

Hydraulic Design Information Sheet

Name - Brick North Auditorium Date - 8-18-14
 Location -
 Building - Brick North West wing System No. - 1 of 1
 Contractor - Residential Fire Protection Contract No. - C14019
 Calculated By - JAL Drawing No. - 1 of 1
 Construction: (X) Combustible () Non-Combustible Ceiling Height - Varies
 Occupancy - Auditorium

S (X) NFPA 13 () 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

| M | Area of Sprinkler Operation - 1500 | System Type | Sprinkler/Nozzle |
|---|------------------------------------|---------------|------------------|
| | Density - .1 | (X) Wet | Make Viking |
| D | Area Per Sprinkler - 190 | () Dry | Model VK300 |
| E | Elevation at Highest Outlet - 10.5 | () Deluge | Size 1/2" |
| S | Hose Allowance - Inside - | () Preaction | K-Factor =SPG2 |
| I | Rack Sprinkler Allowance - | () Other | Temp.Rat.200 |
| G | Hose Allowance - Outside - 250 | | |

N Note Safety Margin: 25.486

Calculation Flow Required - 355.838 Press Required - 72.104
 Summary C-Factor Used: 120 Overhead 140 Underground

| W | Water Flow Test: | Pump Data: | Tank or Reservoir: |
|---|------------------------|-------------|--------------------|
| A | Date of Test - 9-13-11 | | Cap. - |
| T | Time of Test - | Rated Cap.- | Elev.- |
| E | Static Press - 98 | @ Press - | |
| R | Residual Press - 92 | Elev. - | Well |
| | Flow - 1519 | | Proof Flow |
| S | Elevation - 20 | | |

U Location -

P Source of Information -

| 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

G Horizontal Barriers Provided:

Water Supply Curve (C)

Residential Fire Protection
Brick North Auditorium

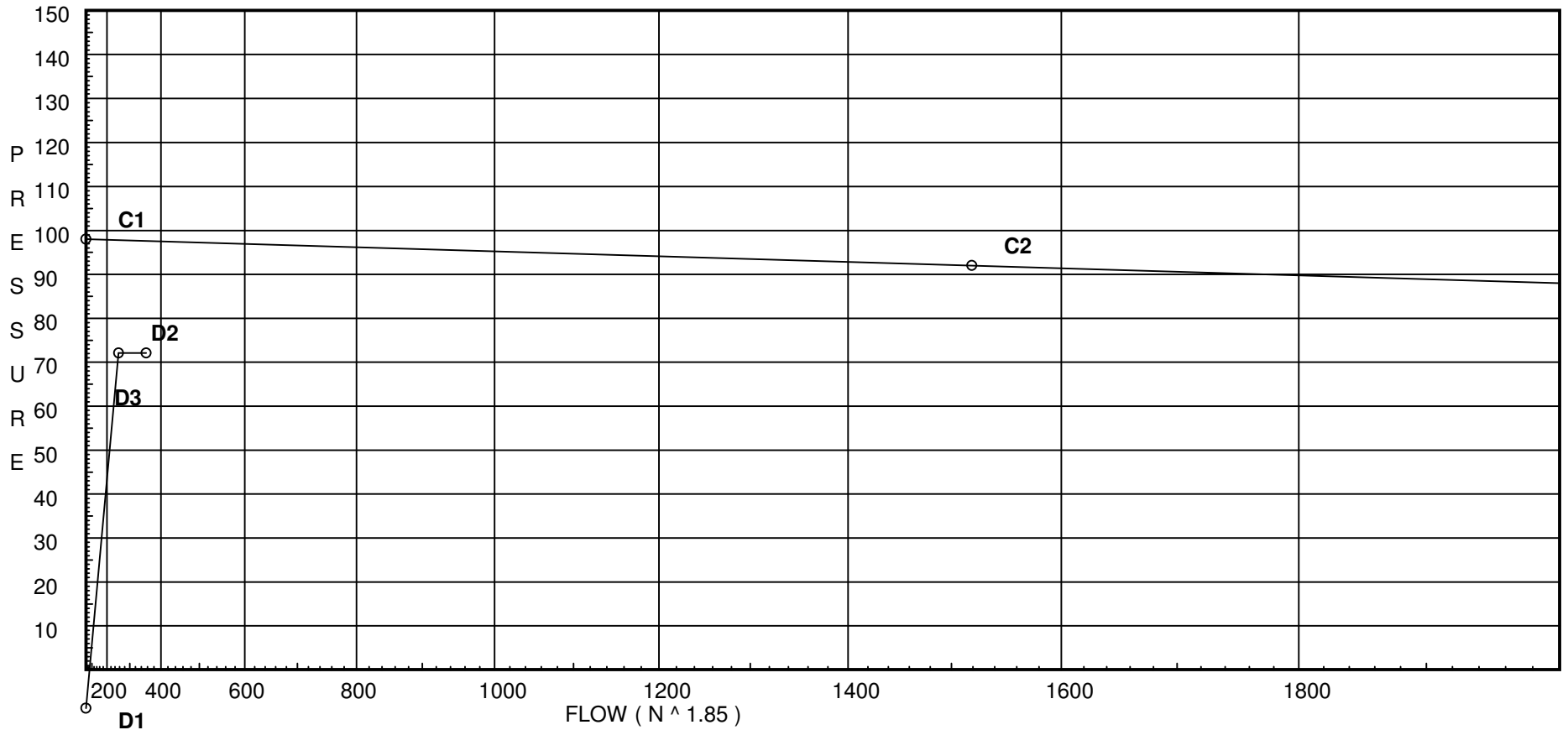
Page 2
Date 8-18-14

City Water Supply:

C1 - Static Pressure : 98
C2 - Residual Pressure: 92
C2 - Residual Flow : 1519

Demand:

D1 - Elevation : -8.662
D2 - System Flow : 255.838
D2 - System Pressure : 72.104
Hose (Adj City) : _____
Hose (Demand) : 100
D3 - System Demand : 355.838
Safety Margin : 25.486



Fittings Used Summary

Residential Fire Protection
Brick North Auditorium

Page 3
Date 8-18-14

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 | 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 |
| S | Generic Swing Check Valve | 4 | 5 | 5 | 7 | 9 | 11 | 14 | 16 | 19 | 22 | 27 | 32 | 45 | 55 | 65 | 76 | 87 | 98 | 109 | 130 |
| 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 |
| Z | Generic Flow Switch | 2 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 18 | 22 | 27 | 35 | 40 | 45 | 50 | 61 |
| Zia | Wilkins 350 | Fitting generates a Fixed Loss Based on Flow | | | | | | | | | | | | | | | | | | | |

Pressure / Flow Summary - STANDARD

Residential Fire Protection
Brick North Auditorium

Page 4
Date 8-18-14

| Node No. | Elevation | K-Fact | Pt Actual | Pn | Flow Actual | Density | Area | Press Req. |
|----------|-----------|--------------|-----------|----|-------------|---------|------|------------|
| SP1 | 34.95 | 5.6 | 7.0 | na | 14.82 | 0.1 | 130 | 7.0 |
| SP2 | 29.95 | 5.6 | 7.0 | na | 14.82 | 0.1 | 130 | 7.0 |
| SP3 | 24.9 | 5.6 | 7.0 | na | 14.82 | 0.1 | 130 | 7.0 |
| 1 | 0.0 | K = K @ SPG1 | 47.93 | na | 21.6 | | | |
| 2 | 0.0 | K = K @ SPG1 | 47.88 | na | 21.59 | | | |
| 3 | 0.0 | K = K @ SPG1 | 47.53 | na | 21.51 | | | |
| 4 | 0.0 | K = K @ SPG1 | 47.53 | na | 21.51 | | | |
| 5 | 0.0 | K = K @ SPG1 | 47.82 | na | 21.58 | | | |
| 7 | 0.0 | K = K @ SPG2 | 20.38 | na | 14.82 | | | |
| 8 | 0.0 | K = K @ SPG2 | 20.48 | na | 14.85 | | | |
| 9 | 0.0 | K = K @ SPG2 | 21.05 | na | 15.06 | | | |
| 10 | 0.0 | K = K @ SPG2 | 21.75 | na | 15.3 | | | |
| 11 | 0.0 | K = K @ SPG2 | 23.86 | na | 16.03 | | | |
| 13 | 0.0 | K = K @ SPG3 | 47.65 | na | 23.98 | | | |
| 14 | 0.0 | K = K @ SPG3 | 47.63 | na | 23.97 | | | |
| 15 | 0.0 | K = K @ SPG3 | 47.89 | na | 24.04 | | | |
| 23 | 0.0 | | 50.12 | na | | | | |
| 6 | 0.0 | | 48.44 | na | | | | |
| 24 | 0.0 | | 49.97 | na | | | | |
| 12 | 0.0 | | 25.71 | na | | | | |
| 25 | 0.0 | | 49.94 | na | | | | |
| 16 | 0.0 | | 48.54 | na | | | | |
| 20 | 0.0 | | 50.52 | na | | | | |
| 21 | 0.0 | | 50.49 | na | | | | |
| 22 | 0.0 | | 50.39 | na | | | | |
| 30 | 0.0 | | 61.74 | na | | | | |
| 31 | 0.0 | | 61.77 | na | | | | |
| TR | 0.0 | | 61.82 | na | | | | |
| 32 | 0.0 | | 61.42 | na | | | | |
| 33 | 0.0 | | 60.68 | na | | | | |
| 34 | 0.0 | | 60.2 | na | | | | |
| HDR | 0.0 | | 75.21 | na | | | | |
| BR | 0.0 | | 79.58 | na | | | | |
| UG1 | 0.0 | | 79.79 | na | 100.0 | | | |
| TEST | 20.0 | | 72.1 | na | | | | |

The maximum velocity is 15.05 and it occurs in the pipe between nodes TR and HDR

Final Calculations - Hazen-Williams

Residential Fire Protection
Brick North Auditorium

Page 5
Date 8-18-14

| Hyd. Ref. Point | Qa Qt | Dia. "C" Pf/Ft | Fitting or Eqv. | Ln. | Pipe Ftng's Total | Pt Pe Pf | Pt Pv Pn | ***** | Notes | ***** |
|-----------------------|----------|----------------------|-----------------------|------------|-------------------------|-----------------|----------------|-------|----------------------|-------|
| SP1 to SPG1 | 14.82 | 1.049 120 | 1T | 5.0 0.0 | 0.500 5.000 | 7.000 15.137 | | | K Factor = 5.60 | |
| | 0.0 | | | | | | | | Vel = 5.50 | |
| | 14.82 | | | | | 22.548 | | | K Factor = 3.12 | |
| SP2 to SPG2 | 14.82 | 1.049 120 | 1T | 5.0 0.0 | 0.500 5.000 | 7.000 12.971 | | | K Factor = 5.60 | |
| | 0.0 | | | | | | | | Vel = 5.50 | |
| | 14.82 | | | | | 20.382 | | | K Factor = 3.28 | |
| SP3 to SPG3 | 14.82 | 1.049 120 | 1T | 5.0 0.0 | 0.500 5.000 | 7.000 10.784 | | | K Factor = 5.60 | |
| | 0.0 | | | | | | | | Vel = 5.50 | |
| | 14.82 | | | | | 18.195 | | | K Factor = 3.47 | |
| 1 to 2 | -10.25 | 1.442 120 | | 0.0 0.0 | 6.170 0.0 | 47.930 0.0 | | | K Factor @ node SPG1 | |
| | -10.25 | -0.0081 | | 0.0 | 6.170 | -0.050 | | | Vel = 2.01 | |
| 2 to 3 | -12.38 | 1.442 120 | | 0.0 0.0 | 10.000 0.0 | 47.880 0.0 | | | K Factor @ node SPG1 | |
| | -22.63 | -0.0347 | | 0.0 | 10.000 | -0.347 | | | Vel = 4.45 | |
| 3 to 4 | 21.51 | 1.442 120 | | 0.0 0.0 | 5.670 0.0 | 47.533 0.0 | | | K Factor @ node SPG1 | |
| | -1.12 | -0.0002 | | 0.0 | 5.670 | -0.001 | | | Vel = 0.22 | |
| 4 to 5 | 21.52 | 1.442 120 | | 0.0 0.0 | 10.000 0.0 | 47.532 0.0 | | | K Factor @ node SPG1 | |
| | 20.4 | 0.0286 | | 0.0 | 10.000 | 0.286 | | | Vel = 4.01 | |
| 5 to 6 | 21.57 | 1.442 120 | | 0.0 0.0 | 5.670 0.0 | 47.818 0.0 | | | K Factor @ node SPG1 | |
| | 41.97 | 0.1090 | | 0.0 | 5.670 | 0.618 | | | Vel = 8.25 | |
| | 0.0 | | | | | | | | | |
| | 41.97 | | | | | 48.436 | | | K Factor = 6.03 | |
| 7 to 8 | 14.82 | 1.442 120 | | 0.0 0.0 | 6.170 0.0 | 20.382 0.0 | | | K Factor @ node SPG2 | |
| | 14.82 | 0.0159 | | 0.0 | 6.170 | 0.098 | | | Vel = 2.91 | |
| 8 to 9 | 14.85 | 1.442 120 | | 0.0 0.0 | 10.000 0.0 | 20.480 0.0 | | | K Factor @ node SPG2 | |
| | 29.67 | 0.0573 | | 0.0 | 10.000 | 0.573 | | | Vel = 5.83 | |
| 9 to 10 | 15.06 | 1.442 120 | | 0.0 0.0 | 5.670 0.0 | 21.053 0.0 | | | K Factor @ node SPG2 | |
| | 44.73 | 0.1226 | | 0.0 | 5.670 | 0.695 | | | Vel = 8.79 | |
| 10 to 11 | 15.30 | 1.442 120 | | 0.0 0.0 | 10.000 0.0 | 21.748 0.0 | | | K Factor @ node SPG2 | |
| | 60.03 | 0.2110 | | 0.0 | 10.000 | 2.110 | | | Vel = 11.79 | |
| 11 to 12 | 16.03 | 1.442 120 | | 0.0 0.0 | 5.670 0.0 | 23.858 0.0 | | | K Factor @ node SPG2 | |
| | 76.06 | 0.3272 | | 0.0 | 5.670 | 1.855 | | | Vel = 14.94 | |
| | 0.0 | | | | | | | | | |

Final Calculations - Standard

Residential Fire Protection
Brick North Auditorium

Page 6
Date 8-18-14

| Hyd. Ref. Point | Qa Qt | Dia. "C" Pf/Ft | Fitting or Eqv. | Ln. | Pipe Ftng's Total | Pt Pe Pf | Pt Pv Pn | ***** | Notes | ***** |
|-----------------------|---------------|-------------------------|-----------------------|-----------------|-------------------------|----------------|----------------|-------|----------------------|-------|
| | 76.06 | | | | | 25.713 | | | K Factor = 15.00 | |
| 13 to 14 | -4.82 | 1.442 120 | | 0.0 | 6.170 0.0 | 47.646 0.0 | | | K Factor @ node SPG3 | |
| 14 to 15 | -4.82 | -0.0021 1.442 120 | | 0.0 | 6.170 0.0 | -0.013 0.0 | | | Vel = 0.95 | |
| 14 to 15 | 23.97 | 1.442 120 | | 0.0 | 10.000 0.0 | 47.633 0.0 | | | K Factor @ node SPG3 | |
| 15 to 16 | 19.15 | 0.0255 1.442 120 | | 0.0 | 10.000 0.0 | 0.255 0.0 | | | Vel = 3.76 | |
| 15 to 16 | 24.04 | 1.442 120 | | 0.0 | 5.670 0.0 | 47.888 0.0 | | | K Factor @ node SPG3 | |
| 16 | 43.19 | 0.1148 | | 0.0 | 5.670 | 0.651 | | | Vel = 8.48 | |
| | 0.0 43.19 | | | | | 48.539 | | | K Factor = 6.20 | |
| 23 to 1 | -31.86 | 1.442 120 | 1E 1T | 3.716 7.432 | 22.300 11.148 | 50.116 0.0 | | | | |
| 1 | -31.86 | -0.0654 | | 0.0 | 33.448 | -2.186 | | | Vel = 6.26 | |
| | 0.0 -31.86 | | | | | 47.930 | | | K Factor = -4.60 | |
| 6 to 33 | 41.97 | 1.442 120 | 1E 1T | 3.716 7.432 | 101.300 11.148 | 48.436 0.0 | | | | |
| 33 | 41.97 | 0.1089 | | 0.0 | 112.448 | 12.244 | | | Vel = 8.25 | |
| | 0.0 41.97 | | | | | 60.680 | | | K Factor = 5.39 | |
| 24 to 2 | -33.96 | 1.442 120 | 1E 1T | 3.716 7.432 | 17.250 11.148 | 49.970 0.0 | | | | |
| 2 | -33.96 | -0.0736 | | 0.0 | 28.398 | -2.090 | | | Vel = 6.67 | |
| | 0.0 -33.96 | | | | | 47.880 | | | K Factor = -4.91 | |
| 12 to 34 | 76.06 | 1.442 120 | 1E 1T | 3.716 7.432 | 94.300 11.148 | 25.713 0.0 | | | | |
| 34 | 76.06 | 0.3271 | | 0.0 | 105.448 | 34.489 | | | Vel = 14.94 | |
| | 0.0 76.06 | | | | | 60.202 | | | K Factor = 9.80 | |
| 25 to 13 | -28.80 | 1.442 120 | 1E 1T | 3.716 7.432 | 31.080 11.148 | 49.936 0.0 | | | | |
| 13 | -28.8 | -0.0542 | | 0.0 | 42.228 | -2.290 | | | Vel = 5.66 | |
| | 0.0 -28.80 | | | | | 47.646 | | | K Factor = -4.17 | |
| 16 to 35 | 43.19 | 1.442 120 | 1E 1T | 3.716 7.432 | 89.800 11.148 | 48.539 0.0 | | | | |
| 35 | 43.19 | 0.1148 | | 0.0 | 100.948 | 11.589 | | | Vel = 8.48 | |
| | 0.0 43.19 | | | | | 60.128 | | | K Factor = 5.57 | |
| 20 to 30 | 31.65 | 1.442 120 | 2E 2T | 7.432 14.864 | 151.330 22.296 | 50.522 0.0 | | | | |
| 30 | 31.65 | 0.0646 | | 0.0 | 173.626 | 11.216 | | | Vel = 6.22 | |
| | 0.0 31.65 | | | | | 61.738 | | | K Factor = 4.03 | |

Final Calculations - Standard

Residential Fire Protection
Brick North Auditorium

Page 7
Date 8-18-14

| Hyd. Ref. Point | Qa Qt | Dia. "C" Pf/Ft | Fitting or Eqv. | Ln. | Pipe Ftng's Total | Pt Pe Pf | Pt Pv Pn | ***** | Notes | ***** |
|-----------------------|------------------------|-------------------------|-----------------------|------------------------|------------------------------|-------------------------|----------------|------------------|-------|-------|
| 21 to 31 | 31.76 31.76 | 1.442 120 0.0650 | 2E 2T | 7.432 14.864 0.0 | 151.330 22.296 173.626 | 50.488 0.0 11.284 | | Vel = 6.24 | | |
| | 0.0 31.76 | | | | | 61.772 | | K Factor = 4.04 | | |
| 22 to 32 | 31.21 31.21 | 1.442 120 0.0629 | 2E 2T | 7.432 14.864 0.0 | 152.880 22.296 175.176 | 50.390 0.0 11.026 | | Vel = 6.13 | | |
| | 0.0 31.21 | | | | | 61.416 | | K Factor = 3.98 | | |
| 20 to 21 | -31.65 -31.65 | 2.635 120 -0.0034 | | 0.0 0.0 0.0 | 10.000 0.0 10.000 | 50.522 0.0 -0.034 | | Vel = 1.86 | | |
| 21 to 22 | -31.76 -63.41 | 2.635 120 -0.0124 | | 0.0 0.0 0.0 | 7.880 0.0 7.880 | 50.488 0.0 -0.098 | | Vel = 3.73 | | |
| 22 to 23 | -31.21 -94.62 | 2.635 120 -0.0260 | | 0.0 0.0 0.0 | 10.550 0.0 10.550 | 50.390 0.0 -0.274 | | Vel = 5.57 | | |
| 23 to 24 | 31.86 -62.76 | 2.635 120 -0.0122 | | 0.0 0.0 0.0 | 12.000 0.0 12.000 | 50.116 0.0 -0.146 | | Vel = 3.69 | | |
| 24 to 25 | 33.96 -28.8 | 2.635 120 -0.0028 | | 0.0 0.0 0.0 | 12.000 0.0 12.000 | 49.970 0.0 -0.034 | | Vel = 1.69 | | |
| | 0.0 -28.80 | | | | | 49.936 | | K Factor = -4.08 | | |
| 30 to 31 | 31.65 31.65 | 2.635 120 0.0034 | | 0.0 0.0 0.0 | 10.000 0.0 10.000 | 61.738 0.0 0.034 | | Vel = 1.86 | | |
| 31 to TR | 31.76 63.41 | 2.635 120 0.0125 | | 0.0 0.0 0.0 | 3.750 0.0 3.750 | 61.772 0.0 0.047 | | Vel = 3.73 | | |
| TR to 32 | -255.84 -192.43 | 2.635 120 -0.0966 | | 0.0 0.0 0.0 | 4.170 0.0 4.170 | 61.819 0.0 -0.403 | | Vel = 11.32 | | |
| 32 to 33 | 31.21 -161.22 | 2.635 120 -0.0698 | | 0.0 0.0 0.0 | 10.550 0.0 10.550 | 61.416 0.0 -0.736 | | Vel = 9.49 | | |
| 33 to 34 | 41.97 -119.25 | 2.635 120 -0.0398 | | 0.0 0.0 0.0 | 12.000 0.0 12.000 | 60.680 0.0 -0.478 | | Vel = 7.02 | | |
| 34 to 35 | 76.06 -43.19 | 2.635 120 -0.0062 | | 0.0 0.0 0.0 | 12.000 0.0 12.000 | 60.202 0.0 -0.074 | | Vel = 2.54 | | |
| | 0.0 -43.19 | | | | | 60.128 | | K Factor = -5.57 | | |

Final Calculations - Standard

Residential Fire Protection
Brick North Auditorium

Page 8
Date 8-18-14

| Hyd. Ref. Point | Qa Qt | Dia. "C" Pf/Ft | Fitting or Eqv. Ln. | Pipe Ftng's Total | Pt Pe Pf | Pt Pv Pn | ***** | Notes | ***** |
|-----------------------|----------------------|------------------------|--|---------------------------------|---------------------------|----------------|-------|--------------------------------|-------|
| TR to HDR | 255.84 255.84 | 2.635 120 0.1637 | 1E 8.237 1T 16.474 1Z 8.237 1S 19.22 1B 9.61 | 20.000 61.778 81.778 | 61.819 0.0 13.391 | | | Vel = 15.05 | |
| HDR to BR | 0.0 255.84 | 4.26 120 0.0158 | 2E 26.334 2T 52.668 1Zia 0.0 | 8.000 79.002 87.002 | 75.210 3.000 1.373 | | | * Fixed loss = 3 Vel = 5.76 | |
| BR to UG1 | 0.0 255.84 | 6.16 140 0.0020 | 1E 20.084 1G 4.304 1T 43.037 | 40.000 67.425 107.425 | 79.583 0.0 0.212 | | | Vel = 2.75 | |
| UG1 to TEST | 100.00 355.84 | 8.27 140 0.0009 | 2G 12.652 2E 56.936 1T 55.354 | 1000.000 124.942 1124.942 | 79.795 -8.662 0.971 | | | Qa = 100 Vel = 2.13 | |
| | 0.0 355.84 | | | | 72.104 | | | K Factor = 41.91 | |