



. . . Fire Protection by Computer Design

FREEDOM FIRE PROTECTION INC.
209 QUAKER RIDGE ROAD
CASCO, MAINE 04015
207-627-4109

Job Name : DANFORTH ON HIGH CONDOS HC2
Building : 81 DANFORTH STREET
Location : PORTLAND, MAINE 04101
System : #1 AREA #2
Contract :
Data File : DANFORTH ON HIGH CONDOS HC2.WXF

HYDRAULIC DESIGN INFORMATION SHEET

Name - DANFORTH ON HIGH CONDOS Date - 10/24/12
 Location - PORTLAND, MAINE 04101
 Building - 81 DANFORTH STREET System No. - #1 AREA #2
 Contractor - Contract No. -
 Calculated By - MIKE NOBLIT Drawing No. - FP-3
 Construction: (X) Combustible () Non-Combustible Ceiling Height 9'-4"
 OCCUPANCY - APARTMENTS

S Type of Calculation: ()NFPA 13 Residential (X)NFPA 13R ()NFPA 13D
 Y Number of Sprinklers Flowing: ()1 ()2 (X)4 ()
 S ()Other
 T ()Specific Ruling Made by Date
 E
 M Listed Flow at Start Point - 16 Gpm System Type
 Listed Pres. at Start Point - 13.2 Psi (X) Wet () Dry
 D MAXIMUM LISTED SPACING 16' x 16' () Deluge () PreAction
 E Domestic Flow Added - Gpm Sprinkler or Nozzle
 S Additional Flow Added - 100 Gpm Make TYCO Model LFII
 I Elevation at Highest Outlet - 49'-4"Feet Size 1/2" K-Factor 4.4
 G Note: Temperature Rating 155
 N

Calculation Gpm Required 168.349 Psi Required 70.916 At Test
 Summary C-Factor Used: Overhead 150 Underground 140

W Water Flow Test: Pump Data: Tank or Reservoir:
 A Date of Test - 3/26/2008 Rated Cap. Cap.
 T Time of Test - @ Psi Elev.
 E Static (Psi) - 81 Elev.
 R Residual (Psi) - 0 Other Well
 Flow (Gpm) - 1644 Proof Flow Gpm
 S Elevation - -2'-0"

P Location:
 P
 L Source of Information: PORTLAND WATER DISTRICT
 Y

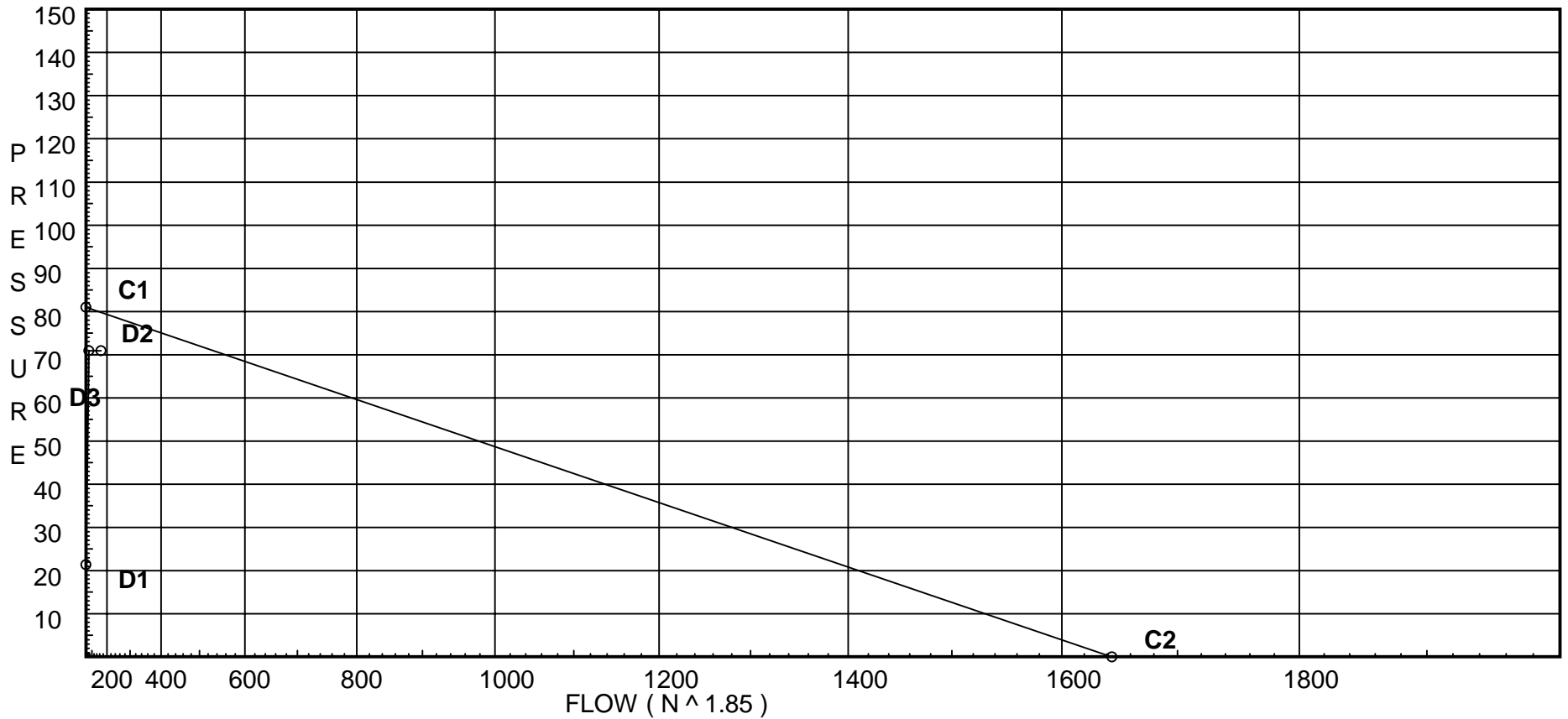
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 81
C2 - Residual Pressure: 0
C2 - Residual Flow : 1644

Demand:
D1 - Elevation : 21.365
D2 - System Flow : 68.349
D2 - System Pressure : 70.912
Hose (Adj City) :
Hose (Demand) : 100
D3 - System Demand : 168.349
Safety Margin : 8.893



Fittings Used Summary

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| 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 |
| 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 |
| Zac | Ames 2000SS | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Pressure / Flow Summary - STANDARD

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| Node No. | Elevation | K-Fact | Pt Actual | Pn | Flow Actual | Density | Area | Press Req. |
|----------|-----------|--------|-----------|----|-------------|---------|-------|------------|
| 201 | 49.33 | 4.4 | 15.87 | na | 17.53 | 0.1 | 0.001 | 13.2 |
| 47 | 49.33 | | 16.1 | na | | | | |
| 46 | 39.583 | | 21.05 | na | | | | |
| 202 | 49.33 | 4.4 | 14.04 | na | 16.49 | 0.1 | 0.001 | 13.2 |
| 49 | 49.33 | | 14.24 | na | | | | |
| 48 | 39.583 | | 19.11 | na | | | | |
| 203 | 49.33 | 4.4 | 13.2 | na | 15.99 | 0.1 | 0.001 | 13.2 |
| 45 | 49.33 | | 13.78 | na | | | | |
| 44 | 39.583 | | 18.87 | na | | | | |
| 43 | 39.583 | | 19.44 | na | | | | |
| 42 | 39.583 | | 19.67 | na | | | | |
| 41 | 39.583 | | 21.67 | na | | | | |
| 204 | 49.33 | 4.4 | 17.39 | na | 18.35 | 0.1 | 0.001 | 13.2 |
| 40 | 49.33 | | 17.97 | na | | | | |
| 39 | 41.583 | | 22.45 | na | | | | |
| 38 | 41.583 | | 23.22 | na | | | | |
| 37 | 41.583 | | 25.02 | na | | | | |
| 36 | 41.583 | | 26.05 | na | | | | |
| 35 | 41.583 | | 26.97 | na | | | | |
| 34 | 41.583 | | 27.04 | na | | | | |
| 33 | 41.583 | | 34.0 | na | | | | |
| 32 | 41.583 | | 38.06 | na | | | | |
| 31 | 41.583 | | 39.14 | na | | | | |
| 30 | 41.583 | | 46.29 | na | | | | |
| 7 | 31.583 | | 51.34 | na | | | | |
| 6 | 20.75 | | 56.43 | na | | | | |
| 5 | 12.25 | | 60.67 | na | | | | |
| 4 | 12.25 | | 60.93 | na | | | | |
| 3 | 9.33 | | 62.54 | na | | | | |
| 2 | 9.33 | | 63.54 | na | | | | |
| 1 | 5.42 | | 65.28 | na | | | | |
| 0 | 2.0 | | 70.04 | na | | | | |
| TEST | 0.0 | | 70.91 | na | 100.0 | | | |

The maximum velocity is 16.85 and it occurs in the pipe between nodes 41 and 34

Final Calculations - Hazen-Williams

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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 | ***** |
|-----------------|--------------|------------------------|---------------------|----------------------|---------------------------|---------------------------|-------|-----------------|-------|
| 201 to 47 | 17.53 | 1.101 150 0.0534 | 1E | 3.825 0.0 0.0 | 0.500 3.825 4.325 | 15.870 0.0 0.231 | | K Factor = 4.40 | |
| 47 to 46 | 0.0 | 1.101 150 0.0533 | 1E | 3.825 0.0 0.0 | 9.750 3.825 13.575 | 16.101 4.221 0.724 | | Vel = 5.91 | |
| 46 to 41 | 0.0 | 1.101 150 0.0533 | 1T | 9.563 0.0 0.0 | 2.166 9.562 11.728 | 21.046 0.0 0.625 | | Vel = 5.91 | |
| | 0.0 17.53 | | | | | 21.671 | | K Factor = 3.77 | |
| 202 to 49 | 16.49 | 1.101 150 0.0476 | 1E | 3.825 0.0 0.0 | 0.500 3.825 4.325 | 14.038 0.0 0.206 | | K Factor = 4.40 | |
| 49 to 48 | 0.0 | 1.101 150 0.0477 | 1E | 3.825 0.0 0.0 | 9.750 3.825 13.575 | 14.244 4.221 0.647 | | Vel = 5.56 | |
| 48 to 42 | 0.0 | 1.101 150 0.0476 | 1T | 9.563 0.0 0.0 | 2.166 9.562 11.728 | 19.112 0.0 0.558 | | Vel = 5.56 | |
| | 0.0 16.49 | | | | | 19.670 | | K Factor = 3.72 | |
| 203 to 45 | 15.99 | 1.101 150 0.0449 | 3E | 11.475 0.0 0.0 | 1.500 11.475 12.975 | 13.200 0.0 0.583 | | K Factor = 4.40 | |
| 45 to 44 | 0.0 | 1.101 150 0.0450 | 1T | 9.563 0.0 0.0 | 9.750 9.562 19.312 | 13.783 4.221 0.869 | | Vel = 5.39 | |
| 44 to 43 | 0.0 | 1.101 150 0.0450 | 1T | 9.563 0.0 0.0 | 3.000 9.562 12.562 | 18.873 0.0 0.565 | | Vel = 5.39 | |
| 43 to 42 | 0.0 | 1.101 150 0.0449 | | 0.0 0.0 0.0 | 5.166 0.0 5.166 | 19.438 0.0 0.232 | | Vel = 5.39 | |
| 42 to 41 | 16.48 | 1.101 150 0.1667 | | 0.0 0.0 0.0 | 12.000 0.0 12.000 | 19.670 0.0 2.001 | | Vel = 10.94 | |
| 41 to 34 | 17.53 | 1.101 150 0.3706 | 1T | 9.563 0.0 0.0 | 7.250 9.562 16.812 | 21.671 -0.866 6.231 | | Vel = 16.85 | |
| | 0.0 50.00 | | | | | 27.036 | | K Factor = 9.62 | |

Final Calculations - Standard

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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 | ***** |
|-----------------|----------|-------------------|---------------------|-------------------|------------------|-----------------|-------|------------------|-------|
| 204 to 40 | 18.35 | 1.101 150 | 1T | 9.563 0.0 | 0.500 9.562 | 17.391 0.0 | | K Factor = 4.40 | |
| 40 to 39 | 18.35 | 0.0579 | | 0.0 | 10.062 | 0.583 | | Vel = 6.18 | |
| 40 to 39 | 0.0 | 1.101 150 | 1T | 9.563 0.0 | 9.750 9.562 | 17.974 3.355 | | | |
| 39 to 38 | 18.35 | 0.0580 | | 0.0 | 19.312 | 1.121 | | Vel = 6.18 | |
| 39 to 38 | 0.0 | 1.101 150 | 1T | 9.563 0.0 | 3.660 9.562 | 22.450 0.0 | | | |
| 38 to 37 | 18.35 | 0.0580 | | 0.0 | 13.222 | 0.767 | | Vel = 6.18 | |
| 38 to 37 | 0.0 | 1.101 150 | 1E | 3.825 0.0 | 27.330 3.825 | 23.217 0.0 | | | |
| 37 to 36 | 18.35 | 0.0580 | | 0.0 | 31.155 | 1.808 | | Vel = 6.18 | |
| 37 to 36 | 0.0 | 1.101 150 | 1T | 9.563 0.0 | 8.083 9.562 | 25.025 0.0 | | | |
| 36 to 35 | 18.35 | 0.0580 | | 0.0 | 17.645 | 1.023 | | Vel = 6.18 | |
| 36 to 35 | 0.0 | 1.101 150 | 1T | 9.563 0.0 | 6.330 9.562 | 26.048 0.0 | | | |
| 35 to 34 | 18.35 | 0.0580 | | 0.0 | 15.892 | 0.922 | | Vel = 6.18 | |
| 35 to 34 | 0.0 | 1.598 150 | | 0.0 0.0 | 7.000 0.0 | 26.970 0.0 | | | |
| 34 to 33 | 18.35 | 0.0094 | | 0.0 | 7.000 | 0.066 | | Vel = 2.94 | |
| 34 to 33 | 50.00 | 1.598 150 | 1T | 11.656 0.0 | 53.000 11.656 | 27.036 0.0 | | | |
| 33 to 32 | 68.35 | 0.1077 | | 0.0 | 64.656 | 6.964 | | Vel = 10.93 | |
| 33 to 32 | 0.0 | 1.598 150 | 1T | 11.656 0.0 | 26.000 11.656 | 34.000 0.0 | | | |
| 32 to 31 | 68.35 | 0.1077 | | 0.0 | 37.656 | 4.055 | | Vel = 10.93 | |
| 32 to 31 | 0.0 | 1.598 150 | 1E | 5.828 0.0 | 4.250 5.828 | 38.055 0.0 | | | |
| 31 to 30 | 68.35 | 0.1078 | | 0.0 | 10.078 | 1.086 | | Vel = 10.93 | |
| 31 to 30 | 0.0 | 1.61 150 | 1T | 12.089 0.0 | 8.583 12.089 | 39.141 5.000 | | * Fixed loss = 5 | |
| 30 to 7 | 68.35 | 0.1038 | | 0.0 | 20.672 | 2.146 | | Vel = 10.77 | |
| 30 to 7 | 0.0 | 2.157 150 | 1T | 18.596 0.0 | 10.250 18.597 | 46.287 4.331 | | | |
| 7 to 6 | 68.35 | 0.0250 | | 0.0 | 28.847 | 0.721 | | Vel = 6.00 | |
| 7 to 6 | 0.0 | 2.157 120 | | 0.0 0.0 | 10.583 0.0 | 51.339 4.692 | | | |
| 6 to 5 | 68.35 | 0.0378 | | 0.0 | 10.583 | 0.400 | | Vel = 6.00 | |
| 6 to 5 | 0.0 | 2.157 120 | 1E | 6.153 0.0 | 8.500 6.153 | 56.431 3.681 | | | |
| 5 | 68.35 | 0.0377 | | 0.0 | 14.653 | 0.553 | | Vel = 6.00 | |

| Hyd. Ref. Point | Qa Qt | Dia. "C" Pf/Ft | Fitting or Eqv. Ln. | Pipe Ftng's Total | Pt Pe Pf | Pt Pv Pn | ***** Notes ***** |
|-----------------------|------------------|------------------------|---------------------------|---------------------------|--------------------------|----------------|-----------------------------------|
| 5 to 4 | 0.0 68.35 | 2.157 120 0.0378 | 1E 6.153 0.0 | 0.830 6.153 6.983 | 60.665 0.0 0.264 | | Vel = 6.00 |
| 4 to 3 | 0.0 68.35 | 2.157 120 0.0377 | 1E 6.153 0.0 | 2.916 6.153 9.069 | 60.929 1.265 0.342 | | Vel = 6.00 |
| 3 to 2 | 0.0 68.35 | 2.157 120 0.0378 | 1E 6.153 0.0 | 20.330 6.153 26.483 | 62.536 0.0 1.000 | | Vel = 6.00 |
| 2 to 1 | 0.0 68.35 | 4.026 120 0.0018 | 1E 10.0 1B 12.0 0.0 | 3.166 22.000 25.166 | 63.536 1.693 0.046 | | Vel = 1.72 |
| 1 to 0 | 0.0 68.35 | 4.026 140 0.0015 | 1Zac 0.0 0.0 | 3.420 0.0 3.420 | 65.275 4.761 0.005 | | * Fixed loss = 3.28 Vel = 1.72 |
| 0 to TEST | 0.0 68.35 | 6.16 140 0.0002 | 0.0 0.0 0.0 | 25.000 0.0 25.000 | 70.041 0.866 0.005 | | Vel = 0.74 |
| | 100.00 168.35 | | | | 70.912 | | Qa = 100.00 K Factor = 19.99 |