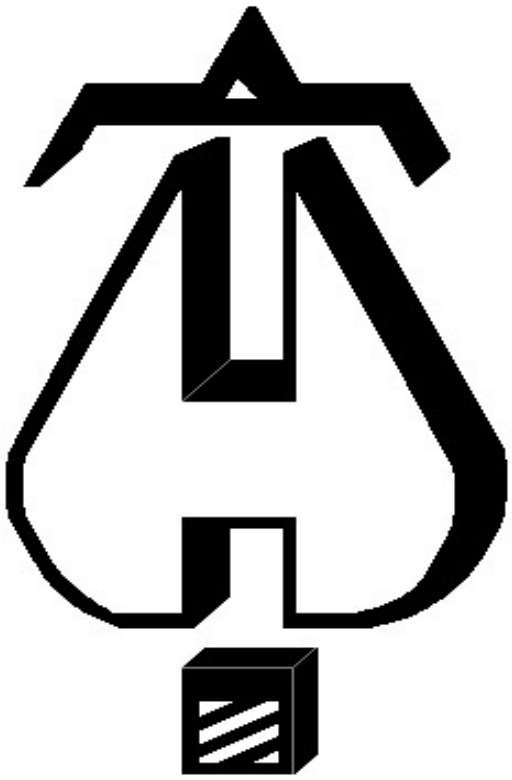


. . . Fire Protection by Computer Design

EASTERN FIRE
170 KITTYHAWK AVE. / P.O. BOX
AUBURN, ME , 04210
207-784-1507

Job Name	:	IMMUCELL
Building	:	1 OF 2
Location	:	PORTLAND
System	:	5
Contract	:	5568
Data File	:	Immucell system #2 walk in cooler.WXF

HYDRAULIC CALCULATIONS
for

Project name: IMMUCELL
Location: PORTLAND
Drawing no: 1 OF 2
Date: 2/28/17

Design

Remote area number: 5
Remote area location: LEVEL 2 WALKIN COOLER
Occupancy classification: EXTRA HAZARD
Density: .3 - Gpm/SqFt
Area of application: 440 - SqFt
Coverage per sprinkler: 80 - SqFt
Type of sprinklers calculated: DRY PENDENTS 8.OK
No. of sprinklers calculated: 6
In-rack demand: - GPM
Hose streams: 500 - GPM
Total water required (including hose streams): 598.5 - GPM @ 31.98 - Psi
Type of system: WET
Volume of dry or preaction system: - Gal

Water supply information

Date: 07-12-2016
Location: FLOW HYDRANT LOCATED ON WELCH ST. & CADDIE ST.
Source: EASTERN FIRE

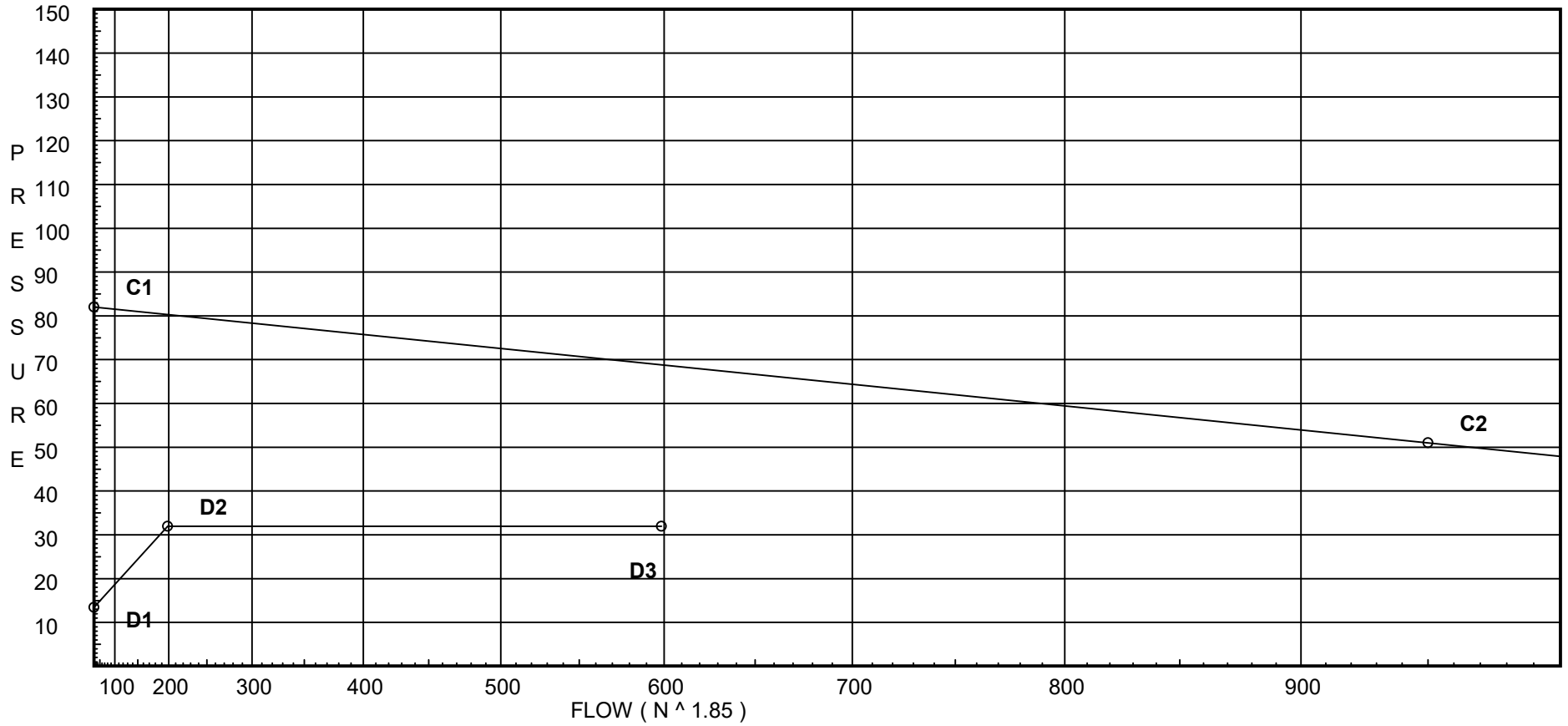
Name of contractor: EASTERN FIRE
Address: 170 KITTYHAWK AVE. / P.O. BOX / / 170 KITTYHAWK AVE. / P.O.
Phone number: 207-784-1507
Name of designer: RJP
Authority having jurisdiction: STATE FIRE MARSHAL
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve C

EASTERN FIRE
IMMUCELL

City Water Supply:
- C1 - Static Pressure : 82
- C2 - Residual Pressure: 51
- C2 - Residual Flow : 950

Demand:
- D1 - Elevation : 13.461
- D2 - System Flow : 198.511
- D2 - System Pressure : 31.974
- Hose (Demand) : 400
- D3 - System Demand : 598.511
- Safety Margin : 36.839



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
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
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
I	90' Grvd-Vic Elbow #10	0	0	2	3	4	3.5	6	5	8	7	8.5	10	13	17	20	23	25	33	36	40
J	90'Tee-Branch Grv Vic #20	0	0	4.5	6	8	8.5	10.8	13	17	16	21	25	33	41	50	65	78	88	98	120
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
Zma	Maxim M200 Horz Butt	Fitting generates a Fixed Loss Based on Flow																			

Unit 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

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP02	0.0	8	9.0	na	24.0	0.3	80	7.0
EQ02	0.0		10.09	na				
DP04	0.0	8	9.0	na	24.0	0.3	80	7.0
EQ04	0.0		10.81	na				
DP01	0.0	8	9.0	na	24.0	0.3	80	7.0
EQ01	0.0		10.09	na				
DP03	0.0	8	9.0	na	24.0	0.3	80	7.0
EQ03	0.0		10.81	na				
85	131.08	K = K @ EQ04	10.86	na	24.05			
86	131.08		11.13	na				
87	131.08		11.71	na				
88	131.08		12.92	na				
89	129.33		14.67	na				
69	130.36		14.52	na				
70	129.83		14.89	na				
TOR2	129.7		15.34	na				
HDR1	107.0		25.55	na	50.0			
BFP	102.0		27.85	na				
BASE	100.0		31.62	na				
TEST	100.0		31.97	na	400.0			
90	131.08	K = K @ EQ01	10.71	na	24.72			
91	131.08	K = K @ EQ02	10.76	na	24.78			
91A	131.08		11.06	na				
92	131.08	K = K @ EQ03	10.81	na	24.0			
93	131.08	K = K @ EQ01	11.35	na	25.45			
94	131.08	K = K @ EQ02	11.4	na	25.51			

The maximum velocity is 8.91 and it occurs in the pipe between nodes DP02 and EQ02

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
DP02	24.00	1.049	T	5.0	1.000	9.000		K Factor = 8.00
to		120.0		0.0	5.000	0.0		
EQ02	24.0	0.1823		0.0	6.000	1.094		Vel = 8.91
	0.0							
	24.00					10.094		K Factor = 7.55
DP04	24.00	1.049	E	2.0	2.920	9.000		K Factor = 8.00
to		120.0	T	5.0	7.000	0.0		
EQ04	24.0	0.1824		0.0	9.920	1.809		Vel = 8.91
	0.0							
	24.00					10.809		K Factor = 7.30
DP01	24.00	1.049	T	5.0	1.000	9.000		K Factor = 8.00
to		120.0		0.0	5.000	0.0		
EQ01	24.0	0.1823		0.0	6.000	1.094		Vel = 8.91
	0.0							
	24.00					10.094		K Factor = 7.55
DP03	24.00	1.049	T	5.0	2.920	9.000		K Factor = 8.00
to		120.0	E	2.0	7.000	0.0		
EQ03	24.0	0.1824		0.0	9.920	1.809		Vel = 8.91
	0.0							
	24.00					10.809		K Factor = 7.30
85	48.05	2.157	J	10.461	3.670	10.856		K Factor @ node EQ04
to		120.0		0.0	10.461	0.0		
86	48.05	0.0197		0.0	14.131	0.278		Vel = 4.22
86	49.51	2.635	J	14.827	6.080	11.134		
to		120.0		0.0	14.827	0.0		
87	97.56	0.0276		0.0	20.907	0.576		Vel = 5.74
87	50.95	2.635	2l	16.474	3.750	11.710		
to		120.0		0.0	16.474	0.0		
88	148.51	0.0599		0.0	20.224	1.211		Vel = 8.74
88	0.0	2.635	J	14.827	1.750	12.921		
to		120.0		0.0	14.827	0.758		
89	148.51	0.0598		0.0	16.577	0.992		Vel = 8.74
89	0.0	4.26	2l	18.434	32.250	14.671		
to		120.0		0.0	18.434	-0.446		
69	148.51	0.0058		0.0	50.684	0.292		Vel = 3.34
69	0.0	4.26		0.0	25.420	14.517		
to		120.0		0.0	0.0	0.230		
70	148.51	0.0058		0.0	25.420	0.147		Vel = 3.34
70	0.0	4.26	2l	18.434	28.260	14.894		
to		120.0	J	21.067	39.501	0.056		
TOR2	148.51	0.0058		0.0	67.761	0.391		Vel = 3.34
TOR2	0.0	4.26	B	15.8	20.000	15.341		
to		120.0	S	28.968	44.768	9.831		
HDR1	148.51	0.0058		0.0	64.768	0.374		Vel = 3.34
HDR1	50.00	4.26	I	9.217	2.000	25.546		Qa = 50.00
to		120.0	G	2.633	11.850	2.166		
BFP	198.51	0.0098		0.0	13.850	0.136		Vel = 4.47
BFP	0.0	4.26	Zma	0.0	2.000	27.848		
to		120.0	I	9.217	9.217	3.666		* Fixed Loss = 2.8
BASE	198.51	0.0099		0.0	11.217	0.111		Vel = 4.47

Final Calculations - Hazen-Williams

EASTERN FIRE
IMMUCELL

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
BASE	0.0	6.16	3I	43.037	200.000	31.625		
to		140.0	J	35.864	83.205	0.0		
TEST	198.51	0.0012	G	4.304	283.205	0.349		Vel = 2.14
	400.00							Qa = 400.00
	598.51					31.974		K Factor = 105.85
90	24.72	2.157		0.0	8.750	10.713		K Factor @ node EQ01
to		120.0		0.0	0.0	0.0		
91	24.72	0.0057		0.0	8.750	0.050		Vel = 2.17
91	24.79	2.157	J	10.461	3.667	10.763		K Factor @ node EQ02
to		120.0		0.0	10.461	0.0		
91A	49.51	0.0208		0.0	14.128	0.294		Vel = 4.35
91A	0.0	2.635		0.0	9.917	11.057		
to		120.0		0.0	0.0	0.0		
86	49.51	0.0078		0.0	9.917	0.077		Vel = 2.91
	0.0							
	49.51					11.134		K Factor = 14.84
92	24.00	2.157		0.0	8.750	10.809		K Factor @ node EQ03
to		120.0		0.0	0.0	0.0		
85	24.0	0.0054		0.0	8.750	0.047		Vel = 2.11
	0.0							
	24.00					10.856		K Factor = 7.28
93	25.45	2.157		0.0	8.750	11.347		K Factor @ node EQ01
to		120.0		0.0	0.0	0.0		
94	25.45	0.0061		0.0	8.750	0.053		Vel = 2.23
94	25.50	2.157	J	10.461	3.670	11.400		K Factor @ node EQ02
to		120.0		0.0	10.461	0.0		
87	50.95	0.0219		0.0	14.131	0.310		Vel = 4.47
	0.0							
	50.95					11.710		K Factor = 14.89