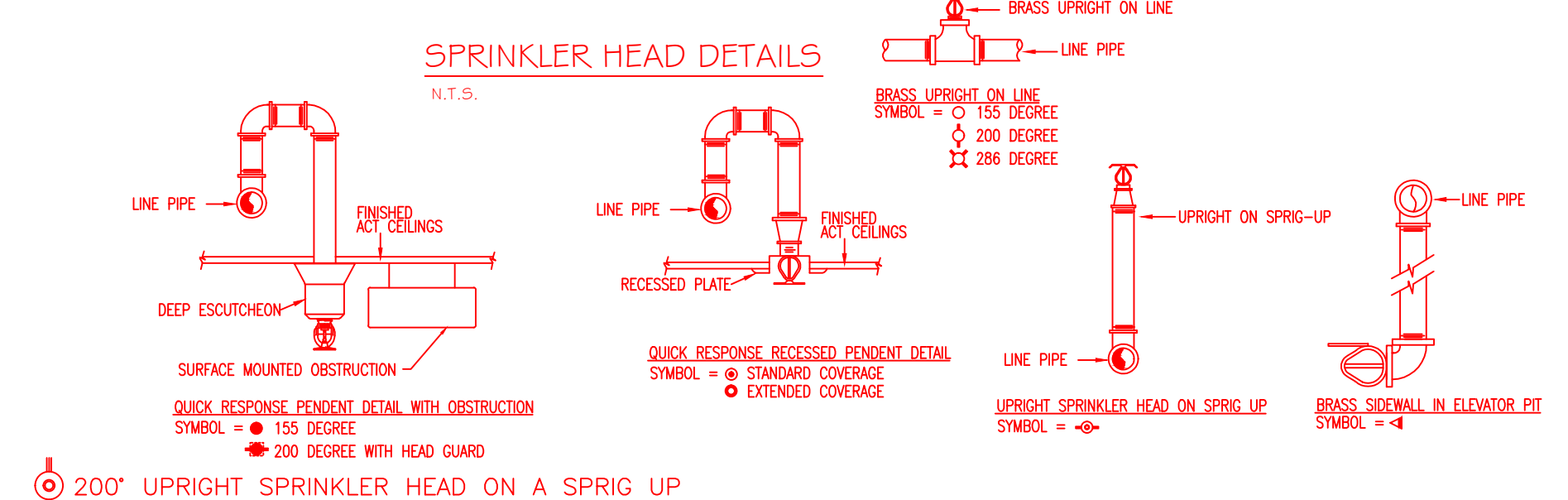


### FIRST FLOOR SPRINKLER PLAN

SCALE: 1/8" = 1'-0"  
 FINISH FLOOR ELEV. 105.0'  
 UNLESS OTHERWISE SPECIFIED

WET SYSTEM		WET SYSTEM		WET SYSTEM	
HYDRAULIC DATA NAMEPLATE		HYDRAULIC DATA NAMEPLATE		HYDRAULIC DATA NAMEPLATE	
This Building is protected by a hydraulically designed Automatic Sprinkler System					
Location	AREA-5	Location	AREA-6	Location	AREA-7
No. of Sprinkler	10	No. of Sprinkler	6	No. of Sprinkler	12
Basis of design					
1. Density	15 gpm/ft <sup>2</sup>	1. Density	10 gpm/ft <sup>2</sup>	1. Density	15 gpm/ft <sup>2</sup>
2. Design area	ENTIRE	2. Design area	900	2. Design area	900
System Demand					
1. Water Flow Rate					
Base	205.70 gpm	Base	113.72 gpm	Base	248.70 gpm
2. Residual Pressure					
Base	39.445 psi	Base	41.818 psi	Base	57.225 psi
CUSHION = 13.02 psi					
NOT MOST REMOTE		NOT MOST REMOTE		MOST REMOTE	



SYMBOL	MAKE	MODEL	SIN	FINISH	TYPE	TEMP	NPT	ORIFICE	K-FACTOR	TOTAL
○	RELIABLE	F1FR 56	RA1414	WHITE	RECESSED PENDENT	155° F	1/2"	1/2"	5.6	300
○	RELIABLE	F1FR 56	RA1414	WHITE	RECESSED UPRIGHT	200° F	1/2"	1/2"	5.6	8
○	RELIABLE	F1FR 56	RA1425	BRONZE	UPRIGHT	200° F	1/2"	1/2"	5.6	245
○	RELIABLE	F1FR 56	RA1414	WHITE	DEEP BELL PENDENT	155° F	1/2"	1/2"	5.6	4
○	RELIABLE	F1FR 56	RA1414	WHITE	DEEP BELL PENDENT	200° F	1/2"	1/2"	5.6	4
○	RELIABLE	J112	RA7216	WHITE	RECESSED PENDENT	155° F	3/4"	3/4"	11.2	4
○	RELIABLE	F3QR	RS714	WHITE	DRY PENDENT	155° F	1"	1/2"	5.6	4
○	RELIABLE	F1FR 56	RA1435	BRONZE	HORIZONTAL	200° F	1/2"	1/2"	5.6	1
○	RELIABLE	F3QR	RS734	CHROME	UPRIGHT	200° F	1"	1/2"	5.6	3
TOTAL										573

SPRINKLER SYSTEMS INC.  
 LICENSE # 093  
 R.M.S.# 442  
 PERMIT # ????  
 P.O. BOX 1285  
 LEWISTON MAINE  
 04243-1285

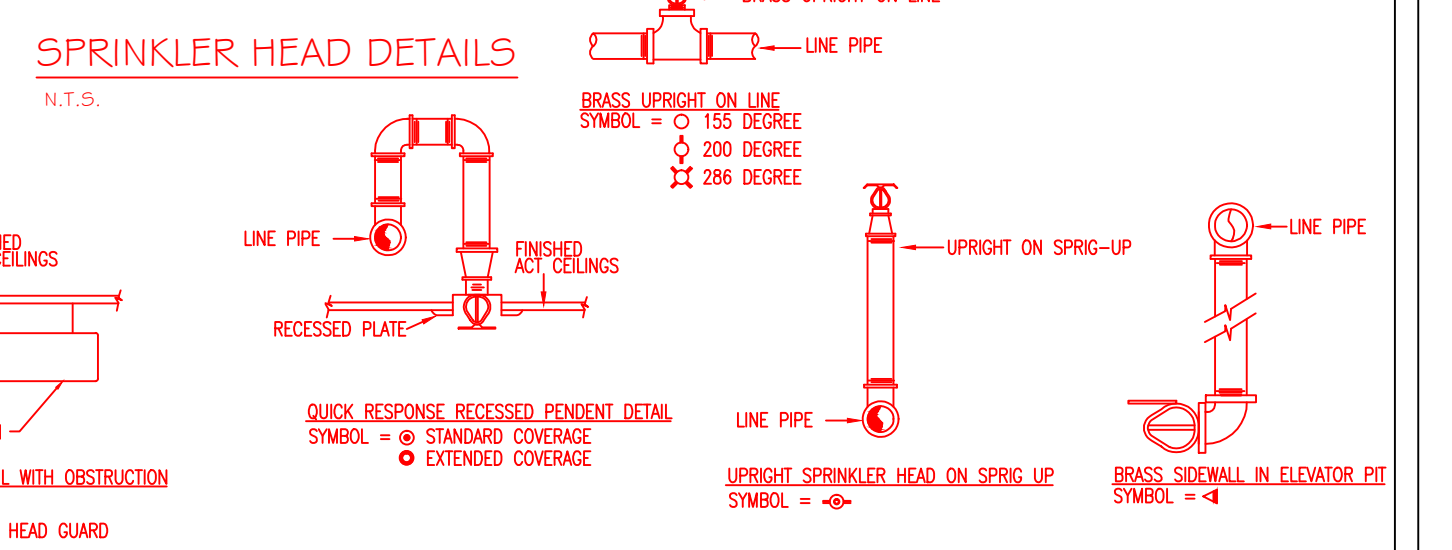
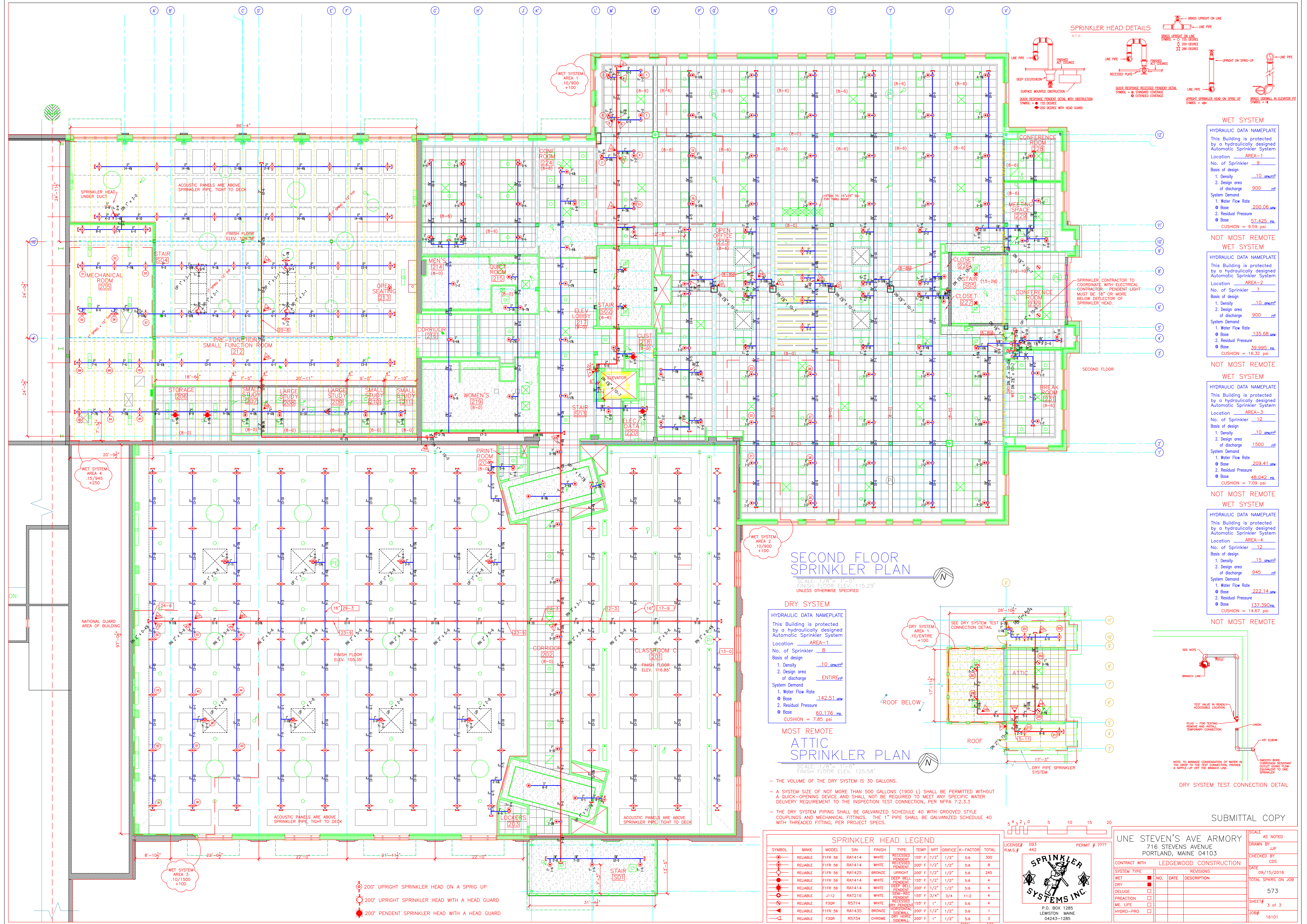
UNE STEVEN'S AVE ARMORY  
 716 STEVENS AVENUE  
 PORTLAND, MAINE 04103

CONTRACT WITH LEDGEWOOD CONSTRUCTION

SYSTEM TYPE	NO.	DATE	REVISIONS DESCRIPTION
WET			
DRY			
DELUGE			
PREACTION			
ME. LIFE			
HYDRO-PRO			

DATE: 09/15/2016  
 TOTAL SPKRS ON JOB: 573  
 SHEET# 2 of 3  
 JOB# 16101

SUBMITTAL COPY



**WET SYSTEM**

HYDRAULIC DATA NAMEPLATE  
 This Building is protected by a hydraulically designed Automatic Sprinkler System  
 Location AREA-1  
 No. of Sprinkler 9  
 Basis of design  
 1. Density 1.10 gpm/sqft  
 2. Design area of discharge 900 sqft  
 System Demand  
 1. Water Flow Rate 200.06 gpm  
 2. Residual Pressure 57.425 psi  
 CUSHION = 9.59 psi

**NOT MOST REMOTE WET SYSTEM**

HYDRAULIC DATA NAMEPLATE  
 This Building is protected by a hydraulically designed Automatic Sprinkler System  
 Location AREA-2  
 No. of Sprinkler 7  
 Basis of design  
 1. Density 1.10 gpm/sqft  
 2. Design area of discharge 900 sqft  
 System Demand  
 1. Water Flow Rate 135.68 gpm  
 2. Residual Pressure 39.995 psi  
 CUSHION = 16.32 psi

**NOT MOST REMOTE WET SYSTEM**

HYDRAULIC DATA NAMEPLATE  
 This Building is protected by a hydraulically designed Automatic Sprinkler System  
 Location AREA-3  
 No. of Sprinkler 12  
 Basis of design  
 1. Density 1.10 gpm/sqft  
 2. Design area of discharge 1500 sqft  
 System Demand  
 1. Water Flow Rate 209.41 gpm  
 2. Residual Pressure 48.042 psi  
 CUSHION = 7.09 psi

**NOT MOST REMOTE WET SYSTEM**

HYDRAULIC DATA NAMEPLATE  
 This Building is protected by a hydraulically designed Automatic Sprinkler System  
 Location AREA-4  
 No. of Sprinkler 12  
 Basis of design  
 1. Density 1.15 gpm/sqft  
 2. Design area of discharge 945 sqft  
 System Demand  
 1. Water Flow Rate 222.14 gpm  
 2. Residual Pressure 137.390 psi  
 CUSHION = 14.67 psi

**SECOND FLOOR SPRINKLER PLAN**

SCALE: 1/8" = 1'-0"  
 FINISH FLOOR ELEV. 115.29'  
 UNLESS OTHERWISE SPECIFIED

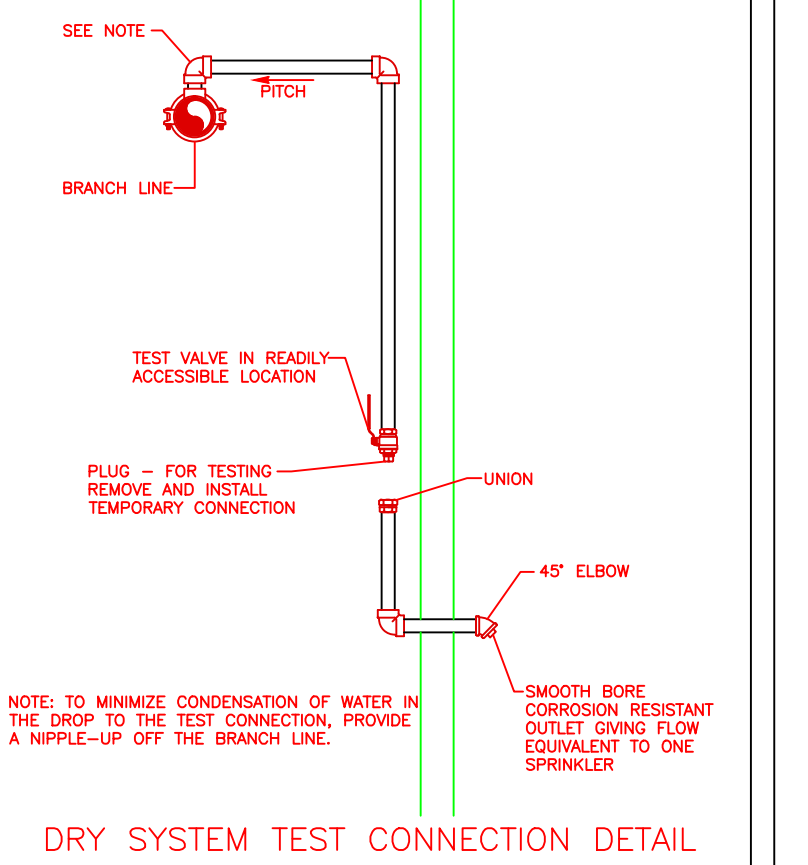
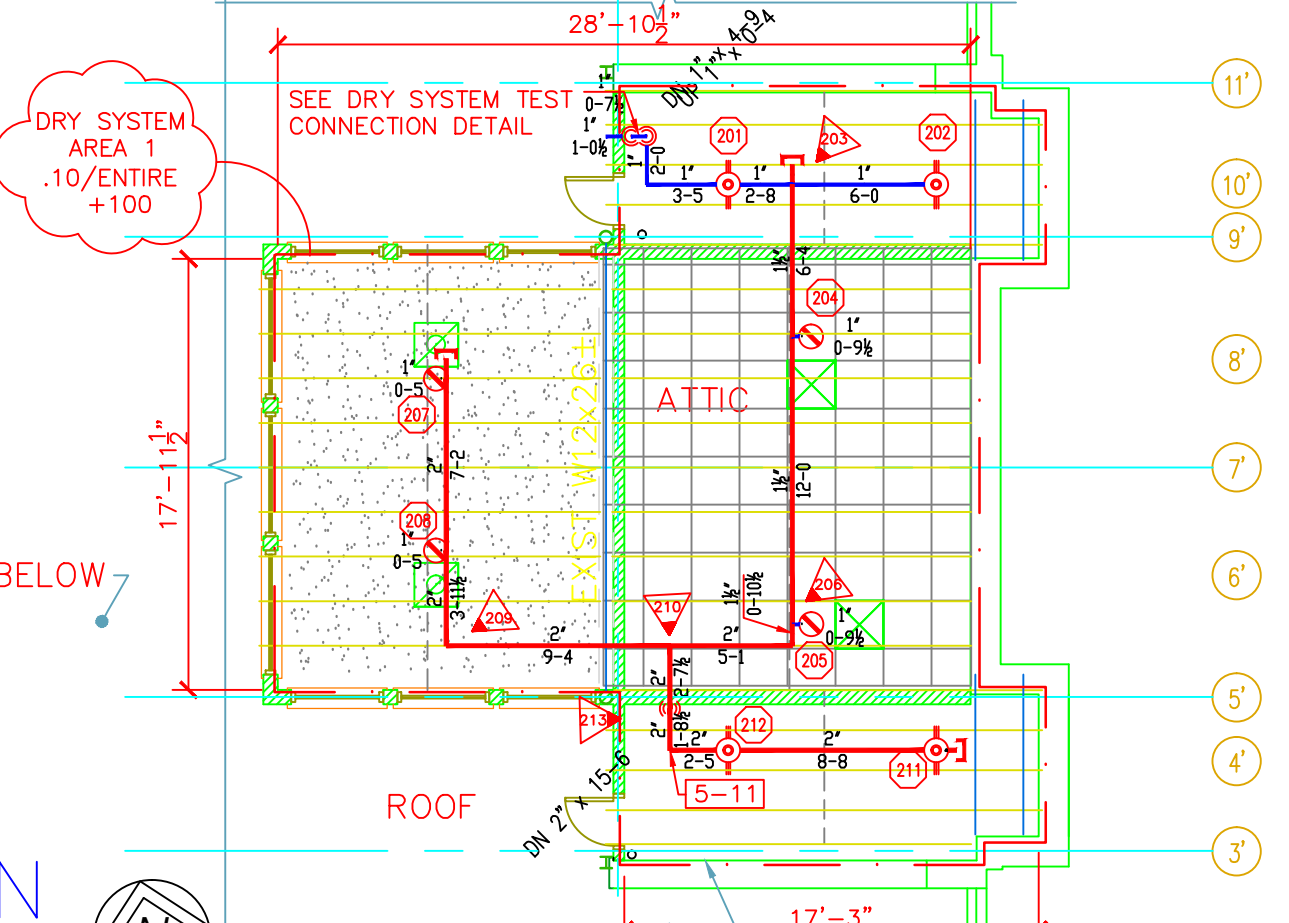
**DRY SYSTEM**

HYDRAULIC DATA NAMEPLATE  
 This Building is protected by a hydraulically designed Automatic Sprinkler System  
 Location AREA-1  
 No. of Sprinkler 8  
 Basis of design  
 1. Density 1.10 gpm/sqft  
 2. Design area of discharge ENTIRE sqft  
 System Demand  
 1. Water Flow Rate 142.51 gpm  
 2. Residual Pressure 60.176 psi  
 CUSHION = 7.89 psi

**MOST REMOTE ATTIC SPRINKLER PLAN**

SCALE: 1/8" = 1'-0"  
 FINISH FLOOR ELEV. 125.56'

- THE VOLUME OF THE DRY SYSTEM IS 30 GALLONS.
- A SYSTEM SIZE OF NOT MORE THAN 500 GALLONS (1900 L) SHALL BE PERMITTED WITHOUT A QUICK-OPENING DEVICE AND SHALL NOT BE REQUIRED TO MEET ANY SPECIFIC WATER DELIVERY REQUIREMENT TO THE INSPECTION TEST CONNECTION, PER NFPA 7.2.3.3
- THE DRY SYSTEM PIPING SHALL BE GALVANIZED SCHEDULE 40 WITH GROOVED STYLE COUPLINGS AND MECHANICAL FITTINGS. THE 1" PIPE SHALL BE GALVANIZED SCHEDULE 40 WITH THREADED FITTING, PER PROJECT SPECS.



**SPRINKLER HEAD LEGEND**

SYMBOL	MAKE	MODEL	SIN	FINISH	TYPE	TEMP	NPT	ORIFICE	K-FACTOR	TOTAL
○	RELIABLE	F1R 56	RA1414	WHITE	RECESSED PENDENT	155° F	1/2"	1/2"	5.6	300
○	RELIABLE	F1R 56	RA1414	WHITE	RECESSED PENDENT	200° F	1/2"	1/2"	5.6	8
○	RELIABLE	F1R 56	RA1425	BRONZE	UPRIGHT	200° F	1/2"	1/2"	5.6	245
○	RELIABLE	F1R 56	RA1414	WHITE	DEEP BELL PENDENT	155° F	1/2"	1/2"	5.6	4
○	RELIABLE	F1R 56	RA1414	WHITE	DEEP BELL PENDENT	200° F	1/2"	1/2"	5.6	4
○	RELIABLE	J112	RA7216	WHITE	RECESSED PENDENT	155° F	3/4"	3/4"	11.2	4
○	RELIABLE	F3QR	R5714	WHITE	RECESSED PENDENT	155° F	1"	1/2"	5.6	4
○	RELIABLE	F1R 56	RA1435	BRONZE	UPRIGHT	200° F	1/2"	1/2"	5.6	1
○	RELIABLE	F3QR	R5734	CHROME	UPRIGHT	200° F	1"	1/2"	5.6	3
<b>TOTAL</b>										<b>573</b>

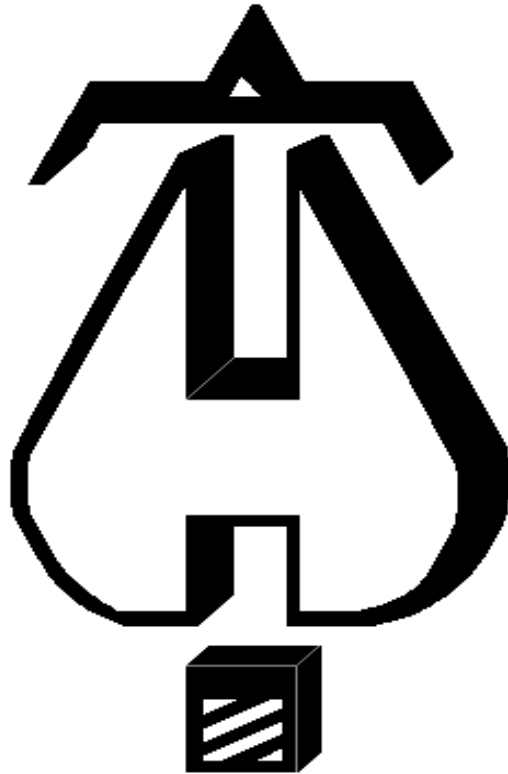
SPRINKLER SYSTEMS INC.  
 P.O. BOX 1285  
 LEWISTON MAINE  
 04243-1285

**UNE STEVEN'S AVE ARMORY**  
 716 STEVENS AVENUE  
 PORTLAND, MAINE 04103

CONTRACT WITH LEDGEWOOD CONSTRUCTION

DATE: 09/15/2016  
 TOTAL SPIKERS ON JOB: 573  
 SHEET# 3 of 3  
 JOB# 16101

- 200' UPRIGHT SPRINKLER HEAD ON A SPRING UP
- 200' UPRIGHT SPRINKLER HEAD WITH A HEAD GUARD
- 200' PENDENT SPRINKLER HEAD WITH A HEAD GUARD



**. . . Fire Protection by Computer Design**

SPRINKLER SYSTEMS INC.  
4 AVON STREET  
P O BOX 1285  
LEWISTON, ME. 04243  
207-782-0104

Job Name : UNE Armory Wet System Area 1  
Building : Existing  
Location : 716 Steven's Ave Portland, Maine  
System : 1 Wet  
Contract : 16-101  
Data File : UNE Armory Area 1.WXF

Hydraulic Design Information Sheet

Name - UNE Armory Wet System Area 1 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 1 Wet  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Light Hazard Offices

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E				
M	Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
	Density	- .10	(X) Wet	Make Reliable
D	Area Per Sprinkler	- 196	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet	- 124	( ) Deluge	Size 1/2" X 1/2"
S	Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155 Deg.
G	Hose Allowance - Outside	- 100		

N Note

Calculation Flow Required - 200.06 Press Required - 57.425 At Base  
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 03/16/2016		Cap. -
T	Time of Test - AM	Rated Cap.-	Elev.-
E	Static Press - 70	@ Press -	
R	Residual Press - 50	Elev. -	Well
	Flow - 900		Proof Flow
S	Elevation - 100		

U Location - On Site

P Source of Information - Owner and Water District

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
	( ) Single Row	( ) Conven. Pallet	( ) Auto. Storage ( ) Encap.
S	( ) Double Row	( ) Slave Pallet	( ) Solid Shelf ( ) Non
T	( ) Mult. Row		( ) Open Shelf

R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

E Horizontal Barriers Provided:

# Fittings Used Summary

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 1

Page 2  
Date

Fitting Legend		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
Bvcb	B Fly Vic 705W	0	0	0	0	0	0	5	5	0	12	12	8	11	12	14	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
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
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
Zac	Ames 2000SS	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

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 1

Page 3  
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	12.25	na	19.6	0.1	196	7.0
15	124.0	K = K @ ARM	30.4	na	29.21			
16	124.0	K = K @ ARM	30.79	na	29.39			
17	124.0		33.98	na				
B	124.0		35.87	na				
BB	113.5		40.57	na				
13	124.0	5.6	14.58	na	21.38	0.1	196	7.0
11	124.0	5.6	13.32	na	20.44	0.1	196	7.0
9	124.0	5.6	13.01	na	20.2	0.1	196	7.0
7	124.0	5.6	12.42	na	19.74	0.1	196	7.0
5	124.0	5.6	12.9	na	20.11	0.1	196	7.0
3	124.0	5.6	12.75	na	20.0	0.1	196	7.0
1	124.0	5.6	12.25	na	19.6	0.1	196	7.0
2	124.0		14.69	na				
4	124.0		14.7	na				
6	124.0		14.87	na				
8	124.0		14.9	na				
10	124.0		15.39	na				
12	124.0		15.55	na				
14	124.0		17.23	na				
A	124.0		29.02	na				
AA	113.5		37.51	na				
AAA	103.0		43.73	na				
BBB	103.0		45.56	na				
CCC	103.0		46.29	na				
DDD	103.0		47.02	na				
A3	103.0		48.85	na				
A4	103.0		48.95	na				
A5	103.0		51.43	na				
A6	103.0		51.84	na				
TI	103.0		51.86	na				
DTI	103.0		51.87	na				
BAV	103.0		53.0	na				
TAV	103.0		53.04	na				
BKFL	102.0		53.53	na				
BASE	100.0		57.42	na				
HOSE	100.0		57.72	na	100.0			
TEST	100.0		57.78	na				

The maximum velocity is 13.53 and it occurs in the pipe between nodes 14 and A

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 1

Page 4  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to ARM	19.60 19.6	1.049 120.0 0.1254	2E T	4.0 5.0 0.0	2.500 9.000 11.500	12.250 0.0 1.442			K Factor = 5.60	
	0.0 19.60									
							13.692		K Factor = 5.30	
15 to 16	29.21 29.21	1.61 120.0 0.0325		0.0 0.0 0.0	12.000 0.0 12.000	30.401 0.0 0.390			K Factor @ node ARM	
16 to 17	29.39 58.6	1.61 120.0 0.1180	T	8.0 0.0 0.0	19.000 8.000 27.000	30.791 0.0 3.187			K Factor @ node ARM	
17 to B	0.0 58.6	1.61 120.0 0.1181	2E	8.0 0.0 0.0	8.000 8.000 16.000	33.978 0.0 1.889				Vel = 9.23
B to BB	0.0 58.6	2.469 120.0 0.0146		0.0 0.0 0.0	10.750 0.0 10.750	35.867 4.548 0.157				Vel = 3.93
BB to BBB	0.0 58.6	2.469 120.0 0.0147	E T	6.0 12.0 0.0	11.750 18.000 29.750	40.572 4.548 0.438				Vel = 3.93
	0.0 58.60						45.558		K Factor = 8.68	
13 to 14	21.38 21.38	1.049 120.0 0.1473	3E T	6.0 5.0 0.0	7.000 11.000 18.000	14.583 0.0 2.651			K Factor = 5.60	
	0.0 21.38						17.234		K Factor = 5.15	
11 to 12	20.44 20.44	1.049 120.0 0.1354	3E T	6.0 5.0 0.0	5.500 11.000 16.500	13.319 0.0 2.234			K Factor = 5.60	
	0.0 20.44						15.553		K Factor = 5.18	
9 to 10	20.20 20.2	1.049 120.0 0.1325	3E T	6.0 5.0 0.0	7.000 11.000 18.000	13.005 0.0 2.385			K Factor = 5.60	
	0.0 20.20						15.390		K Factor = 5.15	
7 to 8	19.74 19.74	1.049 120.0 0.1270	3E T	6.0 5.0 0.0	8.500 11.000 19.500	12.423 0.0 2.476			K Factor = 5.60	
	0.0 19.74						14.899		K Factor = 5.11	
5 to 6	20.11 20.11	1.049 120.0 0.1315	3E T	6.0 5.0 0.0	4.000 11.000 15.000	12.899 0.0 1.973			K Factor = 5.60	



# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 1

Page 5  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 20.11									
						14.872			K Factor = 5.21	
3 to 4	20.00	1.049 120.0	3E T	6.0 5.0 0.0	4.000 11.000 15.000	12.751 0.0 1.951			K Factor = 5.60	
	20.0	0.1301							Vel = 7.42	
	0.0 20.00									
						14.702			K Factor = 5.22	
1 to 2	19.60	1.049 120.0	3E T	6.0 5.0 0.0	8.500 11.000 19.500	12.250 0.0 2.444			K Factor = 5.60	
	19.6	0.1253							Vel = 7.28	
2 to 4	0.0	2.067 120.0		0.0 0.0 0.0	1.750 0.0 1.750	14.694 0.0 0.008				Vel = 1.87
	19.6	0.0046								
4 to 6	20.00	2.067 120.0		0.0 0.0 0.0	10.000 0.0 10.000	14.702 0.0 0.170				Vel = 3.79
	39.6	0.0170								
6 to 8	20.11	2.067 120.0		0.0 0.0 0.0	0.750 0.0 0.750	14.872 0.0 0.027				Vel = 5.71
	59.71	0.0360								
8 to 10	19.74	2.067 120.0		0.0 0.0 0.0	8.000 0.0 8.000	14.899 0.0 0.491				Vel = 7.60
	79.45	0.0614								
10 to 12	20.19	2.067 120.0		0.0 0.0 0.0	1.750 0.0 1.750	15.390 0.0 0.163				Vel = 9.53
	99.64	0.0931								
12 to 14	20.44	2.067 120.0		0.0 0.0 0.0	12.750 0.0 12.750	15.553 0.0 1.681				Vel = 11.48
	120.08	0.1318								
14 to A	21.38	2.067 120.0	2E T	10.0 10.0 0.0	46.000 20.000 66.000	17.234 0.0 11.781				Vel = 13.53
	141.46	0.1785								
A to AA	0.0	2.469 120.0	2T E	24.0 6.0 0.0	22.500 30.000 52.500	29.015 4.548 3.944				Vel = 9.48
	141.46	0.0751								
AA to AAA	0.0	2.469 120.0	T	12.0 0.0 0.0	10.330 12.000 22.330	37.507 4.548 1.677				Vel = 9.48
	141.46	0.0751								
AAA to BBB	0.0	3.068 120.0	2T	30.0 0.0 0.0	40.000 30.000 70.000	43.732 0.0 1.826				Vel = 6.14
	141.46	0.0261								
BBB to CCC	58.60	3.068 120.0		0.0 0.0 0.0	14.750 0.0 14.750	45.558 0.0 0.730				Vel = 8.68
	200.06	0.0495								
CCC to DDD	0.0	3.068 120.0		0.0 0.0 0.0	14.750 0.0 14.750	46.288 0.0 0.731				Vel = 8.68
	200.06	0.0496								

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 1

Page 6  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
DDD to A3	0.0 200.06	3.068 120.0 0.0495	T 15.0 0.0 0.0	22.000 15.000 37.000	47.019 0.0 1.832		Vel = 8.68		
A3 to A4	0.0 200.06	3.068 120.0 0.0495	0.0 0.0 0.0	2.000 0.0 2.000	48.851 0.0 0.099		Vel = 8.68		
A4 to A5	0.0 200.06	3.068 120.0 0.0495	T 15.0 0.0 0.0	35.000 15.000 50.000	48.950 0.0 2.476		Vel = 8.68		
A5 to A6	0.0 200.06	4.026 120.0 0.0132	T 20.0 0.0 0.0	11.500 20.000 31.500	51.426 0.0 0.416		Vel = 5.04		
A6 to TI	0.0 200.06	4.026 120.0 0.0127	0.0 0.0 0.0	1.500 0.0 1.500	51.842 0.0 0.019		Vel = 5.04		
TI to DTI	0.0 200.06	6.357 120.0 0.0014	0.0 0.0 0.0	7.000 0.0 7.000	51.861 0.0 0.010		Vel = 2.02		
DTI to BAV	0.0 200.06	6.357 120.0 0.0014	Bvcb 10.059 S 40.235 Fsp 0.0 T 37.72	3.000 88.014 91.014	51.871 1.000 0.130		** Fixed Loss = 1 Vel = 2.02		
BAV to TAV	0.0 200.06	6.357 120.0 0.0014	E 17.603 0.0 0.0	8.000 17.603 25.603	53.001 0.0 0.037		Vel = 2.02		
TAV to BKFL	0.0 200.06	6.065 120.0 0.0018	E 14.0 Eq 20.0 0.0	0.500 34.000 34.500	53.038 0.433 0.062		Vel = 2.22		
BKFL to BASE	0.0 200.06	6.065 120.0 0.0018	E 14.0 Zac 0.0 0.0	0.500 14.000 14.500	53.533 3.866 0.026		** Fixed Loss = 3 Vel = 2.22		
BASE to HOSE	0.0 200.06	6.16 140.0 0.0012	E 20.084 T 43.037 G 4.304	165.000 67.425 232.425	57.425 0.0 0.290		Vel = 2.15		
HOSE to TEST	100.00 300.06	8.27 140.0 0.0006	0.0 0.0 0.0	110.000 0.0 110.000	57.715 0.0 0.069		Qa = 100 Vel = 1.79		
	0.0 300.06				57.784		K Factor = 39.47		

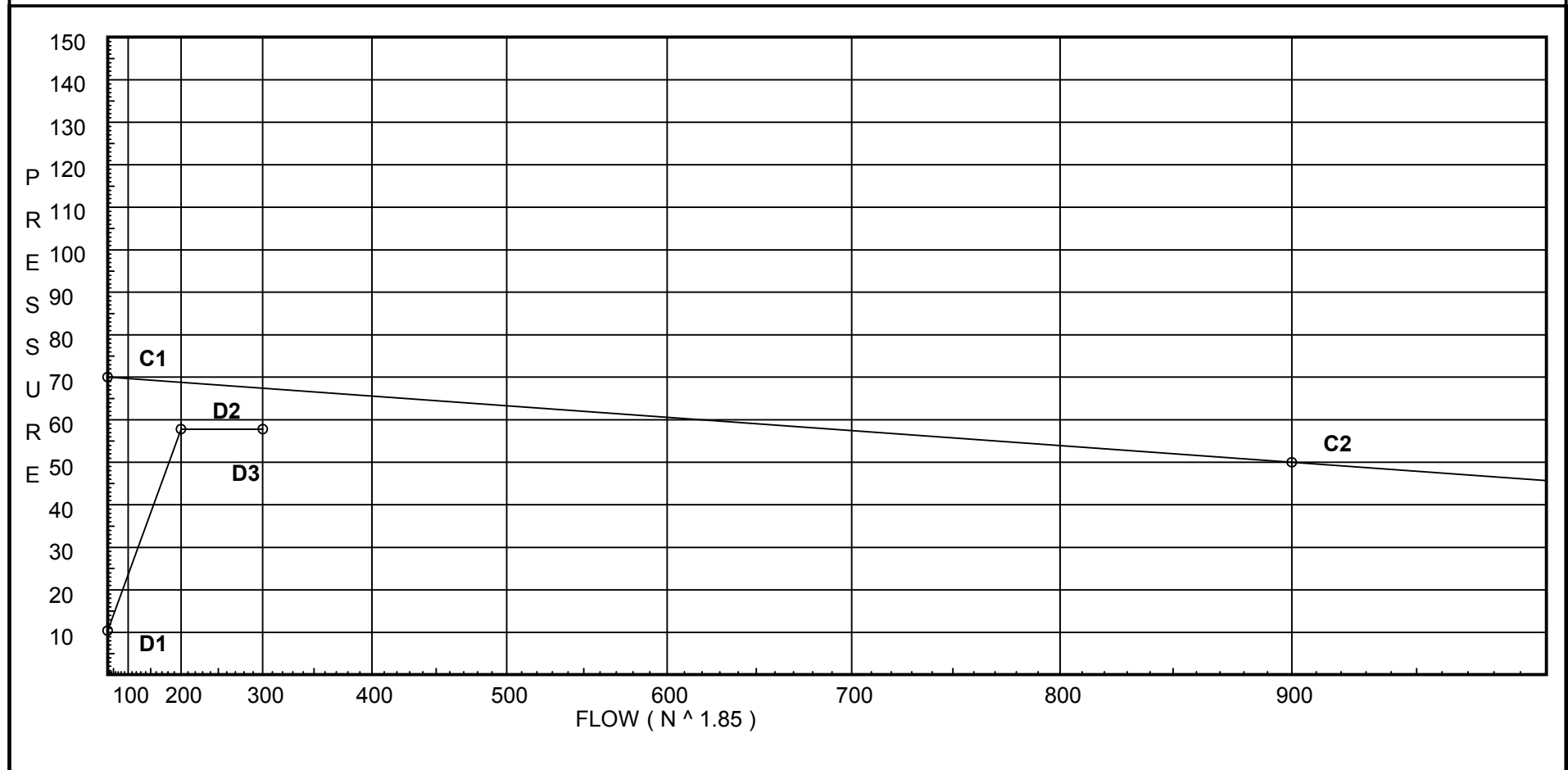
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 1

Page 7  
Date

City Water Supply:  
C1 - Static Pressure : 70  
C2 - Residual Pressure: 50  
C2 - Residual Flow : 900

Demand:  
D1 - Elevation : 10.394  
D2 - System Flow : 200.063  
D2 - System Pressure : 57.784  
Hose ( Demand ) : 100  
D3 - System Demand : 300.063  
Safety Margin : 9.594



Hydraulic Design Information Sheet

Name - UNE Armory Wet System Area 2 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 1 Wet  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Light Hazard Offices

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E				
M	Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
	Density	- .10	(X) Wet	Make Reliable
D	Area Per Sprinkler	- 180	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet	- 124	( ) Deluge	Size 1/2" X 1/2"
S	Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155 Deg.
G	Hose Allowance - Outside	- 100		

N Note

Calculation Flow Required - 135.68 Press Required - 39.995 At Base  
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 03/16/2016 Cap. -  
 T Time of Test - AM Rated Cap.- Elev.-  
 E Static Press - 58 @ Press -  
 R Residual Press - 36 Elev. - Well  
 Flow - 1006 Proof Flow  
 S Elevation - 100.0'

U Location - On Site

P Source of Information - Owner and Water District

C Commodity Class Location  
 O Storage Ht. Area Aisle W.  
 M Storage Method: Solid Piled % Palletized % Rack  
 M ( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.  
 S R ( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non  
 T A ( ) Mult. Row ( ) Open Shelf

O C  
 R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

G  
 E Horizontal Barriers Provided:

# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 2

Page 9  
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	10.33	na	18.0	0.1	180	7.0
25	124.0	K = K @ ARM	11.56	na	18.0			
26	124.0	K = K @ ARM	11.7	na	18.1			
27	124.0	K = K @ ARM	12.19	na	18.48			
28	124.0	K = K @ ARM	13.43	na	19.4			
29	124.0		19.06	na				
D	124.0		21.43	na				
DD	113.5		26.22	na				
21	124.0	K = K @ ARM	14.74	na	20.32			
22	124.0	K = K @ ARM	14.91	na	20.44			
23	124.0	K = K @ ARM	15.63	na	20.93			
24	124.0		19.79	na				
C	124.0		21.61	na				
CC	113.5		26.33	na				
CCC	103.0		31.36	na				
DDD	103.0		31.44	na				
A3	103.0		32.33	na				
A4	103.0		32.38	na				
A5	103.0		33.59	na				
A6	103.0		33.79	na				
TI	103.0		33.8	na				
DTI	103.0		33.8	na				
BAV	103.0		34.87	na				
TAV	103.0		34.89	na				
BKFL	102.0		35.35	na				
BASE	100.0		40.0	na				
HOSE	100.0		40.14	na	100.0			
TEST	100.0		40.18	na				

The maximum velocity is 11.66 and it occurs in the pipe between nodes 28 and 29

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 2

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to ARM	18.00 18.0	1.049 120.0 0.1070	2E T	4.0 5.0 0.0	2.500 9.000 11.500	10.332 0.0 1.231			K Factor = 5.60	
	0.0 18.00						11.563		K Factor = 5.29	
25 to 26	18.00 18.0	1.61 120.0 0.0133		0.0 0.0 0.0	10.000 0.0 10.000	11.563 0.0 0.133			K Factor @ node ARM	Vel = 2.84
26 to 27	18.10 36.1	1.61 120.0 0.0482		0.0 0.0 0.0	10.250 0.0 10.250	11.696 0.0 0.494			K Factor @ node ARM	Vel = 5.69
27 to 28	18.48 54.58	1.61 120.0 0.1035		0.0 0.0 0.0	12.000 0.0 12.000	12.190 0.0 1.242			K Factor @ node ARM	Vel = 8.60
28 to 29	19.40 73.98	1.61 120.0 0.1817	T	8.0 0.0 0.0	23.000 8.000 31.000	13.432 0.0 5.632			K Factor @ node ARM	Vel = 11.66
29 to D	0.0 73.98	1.61 120.0 0.1817	2E	8.0 0.0 0.0	5.000 8.000 13.000	19.064 0.0 2.362				Vel = 11.66
D to DD	0.0 73.98	2.469 120.0 0.0226		0.0 0.0 0.0	10.750 0.0 10.750	21.426 4.548 0.243				Vel = 4.96
DD to DDD	0.0 73.98	2.469 120.0 0.0227	E T	6.0 12.0 0.0	11.750 18.000 29.750	26.217 4.548 0.674				Vel = 4.96
	0.0 73.98						31.439		K Factor = 13.19	
21 to 22	20.32 20.32	1.61 120.0 0.0167		0.0 0.0 0.0	10.250 0.0 10.250	14.739 0.0 0.171			K Factor @ node ARM	Vel = 3.20
22 to 23	20.44 40.76	1.61 120.0 0.0603		0.0 0.0 0.0	12.000 0.0 12.000	14.910 0.0 0.724			K Factor @ node ARM	Vel = 6.42
23 to 24	20.93 61.69	1.61 120.0 0.1298	T	8.0 0.0 0.0	24.000 8.000 32.000	15.634 0.0 4.154			K Factor @ node ARM	Vel = 9.72
24 to C	0.0 61.69	1.61 120.0 0.1298	2E	8.0 0.0 0.0	6.000 8.000 14.000	19.788 0.0 1.817				Vel = 9.72
C to CC	0.0 61.69	2.469 120.0 0.0162		0.0 0.0 0.0	10.750 0.0 10.750	21.605 4.548 0.174				Vel = 4.13
CC to CCC	0.0 61.69	2.469 120.0 0.0162	E T	6.0 12.0 0.0	11.750 18.000 29.750	26.327 4.548 0.481				Vel = 4.13

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 2

Page 11  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
CCC to DDD	0.0 61.69	3.068 120.0 0.0056		14.750 0.0 14.750	31.356 0.0 0.083		Vel = 2.68		
DDD to A3	73.99 135.68	3.068 120.0 0.0241	T 15.0 0.0	22.000 15.000 37.000	31.439 0.0 0.893		Vel = 5.89		
A3 to A4	0.0 135.68	3.068 120.0 0.0240		2.000 0.0 2.000	32.332 0.0 0.048		Vel = 5.89		
A4 to A5	0.0 135.68	3.068 120.0 0.0241	T 15.0 0.0	35.000 15.000 50.000	32.380 0.0 1.207		Vel = 5.89		
A5 to A6	0.0 135.68	4.026 120.0 0.0064	T 20.0 0.0	11.500 20.000 31.500	33.587 0.0 0.203		Vel = 3.42		
A6 to TI	0.0 135.68	4.026 120.0 0.0060		1.500 0.0 1.500	33.790 0.0 0.009		Vel = 3.42		
TI to DTI	0.0 135.68	6.357 120.0 0.0007		7.000 0.0 7.000	33.799 0.0 0.005		Vel = 1.37		
DTI to BAV	0.0 135.68	6.357 120.0 0.0007	Bvcb 10.059 S 40.235 Fsp 0.0 T 37.72	3.000 88.014 91.014	33.804 1.000 0.064		** Fixed Loss = 1 Vel = 1.37		
BAV to TAV	0.0 135.68	6.357 120.0 0.0007	E 17.603 0.0	8.000 17.603 25.603	34.868 0.0 0.017		Vel = 1.37		
TAV to BKFL	0.0 135.68	6.065 120.0 0.0009	E 14.0 Eq 20.0	0.500 34.000 34.500	34.885 0.433 0.031		Vel = 1.51		
BKFL to BASE	0.0 135.68	6.065 120.0 0.0009	E 14.0 Zac 0.0	0.500 14.000 14.500	35.349 4.634 0.013		** Fixed Loss = 3.768 Vel = 1.51		
BASE to HOSE	0.0 135.68	6.16 140.0 0.0006	E 20.084 T 43.037 G 4.304	165.000 67.425 232.425	39.996 0.0 0.141		Vel = 1.46		
HOSE to TEST	100.00 235.68	8.27 140.0 0.0004		110.000 0.0 110.000	40.137 0.0 0.044		Qa = 100 Vel = 1.41		
	0.0 235.68				40.181		K Factor = 37.18		

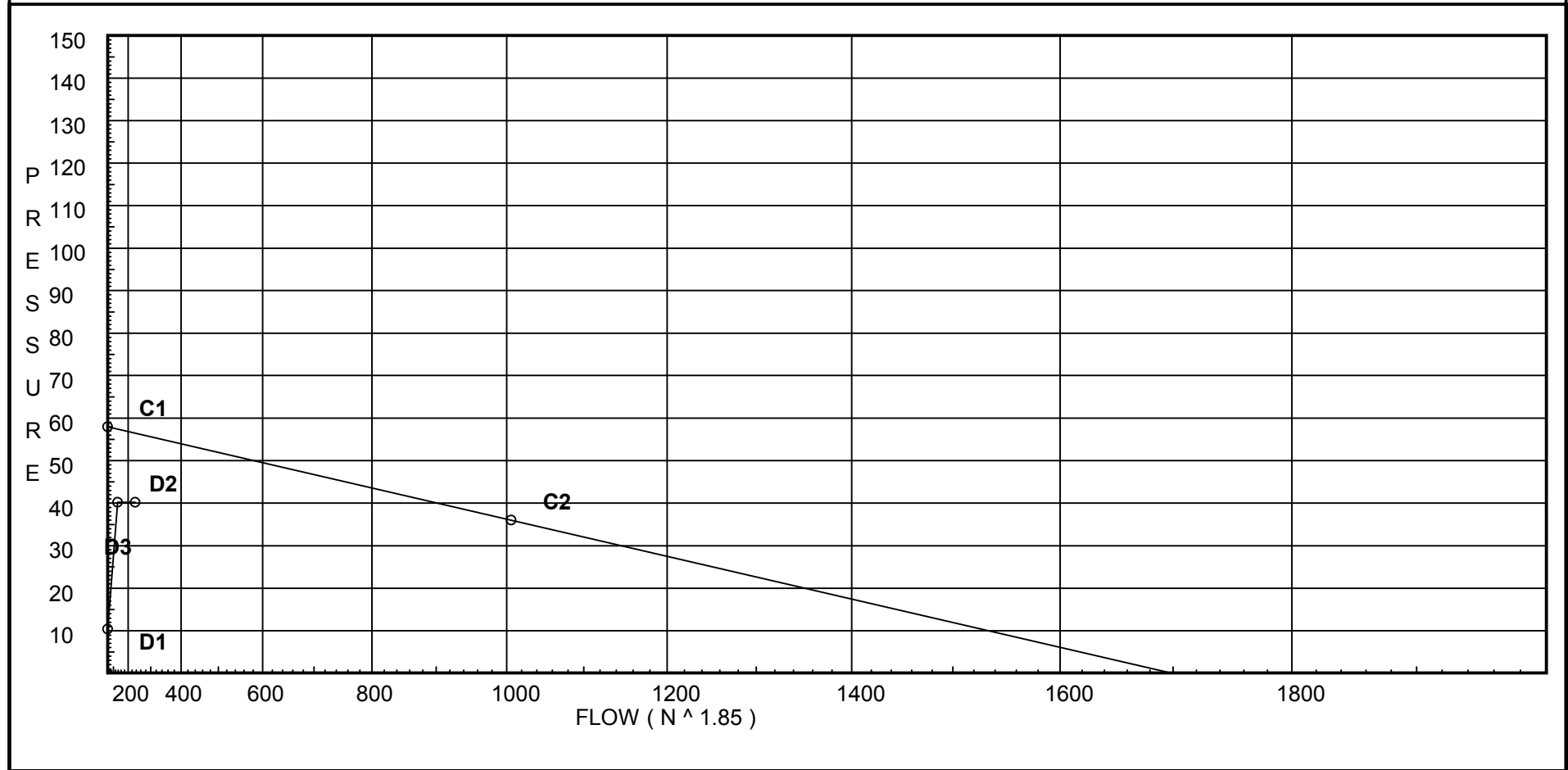
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 2

Page 12  
Date

City Water Supply:  
C1 - Static Pressure : 58  
C2 - Residual Pressure: 36  
C2 - Residual Flow : 1006

Demand:  
D1 - Elevation : 10.394  
D2 - System Flow : 135.677  
D2 - System Pressure : 40.181  
Hose ( Demand ) : 100  
D3 - System Demand : 235.677  
Safety Margin : 16.318





Hydraulic Design Information Sheet

Name - UNE Armory Wet System Area 3 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 1 Wet  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Light Hazard Assembly

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E				
M	Area of Sprinkler Operation - 1500	System Type	Sprinkler/Nozzle	
	Density - .10	(X) Wet	Make Reliable	
D	Area Per Sprinkler - 168	( ) Dry	Model F1FR56	
E	Elevation at Highest Outlet - 134.600	( ) Deluge	Size 1/2" X 1/2"	
S	Hose Allowance - Inside - 0	( ) Preaction	K-Factor 5.6	
I	Rack Sprinkler Allowance - 0	( ) Other	Temp.Rat.200 Deg.	
G	Hose Allowance - Outside - 100			

N Note

Calculation Flow Required - 209.41 Press Required - 48.042 At Base  
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 03/16/2016 Cap. -  
 T Time of Test - AM Rated Cap.- Elev.-  
 E Static Press - 58 @ Press -  
 R Residual Press - 36 Elev. - Well  
 Flow - 1006 Proof Flow  
 S Elevation - 100.0'

U Location - On Site

P Source of Information - Owner and Water District

C Commodity Class Location  
 O Storage Ht. Area Aisle W.  
 M Storage Method: Solid Piled % Palletized % Rack  
 M ( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.  
 S R ( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non  
 T A ( ) Mult. Row ( ) Open Shelf

O C  
 R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

G  
 E Horizontal Barriers Provided:

# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 3

Page 14  
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	9.0	na	16.8	0.1	168	7.0
43	134.6	K = K @ SPRG	11.49	na	18.46			
44	134.6	K = K @ SPRG	11.55	na	18.51			
45	134.6	K = K @ SPRG	11.76	na	18.67			
46T	134.6		12.23	na				
38	137.0	5.6	7.44	na	15.27	0.1	150	7.0
36	134.6	K = K @ SPRG	9.52	na	16.8			
37	134.6	K = K @ SPRG	9.57	na	16.84			
39	134.6		9.66	na				
40	134.6	K = K @ SPRG	9.75	na	17.0			
41	134.6	K = K @ SPRG	10.35	na	17.52			
42T	134.6		11.35	na				
31	134.6	K = K @ SPRG	10.2	na	17.39			
32	134.6	K = K @ SPRG	10.25	na	17.43			
33	134.6	K = K @ SPRG	10.44	na	17.59			
34	134.6	K = K @ SPRG	10.83	na	17.92			
35T	134.6		11.56	na				
35	129.1		14.7	na				
42	129.1		14.77	na				
46	129.1		15.1	na				
47	129.1		20.28	na				
48	124.12		27.77	na				
49	124.12		28.85	na				
AB	114.66		33.55	na				
AC	114.66		34.36	na				
AD	115.83		34.38	na				
AE	115.83		35.27	na				
AF	103.0		41.14	na				
A5	103.0		42.0	na				
A6	103.0		42.45	na				
TI	103.0		42.47	na				
DTI	103.0		42.48	na				
BAV	103.0		43.62	na				
TAV	103.0		43.66	na				
BKFL	102.0		44.17	na				
BASE	100.0		48.04	na				
HOSE	100.0		48.36	na	100.0			
TEST	100.0		48.43	na				

The maximum velocity is 9.09 and it occurs in the pipe between nodes 46 and 47

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 3

Page 15  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to SPRG	16.80 16.8	1.049 120.0 0.0942	T	5.0 0.0 0.0	0.500 5.000 5.500	9.000 0.0 0.518			K Factor = 5.60	
	0.0 16.80						9.518		K Factor = 5.45	
43 to 44	18.46 18.46	2.067 120.0 0.0041		0.0 0.0 0.0	14.000 0.0 14.000	11.494 0.0 0.058			K Factor @ node SPRG	
									Vel = 1.76	
44 to 45	18.51 36.97	2.067 120.0 0.0149		0.0 0.0 0.0	14.000 0.0 14.000	11.552 0.0 0.209			K Factor @ node SPRG	
									Vel = 3.53	
45 to 46T	18.67 55.64	2.067 120.0 0.0317	T	10.0 0.0 0.0	4.750 10.000 14.750	11.761 0.0 0.468			K Factor @ node SPRG	
									Vel = 5.32	
46T to 46	0.0 55.64	2.067 120.0 0.0318	T	10.0 0.0 0.0	5.500 10.000 15.500	12.229 2.382 0.493				Vel = 5.32
	0.0 55.64						15.104		K Factor = 14.32	
38 to 39	15.27 15.27	1.049 120.0 0.0791	2E T	4.0 5.0 0.0	6.000 9.000 15.000	7.439 1.039 1.186			K Factor = 5.60	
	0.0 15.27						9.664		Vel = 5.67	
									K Factor = 4.91	
36 to 37	16.80 16.8	2.067 120.0 0.0035		0.0 0.0 0.0	14.000 0.0 14.000	9.518 0.0 0.049			K Factor @ node SPRG	
									Vel = 1.61	
37 to 39	16.84 33.64	2.067 120.0 0.0125		0.0 0.0 0.0	7.750 0.0 7.750	9.567 0.0 0.097			K Factor @ node SPRG	
									Vel = 3.22	
39 to 40	15.28 48.92	2.067 120.0 0.0249		0.0 0.0 0.0	3.250 0.0 3.250	9.664 0.0 0.081				Vel = 4.68
40 to 41	17.00 65.92	2.067 120.0 0.0435		0.0 0.0 0.0	14.000 0.0 14.000	9.745 0.0 0.609			K Factor @ node SPRG	
									Vel = 6.30	
41 to 42T	17.52 83.44	2.067 120.0 0.0672	T	10.0 0.0 0.0	4.750 10.000 14.750	10.354 0.0 0.991			K Factor @ node SPRG	
									Vel = 7.98	
42T to 42	0.0 83.44	2.067 120.0 0.0672	T	10.0 0.0 0.0	5.500 10.000 15.500	11.345 2.382 1.042				Vel = 7.98
	0.0 83.44						14.769		K Factor = 21.71	
31 to 32	17.39 17.39	2.067 120.0 0.0037		0.0 0.0 0.0	14.000 0.0 14.000	10.196 0.0 0.052			K Factor @ node SPRG	
									Vel = 1.66	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 3

Page 16  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
32 to 33	17.43 34.82	2.067 120.0 0.0134		0.0 0.0	14.000 0.0	10.248 0.0			K Factor @ node SPRG	
33 to 34	17.59 52.41	2.067 120.0 0.0284		0.0 0.0	14.000 0.0	10.435 0.0			K Factor @ node SPRG	
34 to 35T	17.92 70.33	2.067 120.0 0.0490	T	10.0 0.0	4.750 10.000	10.833 0.0			K Factor @ node SPRG	
35T to 35	0.0 70.33	2.067 120.0 0.0490	T	10.0 0.0	5.500 10.000	11.556 2.382				Vel = 6.72
35 to 42	0.0 70.33	3.068 120.0 0.0072		0.0 0.0	10.000 0.0	14.697 0.0				Vel = 3.05
42 to 46	83.44 153.77	3.068 120.0 0.0305		0.0 0.0	11.000 0.0	14.769 0.0				Vel = 6.67
46 to 47	55.65 209.42	3.068 120.0 0.0539	T	15.0 0.0	81.000 15.000	15.104 0.0				Vel = 9.09
47 to 48	0.0 209.42	3.068 120.0 0.0539	2T	30.0 14.0	55.000 44.000	20.278 2.157				Vel = 9.09
48 to 49	0.0 209.42	4.026 120.0 0.0143	2E	20.0 20.0	35.000 40.000	27.770 0.0				Vel = 5.28
49 to AB	0.0 209.42	4.026 120.0 0.0144	E	10.0 20.0	12.500 30.000	28.846 4.097				Vel = 5.28
AB to AC	0.0 209.42	4.026 120.0 0.0143	T	20.0 0.0	36.500 20.000	33.553 0.0				Vel = 5.28
AC to AD	0.0 209.42	4.026 120.0 0.0144	E	10.0 20.0	6.250 30.000	34.363 -0.507				Vel = 5.28
AD to AE	0.0 209.42	4.026 120.0 0.0143	2E	20.0 0.0	42.000 20.000	34.377 0.0				Vel = 5.28
AE to AF	0.0 209.42	4.026 120.0 0.0144	E	10.0 0.0	12.000 10.000	35.266 5.557				Vel = 5.28
AF to A5	0.0 209.42	4.026 120.0 0.0143	E	10.0 0.0	50.000 10.000	41.139 0.0				Vel = 5.28

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 3

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
A5 to A6	0.0 209.42	4.026 120.0 0.0143	T 20.0 0.0 0.0	11.500 20.000 31.500	41.999 0.0 0.452		Vel = 5.28		
A6 to TI	0.0 209.42	4.026 120.0 0.0147	0.0 0.0 0.0	1.500 0.0 1.500	42.451 0.0 0.022		Vel = 5.28		
TI to DTI	0.0 209.42	6.357 120.0 0.0016	0.0 0.0 0.0	7.000 0.0 7.000	42.473 0.0 0.011		Vel = 2.12		
DTI to BAV	0.0 209.42	6.357 120.0 0.0015	Bvcb 10.059 S 40.235 Fsp 0.0 T 37.72	3.000 88.014 91.014	42.484 1.000 0.141		** Fixed Loss = 1 Vel = 2.12		
BAV to TAV	0.0 209.42	6.357 120.0 0.0016	E 17.603 0.0 0.0	8.000 17.603 25.603	43.625 0.0 0.040		Vel = 2.12		
TAV to BKFL	0.0 209.42	6.065 120.0 0.0019	E 14.0 Eq 20.0 0.0	0.500 34.000 34.500	43.665 0.433 0.067		Vel = 2.33		
BKFL to BASE	0.0 209.42	6.065 120.0 0.0020	E 14.0 Zac 0.0 0.0	0.500 14.000 14.500	44.165 3.848 0.029		** Fixed Loss = 2.982 Vel = 2.33		
BASE to HOSE	0.0 209.42	6.16 140.0 0.0014	E 20.084 T 43.037 G 4.304	165.000 67.425 232.425	48.042 0.0 0.316		Vel = 2.25		
HOSE to TEST	100.00 309.42	8.27 140.0 0.0007	0.0 0.0 0.0	110.000 0.0 110.000	48.358 0.0 0.073		Qa = 100 Vel = 1.85		
	0.0 309.42				48.431		K Factor = 44.46		

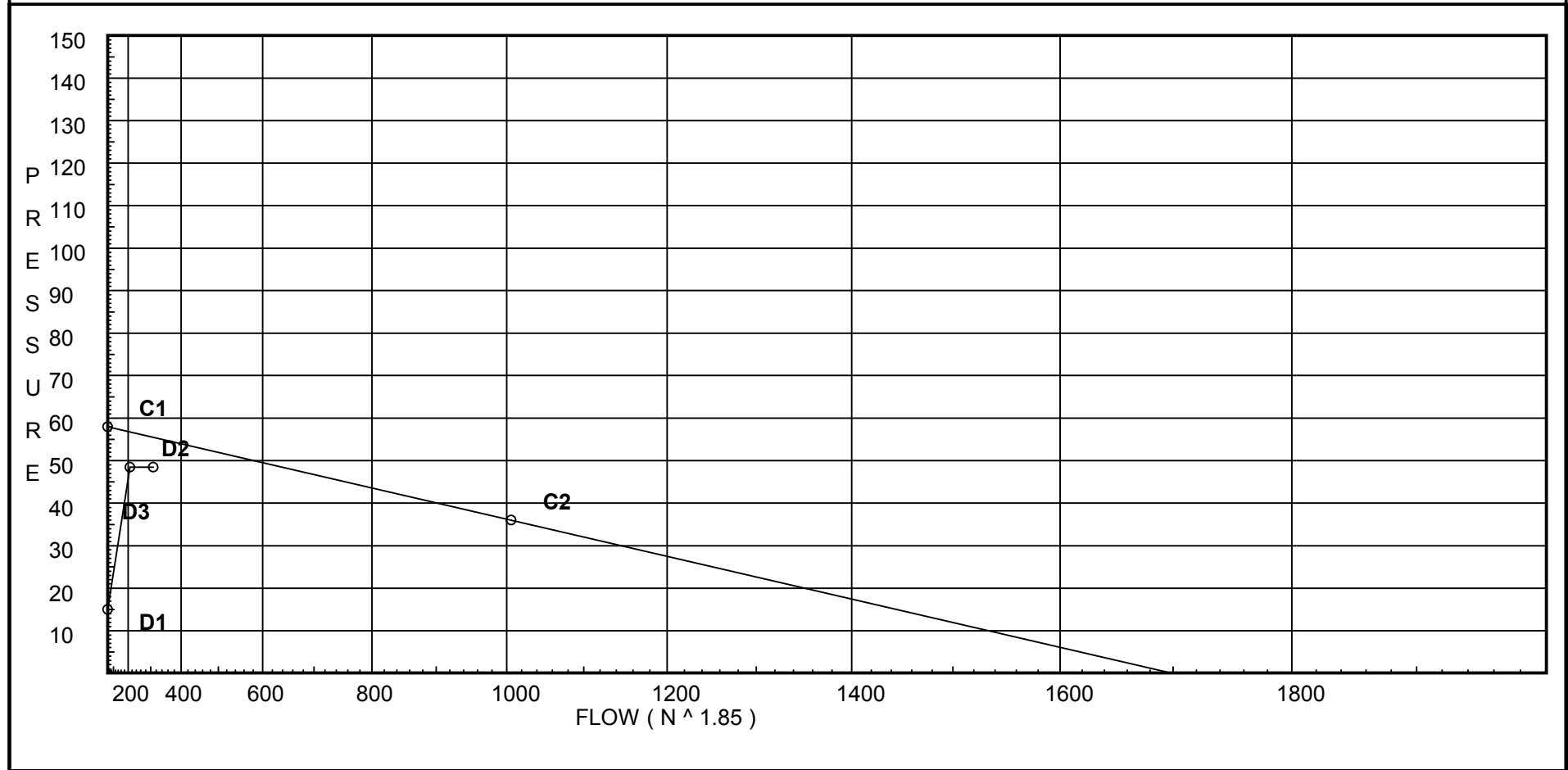
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 3

Page 18  
Date

City Water Supply:  
C1 - Static Pressure : 58  
C2 - Residual Pressure: 36  
C2 - Residual Flow : 1006

Demand:  
D1 - Elevation : 14.985  
D2 - System Flow : 209.415  
D2 - System Pressure : 48.431  
Hose ( Demand ) : 100  
D3 - System Demand : 309.415  
Safety Margin : 7.085



Hydraulic Design Information Sheet

Name - UNE Armory Wet System Area 4 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 1 Wet  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Ordinary Hazard / Mechanical Room

S (X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. (X) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E				
M	Area of Sprinkler Operation	- 945	System Type	Sprinkler/Nozzle
	Density	- .15	(X) Wet	Make Reliable
D	Area Per Sprinkler	- 120	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet	- 125.050	( ) Deluge	Size 1/2" X 1/2"
S	Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.200 Deg.
G	Hose Allowance - Outside	- 250		

N Note

Calculation Flow Required - 222.14 Press Required - 37.390 At Base  
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 03/16/2016		Cap. -
T	Time of Test - AM	Rated Cap.-	Elev.-
E	Static Press - 58	@ Press -	
R	Residual Press - 36	Elev. -	Well
	Flow - 1006		Proof Flow
S	Elevation - 100		

U Location - On Site

P Source of Information - Owner and Water District

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
	( ) Single Row	( ) Conven. Pallet	( ) Auto. Storage ( ) Encap.
S	( ) Double Row	( ) Slave Pallet	( ) Solid Shelf ( ) Non
T	( ) Mult. Row		( ) Open Shelf

R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

E Horizontal Barriers Provided:

# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 4

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Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	10.33	na	18.0	0.15	120	7.0
TYP1	0.0	5.6	10.33	na	18.0	0.15	120	7.0
63	125.05	K = K @ SPRG	12.0	na	18.82			
64	125.05	K = K @ SPRG	12.04	na	18.85			
65	125.05	K = K @ SPRG	12.15	na	18.94			
59	125.05	K = K @ SPRG	11.62	na	18.52			
60	125.05	K = K @ SPRG	11.65	na	18.55			
61	125.05	K = K @ SPRG	11.76	na	18.64			
ARM1	125.05	5.6	10.36	na	18.03	0.15	120	7.0
ARM2	125.05	5.6	10.33	na	18.0	0.15	120	7.0
55	125.05		11.35	na				
56	125.05		11.38	na				
57	125.05	K = K @ SPRG	11.66	na	18.55			
51	125.05	K = K @ SPRG	11.42	na	18.37			
52	125.05	K = K @ SPRG	11.46	na	18.39			
53	125.05	K = K @ SPRG	11.58	na	18.49			
54	125.05		12.8	na				
58	125.05		12.85	na				
62	125.05		13.05	na				
66	125.05		13.48	na				
49	124.12		17.67	na				
AB	114.66		22.45	na				
AC	114.66		23.35	na				
AD	115.83		23.42	na				
AE	115.83		24.42	na				
AF	103.0		30.33	na				
A5	103.0		31.29	na				
A6	103.0		31.79	na				
TI	103.0		31.81	na				
DTI	103.0		31.83	na				
BAV	103.0		32.98	na				
TAV	103.0		33.03	na				
BKFL	102.0		33.54	na				
BASE	100.0		37.39	na				
HOSE	100.0		37.74	na	250.0			
TEST	100.0		37.9	na				

The maximum velocity is 9.64 and it occurs in the pipe between nodes 66 and 49



# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 4

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to SPRG	18.00 18.0	1.049 120.0 0.1070	T	5.0 0.0 0.0	1.000 5.000 6.000	10.332 0.0 0.642			K Factor = 5.60	
	0.0 18.00						10.974		K Factor = 5.43	
TYP1 to SPG1	18.00 18.0	1.049 120.0 0.1070	T	5.0 0.0 0.0	1.000 5.000 6.000	10.332 0.0 0.642			K Factor = 5.60	
	0.0 18.00						10.974		K Factor = 5.43	
63 to 64	18.82 18.82	2.067 120.0 0.0043		0.0 0.0 0.0	7.750 0.0 7.750	12.003 0.0 0.033			K Factor @ node SPRG	
									Vel = 1.80	
64 to 65	18.86 37.68	2.067 120.0 0.0155		0.0 0.0 0.0	7.500 0.0 7.500	12.036 0.0 0.116			K Factor @ node SPRG	
									Vel = 3.60	
65 to 66	18.94 56.62	2.067 120.0 0.0328	T	10.0 0.0 0.0	30.500 10.000 40.500	12.152 0.0 1.328			K Factor @ node SPRG	
	0.0 56.62						13.480		K Factor = 15.42	
59 to 60	18.52 18.52	2.067 120.0 0.0041		0.0 0.0 0.0	7.500 0.0 7.500	11.620 0.0 0.031			K Factor @ node SPRG	
									Vel = 1.77	
60 to 61	18.55 37.07	2.067 120.0 0.0151		0.0 0.0 0.0	7.500 0.0 7.500	11.651 0.0 0.113			K Factor @ node SPRG	
									Vel = 3.54	
61 to 62	18.64 55.71	2.067 120.0 0.0318	T	10.0 0.0 0.0	30.500 10.000 40.500	11.764 0.0 1.289			K Factor @ node SPRG	
	0.0 55.71						13.053		K Factor = 15.42	
ARM1 to 56	18.03 18.03	1.049 120.0 0.1074	E T	2.0 5.0 0.0	2.500 7.000 9.500	10.360 0.0 1.020			K Factor = 5.60	
	0.0 18.03						11.380		K Factor = 5.34	
ARM2 to 55	18.00 18.0	1.049 120.0 0.1071	E T	2.0 5.0 0.0	2.500 7.000 9.500	10.332 0.0 1.017			K Factor = 5.60	
									Vel = 6.68	
55 to 56	0.0 18.0	2.067 120.0 0.0039		0.0 0.0 0.0	8.000 0.0 8.000	11.349 0.0 0.031				
									Vel = 1.72	
56 to 57	18.03 36.03	2.067 120.0 0.0143	2E	10.0 0.0 0.0	9.500 10.000 19.500	11.380 0.0 0.278				
									Vel = 3.44	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 4

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
57 to 58	18.55 54.58	2.067 120.0 0.0306	T	10.0 0.0 0.0	29.000 10.000 39.000	11.658 0.0 1.195			K Factor @ node SPRG	
	0.0 54.58						12.853		K Factor = 15.22	
51 to 52	18.37 18.37	2.067 120.0 0.0040		0.0 0.0 0.0	8.000 0.0 8.000	11.425 0.0 0.032			K Factor @ node SPRG	
52 to 53	18.39 36.76	2.067 120.0 0.0148		0.0 0.0 0.0	8.000 0.0 8.000	11.457 0.0 0.118			K Factor @ node SPRG	
53 to 54	18.48 55.24	2.067 120.0 0.0314	T	10.0 0.0 0.0	29.000 10.000 39.000	11.575 0.0 1.223			K Factor @ node SPRG	
54 to 58	0.0 55.24	3.068 120.0 0.0046		0.0 0.0 0.0	12.000 0.0 12.000	12.798 0.0 0.055				Vel = 2.40
58 to 62	54.58 109.82	3.068 120.0 0.0163		0.0 0.0 0.0	12.250 0.0 12.250	12.853 0.0 0.200				Vel = 4.77
62 to 66	55.71 165.53	3.068 120.0 0.0349		0.0 0.0 0.0	12.250 0.0 12.250	13.053 0.0 0.427				Vel = 7.18
66 to 49	56.61 222.14	3.068 120.0 0.0601	T	15.0 0.0 0.0	48.000 15.000 63.000	13.480 0.403 3.787				Vel = 9.64
49 to AB	0.0 222.14	4.026 120.0 0.0160	E T	10.0 20.0 0.0	12.500 30.000 42.500	17.670 4.097 0.680				Vel = 5.60
AB to AC	0.0 222.14	4.026 120.0 0.0160	T	20.0 0.0 0.0	36.500 20.000 56.500	22.447 0.0 0.904				Vel = 5.60
AC to AD	0.0 222.14	4.026 120.0 0.0160	E T	10.0 20.0 0.0	6.250 30.000 36.250	23.351 -0.507 0.581				Vel = 5.60
AD to AE	0.0 222.14	4.026 120.0 0.0160	2E	20.0 0.0 0.0	42.000 20.000 62.000	23.425 0.0 0.992				Vel = 5.60
AE to AF	0.0 222.14	4.026 120.0 0.0160	E	10.0 0.0 0.0	12.000 10.000 22.000	24.417 5.557 0.352				Vel = 5.60
AF to A5	0.0 222.14	4.026 120.0 0.0160	E	10.0 0.0 0.0	50.000 10.000 60.000	30.326 0.0 0.960				Vel = 5.60
A5 to A6	0.0 222.14	4.026 120.0 0.0160	T	20.0 0.0 0.0	11.500 20.000 31.500	31.286 0.0 0.504				Vel = 5.60

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 4

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
A6	0.0	4.026		1.500	31.790				
to		120.0		0.0	0.0				
TI	222.14	0.0160		1.500	0.024		Vel = 5.60		
TI	0.0	6.357		7.000	31.814				
to		120.0		0.0	0.0				
DTI	222.14	0.0017		7.000	0.012		Vel = 2.25		
DTI	0.0	6.357	Bvcb	10.059	3.000	31.826			
to		120.0	S	40.235	88.014	1.000	** Fixed Loss = 1		
BAV	222.14	0.0017	Fsp	0.0	91.014	0.157	Vel = 2.25		
			T	37.72					
BAV	0.0	6.357	E	17.603	8.000	32.983			
to		120.0		0.0	17.603	0.0			
TAV	222.14	0.0018		0.0	25.603	0.045	Vel = 2.25		
TAV	0.0	6.065	E	14.0	0.500	33.028			
to		120.0	Eq	20.0	34.000	0.433			
BKFL	222.14	0.0022		0.0	34.500	0.075	Vel = 2.47		
BKFL	0.0	6.065	E	14.0	0.500	33.536			
to		120.0	Zac	0.0	14.000	3.822	** Fixed Loss = 2.956		
BASE	222.14	0.0022		0.0	14.500	0.032	Vel = 2.47		
BASE	0.0	6.16	E	20.084	165.000	37.390			
to		140.0	T	43.037	67.425	0.0			
HOSE	222.14	0.0015	G	4.304	232.425	0.352	Vel = 2.39		
HOSE	250.00	8.27		0.0	110.000	37.742	Qa = 250		
to		140.0		0.0	0.0	0.0			
TEST	472.14	0.0015		0.0	110.000	0.160	Vel = 2.82		
	0.0								
	472.14				37.902		K Factor = 76.69		

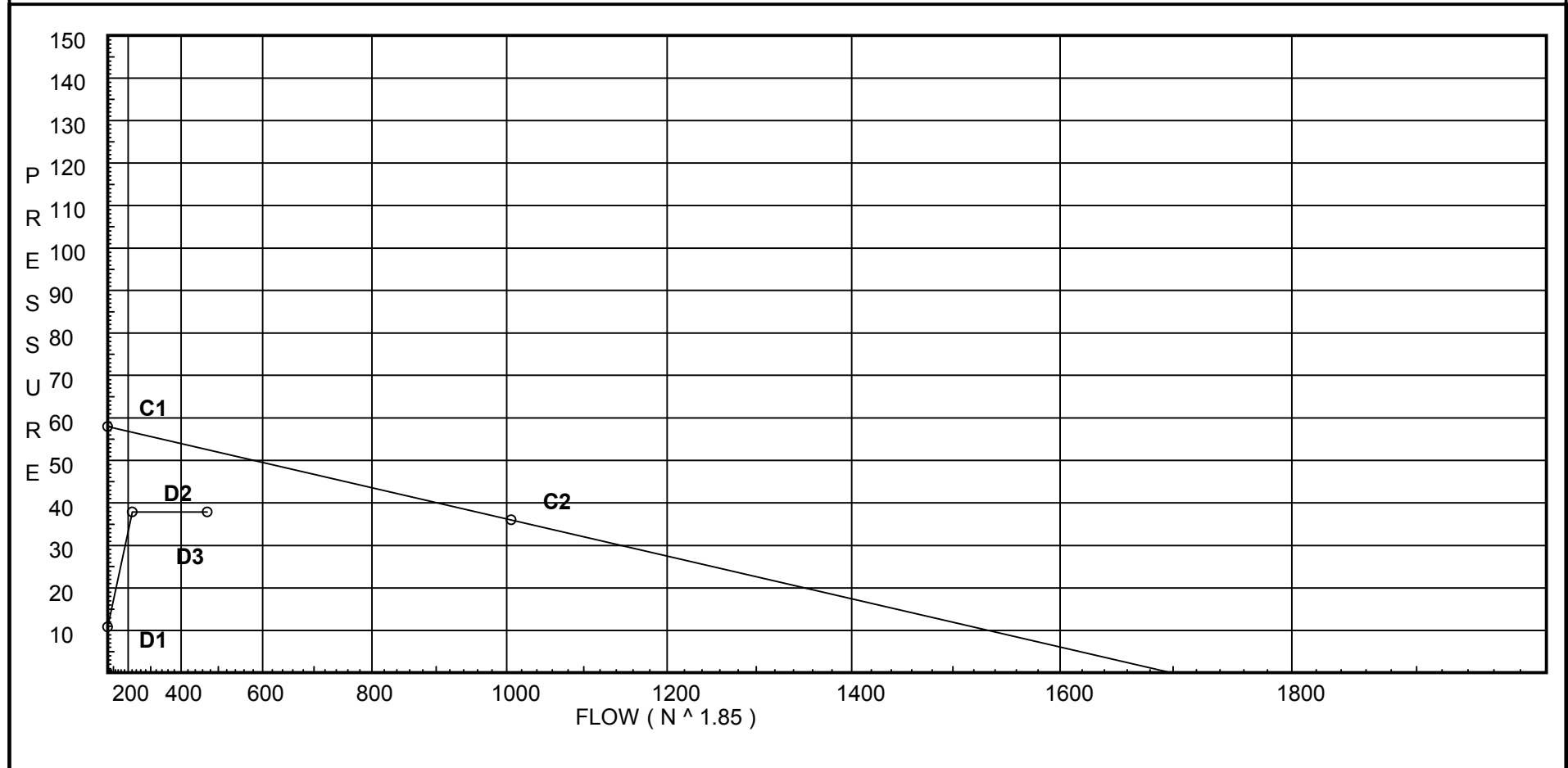
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 4

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Date

City Water Supply:  
C1 - Static Pressure : 58  
C2 - Residual Pressure: 36  
C2 - Residual Flow : 1006

Demand:  
D1 - Elevation : 10.849  
D2 - System Flow : 222.144  
D2 - System Pressure : 37.902  
Hose ( Demand ) : 250  
D3 - System Demand : 472.144  
Safety Margin : 14.670



Hydraulic Design Information Sheet

Name - UNE Armory Wet System Area 5 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 1 Wet  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Ordinary Hazard / Kitchen

S (X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. (X) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E				
M	Area of Sprinkler Operation	- Entire	System Type	Sprinkler/Nozzle
	Density	- .15	(X) Wet	Make Reliable
D	Area Per Sprinkler	- 130	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet	- 114.660	( ) Deluge	Size 1/2" X 1/2"
S	Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.200 Deg.
G	Hose Allowance - Outside	- 250		

N Note

Calculation Flow Required - 205.70 Press Required - 39.445 At Base  
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 03/16/2016 Cap. -  
 T Time of Test - AM Rated Cap.- Elev.-  
 E Static Press - 58 @ Press -  
 R Residual Press - 36 Elev. - Well  
 Flow - 1006 Proof Flow  
 S Elevation - 100

U Location - On Site

P Source of Information - Owner and Water District

C Commodity Class Location  
 O Storage Ht. Area Aisle W.  
 M Storage Method: Solid Piled % Palletized % Rack  
 M ( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.  
 S R ( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non  
 T A ( ) Mult. Row ( ) Open Shelf

O C  
 R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

G  
 E Horizontal Barriers Provided:

# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 5

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Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	12.13	na	19.5	0.15	130	7.0
ARM1	114.66	5.6	17.15	na	23.19	0.15	130	7.0
ARM2	114.66	5.6	17.02	na	23.1	0.15	130	7.0
ARM3	114.66	5.6	12.99	na	20.19	0.15	130	7.0
78	114.66	K = K @ ARM	13.71	na	19.61			
79	114.66	K = K @ ARM	13.87	na	19.73			
80	114.66	K = K @ ARM	14.32	na	20.04			
81	114.66	K = K @ ARM	15.41	na	20.79			
71	114.66	K = K @ ARM	13.55	na	19.5			
72	114.66	K = K @ ARM	13.71	na	19.61			
73	114.66	K = K @ ARM	14.15	na	19.93			
74	114.66		15.11	na				
75	114.66		18.1	na				
76	114.66		18.12	na				
77	114.66		18.27	na				
82	114.66		18.31	na				
83	114.66		22.27	na				
AB	114.66		25.09	na				
AC	114.66		25.87	na				
AD	115.83		25.87	na				
AE	115.83		26.73	na				
AF	103.0		32.59	na				
A5	103.0		33.42	na				
A6	103.0		33.86	na				
TI	103.0		33.88	na				
DTI	103.0		33.89	na				
BAV	103.0		35.03	na				
TAV	103.0		35.07	na				
BKFL	102.0		35.56	na				
BASE	100.0		39.45	na				
HOSE	100.0		39.75	na	250.0			
TEST	100.0		39.9	na				

The maximum velocity is 12.64 and it occurs in the pipe between nodes 81 and 82

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 5

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to ARM	19.50 19.5 0.0 19.50	1.049 120.0 0.1242	2E T	4.0 5.0 0.0	2.500 9.000 11.500	12.125 0.0 1.428		K Factor = 5.60 Vel = 7.24	
						13.553		K Factor = 5.30	
ARM1 to 77	23.19 23.19 0.0 23.19	1.049 120.0 0.1711	T	5.0 0.0 0.0	1.500 5.000 6.500	17.154 0.0 1.112		K Factor = 5.60 Vel = 8.61	
						18.266		K Factor = 5.43	
ARM2 to 76	23.10 23.1 0.0 23.10	1.049 120.0 0.1700	T	5.0 0.0 0.0	1.500 5.000 6.500	17.015 0.0 1.105		K Factor = 5.60 Vel = 8.58	
						18.120		K Factor = 5.43	
ARM3 to 74	20.19 20.19 0.0 20.19	1.049 120.0 0.1324	3E T	6.0 5.0 0.0	5.000 11.000 16.000	12.994 0.0 2.118		K Factor = 5.60 Vel = 7.50	
						15.112		K Factor = 5.19	
78 to 79	19.61 19.61 0.0 19.61	1.61 120.0 0.0156		0.0 0.0 0.0	10.000 0.0 10.000	13.713 0.0 0.156		K Factor @ node ARM Vel = 3.09	
79 to 80	19.73 39.34 0.0 19.73	1.61 120.0 0.0565		0.0 0.0 0.0	8.000 0.0 8.000	13.869 0.0 0.452		K Factor @ node ARM Vel = 6.20	
80 to 81	20.04 59.38 0.0 20.04	1.61 120.0 0.1210		0.0 0.0 0.0	9.000 0.0 9.000	14.321 0.0 1.089		K Factor @ node ARM Vel = 9.36	
81 to 82	20.80 80.18 0.0 20.80	1.61 120.0 0.2108	T	8.0 0.0 0.0	5.750 8.000 13.750	15.410 0.0 2.898		K Factor @ node ARM Vel = 12.64	
						18.308		K Factor = 18.74	
71 to 72	19.50 19.5 0.0 19.50	1.61 120.0 0.0155		0.0 0.0 0.0	10.000 0.0 10.000	13.553 0.0 0.155		K Factor @ node ARM Vel = 3.07	
72 to 73	19.61 39.11 0.0 19.61	1.61 120.0 0.0558		0.0 0.0 0.0	8.000 0.0 8.000	13.708 0.0 0.446		K Factor @ node ARM Vel = 6.16	
73 to 74	19.93 59.04 0.0 19.93	1.61 120.0 0.1198		0.0 0.0 0.0	8.000 0.0 8.000	14.154 0.0 0.958		K Factor @ node ARM Vel = 9.30	
74 to 75	20.18 79.22 0.0 20.18	1.61 120.0 0.2062	T	8.0 0.0 0.0	6.500 8.000 14.500	15.112 0.0 2.990		K Factor @ node ARM Vel = 12.48	

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 5

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
75	0.0	3.068		0.0	2.000	18.102				
to		120.0		0.0	0.0	0.0				
76	79.22	0.0090		0.0	2.000	0.018		Vel =	3.44	
76	23.10	3.068		0.0	10.250	18.120				
to		120.0		0.0	0.0	0.0				
77	102.32	0.0142		0.0	10.250	0.146		Vel =	4.44	
77	23.20	3.068		0.0	2.000	18.266				
to		120.0		0.0	0.0	0.0				
82	125.52	0.0210		0.0	2.000	0.042		Vel =	5.45	
82	80.18	3.068	T	15.0	61.000	18.308				
to		120.0		0.0	15.000	0.0				
83	205.7	0.0521		0.0	76.000	3.963		Vel =	8.93	
83	0.0	3.068	E	7.0	32.000	22.271				
to		120.0	T	15.0	22.000	0.0				
AB	205.7	0.0521		0.0	54.000	2.815		Vel =	8.93	
AB	0.0	4.026	T	20.0	36.500	25.086				
to		120.0		0.0	20.000	0.0				
AC	205.7	0.0139		0.0	56.500	0.784		Vel =	5.18	
AC	0.0	4.026	E	10.0	6.250	25.870				
to		120.0	T	20.0	30.000	-0.507				
AD	205.7	0.0139		0.0	36.250	0.504		Vel =	5.18	
AD	0.0	4.026	2E	20.0	42.000	25.867				
to		120.0		0.0	20.000	0.0				
AE	205.7	0.0139		0.0	62.000	0.860		Vel =	5.18	
AE	0.0	4.026	E	10.0	12.000	26.727				
to		120.0		0.0	10.000	5.557				
AF	205.7	0.0139		0.0	22.000	0.305		Vel =	5.18	
AF	0.0	4.026	E	10.0	50.000	32.589				
to		120.0		0.0	10.000	0.0				
A5	205.7	0.0139		0.0	60.000	0.833		Vel =	5.18	
A5	0.0	4.026	T	20.0	11.500	33.422				
to		120.0		0.0	20.000	0.0				
A6	205.7	0.0139		0.0	31.500	0.437		Vel =	5.18	
A6	0.0	4.026		0.0	1.500	33.859				
to		120.0		0.0	0.0	0.0				
TI	205.7	0.0140		0.0	1.500	0.021		Vel =	5.18	
TI	0.0	6.357		0.0	7.000	33.880				
to		120.0		0.0	0.0	0.0				
DTI	205.7	0.0014		0.0	7.000	0.010		Vel =	2.08	
DTI	0.0	6.357	Bvcb	10.059	3.000	33.890				
to		120.0	S	40.235	88.014	1.000		** Fixed Loss = 1		
BAV	205.7	0.0015	Fsp	0.0	91.014	0.137		Vel =	2.08	
			T	37.72						
BAV	0.0	6.357	E	17.603	8.000	35.027				
to		120.0		0.0	17.603	0.0				
TAV	205.7	0.0015		0.0	25.603	0.039		Vel =	2.08	



# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 5

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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	*****	Notes	*****
TAV	0.0	6.065	E 14.0	0.500	35.066				
to		120.0	Eq 20.0	34.000	0.433				
BKFL	205.7	0.0019	0.0	34.500	0.065		Vel = 2.28		
BKFL	0.0	6.065	E 14.0	0.500	35.564				
to		120.0	Zac 0.0	14.000	3.854		** Fixed Loss = 2.988		
BASE	205.7	0.0019	0.0	14.500	0.027		Vel = 2.28		
BASE	0.0	6.16	E 20.084	165.000	39.445				
to		140.0	T 43.037	67.425	0.0				
HOSE	205.7	0.0013	G 4.304	232.425	0.306		Vel = 2.21		
HOSE	250.00	8.27	0.0	110.000	39.751		Qa = 250		
to		140.0	0.0	0.0	0.0				
TEST	455.7	0.0014	0.0	110.000	0.150		Vel = 2.72		
	0.0								
	455.70				39.901		K Factor = 72.14		

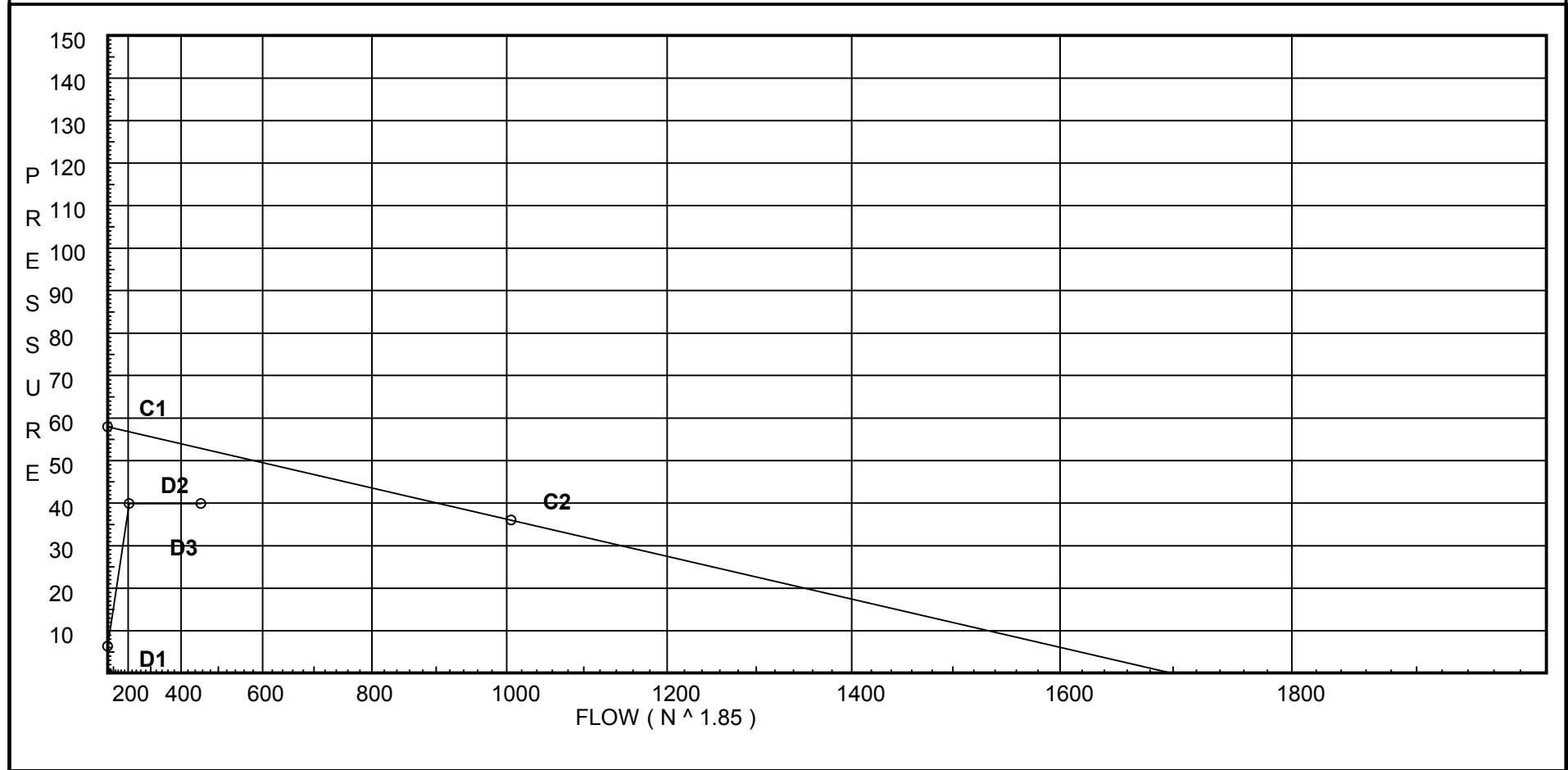
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 5

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Date

City Water Supply:  
C1 - Static Pressure : 58  
C2 - Residual Pressure: 36  
C2 - Residual Flow : 1006

Demand:  
D1 - Elevation : 6.349  
D2 - System Flow : 205.696  
D2 - System Pressure : 39.901  
Hose ( Demand ) : 250  
D3 - System Demand : 455.696  
Safety Margin : 13.015



Hydraulic Design Information Sheet

Name - UNE Armory Wet System Area 6 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 1 Wet  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Light Hazard Classrooms

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E				
M	Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
	Density	- .10	(X) Wet	Make Reliable
D	Area Per Sprinkler	- 182	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet	- 114.640	( ) Deluge	Size 1/2" X 1/2"
S	Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155 Deg.
G	Hose Allowance - Outside	- 100		

N Note

Calculation Flow Required - 113.72 Press Required - 41.818 At Base  
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 03/16/2016 Cap. -  
 T Time of Test - AM Rated Cap.- Elev.-  
 E Static Press - 58 @ Press -  
 R Residual Press - 36 Elev. - Well  
 Flow - 1006 Proof Flow  
 S Elevation - 100

U Location - On Site

P Source of Information - Owner and Water District

C Commodity Class Location  
 O Storage Ht. Area Aisle W.  
 M Storage Method: Solid Piled % Palletized % Rack  
 M ( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.  
 S R ( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non  
 T A ( ) Mult. Row ( ) Open Shelf

O C  
 R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

G  
 E Horizontal Barriers Provided:

# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 6

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Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	10.56	na	18.2	0.1	182	7.0
105	114.64	K = K @ ARM	12.43	na	18.66			
106	114.64	K = K @ ARM	12.85	na	18.98			
107	114.64	K = K @ ARM	14.39	na	20.08			
101	114.64	K = K @ ARM	11.82	na	18.2			
102	114.64	K = K @ ARM	12.22	na	18.51			
103	114.64	K = K @ ARM	13.27	na	19.29			
104	114.64		17.47	na				
108	114.64		17.92	na				
109	115.83		29.03	na				
AE	115.83		29.3	na				
AF	103.0		34.96	na				
A5	103.0		35.24	na				
A6	103.0		35.39	na				
TI	103.0		35.39	na				
DTI	103.0		35.4	na				
BAV	103.0		36.44	na				
TAV	103.0		36.46	na				
BKFL	102.0		36.91	na				
BASE	100.0		41.82	na				
HOSE	100.0		41.92	na	100.0			
TEST	100.0		41.96	na				

The maximum velocity is 12.38 and it occurs in the pipe between nodes 107 and 108

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 6

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to ARM	18.20 18.2	1.049 120.0 0.1093	2E T	4.0 5.0 0.0	2.500 9.000 11.500	10.562 0.0 1.257			K Factor = 5.60	
	0.0 18.20						11.819		K Factor = 5.29	
105 to 106	18.66 18.66	1.38 120.0 0.0301		0.0 0.0 0.0	14.000 0.0 14.000	12.428 0.0 0.422			K Factor @ node ARM	Vel = 4.00
106 to 107	18.98 37.64	1.38 120.0 0.1103		0.0 0.0 0.0	14.000 0.0 14.000	12.850 0.0 1.544			K Factor @ node ARM	Vel = 8.07
107 to 108	20.08 57.72	1.38 120.0 0.2432	E T	3.0 6.0 0.0	5.500 9.000 14.500	14.394 0.0 3.526			K Factor @ node ARM	Vel = 12.38
	0.0 57.72						17.920		K Factor = 13.64	
101 to 102	18.20 18.2	1.38 120.0 0.0288		0.0 0.0 0.0	14.000 0.0 14.000	11.819 0.0 0.403			K Factor @ node ARM	Vel = 3.90
102 to 103	18.51 36.71	1.38 120.0 0.1052		0.0 0.0 0.0	10.000 0.0 10.000	12.222 0.0 1.052			K Factor @ node ARM	Vel = 7.87
103 to 104	19.29 56.0	1.38 120.0 0.2299	E T	3.0 6.0 0.0	9.250 9.000 18.250	13.274 0.0 4.196			K Factor @ node ARM	Vel = 12.01
104 to 108	0.0 56.0	2.067 120.0 0.0321		0.0 0.0 0.0	14.000 0.0 14.000	17.470 0.0 0.450				Vel = 5.35
108 to 109	57.72 113.72	2.067 120.0 0.1192	2E T	10.0 10.0 0.0	77.500 20.000 97.500	17.920 -0.515 11.620				Vel = 10.87
109 to AE	0.0 113.72	4.026 120.0 0.0047	2E	20.0 0.0 0.0	40.000 20.000 60.000	29.025 0.0 0.279				Vel = 2.87
AE to AF	0.0 113.72	4.026 120.0 0.0046	E	10.0 0.0 0.0	12.000 10.000 22.000	29.304 5.557 0.101				Vel = 2.87
AF to A5	0.0 113.72	4.026 120.0 0.0046	E	10.0 0.0 0.0	50.000 10.000 60.000	34.962 0.0 0.278				Vel = 2.87
A5 to A6	0.0 113.72	4.026 120.0 0.0046	T	20.0 0.0 0.0	11.500 20.000 31.500	35.240 0.0 0.146				Vel = 2.87
A6 to TI	0.0 113.72	4.026 120.0 0.0047		0.0 0.0 0.0	1.500 0.0 1.500	35.386 0.0 0.007				Vel = 2.87

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 6

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TI	0.0	6.357		7.000		35.393			
to		120.0		0.0		0.0			
DTI	113.72	0.0006		7.000		0.004	Vel =	1.15	
DTI	0.0	6.357	Bvcb	10.059	3.000	35.397			
to		120.0	S	40.235	88.014	1.000	** Fixed Loss =	1	
BAV	113.72	0.0005	Fsp	0.0	91.014	0.046	Vel =	1.15	
			T	37.72					
BAV	0.0	6.357	E	17.603	8.000	36.443			
to		120.0		0.0	17.603	0.0			
TAV	113.72	0.0005		0.0	25.603	0.012	Vel =	1.15	
TAV	0.0	6.065	E	14.0	0.500	36.455			
to		120.0	Eq	20.0	34.000	0.433			
BKFL	113.72	0.0006		0.0	34.500	0.022	Vel =	1.26	
BKFL	0.0	6.065	E	14.0	0.500	36.910			
to		120.0	Zac	0.0	14.000	4.898	** Fixed Loss =	4.032	
BASE	113.72	0.0007		0.0	14.500	0.010	Vel =	1.26	
BASE	0.0	6.16	E	20.084	165.000	41.818			
to		140.0	T	43.037	67.425	0.0			
HOSE	113.72	0.0004	G	4.304	232.425	0.102	Vel =	1.22	
HOSE	100.00	8.27		0.0	110.000	41.920	Qa =	100	
to		140.0		0.0	0.0	0.0			
TEST	213.72	0.0003		0.0	110.000	0.037	Vel =	1.28	
	0.0								
	213.72					41.957	K Factor =	32.99	

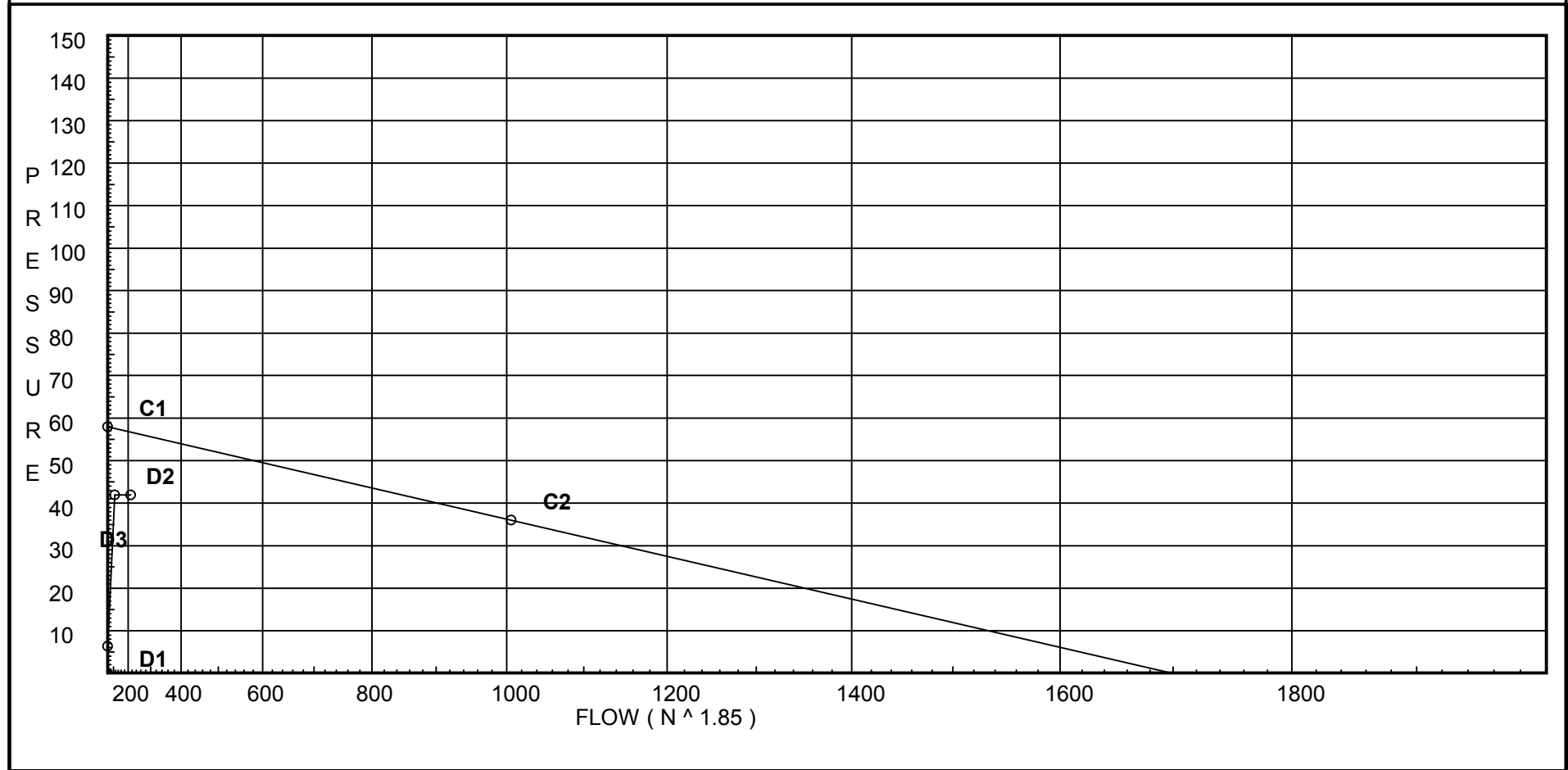
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
UNE Armory Wet System Area 6

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Date

City Water Supply:  
C1 - Static Pressure : 58  
C2 - Residual Pressure: 36  
C2 - Residual Flow : 1006

Demand:  
D1 - Elevation : 6.341  
D2 - System Flow : 113.719  
D2 - System Pressure : 41.957  
Hose ( Demand ) : 100  
D3 - System Demand : 213.719  
Safety Margin : 14.791



Hydraulic Design Information Sheet

Name - UNE Armory Wet System Area 7 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 1 Wet  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Ordinary Hazard

S (X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. (X) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E				
M	Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
	Density	- .15	(X) Wet	Make Reliable
D	Area Per Sprinkler	- 130	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet	- 113.500	( ) Deluge	Size 1/2" X 1/2"
S	Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155 Deg.
G	Hose Allowance - Outside	- 250		

N Note

Calculation Flow Required - 248.20 Press Required - 57.225 At Base  
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 03/16/2016 Cap. -  
 T Time of Test - AM Rated Cap.- Elev.-  
 E Static Press - 70 @ Press -  
 R Residual Press - 50 Elev. - Well  
 Flow - 900 Proof Flow  
 S Elevation - 100

U Location - On Site

P Source of Information - Owner and Water District

C Commodity Class Location  
 O Storage Ht. Area Aisle W.  
 M Storage Method: Solid Piled % Palletized % Rack  
 M ( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.  
 S R ( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non  
 T A ( ) Mult. Row ( ) Open Shelf

O C  
 R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

G  
 E Horizontal Barriers Provided:



# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
UNE Armory Area 7

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Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	12.13	na	19.5	0.15	130	7.0
125	113.5	K = K @ ARM	15.64	na	20.95			
126	113.5	K = K @ ARM	15.81	na	21.06			
127	113.5	K = K @ ARM	16.45	na	21.48			
128	113.5	K = K @ ARM	19.22	na	23.22			
129	113.5		27.76	na				
BB	113.5		31.9	na				
122	113.5	5.6	13.71	na	20.74	0.15	130	7.0
120	113.5	5.6	14.68	na	21.46	0.15	130	7.0
117	113.5	5.6	12.77	na	20.01	0.15	130	7.0
118	113.5	5.6	13.22	na	20.36	0.15	130	7.0
114	113.5	5.6	12.27	na	19.61	0.15	130	7.0
115	113.5	5.6	12.7	na	19.96	0.15	130	7.0
111	113.5	5.6	12.13	na	19.5	0.15	130	7.0
112	113.5	5.6	12.56	na	19.84	0.15	130	7.0
113	113.5		14.67	na				
116	113.5		14.84	na				
119	113.5		15.44	na				
121	113.5		16.39	na				
123	113.5		16.57	na				
124	113.5		30.59	na				
AA	113.5		33.21	na				
AAA	103.0		39.9	na				
BBB	103.0		42.23	na				
CCC	103.0		43.32	na				
DDD	103.0		44.41	na				
A3	103.0		47.14	na				
A4	103.0		47.29	na				
A5	103.0		50.98	na				
A6	103.0		51.6	na				
TI	103.0		51.63	na				
DTI	103.0		51.64	na				
BAV	103.0		52.84	na				
TAV	103.0		52.89	na				
BKFL	102.0		53.42	na				
BASE	100.0		57.23	na				
HOSE	100.0		57.66	na	250.0			
TEST	100.0		57.84	na				

The maximum velocity is 15.44 and it occurs in the pipe between nodes 123 and 124

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Area 7

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to ARM	19.50 19.5	1.049 120.0 0.1242	2E T	4.0 5.0 0.0	2.500 9.000 11.500	12.125 0.0 1.428			K Factor = 5.60	
	0.0 19.50								Vel = 7.24	
							13.553		K Factor = 5.30	
125 to 126	20.95 20.95	1.61 120.0 0.0176		0.0 0.0 0.0	10.000 0.0 10.000	15.638 0.0 0.176			K Factor @ node ARM	
									Vel = 3.30	
126 to 127	21.06 42.01	1.61 120.0 0.0638		0.0 0.0 0.0	10.000 0.0 10.000	15.814 0.0 0.638			K Factor @ node ARM	
									Vel = 6.62	
127 to 128	21.48 63.49	1.61 120.0 0.1369	2E	8.0 0.0 0.0	12.250 8.000 20.250	16.452 0.0 2.772			K Factor @ node ARM	
									Vel = 10.01	
128 to 129	23.23 86.72	1.61 120.0 0.2437	T	8.0 0.0 0.0	27.000 8.000 35.000	19.224 0.0 8.531			K Factor @ node ARM	
									Vel = 13.67	
129 to BB	0.0 86.72	1.61 120.0 0.2437	T	8.0 0.0 0.0	9.000 8.000 17.000	27.755 0.0 4.143				Vel = 13.67
BB to BBB	0.0 86.72	1.61 120.0 0.2437	E T	4.0 8.0 0.0	11.750 12.000 23.750	31.898 4.548 5.789				Vel = 13.67
	0.0 86.72						42.235		K Factor = 13.34	
122 to 123	20.74 20.74	1.049 120.0 0.1391	3E T	6.0 5.0 0.0	9.500 11.000 20.500	13.713 0.0 2.852			K Factor = 5.60	
	0.0 20.74								Vel = 7.70	
							16.565		K Factor = 5.10	
120 to 121	21.46 21.46	1.049 120.0 0.1482	2E T	4.0 5.0 0.0	2.500 9.000 11.500	14.684 0.0 1.704			K Factor = 5.60	
	0.0 21.46								Vel = 7.97	
							16.388		K Factor = 5.30	
117 to 119	20.01 20.01	1.049 120.0 0.1303	3E T	6.0 5.0 0.0	9.500 11.000 20.500	12.773 0.0 2.671			K Factor = 5.60	
	0.0 20.01								Vel = 7.43	
							15.444		K Factor = 5.09	
118 to 119	20.36 20.36	1.049 120.0 0.1345	3E T	6.0 5.0 0.0	5.500 11.000 16.500	13.224 0.0 2.220			K Factor = 5.60	
	0.0 20.36								Vel = 7.56	
							15.444		K Factor = 5.18	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Area 7

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
114 to 116	19.61 19.61	1.049 120.0 0.1255	3E T	6.0 5.0 0.0	9.500 11.000 20.500	12.265 0.0 2.573		K Factor = 5.60		Vel = 7.28
	0.0 19.61						14.838	K Factor = 5.09		
115 to 116	19.96 19.96	1.049 120.0 0.1296	3E T	6.0 5.0 0.0	5.500 11.000 16.500	12.700 0.0 2.138		K Factor = 5.60		Vel = 7.41
	0.0 19.96						14.838	K Factor = 5.18		
111 to 113	19.50 19.5	1.049 120.0 0.1242	3E T	6.0 5.0 0.0	9.500 11.000 20.500	12.125 0.0 2.546		K Factor = 5.60		Vel = 7.24
	0.0 19.50						14.671	K Factor = 5.09		
112 to 113	19.84 19.84	1.049 120.0 0.1282	3E T	6.0 5.0 0.0	5.500 11.000 16.500	12.555 0.0 2.116		K Factor = 5.60		Vel = 7.37
113 to 116	19.50 39.34	2.067 120.0 0.0167		0.0 0.0 0.0	10.000 0.0 10.000	14.671 0.0 0.167				Vel = 3.76
116 to 119	39.57 78.91	2.067 120.0 0.0606		0.0 0.0 0.0	10.000 0.0 10.000	14.838 0.0 0.606				Vel = 7.54
119 to 121	40.38 119.29	2.067 120.0 0.1302		0.0 0.0 0.0	7.250 0.0 7.250	15.444 0.0 0.944				Vel = 11.41
121 to 123	21.46 140.75	2.067 120.0 0.1770		0.0 0.0 0.0	1.000 0.0 1.000	16.388 0.0 0.177				Vel = 13.46
123 to 124	20.74 161.49	2.067 120.0 0.2280	2E T	10.0 10.0 0.0	41.500 20.000 61.500	16.565 0.0 14.024				Vel = 15.44
124 to AA	0.0 161.49	2.067 120.0 0.2281	T	10.0 0.0 0.0	1.500 10.000 11.500	30.589 0.0 2.623				Vel = 15.44
AA to AAA	0.0 161.49	2.469 120.0 0.0959	T	12.0 0.0 0.0	10.330 12.000 22.330	33.212 4.548 2.142				Vel = 10.82
AAA to BBB	0.0 161.49	3.068 120.0 0.0333	2T	30.0 0.0 0.0	40.000 30.000 70.000	39.902 0.0 2.333				Vel = 7.01
BBB to CCC	86.71 248.2	3.068 120.0 0.0738		0.0 0.0 0.0	14.750 0.0 14.750	42.235 0.0 1.088				Vel = 10.77

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Area 7

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
CCC to DDD	0.0 248.2	3.068 120.0 0.0738		0.0	14.750 0.0 14.750	43.323 0.0 1.089				Vel = 10.77
DDD to A3	0.0 248.2	3.068 120.0 0.0738	T	15.0	22.000 15.000 37.000	44.412 0.0 2.730				Vel = 10.77
A3 to A4	0.0 248.2	3.068 120.0 0.0740		0.0	2.000 0.0 2.000	47.142 0.0 0.148				Vel = 10.77
A4 to A5	0.0 248.2	3.068 120.0 0.0738	T	15.0	35.000 15.000 50.000	47.290 0.0 3.690				Vel = 10.77
A5 to A6	0.0 248.2	4.026 120.0 0.0197	T	20.0	11.500 20.000 31.500	50.980 0.0 0.619				Vel = 6.26
A6 to TI	0.0 248.2	4.026 120.0 0.0200		0.0	1.500 0.0 1.500	51.599 0.0 0.030				Vel = 6.26
TI to DTI	0.0 248.2	6.357 120.0 0.0020		0.0	7.000 0.0 7.000	51.629 0.0 0.014				Vel = 2.51
DTI to BAV	0.0 248.2	6.357 120.0 0.0021	Bvcb S Fsp T	10.059 40.235 0.0 37.72	3.000 88.014 91.014	51.643 1.000 0.194		** Fixed Loss = 1		Vel = 2.51
BAV to TAV	0.0 248.2	6.357 120.0 0.0021	E	17.603	8.000 17.603 25.603	52.837 0.0 0.054				Vel = 2.51
TAV to BKFL	0.0 248.2	6.065 120.0 0.0027	E Eq	14.0 20.0	0.500 34.000 34.500	52.891 0.433 0.092				Vel = 2.76
BKFL to BASE	0.0 248.2	6.065 120.0 0.0027	E Zac	14.0 0.0	0.500 14.000 14.500	53.416 3.770 0.039		** Fixed Loss = 2.904		Vel = 2.76
BASE to HOSE	0.0 248.2	6.16 140.0 0.0019	E T G	20.084 43.037 4.304	165.000 67.425 232.425	57.225 0.0 0.433				Vel = 2.67
HOSE to TEST	250.00 498.2	8.27 140.0 0.0016		0.0	110.000 0.0 110.000	57.658 0.0 0.177				Qa = 250 Vel = 2.98
	0.0 498.20					57.835				K Factor = 65.51

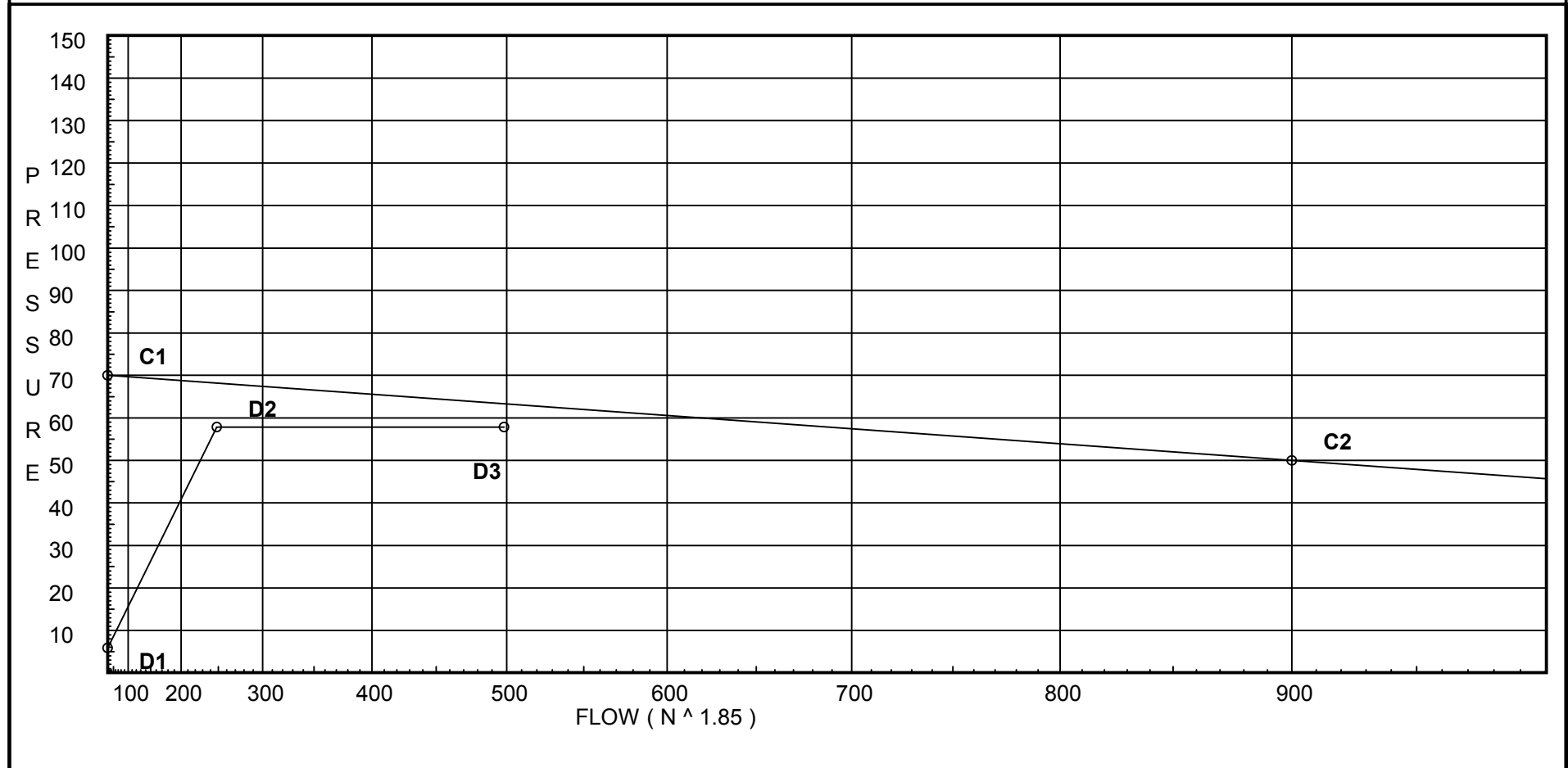
# Water Supply Curve C

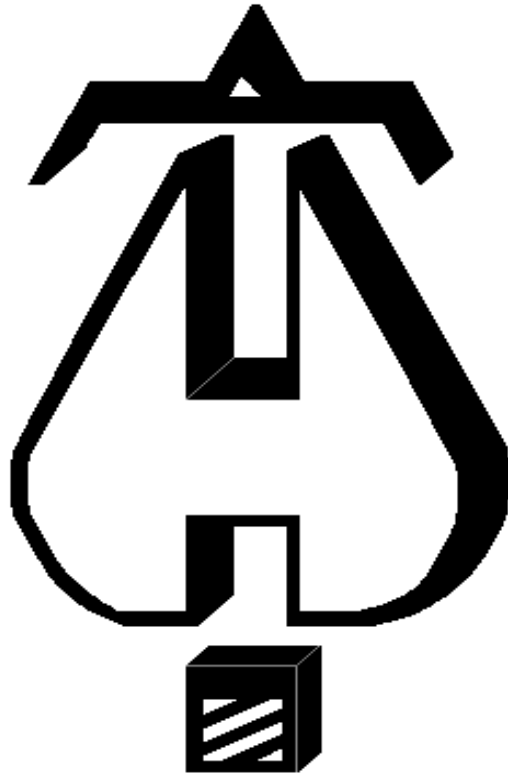
SPRINKLER SYSTEMS INC.  
UNE Armory Area 7

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Date

City Water Supply:  
C1 - Static Pressure : 70  
C2 - Residual Pressure: 50  
C2 - Residual Flow : 900

Demand:  
D1 - Elevation : 5.847  
D2 - System Flow : 248.204  
D2 - System Pressure : 57.835  
Hose ( Demand ) : 250  
D3 - System Demand : 498.204  
Safety Margin : 5.468





**... Fire Protection by Computer Design**

SPRINKLER SYSTEMS INC.  
4 AVON STREET  
P O BOX 1285  
LEWISTON, ME. 04243  
207-782-0104

Job Name : UNE Armory Dry System Area 1  
Building : Existing  
Location : 716 Steven's Ave Portland, Maine  
System : 2 Dry  
Contract : 16-101  
Data File : UNE Armory Dry System Area 1.WXF

Hydraulic Design Information Sheet

Name - UNE Armory Dry System Area 1 Date - 10-14-15  
 Location - 716 Steven's Ave Portland, Maine  
 Building - Existing System No. - 2 Dry  
 Contractor - Sprinkler Systems Inc Contract No. - 16-101  
 Calculated By - CDS Drawing No. - 1-3 of 3  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - Varies  
 Occupancy - Light Hazard

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

E	M	D	E	S	I	G	N
	Area of Sprinkler Operation - Entire		System Type		Sprinkler/Nozzle		
	Density - .10		( ) Wet		Make Reliable		
	Area Per Sprinkler - 168		( ) Dry		Model F1FR56		
	Elevation at Highest Outlet - 131.500		( ) Deluge		Size 1/2" X 1/2"		
	Hose Allowance - Inside - 0		( ) Preaction		K-Factor 5.6		
	Rack Sprinkler Allowance - 0		( ) Other		Temp.Rat.155 Deg.		
	Hose Allowance - Outside - 100						

Note

Calculation Flow Required - 142.51 Press Required - 60.176 At Base  
 Summary C-Factor Used: 100 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 03/16/2016 Cap. -  
 T Time of Test - AM Rated Cap.- Elev.-  
 E Static Press - 70 @ Press -  
 R Residual Press - 50 Elev. - Well  
 Flow - 900 Proof Flow  
 S Elevation - 100

U Location - On Site

P Source of Information - Owner and Water District

C Commodity Class Location  
 O Storage Ht. Area Aisle W.  
 M Storage Method: Solid Piled % Palletized % Rack  
 M ( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.  
 S R ( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non  
 T A ( ) Mult. Row ( ) Open Shelf

O C  
 R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

E Horizontal Barriers Provided:

# Fittings Used Summary

SPRINKLER SYSTEMS INC.  
UNE Armory Dry System Area 1

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Date

Fitting Legend		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
Abbrev.	Name																				
Ball	B Ball Milw BB-SC100			2.25	2	2.5	2.25	10													
Bvcb	B Fly Vic 705W	0	0	0	0	0	0	5	5	0	12	12	8	11	12	14	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
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65	65	71	81	91	101
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
Zac	Ames 2000SS	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

SPRINKLER SYSTEMS INC.  
UNE Armory Dry System Area 1

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Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	9.0	na	16.8	0.1	168	7.0
211	131.5	5.6	12.6	na	19.88	0.15	100	7.0
212	131.5	5.6	12.66	na	19.93	0.15	100	7.0
207	131.5	K = K @ ARM	11.08	na	17.75			
208	131.5	K = K @ ARM	11.12	na	17.78			
209	131.5		11.34	na				
201	131.5	5.6	8.98	na	16.78	0.15	100	7.0
202	131.5	5.6	8.6	na	16.42	0.15	100	7.0
203	131.5		9.81	na				
204	131.5	K = K @ ARM	9.92	na	16.8			
205	131.5	K = K @ ARM	10.36	na	17.17			
206	131.5		10.88	na				
210	131.5		11.66	na				
213	131.5		13.02	na				
214	103.0		45.03	na				
TDR	103.0		50.7	na				
TDV	102.5		50.97	na				
DTI	103.0		54.06	na				
BAV	103.0		55.13	na				
TAV	103.0		55.15	na				
BKFL	102.0		55.61	na				
BASE	100.0		60.18	na				
HOSE	100.0		60.33	na	100.0			
TEST	100.0		60.38	na				

The maximum velocity is 13.63 and it occurs in the pipe between nodes 213 and 214

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Dry System Area 1

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to ARM	16.80 16.8	1.049 100.0 0.1321	E T	1.427 3.568 0.0	2.000 4.995 6.995	9.000 0.0 0.924		K Factor = 5.60 Vel = 6.24	
	0.0 16.80					9.924		K Factor = 5.33	
211 to 212	19.88 19.88	2.067 100.0 0.0066		0.0 0.0 0.0	8.750 0.0 8.750	12.602 0.0 0.058		K Factor = 5.60 Vel = 1.90	
212 to 213	19.92 39.8	2.067 100.0 0.0239	E T	3.568 7.137 0.0	4.500 10.705 15.205	12.660 0.0 0.364		K Factor = 5.60 Vel = 3.81	
	0.0 39.80					13.024		K Factor = 11.03	
207 to 208	17.75 17.75	2.067 100.0 0.0054		0.0 0.0 0.0	7.250 0.0 7.250	11.081 0.0 0.039		K Factor @ node ARM Vel = 1.70	
208 to 209	17.79 35.54	2.067 100.0 0.0194	T	7.137 0.0 0.0	4.000 7.137 11.137	11.120 0.0 0.216		K Factor @ node ARM Vel = 3.40	
209 to 210	0.0 35.54	2.067 100.0 0.0194	T	7.137 0.0 0.0	9.330 7.137 16.467	11.336 0.0 0.320		Vel = 3.40	
	0.0 35.54					11.656		K Factor = 10.41	
201 to 203	16.78 16.78	1.049 100.0 0.1317	T	3.568 0.0 0.0	2.750 3.568 6.318	8.980 0.0 0.832		K Factor = 5.60 Vel = 6.23	
	0.0 16.78					9.812		K Factor = 5.36	
202 to 203	16.42 16.42	1.049 100.0 0.1266	T	3.568 0.0 0.0	6.000 3.568 9.568	8.601 0.0 1.211		K Factor = 5.60 Vel = 6.10	
203 to 204	16.78 33.2	2.067 100.0 0.0172		0.0 0.0 0.0	6.500 0.0 6.500	9.812 0.0 0.112		Vel = 3.17	
204 to 205	16.80 50.0	2.067 100.0 0.0365		0.0 0.0 0.0	12.000 0.0 12.000	9.924 0.0 0.438		K Factor @ node ARM Vel = 4.78	
205 to 206	17.17 67.17	2.067 100.0 0.0630	T	7.137 0.0 0.0	1.000 7.137 8.137	10.362 0.0 0.513		K Factor @ node ARM Vel = 6.42	
206 to 210	0.0 67.17	2.067 100.0 0.0630	T	7.137 0.0 0.0	5.250 7.137 12.387	10.875 0.0 0.781		Vel = 6.42	
210 to 213	35.54 102.71	2.067 100.0 0.1384	T	7.137 0.0 0.0	2.750 7.137 9.887	11.656 0.0 1.368		Vel = 9.82	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
UNE Armory Dry System Area 1

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
213	39.80	2.067	8E	28.548	49.000	13.024			
to		100.0		0.0	28.548	12.343			
214	142.51	0.2535		0.0	77.548	19.662		Vel = 13.63	
214	0.0	2.469	4E	17.129	36.000	45.029			
to		100.0		0.0	17.129	0.0			
TDR	142.51	0.1067		0.0	53.129	5.669		Vel = 9.55	
TDR	0.0	2.469		0.0	0.500	50.698			
to		100.0		0.0	0.0	0.217			
TDV	142.51	0.1060		0.0	0.500	0.053		Vel = 9.55	
TDV	0.0	2.469	2E	12.0	5.000	50.968			
to		120.0	T	12.0	38.400	-0.217			
DTI	142.51	0.0762	Ball Eq	10.0 4.4	43.400	3.306		Vel = 9.55	
DTI	0.0	6.357	Bvcb	10.059	3.000	54.057			
to		120.0	S	40.235	88.014	1.000		** Fixed Loss = 1	
BAV	142.51	0.0008	Fsp T	0.0 37.72	91.014	0.069		Vel = 1.44	
BAV	0.0	6.357	E	17.603	8.000	55.126			
to		120.0		0.0	17.603	0.0			
TAV	142.51	0.0008		0.0	25.603	0.020		Vel = 1.44	
TAV	0.0	6.065	E	14.0	0.500	55.146			
to		120.0	Eq	20.0	34.000	0.433			
BKFL	142.51	0.0010		0.0	34.500	0.033		Vel = 1.58	
BKFL	0.0	6.065	E	14.0	0.500	55.612			
to		120.0	Zac	0.0	14.000	4.550		** Fixed Loss = 3.684	
BASE	142.51	0.0010		0.0	14.500	0.014		Vel = 1.58	
BASE	0.0	6.16	E	20.084	165.000	60.176			
to		140.0	T	43.037	67.425	0.0			
HOSE	142.51	0.0007	G	4.304	232.425	0.155		Vel = 1.53	
HOSE	100.00	8.27		0.0	110.000	60.331		Qa = 100	
to		140.0		0.0	0.0	0.0			
TEST	242.51	0.0004		0.0	110.000	0.047		Vel = 1.45	
	0.0								
	242.51					60.378		K Factor = 31.21	

# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
UNE Armory Dry System Area 1

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Date

City Water Supply:  
C1 - Static Pressure : 70  
C2 - Residual Pressure: 50  
C2 - Residual Flow : 900

Demand:  
D1 - Elevation : 13.643  
D2 - System Flow : 142.512  
D2 - System Pressure : 60.378  
Hose ( Demand ) : 100  
D3 - System Demand : 242.512  
Safety Margin : 7.855

