Reviewed for Code Compliance
Inspections Division
Approved with Conditions
Date: 12/07/16

. . . 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	:	667 Congress Street 2nd floor fitness room #2A
Drawing	:	FP-02
Location	:	2nd Floor Fitness Room
Remote Area	:	#2A
Contract	:	091815-1
Data File	:	2nd floor calc avon st only #2A.WXF

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HYDRAULIC CALCULATIONS
for

Project name: 667 Congress Street 2nd Floor #2A
Location: 2nd Floor Fitness Room
Drawing no: FP-02
Date: 6-29-16

Design

Remote area number: #2A
Remote area location: 2nd Floor Fitness Room 230
Occupancy classification: Light Hazard
Density: .1 - Gpm/SqFt
Area of application: 900 - SqFt
Coverage per sprinkler: 225 - SqFt
Type of sprinklers calculated: quick response pendent
No. of sprinklers calculated: 6
In-rack demand: n/a - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 243 - GPM @ 49 - Psi
Type of system: Wet
Volume of dry or preaction system: n/a - Gal

Water supply information

Date: 8-8-14
Location: Congress Street Front of Building
Source: Portand 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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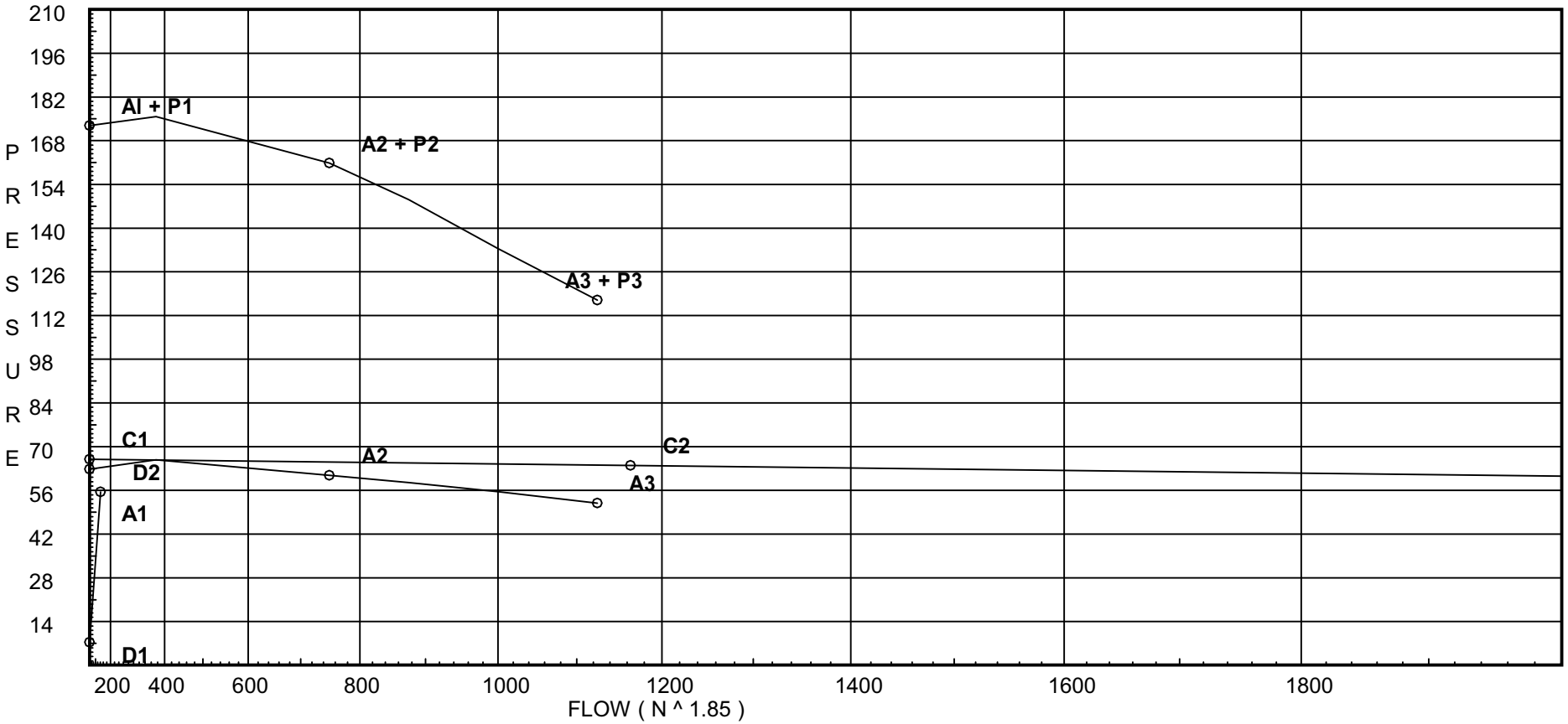
City Water Supply:
- C1 - Static Pressure : 66
- C2 - Residual Pressure: 64
- C2 - Residual Flow : 1164

City Water Adjusted to Pump Inlet
for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 62.831
- A2 - Adj Resid : 60.836 @ 750
- A3 - Adj Resid : 51.921 @ 1125

Pump Data:
- P1 - Pump Churn Pressure : 110
- P2 - Pump Rated Pressure : 100
- P2 - Pump Rated Flow : 750
- P3 - Pump Pressure @ Max Flow : 65
- P3 - Pump Max Flow : 1125
- City Residual Flow @ 0 = 7704.98
- City Residual Flow @ 20 = 6339.02
- City Water @ 150% of Pump = 64.12

Demand:
- D1 - Elevation : 7.363
- D2 - System Flow : 142.176
- D2 - System Pressure : 55.526
- Hose (Demand) : _____
- D3 - System Demand : 142.176
- Hose (Adj City) : 100
- Safety Margin : 114.481



Fittings Used Summary

HIGH TECH FIRE PROTECTION
667 Congress Street 2nd floor fitness room #2A

RESURGAM CITY OF PORTLAND, MAINE
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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			
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
Bvca	B Fly Vic 705						6	6	7		8	12	14	16	18	19					
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
N *	CPVC 90'Ell Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
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
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	
DP1	-0.7	5.6	16.14	na	22.5	0.1	225	7.0
DP2	-0.7	5.6	16.14	na	22.5	0.1	225	7.0
200	20.0	K = K @ EQ01	16.54	na	22.53			
201	20.0	K = K @ EQ02	17.56	na	23.34			
202	20.0	K = K @ EQ02	20.72	na	25.35			
203	20.0		30.34	na				
210	20.0	K = K @ EQ01	16.49	na	22.5			
211	20.0	K = K @ EQ01	17.64	na	23.27			
212	20.0		18.31	na				
213	20.0	K = K @ EQ01	20.68	na	25.19			
214	20.0		21.46	na				
215	20.0		31.02	na				
220	20.0		33.03	na				
221	20.0		37.62	na				
222	20.0		38.65	na				
223	20.0		46.66	na				
OB1	-2.0		56.21	na				
OB2	-2.0		56.29	na				
OB3	-2.0		56.34	na				
HD1	-8.0		58.95	na				
PO	0.0		55.53	na				
PI	-8.0		63.47	na				
JN1	-2.0		60.91	na				
JN2	-2.0		60.94	na				
FSA	-2.0		67.9	na				
FSAS	-2.0		67.95	na				
FSAT	-2.0		68.0	na				
HOSE	-2.0		68.0	na	100.0			
TEST	3.0		65.89	na				

The maximum velocity is 24 and it occurs in the pipe between nodes 202 and 203

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
DP1	22.50	1.101	1N	7.0	0.700	16.143		K Factor = 5.60
to		150.0		0.0	7.000	-0.303		
EQ01	22.5	0.0847		0.0	7.700	0.652		Vel = 7.58
	0.0							
	22.50					16.492		K Factor = 5.54
DP2	22.50	1.101	1O	5.0	0.700	16.143		K Factor = 5.60
to		150.0		0.0	5.000	-0.303		
EQ02	22.5	0.0846		0.0	5.700	0.482		Vel = 7.58
	0.0							
	22.50					16.322		K Factor = 5.57
200	22.53	1.101		0.0	12.000	16.539		K Factor @ node EQ01
to		150.0		0.0	0.0	0.0		
201	22.53	0.0848		0.0	12.000	1.018		Vel = 7.59
201	23.34	1.101		0.0	10.000	17.557		K Factor @ node EQ02
to		150.0		0.0	0.0	0.0		
202	45.87	0.3160		0.0	10.000	3.160		Vel = 15.46
202	25.35	1.101	1O	5.0	8.500	20.717		K Factor @ node EQ02
to		150.0		0.0	5.000	0.0		
203	71.22	0.7130		0.0	13.500	9.626		Vel = 24.00
203	0.0	2.003		0.0	17.500	30.343		
to		150.0		0.0	0.0	0.0		
215	71.22	0.0387		0.0	17.500	0.677		Vel = 7.25
	0.0							
	71.22					31.020		K Factor = 12.79
210	22.50	1.101	1N	7.0	14.500	16.492		K Factor @ node EQ01
to		150.0		0.0	7.000	0.0		
212	22.5	0.0846		0.0	21.500	1.818		Vel = 7.58
	0.0							
	22.50					18.310		K Factor = 5.26
211	23.27	1.101	1O	5.0	2.500	17.635		K Factor @ node EQ01
to		150.0		0.0	5.000	0.0		
212	23.27	0.0900		0.0	7.500	0.675		Vel = 7.84
212	22.50	1.101		0.0	10.000	18.310		
to		150.0		0.0	0.0	0.0		
214	45.77	0.3148		0.0	10.000	3.148		Vel = 15.42
	0.0							
	45.77					21.458		K Factor = 9.88
213	25.19	1.101	1O	5.0	2.500	20.675		K Factor @ node EQ01
to		150.0		0.0	5.000	0.0		
214	25.19	0.1044		0.0	7.500	0.783		Vel = 8.49
214	45.77	1.101	1O	5.0	8.500	21.458		
to		150.0		0.0	5.000	0.0		
215	70.96	0.7083		0.0	13.500	9.562		Vel = 23.91
	0.0							
	70.96					31.020		K Factor = 12.74
215	142.18	2.003	1O	10.0	4.500	31.020		
to		150.0		0.0	10.000	0.0		
220	142.18	0.1390		0.0	14.500	2.015		Vel = 14.48

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220	0.0	2.003	1O	10.0	23.000	33.035		
to		150.0		0.0	10.000	0.0		
221	142.18	0.1390		0.0	33.000	4.586		Vel = 14.48
221	0.0	2.157		0.0	7.000	37.621		
to		120.0		0.0	0.0	0.0		
222	142.18	0.1464		0.0	7.000	1.025		Vel = 12.48
222	0.0	2.157	1Bvca	7.384	1.000	38.646		
to		120.0	1Fsp	0.0	33.228	3.000		* Fixed loss = 3
223	142.18	0.1464	1S	13.537	34.228	5.011		Vel = 12.48
			1T	12.307				
223	0.0	6.357	1V	12.573	22.000	46.657		
to		120.0		0.0	12.573	9.528		
OB1	142.18	0.0008		0.0	34.573	0.026		Vel = 1.44
OB1	0.0	6.357	4V	50.294	57.500	56.211		
to		120.0		0.0	50.294	0.0		
OB2	142.18	0.0008		0.0	107.794	0.082		Vel = 1.44
OB2	0.0	6.357	1B	12.573	7.000	56.293		
to		120.0	1T	37.72	54.065	0.0		
OB3	142.18	0.0008	1G	3.772	61.065	0.046		Vel = 1.44
OB3	0.0	6.357	1V	12.573	9.000	56.339		
to		120.0		0.0	12.573	2.599		
HD1	142.18	0.0007		0.0	21.573	0.016		Vel = 1.44
HD1	0.0	6.357	1G	3.772	5.000	58.954		
to		120.0	1S	40.235	44.007	-3.465		
PO	142.18	0.0008		0.0	49.007	0.037		Vel = 1.44
	0.0							
	142.18					55.526		K Factor = 19.08
System Demand Pressure						55.526		
Safety Margin						114.481		
Continuation Pressure						170.007		
Pressure @ Pump Outlet						170.007		
Pressure From Pump Curve						-106.533		
Pressure @ Pump Inlet						63.474		
PI	0.0	6.357	2E	35.205	6.000	63.474		
to		120.0	1G	3.772	38.977	-2.599		
JN1	142.18	0.0008		0.0	44.977	0.034		Vel = 1.44
JN1	0.0	6.357	1T	37.72	1.000	60.909		
to		120.0		0.0	37.720	0.0		
JN2	142.18	0.0008		0.0	38.720	0.030		Vel = 1.44
JN2	0.0	6.357	1Zib	0.0	6.000	60.939		
to		120.0	3E	52.808	52.808	6.922		* Fixed loss = 6.922
FSA	142.18	0.0007		0.0	58.808	0.044		Vel = 1.44
FSA	0.0	8.27	1G	6.326	197.000	67.905		
to		140.0	1T	55.354	118.616	0.0		
FSAS	142.18	0.0002	2E	56.936	315.616	0.050		Vel = 0.85
FSAS	0.0	8.27	1G	6.326	186.000	67.955		
to		140.0	1T	55.354	61.680	0.0		
FSAT	142.18	0.0002		0.0	247.680	0.040		Vel = 0.85

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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
FSAT	0.0	16.32	1T	87.173	12.000	67.995			
to		100.0		0.0	87.174	0.0			
HOSE	142.18	0.0		0.0	99.174	0.001		Vel = 0.22	
HOSE	100.00	6.14	1G	2.273	5.000	67.996		Qa = 100	
to		100.0	1E	10.608	12.881	-2.166			
TEST	242.18	0.0034		0.0	17.881	0.060		Vel = 2.62	
	0.0								
	242.18					65.890		K Factor = 29.84	