Reviewed for Code Compliance
Inspections Division
Approved with Conditions
Date: 05/02/17

. . . 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	:	Brick South Function Area #1
Drawing	:	FP-01
Location	:	Thompsons Point
Remote Area	:	#1
Contract	:	
Data File	:	Function area 1.WXF

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HYDRAULIC CALCULATIONS
for

Project name: Brick South Function Area #1
Location: Thompsons Point
Drawing no: FP-01
Date: 1-2-17

Design

Remote area number: #1
Remote area location: Function Area
Occupancy classification: Ordinary Hazard 1
Density: .15 - Gpm/SqFt
Area of application: 1500 - SqFt
Coverage per sprinkler: 121 - SqFt
Type of sprinklers calculated: quick response upright
No. of sprinklers calculated: 20
In-rack demand: n/a - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 611 - GPM @ 61 - Psi
Type of system: Wet System
Volume of dry or preaction system: n/a - Gal

Water supply information

Date: 9-13-15
Location: Sewall Road
Source: Portland Water District

Name of contractor: HIGH TECH FIRE PROTECTION
Address: 84 HACKETT MILLS ROAD / P.O. BOX 156 / POLAND, ME 04274
Phone number: 207-998-2551
Name of designer: Ed Poulin
Authority having jurisdiction: State of Maine / City of Portland
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve (C)

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City Water Supply:
- C1 - Static Pressure : 98
- C2 - Residual Pressure: 92
- C2 - Residual Flow : 1519

Demand:
- D1 - Elevation : 19.056
- D2 - System Flow : 360.44
- D2 - System Pressure : 60.531
- Hose (Demand) : 250
- D3 - System Demand : 610.44
- Safety Margin : 36.358

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	12	14	16			
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
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	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
V	90' Ell Firelock #001	0	0	0	0	3.5	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	8	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zib	Wilkins 350A	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	Area	
10	25.0	5.6	10.5	na	18.15	0.15	121	7.0
11	25.0	5.6	10.62	na	18.25	0.15	121	7.0
12	25.0	5.6	11.06	na	18.62	0.15	121	7.0
13	25.0	5.6	11.99	na	19.39	0.15	121	7.0
14	25.0		13.19	na				
20	25.0	5.6	10.55	na	18.19	0.15	121	7.0
21	25.0	5.6	10.67	na	18.29	0.15	121	7.0
22	25.0	5.6	11.11	na	18.66	0.15	121	7.0
23	25.0	5.6	12.05	na	19.44	0.15	121	7.0
24	25.0		13.25	na				
30	25.0	5.6	10.72	na	18.34	0.15	121	7.0
31	25.0	5.6	10.84	na	18.44	0.15	121	7.0
32	25.0	5.6	11.29	na	18.81	0.15	121	7.0
33	25.0	5.6	12.24	na	19.59	0.15	121	7.0
34	25.0		13.46	na				
43	25.0	5.6	15.32	na	21.92	0.15	121	7.0
44	25.0		15.44	na				
15	24.0		15.24	na				
25	24.0		15.31	na				
35	24.0		15.54	na				
45	24.0		16.04	na				
50	24.0		22.18	na				
51	20.0		24.49	na				
C1	15.0	5.6	12.71	na	19.97	0.15	100	7.0
C2	25.0		10.72	na				
S1	25.0	5.6	10.72	na	18.33	0.15	100	7.0
S2	25.0	5.6	10.8	na	18.4	0.15	100	7.0
S3	25.0	5.6	10.96	na	18.54	0.15	100	7.0
C5	15.0	5.6	13.18	na	20.33	0.15	100	7.0
S4	25.0	5.6	11.23	na	18.76	0.15	100	7.0
C6	25.0		11.26	na				
S5	25.0		11.8	na				
S6	20.0		25.36	na				
S7	20.0		26.87	na				
209	20.0		26.98	na				
TOR	20.0		33.63	na				
FLW	7.0		42.82	na				
BOR	0.0		49.88	na				
BASE	0.0		51.14	na				
HOSE	0.0		51.63	na	250.0			
TEST	-19.0		60.53	na				

The maximum velocity is 13.85 and it occurs in the pipe between nodes S7 and 209

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	******* Note
10	18.15	1.682		0.0	11.000	10.504		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
11	18.15	0.0109		0.0	11.000	0.120		Vel = 2.62
11	18.25	1.682		0.0	11.000	10.624		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
12	36.4	0.0395		0.0	11.000	0.435		Vel = 5.26
12	18.63	1.682		0.0	11.000	11.059		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
13	55.03	0.0849		0.0	11.000	0.934		Vel = 7.95
13	19.39	1.682	1V	4.331	3.750	11.993		K Factor = 5.60
to		120.0		0.0	4.331	0.0		
14	74.42	0.1485		0.0	8.081	1.200		Vel = 10.75
14	0.0	1.682	1T	9.9	1.000	13.193		
to		120.0		0.0	9.900	0.433		
15	74.42	0.1484		0.0	10.900	1.618		Vel = 10.75
	0.0							
	74.42					15.244		K Factor = 19.06
20	18.19	1.682		0.0	11.000	10.552		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
21	18.19	0.0109		0.0	11.000	0.120		Vel = 2.63
21	18.30	1.682		0.0	11.000	10.672		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
22	36.49	0.0397		0.0	11.000	0.437		Vel = 5.27
22	18.66	1.682		0.0	11.000	11.109		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
23	55.15	0.0853		0.0	11.000	0.938		Vel = 7.96
23	19.44	1.682	1V	4.331	3.750	12.047		K Factor = 5.60
to		120.0		0.0	4.331	0.0		
24	74.59	0.1490		0.0	8.081	1.204		Vel = 10.77
24	0.0	1.682	1T	9.9	1.000	13.251		
to		120.0		0.0	9.900	0.433		
25	74.59	0.1491		0.0	10.900	1.625		Vel = 10.77
	0.0							
	74.59					15.309		K Factor = 19.06
30	18.34	1.682		0.0	11.000	10.722		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
31	18.34	0.0112		0.0	11.000	0.123		Vel = 2.65
31	18.44	1.682		0.0	11.000	10.845		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
32	36.78	0.0403		0.0	11.000	0.443		Vel = 5.31
32	18.81	1.682		0.0	11.000	11.288		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
33	55.59	0.0865		0.0	11.000	0.952		Vel = 8.03
33	19.59	1.682	1V	4.331	3.750	12.240		K Factor = 5.60
to		120.0		0.0	4.331	0.0		
34	75.18	0.1512		0.0	8.081	1.222		Vel = 10.86
34	0.0	1.682	1T	9.9	1.000	13.462		
to		120.0		0.0	9.900	0.433		
35	75.18	0.1513		0.0	10.900	1.649		Vel = 10.86

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	0.0							
	75.18					15.544		K Factor = 19.07
43	21.92	1.682	1V	4.331	3.750	15.318		K Factor = 5.60
to		120.0		0.0	4.331	0.0		
44	21.92	0.0155		0.0	8.081	0.125		Vel = 3.17
44	0.0	1.682	1T	9.9	1.000	15.443		
to		120.0		0.0	9.900	0.433		
45	21.92	0.0154		0.0	10.900	0.168		Vel = 3.17
	0.0							
	21.92					16.044		K Factor = 5.47
15	74.42	3.26		0.0	11.000	15.244		
to		120.0		0.0	0.0	0.0		
25	74.42	0.0059		0.0	11.000	0.065		Vel = 2.86
25	74.59	3.26		0.0	11.000	15.309		
to		120.0		0.0	0.0	0.0		
35	149.01	0.0214		0.0	11.000	0.235		Vel = 5.73
35	75.18	3.26		0.0	11.000	15.544		
to		120.0		0.0	0.0	0.0		
45	224.19	0.0455		0.0	11.000	0.500		Vel = 8.62
45	21.92	3.26	1X	17.471	96.000	16.044		
to		120.0		0.0	17.471	0.0		
50	246.11	0.0541		0.0	113.471	6.134		Vel = 9.46
50	0.0	3.26	1V	6.72	4.000	22.178		
to		120.0		0.0	6.720	1.732		
51	246.11	0.0541		0.0	10.720	0.580		Vel = 9.46
51	0.0	3.26		0.0	44.000	24.490		
to		120.0		0.0	0.0	0.0		
S7	246.11	0.0541		0.0	44.000	2.379		Vel = 9.46
	0.0							
	246.11					26.869		K Factor = 47.48
C1	19.97	1.049	1E	2.0	11.000	12.713		K Factor = 5.60
to		120.0	1T	5.0	7.000	-4.331		
C2	19.97	0.1297		0.0	18.000	2.335		Vel = 7.41
C2	0.0	2.157		0.0	0.500	10.717		
to		120.0		0.0	0.0	0.0		
S1	19.97	0.0040		0.0	0.500	0.002		Vel = 1.75
S1	18.33	2.157		0.0	6.000	10.719		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
S2	38.3	0.0128		0.0	6.000	0.077		Vel = 3.36
S2	18.40	2.157		0.0	6.000	10.796		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
S3	56.7	0.0268		0.0	6.000	0.161		Vel = 4.98
S3	18.54	2.157		0.0	6.000	10.957		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
S4	75.24	0.0450		0.0	6.000	0.270		Vel = 6.61
	0.0							
	75.24					11.227		K Factor = 22.46

Final Calculations - Hazen-Williams

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C5	20.33	1.049	1E	2.0	11.000	13.178		K Factor = 5.60
to		120.0	1T	5.0	7.000	-4.331		
C6	20.33	0.1342		0.0	18.000	2.415		Vel = 7.55
	0.0							
	20.33					11.262		K Factor = 6.06
S4	94.00	2.157		0.0	0.500	11.227		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
C6	94.0	0.0700		0.0	0.500	0.035		Vel = 8.25
C6	20.33	2.157		0.0	5.500	11.262		
to		120.0		0.0	0.0	0.0		
S5	114.33	0.0976		0.0	5.500	0.537		Vel = 10.04
S5	0.0	2.157	1X	10.461	106.000	11.799		
to		120.0		0.0	10.461	2.166		
S6	114.33	0.0978		0.0	116.461	11.392		Vel = 10.04
S6	0.0	2.157	1X	10.461	5.000	25.357		
to		120.0		0.0	10.461	0.0		
S7	114.33	0.0978		0.0	15.461	1.512		Vel = 10.04
S7	246.11	3.26		0.0	1.000	26.869		
to		120.0		0.0	0.0	0.0		
209	360.44	0.1090		0.0	1.000	0.109		Vel = 13.85
209	0.0	3.26	1V	6.72	54.000	26.978		
to		120.0		0.0	6.720	0.0		
TOR	360.44	0.1095		0.0	60.720	6.649		Vel = 13.85
TOR	0.0	4.26	1Fsp	0.0	19.000	33.627		
to		120.0		0.0	0.0	8.630		* Fixed loss = 3
FLW	360.44	0.0298		0.0	19.000	0.566		Vel = 8.11
FLW	0.0	4.26	1Zib	0.0	5.000	42.823		
to		120.0		0.0	0.0	6.911		* Fixed loss = 3.879
BOR	360.44	0.0296		0.0	5.000	0.148		Vel = 8.11
BOR	0.0	6.16	1G	4.304	250.000	49.882		
to		140.0	2E	40.168	87.509	0.0		
BASE	360.44	0.0037	1T	43.037	337.509	1.254		Vel = 3.88
BASE	0.0	8.27		0.0	560.000	51.136		
to		140.0		0.0	0.0	0.0		
HOSE	360.44	0.0009		0.0	560.000	0.495		Vel = 2.15
HOSE	250.00	12.46	1G	5.275	1050.000	51.631		Qa = 250
to		100.0	1E	23.735	81.754	8.229		
TEST	610.44	0.0006	1T	52.745	1131.754	0.671		Vel = 1.61
	0.0							
	610.44					60.531		K Factor = 78.46