Reviewed for Code Compliance
Inspections Division
Approved with Conditions

Date: 06/17/15

. . . Fire Protection by Computer Design

HIGH TECH FIRE PROTECTION
84 HACKETT MILLS ROAD
P.O. BOX 156
POLAND, ME 04274
207-998-2551

Job Name	:	420 FORE STREET LOFT/UPRIGHT CALC
Drawing	:	
Location	:	420 Fore Street Portland Maine
Remote Area	:	2
Contract	:	
Data File	:	UPRIGHT CALCS.WXF

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HYDRAULIC CALCULATIONS
for

Project name: 420 Fore Street Loft/Upright Calc
Location: 420 Fore Street Portland Maine
Drawing no:
Date: 5/22/2015

Design

Remote area number: 2
Remote area location: South Loft
Occupancy classification: Light
Density: .1 - Gpm/SqFt
Area of application: 650 - SqFt
Coverage per sprinkler: 196 - SqFt
Type of sprinklers calculated: Residential
No. of sprinklers calculated: 9
In-rack demand: - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 277 - GPM @ 88 - Psi
Type of system: Wet System
Volume of dry or preaction system: 0 - Gal

Water supply information

Date: 05-11-2013
Location: Corner Of Union Street And Fore Street
Source: Portland Water District

Name of contractor: HIGH TECH FIRE PROTECTION
Address: P.O. BOX 156 / / MINOT, ME 04258
Phone number: 207-998-2551
Name of designer: Ed Pennell
Authority having jurisdiction: State of Maine / Portland Fire Department
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve (C)

HIGH TECH FIRE PROTECTION
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City Water Supply:
C1 - Static Pressure : 101
C2 - Residual Pressure: 99
C2 - Residual Flow : 1342

Demand:
D1 - Ele
D2 - Sy
D2 - Sy
Hose (
D3 - Sy
Safety Margin : 12.971

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Fittings Used Summary

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	1					4
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	2					
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	2					1
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	1	1	1	1	1	2	2	3	4	5	6					3
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	0	0	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
Zac	Ames 2000SS	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

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density		
B1	54.25	5.6	12.25	na	19.6	0.1		
B2	53.25		13.81	na				
B3	56.0	5.6	13.75	na	20.76	0.1		
B4	56.0	5.6	17.09	na	23.15	0.1		
B5	56.0		23.71	na				
B6	56.0		26.03	na				
B11	54.25	5.6	12.71	na	19.97	0.1	196	7.0
B13	54.25	5.6	13.17	na	20.32	0.1	196	7.0
B12	53.25		14.62	na				
B14	56.0		15.91	na				
B10	56.0	5.6	17.45	na	23.39	0.1	196	7.0
B9	56.0	5.6	18.49	na	24.08	0.1	196	7.0
B15	56.0	5.6	20.61	na	25.43	0.1	196	7.0
B8	56.0		24.5	na				
B7	43.5		34.62	na				
B16	37.0		39.3	na				
B17	37.0		43.74	na				
C1	23.11		55.78	na				
C2	14.5		60.56	na				
C3	6.4		65.14	na				
C4	6.4		66.37	na				
C5	5.75		70.03	na				
C6	5.75		70.57	na				
TOR	2.0		80.16	na				
BOR	2.0		83.7	na				
H1	10.0		81.08	na				
H2	10.0		82.42	na				
H3	10.0		82.49	na				
H4	10.0		83.24	na	100.0			
TEST	0.0		87.92	na				

The maximum velocity is 24.28 and it occurs in the pipe between nodes B15 and B8

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	**
B1	19.60	1.049	2E	4.0	5.000	12.250		K Factor = 5.60
to		120.0		0.0	4.000	0.433		
B2	19.6	0.1253		0.0	9.000	1.128		Vel = 7.28
B2	0.0	1.049	2E	4.0	5.000	13.811		
to		120.0		0.0	4.000	-1.191		
B3	19.6	0.1253		0.0	9.000	1.128		Vel = 7.28
B3	20.76	1.049	1E	2.0	5.000	13.748		K Factor = 5.60
to		120.0		0.0	2.000	0.0		
B4	40.36	0.4771		0.0	7.000	3.340		Vel = 14.98
B4	23.15	1.049		0.0	6.000	17.088		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
B5	63.51	1.1035		0.0	6.000	6.621		Vel = 23.58
B5	0.0	1.38		0.0	8.000	23.709		
to		120.0		0.0	0.0	0.0		
B6	63.51	0.2902		0.0	8.000	2.322		Vel = 13.62
B6	0.0	1.61	1T	8.0	11.200	26.031		
to		120.0	1E	4.0	12.000	5.414		
B7	63.51	0.1370		0.0	23.200	3.178		Vel = 10.01
	0.0							
	63.51					34.623		K Factor = 10.79
B11	19.97	1.049	1T	5.0	6.400	12.713		K Factor = 5.60
to		120.0		0.0	5.000	0.433		
B12	19.97	0.1297		0.0	11.400	1.479		Vel = 7.41
	0.0							
	19.97					14.625		K Factor = 5.22
B13	20.32	1.049	1T	5.0	2.600	13.173		K Factor = 5.60
to		120.0		0.0	5.000	0.433		
B12	20.32	0.1341		0.0	7.600	1.019		Vel = 7.54
B12	19.97	1.049	2E	4.0	1.200	14.625		
to		120.0		0.0	4.000	-1.191		
B14	40.29	0.4754		0.0	5.200	2.472		Vel = 14.96
B14	0.0	1.049	1T	5.0	4.900	15.906		
to		120.0		0.0	5.000	0.0		
B15	40.29	0.4756		0.0	9.900	4.708		Vel = 14.96
	0.0							
	40.29					20.614		K Factor = 8.87
B10	23.39	1.049		0.0	6.000	17.445		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
B9	23.39	0.1740		0.0	6.000	1.044		Vel = 8.68
B9	24.08	1.049		0.0	3.300	18.489		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
B15	47.47	0.6439		0.0	3.300	2.125		Vel = 17.62
B15	65.72	1.38		0.0	4.600	20.614		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
B8	113.19	0.8450		0.0	4.600	3.887		Vel = 24.28
B8	0.0	1.61	1T	8.0	3.800	24.501		
to		120.0		0.0	8.000	5.414		
B7	113.19	0.3990		0.0	11.800	4.708		Vel = 17.84

Final Calculations - Hazen-Williams

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	0.0							
	113.19					34.623		K Factor = 19.24
B7	176.70	2.157		0.0	8.500	34.623		
to		120.0		0.0	0.0	2.815		
B16	176.7	0.2188		0.0	8.500	1.860		Vel = 15.51
B16	0.0	2.157	1T	12.307	8.000	39.298		
to		120.0		0.0	12.307	0.0		
B17	176.7	0.2189		0.0	20.307	4.445		Vel = 15.51
B17	0.0	2.469	3E	18.0	35.100	43.743		
to		120.0		0.0	18.000	6.016		
C1	176.7	0.1134		0.0	53.100	6.019		Vel = 11.84
C1	0.0	2.635		0.0	12.750	55.778		
to		120.0		0.0	0.0	3.729		
C2	176.7	0.0826		0.0	12.750	1.053		Vel = 10.40
C2	0.0	2.635		0.0	13.000	60.560		
to		120.0		0.0	0.0	3.508		
C3	176.7	0.0825		0.0	13.000	1.073		Vel = 10.40
C3	0.0	2.635	1V	5.903	9.000	65.141		
to		120.0		0.0	5.903	0.0		
C4	176.7	0.0826		0.0	14.903	1.231		Vel = 10.40
C4	0.0	2.635	2V	11.807	29.100	66.372		
to		120.0		0.0	11.807	0.282		
C5	176.7	0.0826		0.0	40.907	3.377		Vel = 10.40
C5	0.0	2.635	1V	5.903	0.670	70.031		
to		120.0		0.0	5.903	0.0		
C6	176.7	0.0826		0.0	6.573	0.543		Vel = 10.40
C6	0.0	2.635	1V	5.903	28.100	70.574		
to		120.0	1T	16.474	31.987	4.624		* Fixed loss = 3
TOR	176.7	0.0826	1B	9.61	60.087	4.962		Vel = 10.40
			1Fsp	0.0				
TOR	0.0	2.635	1E	8.237	3.000	80.160		
to		120.0	1Zac	0.0	8.237	2.615		* Fixed loss = 2.615
BOR	176.7	0.0826		0.0	11.237	0.928		Vel = 10.40
BOR	0.0	2.635	1E	8.237	2.000	83.703		
to		120.0		0.0	8.237	-3.465		
H1	176.7	0.0825		0.0	10.237	0.845		Vel = 10.40
H1	0.0	2.635	1E	8.237	8.000	81.083		
to		120.0		0.0	8.237	0.0		
H2	176.7	0.0826		0.0	16.237	1.341		Vel = 10.40
H2	0.0	6.14	1T	22.732	15.000	82.424		
to		100.0		0.0	22.732	0.0		
H3	176.7	0.0019		0.0	37.732	0.071		Vel = 1.91
H3	0.0	6.14	1T	22.732	375.000	82.495		
to		100.0		0.0	22.732	0.0		
H4	176.7	0.0019		0.0	397.732	0.747		Vel = 1.91
H4	100.00	6.14	1E	10.608	45.000	83.242		Qa = 100
to		100.0	1G	2.273	35.613	4.331		
TEST	276.7	0.0043	1T	22.732	80.613	0.348		Vel = 3.00

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	0.0							
	276.70					87.921		K Factor = 29.51