

... Fire Protection by Computer Design

EASTERN FIRE PROTECTION
170 KITTYHAWK AVE
P.O. BOX 1390
AUBURN, ME. 04210
207-784-1507

Job Name : Immucell- Freezer Addition
Drawing : 1 of 1
Location : New Freezer Addition
Remote Area : #4
Contract : AU-5216-14
Data File : Immucell Freezer Addition-Colostrum Freezer-Dry System.WXF

HYDRAULIC CALCULATIONS
for

Project name: Immucell Corporation
Location: New Freezer Addition
Drawing no: 1 of 1
Date: 11/12/14

Design

Remote area number: #4
Remote area location: Colostrum Freezer
Occupancy classification: Ordinary Group I
Density: .15 - Gpm/SqFt
Area of application: 1116 - SqFt
Coverage per sprinkler: 128 - SqFt
Type of sprinklers calculated: 3/4" TY-FRB Brass Upright K=8.0
No. of sprinklers calculated: 9
In-rack demand: - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 460.91 - GPM @ 58.05 - Psi
Type of system: Dry System
Volume of dry or preaction system: 20 - Gal

Water supply information

Date: 10/17/14
Location: Hydrants locted on Industrial Drive, See plot plan
Source: Portland Water District

Name of contractor: Eastern Fire Protection
Address: 170 Kitty Hawk Ave., Auburn, Me. 04210
Phone number: 207-784-1507
Name of designer: T. Pray
Authority having jurisdiction: S.F.M.O.
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve C

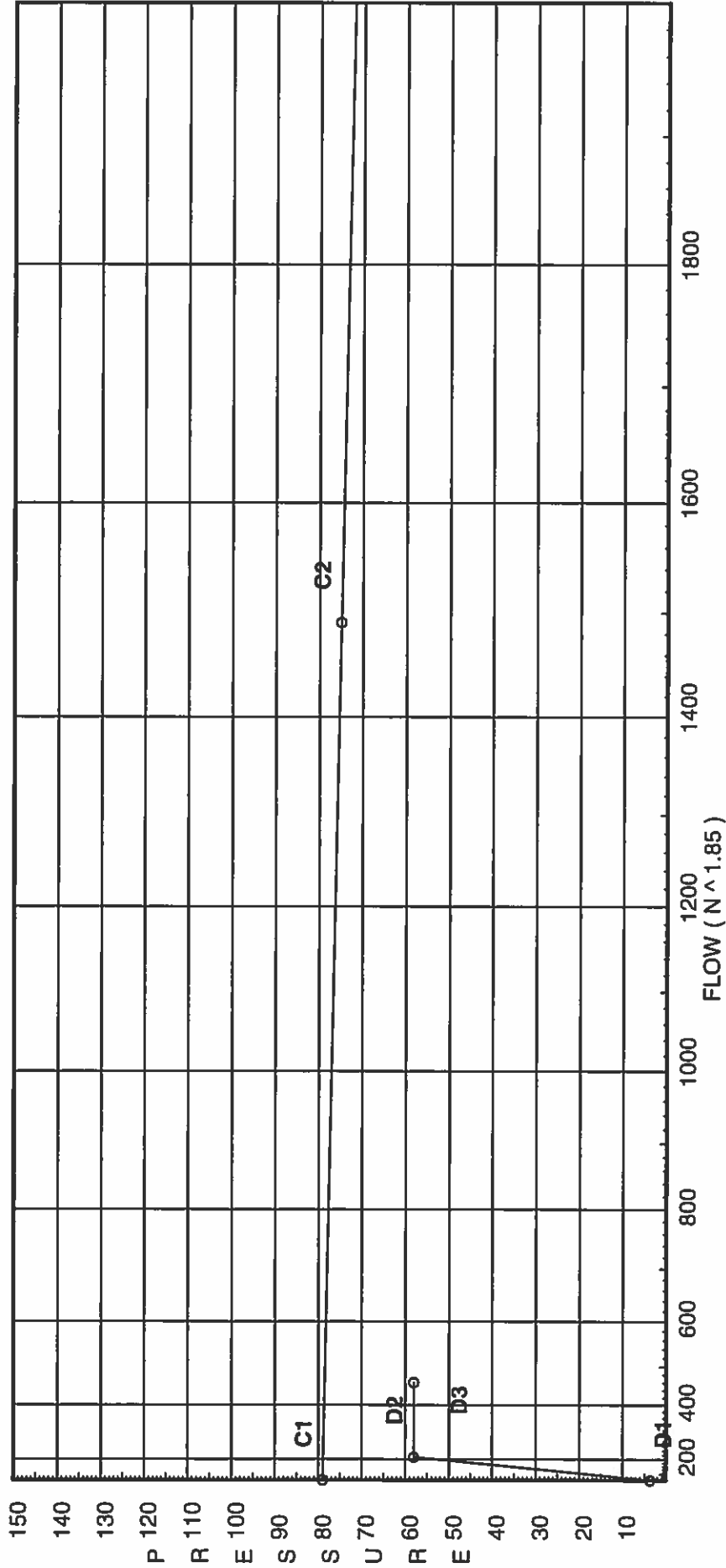
EASTERN FIRE PROTECTION
 Immuell- Freezer Addition

City Water Supply:

C1 - Static Pressure : 79
 C2 - Residual Pressure: 75
 C2 - Residual Flow : 1491

Demand:

D1 - Elevation : 3.664
 D2 - System Flow : 210.908
 D2 - System Pressure : 58.048
 Hose (Demand) : 250
 D3 - System Demand : 460.908
 Safety Margin : 20.496



Fittings Used Summary

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Fitting Legend Abbrev. Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	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
C Roff Groove Coupling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dge Dry Gem DPV-1	1	2	2	3	4	5	2.2	4.9	8	8.9	22	14	18	22	27	35	40	45	50	61
E NFPA 13 90' Standard Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
F NFPA 13 45' Elbow	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
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
S NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65	71	81	91	101	121
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

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.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	79.0	75	1491.0	78.544	460.91	58.048

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
DO01	0.0	8	9.0	24.0	
DO02	0.0	8	9.77	25.0	
150	108.46	8	7.0	21.17	
151	108.46	8	7.54	21.96	
152	108.46	8	9.54	24.71	
153	108.46	8	7.31	21.62	
154	108.46	8	7.86	22.43	
155	108.96	8	9.73	24.96	
156	108.46	8	8.35	23.12	
157	108.46	8	8.99	23.98	
158	108.46	8	11.35	26.95	
170	108.46		13.36		
171	108.46		13.9		
172	108.46		15.84		
DPV	105.0		34.35		
217	121.25		35.61		
50	121.25		37.09		
5	121.25		37.42		
51	121.25		37.46		
10	121.25		37.75		
52	121.25		37.86		
15	121.25		38.0		
53	121.25		38.27		
TOR	109.67		50.86		
BASE	101.0		57.34		
TEST	100.0		58.05	250.0	

Final Calculations - Hazen-Williams - 2007

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv.	Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
DO01 to EQ01	0 0	8.00	24.00 24.0	1 1.049	1T	5.0 0.0 0.0	0.670 5.000 5.670	120 0.1824	9.000 0.0 1.034			Vel = 8.91
EQ01			0.0 24.00						10.034		K Factor = 7.58	
DO02 to EQ02	0 0	8.00	25.00 25.0	1 1.049	1T	5.0 0.0 0.0	0.670 5.000 5.670	120 0.1966	9.766 0.0 1.115			Vel = 9.28
EQ02			0.0 25.00						10.881		K Factor = 7.58	
150 to 151	108.460 108.460	8.00	21.17 21.17	1.25 1.442		0.0 0.0 0.0	12.500 0.0 12.500	100 0.0430	7.000 0.0 0.537			Vel = 4.16
151 to 152	108.460 108.460	8.00	21.96 43.13	1.25 1.442		0.0 0.0 0.0	12.500 0.0 12.500	100 0.1605	7.537 0.0 2.006			Vel = 8.47
152 to 170	108.460 108.460	8.00	24.71 67.84	1.25 1.442	1T	5.304 0.0 0.0	5.000 5.304 10.304	100 0.3709	9.543 0.0 3.822			Vel = 13.33
170			0.0 67.84						13.365		K Factor = 18.56	
153 to 154	108.460 108.460	8.00	21.62 21.62	1.25 1.442		0.0 0.0 0.0	12.500 0.0 12.500	100 0.0447	7.305 0.0 0.559			Vel = 4.25
154 to 155	108.460 108.960	8.00	22.44 44.06	1.25 1.442		0.0 0.0 0.0	12.500 0.0 12.500	100 0.1670	7.864 -0.217 2.087			Vel = 8.66
155 to 171	108.960 108.460	8.00	24.96 69.02	1.25 1.442	1T	5.304 0.0 0.0	5.000 5.304 10.304	100 0.3828	9.734 0.217 3.944			Vel = 13.56
171			0.0 69.02						13.895		K Factor = 18.52	
156 to 157	108.460 108.460	8.00	23.12 23.12	1.25 1.442		0.0 0.0 0.0	12.500 0.0 12.500	100 0.0506	8.353 0.0 0.633			Vel = 4.54
157 to 158	108.460 108.460	8.00	23.98 47.1	1.25 1.442		0.0 0.0 0.0	12.500 0.0 12.500	100 0.1888	8.986 0.0 2.360			Vel = 9.25
158 to 172	108.460 108.460	8.00	26.95 74.05	1.25 1.442	1T	5.304 0.0 0.0	5.000 5.304 10.304	100 0.4361	11.346 0.0 4.494			Vel = 14.55
172			0.0 74.05						15.840		K Factor = 18.61	
170 to 171	108.460 108.460		67.84 67.84	2 2.157		0.0 0.0 0.0	10.170 0.0 10.170	100 0.0521	13.365 0.0 0.530			Vel = 5.96

Final Calculations - Hazen-Williams - 2007

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv.	Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	***** Notes *****
171 to 172	108.460 108.460		69.02 136.86	2 2.157		0.0 0.0	10.170 0.0	100 0.1912	13.895 0.0 1.945	Vel = 12.02
172 to DPV	108.460 105		74.05 210.91	2 2.157	5V 1B	15.371 5.27 0.0	19.340 20.641 39.981	100 0.4254	15.840 1.499 17.009	Vel = 18.52
DPV to 217	105 121.250		0.0 210.91	2.5 2.635	3V 1T 1B 1C 1Dge	17.71 16.474 9.61 1.373 3.02	24.250 48.187 72.437	120 0.1146	34.348 -7.038 8.299	Vel = 12.41
217 to 50	121.250 121.250		0.0 210.91	3 3.26	2V	13.44 0.0	23.080 13.440 36.520	120 0.0406	35.609 0.0 1.484	Vel = 8.11
50 to 5	121.250 121.250		0.0 210.91	3 3.26		0.0 0.0	8.170 0.0 8.170	120 0.0406	37.093 0.0 0.332	Vel = 8.11
5 to 51	121.250 121.250		0.0 210.91	3 3.26		0.0 0.0	0.875 0.0 0.875	120 0.0400	37.425 0.0 0.035	Vel = 8.11
51 to 10	121.250 121.250		0.0 210.91	3 3.26		0.0 0.0	7.125 0.0 7.125	120 0.0407	37.460 0.0 0.290	Vel = 8.11
10 to 52	121.250 121.250		0.0 210.91	3 3.26		0.0 0.0	2.830 0.0 2.830	120 0.0406	37.750 0.0 0.115	Vel = 8.11
52 to 15	121.250 121.250		0.0 210.91	3 3.26		0.0 0.0	3.250 0.0 3.250	120 0.0406	37.865 0.0 0.132	Vel = 8.11
15 to 53	121.250 121.250		0.0 210.91	3 3.26		0.0 0.0	6.750 0.0 6.750	120 0.0406	37.997 0.0 0.274	Vel = 8.11
53 to TOR	121.250 109.670		0.0 210.91	3 3.26	4T 6I	80.637 40.319 0.0	65.410 120.956 186.366	120 0.0406	38.271 5.015 7.572	Vel = 8.11
TOR to BASE	109.670 101		0.0 210.91	3 3.26	1B 2F 1S 1T	13.44 8.064 21.503 20.159	4.000 63.166 67.166	120 0.0406	50.858 3.755 2.729	Vel = 8.11
BASE to TEST	101 100		0.0 210.91	6 6.16	2E 1G 1T	40.168 4.304 43.037	110.000 87.509 197.509	140 0.0014	57.342 0.433 0.273	Vel = 2.27
TEST			250.00 460.91						58.048	Qa = 250.00 K Factor = 60.50