

. . . 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 : LOWER ROOF
System : 1
Contract : 4480 CME
Data File : 4480 CME - LOWER ROOF.WXF

Hydraulic Design Information Sheet

Name - EVOLUTION ROCKS PORTLAND Date - 1/22/2014
 Location - LOWER 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

M	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 - 349.1 Press Required - 42.3
 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		

P Location - HYDRANT 01318

L 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

E Horizontal Barriers Provided:

Water Supply Curve C

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

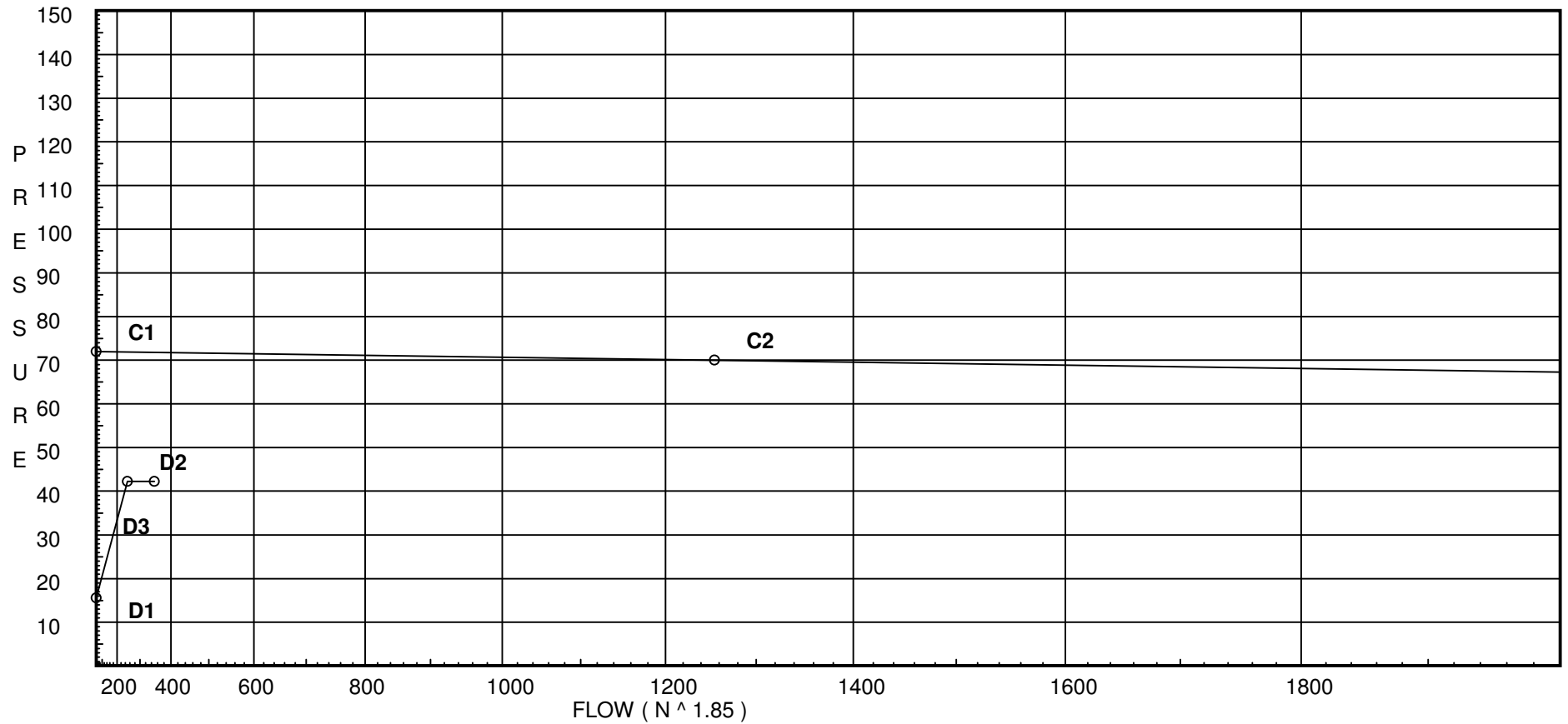
Page 2
Date 1/22/2014

City Water Supply:

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

Demand:

D1 - Elevation : 15.592
D2 - System Flow : 249.108
D2 - System Pressure : 42.243
Hose (Demand) : 100
D3 - System Demand : 349.108
Safety Margin : 29.569



Fittings Used Summary

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 3
Date 1/22/2014

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	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 1/22/2014

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
H101	31.0	5.6	9.04	na	16.83	0.1	153	7.0
H102	31.0	5.6	9.39	na	17.16	0.1	110	7.0
101	31.0		10.39	na				
H103	31.0	5.6	9.05	na	16.84	0.1	138	7.0
H104	31.0	5.6	9.41	na	17.17	0.1	110	7.0
102	31.0		10.4	na				
H105	31.0	5.6	7.0	na	14.82	0.1	32	7.0
H106	31.0	5.6	7.18	na	15.01	0.1	113	7.0
H107	31.0	5.6	8.21	na	16.05	0.1	126	7.0
103	31.0		9.94	na				
H108	31.0	5.6	7.09	na	14.91	0.1	43	7.0
H109	31.0	5.6	7.27	na	15.1	0.1	113	7.0
H110	31.0	5.6	8.32	na	16.15	0.1	126	7.0
104	31.0		10.07	na				
H111	31.0	5.6	9.39	na	17.16	0.1	144	7.0
H112	31.0	5.6	9.76	na	17.49	0.1	132	7.0
105	31.0		10.79	na				
H113	31.0	5.6	9.7	na	17.44	0.1	144	7.0
H114	31.0	5.6	10.08	na	17.78	0.1	132	7.0
106	31.0		11.15	na				
H115	31.0	5.6	11.73	na	19.18	0.1	132	7.0
107	31.0		12.07	na				
A	29.167		11.87	na				
B	29.167		11.88	na				
C	29.167		11.92	na				
D	29.167		12.07	na				
E	29.167		12.29	na				
F	29.167		12.67	na				
G	29.167		13.11	na				
H	39.333		13.45	na				
J	39.333		14.38	na				
K	39.333		16.11	na				
TOR	39.333		16.27	na				
BOR	3.0		32.87	na				
FLG	-5.0		41.41	na				
TEST	-5.0		42.24	na	100.0			

The maximum velocity is 9.58 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 1/22/2014

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	16.83	1.442	1T	7.432	10.375	9.037			K Factor = 5.60	
to		120.0		0.0	7.432	0.0				
H102	16.83	0.0200		0.0	17.807	0.357			Vel = 3.31	
H102	17.17	1.442	1T	7.432	2.333	9.394			K Factor = 5.60	
to		120.0	1E	3.716	11.148	0.0				
101	34.0	0.0737		0.0	13.481	0.994			Vel = 6.68	
101	0.0	1.442	1T	7.432	1.833	10.388				
to		120.0		0.0	7.432	0.794				
A	34.0	0.0738		0.0	9.265	0.684			Vel = 6.68	
	0.0									
	34.00					11.866			K Factor = 9.87	
*LINE 2										
H103	16.84	1.442	1T	7.432	10.375	9.048			K Factor = 5.60	
to		120.0		0.0	7.432	0.0				
H104	16.84	0.0201		0.0	17.807	0.358			Vel = 3.31	
H104	17.18	1.442	1T	7.432	2.333	9.406			K Factor = 5.60	
to		120.0	1E	3.716	11.148	0.0				
102	34.02	0.0738		0.0	13.481	0.995			Vel = 6.68	
102	0.0	1.442	1T	7.432	1.833	10.401				
to		120.0		0.0	7.432	0.794				
B	34.02	0.0738		0.0	9.265	0.684			Vel = 6.68	
	0.0									
	34.02					11.879			K Factor = 9.87	
*LINE 3										
H105	14.82	1.442	1T	7.432	4.000	7.000			K Factor = 5.60	
to		120.0		0.0	7.432	0.0				
H106	14.82	0.0158		0.0	11.432	0.181			Vel = 2.91	
H106	15.00	1.442	1T	7.432	10.375	7.181			K Factor = 5.60	
to		120.0		0.0	7.432	0.0				
H107	29.82	0.0579		0.0	17.807	1.031			Vel = 5.86	
H107	16.05	1.442	1T	7.432	2.333	8.212			K Factor = 5.60	
to		120.0	1E	3.716	11.148	0.0				
103	45.87	0.1283		0.0	13.481	1.730			Vel = 9.01	
103	0.0	1.442	1T	7.432	1.833	9.942				
to		120.0		0.0	7.432	0.794				
C	45.87	0.1283		0.0	9.265	1.189			Vel = 9.01	
	0.0									
	45.87					11.925			K Factor = 13.28	
*LINE 4										
H108	14.91	1.442	1T	7.432	4.000	7.091			K Factor = 5.60	
to		120.0		0.0	7.432	0.0				
H109	14.91	0.0161		0.0	11.432	0.184			Vel = 2.93	
H109	15.11	1.442	1T	7.432	10.375	7.275			K Factor = 5.60	
to		120.0		0.0	7.432	0.0				
H110	30.02	0.0586		0.0	17.807	1.043			Vel = 5.90	
H110	16.15	1.442	1T	7.432	2.333	8.318			K Factor = 5.60	
to		120.0	1E	3.716	11.148	0.0				
104	46.17	0.1298		0.0	13.481	1.750			Vel = 9.07	

Final Calculations - Hazen-Williams

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 6
Date 1/22/2014

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	0.0	1.442	1T	7.432	1.833	10.068				
to		120.0		0.0	7.432	0.794				
D	46.17	0.1298		0.0	9.265	1.203		Vel =	9.07	
	0.0									
	46.17					12.065		K Factor =	13.29	
*LINE 5										
H111	17.16	1.442	1T	7.432	10.375	9.387		K Factor =	5.60	
to		120.0		0.0	7.432	0.0				
H112	17.16	0.0208		0.0	17.807	0.371		Vel =	3.37	
H112	17.49	1.442	1T	7.432	2.333	9.758		K Factor =	5.60	
to		120.0	1E	3.716	11.148	0.0				
105	34.65	0.0763		0.0	13.481	1.029		Vel =	6.81	
105	0.0	1.442	1T	7.432	1.833	10.787				
to		120.0		0.0	7.432	0.794				
E	34.65	0.0764		0.0	9.265	0.708		Vel =	6.81	
	0.0									
	34.65					12.289		K Factor =	9.88	
*LINE 6										
H113	17.44	1.442	1T	7.432	10.375	9.702		K Factor =	5.60	
to		120.0		0.0	7.432	0.0				
H114	17.44	0.0215		0.0	17.807	0.382		Vel =	3.43	
H114	17.79	1.442	1T	7.432	2.333	10.084		K Factor =	5.60	
to		120.0	1E	3.716	11.148	0.0				
106	35.23	0.0787		0.0	13.481	1.061		Vel =	6.92	
106	0.0	1.442	1T	7.432	1.833	11.145				
to		120.0		0.0	7.432	0.794				
F	35.23	0.0788		0.0	9.265	0.730		Vel =	6.92	
	0.0									
	35.23					12.669		K Factor =	9.90	
*LINE 7										
H115	19.18	1.442	1T	7.432	2.458	11.727		K Factor =	5.60	
to		120.0	1E	3.716	11.148	0.0				
107	19.18	0.0256		0.0	13.606	0.348		Vel =	3.77	
107	0.0	1.442	1T	7.432	1.833	12.075				
to		120.0		0.0	7.432	0.794				
G	19.18	0.0256		0.0	9.265	0.237		Vel =	3.77	
	0.0									
	19.18					13.106		K Factor =	5.30	
*MAIN										
A	34.00	3.26		0.0	9.500	11.866				
to		120.0		0.0	0.0	0.0				
B	34.0	0.0014		0.0	9.500	0.013		Vel =	1.31	
B	34.02	3.26		0.0	9.167	11.879				
to		120.0		0.0	0.0	0.0				
C	68.02	0.0050		0.0	9.167	0.046		Vel =	2.61	
C	45.87	3.26		0.0	10.833	11.925				
to		120.0		0.0	0.0	0.0				
D	113.89	0.0129		0.0	10.833	0.140		Vel =	4.38	

Final Calculations - Hazen-Williams

Hampshire Fire Protection
EVOLUTION ROCKS PORTLAND

Page 7
Date 1/22/2014

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	46.17	3.26		0.0	9.167	12.065				
to		120.0		0.0	0.0	0.0				
E	160.06	0.0244		0.0	9.167	0.224		Vel =	6.15	
E	34.64	3.26		0.0	10.833	12.289				
to		120.0		0.0	0.0	0.0				
F	194.7	0.0351		0.0	10.833	0.380		Vel =	7.48	
F	35.23	3.26		0.0	9.167	12.669				
to		120.0		0.0	0.0	0.0				
G	229.93	0.0477		0.0	9.167	0.437		Vel =	8.84	
G	19.18	3.26	2V	13.44	72.417	13.106				
to		120.0		0.0	13.440	-4.403				
H	249.11	0.0553		0.0	85.857	4.746		Vel =	9.58	
H	0.0	3.26	1V	6.72	10.167	13.449				
to		120.0		0.0	6.720	0.0				
J	249.11	0.0553		0.0	16.887	0.934		Vel =	9.58	
J	0.0	3.26	1X	17.471	9.792	14.383				
to		120.0	1Eq	4.032	21.503	0.0				
K	249.11	0.0553		0.0	31.295	1.730		Vel =	9.58	
K	0.0	3.26		0.0	2.917	16.113				
to		120.0		0.0	0.0	0.0				
TOR	249.11	0.0552		0.0	2.917	0.161		Vel =	9.58	
	0.0									
	249.11					16.274		K Factor =	61.75	
*RISER										
TOR	249.11	4.26	1X	21.067	36.333	16.274				
to		120.0		0.0	21.067	15.736				
BOR	249.11	0.0150		0.0	57.400	0.862		Vel =	5.61	
BOR	0.0	4.26	1V	8.954	4.000	32.872				
to		120.0	1Zca	0.0	8.954	8.340		** Fixed Loss =	4.876	
FLG	249.11	0.0151		0.0	12.954	0.195		Vel =	5.61	
FLG	0.0	8.27	1H	10.28	1800.000	41.407				
to		140.0	1G	6.326	71.960	0.0				
TEST	249.11	0.0004	1T	55.354	1871.960	0.836		Vel =	1.49	
	100.00							Qa =	100.00	
	349.11					42.243		K Factor =	53.71	