

... Fire Protection by Computer Design

EASTERN FIRE PROTECTION
170 KITTY HAWK AVE
LEW/AUB IND PARK
AUBURN, MAINE 04210
207-784-1508

Job Name : 23 OCEAN AVE
Drawing : THIRD FLOOR
Location : PORTLAND, ME
Remote Area : THIRD FLOOR
Contract : 1-5744-SP-17
Data File : 5744 3rd.WXF

HYDRAULIC CALCULATIONS
for

Project name: 23 OCEAN AVE
Location: PORTLAND, ME
Drawing no: THIRD FLOOR
Date: 1/25/2018

Design

Remote area number: THIRD FLOOR
Remote area location: THIRD FLOOR
Occupancy classification: LIGHT HAZARD
Density: .10 - Gpm/SqFt
Area of application: 400 - SqFt
Coverage per sprinkler: 200 - SqFt
Type of sprinklers calculated: RELIABLE 4.9K F1RES49 1/2" 175 DEGREE
No. of sprinklers calculated: 4
In-rack demand: - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 184.475 - GPM @ 67.842 - Psi
Type of system: WET
Volume of dry or preaction system: - Gal

Water supply information

Date: 6/22/2016
Location: PLEASANT & FORREST
Source: PORTLAND WATER DISTRICT

Name of contractor: EASTERN FIRE PROTECTION
Address: 170 KITTYHAWK AVE AUBURN, ME 04210
Phone number: 207-784-1507
Name of designer: S. COTE
Authority having jurisdiction: PORTLAND FIRE DEPARTMENT
Notes: (Include peaking information or gridded systems here.)

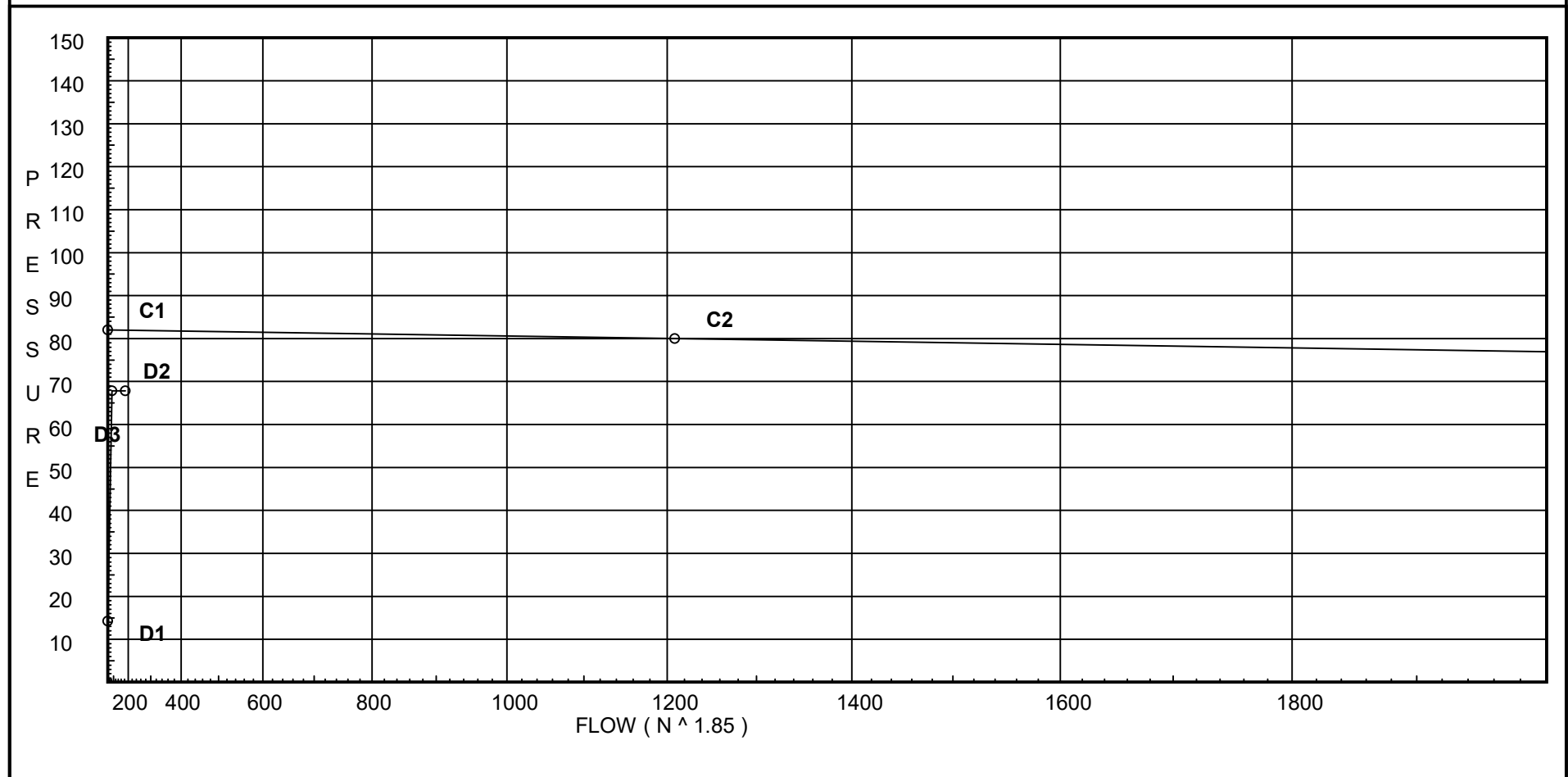
Water Supply Curve C

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City Water Supply:
C1 - Static Pressure : 82
C2 - Residual Pressure: 80
C2 - Residual Flow : 1209

Demand:
D1 - Elevation : 14.256
D2 - System Flow : 84.475
D2 - System Pressure : 67.842
Hose (Demand) : 100
D3 - System Demand : 184.475
Safety Margin : 14.096



Fittings Used Summary

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Fitting Legend

| Abbrev. | Name | 1/2 | 3/4 | 1 | 1 1/4 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |
|---------|----------------------------|-----|-----|-----|-------|-------|-----|-------|----|-------|-----|-----|----|----|----|----|----|----|----|-----|-----|
| B | NFPA 13 Butterfly Valve | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 10 | 0 | 12 | 9 | 10 | 12 | 19 | 21 | 0 | 0 | 0 | 0 | 0 |
| 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 |
| G | NFPA 13 Gate Valve | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 13 |
| I | 90' Grvd-Vic Elbow #10 | 0 | 0 | 2 | 3 | 4 | 3.5 | 6 | 5 | 8 | 7 | 8.5 | 10 | 13 | 17 | 20 | 23 | 25 | 33 | 36 | 40 |
| J | 90'Tee-Branch Grv Vic #20 | 0 | 0 | 4.5 | 6 | 8 | 8.5 | 10.8 | 13 | 17 | 16 | 21 | 25 | 33 | 41 | 50 | 65 | 78 | 88 | 98 | 120 |
| N* | CPVC 90'Ell Harvel-Spears | | 7 | 7 | 8 | 9 | 11 | 12 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| O* | CPVC Tee - Branch | 3 | 3 | 5 | 6 | 8 | 10 | 12 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| T | NFPA 13 90' Flow thru Tee | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 15 | 17 | 20 | 25 | 30 | 35 | 50 | 60 | 71 | 81 | 91 | 101 | 121 |
| V | 90' Ell Firelock #001 | 0 | 0 | 0 | 0 | 0 | 3.5 | 4.3 | 5 | 0 | 6.8 | 8.5 | 10 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Units Summary

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

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

SUPPLY ANALYSIS

| Node at Source | Static Pressure | Residual Pressure | Flow | Available Pressure | Total Demand | Required Pressure |
|-----------------------|------------------------|--------------------------|-------------|---------------------------|---------------------|--------------------------|
| TEST | 82.0 | 80 | 1209.0 | 81.938 | 184.48 | 67.842 |

NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes |
|-----------------|------------------|------------------|-------------------------|--------------------------|--------------|
| TP1 | 0.0 | 4.9 | 16.66 | 20.0 | |
| T1 | 130.916 | 4.8 | 20.26 | 21.58 | K=K @ TP2 |
| T2 | 130.916 | 4.8 | 17.4 | 20.0 | K=K @ TP2 |
| T3 | 130.916 | 4.8 | 18.31 | 20.52 | K=K @ TP2 |
| T4 | 130.916 | 4.8 | 21.77 | 22.37 | K=K @ TP2 |
| 300 | 130.083 | | 22.1 | | |
| 301 | 130.083 | | 22.23 | | |
| 302 | 130.083 | | 23.31 | | |
| 303 | 130.083 | | 29.82 | | |
| 304 | 130.083 | | 32.76 | | |
| 305 | 119.583 | | 42.2 | | |
| 306 | 110.5 | | 49.01 | | |
| 110 | 109.166 | | 53.97 | | |
| 111 | 109.166 | | 55.15 | | |
| 10 | 99.5 | | 61.46 | | |
| 11 | 98.666 | | 64.2 | | |
| TOW | 98.666 | | 64.68 | | |
| HDW | 92.666 | | 67.96 | | |
| BASE | 91.666 | | 70.45 | | |
| TEST | 98.0 | | 67.84 | 100.0 | |

Final Calculations - Hazen-Williams - 2007

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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqv. | Ln. | Pipe Ftng's Total | CFact Pf/Ft | Pt Pe Pf | ***** | Notes | ***** |
|----------------------|--------------------|-----------|----------------|--------------|-----------------------|----------------|----------------------------|----------------|--------------------------|-------|----------------------------|-------|
| TP1 to TP2 | 0 0 | 4.90 | 20.00 20.0 | 1 1.049 | T | 7.555 0.0 | 1.000 7.555 8.555 | 150 0.0860 | 16.660 0.0 0.736 | | Vel = 7.42 | |
| TP2 | | | 0.0 20.00 | | | | | | 17.396 | | K Factor = 4.80 | |
| T1 to 300 | 130.916 130.083 | 4.8 | 21.58 21.58 | 1 1.101 | N O | 7.0 5.0 | 6.833 12.000 18.833 | 150 0.0784 | 20.259 0.361 1.476 | | K = K @ TP2 Vel = 7.27 | |
| 300 | | | 0.0 21.58 | | | | | | 22.096 | | K Factor = 4.59 | |
| T2 to T3 | 130.916 130.916 | 4.8 | 20.00 20.0 | 1 1.101 | | 0.0 0.0 | 13.458 0.0 13.458 | 150 0.0681 | 17.396 0.0 0.916 | | K = K @ TP2 Vel = 6.74 | |
| T3 to 301 | 130.916 130.083 | 4.8 | 20.52 40.52 | 1 1.101 | N O | 7.0 5.0 | 2.166 12.000 14.166 | 150 0.2512 | 18.312 0.361 3.559 | | K = K @ TP2 Vel = 13.65 | |
| 301 | | | 0.0 40.52 | | | | | | 22.232 | | K Factor = 8.59 | |
| T4 to 302 | 130.916 130.083 | 4.8 | 22.37 22.37 | 1 1.101 | N O | 7.0 5.0 | 2.166 12.000 14.166 | 150 0.0837 | 21.767 0.361 1.186 | | K = K @ TP2 Vel = 7.54 | |
| 302 | | | 0.0 22.37 | | | | | | 23.314 | | K Factor = 4.63 | |
| 300 to 301 | 130.083 130.083 | | 21.58 21.58 | 1.5 1.598 | | 0.0 0.0 | 10.666 0.0 10.666 | 150 0.0128 | 22.096 0.0 0.136 | | Vel = 3.45 | |
| 301 to 302 | 130.083 130.083 | | 40.52 62.1 | 1.5 1.598 | | 0.0 0.0 | 12.000 0.0 12.000 | 150 0.0902 | 22.232 0.0 1.082 | | Vel = 9.93 | |
| 302 to 303 | 130.083 130.083 | | 22.37 84.47 | 1.5 1.598 | O | 8.0 0.0 | 32.833 8.000 40.833 | 150 0.1594 | 23.314 0.0 6.507 | | Vel = 13.51 | |
| 303 to 304 | 130.083 130.083 | | 0.0 84.47 | 1.5 1.598 | O | 8.0 0.0 | 10.458 8.000 18.458 | 150 0.1594 | 29.821 0.0 2.942 | | Vel = 13.51 | |
| 304 to 305 | 130.083 119.583 | | 0.0 84.47 | 1.5 1.598 | O N | 8.0 9.0 | 13.666 17.000 30.666 | 150 0.1594 | 32.763 4.548 4.887 | | Vel = 13.51 | |
| 305 to 306 | 119.583 110.500 | | 0.0 84.47 | 1.5 1.598 | N | 9.0 0.0 | 9.041 9.000 18.041 | 150 0.1594 | 42.198 3.934 2.875 | | Vel = 13.51 | |
| 306 to 110 | 110.500 109.166 | | 0.0 84.47 | 1.5 1.682 | I J | 7.48 14.959 | 12.916 22.439 35.355 | 150 0.1242 | 49.007 0.578 4.390 | | Vel = 12.20 | |
| 110 to 111 | 109.166 109.166 | | 0.0 84.47 | 1.5 1.682 | I | 7.48 0.0 | 1.958 7.479 9.437 | 150 0.1241 | 53.975 0.0 1.171 | | Vel = 12.20 | |
| 111 to 10 | 109.166 99.500 | | 0.0 84.47 | 1.5 1.682 | I | 7.48 0.0 | 9.666 7.479 17.145 | 150 0.1242 | 55.146 4.186 2.130 | | Vel = 12.20 | |

Final Calculations - Hazen-Williams

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| Node1 to Node2 | Elev1 Elev2 | K Fact | Qa Qt | Nom Act | Fitting or Eqv. Ln. | Pipe Ftng's Total | CFact Pf/Ft | Pt Pe Pf | ***** | Notes | ***** |
|----------------------|------------------|-----------|------------------|------------|------------------------------|-------------------------|-----------------|----------------|------------------|---------------------------------|-------|
| | | | 0.0 84.47 | | | | | 61.462 | | K Factor = 10.77 | |
| 10 to 11 | 99.500 98.666 | | 84.47 | 2 | 2V 2T | 8.615 24.613 | 9.333 | 120 | 61.462 0.361 | | |
| | | | 84.47 | 2.157 | | 0.0 | 42.561 | 0.0559 | 2.378 | Vel = 7.42 | |
| 11 to TOW | 98.666 98.666 | | 0.0 | 2.5 | V | 5.903 0.0 | 16.916 5.903 | 120 | 64.201 0.0 | | |
| | | | 84.47 | 2.635 | | 0.0 | 22.819 | 0.0211 | 0.481 | Vel = 4.97 | |
| TOW to HDW | 98.666 92.666 | | 0.0 | 2.5 | B T | 9.61 16.474 | 6.000 | 120 | 64.682 2.599 | | |
| | | | 84.47 | 2.635 | | 0.0 | 32.084 | 0.0211 | 0.676 | Vel = 4.97 | |
| HDW to BASE | 92.666 91.666 | | 0.0 | 4 | 2E | 26.334 0.0 | 5.000 | 120 | 67.957 2.433 | ** Fixed Loss = 2 | |
| | | | 84.47 | 4.26 | | 0.0 | 31.334 | 0.0020 | 0.064 | Vel = 1.90 | |
| BASE to TEST | 91.666 98 | | 0.0 | 4 | E T | 14.534 29.067 | 25.000 | 140 | 70.454 -2.743 | | |
| | | | 84.47 | 4.1 | G | 2.907 | 71.508 | 0.0018 | 0.131 | Vel = 2.05 | |
| TEST | | | 100.00 184.47 | | | | | | 67.842 | Qa = 100.00 K Factor = 22.40 | |