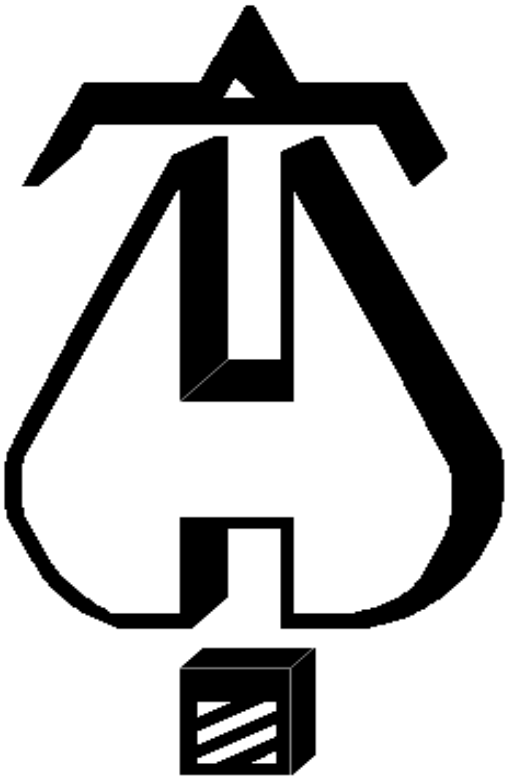


. . . Fire Protection by Computer Design

Dean and Allyn, Inc.
116 Lewiston Rd
Gray, ME 04039
(207) 657-5646

Job Name	:	Unum
Drawing	:	FP-04
Location	:	2211 Congress St. Portland, ME 04122
Remote Area	:	1
Contract	:	C171470
Data File	:	Unum C171470.WXF

HYDRAULIC CALCULATIONS
for

Project name: Unum HO 2 Restack and Consolidation
Location: 2211 Congress St. Portland, ME 04122
Drawing no: FP-04
Date: 11/20/17

Design

Remote area number: 1
Remote area location: 2nd Floor West Open Collab 2.2.C.303
Occupancy classification: Light Hazard
Density: .1 - Gpm/SqFt
Area of application: 1002 - SqFt
Coverage per sprinkler: 225 - SqFt
Type of sprinklers calculated: Reliable Model G5-56 Concealed Pendent
No. of sprinklers calculated: 10
In-rack demand: N/A - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 274.23 - GPM @ 48.8443 - Psi
Type of system: Wet
Volume of dry or preaction system: N/A - Gal

Water supply information

Date: Sept. 2012
Location: Unum Hyd. #6 Congress St. and Johnson Rd.
Source: Hydrant Flow Data

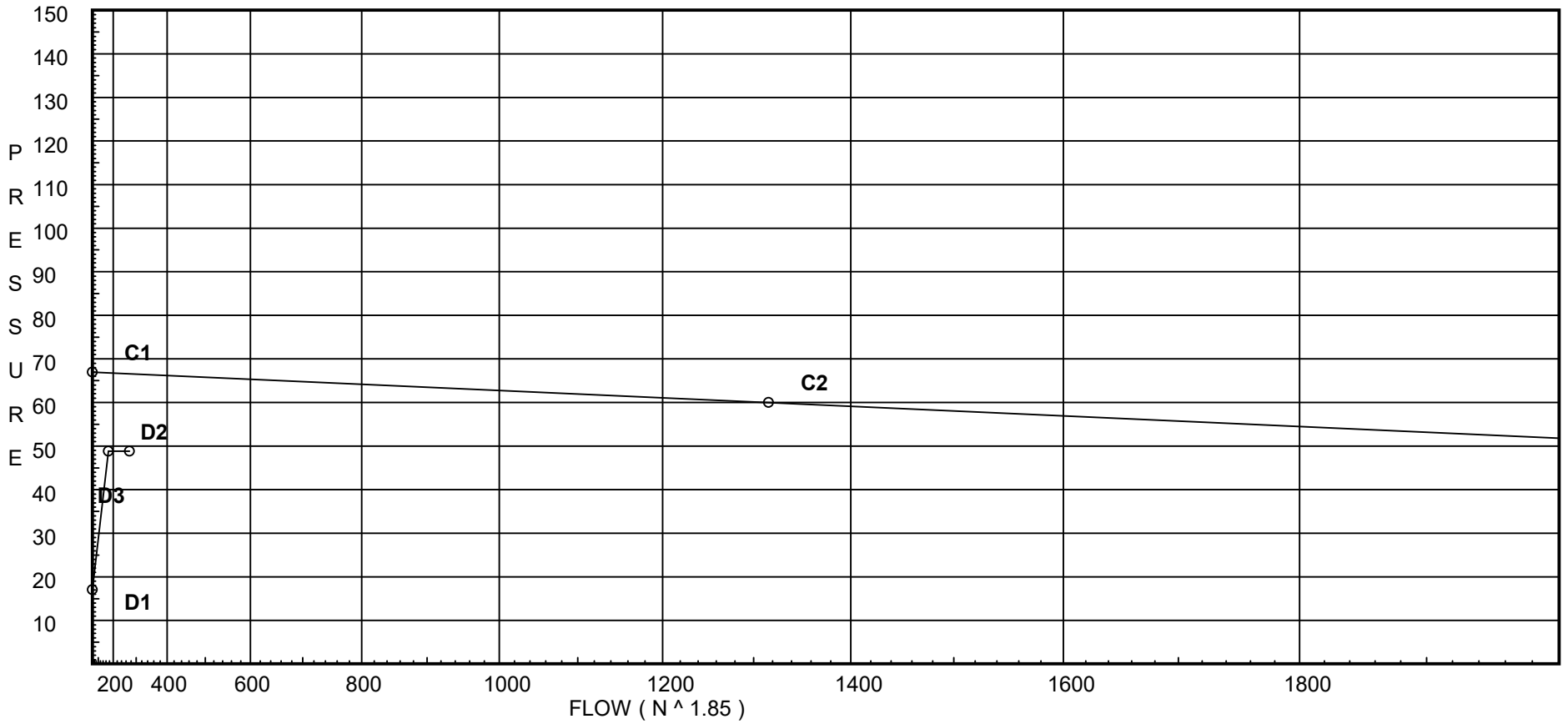
Name of contractor: Dean and Allyn, Inc.
Address: 116 Lewiston Rd / Your Street Address 2 / Gray, ME 04039
Phone number: (207) 657-5646
Name of designer: ZJG
Authority having jurisdiction: State of Maine Fire Dept.
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve C

Dean and Allyn, Inc.
Unum

City Water Supply:
- C1 - Static Pressure : 67
- C2 - Residual Pressure: 60
- C2 - Residual Flow : 1316

Demand:
- D1 - Elevation : 17.035
- D2 - System Flow : 174.23
- D2 - System Pressure : 48.844
- Hose (Demand) : 100
- D3 - System Demand : 274.23
- Safety Margin : 17.771



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
A	Alarm Rel E1 & E3							7.7	21.5		17		27	29							
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
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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
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
Y	Mechanical Tee	2	4	5	6	8	10.5	12.5	15.5	0	22	0	0	0	0	0	0	0	0	0	0

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.
1	39.333	5.6	9.02	na	16.82	0.1	144	7.0
2	39.708		11.13	na				
3	40.042		11.27	na				
5	39.333	5.6	8.08	na	15.92	0.1	49	7.0
6	39.708		9.96	na				
7	39.333	5.6	9.11	na	16.91	0.1	89	7.0
8	40.042		10.33	na				
4	40.042		11.77	na				
9	40.042		12.07	na				
10	39.333	5.6	9.75	na	17.48	0.1	118	7.0
11	39.708		12.02	na				
12	39.333	5.6	10.4	na	18.06	0.1	85	7.0
13	40.042		12.68	na				
14	40.042		14.7	na				
16	39.333	5.6	9.88	na	17.6	0.1	176	7.0
17	39.708		11.56	na				
19	39.333	5.6	7.87	na	15.71	0.1	120	7.0
20	39.708		9.7	na				
21	39.333	5.6	9.31	na	17.08	0.1	168	7.0
22	40.042		10.56	na				
18	40.042		11.97	na				
23	40.042		12.29	na				
24	39.333	5.6	12.3	na	19.64	0.1	170	7.0
25	39.708		14.4	na				
26	40.042		14.93	na				
28	39.333	5.6	11.52	na	19.01	0.1	176	7.0
29	40.042		13.7	na				
30	40.042		15.7	na				
15	40.042		14.94	na				
27	40.042		15.24	na				
31	40.042		16.18	na				
32	40.042		19.51	na				
33	40.042		24.89	na				
34	40.042		26.95	na				
35	40.042		27.24	na				
36	13.25		40.71	na				
37	13.25		40.98	na				
38	13.25		41.36	na				
39	13.25		41.64	na				
40	13.25		42.0	na				
41	12.792		42.29	na				
42	12.792		42.33	na				
43	12.792		42.4	na				
TR	3.208		46.61	na				
BR	3.208		46.98	na				
MAN	-6.0		51.28	na				
UG	-6.0		51.31	na				
UG1	-6.0		51.32	na				
UG2	-6.0		51.36	na				
UG3	14.0		42.73	na				
TEST	0.0		48.84	na	100.0			

The maximum velocity is 13.2 and it occurs in the pipe between nodes 13 and 14

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
1	16.82	1.049		0.0	24.000	9.024		K Factor = 5.60
to		120.0		0.0	0.0	-0.162		
2	16.82	0.0945		0.0	24.000	2.268		Vel = 6.24
2	0.0	1.049	E	2.0	1.000	11.130		
to		120.0		0.0	2.000	-0.145		
3	16.82	0.0947		0.0	3.000	0.284		Vel = 6.24
3	0.0	1.049	T	5.0	0.333	11.269		
to		120.0		0.0	5.000	0.0		
4	16.82	0.0943		0.0	5.333	0.503		Vel = 6.24
	0.0							
	16.82					11.772		K Factor = 4.90
5	15.92	1.049		0.0	24.000	8.080		K Factor = 5.60
to		120.0		0.0	0.0	-0.162		
6	15.92	0.0853		0.0	24.000	2.047		Vel = 5.91
6	0.0	1.049	T	5.0	1.000	9.965		
to		120.0		0.0	5.000	-0.145		
8	15.92	0.0853		0.0	6.000	0.512		Vel = 5.91
	0.0							
	15.92					10.332		K Factor = 4.95
7	16.91	1.049		0.0	16.000	9.114		K Factor = 5.60
to		120.0		0.0	0.0	-0.307		
8	16.91	0.0953		0.0	16.000	1.525		Vel = 6.28
8	15.91	1.049	T	5.0	0.333	10.332		
to		120.0		0.0	5.000	0.0		
9	32.82	0.3255		0.0	5.333	1.736		Vel = 12.18
	0.0							
	32.82					12.068		K Factor = 9.45
4	16.82	1.38		0.0	11.875	11.772		
to		120.0		0.0	0.0	0.0		
9	16.82	0.0249		0.0	11.875	0.296		Vel = 3.61
9	32.83	1.38	T	6.0	9.583	12.068		
to		120.0		0.0	6.000	0.0		
15	49.65	0.1840		0.0	15.583	2.867		Vel = 10.65
	0.0							
	49.65					14.935		K Factor = 12.85
10	17.48	1.049		0.0	24.000	9.745		K Factor = 5.60
to		120.0		0.0	0.0	-0.162		
11	17.48	0.1015		0.0	24.000	2.435		Vel = 6.49
11	0.0	1.049	T	5.0	3.000	12.018		
to		120.0		0.0	5.000	-0.145		
13	17.48	0.1014		0.0	8.000	0.811		Vel = 6.49
	0.0							
	17.48					12.684		K Factor = 4.91
12	18.06	1.049		0.0	24.000	10.405		K Factor = 5.60
to		120.0		0.0	0.0	-0.307		
13	18.06	0.1078		0.0	24.000	2.586		Vel = 6.70
13	17.49	1.049	T	5.0	0.333	12.684		
to		120.0		0.0	5.000	0.0		
14	35.55	0.3771		0.0	5.333	2.011		Vel = 13.20

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
14	0.0	1.38		0.0	2.417	14.695		
to		120.0		0.0	0.0	0.0		
15	35.55	0.0993		0.0	2.417	0.240		Vel = 7.63
	0.0							
	35.55					14.935		K Factor = 9.20
16	17.60	1.049	E	2.0	16.000	9.878		K Factor = 5.60
to		120.0		0.0	2.000	-0.162		
17	17.6	0.1027		0.0	18.000	1.848		Vel = 6.53
17	0.0	1.049	T	5.0	0.333	11.564		
to		120.0		0.0	5.000	-0.145		
18	17.6	0.1028		0.0	5.333	0.548		Vel = 6.53
	0.0							
	17.60					11.967		K Factor = 5.09
19	15.71	1.049		0.0	24.000	7.867		K Factor = 5.60
to		120.0		0.0	0.0	-0.162		
20	15.71	0.0832		0.0	24.000	1.997		Vel = 5.83
20	0.0	1.049	T	5.0	7.000	9.702		
to		120.0		0.0	5.000	-0.145		
22	15.71	0.0832		0.0	12.000	0.999		Vel = 5.83
	0.0							
	15.71					10.556		K Factor = 4.84
21	17.08	1.049		0.0	16.000	9.307		K Factor = 5.60
to		120.0		0.0	0.0	-0.307		
22	17.08	0.0972		0.0	16.000	1.556		Vel = 6.34
22	15.71	1.049	T	5.0	0.333	10.556		
to		120.0		0.0	5.000	0.0		
23	32.79	0.3248		0.0	5.333	1.732		Vel = 12.17
	0.0							
	32.79					12.288		K Factor = 9.35
18	17.60	1.38		0.0	11.875	11.967		
to		120.0		0.0	0.0	0.0		
23	17.6	0.0270		0.0	11.875	0.321		Vel = 3.78
23	32.79	1.38	T	6.0	9.583	12.288		
to		120.0		0.0	6.000	0.0		
27	50.39	0.1892		0.0	15.583	2.948		Vel = 10.81
	0.0							
	50.39					15.236		K Factor = 12.91
24	19.64	1.049	E	2.0	16.000	12.302		K Factor = 5.60
to		120.0		0.0	2.000	-0.162		
25	19.64	0.1258		0.0	18.000	2.265		Vel = 7.29
25	0.0	1.049	T	5.0	0.333	14.405		
to		120.0		0.0	5.000	-0.145		
26	19.64	0.1260		0.0	5.333	0.672		Vel = 7.29
26	0.0	1.049		0.0	2.417	14.932		
to		120.0		0.0	0.0	0.0		
27	19.64	0.1258		0.0	2.417	0.304		Vel = 7.29
	0.0							

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
	19.64					15.236		K Factor = 5.03
28	19.00	1.049	T	5.0	16.000	11.518		K Factor = 5.60
to		120.0		0.0	5.000	-0.307		
29	19.0	0.1184		0.0	21.000	2.486		Vel = 7.05
29	0.0	1.049	T	5.0	11.875	13.697		
to		120.0		0.0	5.000	0.0		
30	19.0	0.1184		0.0	16.875	1.998		Vel = 7.05
30	0.0	1.38	T	6.0	9.583	15.695		
to		120.0		0.0	6.000	0.0		
31	19.0	0.0311		0.0	15.583	0.485		Vel = 4.08
	0.0							
	19.00					16.180		K Factor = 4.72
15	85.19	2.635		0.0	14.042	14.935		
to		120.0		0.0	0.0	0.0		
27	85.19	0.0214		0.0	14.042	0.301		Vel = 5.01
27	70.03	2.635		0.0	14.542	15.236		
to		120.0		0.0	0.0	0.0		
31	155.22	0.0649		0.0	14.542	0.944		Vel = 9.13
31	19.01	2.635	T	16.474	16.625	16.180		
to		120.0	E	8.237	24.711	0.0		
32	174.23	0.0805		0.0	41.336	3.326		Vel = 10.25
32	0.0	2.635	T	16.474	50.417	19.506		
to		120.0		0.0	16.474	0.0		
33	174.23	0.0804		0.0	66.891	5.381		Vel = 10.25
33	0.0	4.26	T	26.334	108.458	24.887		
to		120.0	10E	131.671	158.005	0.0		
34	174.23	0.0078		0.0	266.463	2.067		Vel = 3.92
34	0.0	4.26	E	13.167	23.167	26.954		
to		120.0		0.0	13.167	0.0		
35	174.23	0.0077		0.0	36.334	0.281		Vel = 3.92
35	0.0	4.26	Y	28.968	64.708	27.235		
to		120.0	5T	131.671	176.439	11.604		
36	174.23	0.0078	G	2.633	241.147	1.870		Vel = 3.92
			E	13.167				
36	0.0	5.295	E	15.158	53.583	40.709		
to		120.0	T	31.579	46.737	0.0		
37	174.23	0.0027		0.0	100.320	0.269		Vel = 2.54
37	0.0	5.295	E	15.158	128.583	40.978		
to		120.0		0.0	15.158	0.0		
38	174.23	0.0027		0.0	143.741	0.387		Vel = 2.54
38	0.0	5.295	E	15.158	86.708	41.365		
to		120.0		0.0	15.158	0.0		
39	174.23	0.0027		0.0	101.866	0.274		Vel = 2.54
39	0.0	5.295	E	15.158	117.625	41.639		
to		120.0		0.0	15.158	0.0		
40	174.23	0.0027		0.0	132.783	0.357		Vel = 2.54
40	0.0	5.295	E	15.158	19.250	41.996		
to		120.0		0.0	15.158	0.198		
41	174.23	0.0027		0.0	34.408	0.092		Vel = 2.54

Final Calculations - Hazen-Williams

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
41	0.0	5.295	E	15.158	0.542	42.286		
to		120.0		0.0	15.158	0.0		
42	174.23	0.0027		0.0	15.700	0.043		Vel = 2.54
42	0.0	5.295	E	15.158	10.208	42.329		
to		120.0		0.0	15.158	0.0		
43	174.23	0.0027		0.0	25.366	0.068		Vel = 2.54
43	0.0	5.295	E	15.158	9.667	42.397		
to		120.0		0.0	15.158	4.151		
TR	174.23	0.0027		0.0	24.825	0.066		Vel = 2.54
TR	0.0	4.26	G	2.633	9.583	46.614		
to		120.0	A	22.384	38.184	0.0		
BR	174.23	0.0078	E	13.167	47.767	0.371		Vel = 3.92
BR	0.0	4.26	T	26.334	8.021	46.985		
to		120.0	Eql	5.267	31.601	3.988		
MAN	174.23	0.0077		0.0	39.622	0.307		Vel = 3.92
MAN	0.0	6.16	E	20.084	9.208	51.280		
to		140.0		0.0	20.084	0.0		
UG	174.23	0.0010		0.0	29.292	0.028		Vel = 1.88
UG	0.0	6.16	F	10.042	7.000	51.308		
to		140.0		0.0	10.042	0.0		
UG1	174.23	0.0010		0.0	17.042	0.017		Vel = 1.88
UG1	0.0	6.16	E	20.084	14.458	51.325		
to		140.0		0.0	20.084	0.0		
UG2	174.23	0.0010		0.0	34.542	0.033		Vel = 1.88
UG2	0.0	8.27	F	14.234	136.292	51.358		
to		140.0		0.0	14.234	-8.662		
UG3	174.23	0.0002		0.0	150.526	0.035		Vel = 1.04
UG3	0.0	8.27	T	55.354	161.542	42.731		
to		140.0		0.0	55.354	6.063		
TEST	174.23	0.0002		0.0	216.896	0.050		Vel = 1.04
	100.00							Qa = 100.00
	274.23					48.844		K Factor = 39.24