



Hydraulic Calculations by HydraCALC

RANGER FIRE, INC.
1000 S. MAIN ST
SUITE 150
GRAPEVINE, TX 76051
817-410-9070

5-14-2025



Job Name : TOWNEPLACE SUITES
Drawing :
Location : 1ST FLOOR
Remote Area :
Contract :
Data File : Remote #1_Club Area.WXF

Water Supply Curve

RANGER FIRE, INC.
TOWNEPLACE SUITES

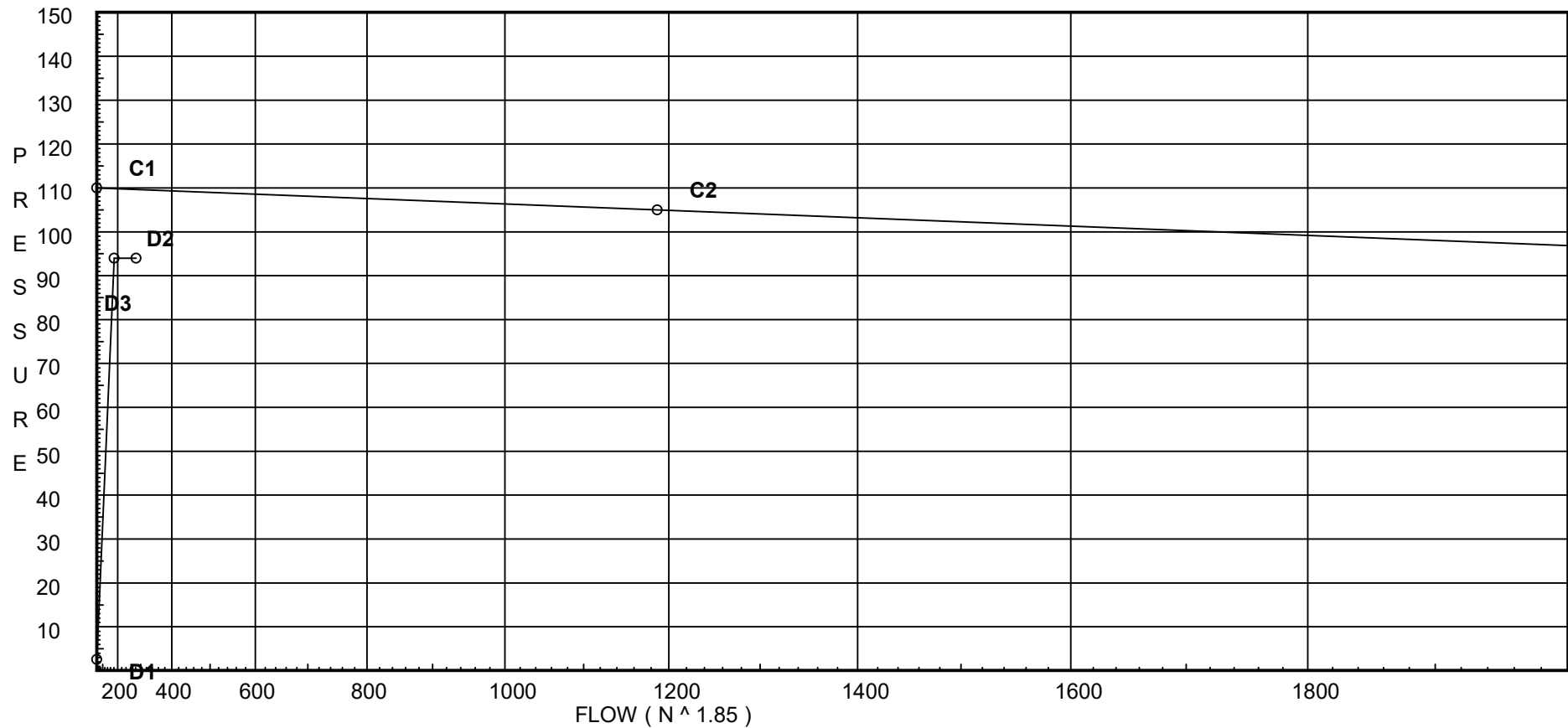
Page 1
Date

City Water Supply:

C1 - Static Pressure : 110
C2 - Residual Pressure: 105
C2 - Residual Flow : 1187

Demand:

D1 - Elevation : 2.563
D2 - System Flow : 182.24
D2 - System Pressure : 94.000
Hose (Demand) : 100
D3 - System Demand : 282.24
Safety Margin : 15.649



Fittings Used Summary

RANGER FIRE, INC.
TOWNEPLACE SUITES

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
Ball	B Ball Milw BB-SC100			2.25	2	2.5	2.25	10													
E	NFPA 13 90' Standard Elbow	0	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	0	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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
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
Zcb	Colt C200 Vert	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.

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 3
Date

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
CTY	110.0	105	1187.0	109.649	282.24	94.0

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
A1	7.917	5.6	9.3	17.08	0.1	92
A2	7.917	5.6	8.73	16.55	0.1	92
A3	8.917	5.6	7.83	15.67	0.1	63
A4	7.917	5.6	7.7	15.53	0.1	11
A5	7.917	5.6	7.57	15.41	0.1	5
A6	8.917	5.6	7.0	14.82	0.1	136
A7	7.917	5.6	7.67	15.51	0.1	114
A8	7.917	5.6	9.53	17.29	0.1	114
A9	7.917	5.6	8.47	16.3	0.1	114
A10	7.917	5.6	8.88	16.69	0.1	114
A11	8.917	5.6	14.61	21.4	0.1	136
L1	7.917		38.88			
L2	7.917		38.88			
L3	7.917		38.88			
L4	7.917		34.25			
L5	7.917		34.25			
L6	7.917		34.25			
A2T	9.5		8.65			
A5T	9.5		7.42			
A7T	9.5		7.52			
A9T	9.5		8.99			
L2T	9.5		38.2			
L5T	9.5		33.56			
100	9.5		10.3			
101	9.5		9.92			
102	9.5		9.86			
103	9.5		11.35			
104	9.5		14.82			
105	9.5		26.44			
106	9.5		33.56			
107	9.5		38.2			
TW1	9.5		80.7			
108	9.5		75.48			
109	9.5		55.49			
BW1	4.0		87.85			
BD	4.0		88.52			
FLG	1.0		94.39			
CHG	-5.0		97.02			
UG2Y	-5.0		97.15			
DOM	-5.0		97.15			
UG2Z	-5.0		97.3			
UG2X	-5.0		97.28			

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 4
Date

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
UG2	-5.0		97.38		
UG3	-5.0		97.42		
UG3X	-5.0		97.39		
UG4	-5.0		97.39		
UG5	-5.0		97.38		
UG6	-5.0		97.38		
UG7	-5.0		97.38		
UG1	-5.0		97.38		
UG3Y	-5.0		97.43		
CTY	3.0		94.0	100.0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 5
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
A1 to 100	7.917 9.500	5.60	17.08 17.08	1 1.049	E T	2.0 5.0	10.333 7.000 17.333	120 0.0972	9.300 -0.686 1.684		Vel = 6.34	
100			0.0 17.08						10.298		K Factor = 5.32	
A2 to A2T	7.917 9.500	5.60	16.55 16.55	1 1.049	T	5.0	1.583 5.000 6.583	120 0.0918	8.730 -0.686 0.604		Vel = 6.14	
A2T			0.0 16.55						8.648		K Factor = 5.63	
A3 to A2T	8.917 9.500	5.60	15.67 15.67	1 1.049	E	2.0	10.917 2.000 12.917	120 0.0828	7.830 -0.252 1.070		Vel = 5.82	
A2T			0.0 15.67						8.648		K Factor = 5.33	
A4 to A5T	7.917 9.500	5.60	15.53 15.53	1 1.049	E	2.0	3.000 2.000 5.000	120 0.0816	7.696 -0.686 0.408		Vel = 5.77	
A5T			0.0 15.53						7.418		K Factor = 5.70	
A5 to A5T	7.917 9.500	5.60	15.41 15.41	1 1.049	T	5.0	1.583 5.000 6.583	120 0.0805	7.574 -0.686 0.530		Vel = 5.72	
A5T			0.0 15.41						7.418		K Factor = 5.66	
A6 to A7T	8.917 9.500	5.60	14.82 14.82	1 1.049	E	2.0	8.333 2.000 10.333	120 0.0746	7.000 -0.252 0.771		Vel = 5.50	
A7T			0.0 14.82						7.519		K Factor = 5.40	
A7 to A7T	7.917 9.500	5.60	15.51 15.51	1 1.049	T	5.0	1.583 5.000 6.583	120 0.0813	7.670 -0.686 0.535		Vel = 5.76	
A7T			0.0 15.51						7.519		K Factor = 5.66	
A8 to 102	7.917 9.500	5.60	17.29 17.29	1 1.049	E T	2.0 5.0	3.250 7.000 10.250	120 0.0994	9.529 -0.686 1.019		Vel = 6.42	
102			0.0 17.29						9.862		K Factor = 5.51	
A9 to A9T	7.917 9.500	5.60	16.30 16.3	1 1.049	E T	2.0 5.0	6.583 7.000 13.583	120 0.0891	8.470 -0.686 1.210		Vel = 6.05	
A9T			0.0 16.30						8.994		K Factor = 5.44	
A10 to A9T	7.917 9.500	5.60	16.69 16.69	1 1.049	E	2.0	6.583 2.000 8.583	120 0.0931	8.881 -0.686 0.799		Vel = 6.20	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 6
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
A9T			0.0 16.69					8.994		K Factor = 5.57	
A11 to 104	8.917 9.500	5.60	21.40 21.4	1 1.049		3.167 3.167	120 0.1471	14.606 -0.252 0.466		Vel = 7.94	
104			0.0 21.40					14.820		K Factor = 5.56	
L1 to L2T	7.917 9.500		0.0 0.0	1 1.049	E T 2.0 5.0	17.583 7.000 24.583	120 0	38.882 -0.686 0.001		Vel = 0	
L2T			0.0 0.0					38.197		K Factor = 0	
L2 to L2T	7.917 9.500		0.0 0.0	1 1.049	T 5.0	1.583 5.000 6.583	120 0.0002	38.882 -0.686 0.001		Vel = 0	
L2T			0.0 0.0					38.197		K Factor = 0	
L3 to 107	7.917 9.500		0.0 0.0	1 1.049	E T 2.0 5.0	7.333 7.000 14.333	120 0.0001	38.882 -0.686 0.001		Vel = 0	
107			0.0 0.0					38.197		K Factor = 0	
L4 to 106	7.917 9.500		0.0 0.0	1 1.049	E T 2.0 5.0	7.833 7.000 14.833	120 0	34.250 -0.686 0.0		Vel = 0	
106			0.0 0.0					33.564		K Factor = 0	
L5 to L5T	7.917 9.500		0.0 0.0	1 1.049	T 5.0	1.583 5.000 6.583	120 0	34.250 -0.686 0.0		Vel = 0	
L5T			0.0 0.0					33.564		K Factor = 0	
L6 to L5T	7.917 9.500		0.0 0.0	1 1.049	E 2.0	11.167 2.000 13.167	120 0	34.250 -0.686 0.0		Vel = 0	
L5T			0.0 0.0					33.564		K Factor = 0	
A2T to 100	9.500 9.500		32.22 32.22	1 1.049		5.250 5.250	120 0.3143	8.648 0.0 1.650		Vel = 11.96	
100			0.0 32.22					10.298		K Factor = 10.04	
A5T to 101	9.500 9.500		30.95 30.95	1 1.049	T 5.0	3.583 5.000 8.583	120 0.2917	7.418 0.0 2.504		Vel = 11.49	
101			0.0 30.95					9.922		K Factor = 9.83	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 7
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
A7T to 102	9.500 9.500		30.33 30.33	1 1.049		8.333 8.333	120 0.2812	7.519 0.0 2.343		Vel = 11.26	
102			0.0 30.33					9.862		K Factor = 9.66	
A9T to 103	9.500 9.500		32.99 32.99	1 1.049	T 5.0	2.167 5.000 7.167	120 0.3284	8.994 0.0 2.354		Vel = 12.25	
103			0.0 32.99					11.348		K Factor = 9.79	
L2T to 107	9.500 9.500		0.0 0.0	1 1.049	T 5.0	6.250 5.000 11.250	120 0	38.197 0.0 0.0		Vel = 0	
107			0.0 0.0					38.197		K Factor = 0	
L5T to 106	9.500 9.500		0.0 0.0	1 1.049		1.750 1.750	120 0	33.564 0.0 0.0		Vel = 0	
106			0.0 0.0					33.564		K Factor = 0	
100 to 101	9.500 9.500		-41.14 -41.14	1.25 1.442		3.583 3.583	120 -0.1049	10.298 0.0 -0.376		Vel = 8.08	
101 to 102	9.500 9.500		30.94 -10.2	1.25 1.442		7.667 7.667	120 -0.0078	9.922 0.0 -0.060		Vel = 2.00	
102 to 103	9.500 9.500		47.62 37.42	1.25 1.442	E 3.716	13.167 3.716 16.883	120 0.0880	9.862 0.0 1.486		Vel = 7.35	
103 to 104	9.500 9.500		32.98 70.4	1.25 1.442		12.250 12.250	120 0.2834	11.348 0.0 3.472		Vel = 13.83	
104 to 105	9.500 9.500		21.40 91.8	1.25 1.442		25.083 25.083	120 0.4632	14.820 0.0 11.619		Vel = 18.03	
105 to 106	9.500 9.500		0.0 91.8	1.25 1.442	E 3.716	11.667 3.716 15.383	120 0.4632	26.439 0.0 7.125		Vel = 18.03	
106 to 107	9.500 9.500		0.0 91.8	1.25 1.442		10.000 10.000	120 0.4633	33.564 0.0 4.633		Vel = 18.03	
107 to TW1	9.500 9.500		0.0 91.8	1.25 1.442	T 7.432	84.333 7.432 91.765	120 0.4632	38.197 0.0 42.506		Vel = 18.03	
TW1 to 108	9.500 9.500		-182.24 -90.44	1.25 1.442		11.583 11.583	120 -0.4506	80.703 0.0 -5.219		Vel = 17.77	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 8
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
108 to 109	9.500 9.500		0.0 -90.44	1.25 1.442	E	3.716	40.667 3.716 44.383	120 -0.4505	75.484 0.0 -19.996		Vel = 17.77	
109 to 100	9.500 9.500		0.0 -90.44	1.25 1.442	E	3.716	96.583 3.716 100.299	120 -0.4506	55.488 0.0 -45.190		Vel = 17.77	
100			0.0 -90.44						10.298		K Factor = -28.18	
TW1 to BW1	9.500 4		182.24 182.24	2 2.157	Ball T	2.769 12.307	5.500 15.076 20.576	120 0.2317	80.703 2.382 4.768		Vel = 16.00	
BW1 to BD	4 4		0.0 182.24	3 3.26	T	20.159	1.500 20.159 21.659	120 0.0310	87.853 0.0 0.672		Vel = 7.00	
BD to FLG	4 1		0.0 182.24	3 3.26	3E Zcb	28.223 0.0	19.083 28.223 47.306	120 0.0310	88.525 4.398 1.466		* * Fixed Loss = 3.098 Vel = 7.00	
FLG to CHG	1 -5		0.0 182.24	6 6.16	E	20.084	12.000 20.084 32.084	140 0.0011	94.389 2.599 0.034		Vel = 1.96	
CHG			0.0 182.24						97.022		K Factor = 18.50	
CHG to UG2Y	-5 -5		182.24 182.24	6 5.86	E G T	17.893 3.834 38.342	51.750 60.069 111.819	150 0.0012	97.022 0.0 0.132		Vel = 2.17	
UG2Y			0.0 182.24						97.154		K Factor = 18.49	
UG2Y to DOM	-5 -5		84.23 84.23	6 5.86			4.000 4.000	150 0.0002	97.154 0.0 0.001		Vel = 1.00	
DOM to UG2Z	-5 -5		0.0 84.23	6 5.86	G	3.834	509.583 3.834 513.417	150 0.0003	97.155 0.0 0.145		Vel = 1.00	
UG2Z to UG3X	-5 -5		0.0 84.23	6 5.86	4F T 2G	35.786 38.342 7.668	229.750 81.796 311.546	150 0.0003	97.300 0.0 0.088		Vel = 1.00	
UG3X			0.0 84.23						97.388		K Factor = 8.54	
UG2Y to UG2X	-5 -5		98.02 98.02	6 5.86	G T	3.834 38.342	287.583 42.176 329.759	150 0.0004	97.154 0.0 0.123		Vel = 1.17	
UG2X to UG2	-5 -5		0.0 98.02	6 5.86	2F T G	17.893 38.342 3.834	217.333 60.069 277.402	150 0.0004	97.277 0.0 0.104		Vel = 1.17	
UG2 to UG3	-5 -5		-15.25 82.77	8 7.68	E 4F	22.555 45.11	515.833 67.665 583.498	150 0.0001	97.381 0.0 0.043		Vel = 0.57	
UG3 to UG3X	-5 -5		-182.24 -99.47	8 7.68	T	43.857	302.250 43.857 346.107	150 -0.0001	97.424 0.0 -0.036		Vel = 0.69	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 9
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
UG3X to UG4	-5 -5		84.22 -15.25	8 7.68	G T 5.012 43.857	184.917 48.869 233.786	150 0	97.388 0.0 0.0		Vel = 0.11	
UG4 to UG5	-5 -5		0.0 -15.25	8 7.68	7F 2E T 78.943 45.11 43.857	633.833 167.910 801.743	150 0	97.388 0.0 -0.003		Vel = 0.11	
UG5 to UG6	-5 -5		0.0 -15.25	12 11.2	2F E 28.793 29.901	1266.500 58.695 1325.195	150 0	97.385 0.0 -0.001		Vel = 0.05	
UG6 to UG7	-5 -5		0.0 -15.25	12 11.2	E 6F T 29.901 86.38 66.446	1047.167 182.727 1229.894	150 0	97.384 0.0 0.0		Vel = 0.05	
UG7 to UG1	-5 -5		0.0 -15.25	8 7.68	2F T 22.555 43.857	533.667 22.555 556.222	150 0	97.384 0.0 -0.002		Vel = 0.11	
UG1 to UG2	-5 -5		0.0 -15.25	8 7.68	T 43.857	179.250 43.857 223.107	150 0	97.382 0.0 -0.001		Vel = 0.11	
UG2			0.0 -15.25					97.381		K Factor = -1.55	
UG3 to UG3Y	-5 -5		182.24 182.24	6 5.86		2.500 2.500	150 0.0012	97.424 0.0 0.003		Vel = 2.17	
UG3Y to CTY	-5 3		0.0 182.24	6 6.16	E G 20.084 4.304	12.000 24.388 36.388	140 0.0010	97.427 -3.465 0.038		Vel = 1.96	
CTY			100.00 282.24					94.000		Qa = 100.00 K Factor = 29.11	



Hydraulic Calculations by HydraCALC

RANGER FIRE, INC.
1000 S. MAIN ST
SUITE 150
GRAPEVINE, TX 76051
817-410-9070

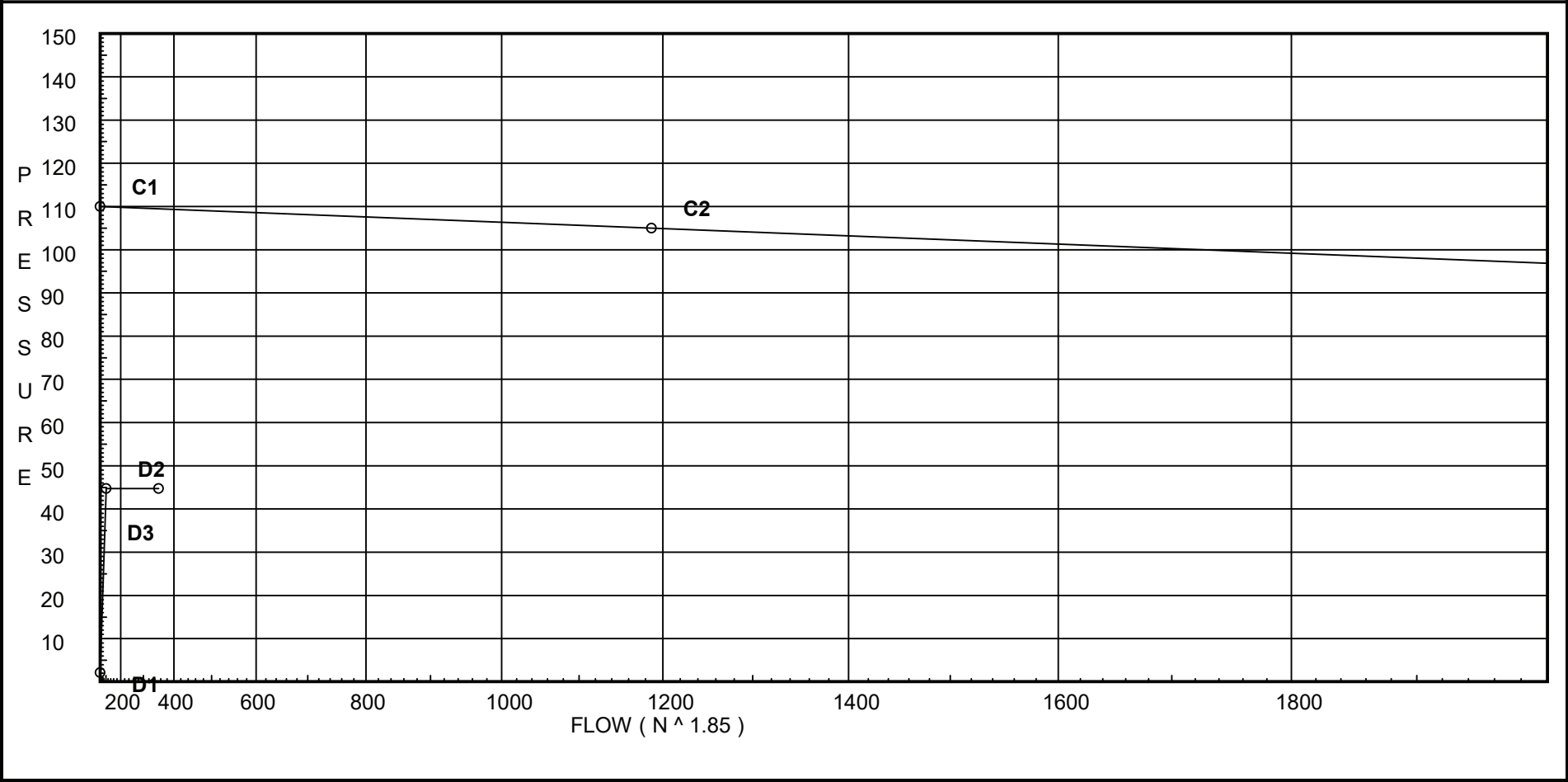
Job Name : TOWNEPLACE SUITES
Drawing :
Location : 1ST FLOOR
Remote Area :
Contract :
Data File : Remote #2_Laundry.WXF

Water Supply Curve

RANGER FIRE, INC.
TOWNEPLACE SUITES

City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 105
C2 - Residual Flow : 1187

Demand:
D1 - Elevation : 2.130
D2 - System Flow : 102.954
D2 - System Pressure : 44.734
Hose (Demand) : 250
D3 - System Demand : 352.954
Safety Margin : 64.735



Fittings Used Summary

RANGER FIRE, INC.
TOWNEPLACE SUITES

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
Ball	B Ball Milw BB-SC100			2.25	2	2.5	2.25	10													
E	NFPA 13 90' Standard Elbow	0	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	0	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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
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
Zcb	Colt C200 Vert	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.

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 3
Date

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
CTY	110.0	105	1187.0	109.47	352.95	44.734

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
A1	7.917		19.5			
A2	7.917		19.5			
A3	8.917		19.07			
A4	7.917		19.17			
A5	7.917		19.17			
A6	8.917		18.02			
A7	7.917		18.45			
A8	7.917		18.45			
A9	7.917		16.87			
A10	7.917		16.87			
A11	8.917		15.3			
L1	7.917	5.6	7.0	14.82	0.15	77
L2	7.917	5.6	8.26	16.1	0.15	77
L3	7.917	5.6	10.55	18.19	0.15	77
L4	7.917	5.6	10.35	18.02	0.15	77
L5	7.917	5.6	10.56	18.2	0.15	77
L6	7.917	5.6	9.92	17.64	0.15	77
A2T	9.5		18.82			
A5T	9.5		18.48			
A7T	9.5		17.77			
A9T	9.5		16.19			
L2T	9.5		8.15			
L5T	9.5		10.59			
100	9.5		18.82			
101	9.5		18.48			
102	9.5		17.77			
103	9.5		16.19			
104	9.5		15.04			
105	9.5		12.7			
106	9.5		11.26			
107	9.5		11.43			
TW1	9.5		33.43			
108	9.5		32.34			
109	9.5		28.19			
BW1	4.0		37.47			
BD	4.0		37.7			
FLG	1.0		45.43			
CHG	-5.0		48.04			
UG2Y	-5.0		48.09			
DOM	-5.0		48.09			
UG2Z	-5.0		48.14			
UG2X	-5.0		48.13			

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 4
Date

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
UG2	-5.0		48.17		
UG3	-5.0		48.18		
UG3X	-5.0		48.17		
UG4	-5.0		48.17		
UG5	-5.0		48.17		
UG6	-5.0		48.17		
UG7	-5.0		48.17		
UG1	-5.0		48.17		
UG3Y	-5.0		48.19		
CTY	3.0		44.73	250.0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 5
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
A1 to 100	7.917 9.500		0.0 0.0	1 1.049	E T 5.0	10.333 7.000 17.333	120 0.0001	19.504 -0.686 0.001		Vel = 0	
100			0.0 0.0					18.819		K Factor = 0	
A2 to A2T	7.917 9.500		0.0 0.0	1 1.049	T 5.0	1.583 5.000 6.583	120 0.0002	19.504 -0.686 0.001		Vel = 0	
A2T			0.0 0.0					18.819		K Factor = 0	
A3 to A2T	8.917 9.500		0.0 0.0	1 1.049	E 2.0	10.917 2.000 12.917	120 0	19.071 -0.252 0.0		Vel = 0	
A2T			0.0 0.0					18.819		K Factor = 0	
A4 to A5T	7.917 9.500		0.0 0.0	1 1.049	E 2.0	3.000 2.000 5.000	120 0	19.170 -0.686 0.0		Vel = 0	
A5T			0.0 0.0					18.484		K Factor = 0	
A5 to A5T	7.917 9.500		0.0 0.0	1 1.049	T 5.0	1.583 5.000 6.583	120 0	19.170 -0.686 0.0		Vel = 0	
A5T			0.0 0.0					18.484		K Factor = 0	
A6 to A7T	8.917 9.500		0.0 0.0	1 1.049	E 2.0	8.333 2.000 10.333	120 -0.0001	18.020 -0.252 -0.001		Vel = 0	
A7T			0.0 0.0					17.767		K Factor = 0	
A7 to A7T	7.917 9.500		0.0 0.0	1 1.049	T 5.0	1.583 5.000 6.583	120 0	18.453 -0.686 0.0		Vel = 0	
A7T			0.0 0.0					17.767		K Factor = 0	
A8 to 102	7.917 9.500		0.0 0.0	1 1.049	E T 5.0	3.250 7.000 10.250	120 0	18.453 -0.686 0.0		Vel = 0	
102			0.0 0.0					17.767		K Factor = 0	
A9 to A9T	7.917 9.500		0.0 0.0	1 1.049	E T 5.0	6.583 7.000 13.583	120 0.0001	16.874 -0.686 0.001		Vel = 0	
A9T			0.0 0.0					16.189		K Factor = 0	
A10 to A9T	7.917 9.500		0.0 0.0	1 1.049	E 2.0	6.583 2.000 8.583	120 0.0001	16.874 -0.686 0.001		Vel = 0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 6
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
A9T			0.0 0.0					16.189		K Factor = 0	
A11 to 104	8.917 9.500		0.0 0.0	1 1.049		3.167 3.167	120 0	15.296 -0.252 0.0		Vel = 0	
104			0.0 0.0					15.044		K Factor = 0	
L1 to L2T	7.917 9.500	5.60	14.82 14.82	1 1.049	E T 2.0 5.0	17.583 7.000 24.583	120 0.0747	7.000 -0.686 1.837		Vel = 5.50	
L2T			0.0 14.82					8.151		K Factor = 5.19	
L2 to L2T	7.917 9.500	5.60	16.10 16.1	1 1.049	T 5.0	1.583 5.000 6.583	120 0.0872	8.263 -0.686 0.574		Vel = 5.98	
L2T			0.0 16.10					8.151		K Factor = 5.64	
L3 to 107	7.917 9.500	5.60	18.19 18.19	1 1.049	E T 2.0 5.0	7.333 7.000 14.333	120 0.1092	10.548 -0.686 1.565		Vel = 6.75	
107			0.0 18.19					11.427		K Factor = 5.38	
L4 to 106	7.917 9.500	5.60	18.02 18.02	1 1.049	E T 2.0 5.0	7.833 7.000 14.833	120 0.1073	10.355 -0.686 1.592		Vel = 6.69	
106			0.0 18.02					11.261		K Factor = 5.37	
L5 to L5T	7.917 9.500	5.60	18.20 18.2	1 1.049	T 5.0	1.583 5.000 6.583	120 0.1092	10.558 -0.686 0.719		Vel = 6.76	
L5T			0.0 18.20					10.591		K Factor = 5.59	
L6 to L5T	7.917 9.500	5.60	17.64 17.64	1 1.049	E 2.0	11.167 2.000 13.167	120 0.1031	9.919 -0.686 1.358		Vel = 6.55	
L5T			0.0 17.64					10.591		K Factor = 5.42	
A2T to 100	9.500 9.500		0.0 0.0	1 1.049		5.250 5.250	120 0	18.819 0.0 0.0		Vel = 0	
100			0.0 0.0					18.819		K Factor = 0	
A5T to 101	9.500 9.500		0.0 0.0	1 1.049	T 5.0	3.583 5.000 8.583	120 0	18.484 0.0 0.0		Vel = 0	
101			0.0 0.0					18.484		K Factor = 0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 7
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
A7T to 102	9.500 9.500		0.0 0.0	1 1.049		8.333 8.333	120 0	17.767 0.0 0.0		Vel = 0	
102			0.0 0.0					17.767		K Factor = 0	
A9T to 103	9.500 9.500		0.0 0.0	1 1.049	T 5.0	2.167 5.000 7.167	120 0	16.189 0.0 0.0		Vel = 0	
103			0.0 0.0					16.189		K Factor = 0	
L2T to 107	9.500 9.500		30.91 30.91	1 1.049	T 5.0	6.250 5.000 11.250	120 0.2912	8.151 0.0 3.276		Vel = 11.47	
107			0.0 30.91					11.427		K Factor = 9.14	
L5T to 106	9.500 9.500		35.83 35.83	1 1.049		1.750 1.750	120 0.3829	10.591 0.0 0.670		Vel = 13.30	
106			0.0 35.83					11.261		K Factor = 10.68	
100 to 101	9.500 9.500		-38.65 -38.65	1.25 1.442		3.583 3.583	120 -0.0935	18.819 0.0 -0.335		Vel = 7.59	
101 to 102	9.500 9.500		0.0 -38.65	1.25 1.442		7.667 7.667	120 -0.0935	18.484 0.0 -0.717		Vel = 7.59	
102 to 103	9.500 9.500		0.0 -38.65	1.25 1.442	E 3.716	13.167 3.716 16.883	120 -0.0935	17.767 0.0 -1.578		Vel = 7.59	
103 to 104	9.500 9.500		0.0 -38.65	1.25 1.442		12.250 12.250	120 -0.0935	16.189 0.0 -1.145		Vel = 7.59	
104 to 105	9.500 9.500		0.0 -38.65	1.25 1.442		25.083 25.083	120 -0.0935	15.044 0.0 -2.345		Vel = 7.59	
105 to 106	9.500 9.500		0.0 -38.65	1.25 1.442	E 3.716	11.667 3.716 15.383	120 -0.0935	12.699 0.0 -1.438		Vel = 7.59	
106 to 107	9.500 9.500		53.85 15.2	1.25 1.442		10.000 10.000	120 0.0166	11.261 0.0 0.166		Vel = 2.99	
107 to TW1	9.500 9.500		49.10 64.3	1.25 1.442	T 7.432	84.333 7.432 91.765	120 0.2397	11.427 0.0 22.000		Vel = 12.63	
TW1 to 108	9.500 9.500		-102.95 -38.65	1.25 1.442		11.583 11.583	120 -0.0935	33.427 0.0 -1.083		Vel = 7.59	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 8
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
108 to 109	9.500 9.500		0.0 -38.65	1.25 1.442	E	3.716	40.667 3.716 44.383	120 -0.0935	32.344 0.0 -4.149		Vel = 7.59	
109 to 100	9.500 9.500		0.0 -38.65	1.25 1.442	E	3.716	96.583 3.716 100.299	120 -0.0935	28.195 0.0 -9.376		Vel = 7.59	
100			0.0 -38.65						18.819		K Factor = -8.91	
TW1 to BW1	9.500 4		102.95 102.95	2 2.157	Ball T	2.769 12.307	5.500 15.076 20.576	120 0.0806	33.427 2.382 1.658		Vel = 9.04	
BW1 to BD	4 4		0.0 102.95	3 3.26	T	20.159	1.500 20.159 21.659	120 0.0108	37.467 0.0 0.233		Vel = 3.96	
BD to FLG	4 1		0.0 102.95	3 3.26	3E Zcb	28.223 0.0	19.083 28.223 47.306	120 0.0108	37.700 7.224 0.511		* * Fixed Loss = 5.925 Vel = 3.96	
FLG to CHG	1 -5		0.0 102.95	6 6.16	E	20.084	12.000 20.084 32.084	140 0.0003	45.435 2.599 0.011		Vel = 1.11	
CHG			0.0 102.95						48.045		K Factor = 14.85	
CHG to UG2Y	-5 -5		102.95 102.95	6 5.86	E G T	17.893 3.834 38.342	51.750 60.069 111.819	150 0.0004	48.045 0.0 0.046		Vel = 1.22	
UG2Y			0.0 102.95						48.091		K Factor = 14.85	
UG2Y to DOM	-5 -5		47.58 47.58	6 5.86			4.000 4.000	150 0	48.091 0.0 0.0		Vel = 0.57	
DOM to UG2Z	-5 -5		0.0 47.58	6 5.86	G	3.834	509.583 3.834 513.417	150 0.0001	48.091 0.0 0.051		Vel = 0.57	
UG2Z to UG3X	-5 -5		0.0 47.58	6 5.86	4F T 2G	35.786 38.342 7.668	229.750 81.796 311.546	150 0.0001	48.142 0.0 0.030		Vel = 0.57	
UG3X			0.0 47.58						48.172		K Factor = 6.86	
UG2Y to UG2X	-5 -5		55.37 55.37	6 5.86	G T	3.834 38.342	287.583 42.176 329.759	150 0.0001	48.091 0.0 0.043		Vel = 0.66	
UG2X to UG2	-5 -5		0.0 55.37	6 5.86	2F T G	17.893 38.342 3.834	217.333 60.069 277.402	150 0.0001	48.134 0.0 0.036		Vel = 0.66	
UG2 to UG3	-5 -5		-8.61 46.76	8 7.68	E 4F	22.555 45.11	515.833 67.665 583.498	150 0	48.170 0.0 0.015		Vel = 0.32	
UG3 to UG3X	-5 -5		-102.96 -56.2	8 7.68	T	43.857	302.250 43.857 34					

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 9
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
UG3X to UG4	-5 -5		47.59 -8.61	8 7.68	G T 5.012 43.857	184.917 48.869 233.786	150 0	48.172 0.0 0.0		Vel = 0.06	
UG4 to UG5	-5 -5		0.0 -8.61	8 7.68	7F 2E T 78.943 45.11 43.857	633.833 167.910 801.743	150 0	48.172 0.0 -0.001		Vel = 0.06	
UG5 to UG6	-5 -5		0.0 -8.61	12 11.2	2F E 28.793 29.901	1266.500 58.695 1325.195	150 0	48.171 0.0 0.0		Vel = 0.03	
UG6 to UG7	-5 -5		0.0 -8.61	12 11.2	E 6F T 29.901 86.38 66.446	1047.167 182.727 1229.894	150 0	48.171 0.0 0.0		Vel = 0.03	
UG7 to UG1	-5 -5		0.0 -8.61	8 7.68	2F T 22.555 43.857	533.667 22.555 556.222	150 0	48.171 0.0 -0.001		Vel = 0.06	
UG1 to UG2	-5 -5		0.0 -8.61	8 7.68	T 43.857	179.250 43.857 223.107	150 0	48.170 0.0 0.0		Vel = 0.06	
UG2			0.0 -8.61					48.170		K Factor = -1.24	
UG3 to UG3Y	-5 -5		102.95 102.95	6 5.86		2.500 2.500	150 0.0004	48.185 0.0 0.001		Vel = 1.22	
UG3Y to CTY	-5 3		0.0 102.95	6 6.16	E G 20.084 4.304	12.000 24.388 36.388	140 0.0004	48.186 -3.465 0.013		Vel = 1.11	
CTY			250.00 352.95					44.734		Qa = 250.00 K Factor = 52.77	



Hydraulic Calculations by HydraCALC

RANGER FIRE, INC.
1000 S. MAIN ST
SUITE 150
GRAPEVINE, TX 76051
817-410-9070

Job Name : TOWNEPLACE SUITES
Drawing :
Location : 1ST FLOOR
Remote Area :
Contract :
Data File : Remote #3_Garage.WXF

Water Supply Curve

RANGER FIRE, INC.
TOWNEPLACE SUITES

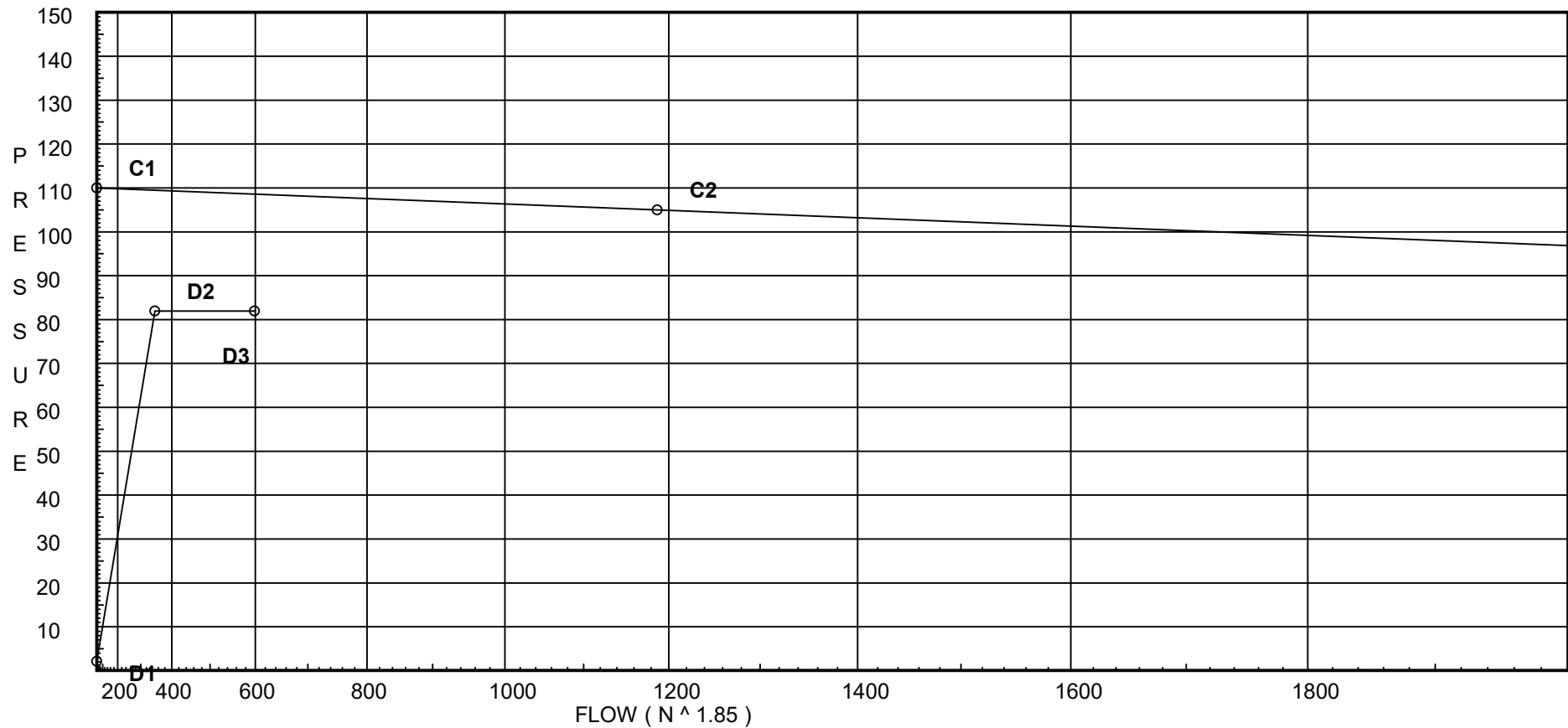
Page 1
Date

City Water Supply:

C1 - Static Pressure : 110
C2 - Residual Pressure: 105
C2 - Residual Flow : 1187

Demand:

D1 - Elevation : 2.130
D2 - System Flow : 348.29
D2 - System Pressure : 81.953
Hose (Demand) : 250
D3 - System Demand : 598.29
Safety Margin : 26.640



Fittings Used Summary

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 2
Date

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
Dvc	Dry Vic 768 NXT					3	9	8	17		21		22	50							
E	NFPA 13 90' Standard Elbow	0	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	0	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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
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
Zcb	Colt C200 Vert	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.

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 3
Date

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
CTY	110.0	105	1187.0	108.592	598.29	81.953

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
G1	7.917	5.6	14.66	21.44	0.15	115
G2	7.917	5.6	14.98	21.68	0.15	115
G3	7.917	5.6	14.93	21.64	0.15	115
G4	7.917	5.6	14.61	21.4	0.15	115
G5	7.917	5.6	12.21	19.57	0.15	124
G6	7.917	5.6	12.49	19.79	0.15	124
G7	7.917	5.6	13.51	20.58	0.15	124
G8	7.917	5.6	14.23	21.12	0.15	124
G9	7.917	5.6	12.21	19.57	0.15	124
G10	7.917	5.6	11.29	18.81	0.15	124
G11	7.917	5.6	11.03	18.6	0.15	124
G12	7.917	5.6	15.16	21.8	0.15	124
G13	7.917	5.6	15.5	22.05	0.15	124
G14	7.917	5.6	15.01	21.69	0.15	124
G15	7.917	5.6	12.88	20.1	0.15	124
G16	7.917	5.6	11.91	19.33	0.15	124
G17	7.917	5.6	11.64	19.11	0.15	124
G1T	9.917		15.34			
G2T	9.917		15.7			
G3T	9.917		15.65			
G4T	9.917		15.29			
G5T	9.917		12.66			
G6T	9.917		12.97			
G7T	9.917		14.08			
G8T	9.917		14.87			
G9T	9.917		12.66			
G10T	9.917		11.64			
G11T	9.917		11.36			
G12T	9.917		15.89			
G13T	9.917		16.27			
G14T	9.917		15.73			
G15T	9.917		13.4			
G16T	9.917		12.33			
G17T	9.917		12.03			
100X	9.917		16.75			
101X	9.917		16.88			
102X	9.917		17.84			
103X	9.917		47.38			
TD	9.917		61.38			
BD	4.0		70.59			
FLG	1.0		81.24			
CHG	-5.0		83.95			

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 4
Date

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
UG2Y	-5.0		84.39		
DOM	-5.0		84.39		
UG2Z	-5.0		84.87		
UG2X	-5.0		84.79		
UG2	-5.0		85.14		
UG3	-5.0		85.28		
UG3X	-5.0		85.16		
UG4	-5.0		85.16		
UG5	-5.0		85.15		
UG6	-5.0		85.15		
UG7	-5.0		85.15		
UG1	-5.0		85.14		
UG3Y	-5.0		85.29		
CTY	3.0		81.95	250.0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 5
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
G1 to G1T	7.917 9.917	5.60	21.44 21.44	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.2073	14.656 -0.866 1.554		Vel = 7.96	
G1T			0.0 21.44						15.344		K Factor = 5.47	
G2 to G2T	7.917 9.917	5.60	21.68 21.68	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.2116	14.984 -0.866 1.586		Vel = 8.05	
G2T			0.0 21.68						15.704		K Factor = 5.47	
G3 to G3T	7.917 9.917	5.60	21.64 21.64	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.2109	14.934 -0.866 1.581		Vel = 8.03	
G3T			0.0 21.64						15.649		K Factor = 5.47	
G4 to G4T	7.917 9.917	5.60	21.40 21.4	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.2067	14.608 -0.866 1.549		Vel = 7.94	
G4T			0.0 21.40						15.291		K Factor = 5.47	
G5 to G5T	7.917 9.917	5.60	19.57 19.57	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.1752	12.213 -0.866 1.313		Vel =	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 6
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
G10T			0.0 18.81						11.640		K Factor = 5.51	
G11 to G11T	7.917 9.917	5.60	18.60 18.6	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.1594	11.032 -0.866 1.195		Vel = 6.90	
G11T			0.0 18.60						11.361		K Factor = 5.52	
G12 to G12T	7.917 9.917	5.60	21.80 21.8	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.2139	15.157 -0.866 1.603		Vel = 8.09	
G12T			0.0 21.80						15.894		K Factor = 5.47	
G13 to G13T	7.917 9.917	5.60	22.05 22.05	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.2183	15.498 -0.866 1.636		Vel = 8.19	
G13T			0.0 22.05						16.268		K Factor = 5.47	
G14 to G14T	7.917 9.917	5.60	21.69 21.69	1 1.049	E T	1.427 3.568	2.500 4.995 7.495	100 0.2119	15.005 -0.866 1.588		Vel = 8.05	
G14T			0.0 21.69						15.727		K Factor = 5.47	
G15 to G15T	7.917 9.917	5.60	20									

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 7
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
100X			0.0 43.04					16.755		K Factor = 10.51	
G4T to G3T	9.917 9.917		21.40 21.4	1.25 1.442		8.167 8.167	100 0.0438	15.291 0.0 0.358		Vel = 4.20	
G3T			0.0 21.40					15.649		K Factor = 5.41	
G5T to G6T	9.917 9.917		19.57 19.57	1.25 1.442		8.250 8.250	100 0.0372	12.660 0.0 0.307		Vel = 3.84	
G6T to G7T	9.917 9.917		19.79 39.36	1.25 1.442		8.250 8.250	100 0.1355	12.967 0.0 1.118		Vel = 7.73	
G7T to 101X	9.917 9.917		20.59 59.95	1.25 1.442	T 5.304	4.167 5.304 9.471	100 0.2950	14.085 0.0 2.794		Vel = 11.78	
101X			0.0 59.95					16.879		K Factor = 14.59	
G8T to 101X	9.917 9.917		78.10 78.1	1.25 1.442		4.167 4.167	100 0.4814	14.873 0.0 2.006		Vel = 15.34	
101X			0.0 78.10					16.879		K Factor = 19.01	
G9T to G8T	9.917 9.917		56.98 56.98	1.25 1.442		8.250 8.250	100 0.2686	12.657 0.0 2.216			

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 8
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
102X			0.0 80.23					17.835		K Factor = 19.00	
G15T to G14T	9.917 9.917		58.54 58.54	1.25 1.442		8.250 8.250	100 0.2823	13.398 0.0 2.329		Vel = 11.50	
G14T			0.0 58.54					15.727		K Factor = 14.76	
G16T to G15T	9.917 9.917		38.44 38.44	1.25 1.442		8.250 8.250	100 0.1297	12.328 0.0 1.070		Vel = 7.55	
G15T			0.0 38.44					13.398		K Factor = 10.50	
G17T to G16T	9.917 9.917		19.11 19.11	1.25 1.442		8.250 8.250	100 0.0355	12.035 0.0 0.293		Vel = 3.75	
G16T			0.0 19.11					12.328		K Factor = 5.44	
100X to 101X	9.917 9.917		86.16 86.16	3 3.26		11.417 11.417	100 0.0109	16.755 0.0 0.124		Vel = 3.31	
101X to 102X	9.917 9.917		138.05 224.21	3 3.26		15.000 15.000	100 0.0637	16.879 0.0 0.956		Vel = 8.62	
102X to 103X	9.917 9.917		124.08 348.29	3 3.26		205.167 205.167	100 0.1440	17.835			

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 9
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
UG2Y to DOM	-5 -5		160.97	6		4.000	150	84.385 0.0			
DOM to UG2Z	-5 -5		160.97	5.86		4.000	0.0010	0.004	Vel =	1.91	
UG2Z to UG3X	-5 -5		0.0	6	G	3.834	509.583 3.834	84.389 0.0			
UG2Z to UG3X	-5 -5		160.97	5.86		513.417	0.0009	0.481	Vel =	1.91	
UG2Z to UG3X	-5 -5		0.0	6	4F T	35.786 38.342	229.750 81.796	84.870 0.0			
UG3X to UG3X	-5 -5		160.97	5.86	2G	7.668	311.546	0.0009	0.293	Vel =	1.91
UG3X to UG2Y	-5 -5		0.0 160.97					85.163	K Factor =	17.44	
UG2Y to UG2X	-5 -5		187.32	6	G T	3.834 38.342	287.583 42.176	84.385 0.0			
UG2X to UG2	-5 -5		187.32	5.86		329.759	0.0012	0.409	Vel =	2.23	
UG2X to UG2	-5 -5		0.0	6	2F T	17.893 38.342	217.333 60.069	84.794 0.0			
UG2 to UG3	-5 -5		187.32	5.86	G	3.834					

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 10
Date

Node1	Elev1	K	Qa	Nom	Fitting or	Pipe	CFact	Pt			
to						Ftngs		Pe			
Node2	Elev2	Fact	Qt	Act	Equiv	Len	Pf/Ft	Pf		*****	Notes *****
			250.00						Qa = 250.00		
CTY			598.29						81.953	K Factor = 66.09	



Hydraulic Calculations by HydraCALC

RANGER FIRE, INC.
1000 S. MAIN ST
SUITE 150
GRAPEVINE, TX 76051
817-410-9070

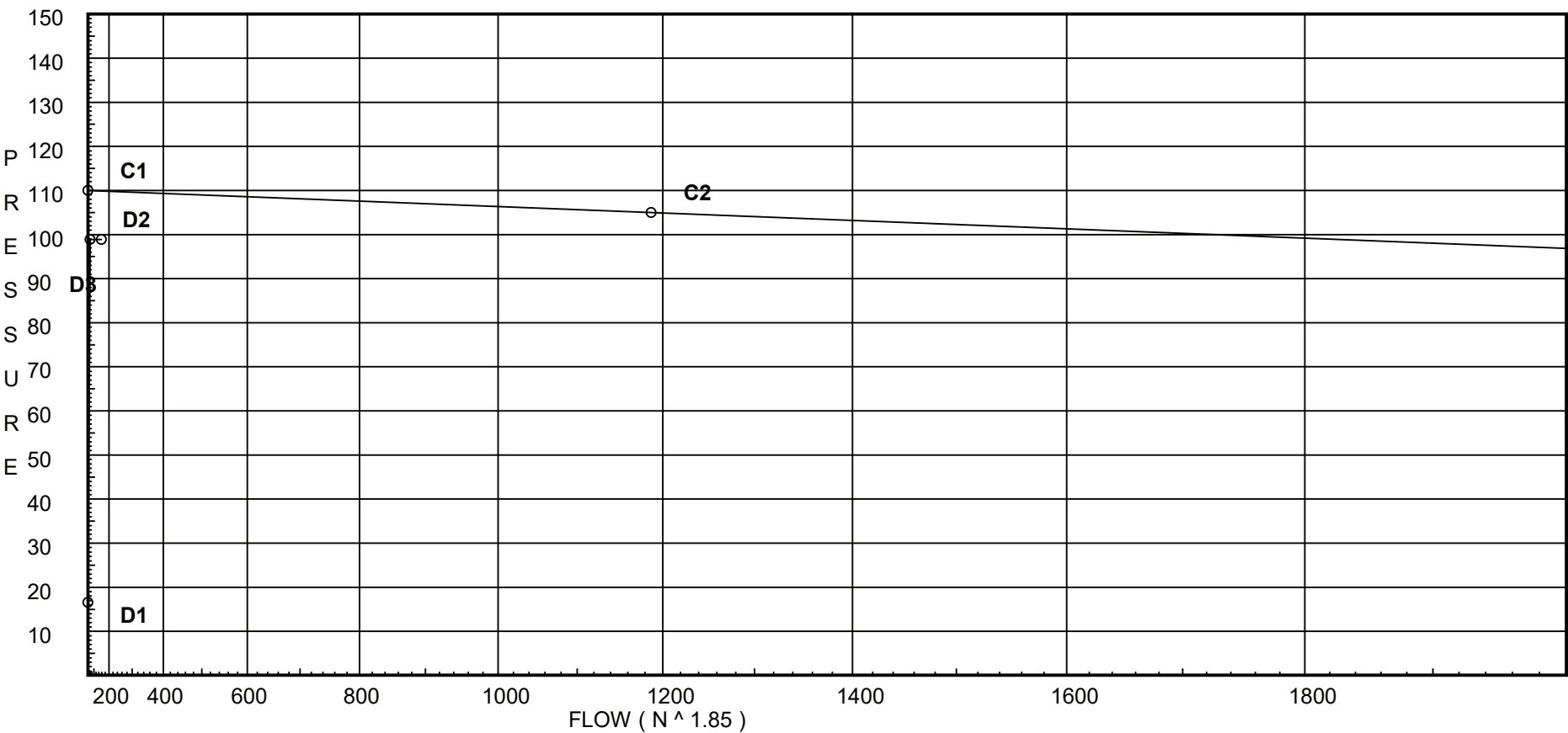
Job Name : TOWNEPLACE SUITES
Drawing :
Location : 4TH FLOOR
Remote Area :
Contract :
Data File : Remote #4_Corridor.WXF

Water Supply Curve

RANGER FIRE, INC.
TOWNEPLACE SUITES

City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 105
C2 - Residual Flow : 1187

Demand:
D1 - Elevation : 16.566
D2 - System Flow : 57.879
D2 - System Pressure : 98.865
Hose (Demand) : 100
D3 - System Demand : 157.879
Safety Margin : 11.016



Fittings Used Summary

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 2
Date

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
Ball	B Ball Milw BB-SC100			2.25	2	2.5	2.25	10													
E	NFPA 13 90' Standard Elbow	0	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	0	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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
N *	CPVC 90' Ell	0	4	5	6	7	9	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Branch Tee	0	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
Zcb	Colt C200 Vert	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.

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 3
Date

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
CTY	110.0	105	1187.0	109.88	157.88	98.865

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
C1	41.25	4.4	10.59	14.32	0.1	80
C2	41.25	4.4	10.2	14.05	0.1	80
C3	41.25	4.4	11.3	14.79	0.1	80
C4	41.25	4.4	11.19	14.72	0.1	80
R1	42.0		16.02			
R2	42.0		17.42			
R3	42.0		15.83			
R4	42.0		22.0			
R5	42.0		22.0			
C1X	32.833		15.19			
C2X	32.833		14.76			
C3X	32.833		15.95			
C4X	32.833		15.83			
C1B	22.75		24.35			
C2B	22.75		24.03			
R1B	22.75		24.35			
R2B	22.75		25.76			
R3B	22.75		24.17			
R4B	22.75		30.34			
R5B	22.75		30.34			
200	22.75		25.54			
201	22.75		25.54			
202	22.75		25.76			
203	22.75		26.26			
204	22.75		30.34			
205	22.75		34.38			
206	22.75		38.36			
207	22.75		63.89			
208	22.75		68.45			
209	22.75		77.74			
210	22.75		76.0			
211	22.75		71.32			
212	22.75		54.85			
213	22.75		25.78			
209A	22.75		79.18			
209B	9.5		86.52			
TW2	9.5		87.2			
BW2	4.0		91.3			
BW1	4.0		91.38			
BD	4.0		91.46			
FLG	1.0		99.67			
CHG	-5.0		102.28			

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 4
Date

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
UG2Y	-5.0		102.29		
DOM	-5.0		102.29		
UG2Z	-5.0		102.31		
UG2X	-5.0		102.31		
UG2	-5.0		102.32		
UG3	-5.0		102.32		
UG3X	-5.0		102.32		
UG4	-5.0		102.32		
UG5	-5.0		102.32		
UG6	-5.0		102.32		
UG7	-5.0		102.32		
UG1	-5.0		102.32		
UG3Y	-5.0		102.32		
CTY	3.0		98.86	100.0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 5
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
C1 to C1X	41.250 32.833	4.40	14.32 14.32	0.75 0.874			8.417 8.417	150 0.1129	10.594 3.645 0.950		Vel = 7.66	
C1X			0.0 14.32						15.189		K Factor = 3.67	
C2 to C2X	41.250 32.833	4.40	14.05 14.05	0.75 0.874			8.417 8.417	150 0.1091	10.200 3.645 0.918		Vel = 7.51	
C2X			0.0 14.05						14.763		K Factor = 3.66	
C3 to C3X	41.250 32.833	4.40	14.79 14.79	0.75 0.874			8.417 8.417	150 0.1199	11.298 3.645 1.009		Vel = 7.91	
C3X			0.0 14.79						15.952		K Factor = 3.70	
C4 to C4X	41.250 32.833	4.40	14.72 14.72	0.75 0.874			8.417 8.417	150 0.1188	11.186 3.645 1.000		Vel = 7.87	
C4X			0.0 14.72						15.831		K Factor = 3.70	
R1 to R1B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	16.017 8.337 0.0		Vel = 0	
R1B			0.0 0.0						24.354		K Factor = 0	
R2 to R2B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	17.420 8.337 0.0		Vel = 0	
R2B			0.0 0.0						25.757		K Factor = 0	
R3 to R3B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	15.829 8.337 0.0		Vel = 0	
R3B			0.0 0.0						24.166		K Factor = 0	
R4 to R4B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	22.000 8.337 0.0		Vel = 0	
R4B			0.0 0.0						30.337		K Factor = 0	
R5 to R5B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	22.000 8.337 0.0		Vel = 0	
R5B			0.0 0.0						30.337		K Factor = 0	
C1X to C1B	32.833 22.750		14.32 14.32	0.75 0.874	3N O	12.0 3.0	27.417 15.000 42.417	150 0.1129	15.189 4.367 4.790		Vel = 7.66	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 6
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
C1B			0.0 14.32					24.346		K Factor = 2.90	
C2X to C2B	32.833 22.750		14.05 14.05	0.75 0.874	5N O 20.0 3.0	21.917 23.000 44.917	150 0.1090	14.763 4.367 4.897		Vel = 7.51	
C2B			0.0 14.05					24.027		K Factor = 2.87	
C3X to R1B	32.833 22.750		14.79 14.79	0.75 0.874	3N O 12.0 3.0	18.667 15.000 33.667	150 0.1199	15.952 4.367 4.035		Vel = 7.91	
R1B			0.0 14.79					24.354		K Factor = 3.00	
C4X to R3B	32.833 22.750		14.72 14.72	0.75 0.874	4N O 16.0 3.0	14.417 19.000 33.417	150 0.1187	15.831 4.367 3.968		Vel = 7.87	
R3B			0.0 14.72					24.166		K Factor = 2.99	
C1B to 213	22.750 22.750		14.32 14.32	0.75 0.874	N O 4.0 3.0	5.667 7.000 12.667	150 0.1129	24.346 0.0 1.430		Vel = 7.66	
213			0.0 14.32					25.776		K Factor = 2.82	
C2B to 200	22.750 22.750		14.05 14.05	0.75 0.874	N O 4.0 3.0	6.917 7.000 13.917	150 0.1091	24.027 0.0 1.518		Vel = 7.51	
200			0.0 14.05					25.545		K Factor = 2.78	
R1B to 201	22.750 22.750		14.79 14.79	0.75 0.874	O 3.0	6.917 3.000 9.917	150 0.1199	24.354 0.0 1.189		Vel = 7.91	
201			0.0 14.79					25.543		K Factor = 2.93	
R2B to 202	22.750 22.750		0.0 0.0	0.75 0.874	N O 4.0 3.0	5.667 7.000 12.667	150 0	25.757 0.0 0.0		Vel = 0	
202			0.0 0.0					25.757		K Factor = 0	
R3B to 203	22.750 22.750		14.72 14.72	0.75 0.874	N O 4.0 3.0	10.667 7.000 17.667	150 0.1188	24.166 0.0 2.098		Vel = 7.87	
203			0.0 14.72					26.264		K Factor = 2.87	
R4B to 204	22.750 22.750		0.0 0.0	0.75 0.874	N O 4.0 3.0	4.583 7.000 11.583	150 0	30.337 0.0 0.0		Vel = 0	
204			0.0 0.0					30.337		K Factor = 0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 7
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
R5B to 204	22.750 22.750		0.0 0.0	0.75 0.874	N	4.0 8.917 4.000 12.917	150 0	30.337 0.0 0.0		Vel = 0	
204			0.0 0.0					30.337		K Factor = 0	
200 to 201	22.750 22.750		-0.67 -0.67	1 1.101		16.667 16.667	150 -0.0001	25.545 0.0 -0.002		Vel = 0.23	
201 to 202	22.750 22.750		14.79 14.12	1 1.101		6.000 6.000	150 0.0357	25.543 0.0 0.214		Vel = 4.76	
202 to 203	22.750 22.750		0.0 14.12	1 1.101		14.167 14.167	150 0.0358	25.757 0.0 0.507		Vel = 4.76	
203 to 204	22.750 22.750		14.72 28.84	1 1.101	N	5.0 25.417 5.000 30.417	150 0.1339	26.264 0.0 4.073		Vel = 9.72	
204 to 205	22.750 22.750		0.0 28.84	1 1.101	N	5.0 25.167 5.000 30.167	150 0.1339	30.337 0.0 4.039		Vel = 9.72	
205 to 206	22.750 22.750		0.0 28.84	1 1.101		29.750 29.750	150 0.1339	34.376 0.0 3.984		Vel = 9.72	
206 to 207	22.750 22.750		0.0 28.84	1 1.101		190.667 190.667	150 0.1339	38.360 0.0 25.533		Vel = 9.72	
207 to 208	22.750 22.750		0.0 28.84	1 1.101	2N	10.0 24.000 10.000 34.000	150 0.1339	63.893 0.0 4.553		Vel = 9.72	
208 to 209	22.750 22.750		0.0 28.84	1 1.101	O	5.0 64.417 5.000 69.417	150 0.1339	68.446 0.0 9.296		Vel = 9.72	
209 to 210	22.750 22.750		-57.88 -29.04	1 1.101		12.833 12.833	150 -0.1357	77.742 0.0 -1.741		Vel = 9.79	
210 to 211	22.750 22.750		0.0 -29.04	1 1.101	N	5.0 29.500 5.000 34.500	150 -0.1357	76.001 0.0 -4.680		Vel = 9.79	
211 to 212	22.750 22.750		0.0 -29.04	1 1.101	N	5.0 116.417 5.000 121.417	150 -0.1356	71.321 0.0 -16.470		Vel = 9.79	
212 to 213	22.750 22.750		0.0 -29.04	1 1.101	N	5.0 209.333 5.000 214.333	150 -0.1357	54.851 0.0 -29.075		Vel = 9.79	
213 to 200	22.750 22.750		14.32 -14.72	1 1.101		6.000 6.000	150 -0.0385	25.776 0.0 -0.231		Vel = 4.96	
			0.0								

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 8
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
200			-14.72						25.545		K Factor = -2.91	
209 to 209A	22.750 22.750		57.88	1.5	N	7.0	11.167 7.000 18.167	150	77.742 0.0			
209A to 209B	22.750 9.500		57.88	1.598			18.167	0.0792	1.438		Vel = 9.26	
209A to 209B	22.750 9.500		0.0	1.5	N	7.0	13.250 7.000 20.250	150	79.180 5.739			
209B to TW2	9.500 9.500		57.88	1.598			20.250	0.0792	1.603		Vel = 9.26	
209B to TW2	9.500 9.500		0.0	1.5	N	7.0	1.500 7.000 8.500	150	86.522 0.0			
TW2			57.88						0.673		Vel = 9.26	
TW2			0.0									
TW2			57.88						87.195		K Factor = 6.20	
TW2 to BW2	9.500 4		57.88	1.5	Ball T	3.094 9.9	5.500 12.994 18.494	120	87.195 2.382			
BW2 to BW1	4 4		57.88	1.682			18.494	0.0932	1.724		Vel = 8.36	
BW2 to BW1	4 4		0.0	3	T	20.159	1.500 20.159 21.659	120	91.301 0.0			
BW1 to BD	4 4		57.88	3.26			21.659	0.0037	0.081		Vel = 2.22	
BW1 to BD	4 4		0.0	3	T	20.159	1.500 20.159 21.659	120	91.382 0.0			
BD to FLG	4 1		57.88	3.26			21.659	0.0037	0.080		Vel = 2.22	
BD to FLG	4 1		0.0	3	3E Zcb	28.223 0.0	19.083 28.223 47.306	120	91.462 8.036		** Fixed Loss = 6.736	
FLG to CHG	1 -5		57.88	3.26			47.306	0.0037	0.176		Vel = 2.22	
FLG to CHG	1 -5		0.0	6	E	20.084	12.000 20.084 32.084	140	99.674 2.599			
CHG			57.88	6.16				0.0001	0.003		Vel = 0.62	
CHG			0.0									
CHG			57.88						102.276		K Factor = 5.72	
CHG to UG2Y	-5 -5		57.88	6	E G T	17.893 3.834 38.342	51.750 60.069 111.819	150	102.276 0.0			
UG2Y			57.88	5.86				0.0001	0.016		Vel = 0.69	
UG2Y			0.0									
UG2Y			57.88						102.292		K Factor = 5.72	
UG2Y to DOM	-5 -5		26.75	6			4.000	150	102.292 0.0			
DOM to UG2Z	-5 -5		26.75	5.86			4.000	0	0.0		Vel = 0.32	
DOM to UG2Z	-5 -5		0.0	6	G	3.834	509.583 3.834 513.417	150	102.292 0.0			
UG2Z to UG3X	-5 -5		26.75	5.86			513.417	0	0.018		Vel = 0.32	
UG2Z to UG3X	-5 -5		0.0	6	4F T	35.786 38.342	229.750 81.796 311.546	150	102.310 0.0			
UG3X			26.75	5.86	2G	7.668		0	0.010		Vel = 0.32	
UG3X			0.0									
UG3X			26.75						102.320		K Factor = 2.64	
UG2Y to UG2X	-5 -5		31.13	6	G T	3.834 38.342	287.583 42.176 329.759	150	102.292 0.0			
UG2X			31.13	5.86				0	0.015		Vel = 0.37	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 9
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
UG2X to UG2	-5 -5		0.0 31.13	6 5.86	2F T G	17.893 38.342 3.834	217.333 60.069 277.402	150 0	102.307 0.0 0.012		Vel = 0.37	
UG2 to UG3	-5 -5		-4.84 26.29	8 7.68	E 4F	22.555 45.11	515.833 67.665 583.498	150 0	102.319 0.0 0.005		Vel = 0.18	
UG3 to UG3X	-5 -5		-57.88 -31.59	8 7.68	T	43.857	302.250 43.857 346.107	150 0	102.324 0.0 -0.004		Vel = 0.22	
UG3X to UG4	-5 -5		26.75 -4.84	8 7.68	G T	5.012 43.857	184.917 48.869 233.786	150 0	102.320 0.0 0.0		Vel = 0.03	
UG4 to UG5	-5 -5		0.0 -4.84	8 7.68	7F 2E T	78.943 45.11 43.857	633.833 167.910 801.743	150 0	102.320 0.0 0.0		Vel = 0.03	
UG5 to UG6	-5 -5		0.0 -4.84	12 11.2	2F E	28.793 29.901	1266.500 58.695 1325.195	150 0	102.320 0.0 0.0		Vel = 0.02	
UG6 to UG7	-5 -5		0.0 -4.84	12 11.2	E 6F T	29.901 86.38 66.446	1047.167 182.727 1229.894	150 0	102.320 0.0 0.0		Vel = 0.02	
UG7 to UG1	-5 -5		0.0 -4.84	8 7.68	2F	22.555	533.667 22.555 556.222	150 0	102.320 0.0 -0.001		Vel = 0.03	
UG1 to UG2	-5 -5		0.0 -4.84	8 7.68	T	43.857	179.250 43.857 223.107	150 0	102.319 0.0 0.0		Vel = 0.03	
UG2			0.0 -4.84						102.319		K Factor = -0.48	
UG3 to UG3Y	-5 -5		57.88	6 5.86			2.500	150	102.324 0.0		Vel = 0.69	
UG3Y to CTY	-5 3		0.0 57.88	6 6.16	E G	20.084 4.304	12.000 24.388 36.388	140 0.0001	102.325 -3.465 0.005		Vel = 0.62	
CTY			100.00 157.88						98.865		Qa = 100.00 K Factor = 15.88	



Hydraulic Calculations by HydraCALC

RANGER FIRE, INC.
1000 S. MAIN ST
SUITE 150
GRAPEVINE, TX 76051
817-410-9070

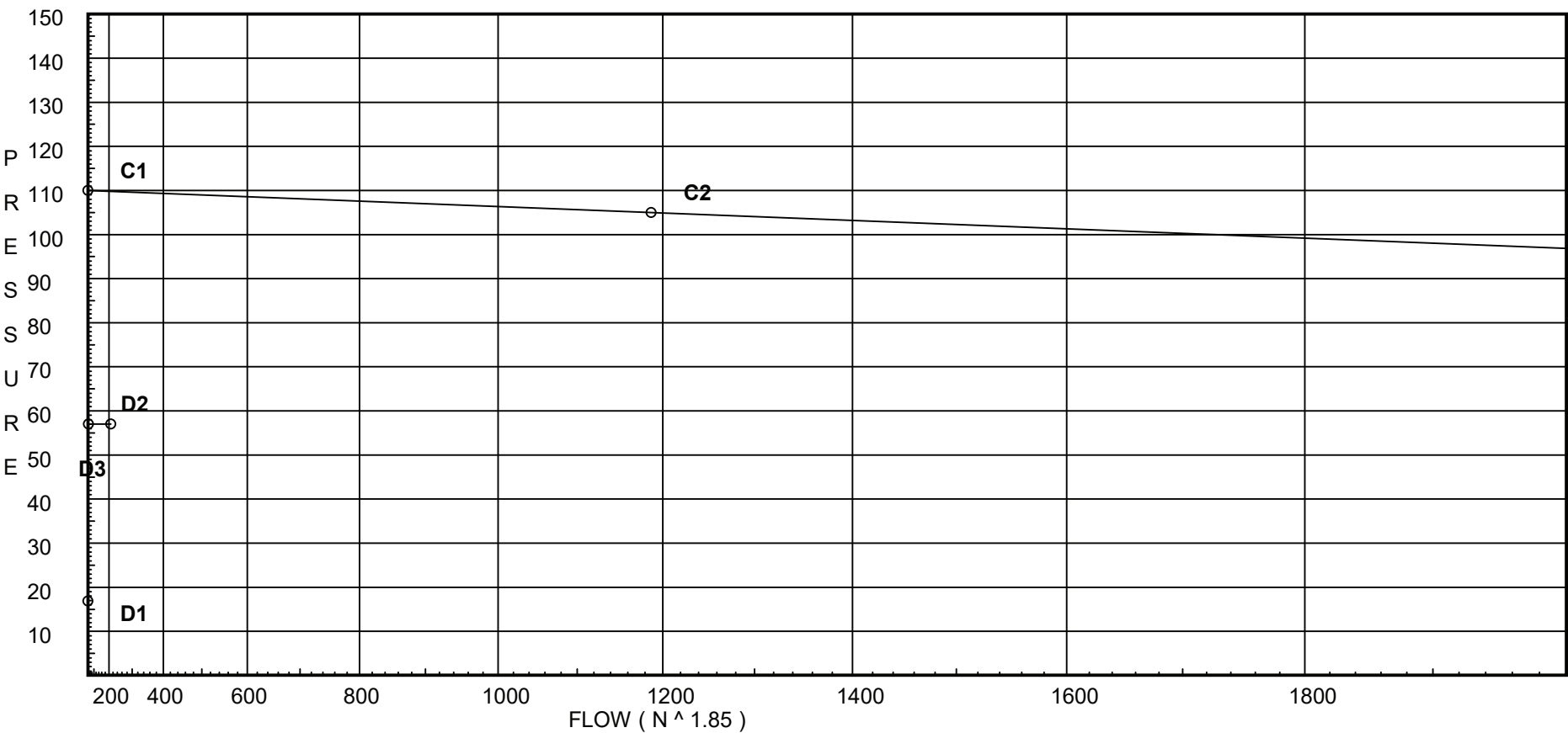
Job Name : TOWNEPLACE SUITES
Drawing :
Location : 4TH FLOOR
Remote Area :
Contract :
Data File : Remote #5_Unit.WXF

Water Supply Curve

RANGER FIRE, INC.
TOWNEPLACE SUITES

City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 105
C2 - Residual Flow : 1187

Demand:
D1 - Elevation : 16.891
D2 - System Flow : 30.137
D2 - System Pressure : 57.026
Hose (Demand) : 180
D3 - System Demand : 210.137
Safety Margin : 52.771



Fittings Used Summary

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 2
Date

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
Ball	B Ball Milw BB-SC100			2.25	2	2.5	2.25	10													
E	NFPA 13 90' Standard Elbow	0	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	0	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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
N *	CPVC 90' Ell	0	4	5	6	7	9	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Branch Tee	0	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
Zcb	Colt C200 Vert	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.

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 3
Date

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
CTY	110.0	105	1187.0	109.797	210.14	57.026

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
C1	41.25		17.12			
C2	41.25		16.88			
C3	41.25		14.97			
C4	41.25		16.79			
R1	42.0	4.4	11.86	15.15	0.05	225
R2	42.0	4.4	11.6	14.99	0.05	225
R3	42.0		16.46			
R4	42.0		17.7			
R5	42.0		17.7			
C1X	32.833		20.76			
C2X	32.833		20.52			
C3X	32.833		18.62			
C4X	32.833		20.43			
C1B	22.75		25.13			
C2B	22.75		24.89			
R1B	22.75		22.98			
R2B	22.75		22.67			
R3B	22.75		24.8			
R4B	22.75		26.04			
R5B	22.75		26.04			
200	22.75		24.89			
201	22.75		24.23			
202	22.75		24.23			
203	22.75		24.8			
204	22.75		26.04			
205	22.75		27.26			
206	22.75		28.47			
207	22.75		36.23			
208	22.75		37.61			
209	22.75		40.43			
210	22.75		39.92			
211	22.75		38.54			
212	22.75		33.69			
213	22.75		25.13			
209A	22.75		40.86			
209B	9.5		47.08			
TW2	9.5		47.28			
BW2	4.0		50.18			
BW1	4.0		50.2			
BD	4.0		50.23			
FLG	1.0		57.48			
CHG	-5.0		60.08			

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 4
Date

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
UG2Y	-5.0		60.09		
DOM	-5.0		60.09	180.0	
UG2Z	-5.0		60.28		
UG2X	-5.0		60.25		
UG2	-5.0		60.38		
UG3	-5.0		60.44		
UG3X	-5.0		60.39		
UG4	-5.0		60.39		
UG5	-5.0		60.39		
UG6	-5.0		60.39		
UG7	-5.0		60.38		
UG1	-5.0		60.38		
UG3Y	-5.0		60.44		
CTY	3.0		57.03		

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 5
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
C1 to C1X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0.0001	17.118 3.645 0.001		Vel = 0	
C1X			0.0 0.0						20.764		K Factor = 0	
C2 to C2X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0.0001	16.878 3.645 0.001		Vel = 0	
C2X			0.0 0.0						20.524		K Factor = 0	
C3 to C3X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0	14.970 3.645 0.0		Vel = 0	
C3X			0.0 0.0						18.615		K Factor = 0	
C4 to C4X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0	16.789 3.645 0.0		Vel = 0	
C4X			0.0 0.0						20.434		K Factor = 0	
R1 to R1B	42 22.750	4.40	15.15 15.15	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0.1253	11.857 8.337 2.788		Vel = 8.10	
R1B			0.0 15.15						22.982		K Factor = 3.16	
R2 to R2B	42 22.750	4.40	14.99 14.99	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0.1228	11.600 8.337 2.733		Vel = 8.02	
R2B			0.0 14.99						22.670		K Factor = 3.15	
R3 to R3B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	16.464 8.337 0.0		Vel = 0	
R3B			0.0 0.0						24.801		K Factor = 0	
R4 to R4B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	17.701 8.337 0.0		Vel = 0	
R4B			0.0 0.0						26.038		K Factor = 0	
R5 to R5B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	17.701 8.337 0.0		Vel = 0	
R5B			0.0 0.0						26.038		K Factor = 0	
C1X to C1B	32.833 22.750		0.0 0.0	0.75 0.874	3N O	12.0 3.0	27.417 15.000 42.417	150 0	20.764 4.367 -0.001		Vel = 0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 6
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
C1B			0.0 0.0						25.130		K Factor = 0	
C2X to C2B	32.833 22.750		0.0 0.0	0.75 0.874	5N O	20.0 3.0	21.917 23.000 44.917	150 0	20.524 4.367 0.0		Vel = 0	
C2B			0.0 0.0						24.891		K Factor = 0	
C3X to R1B	32.833 22.750		0.0 0.0	0.75 0.874	3N O	12.0 3.0	18.667 15.000 33.667	150 0	18.615 4.367 0.0		Vel = 0	
R1B			0.0 0.0						22.982		K Factor = 0	
C4X to R3B	32.833 22.750		0.0 0.0	0.75 0.874	4N O	16.0 3.0	14.417 19.000 33.417	150 0	20.434 4.367 0.0		Vel = 0	
R3B			0.0 0.0						24.801		K Factor = 0	
C1B to 213	22.750 22.750		0.0 0.0	0.75 0.874	N O	4.0 3.0	5.667 7.000 12.667	150 0	25.130 0.0 0.0		Vel = 0	
213			0.0 0.0						25.130		K Factor = 0	
C2B to 200	22.750 22.750		0.0 0.0	0.75 0.874	N O	4.0 3.0	6.917 7.000 13.917	150 0	24.891 0.0 0.0		Vel = 0	
200			0.0 0.0						24.891		K Factor = 0	
R1B to 201	22.750 22.750		15.15 15.15	0.75 0.874	O	3.0	6.917 3.000 9.917	150 0.1253	22.982 0.0 1.243		Vel = 8.10	
201			0.0 15.15						24.225		K Factor = 3.08	
R2B to 202	22.750 22.750		14.99 14.99	0.75 0.874	N O	4.0 3.0	5.667 7.000 12.667	150 0.1228	22.670 0.0 1.555		Vel = 8.02	
202			0.0 14.99						24.225		K Factor = 3.05	
R3B to 203	22.750 22.750		0.0 0.0	0.75 0.874	N O	4.0 3.0	10.667 7.000 17.667	150 0	24.801 0.0 0.0		Vel = 0	
203			0.0 0.0						24.801		K Factor = 0	
R4B to 204	22.750 22.750		0.0 0.0	0.75 0.874	N O	4.0 3.0	4.583 7.000 11.583	150 0	26.038 0.0 0.0		Vel = 0	
204			0.0 0.0						26.038		K Factor = 0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 7
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
R5B to 204	22.750 22.750		0.0 0.0	0.75 0.874	N	4.0 8.917 4.000 12.917	150 0	26.038 0.0 0.0			
204			0.0 0.0					26.038		K Factor = 0	
200 to 201	22.750 22.750		-15.00 -15.0	1 1.101		16.667 16.667	150 -0.0400	24.891 0.0 -0.666		Vel = 5.05	
201 to 202	22.750 22.750		15.16 0.16	1 1.101		6.000 6.000	150 0	24.225 0.0 0.0		Vel = 0.05	
202 to 203	22.750 22.750		14.98 15.14	1 1.101		14.167 14.167	150 0.0407	24.225 0.0 0.576		Vel = 5.10	
203 to 204	22.750 22.750		0.0 15.14	1 1.101	N	5.0 25.417 5.000 30.417	150 0.0407	24.801 0.0 1.237		Vel = 5.10	
204 to 205	22.750 22.750		0.0 15.14	1 1.101	N	5.0 25.167 5.000 30.167	150 0.0406	26.038 0.0 1.226		Vel = 5.10	
205 to 206	22.750 22.750		0.0 15.14	1 1.101		29.750 29.750	150 0.0407	27.264 0.0 1.210		Vel = 5.10	
206 to 207	22.750 22.750		0.0 15.14	1 1.101		190.667 190.667	150 0.0407	28.474 0.0 7.752		Vel = 5.10	
207 to 208	22.750 22.750		0.0 15.14	1 1.101	2N	10.0 24.000 10.000 34.000	150 0.0406	36.226 0.0 1.382		Vel = 5.10	
208 to 209	22.750 22.750		0.0 15.14	1 1.101	O	5.0 64.417 5.000 69.417	150 0.0407	37.608 0.0 2.823		Vel = 5.10	
209 to 210	22.750 22.750		-30.14 -15.0	1 1.101		12.833 12.833	150 -0.0400	40.431 0.0 -0.513		Vel = 5.05	
210 to 211	22.750 22.750		0.0 -15.0	1 1.101	N	5.0 29.500 5.000 34.500	150 -0.0399	39.918 0.0 -1.378		Vel = 5.05	
211 to 212	22.750 22.750		0.0 -15.0	1 1.101	N	5.0 116.417 5.000 121.417	150 -0.0399	38.540 0.0 -4.849		Vel = 5.05	
212 to 213	22.750 22.750		0.0 -15.0	1 1.101	N	5.0 209.333 5.000 214.333	150 -0.0399	33.691 0.0 -8.561		Vel = 5.05	
213 to 200	22.750 22.750		0.0 -15.0	1 1.101		6.000 6.000	150 -0.0398	25.130 0.0 -0.239		Vel = 5.05	
			0.0								

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 8
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
200			-15.00						24.891		K Factor = -3.01	
209 to 209A	22.750 22.750		30.14	1.5	N	7.0	11.167 7.000 18.167	150	40.431 0.0 0.430		Vel = 4.82	
209A to 209B	22.750 9.500		0.0	1.5	N	7.0	13.250 7.000 20.250	150	40.861 5.739 0.479		Vel = 4.82	
209B to TW2	9.500 9.500		0.0	1.5	N	7.0	1.500 7.000 8.500	150	47.079 0.0 0.201		Vel = 4.82	
TW2			0.0 30.14						47.280		K Factor = 4.38	
TW2 to BW2	9.500 4		30.14	1.5	Ball T	3.094 9.9	5.500 12.994 18.494	120	47.280 2.382 0.516		Vel = 4.35	
BW2 to BW1	4 4		0.0	3	T	20.159	1.500 20.159 21.659	120	50.178 0.0 0.024		Vel = 1.16	
BW1 to BD	4 4		0.0	3	T	20.159	1.500 20.159 21.659	120	50.202 0.0 0.024		Vel = 1.16	
BD to FLG	4 1		0.0	3	3E Zcb	28.223 0.0	19.083 28.223 47.306	120	50.226 7.203 0.053		* * Fixed Loss = 5.904 Vel = 1.16	
FLG to CHG	1 -5		0.0	6	E	20.084	12.000 20.084 32.084	140	57.482 2.599 0.001		Vel = 0.32	
CHG			0.0 30.14						60.082		K Factor = 3.89	
CHG to UG2Y	-5 -5		30.14	6	E G T	17.893 3.834 38.342	51.750 60.069 111.819	150	60.082 0.0 0.004		Vel = 0.36	
UG2Y			0.0 30.14						60.086		K Factor = 3.89	
UG2Y to DOM	-5 -5		-82.65	6			4.000 4.000	150	60.086 0.0 -0.001		Vel = 0.98	
DOM to UG2Z	-5 -5	H180	180.00	6	G	3.834	509.583 3.834 513.417	150	60.085 0.0 0.190		Vel = 1.16	
UG2Z to UG3X	-5 -5		0.0	6	4F T 2G	35.786 38.342 7.668	229.750 81.796 311.546	150	60.275 0.0 0.115		Vel = 1.16	
UG3X			0.0 97.35						60.390		K Factor = 12.53	
UG2Y to UG2X	-5 -5		112.79	6	G T	3.834 38.342	287.583 42.176 329.759	150	60.086 0.0 0.160		Vel = 1.34	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 9
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
UG2X to UG2	-5 -5		0.0 112.79	6 5.86	2F T G	17.893 38.342 3.834	217.333 60.069 277.402	150 0.0005	60.246 0.0 0.135		Vel = 1.34	
UG2 to UG3	-5 -5		-17.43 95.36	8 7.68	E 4F	22.555 45.11	515.833 67.665 583.498	150 0.0001	60.381 0.0 0.056		Vel = 0.66	
UG3 to UG3X	-5 -5		-210.14 -114.78	8 7.68	T	43.857	302.250 43.857 346.107	150 -0.0001	60.437 0.0 -0.047		Vel = 0.79	
UG3X to UG4	-5 -5		97.35 -17.43	8 7.68	G T	5.012 43.857	184.917 48.869 233.786	150 0	60.390 0.0 -0.001		Vel = 0.12	
UG4 to UG5	-5 -5		0.0 -17.43	8 7.68	7F 2E T	78.943 45.11 43.857	633.833 167.910 801.743	150 0	60.389 0.0 -0.003		Vel = 0.12	
UG5 to UG6	-5 -5		0.0 -17.43	12 11.2	2F E	28.793 29.901	1266.500 58.695 1325.195	150 0	60.386 0.0 -0.001		Vel = 0.06	
UG6 to UG7	-5 -5		0.0 -17.43	12 11.2	E 6F T	29.901 86.38 66.446	1047.167 182.727 1229.894	150 0	60.385 0.0 -0.001		Vel = 0.06	
UG7 to UG1	-5 -5		0.0 -17.43	8 7.68	2F	22.555	533.667 22.555 556.222	150 0	60.384 0.0 -0.002		Vel = 0.12	
UG1 to UG2	-5 -5		0.0 -17.43	8 7.68	T	43.857	179.250 43.857 223.107	150 0	60.382 0.0 -0.001		Vel = 0.12	
UG2			0.0 -17.43						60.381		K Factor = -2.24	
UG3 to UG3Y	-5 -5		210.14	6			2.500	150	60.437 0.0			
UG3Y to CTY	-5 3		210.14	5.86			2.500	0.0016	0.004		Vel = 2.50	
UG3Y to CTY	-5 3		0.0 210.14	6 6.16	E G	20.084 4.304	12.000 24.388 36.388	140 0.0014	60.441 -3.465 0.050		Vel = 2.26	
CTY			0.0 210.14						57.026		K Factor = 27.83	



Hydraulic Calculations by HydraCALC

RANGER FIRE, INC.
1000 S. MAIN ST
SUITE 150
GRAPEVINE, TX 76051
817-410-9070

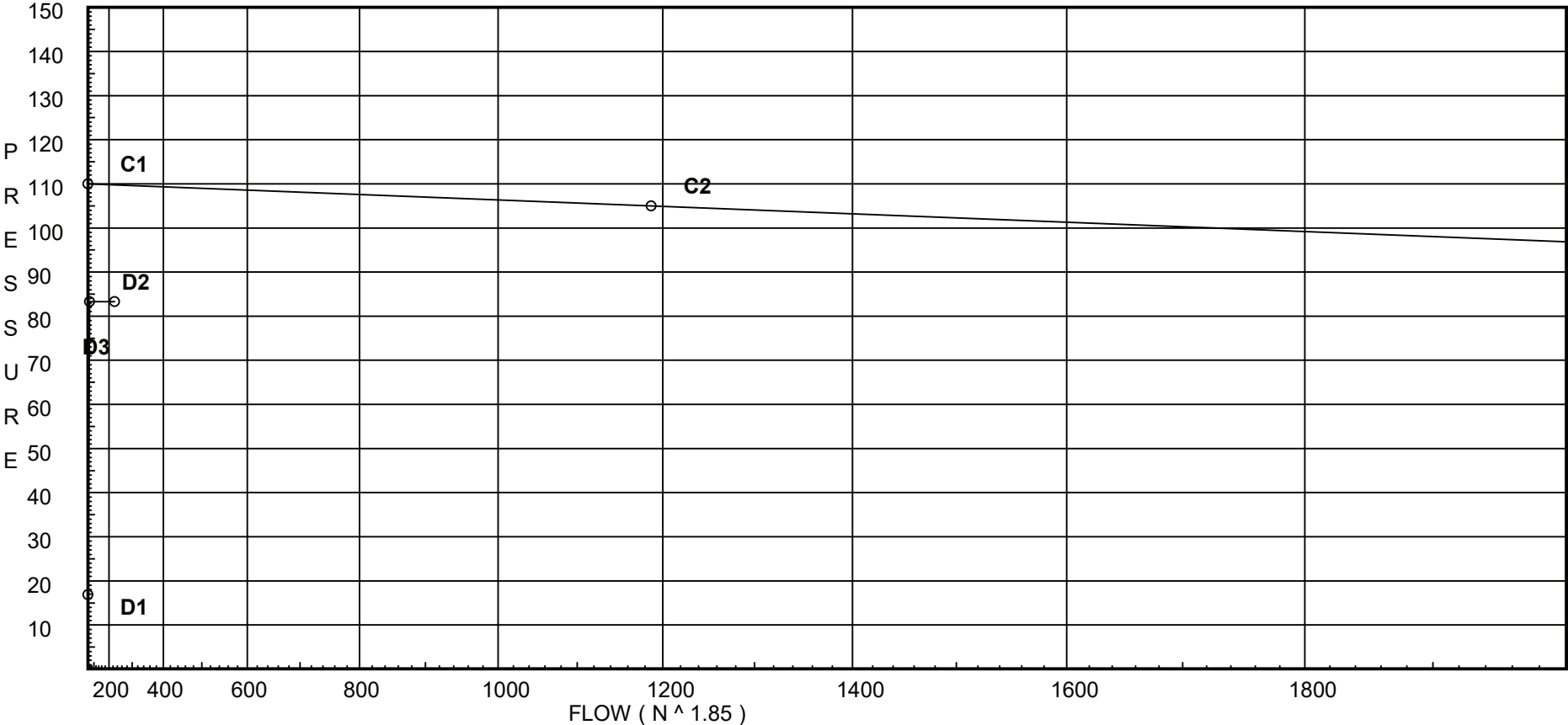
Job Name : TOWNEPLACE SUITES
Drawing :
Location : 4TH FLOOR
Remote Area :
Contract :
Data File : Remote #6_Unit.WXF

Water Supply Curve

RANGER FIRE, INC.
TOWNEPLACE SUITES

City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 105
C2 - Residual Flow : 1187

Demand:
D1 - Elevation : 16.891
D2 - System Flow : 48.06
D2 - System Pressure : 83.270
Hose (Demand) : 180
D3 - System Demand : 228.06
Safety Margin : 26.494



Fittings Used Summary

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 2
Date

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
Ball	B Ball Milw BB-SC100			2.25	2	2.5	2.25	10													
E	NFPA 13 90' Standard Elbow	0	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	0	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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
N *	CPVC 90' Ell	0	4	5	6	7	9	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Branch Tee	0	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
Zcb	Colt C200 Vert	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.

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 3
Date

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
CTY	110.0	105	1187.0	109.764	228.06	83.27

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
C1	41.25		22.52			
C2	41.25		22.0			
C3	41.25		20.56			
C4	41.25		16.4			
R1	42.0		20.24			
R2	42.0		19.72			
R3	42.0	4.4	13.03	15.88	0.05	196
R4	42.0	4.4	13.44	16.13	0.05	256
R5	42.0	4.4	13.3	16.05	0.05	256
C1X	32.833		26.17			
C2X	32.833		25.65			
C3X	32.833		24.21			
C4X	32.833		20.04			
C1B	22.75		30.53			
C2B	22.75		30.02			
R1B	22.75		28.57			
R2B	22.75		28.05			
R3B	22.75		24.41			
R4B	22.75		24.91			
R5B	22.75		24.74			
200	22.75		30.02			
201	22.75		28.57			
202	22.75		28.05			
203	22.75		26.83			
204	22.75		26.54			
205	22.75		29.7			
206	22.75		32.83			
207	22.75		52.84			
208	22.75		56.41			
209	22.75		63.69			
210	22.75		62.58			
211	22.75		59.6			
212	22.75		49.09			
213	22.75		30.53			
209A	22.75		64.71			
209B	9.5		71.59			
TW2	9.5		72.07			
BW2	4.0		75.67			
BW1	4.0		75.73			
BD	4.0		75.79			
FLG	1.0		83.65			
CHG	-5.0		86.25			

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 4
Date

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
UG2Y	-5.0		86.26		
DOM	-5.0		86.26	180.0	
UG2Z	-5.0		86.48		
UG2X	-5.0		86.45		
UG2	-5.0		86.61		
UG3	-5.0		86.67		
UG3X	-5.0		86.62		
UG4	-5.0		86.62		
UG5	-5.0		86.61		
UG6	-5.0		86.61		
UG7	-5.0		86.61		
UG1	-5.0		86.61		
UG3Y	-5.0		86.68		
CTY	3.0		83.27		

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 5
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
C1 to C1X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0.0001	22.522 3.645 0.001		Vel = 0	
C1X			0.0 0.0						26.168		K Factor = 0	
C2 to C2X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0	22.003 3.645 0.0		Vel = 0	
C2X			0.0 0.0						25.648		K Factor = 0	
C3 to C3X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0.0001	20.560 3.645 0.001		Vel = 0	
C3X			0.0 0.0						24.206		K Factor = 0	
C4 to C4X	41.250 32.833		0.0 0.0	0.75 0.874			8.417 8.417	150 0.0001	16.398 3.645 0.001		Vel = 0	
C4X			0.0 0.0						20.044		K Factor = 0	
R1 to R1B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	20.236 8.337 0.0		Vel = 0	
R1B			0.0 0.0						28.573		K Factor = 0	
R2 to R2B	42 22.750		0.0 0.0	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0	19.716 8.337 0.0		Vel = 0	
R2B			0.0 0.0						28.053		K Factor = 0	
R3 to R3B	42 22.750	4.40	15.88 15.88	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0.1368	13.031 8.337 3.043		Vel = 8.49	
R3B			0.0 15.88						24.411		K Factor = 3.21	
R4 to R4B	42 22.750	4.40	16.13 16.13	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0.1407	13.440 8.337 3.131		Vel = 8.63	
R4B			0.0 16.13						24.908		K Factor = 3.23	
R5 to R5B	42 22.750	4.40	16.05 16.05	0.75 0.874	O	3.0	19.250 3.000 22.250	150 0.1394	13.300 8.337 3.101		Vel = 8.58	
R5B			0.0 16.05						24.738		K Factor = 3.23	
C1X to C1B	32.833 22.750		0.0 0.0	0.75 0.874	3N O	12.0 3.0	27.417 15.000 42.417	150 0	26.168 4.367 0.0		Vel = 0	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 6
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
C1B			0.0 0.0						30.535		K Factor = 0	
C2X to C2B	32.833 22.750		0.0 0.0	0.75 0.874	5N O	20.0 3.0	21.917 23.000 44.917	150 0	25.648 4.367 0.0		Vel = 0	
C2B			0.0 0.0						30.015		K Factor = 0	
C3X to R1B	32.833 22.750		0.0 0.0	0.75 0.874	3N O	12.0 3.0	18.667 15.000 33.667	150 0	24.206 4.367 0.0		Vel = 0	
R1B			0.0 0.0						28.573		K Factor = 0	
C4X to R3B	32.833 22.750		0.0 0.0	0.75 0.874	4N O	16.0 3.0	14.417 19.000 33.417	150 0	20.044 4.367 0.0		Vel = 0	
R3B			0.0 0.0						24.411		K Factor = 0	
C1B to 213	22.750 22.750		0.0 0.0	0.75 0.874	N O	4.0 3.0	5.667 7.000 12.667	150 0	30.535 0.0 0.0		Vel = 0	
213			0.0 0.0						30.535		K Factor = 0	
C2B to 200	22.750 22.750		0.0 0.0	0.75 0.874	N O	4.0 3.0	6.917 7.000 13.917	150 0	30.015 0.0 0.0		Vel = 0	
200			0.0 0.0						30.015		K Factor = 0	
R1B to 201	22.750 22.750		0.0 0.0	0.75 0.874	O	3.0	6.917 3.000 9.917	150 0	28.573 0.0 0.0		Vel = 0	
201			0.0 0.0						28.573		K Factor = 0	
R2B to 202	22.750 22.750		0.0 0.0	0.75 0.874	N O	4.0 3.0	5.667 7.000 12.667	150 0	28.053 0.0 0.0		Vel = 0	
202			0.0 0.0						28.053		K Factor = 0	
R3B to 203	22.750 22.750		15.88 15.88	0.75 0.874	N O	4.0 3.0	10.667 7.000 17.667	150 0.1368	24.411 0.0 2.416		Vel = 8.49	
203			0.0 15.88						26.827		K Factor = 3.07	
R4B to 204	22.750 22.750		16.13 16.13	0.75 0.874	N O	4.0 3.0	4.583 7.000 11.583	150 0.1407	24.908 0.0 1.630		Vel = 8.63	
204			0.0 16.13						26.538		K Factor = 3.13	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 7
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
R5B to 204	22.750 22.750		16.05 16.05	0.75 0.874	N	4.0	8.917 4.000 12.917	150 0.0 1.800	24.738 0.0	Vel = 8.58	
204			0.0 16.05					26.538		K Factor = 3.12	
200 to 201	22.750 22.750		-22.78 -22.78	1 1.101		16.667	150 -0.0865	30.015 0.0 -1.442		Vel = 7.68	
201 to 202	22.750 22.750		0.0 -22.78	1 1.101		6.000	150 -0.0867	28.573 0.0 -0.520		Vel = 7.68	
202 to 203	22.750 22.750		0.0 -22.78	1 1.101		14.167	150 -0.0865	28.053 0.0 -1.226		Vel = 7.68	
203 to 204	22.750 22.750		15.88 -6.9	1 1.101	N	5.0	25.417 5.000 30.417	150 0.0 -0.289	26.827 0.0	Vel = 2.33	
204 to 205	22.750 22.750		32.18 25.28	1 1.101	N	5.0	25.167 5.000 30.167	150 0.1050	26.538 0.0 3.167	Vel = 8.52	
205 to 206	22.750 22.750		0.0 25.28	1 1.101		29.750	150 0.1049	29.705 0.0 3.122		Vel = 8.52	
206 to 207	22.750 22.750		0.0 25.28	1 1.101		190.667	150 0.1050	32.827 0.0 20.013		Vel = 8.52	
207 to 208	22.750 22.750		0.0 25.28	1 1.101	2N	10.0	24.000 10.000 34.000	150 0.1050	52.840 0.0 3.569	Vel = 8.52	
208 to 209	22.750 22.750		0.0 25.28	1 1.101	O	5.0	64.417 5.000 69.417	150 0.1050	56.409 0.0 7.286	Vel = 8.52	
209 to 210	22.750 22.750		-48.06 -22.78	1 1.101		12.833	150 -0.0866	63.695 0.0 -1.111		Vel = 7.68	
210 to 211	22.750 22.750		0.0 -22.78	1 1.101	N	5.0	29.500 5.000 34.500	150 -0.0866	62.584 0.0 -2.986	Vel = 7.68	
211 to 212	22.750 22.750		0.0 -22.78	1 1.101	N	5.0	116.417 5.000 121.417	150 -0.0866	59.598 0.0 -10.510	Vel = 7.68	
212 to 213	22.750 22.750		0.0 -22.78	1 1.101	N	5.0	209.333 5.000 214.333	150 -0.0866	49.088 0.0 -18.553	Vel = 7.68	
213 to 200	22.750 22.750		0.0 -22.78	1 1.101		6.000	150 -0.0867	30.535 0.0 -0.520		Vel = 7.68	
			0.0								

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 8
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
200			-22.78						30.015		K Factor = -4.16	
209 to 209A	22.750 22.750		48.06	1.5	N	7.0	11.167 7.000 18.167	150	63.695 0.0			
209A to 209B	22.750 9.500		48.06	1.598			18.167	0.0561	1.020		Vel = 7.69	
209A to 209B	22.750 9.500		0.0	1.5	N	7.0	13.250 7.000 20.250	150	64.715 5.739			
209B to TW2	9.500 9.500		48.06	1.598			20.250	0.0561	1.136		Vel = 7.69	
209B to TW2	9.500 9.500		0.0	1.5	N	7.0	1.500 7.000 8.500	150	71.590 0.0			
TW2			48.06						0.477		Vel = 7.69	
TW2			0.0 48.06						72.067		K Factor = 5.66	
TW2 to BW2	9.500 4		48.06	1.5	Ball T	3.094 9.9	5.500 12.994 18.494	120	72.067 2.382			
BW2 to BW1	4 4		48.06	1.682			18.494	0.0661	1.223		Vel = 6.94	
BW2 to BW1	4 4		0.0	3	T	20.159	1.500 20.159 21.659	120	75.672 0.0			
BW1 to BD	4 4		48.06	3.26			21.659	0.0026	0.057		Vel = 1.85	
BW1 to BD	4 4		0.0	3	T	20.159	1.500 20.159 21.659	120	75.729 0.0			
BD to FLG	4 1		48.06	3.26			21.659	0.0026	0.057		Vel = 1.85	
BD to FLG	4 1		0.0	3	3E Zcb	28.223 0.0	19.083 28.223 47.306	120	75.786 7.741		* * Fixed Loss = 6.442	
FLG to CHG	1 -5		48.06	3.26			47.306	0.0026	0.124		Vel = 1.85	
FLG to CHG	1 -5		0.0	6	E	20.084	12.000 20.084 32.084	140	83.651 2.599			
CHG			48.06	6.16				0.0001	0.003		Vel = 0.52	
CHG			0.0 48.06						86.253		K Factor = 5.17	
CHG to UG2Y	-5 -5		48.06	6	E G	17.893 3.834	51.750 60.069	150	86.253 0.0			
UG2Y			48.06	5.86	T	38.342	111.819	0.0001	0.011		Vel = 0.57	
UG2Y			0.0 48.06						86.264		K Factor = 5.17	
UG2Y to DOM	-5 -5		-74.38	6			4.000	150	86.264 0.0			
DOM to UG2Z	-5 -5		-74.38	5.86			4.000	-0.0002	-0.001		Vel = 0.88	
DOM to UG2Z	-5 -5	H180	180.00	6	G	3.834	509.583 3.834 513.417	150	86.263 0.0			
UG2Z to UG3X	-5 -5		105.62	5.86			513.417	0.0004	0.221		Vel = 1.26	
UG2Z to UG3X	-5 -5		0.0	6	4F T	35.786 38.342	229.750 81.796	150	86.484 0.0			
UG3X			105.62	5.86	2G	7.668	311.546	0.0004	0.134		Vel = 1.26	
UG3X			0.0 105.62						86.618		K Factor = 11.35	
UG2Y to UG2X	-5 -5		122.44	6	G T	3.834 38.342	287.583 42.176 329.759	150	86.264 0.0			
UG2X			122.44	5.86				0.0006	0.187		Vel = 1.46	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 9
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
UG2X to UG2	-5 -5		0.0 122.44	6 5.86	2F T G	17.893 38.342 3.834	217.333 60.069 277.402	150 0.0006	86.451 0.0 0.156		Vel = 1.46	
UG2 to UG3	-5 -5		-18.94 103.5	8 7.68	E 4F	22.555 45.11	515.833 67.665 583.498	150 0.0001	86.607 0.0 0.065		Vel = 0.72	
UG3 to UG3X	-5 -5		-228.06 -124.56	8 7.68	T	43.857	302.250 43.857 346.107	150 -0.0002	86.672 0.0 -0.054		Vel = 0.86	
UG3X to UG4	-5 -5		105.62 -18.94	8 7.68	G T	5.012 43.857	184.917 48.869 233.786	150 0	86.618 0.0 -0.001		Vel = 0.13	
UG4 to UG5	-5 -5		0.0 -18.94	8 7.68	7F 2E T	78.943 45.11 43.857	633.833 167.910 801.743	150 0	86.617 0.0 -0.004		Vel = 0.13	
UG5 to UG6	-5 -5		0.0 -18.94	12 11.2	2F E	28.793 29.901	1266.500 58.695 1325.195	150 0	86.613 0.0 -0.001		Vel = 0.06	
UG6 to UG7	-5 -5		0.0 -18.94	12 11.2	E 6F T	29.901 86.38 66.446	1047.167 182.727 1229.894	150 0	86.612 0.0 -0.001		Vel = 0.06	
UG7 to UG1	-5 -5		0.0 -18.94	8 7.68	2F	22.555	533.667 22.555 556.222	150 0	86.611 0.0 -0.003		Vel = 0.13	
UG1 to UG2	-5 -5		0.0 -18.94	8 7.68	T	43.857	179.250 43.857 223.107	150 0	86.608 0.0 -0.001		Vel = 0.13	
UG2			0.0 -18.94						86.607		K Factor = -2.04	
UG3 to UG3Y	-5 -5		228.06	6			2.500	150	86.672 0.0			
UG3Y to CTY	-5 3		228.06	5.86			2.500	0.0020	0.005		Vel = 2.71	
UG3Y to CTY	-5 3		0.0 228.06	6 6.16	E G	20.084 4.304	12.000 24.388 36.388	140 0.0016	86.677 -3.465 0.058		Vel = 2.46	
CTY			0.0 228.06						83.270		K Factor = 24.99	



Hydraulic Calculations by HydraCALC

RANGER FIRE, INC.
1000 S. MAIN ST
SUITE 150
GRAPEVINE, TX 76051
817-410-9070

Job Name : TOWNEPLACE SUITES
Drawing :
Location : STAIRWELL 1 & 2
Remote Area :
Contract :
Data File : Wet Standpipe.WXF

Water Supply Curve

RANGER FIRE, INC.
TOWNEPLACE SUITES

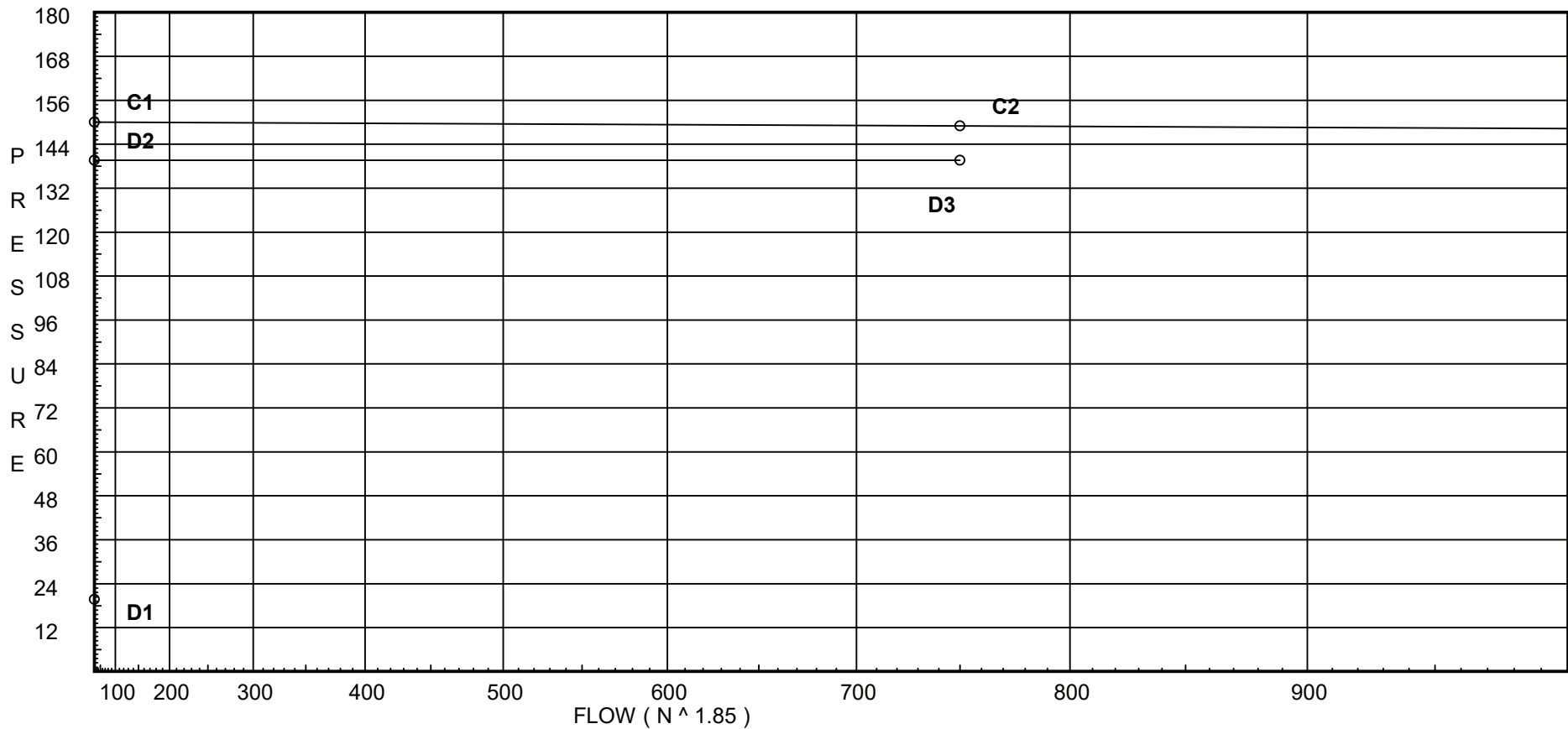
Page 1
Date

City Water Supply:

C1 - Static Pressure : 150
C2 - Residual Pressure: 149
C2 - Residual Flow : 750

Demand:

D1 - Elevation : 19.706
D2 - System Flow :
D2 - System Pressure : 139.637
Hose (Demand) : 750
D3 - System Demand : 750
Safety Margin : 9.363



Fittings Used Summary

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 2
Date

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	0	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
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
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

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.

Flow Summary - NFPA

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 3
Date

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
FDC2	150.0	149	750.0	149.0	750.0	139.637

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
HV1	49.5		100.0	250.0	
HV2	48.5		100.45	250.0	
H1	49.5		102.74		
H2	48.5		103.19		
D2	41.583		107.74		
HV3	37.583		114.11	250.0	
H3	37.583		116.8		
SP1	23.0		122.26		
SP2	23.0		124.25		
SP3	23.0		126.68		
SP4	23.0		126.75		
SP5	9.5		133.11		
TOS	9.5		133.97		
BOS	4.0		137.35		
FDC1	4.0		139.61		
FDC2	4.0		139.64		

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 4
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
HV1 to H1	49.500 49.500	H250	250.00 250.0	2.5 2.469	T	8.564	0.500 8.564 9.064	100 0.3019	100.000 0.0 2.736		Vel = 16.75	
H1			0.0 250.00						102.736		K Factor = 24.66	
HV2 to H2	48.500 48.500	H250	250.00 250.0	2.5 2.469	T	8.564	0.500 8.564 9.064	100 0.3019	100.454 0.0 2.736		Vel = 16.75	
H2			0.0 250.00						103.190		K Factor = 24.61	
H1 to H2	49.500 48.500		250.00 250.0	4 4.26			1.000 1.000	100 0.0210	102.736 0.433 0.021		Vel = 5.63	
H2 to D2	48.500 41.583		250.00 500.0	4 4.26	E G	9.397 1.879	9.000 11.276 20.276	100 0.0764	103.190 2.996 1.549		Vel = 11.25	
D2 to SP1	41.583 23		0.0 500.0	4 4.26	2E B T	26.334 15.8 26.334	50.417 68.468 118.885	120 0.0545	107.735 8.048 6.481		Vel = 11.25	
SP1			0.0 500.00						122.264		K Factor = 45.22	
HV3 to H3	37.583 37.583	H250	250.00 250.0	2.5 2.469	T	12.0	0.500 12.000 12.500	120 0.2154	114.113 0.0 2.692		Vel = 16.75	
H3 to SP2	37.583 23		0.0 250.0	4 4.26	E B T	13.167 15.8 26.334	19.083 55.301 74.384	120 0.0151	116.805 6.316 1.125		Vel = 5.63	
SP2			0.0 250.00						124.246		K Factor = 22.43	
SP1 to SP2	23 23		500.00 500.0	6 6.357			255.417 255.417	120 0.0078	122.264 0.0 1.982		Vel = 5.05	
SP2 to SP3	23 23		250.00 750.0	6 6.357	E T	17.603 37.72	92.500 55.323 147.823	120 0.0164	124.246 0.0 2.429		Vel = 7.58	
SP3 to SP4	23 23		0.0 750.0	6 6.357			4.417 4.417	120 0.0165	126.675 0.0 0.073		Vel = 7.58	
SP4 to SP5	23 9.500		0.0 750.0	6 6.357	E	17.603	13.500 17.603 31.103	120 0.0164	126.748 5.847 0.511		Vel = 7.58	
SP5 to TOS	9.500 9.500		0.0 750.0	6 6.357	2E	35.205	17.500 35.205 52.705	120 0.0164	133.106 0.0 0.866		Vel = 7.58	
TOS			0.0 750.00						133.972		K Factor = 64.80	
TOS to BOS	9.500 4		750.00 750.0	6 6.357	E T	17.603 37.72	5.500 55.323 60.823	120 0.0164	133.972 2.382 0.999		Vel = 7.58	

Final Calculations : Hazen-Williams

RANGER FIRE, INC.
TOWNEPLACE SUITES

Page 5
Date

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
BOS to FDC1	4 4		0.0 750.0	6 6.357	4E S 70.411 40.235	26.750 110.646 137.396	120 0.0164	137.353 0.0 2.258		Vel = 7.58	
FDC1 to FDC2	4 4		0.0 750.0	6 6.357		1.583 1.583	120 0.0164	139.611 0.0 0.026		Vel = 7.58	
FDC2			0.0 750.00					139.637		K Factor = 63.47	