

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

Denali Fire protection, Inc.  
270 Tiger Hill Road  
Your Street Address 2  
Oxford, Maine 04270  
207-539-4226

Job Name : WALGREENS PORTLAND GENERAL SALES  
Building : STEEL STRUCTURE  
Location : WASHINGTON AVE. & ALLEN AVE. PORTLAND, MAINE  
System : 1  
Contract : C21-09  
Data File : 1-C2109.WXF

Hydraulic Design Information Sheet

Name - WALGREENS Date - 10/19/09  
Location - WASHINGTON AVE. & ALLEN AVE. PORTLAND, MAINE  
Building - STEEL STRUCTURE System No. - 1  
Contractor - DENALI FIRE PROTECTION, INC. Contract No. - C21-09  
Calculated By - CKD Drawing No. - 1  
Construction: ( ) Combustible (X) Non-Combustible Ceiling Height - 13'-0"  
Occupancy - GENERAL SALES

S (X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve  
S Other ALSO PER WALGREENS CRITERIA FOR EXTENDED COVERAGE PENDENTS  
T Specific Ruling Made By Date

M	Area of Sprinkler Operation	- 1502	System Type	Sprinkler/Nozzle
	Density	- .2	(X) Wet	Make CENTRAL
D	Area Per Sprinkler	- 256	( ) Dry	Model EC-14
E	Elevation at Highest Outlet	- 113.67	( ) Deluge	Size 3/4"
S	Hose Allowance - Inside	-	( ) Preaction	K-Factor 14.0
I	Rack Sprinkler Allowance	-	( ) Other	Temp.Rat.155
G	Hose Allowance - Outside	- 250		

N Note

Calculation Flow Required - 655.290 Press Required - 71.312 AT TEST  
Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 10/11/06		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 77	@ Press -	
R	Residual Press - 76	Elev. -	Well
	Flow - 1838		Proof Flow
S	Elevation - 100.0		

U Location - 220'-0" FROM THE BUILDING  
P  
L Source of Information - PORTLAND WATER DISTRICT  
Y

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	( ) Double Row	( ) Slave Pallet	( ) Solid Shelf ( ) Non
T	( ) Mult. Row	( ) Open Shelf	
O			
R	Flue Spacing	Clearance:Storage to Ceiling	
A	Longitudinal	Transverse	
G			
E	Horizontal Barriers Provided:		

# Water Supply Curve (C)

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL SALES

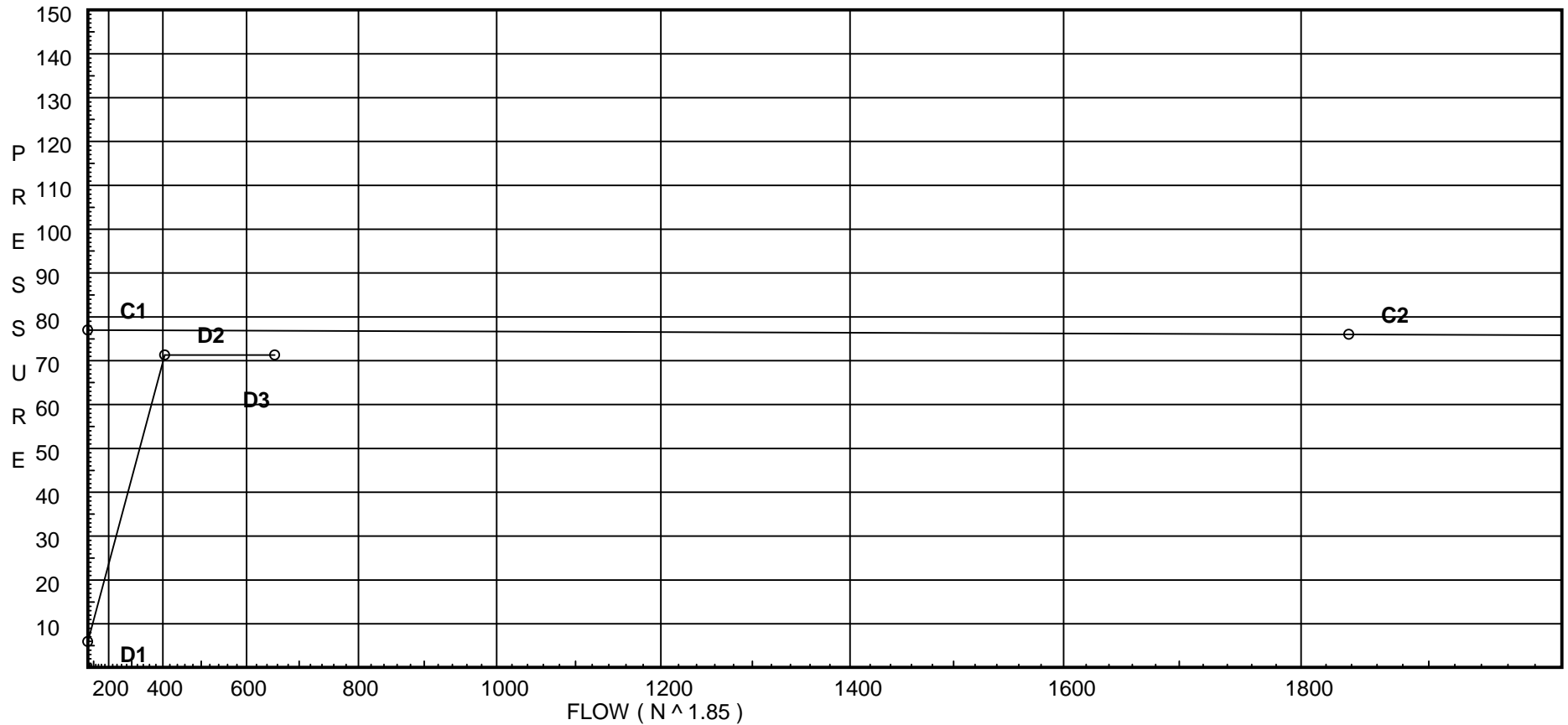
Page 2  
Date 10/19/09

## City Water Supply:

C1 - Static Pressure : 77  
C2 - Residual Pressure: 76  
C2 - Residual Flow : 1838

## Demand:

D1 - Elevation : 5.920  
D2 - System Flow : 405.29  
D2 - System Pressure : 71.312  
Hose ( Adj City ) : \_\_\_\_\_  
Hose ( Demand ) : 250  
D3 - System Demand : 655.29  
Safety Margin : 5.539



# Fittings Used Summary

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL SALES

Page 3  
Date 10/19/09

## Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	Generic Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
L	Long Turn Elbow	1	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
T	90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121

## Units Summary

Diameter Units           Inches  
Length Units               Feet  
Flow Units                 US Gallons per Minute  
Pressure Units             Pounds per Square Inch

# Pressure / Flow Summary - STANDARD

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL SALES

Page 4  
Date 10/19/09

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
D1	0.0	14	13.3	na	51.06	0.2	10	13.3
1	113.67	K = K @ L1	17.72	na	51.06			
2	113.67	K = K @ L1	18.07	na	51.56			
3	113.67	K = K @ L1	19.35	na	53.36			
4	113.67	K = K @ L1	19.97	na	54.2			
5	113.67	K = K @ L1	20.36	na	54.73			
6	113.67	K = K @ L1	21.79	na	56.62			
3A	113.67		24.57	na				
7	113.67	K = K @ L1	47.7	na	83.77			
A	113.67		49.5	na				
B	113.67		49.88	na				
C	113.67		52.75	na				
TOR	113.67		55.26	na				
BFP	104.0		61.45	na				
BASE	101.0		69.46	na				
TEST	100.0		71.31	na	250.0			

The maximum velocity is 28.23 and it occurs in the pipe between nodes 3A and A

# Final Calculations - Hazen-Williams

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL SALES

Page 5  
Date 10/19/09

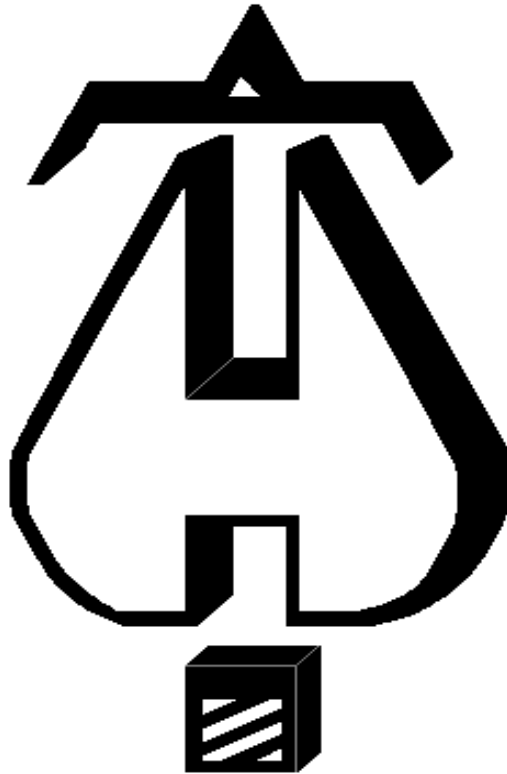
Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
D1 to L1	51.06 51.06	1.049 120 0.7368	1T	5.0 0.0 0.0	1.000 5.000 6.000	13.300 0.0 4.421			K Factor = 14.00	
	0.0 51.06					17.721			K Factor = 12.13	
1 to 2	51.06 51.06	2.157 120 0.0220		0.0 0.0 0.0	16.000 0.0 16.000	17.721 0.0 0.352			K Factor @ node L1	Vel = 4.48
2 to 3	51.56 102.62	2.157 120 0.0801		0.0 0.0 0.0	16.000 0.0 16.000	18.073 0.0 1.282			K Factor @ node L1	Vel = 9.01
3 to 3A	53.36 155.98	2.157 120 0.1738	1L 1T	3.692 12.307 0.0	14.000 15.999 29.999	19.355 0.0 5.213			K Factor @ node L1	Vel = 13.69
	0.0 155.98					24.568			K Factor = 31.47	
4 to 5	54.20 54.2	2.157 120 0.0246		0.0 0.0 0.0	16.000 0.0 16.000	19.968 0.0 0.393			K Factor @ node L1	Vel = 4.76
5 to 6	54.72 108.92	2.157 120 0.0894		0.0 0.0 0.0	16.000 0.0 16.000	20.361 0.0 1.431			K Factor @ node L1	Vel = 9.56
6 to 3A	56.62 165.54	2.157 120 0.1940	1T	12.307 0.0 0.0	2.000 12.307 14.307	21.792 0.0 2.776			K Factor @ node L1	Vel = 14.53
3A to A	155.98 321.52	2.157 120 0.6624	1T	12.307 0.0 0.0	25.330 12.307 37.637	24.568 0.0 24.931				Vel = 28.23
	0.0 321.52					49.499			K Factor = 45.70	
7 to B	83.77 83.77	2.157 120 0.0550	1T	12.307 0.0 0.0	27.330 12.307 39.637	47.704 0.0 2.181			K Factor @ node L1	Vel = 7.35
	0.0 83.77					49.885			K Factor = 11.86	
A to B	321.52 321.52	4.26 120 0.0241		0.0 0.0 0.0	16.000 0.0 16.000	49.499 0.0 0.386				Vel = 7.24
B to C	83.77 405.29	4.26 120 0.0370	1T	26.334 0.0 0.0	51.120 26.334 77.454	49.885 0.0 2.863				Vel = 9.12
C to TOR	0.0 405.29	4.26 120 0.0370	3L	23.701 0.0 0.0	44.370 23.701 68.071	52.748 0.0 2.516				Vel = 9.12
TOR to BFP	0.0 405.29	4.26 120 0.0370	1B 1T	15.8 26.334 0.0	12.000 42.134 54.134	55.264 4.188 2.001				Vel = 9.12
BFP to BASE	0.0 405.29	4.26 120 0.0370	1E	13.167 0.0 0.0	6.000 13.167 19.167	61.453 7.299 0.709			* Fixed loss = 6	Vel = 9.12

# Final Calculations - Standard

Denali Fire protection, Inc.  
 WALGREENS PORTLAND GENERAL SALES

Page 6  
 Date 10/19/09

Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
BASE	0.0	6.16	2E 40.168	220.000	69.461				
to		140	1G 4.304	87.509	0.433				
TEST	405.29	0.0046	1T 43.037	307.509	1.418		Vel = 4.36		
	250.00						Qa = 250.00		
	655.29				71.312		K Factor = 77.60		



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

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270 Tiger Hill Road  
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207-539-4226

Job Name : WALGREENS PORTLAND GENERAL STOCKROOM  
Building : STEEL STRUCTURE  
Location : WASHINGTON AVE. & ALLEN AVE. PORTLAND, MAINE  
System : 1  
Contract : C21-09  
Data File : 2-C2109.WXF



Hydraulic Design Information Sheet

Name - WALGREENS Date - 10/19/09  
 Location - WASHINGTON AVE. & ALLEN AVE. PORTLAND, MAINE  
 Building - STEEL STRUCTURE System No. - 1  
 Contractor - DENALI FIRE PROTECTION, INC. Contract No. - C21-09  
 Calculated By - CKD Drawing No. - 1  
 Construction: ( ) Combustible (X) Non-Combustible Ceiling Height - EXPOSED  
 Occupancy - STOCKROOM

S (X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve  
 S Other ALSO PER WALGREENS CRITERIA FOR THE STOCKROOM  
 T Specific Ruling Made By Date

M	Area of Sprinkler Operation	- 1330	System Type	Sprinkler/Nozzle
	Density	- .35	(X) Wet	Make CENTRAL
D	Area Per Sprinkler	- 98	( ) Dry	Model ELO-231B
E	Elevation at Highest Outlet	- 115.75	( ) Deluge	Size 3/4"
S	Hose Allowance - Inside	-	( ) Preaction	K-Factor 11.2
I	Rack Sprinkler Allowance	-	( ) Other	Temp.Rat.286
G	Hose Allowance - Outside	- 500		

N Note

Calculation Flow Required - 1164.73 Press Required - 66.896 AT TEST  
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 10/11/06		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 77	@ Press -	
R	Residual Press - 76	Elev. -	Well
	Flow - 1838		Proof Flow
S	Elevation - 100.0		

U Location - 220'-0" FROM THE BUILDING  
 P  
 L Source of Information - PORTLAND WATER DISTRICT  
 Y

C	Commodity	MERCANTILE	Class	IV	Location
O	Storage Ht.	20' MAX	Area		Aisle W. 4'-0"
M	Storage Method:	Solid Piled 100 %	Palletized	%	Rack
M		(X) Single Row	(X) Conven. Pallet	( ) Auto. Storage	( ) Encap.
S	R	(X) Double Row	( ) Slave Pallet	( ) Solid Shelf	(X) 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:			

# Water Supply Curve (C)

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL STOCKROOM

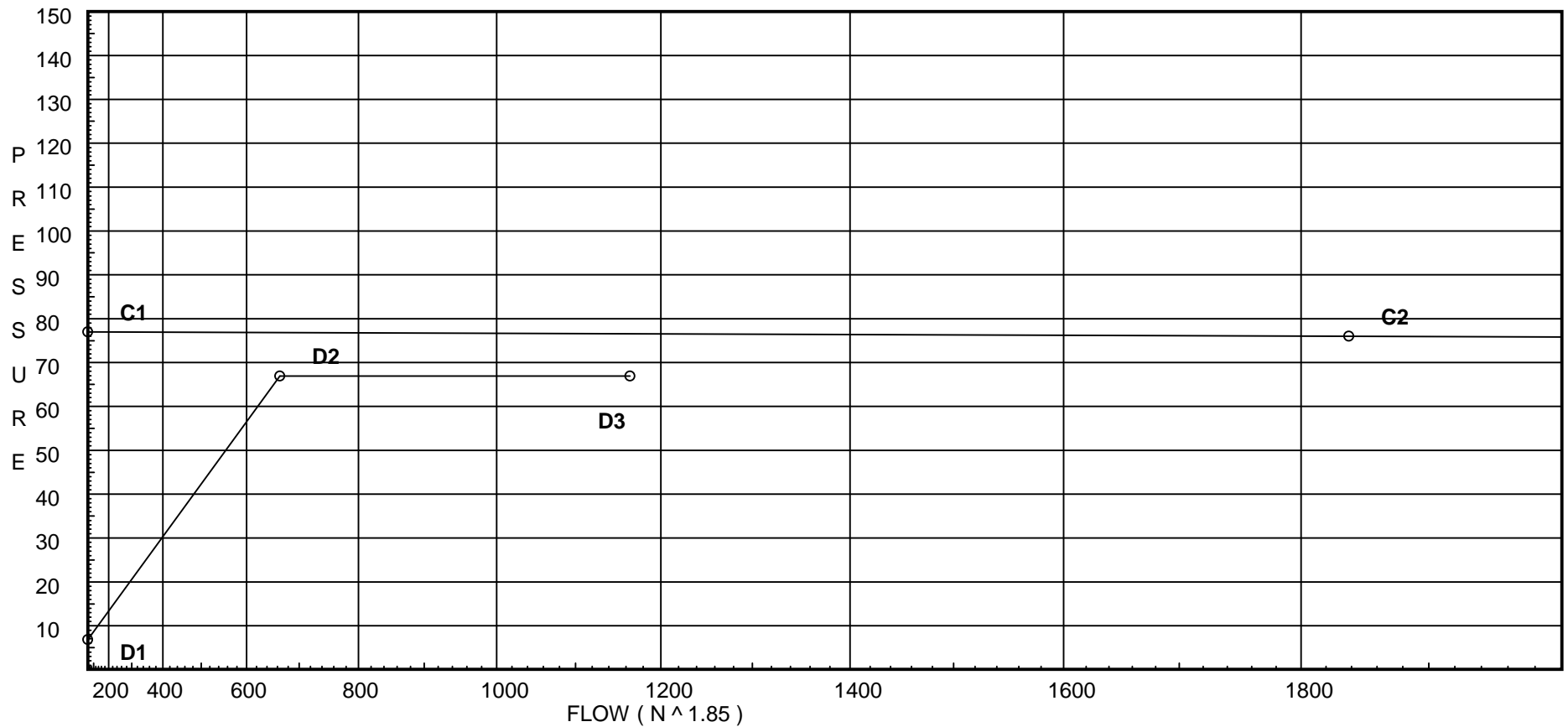
Page 2  
Date 10/19/09

## City Water Supply:

C1 - Static Pressure : 77  
C2 - Residual Pressure: 76  
C2 - Residual Flow : 1838

## Demand:

D1 - Elevation : 6.821  
D2 - System Flow : 664.73  
D2 - System Pressure : 66.896  
Hose ( Adj City ) : \_\_\_\_\_  
Hose ( Demand ) : 500  
D3 - System Demand : 1164.73  
Safety Margin : 9.674



# Fittings Used Summary

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL STOCKROOM

Page 3  
Date 10/19/09

## Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	Generic Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
L	Long Turn Elbow	1	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
T	90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121

## Units Summary

Diameter Units           Inches  
Length Units               Feet  
Flow Units                 US Gallons per Minute  
Pressure Units             Pounds per Square Inch

# Pressure / Flow Summary - STANDARD

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL STOCKROOM

Page 4  
Date 10/19/09

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
8	115.75	11.2	9.38	na	34.3	0.35	98	7.0
9	115.75	11.2	9.48	na	34.49	0.35	98	7.0
10	115.75	11.2	9.86	na	35.18	0.35	98	7.0
11	115.75	11.2	10.68	na	36.6	0.35	98	7.0
12	115.75	11.2	12.11	na	38.97	0.35	98	7.0
13	115.75	11.2	14.36	na	42.43	0.35	98	7.0
14	115.75	11.2	17.68	na	47.09	0.35	98	7.0
15	115.75	11.2	22.43	na	53.04	0.35	98	7.0
16	115.75	11.2	29.88	na	61.23	0.35	98	7.0
17	115.75	11.2	30.19	na	61.54	0.35	98	7.0
18	115.75	11.2	14.1	na	42.06	0.35	98	7.0
19	115.75	11.2	14.25	na	42.28	0.35	98	7.0
20	115.75	11.2	14.81	na	43.1	0.35	98	7.0
21	115.75	11.2	16.0	na	44.8	0.35	98	7.0
22	115.75	11.2	18.08	na	47.62	0.35	98	7.0
D	115.75		32.38	na				
E	115.75		32.77	na				
C	113.67		38.38	na				
TOR	113.67		44.67	na				
BFP	104.0		53.85	na				
BASE	101.0		62.92	na				
TEST	100.0		66.9	na	500.0			

The maximum velocity is 28.28 and it occurs in the pipe between nodes 15 and D

# Final Calculations - Hazen-Williams

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL STOCKROOM

Page 5  
Date 10/19/09

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
8	34.30	2.157			9.960	9.379			K Factor = 11.20	
to		120			0.0	0.0				
9	34.3	0.0105			9.960	0.105			Vel = 3.01	
9	34.49	2.157			9.960	9.484			K Factor = 11.20	
to		120			0.0	0.0				
10	68.79	0.0383			9.960	0.381			Vel = 6.04	
10	35.18	2.157			9.960	9.865			K Factor = 11.20	
to		120			0.0	0.0				
11	103.97	0.0820			9.960	0.817			Vel = 9.13	
11	36.60	2.157			9.960	10.682			K Factor = 11.20	
to		120			0.0	0.0				
12	140.57	0.1434			9.960	1.428			Vel = 12.34	
12	38.98	2.157			9.960	12.110			K Factor = 11.20	
to		120			0.0	0.0				
13	179.55	0.2254			9.960	2.245			Vel = 15.76	
13	42.43	2.157			9.960	14.355			K Factor = 11.20	
to		120			0.0	0.0				
14	221.98	0.3338			9.960	3.325			Vel = 19.49	
14	47.10	2.157			9.960	17.680			K Factor = 11.20	
to		120			0.0	0.0				
15	269.08	0.4765			9.960	4.746			Vel = 23.62	
15	53.03	2.157	1T	12.307	2.670	22.426			K Factor = 11.20	
to		120			0.0	12.307				
D	322.11	0.6647			0.0	14.977			Vel = 28.28	
	0.0									
	322.11					32.381			K Factor = 56.61	
16	61.23	2.157			9.960	29.883			K Factor = 11.20	
to		120			0.0	0.0				
17	61.23	0.0308			9.960	0.307			Vel = 5.38	
17	61.53	2.157	1T	12.307	7.330	30.190			K Factor = 11.20	
to		120			0.0	12.307				
D	122.76	0.1116			0.0	19.637			Vel = 10.78	
	0.0									
	122.76					32.381			K Factor = 21.57	
18	42.06	2.157			9.960	14.100			K Factor = 11.20	
to		120			0.0	0.0				
19	42.06	0.0154			9.960	0.153			Vel = 3.69	
19	42.28	2.157			9.960	14.253			K Factor = 11.20	
to		120			0.0	0.0				
20	84.34	0.0557			9.960	0.555			Vel = 7.40	
20	43.10	2.157			9.960	14.808			K Factor = 11.20	
to		120			0.0	0.0				
21	127.44	0.1196			9.960	1.191			Vel = 11.19	
21	44.80	2.157			9.960	15.999			K Factor = 11.20	
to		120			0.0	0.0				
22	172.24	0.2087			9.960	2.079			Vel = 15.12	
22	47.62	2.157	1T	12.307	32.500	18.078			K Factor = 11.20	
to		120			0.0	12.307				
E	219.86	0.3279			0.0	44.807			Vel = 19.30	

# Final Calculations - Standard

Denali Fire protection, Inc.  
WALGREENS PORTLAND GENERAL STOCKROOM

Page 6  
Date 10/19/09

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 219.86				32.770			K Factor = 38.41	
D to E	444.88	4.26 120	0.0 0.0	8.870 0.0	32.381 0.0			Vel = 10.01	
E to C	219.85 664.73	4.26 120 0.0923	2L 15.8 1T 26.334 0.0	8.870 42.134 51.004	32.770 0.901 4.709			Vel = 14.96	
C to TOR	0.0 664.73	4.26 120 0.0923	3L 23.701 0.0 0.0	44.370 23.701 68.071	38.380 0.0 6.285			Vel = 14.96	
TOR to BFP	0.0 664.73	4.26 120 0.0923	1B 15.8 1T 26.334 0.0	12.000 42.134 54.134	44.665 4.188 4.998			Vel = 14.96	
BFP to BASE	0.0 664.73	4.26 120 0.0923	1E 13.167 0.0 0.0	6.000 13.167 19.167	53.851 7.299 1.770			* Fixed loss = 6 Vel = 14.96	
BASE to TEST	0.0 664.73	6.16 140 0.0115	2E 40.168 1G 4.304 1T 43.037	220.000 87.509 307.509	62.920 0.433 3.543			Vel = 7.16	
	500.00 1164.73				66.896			Qa = 500.00 K Factor = 142.40	