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, Second Floor #4
Drawing	:	FP-01
Location	:	420 Fore Street Portland Maine
Remote Area	:	4
Contract	:	
Data File	:	SECOND FLOOR.WXF

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HYDRAULIC CALCULATIONS
for

Project name: 420 Fore Street Second Floor
Location: 420 Fore Street Portland Maine
Drawing no: FP-01
Date: 5/22/2015

Design

Remote area number: 4
Remote area location: Second Floor
Occupancy classification: Light Hazard
Density: .1 - Gpm/SqFt
Area of application: 1000 - SqFt
Coverage per sprinkler: 144 - SqFt
Type of sprinklers calculated: Commercial
No. of sprinklers calculated: 15
In-rack demand: N/A - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 394 - GPM @ 96 - 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
420 Fore Street, Second Floor #4

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 : 4.850

RESURGAM CITY OF PORTLAND, MAINE
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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
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

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		
D2	37.75	5.6	10.2	na	17.89	0.1		
D3	37.75	5.6	11.1	na	18.66	0.1		
D16	37.25		14.1	na				
D1	37.75	5.6	7.16	na	14.99	0.1		
D1A	37.75		7.6	na				
D1B	37.75	5.6	7.87	na	15.71	0.1	144	7.0
D4	37.75	5.6	8.66	na	16.48	0.1	144	7.0
D5	37.75		13.96	na				
D18	37.25		15.29	na				
D9	37.75	5.6	7.0	na	14.82	0.1	144	7.0
D8	37.75	5.6	7.75	na	15.59	0.1	144	7.0
D6	37.75	5.6	11.43	na	18.93	0.1	144	7.0
D7	37.75	5.6	12.94	na	20.15	0.1	144	7.0
D20	37.25		15.44	na				
D10	37.75	5.6	11.75	na	19.19	0.1	144	7.0
D11	37.75	5.6	12.47	na	19.77	0.1	144	7.0
D22	37.25		15.22	na				
D14	37.25	5.6	21.58	na	26.01	0.1	144	7.0
D15	37.25	5.6	21.2	na	25.78	0.1	144	7.0
D17	37.25		16.28	na				
D19	37.25		16.38	na				
D21	37.25		16.82	na				
D23	37.25	5.6	17.67	na	23.54	0.1	144	7.0
D12	37.25	5.6	21.52	na	25.98	0.1	144	7.0
D13	37.25		22.45	na				
D14B	37.25		23.01	na				
C1	27.7		33.58	na				
C2	14.5		41.3	na				
C3	6.4		47.59	na				
C4	6.4		50.74	na				
C5	5.75		59.66	na				
C6	5.75		61.05	na				
TOR	2.0		78.36	na				
BOR	2.0		86.73	na				
H1	10.0		85.42	na				
H2	10.0		88.85	na				
H3	10.0		89.03	na				
H4	10.0		90.95	na	100.0			
TEST	0.0		95.94	na				

The maximum velocity is 17.51 and it occurs in the pipe between nodes D4 and D5

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	**
D2	17.89	1.049		0.0	8.500	10.205		K Factor = [illegible]
to		120.0		0.0	0.0	0.0		
D3	17.89	0.1059		0.0	8.500	0.900		Vel = 6.64
D3	18.66	1.049	1E	2.0	5.000	11.105		K Factor = 5.60
to		120.0		0.0	2.000	0.217		
D16	36.55	0.3969		0.0	7.000	2.778		Vel = 13.57
D16	0.0	1.049	1T	5.0	0.500	14.100		
to		120.0		0.0	5.000	0.0		
D17	36.55	0.3971		0.0	5.500	2.184		Vel = 13.57
	0.0							
	36.55					16.284		K Factor = 9.06
D1	14.99	1.049	2E	4.0	1.750	7.163		K Factor = 5.60
to		120.0		0.0	4.000	0.0		
D1A	14.99	0.0763		0.0	5.750	0.439		Vel = 5.56
D1A	0.0	1.049	1E	2.0	1.500	7.602		
to		120.0		0.0	2.000	0.0		
D1B	14.99	0.0763		0.0	3.500	0.267		Vel = 5.56
D1B	15.71	1.049		0.0	2.750	7.869		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
D4	30.7	0.2876		0.0	2.750	0.791		Vel = 11.40
D4	16.48	1.049		0.0	8.330	8.660		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
D5	47.18	0.6366		0.0	8.330	5.303		Vel = 17.51
D5	0.0	1.38	1E	3.0	3.660	13.963		
to		120.0		0.0	3.000	0.217		
D18	47.18	0.1674		0.0	6.660	1.115		Vel = 10.12
D18	0.0	1.38	1T	6.0	0.500	15.295		
to		120.0		0.0	6.000	0.0		
D19	47.18	0.1674		0.0	6.500	1.088		Vel = 10.12
	0.0							
	47.18					16.383		K Factor = 11.66
D9	14.82	1.049		0.0	10.100	7.000		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
D8	14.82	0.0747		0.0	10.100	0.754		Vel = 5.50
D8	15.59	1.049	1E	2.0	6.000	7.754		K Factor = 5.60
to		120.0	1T	5.0	7.000	0.0		
D6	30.41	0.2825		0.0	13.000	3.673		Vel = 11.29
D6	18.93	1.38		0.0	8.330	11.427		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
D7	49.34	0.1820		0.0	8.330	1.516		Vel = 10.58
D7	20.15	1.38	1E	3.0	3.660	12.943		K Factor = 5.60
to		120.0		0.0	3.000	0.217		
D20	69.49	0.3426		0.0	6.660	2.282		Vel = 14.91
D20	0.0	1.61	1T	8.0	0.500	15.442		
to		120.0		0.0	8.000	0.0		
D21	69.49	0.1618		0.0	8.500	1.375		Vel = 10.95
	0.0							
	69.49					16.817		K Factor = 16.95

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D10	19.19	1.049		0.0	6.000	11.746		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
D11	19.19	0.1205		0.0	6.000	0.723		Vel = 7.12
D11	19.78	1.049	1E	2.0	3.660	12.469		K Factor = 5.60
to		120.0		0.0	2.000	0.217		
D22	38.97	0.4468		0.0	5.660	2.529		Vel = 14.47
D22	0.0	1.049	1T	5.0	0.500	15.215		
to		120.0		0.0	5.000	0.0		
D23	38.97	0.4471		0.0	5.500	2.459		Vel = 14.47
	0.0							
	38.97					17.674		K Factor = 9.27
D14	26.01	1.049	1T	5.0	1.750	21.578		K Factor = 5.60
to		120.0		0.0	5.000	0.0		
D14B	26.01	0.2117		0.0	6.750	1.429		Vel = 9.66
	0.0							
	26.01					23.007		K Factor = 5.42
D15	25.78	1.049	1T	5.0	3.700	21.196		K Factor = 5.60
to		120.0		0.0	5.000	0.0		
D14B	25.78	0.2082		0.0	8.700	1.811		Vel = 9.57
	0.0							
	25.78					23.007		K Factor = 5.37
D17	36.55	2.157		0.0	8.330	16.284		
to		120.0		0.0	0.0	0.0		
D19	36.55	0.0119		0.0	8.330	0.099		Vel = 3.21
D19	47.18	2.157		0.0	7.900	16.383		
to		120.0		0.0	0.0	0.0		
D21	83.73	0.0549		0.0	7.900	0.434		Vel = 7.35
D21	69.49	2.635		0.0	13.500	16.817		
to		120.0		0.0	0.0	0.0		
D23	153.22	0.0635		0.0	13.500	0.857		Vel = 9.01
D23	62.50	2.635	3V	17.71	14.500	17.674		K Factor = 5.60
to		120.0		0.0	17.710	0.0		
D12	215.72	0.1194		0.0	32.210	3.847		Vel = 12.69
D12	25.98	2.635		0.0	6.330	21.521		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
D13	241.7	0.1474		0.0	6.330	0.933		Vel = 14.22
D13	0.0	2.635		0.0	3.750	22.454		
to		120.0		0.0	0.0	0.0		
D14B	241.7	0.1475		0.0	3.750	0.553		Vel = 14.22
D14B	51.80	2.635	1V	5.903	9.750	23.007		
to		120.0	1X	14.827	20.730	4.136		
C1	293.5	0.2111		0.0	30.480	6.435		Vel = 17.27
	0.0							
	293.50					33.578		K Factor = 50.65
C1	293.50	2.635		0.0	9.500	33.578		
to		120.0		0.0	0.0	5.717		
C2	293.5	0.2111		0.0	9.500	2.005		Vel = 17.27

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C2	0.0	2.635		0.0	13.200	41.300		
to		120.0		0.0	0.0	3.508		
C3	293.5	0.2111		0.0	13.200	2.787		Vel = 17.27
C3	0.0	2.635	1V	5.903	9.000	47.595		
to		120.0		0.0	5.903	0.0		
C4	293.5	0.2111		0.0	14.903	3.146		Vel = 17.27
C4	0.0	2.635	2V	11.807	29.100	50.741		
to		120.0		0.0	11.807	0.282		
C5	293.5	0.2111		0.0	40.907	8.636		Vel = 17.27
C5	0.0	2.635	1V	5.903	0.670	59.659		
to		120.0		0.0	5.903	0.0		
C6	293.5	0.2110		0.0	6.573	1.387		Vel = 17.27
C6	0.0	2.635	1V	5.903	28.100	61.046		
to		120.0	1T	16.474	31.987	4.624		* Fixed loss = 3
TOR	293.5	0.2111	1B	9.61	60.087	12.686		Vel = 17.27
			1Fsp	0.0				
TOR	0.0	2.635	1E	8.237	3.000	78.356		
to		120.0		0.0	8.237	6.000		* Fixed loss = 6
BOR	293.5	0.2111		0.0	11.237	2.372		Vel = 17.27
BOR	0.0	2.635	1E	8.237	2.000	86.728		
to		120.0		0.0	8.237	-3.465		
H1	293.5	0.2111		0.0	10.237	2.161		Vel = 17.27
H1	0.0	2.635	1E	8.237	8.000	85.424		
to		120.0		0.0	8.237	0.0		
H2	293.5	0.2111		0.0	16.237	3.428		Vel = 17.27
H2	0.0	6.14	1T	22.732	15.000	88.852		
to		100.0		0.0	22.732	0.0		
H3	293.5	0.0048		0.0	37.732	0.182		Vel = 3.18
H3	0.0	6.14	1T	22.732	375.000	89.034		
to		100.0		0.0	22.732	0.0		
H4	293.5	0.0048		0.0	397.732	1.911		Vel = 3.18
H4	100.00	6.14	1E	10.608	45.000	90.945		Qa = 100
to		100.0	1G	2.273	35.613	4.331		
TEST	393.5	0.0083	1T	22.732	80.613	0.667		Vel = 4.26
	0.0							
	393.50					95.943		K Factor = 40.17