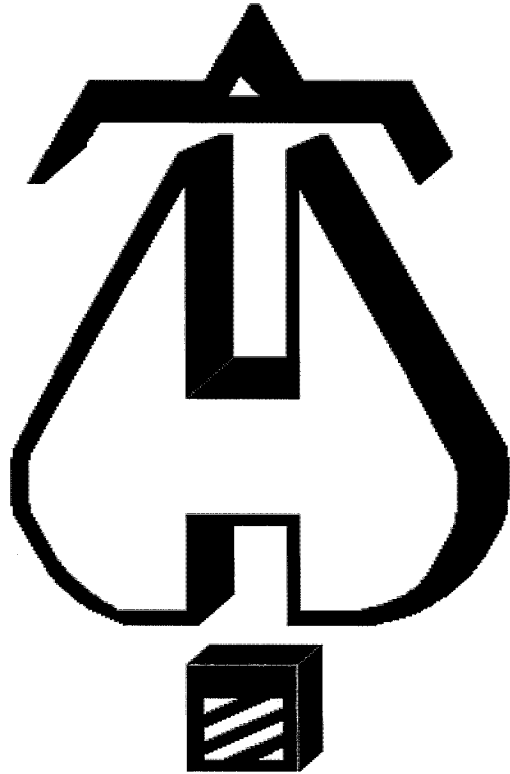
Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
* LINE 1										
H201	14.82	1.442		0.0	7.500	7.000			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H202	14.82	0.0159		0.0	7.500	0.119			Vel = 2.91	
H202	14.94	1.442		0.0	14.000	7.119			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H203	29.76	0.0576		0.0	14.000	0.807			Vel = 5.85	
H203	15.76	1.442		0.0	14.000	7.926			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H204	45.52	0.1265		0.0	14.000	1.771			Vel = 8.94	
H204	17.44	1.442		0.0	14.000	9.697			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H205	62.96	0.2306		0.0	14.000	3.228			Vel = 12.37	
H205	0.0	1.442	1E	3.716	3.625	12.925				
to		120.0		0.0	3.716	0.0				
201	62.96	0.2306		0.0	7.341	1.693			Vel = 12.37	
201	0.0	1.442	1T	7.432	4.500	14.618				
to		120.0		0.0	7.432	2.887				
A2	62.96	0.2306		0.0	11.932	2.751			Vel = 12.37	
	0.0									
	62.96					20.256			K Factor = 13.99	
* LIEN 2										
H206	14.87	1.442		0.0	7.500	7.049			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H207	14.87	0.0160		0.0	7.500	0.120			Vel = 2.92	
H207	14.99	1.442		0.0	14.000	7.169			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H208	29.86	0.0580		0.0	14.000	0.812			Vel = 5.87	
H208	15.82	1.442		0.0	14.000	7.981			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H209	45.68	0.1274		0.0	14.000	1.783			Vel = 8.97	
H209	17.50	1.442		0.0	14.000	9.764			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H210	63.18	0.2321		0.0	14.000	3.249			Vel = 12.41	
H210	0.0	1.442	1E	3.716	3.625	13.013				
to		120.0		0.0	3.716	0.0				
202	63.18	0.2320		0.0	7.341	1.703			Vel = 12.41	
202	0.0	1.442	1T	7.432	4.500	14.716				
to		120.0		0.0	7.432	2.887				
B2	63.18	0.2321		0.0	11.932	2.770			Vel = 12.41	
	0.0									
	63.18					20.373			K Factor = 14.00	
* LINE 3										
H211	19.40	1.442		0.0	15.000	12.006			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H212	19.4	0.0261		0.0	15.000	0.392			Vel = 3.81	
H212	19.72	1.442		0.0	15.000	12.398			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H213	39.12	0.0956		0.0	15.000	1.434			Vel = 7.69	

Final Calculations - Hazen-Williams

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 6
Date 6/9/2014

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
H213 to 203	20.83 59.95	1.442 120.0 0.2106	1E	3.716 0.0 0.0	3.625 3.716 7.341	13.832 0.0 1.546		K Factor = 5.60		
203 to C2	0.0 59.95	1.442 120.0 0.2106	1T	7.432 0.0 0.0	4.500 7.432 11.932	15.378 2.887 2.513		Vel = 11.78		
	0.0 59.95					20.778		K Factor = 13.15		
*MAIN										
A2 to B2	62.96 62.96	2.635 120.0 0.0123		0.0 0.0 0.0	9.500 0.0 9.500	20.256 0.0 0.117		Vel = 3.70		
B2 to C2	63.18 126.14	2.635 120.0 0.0442		0.0 0.0 0.0	9.167 0.0 9.167	20.373 0.0 0.405		Vel = 7.42		
C2 to K	59.95 186.09	2.635 120.0 0.0909	1V 1X	5.903 14.827 0.0	133.917 20.730 154.647	20.778 0.0 14.054		Vel = 10.95		
K to TOR	0.0 186.09	2.635 120.0 0.0908		0.0 0.0 0.0	2.917 0.0 2.917	34.832 0.0 0.265		Vel = 10.95		
	0.0 186.09					35.097		K Factor = 31.41		
*RISER										
TOR to BOR	186.09 186.09	4.26 120.0 0.0088	1X	21.067 0.0 0.0	36.333 21.067 57.400	35.097 13.643 0.503		Vel = 4.19		
BOR to FLG	0.0 186.09	4.26 120.0 0.0087	1V 1Zca	8.954 0.0 0.0	4.000 8.954 12.954	49.243 7.698 0.113		** Fixed Loss = 4.233 Vel = 4.19		
FLG to TEST	0.0 186.09	7.981 100.0 0.0006	1H 1G 1T	4.639 2.855 24.979	1800.000 32.473 1832.473	57.054 0.0 1.058		Vel = 1.19		
	100.00 286.09					58.112		Qa = 100.00 K Factor = 37.53		



... Fire Protection by Computer Design

Hampshire Fire Protection
8 North Wentworth Ave
Londonderry NH, 03053
432-8221

Job Name : EVOLUTION ROCKS PORTLAND
Building : 1
Location : LOW ROOF
System : 1
Contract : 4480 CME
Data File : 4480 CME - LOWER ROOF.WXF

Hydraulic Design Information Sheet

Name - EVOLUTION ROCKS PORTLAND Date - 6/9/2014
 Location - LOW ROOF
 Building - 1 System No. - 1
 Contractor - FLYNN CONSTRUCTION Contract No. - 4480 CME
 Calculated By - CRAIG SIDER Drawing No. - 2
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 29'-10"
 Occupancy - LIGHT HAZARD

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

Specific Ruling	Made By	Date
Area of Sprinkler Operation - 1500	System Type	Sprinkler/Nozzle
Density - 0.1	(X) Wet	Make RELIABLE
D Area Per Sprinkler - 173	() Dry	Model F1FR56
E Elevation at Highest Outlet - 31	() 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 - 100		

N Note

Calculation Flow Required - 340.4 Press Required - 39.6
 Summary C-Factor Used: 120 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
A Date of Test - 5/2/2013		Cap. -
T Time of Test - N/A	Rated Cap.-	Elev.-
E Static Press - 72	@ Press -	
R Residual Press - 70	Elev. -	Well
Flow - 1255		Proof Flow
S Elevation - -5		

P Location - HYDRANT 01318

L Source of Information - PORTLAND WATER DEPARTMENT

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

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

E Horizontal Barriers Provided:

Water Supply Curve C

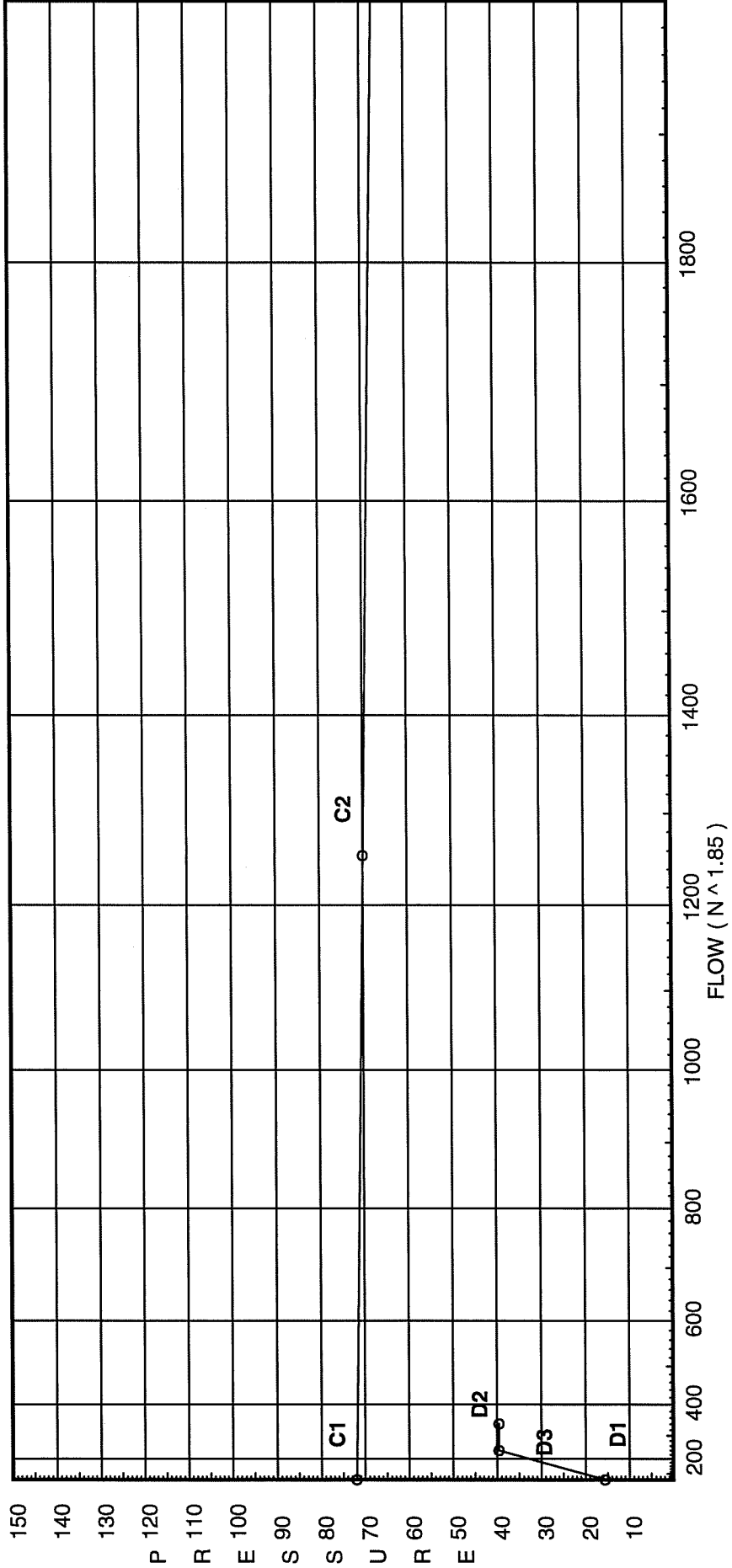
Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

City Water Supply:

C1 - Static Pressure : 72
C2 - Residual Pressure: 70
C2 - Residual Flow : 1255

Demand:

D1 - Elevation : 15.592
D2 - System Flow : 240.423
D2 - System Pressure : 39.627
Hose (Demand) : 100
D3 - System Demand : 340.423
Safety Margin : 32.194



Fittings Used Summary

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

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
H 45' Grvd-Vic Elbow #11	0	0	1	1.5	2	2	3	3	3.5	5	4.5	5	6.5	8.5	10	18	20	23	25	30
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' EIL Firelock #001	0	0	0	3	4	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X 90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zca Colt C200 Horz 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.

Pressure / Flow Summary - STANDARD

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 4
Date 6/9/2014

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
H101	31.0	5.6	8.29	na	16.12	0.1	153	7.0
H102	31.0	5.6	8.48	na	16.31	0.1	110	7.0
101	31.0		8.89	na				
H103	31.0	5.6	8.3	na	16.13	0.1	138	7.0
H104	31.0	5.6	8.49	na	16.32	0.1	110	7.0
102	31.0		8.9	na				
H105	31.0	5.6	7.0	na	14.82	0.1	32	7.0
H106	31.0	5.6	7.06	na	14.88	0.1	113	7.0
H107	31.0	5.6	7.66	na	15.5	0.1	126	7.0
103	31.0		8.41	na				
H108	31.0	5.6	7.1	na	14.92	0.1	43	7.0
H109	31.0	5.6	7.16	na	14.99	0.1	113	7.0
H110	31.0	5.6	7.77	na	15.61	0.1	126	7.0
104	31.0		8.53	na				
H111	31.0	5.6	8.64	na	16.46	0.1	144	7.0
H112	31.0	5.6	8.84	na	16.65	0.1	132	7.0
105	31.0		9.27	na				
H113	31.0	5.6	8.96	na	16.76	0.1	144	7.0
H114	31.0	5.6	9.16	na	16.95	0.1	132	7.0
106	31.0		9.6	na				
H115	31.0	5.6	10.33	na	18.0	0.1	132	7.0
107	31.0		10.47	na				
A	29.167		10.31	na				
B	29.167		10.32	na				
C	29.167		10.37	na				
D	29.167		10.5	na				
E	29.167		10.71	na				
F	29.167		11.07	na				
G	29.167		11.48	na				
H	34.5		13.61	na				
J	34.5		14.24	na				
K	34.5		15.86	na				
TOR	34.5		16.01	na				
BOR	3.0		30.46	na				
FLG	-5.0		38.84	na				
TEST	-5.0		39.63	na	100.0			

The maximum velocity is 9.24 and it occurs in the pipe between nodes G and H

Final Calculations - Hazen-Williams - 2007

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 5
Date 6/9/2014

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
*LINE 1										
H101	16.12	1.442		0.0	10.375	8.290			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H102	16.12	0.0185		0.0	10.375	0.192			Vel = 3.17	
H102	16.31	1.442	1E	3.716	2.333	8.482			K Factor = 5.60	
to		120.0		0.0	3.716	0.0				
101	32.43	0.0676		0.0	6.049	0.409			Vel = 6.37	
101	0.0	1.442	1T	7.432	1.833	8.891				
to		120.0		0.0	7.432	0.794				
A	32.43	0.0676		0.0	9.265	0.626			Vel = 6.37	
	0.0									
	32.43					10.311			K Factor = 10.10	
*LINE 2										
H103	16.13	1.442		0.0	10.375	8.301			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H104	16.13	0.0185		0.0	10.375	0.192			Vel = 3.17	
H104	16.32	1.442	1E	3.716	2.333	8.493			K Factor = 5.60	
to		120.0		0.0	3.716	0.0				
102	32.45	0.0676		0.0	6.049	0.409			Vel = 6.37	
102	0.0	1.442	1T	7.432	1.833	8.902				
to		120.0		0.0*	7.432	0.794				
B	32.45	0.0677		0.0	9.265	0.627			Vel = 6.37	
	0.0									
	32.45					10.323			K Factor = 10.10	
*LINE 3										
H105	14.82	1.442		0.0	4.000	7.000			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H106	14.82	0.0158		0.0	4.000	0.063			Vel = 2.91	
H106	14.88	1.442		0.0	10.375	7.063			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H107	29.7	0.0574		0.0	10.375	0.596			Vel = 5.83	
H107	15.50	1.442	1E	3.716	2.333	7.659			K Factor = 5.60	
to		120.0		0.0	3.716	0.0				
103	45.2	0.1250		0.0	6.049	0.756			Vel = 8.88	
103	0.0	1.442	1T	7.432	1.833	8.415				
to		120.0		0.0	7.432	0.794				
C	45.2	0.1248		0.0	9.265	1.156			Vel = 8.88	
	0.0									
	45.20					10.365			K Factor = 14.04	
*LINE 4										
H108	14.92	1.442		0.0	4.000	7.099			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H109	14.92	0.0160		0.0	4.000	0.064			Vel = 2.93	
H109	14.99	1.442		0.0	10.375	7.163			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
H110	29.91	0.0582		0.0	10.375	0.604			Vel = 5.88	
H110	15.60	1.442	1E	3.716	2.333	7.767			K Factor = 5.60	
to		120.0		0.0	3.716	0.0				
104	45.51	0.1265		0.0	6.049	0.765			Vel = 8.94	

Final Calculations - Hazen-Williams

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 6
Date 6/9/2014

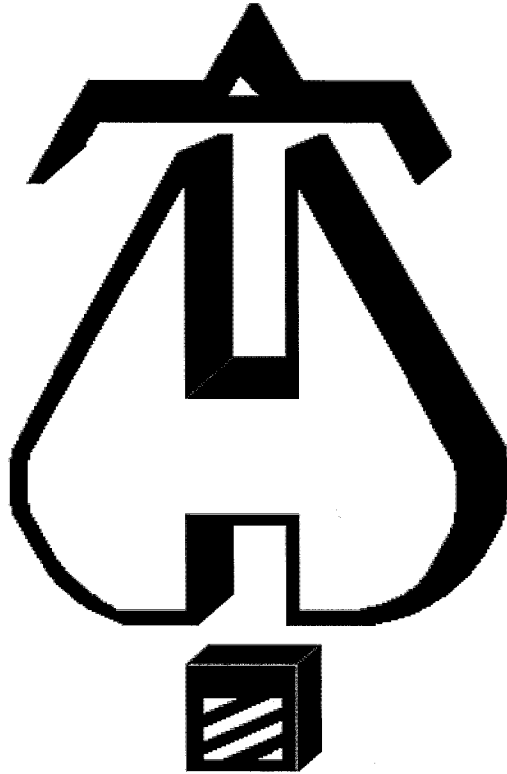
Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
104 to D	0.0 45.51	1.442 120.0 0.1265	1T	7.432 0.0 0.0	1.833 7.432 9.265	8.532 0.794 1.172			Vel = 8.94	
	0.0 45.51						10.498		K Factor = 14.05	
*LINE 5										
H111 to H112	16.46 16.46	1.442 120.0 0.0192		0.0 0.0 0.0	10.375 0.0 10.375	8.641 0.0 0.199			K Factor = 5.60 Vel = 3.23	
H112 to 105	16.65 33.11	1.442 120.0 0.0703	1E	3.716 0.0 0.0	2.333 3.716 6.049	8.840 0.0 0.425			K Factor = 5.60 Vel = 6.50	
105 to E	0.0 33.11	1.442 120.0 0.0703	1T	7.432 0.0 0.0	1.833 7.432 9.265	9.265 0.794 0.651			Vel = 6.50	
	0.0 33.11						10.710		K Factor = 10.12	
*LINE 6										
H113 to H114	16.76 16.76	1.442 120.0 0.0200		0.0 0.0 0.0	10.375 0.0 10.375	8.956 0.0 0.207			K Factor = 5.60 Vel = 3.29	
H114 to 106	16.95 33.71	1.442 120.0 0.0726	1E	3.716 0.0 0.0	2.333 3.716 6.049	9.163 0.0 0.439			K Factor = 5.60 Vel = 6.62	
106 to F	0.0 33.71	1.442 120.0 0.0725	1T	7.432 0.0 0.0	1.833 7.432 9.265	9.602 0.794 0.672			Vel = 6.62	
	0.0 33.71						11.068		K Factor = 10.13	
*LINE 7										
H115 to 107	18.00 18.0	1.442 120.0 0.0227	1E	3.716 0.0 0.0	2.458 3.716 6.174	10.334 0.0 0.140			K Factor = 5.60 Vel = 3.54	
107 to G	0.0 18.0	1.442 120.0 0.0228	1T	7.432 0.0 0.0	1.833 7.432 9.265	10.474 0.794 0.211			Vel = 3.54	
	0.0 18.00						11.479		K Factor = 5.31	
*MAIN										
A to B	32.43 32.43	3.26 120.0 0.0013		0.0 0.0 0.0	9.500 0.0 9.500	10.311 0.0 0.012			Vel = 1.25	
B to C	32.46 64.89	3.26 120.0 0.0046		0.0 0.0 0.0	9.167 0.0 9.167	10.323 0.0 0.042			Vel = 2.49	
C to D	45.19 110.08	3.26 120.0 0.0123		0.0 0.0 0.0	10.833 0.0 10.833	10.365 0.0 0.133			Vel = 4.23	

Final Calculations - Hazen-Williams

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 7
Date 6/9/2014

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
D	45.52	3.26		0.0	9.167	10.498				
to		120.0		0.0	0.0	0.0				
E	155.6	0.0231		0.0	9.167	0.212		Vel =	5.98	
E	33.11	3.26		0.0	10.833	10.710				
to		120.0		0.0	0.0	0.0				
F	188.71	0.0330		0.0	10.833	0.358		Vel =	7.25	
F	33.71	3.26		0.0	9.167	11.068				
to		120.0		0.0	0.0	0.0				
G	222.42	0.0448		0.0	9.167	0.411		Vel =	8.55	
G	18.00	3.26	2V	13.44	72.417	11.479				
to		120.0		0.0	13.440	-2.310				
H	240.42	0.0518		0.0	85.857	4.445		Vel =	9.24	
H	0.0	3.26	1V	6.72	5.333	13.614				
to		120.0		0.0	6.720	0.0				
J	240.42	0.0518		0.0	12.053	0.624		Vel =	9.24	
J	0.0	3.26	1X	17.471	9.792	14.238				
to		120.0	1Eq	4.032	21.503	0.0				
K	240.42	0.0518		0.0	31.295	1.620		Vel =	9.24	
K	0.0	3.26		0.0	2.917	15.858				
to		120.0		0.0	0.0	0.0				
TOR	240.42	0.0518		0.0	2.917	0.151		Vel =	9.24	
	0.0									
	240.42					16.009		K Factor =	60.09	
*RISER										
TOR	240.42	4.26	1X	21.067	36.333	16.009				
to		120.0		0.0	21.067	13.643				
BOR	240.42	0.0141		0.0	57.400	0.808		Vel =	5.41	
BOR	0.0	4.26	1V	8.954	4.000	30.460				
to		120.0	1Zca	0.0	8.954	8.202		** Fixed Loss =	4.737	
FLG	240.42	0.0140		0.0	12.954	0.182		Vel =	5.41	
FLG	0.0	8.27	1H	10.28	1800.000	38.844				
to		140.0	1G	6.326	71.960	0.0				
TEST	240.42	0.0004	1T	55.354	1871.960	0.783		Vel =	1.44	
	100.00							Qa =	100.00	
	340.42					39.627		K Factor =	54.08	



... Fire Protection by Computer Design

Hampshire Fire Protection
8 North Wentworth Ave
Londonderry NH, 03053
432-8221

Job Name : EVOLUTION ROCKS PORTLAND
Building : 1
Location : BELOW MEZZANINE
System : 1
Contract : 4480 CME
Data File : 4480 CME - MEZZANINE.WXF

Hydraulic Design Information Sheet

Name - EVOLUTION ROCKS PORTLAND Date - 6/9/2014
 Location - BELOW MEZZANINE
 Building - 1 System No. - 1
 Contractor - FLYNN CONSTRUCTION Contract No. - 4480 CME
 Calculated By - CRAIG SIDER Drawing No. - 3
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 12'-0"
 Occupancy - LIGHT HAZARD

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

M	Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
	Density	- 0.1	(X) Wet	Make RELIABLE
D	Area Per Sprinkler	- 171	() Dry	Model F1FR56
E	Elevation at Highest Outlet	- 11	() 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	- 100		

N Note

Calculation Flow Required - 318.9 Press Required - 54.5
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 5/2/2013		Cap. -
T	Time of Test - N/A	Rated Cap.-	Elev.-
E	Static Press - 72	@ Press -	
R	Residual Press - 70	Elev. -	Well
	Flow - 1255		Proof Flow
S	Elevation - -5		

U Location - HYDRANT 01318

P Source of Information - PORTLAND WATER DEPARTMENT

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

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

G Horizontal Barriers Provided:

Water Supply Curve C

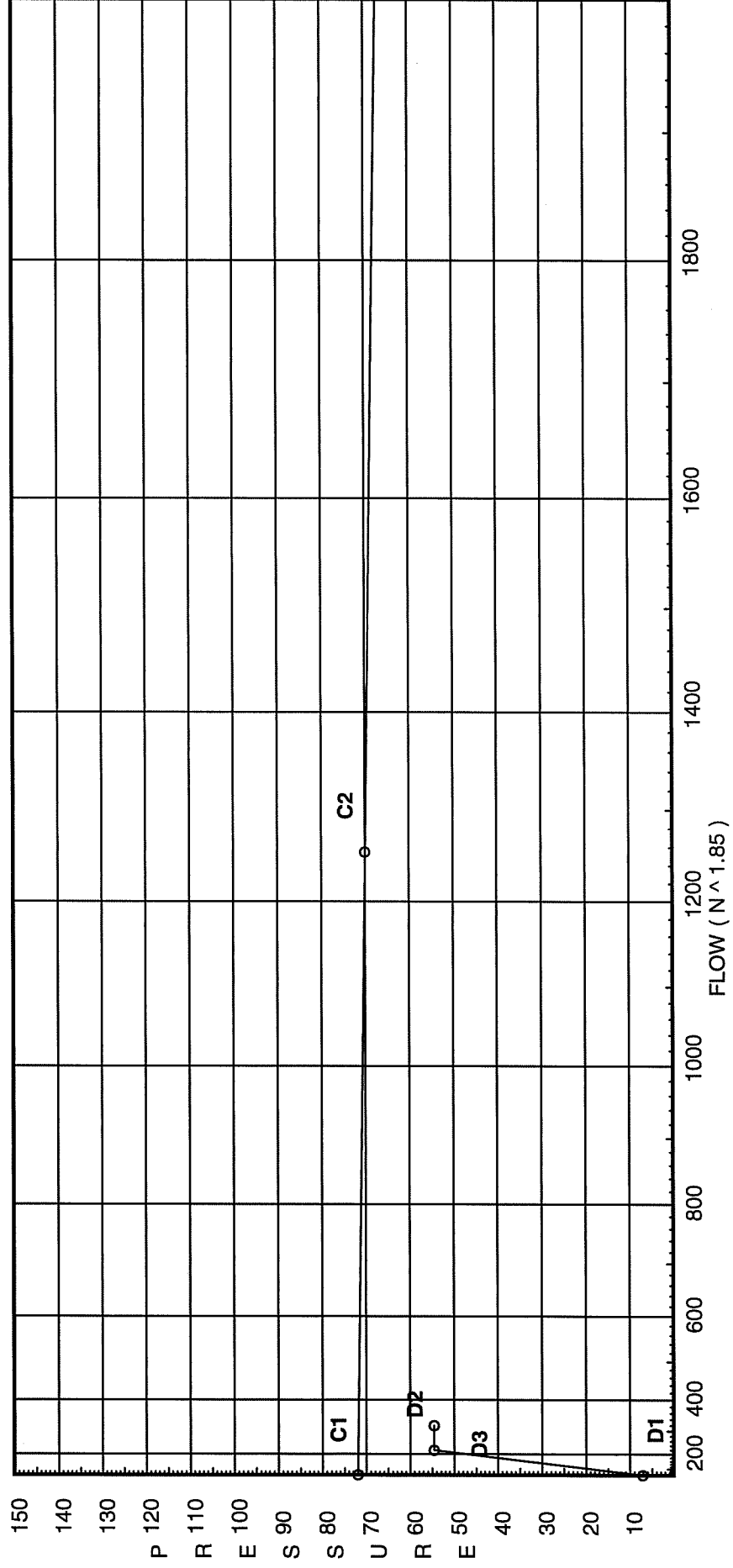
Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

City Water Supply:

C1 - Static Pressure : 72
C2 - Residual Pressure: 70
C2 - Residual Flow : 1255

Demand:

D1 - Elevation : 7.146
D2 - System Flow : 218.891
D2 - System Pressure : 54.543
Hose (Demand) : 100
D3 - System Demand : 318.891
Safety Margin : 17.298



Fittings Used Summary

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

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
H 45' Grnd-Vic Elbow #11	0	0	1	1.5	2	2	3	3	3.5	3.5	4.5	5	6.5	8.5	10	18	20	23	25	30
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	3	4	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X 90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zca Colt C200 Horz 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.

Pressure / Flow Summary - STANDARD

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 4
Date 6/9/2014

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
H301	11.5	5.6	8.51	na	16.34	0.1	89	7.0
H302	11.5	5.6	9.32	na	17.1	0.1	171	7.0
H303	11.5	5.6	13.7	na	20.73	0.1	169	7.0
H304	11.5	5.6	11.39	na	18.9	0.1	171	7.0
H305	11.5	5.6	12.27	na	19.61	0.1	98	7.0
H306	11.5	5.6	17.74	na	23.58	0.1	81	7.0
311	11.5		18.19	na				
H307	11.5	5.6	20.44	na	25.32	0.1	94	7.0
307	11.5		21.72	na				
H308	11.5	5.6	17.74	na	23.59	0.1	60	7.0
H309	11.5	5.6	20.03	na	25.06	0.1	104	7.0
H310	11.5	5.6	26.18	na	28.65	0.1	141	7.0
A3	11.5		29.11	na				
B3	11.5		29.3	na				
C3	11.5		30.09	na				
D3	29.167		23.5	na				
A	29.167		25.54	na				
B	29.167		25.95	na				
C	29.167		26.35	na				
D	29.167		26.82	na				
E	29.167		27.22	na				
F	29.167		27.69	na				
G	29.167		28.09	na				
H	34.5		29.52	na				
J	34.5		30.04	na				
K	34.5		31.4	na				
TOR	34.5		31.53	na				
BOR	3.0		45.85	na				
FLG	-5.0		53.89	na				
TEST	-5.0		54.54	na	100.0			

The maximum velocity is 22.31 and it occurs in the pipe between nodes 307 and A3

Final Calculations - Hazen-Williams - 2007

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 5
Date 6/9/2014

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
*LINE 1										
H301 to H302	16.34	1.049 120.0		0.0	9.083	8.511			K Factor = 5.60	
H302 to H303	16.34	0.0895		0.0	9.083	0.813			Vel = 6.07	
H302 to H303	17.10	1.049 120.0		0.0	13.000	9.324			K Factor = 5.60	
H303 to 311	33.44	0.3368		0.0	13.000	4.378			Vel = 12.41	
H303 to 311	20.73	1.38 120.0	1E 1T	3.0 6.0	11.750 9.000	13.702 0.0			K Factor = 5.60	
	54.17	0.2162		0.0	20.750	4.486			Vel = 11.62	
	0.0 54.17						18.188		K Factor = 12.70	
H304 to H305	18.90	1.049 120.0		0.0	7.500	11.390			K Factor = 5.60	
H305 to H306	18.9	0.1171		0.0	7.500	0.878			Vel = 7.02	
H305 to H306	19.61	1.049 120.0	2E	4.0	8.500	12.268			K Factor = 5.60	
H306 to 311	38.51	0.4374		0.0	12.500	5.468			Vel = 14.30	
H306 to 311	23.59	1.38 120.0		0.0	1.625	17.736			K Factor = 5.60	
311 to 307	62.1	0.2782		0.0	1.625	0.452			Vel = 13.32	
311 to 307	54.16	1.61 120.0		0.0	8.417	18.188				
	116.26	0.4193		0.0	8.417	3.529			Vel = 18.32	
	0.0 116.26						21.717		K Factor = 24.95	
H307 to 307	25.32	1.049 120.0	1T	5.0	1.333	20.442			K Factor = 5.60	
307 to A3	25.32	0.2013		0.0	6.333	1.275			Vel = 9.40	
307 to A3	116.26	1.61 120.0	1E	4.0	8.250	21.717				
	141.58	0.6037		0.0	12.250	7.395			Vel = 22.31	
	0.0 141.58						29.112		K Factor = 26.24	
* LINE 2										
H308 to H309	23.59	1.049 120.0	1E	2.0	10.958	17.744			K Factor = 5.60	
H309 to H310	23.59	0.1766		0.0	12.958	2.288			Vel = 8.76	
H309 to H310	25.06	1.049 120.0		0.0	9.125	20.032			K Factor = 5.60	
H310 to B3	48.65	0.6740		0.0	9.125	6.150			Vel = 18.06	
H310 to B3	28.66	1.38 120.0	1T	6.0	1.458	26.182			K Factor = 5.60	
	77.31	0.4175		0.0	7.458	3.114			Vel = 16.58	
	0.0 77.31						29.296		K Factor = 14.28	
*MAIN										

Final Calculations - Hazen-Williams

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 6
Date 6/9/2014

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
A3	141.58	3.26		0.0	9.458	29.112				
to		120.0		0.0	0.0	0.0				
B3	141.58	0.0195		0.0	9.458	0.184		Vel =	5.44	
B3	77.31	3.26	1V	6.72	11.625	29.296				
to		120.0		0.0	6.720	0.0				
C3	218.89	0.0435		0.0	18.345	0.798		Vel =	8.41	
C3	0.0	3.26	1V	6.72	17.667	30.094				
to		120.0		0.0	6.720	-7.652				
D3	218.89	0.0435		0.0	24.387	1.062		Vel =	8.41	
D3	0.0	3.26	1V	6.72	40.000	23.504				
to		120.0		0.0	6.720	0.0				
A	218.89	0.0435		0.0	46.720	2.033		Vel =	8.41	
A	0.0	3.26		0.0	9.500	25.537				
to		120.0		0.0	0.0	0.0				
B	218.89	0.0435		0.0	9.500	0.413		Vel =	8.41	
B	0.0	3.26		0.0	9.167	25.950				
to		120.0		0.0	0.0	0.0				
C	218.89	0.0436		0.0	9.167	0.400		Vel =	8.41	
C	0.0	3.26		0.0	10.833	26.350				
to		120.0		0.0	0.0	0.0				
D	218.89	0.0435		0.0	10.833	0.471		Vel =	8.41	
D	0.0	3.26		0.0	9.167	26.821				
to		120.0		0.0	0.0	0.0				
E	218.89	0.0435		0.0	9.167	0.399		Vel =	8.41	
E	0.0	3.26		0.0	10.833	27.220				
to		120.0		0.0	0.0	0.0				
F	218.89	0.0435		0.0	10.833	0.471		Vel =	8.41	
F	0.0	3.26		0.0	9.167	27.691				
to		120.0		0.0	0.0	0.0				
G	218.89	0.0435		0.0	9.167	0.399		Vel =	8.41	
G	0.0	3.26	2V	13.44	72.417	28.090				
to		120.0		0.0	13.440	-2.310				
H	218.89	0.0435		0.0	85.857	3.737		Vel =	8.41	
H	0.0	3.26	1V	6.72	5.333	29.517				
to		120.0		0.0	6.720	0.0				
J	218.89	0.0436		0.0	12.053	0.525		Vel =	8.41	
J	0.0	3.26	1X	17.471	9.792	30.042				
to		120.0	1Eq	4.032	21.503	0.0				
K	218.89	0.0435		0.0	31.295	1.362		Vel =	8.41	
K	0.0	3.26		0.0	2.917	31.404				
to		120.0		0.0	0.0	0.0				
TOR	218.89	0.0435		0.0	2.917	0.127		Vel =	8.41	
	0.0									
	218.89					31.531		K Factor =	38.98	
*RISER										
TOR	218.89	4.26	1X	21.067	36.333	31.531				
to		120.0		0.0	21.067	13.643				
BOR	218.89	0.0118		0.0	57.400	0.678		Vel =	4.93	

Final Calculations - Hazen-Williams

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 7
Date 6/9/2014

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
BOR to FLG	0.0 218.89	4.26 120.0 0.0118	1V 1Zca	8.954 0.0 0.0	4.000 8.954 12.954	45.852 7.880 0.153		** Fixed Loss = 4.415 Vel = 4.93	
FLG to TEST	0.0 218.89	8.27 140.0 0.0004	1H 1G 1T	10.28 6.326 55.354	1800.000 71.960 1871.960	53.885 0.0 0.658		Vel = 1.31	
	100.00 318.89					54.543		Qa = 100.00 K Factor = 43.18	