



Hydraulic Overview

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (1)

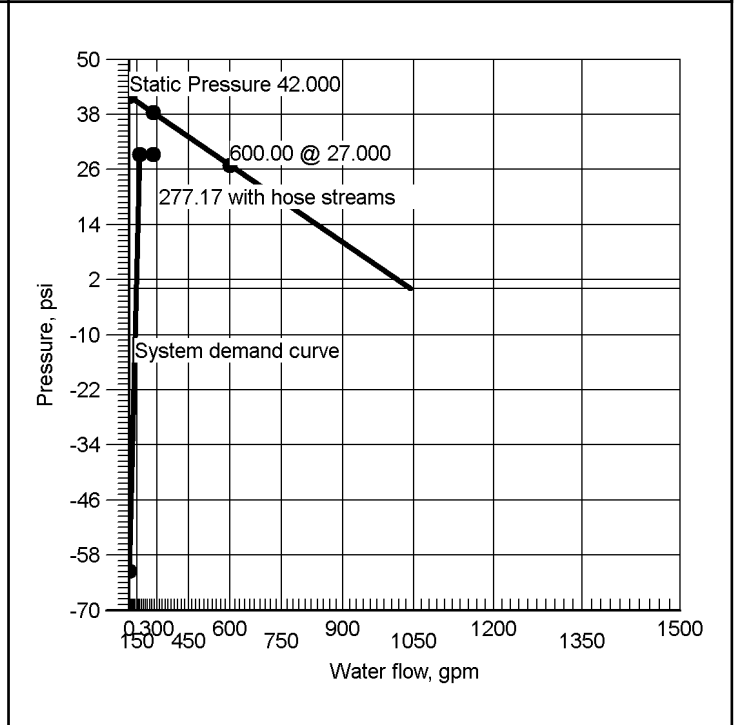
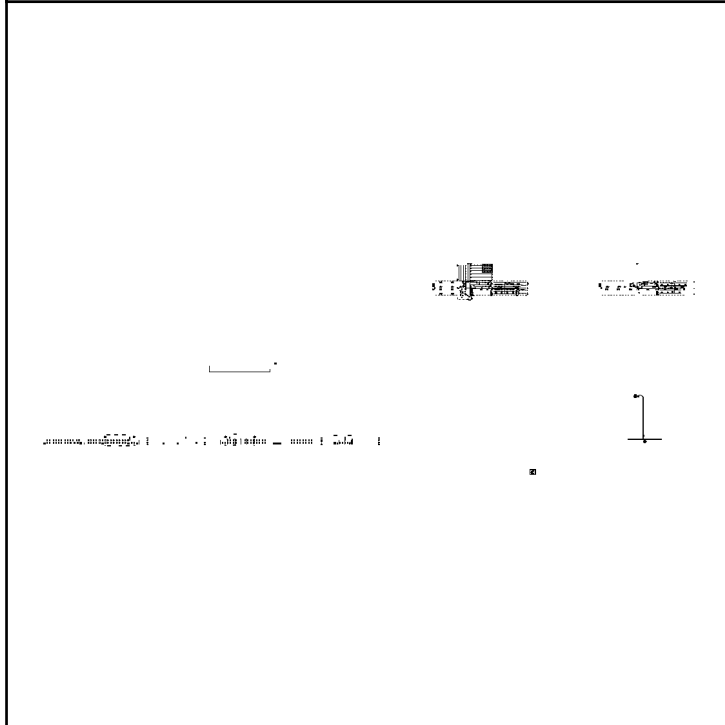
Job	
Job Number 3896-21	Design Engineer Matthew Bayne
Job Name: Carolina Charter Academy	Phone 9103926400
Address 1 8529 NC HWY 55	State Certification/License Number FS-28597
Address 2 Angier, NC	AHJ Harnett County
Address 3	Job Site/Building Carolina Charter Academy

System	
Density 0.10gpm/ft ²	Area of Application 1500ft ² (Actual 1584ft ²)
Most Demanding Sprinkler Data 5.6 K-Factor 19.50 at 12.125	Hose Streams 100.00
Coverage Per Sprinkler 195ft ²	Number Of Sprinklers Calculated 9
System Pressure Demand 29.305	System Flow Demand 177.17
Total Demand 277.17 @ 29.305	Pressure Result +9.101 (23.7%)

Supplies						Check Point Gauges			
<u>Node</u>	<u>Name</u>	<u>Flow(gpm)</u>	<u>Hose Flow(gpm)</u>	<u>Static(psi)</u>	<u>Residual(psi)</u>	<u>Identifier</u>	<u>Pressure(psi)</u>	<u>K-Factor(K)</u>	<u>Flow(gpm)</u>
1	Water Supply	600.00	100.00	42.000	27.000				
423	Pump	250.00		75.000	70.000				

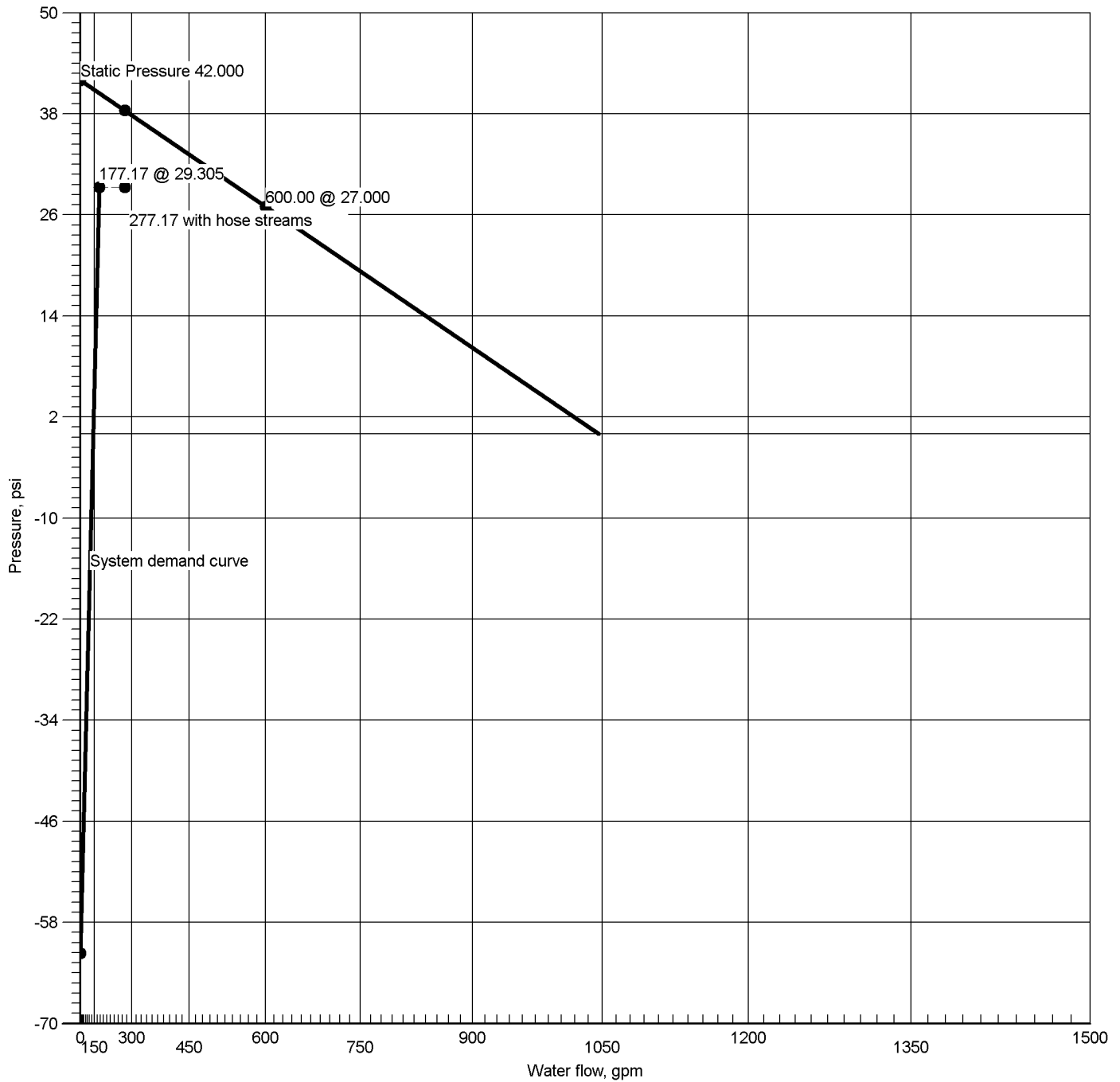
Pumps: Static = Churn (Pressure @ Zero Flow)

Carolina Charter Academy Fire Protection.cad Water Supply at Node 1 (600.00, 0.00, 42.000, 27.000)





Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
42.000

Residual: Pressure
27.000 @ 600.00

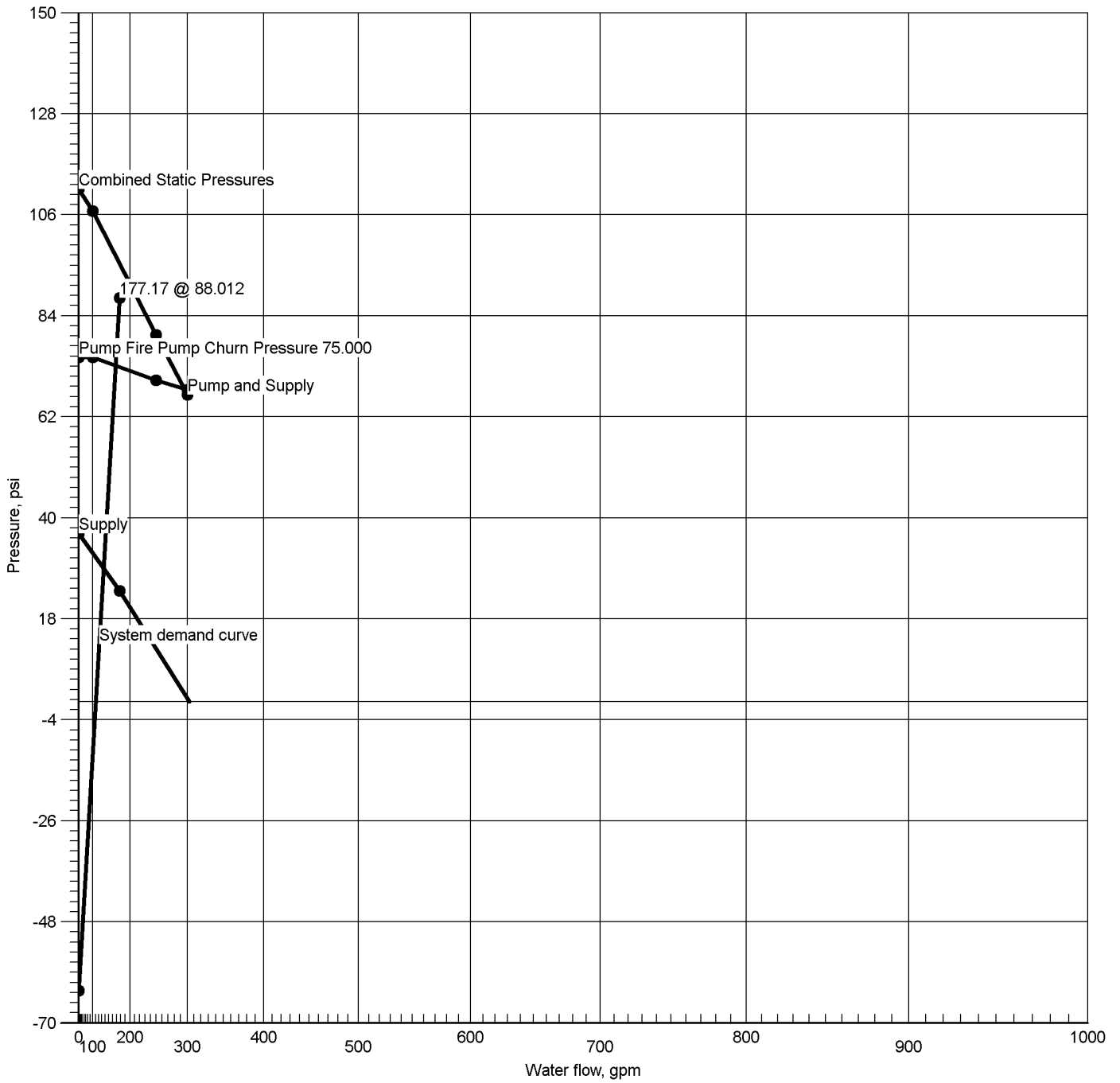
Available Pressure at System Demand
38.406 @ 277.17

Required Pressure at System Demand
29.305 @ 177.17

Required Pressure at System Demand (Including Hose Allowance at Source)
29.305 @ 277.17



Pump at Node 423



Hydraulic Graph	Static + Churn Pressure	Fire Pump Rating
Pump at Node 423	111.699	70.000 @ 250.00
Static: Pressure	Fire Pump Churn Pressure	
111.699	75.000	
Residual: Pressure		
72.913 @ 177.17		
Available Pressure at System Demand		
97.113 @ 177.17		
Required Pressure at System Demand		
88.012 @ 177.17		



Node Analysis

Job Number: 3896-21Carolina Charter
Report Description: Light Hazard (1)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-2'-0	S, T(35'-6½)	29.305	177.17
505	28'-7½	Spr(-12.297)	12.297	19.64
506	28'-7½	Spr(-12.125)	12.125	19.50
507	28'-7½	Spr(-12.209)	12.209	19.57
517	28'-7½	Spr(-12.372)	12.372	19.70
518	28'-7½	Spr(-12.200)	12.200	19.56
519	28'-7½	Spr(-12.284)	12.284	19.63
529	28'-7½	Spr(-12.666)	12.666	19.93
530	28'-7½	Spr(-12.491)	12.491	19.79
531	28'-7½	Spr(-12.578)	12.578	19.86
3	1'-0		15.242	
17	28'-1½	PO(6'-0)	18.674	
22	28'-1½	PO(5'-0)	13.205	
23	28'-1½	PO(5'-0)	13.025	
24	28'-1½	PO(5'-0)	13.113	
25	28'-1½	PO(6'-0)	13.762	
32	28'-1½	PO(6'-0)	18.782	
37	28'-1½	PO(5'-0)	13.284	
38	28'-1½	PO(5'-0)	13.103	
39	28'-1½	PO(5'-0)	13.192	
40	28'-1½	PO(6'-0)	13.845	
46	28'-1½	PO(6'-0)	19.203	
51	28'-1½	PO(5'-0)	13.594	
52	28'-1½	PO(5'-0)	13.410	
53	28'-1½	PO(5'-0)	13.501	
54	28'-1½	PO(6'-0)	14.169	
60	28'-1½	PO(6'-0)	20.171	
68	28'-1½	PO(6'-0)	14.916	
79	28'-1½	PO(6'-0)	21.643	
87	28'-1½	PO(6'-0)	15.309	
93	28'-1½	PO(6'-0)	23.783	
101	28'-1½	PO(12'-3½)	15.549	
113	9'-10	E(6'-2), Z	49.834	
411	1'-0	P1	15.099	
413	0'-0		15.676	
416	0'-11½	PO(12'-3½)	87.929	
423	0'-11½	P2(-72.942)	88.012	
425	9'-6½		77.993	



Node Analysis

Job Number: 3896-21Carolina Charter
Report Description: Light Hazard (1)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-2'-0	S, T(35'-6½)	29.305	177.17
505	28'-7½	Spr(-12.297)	12.297	19.64
506	28'-7½	Spr(-12.125)	12.125	19.50
507	28'-7½	Spr(-12.209)	12.209	19.57
517	28'-7½	Spr(-12.372)	12.372	19.70
518	28'-7½	Spr(-12.200)	12.200	19.56
519	28'-7½	Spr(-12.284)	12.284	19.63
529	28'-7½	Spr(-12.666)	12.666	19.93
530	28'-7½	Spr(-12.491)	12.491	19.79
531	28'-7½	Spr(-12.578)	12.578	19.86
3	1'-0		15.242	
17	28'-1½	PO(6'-0)	18.674	
22	28'-1½	PO(5'-0)	13.205	
23	28'-1½	PO(5'-0)	13.025	
24	28'-1½	PO(5'-0)	13.113	
25	28'-1½	PO(6'-0)	13.762	
32	28'-1½	PO(6'-0)	18.782	
37	28'-1½	PO(5'-0)	13.284	
38	28'-1½	PO(5'-0)	13.103	
39	28'-1½	PO(5'-0)	13.192	
40	28'-1½	PO(6'-0)	13.845	
46	28'-1½	PO(6'-0)	19.203	
51	28'-1½	PO(5'-0)	13.594	
52	28'-1½	PO(5'-0)	13.410	
53	28'-1½	PO(5'-0)	13.501	
54	28'-1½	PO(6'-0)	14.169	
60	28'-1½	PO(6'-0)	20.171	
68	28'-1½	PO(6'-0)	14.916	
79	28'-1½	PO(6'-0)	21.643	
87	28'-1½	PO(6'-0)	15.309	
93	28'-1½	PO(6'-0)	23.783	
101	28'-1½	PO(12'-3½)	15.549	
113	9'-10	E(6'-2), Z	49.834	
411	1'-0	P1	15.099	
413	0'-0		15.676	
416	0'-11½	PO(12'-3½)	87.929	
423	0'-11½	P2(-72.942)	88.012	
425	9'-6½		77.993	



Hydraulic Analysis

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (1)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
Route 1							
SP	1.0490	19.50	7.24	120	0.124177	0'-6"	Pf 0.683
506	28'-7½"	19.50	5.6	12.125	Sprinkler,	5'-0"	Pe 0.217
23	28'-1½"			13.025	PO(5'-0)	5'-6"	Pv
BL	1.3800	11.79	2.53	120	0.012875	14'-0"	Pf 0.180
23	28'-1½"			13.025			Pe
22	28'-1½"			13.205		14'-0"	Pv
BL	1.3800	31.43	6.74	120	0.078970	63'-3"	Pf 5.469
22	28'-1½"	19.64		13.205	Flow (q) from Route 5	6'-0"	Pe
17	28'-1½"			18.674	PO(6'-0)	69'-3"	Pv
BL	2.1570	31.43	2.76	120	0.008971	12'-0"	Pf 0.108
17	28'-1½"			18.674			Pe
32	28'-1½"			18.782		12'-0"	Pv
BL	2.1570	62.94	5.53	120	0.032424	13'-0"	Pf 0.422
32	28'-1½"	31.52		18.782	Flow (q) from Route 2		Pe
46	28'-1½"			19.203		13'-0"	Pv
BL	2.1570	94.81	8.32	120	0.069174	14'-0"	Pf 0.968
46	28'-1½"	31.86		19.203	Flow (q) from Route 7		Pe
60	28'-1½"			20.171		14'-0"	Pv
BL	2.1570	118.89	10.44	120	0.105145	14'-0"	Pf 1.472
60	28'-1½"	24.08		20.171	Flow (q) from Route 3		Pe
79	28'-1½"			21.643		14'-0"	Pv
BL	2.1570	145.52	12.78	120	0.152832	14'-0"	Pf 2.140
79	28'-1½"	26.64		21.643	Flow (q) from Route 13		Pe
93	28'-1½"			23.783		14'-0"	Pv
BL	2.1570	177.17	15.56	120	0.219951	45'-6"	Pf 18.125
93	28'-1½"	31.65		23.783	Flow (q) from Route 14	36'-11"	Pe 7.926
113	9'-10"			49.834	4E(6'-2), T(12'-3½), Z	82'-5"	Pv
CM	2.0030	177.17	18.04	150	0.208789	87'-3½"	Pf 28.040
113	9'-10"			49.834		47'-0"	Pe 0.119
425	9'-6½"			77.993	3E(11'-0), T(10'-0), 2Tr(2'-0)	134'-3½"	Pv
BL	2.1570	177.17	15.56	120	0.219951	8'-6"	Pf 6.198
425	9'-6½"			77.993		19'-8½"	Pe 3.738
416	0'-11½"			87.929	BV(7'-4½), PO(12'-3½)	28'-2"	Pv
CM	3.2600	177.17	6.81	120	0.029431	2'-9½"	Pf 0.082
416	0'-11½"			87.929			Pe 0.000
423	0'-11½"			88.012		2'-9½"	Pv
Pump			Velocity				
423		177.17		88.012	Rating: 70.000 @ 250.00		
411		Q=177.17	3.99	15.099	Fire Pump Churn Pressure: 75.00		
					0		
FR	4.2600	177.17	3.99	120	0.007997	2'-1½"	Pf 0.143
411	1'-0"			15.099		15'-9½"	Pe 0.434
413	0'-0"			15.676	GV(2'-7½), E(13'-2)	17'-11"	Pv
	6.2800	177.17	1.84	120	0.001208	0'-0"	Pf 0.000
413	0'-0"			15.676			Pe -0.434
3	1'-0"			15.242		0'-0"	Pv
UG	6.2800	177.17	1.84	120	0.001208	212'-10"	Pf 12.762
3	1'-0"			15.242		68'-8½"	Pe 1.301
1	-2'-0"			29.305	E(16'-7), 2EE(8'-3½), BFP(-12.42	281'-6½"	Pv
					4), S, T(35'-6½)		
		100.00			Hose Allowance At Source		
1		277.17					
Route 2							
SP	1.0490	19.56	7.26	120	0.124881	0'-6"	Pf 0.687
518	28'-7½"	19.56	5.6	12.200	Sprinkler,	5'-0"	Pe 0.217
38	28'-1½"			13.103	PO(5'-0)	5'-6"	Pv
BL	1.3800	11.82	2.54	120	0.012933	14'-0"	Pf 0.181
38	28'-1½"			13.103			Pe
37	28'-1½"			13.284		14'-0"	Pv
BL	1.3800	31.52	6.76	120	0.079383	63'-3"	Pf 5.497
37	28'-1½"	19.70		13.284	Flow (q) from Route 6	6'-0"	Pe
32	28'-1½"			18.782	PO(6'-0)	69'-3"	Pv
Route 3							
SP	1.0490	19.57	7.26	120	0.124969	0'-6"	Pf 0.687
507	28'-7½"	19.57	5.6	12.209	Sprinkler,	5'-0"	Pe 0.217
24	28'-1½"			13.113	PO(5'-0)	5'-6"	Pv



Hydraulic Analysis

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (1)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
BL	1.3800	27.28	5.85	120	0.060767		4'-8 Pf 0.649
24	28'-1½	7.71		13.113	Flow (q) from Route 10		6'-0 Pe
25	28'-1½			13.762	PO(6'-0)		10'-8 Pv
BL	2.1570	27.28	2.39	120	0.006903		12'-0 Pf 0.083
25	28'-1½			13.762			Pe
40	28'-1½			13.845			12'-0 Pv
BL	2.1570	54.64	4.80	120	0.024961		13'-0 Pf 0.324
40	28'-1½	27.37		13.845	Flow (q) from Route 4		Pe
54	28'-1½			14.169			13'-0 Pv
BL	2.1570	82.37	7.23	120	0.053325		14'-0 Pf 0.747
54	28'-1½	27.72		14.169	Flow (q) from Route 8		Pe
68	28'-1½			14.916			14'-0 Pv
BL	1.3800	24.08	5.17	120	0.048251		96'-11 Pf 5.256
68	28'-1½			14.916	PO(6'-0)		12'-0 Pe
60	28'-1½			20.171	PO(6'-0)		108'-11 Pv
Route 4							
SP	1.0490	19.63	7.29	120	0.125679		0'-6 Pf 0.691
519	28'-7½	19.63	5.6	12.284	Sprinkler,		5'-0 Pe 0.217
39	28'-1½			13.192	PO(5'-0)		5'-6 Pv
BL	1.3800	27.37	5.87	120	0.061141		4'-8 Pf 0.653
39	28'-1½	7.74		13.192	Flow (q) from Route 11		6'-0 Pe
40	28'-1½			13.845	PO(6'-0)		10'-8 Pv
Route 5							
SP	1.0490	19.64	7.29	120	0.125799		0'-6 Pf 0.692
505	28'-7½	19.64	5.6	12.297	Sprinkler,		5'-0 Pe 0.217
22	28'-1½			13.205	PO(5'-0)		5'-6 Pv
Route 6							
SP	1.0490	19.70	7.31	120	0.126509		0'-6 Pf 0.696
517	28'-7½	19.70	5.6	12.372	Sprinkler,		5'-0 Pe 0.217
37	28'-1½			13.284	PO(5'-0)		5'-6 Pv
Route 7							
SP	1.0490	19.79	7.35	120	0.127635		0'-6 Pf 0.702
530	28'-7½	19.79	5.6	12.491	Sprinkler,		5'-0 Pe 0.217
52	28'-1½			13.410	PO(5'-0)		5'-6 Pv
BL	1.3800	11.93	2.56	120	0.013162		14'-0 Pf 0.184
52	28'-1½			13.410			Pe
51	28'-1½			13.594			14'-0 Pv
BL	1.3800	31.86	6.83	120	0.081000		63'-3 Pf 5.609
51	28'-1½	19.93		13.594	Flow (q) from Route 9		6'-0 Pe
46	28'-1½			19.203	PO(6'-0)		69'-3 Pv
Route 8							
SP	1.0490	19.86	7.37	120	0.128455		0'-6 Pf 0.706
531	28'-7½	19.86	5.6	12.578	Sprinkler,		5'-0 Pe 0.217
53	28'-1½			13.501	PO(5'-0)		5'-6 Pv
BL	1.3800	27.72	5.95	120	0.062607		4'-8 Pf 0.668
53	28'-1½	7.86		13.501	Flow (q) from Route 12		6'-0 Pe
54	28'-1½			14.169	PO(6'-0)		10'-8 Pv
Route 9							
SP	1.0490	19.93	7.40	120	0.129290		0'-6 Pf 0.711
529	28'-7½	19.93	5.6	12.666	Sprinkler,		5'-0 Pe 0.217
51	28'-1½			13.594	PO(5'-0)		5'-6 Pv
Route 10							
BL	1.3800	7.71	1.65	120	0.005868		15'-0 Pf 0.088
23	28'-1½	11.79		13.025	Flow (q) from Route 1		Pe
24	28'-1½			13.113			15'-0 Pv
Route 11							
BL	1.3800	7.74	1.66	120	0.005911		15'-0 Pf 0.089
38	28'-1½	11.82		13.103	Flow (q) from Route 2		Pe
39	28'-1½			13.192			15'-0 Pv
Route 12							
BL	1.3800	7.86	1.69	120	0.006081		15'-0 Pf 0.091
52	28'-1½	11.93		13.410	Flow (q) from Route 7		Pe
53	28'-1½			13.501			15'-0 Pv
Route 13							
BL	1.3800	26.64	5.71	120	0.058150		96'-11 Pf 6.334
87	28'-1½			15.309	PO(6'-0)		12'-0 Pe
79	28'-1½			21.643	PO(6'-0)		108'-11 Pv
Route 14							



Hydraulic Analysis

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (1)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
BL	2.1570	58.29	5.12	120		0.028125	
68	28'-1½	24.08		14.916		Flow (q) from Route 3	Pf 0.394
87	28'-1½			15.309			Pe
							Pv
BL	2.1570	31.65	2.78	120		0.009088	
87	28'-1½	26.64		15.309		Flow (q) from Route 13	Pf 0.239
101	28'-1½			15.549		PO(12'-3½)	Pe
							Pv
BL	1.3800	31.65	6.79	120		0.080006	
101	28'-1½			15.549			Pf 8.235
93	28'-1½			23.783		PO(6'-0)	Pe
							Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)	C Value Multiplier
$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$	Value Of C: 100, 130, 140, 150
	Multiplying Factor: 0.713, 1.16, 1.33, 1.51

Pipe Type Legend	Units Legend	Fittings Legend
AO Arm-Over	Diameter Inch	ALV Alarm Valve
BL Branch Line	Elevation Foot	AngV Angle Valve
CM Cross Main	Flow gpm	b Bushing
DN Drain	Discharge gpm	BalV Ball Valve
DR Drop	Velocity fps	BFP Backflow Preventer
DY Dynamic	Pressure psi	BV Butterfly Valve
FM Feed Main	Length Foot	C Cross Flow Turn 90°
FR Feed Riser	Friction Loss psi/Foot	cplg Coupling
MS Miscellaneous	HWC Hazen-Williams Constant	Cr Cross Run
OR Outrigger	Pt Total pressure at a point in a pipe	CV Check Valve
RN Riser Nipple	Pn Normal pressure at a point in a pipe	DeV Deluge Valve
SP Sprig	Pf Pressure loss due to friction between points	DPV Dry Pipe Valve
ST Stand Pipe	Pe Pressure due to elevation difference between indicated points	E 90° Elbow
UG Underground	Pv Velocity pressure at a point in a pipe	EE 45° Elbow
		Ee1 11¼° Elbow
		Ee2 22½° Elbow
		f Flow Device
		fd Flex Drop
		FDC Fire Department Connection
		fE 90° FireLock(TM) Elbow
		fEE 45° FireLock(TM) Elbow
		flg Flange
		FN Floating Node
		fT FireLock(TM) Tee
		g Gauge
		GloV Globe Valve
		GV Gate Valve
		Ho Hose
		Hose Hose
		HV Hose Valve
		Hyd Hydrant
		LtE Long Turn Elbow
		mecT Mechanical Tee
		Noz Nozzle
		P1 Pump In
		P2 Pump Out
		PIV Post Indicating Valve
		PO Pipe Outlet
		PrV Pressure Relief Valve
		PRV Pressure Reducing Valve
		red Reducer/Adapter
		S Supply
		sCV Swing Check Valve
		SFx Seismic Flex
		Spr Sprinkler
		St Strainer
		T Tee Flow Turn 90°
		Tr Tee Run
		U Union
		WirF Wirsbo
		WMV Water Meter Valve
		Z Cap



Hydraulic Overview

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (2)

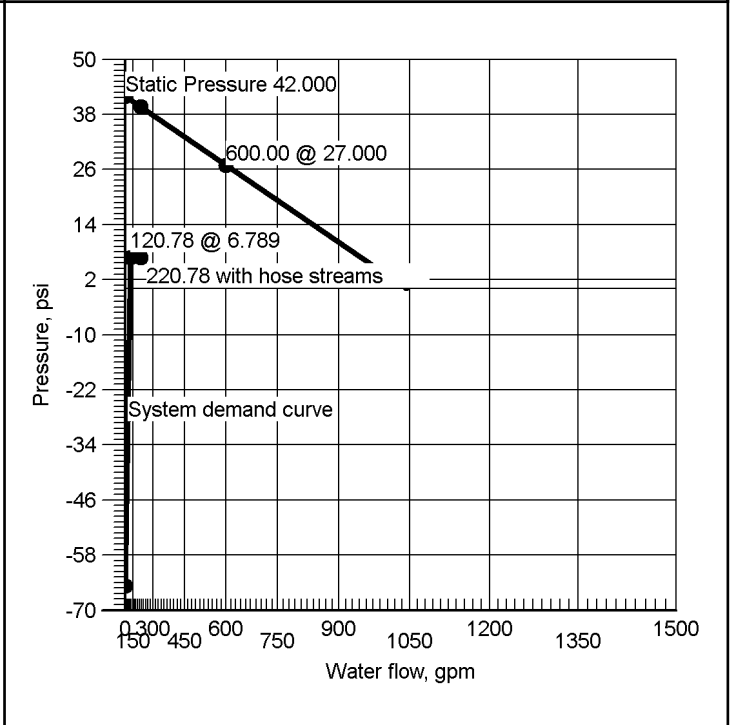
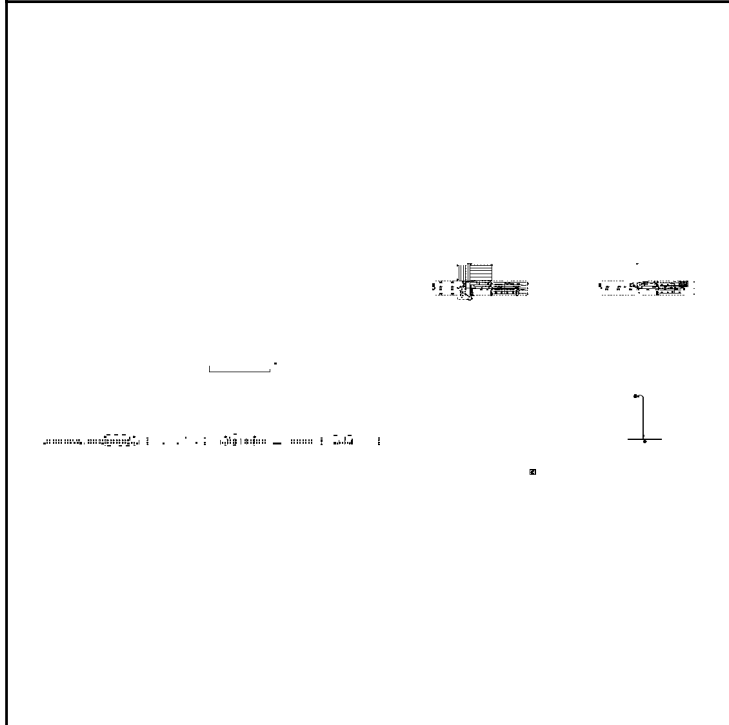
Job	
Job Number 3896-21	Design Engineer Matthew Bayne
Job Name: Carolina Charter Academy	Phone 9103926400
Address 1 8529 NC HWY 55	State Certification/License Number FS-28597
Address 2 Angier, NC	AHJ Harnett County
Address 3	Job Site/Building Carolina Charter Academy

System	
Density 0.10gpm/ft ²	Area of Application 1500ft ² (Actual 1032ft ²)
Most Demanding Sprinkler Data 5.6 K-Factor 19.60 at 12.250	Hose Streams 100.00
Coverage Per Sprinkler 196ft ²	Number Of Sprinklers Calculated 6
System Pressure Demand 6.789	System Flow Demand 120.78
Total Demand 220.78 @ 6.789	Pressure Result +32.851 (82.9%)

Supplies						Check Point Gauges			
<u>Node</u>	<u>Name</u>	<u>Flow(gpm)</u>	<u>Hose Flow(gpm)</u>	<u>Static(psi)</u>	<u>Residual(psi)</u>	<u>Identifier</u>	<u>Pressure(psi)</u>	<u>K-Factor(K)</u>	<u>Flow(gpm)</u>
1	Water Supply	600.00	100.00	42.000	27.000				
423	Pump	250.00		75.000	70.000				

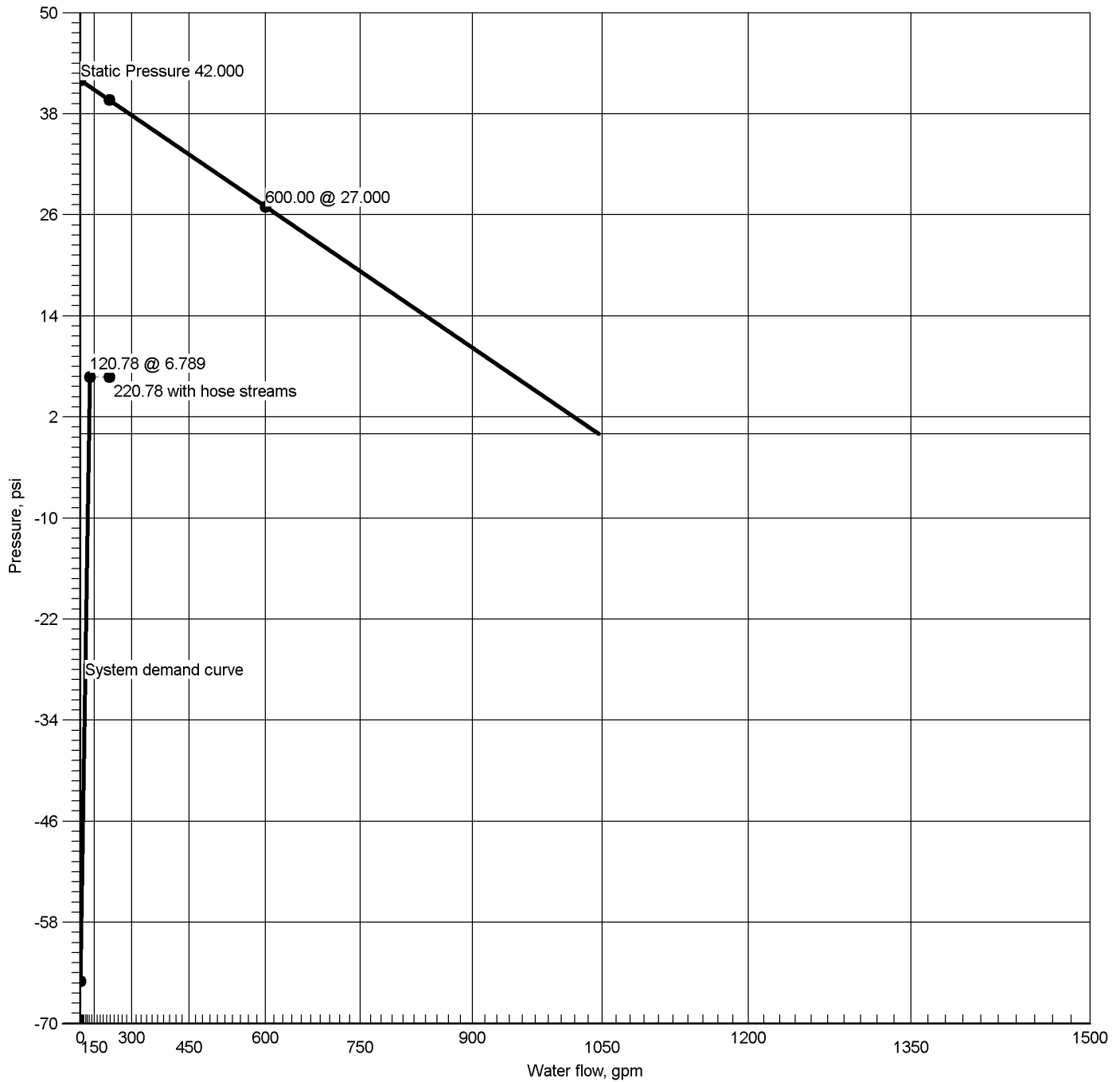
Pumps: Static = Churn (Pressure @ Zero Flow)

Carolina Charter Academy Fire Protection.cad Water Supply at Node 1 (600.00, 0.00, 42.000, 27.000)





Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
42.000

Residual: Pressure
27.000 @ 600.00

Available Pressure at System Demand
39.640 @ 220.78

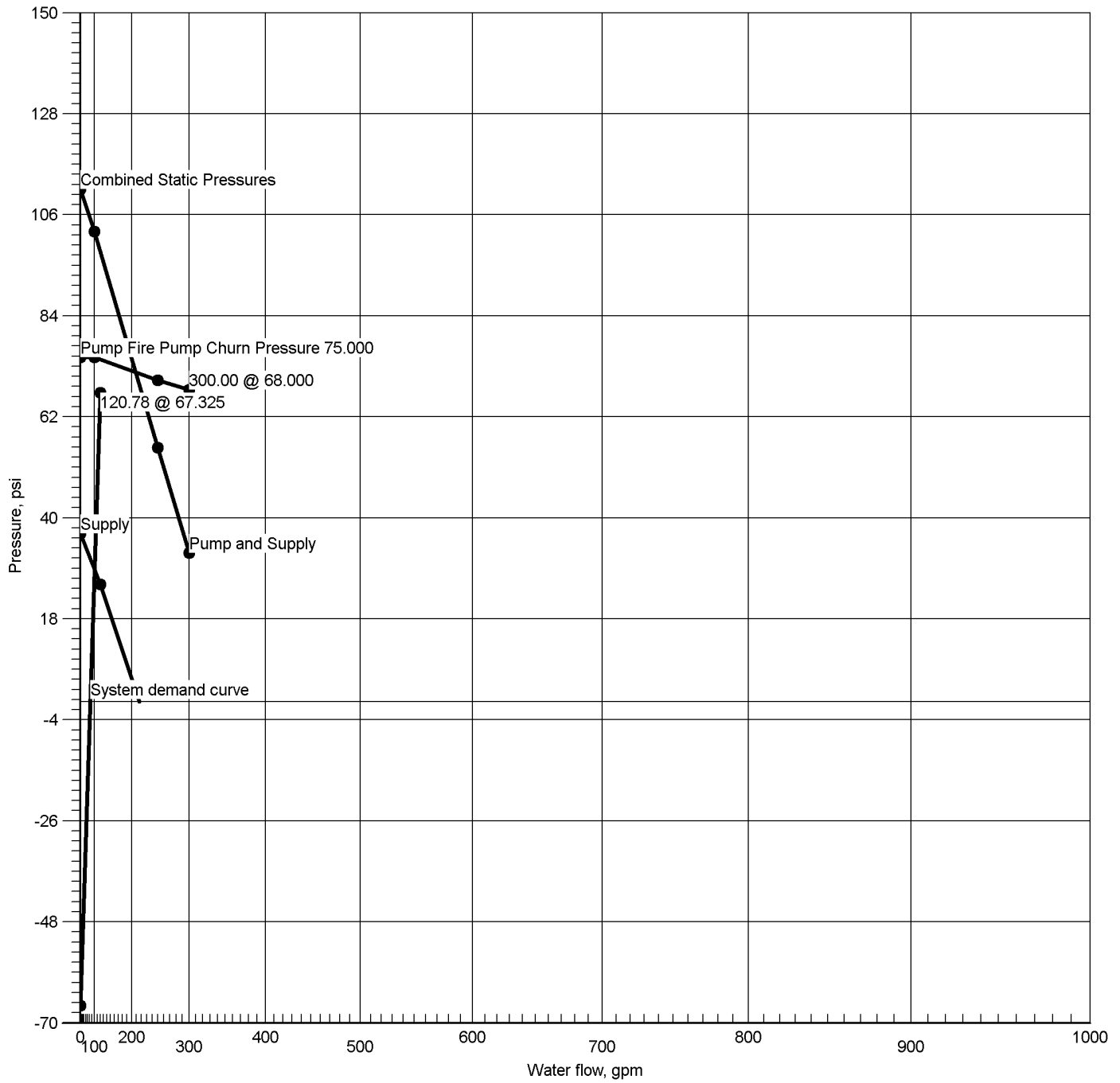
Required Pressure at System Demand
6.789 @ 120.78

Required Pressure at System Demand (Including Hose Allowance at Source)
6.789 @ 220.78

A negative result in Required Pressure indicates that the Pump is capable of furnishing all of the pressure required by the demand reported within this calculation. No pressure is being required from the Source/Supply to meet the demand (by a margin of this negative value).



Pump at Node 423



Hydraulic Graph	Static + Churn Pressure	Fire Pump Rating
Pump at Node 423	111.699	70.000 @ 250.00
Static: Pressure	Fire Pump Churn Pressure	
111.699	75.000	
Residual: Pressure		
74.557 @ 120.78		
Available Pressure at System Demand		
100.176 @ 120.78		
Required Pressure at System Demand		
67.325 @ 120.78		

A negative result in Required Pressure indicates that the Pump is capable of furnishing all of the pressure required by the demand reported within this calculation. No pressure is being required from the Source/Supply to meet the demand (by a margin of this negative value).



Node Analysis

Job Number: 3896-21Carolina Charter
Report Description: Light Hazard (2)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-2'-0	S, T(35'-6½)	6.789	120.78
597	21'-0	Spr(-12.665)	12.665	19.93
598	21'-0	Spr(-12.250)	12.250	19.60
600	21'-0	Spr(-13.587)	13.587	20.64
626	21'-0	Spr(-12.850)	12.850	20.07
627	21'-0	Spr(-12.429)	12.429	19.74
629	21'-0	Spr(-13.785)	13.785	20.79
3	1'-0		-7.161	
168	21'-6	T(6'-0)	20.420	
171	21'-6	T(5'-0), Tr(1'-0)	14.335	
172	21'-6	T(5'-0), Tr(1'-0)	13.347	
173	21'-6	E(7'-0)	13.035	
174	21'-6	E(8'-0)	45.032	
226	21'-6	T(10'-0)	45.063	
231	9'-10	T(12'-3½)	52.687	
233	16'-1		47.978	
245	21'-6	C(6'-0), Tr(2'-0)	20.875	
249	21'-6	T(5'-0), Tr(1'-0)	14.541	
250	21'-6	T(5'-0), Tr(1'-0)	13.539	
251	21'-6	E(7'-0)	13.223	
313	21'-6	Tr(2'-0), T(6'-0)	42.957	
411	1'-0	P1	-7.232	
413	0'-0		-6.728	
416	0'-11½	PO(12'-3½)	67.285	
423	0'-11½	P2(-72.942)	67.325	



Node Analysis

Job Number: 3896-21Carolina Charter
Report Description: Light Hazard (2)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-2'-0	S, T(35'-6½)	6.789	120.78
597	21'-0	Spr(-12.665)	12.665	19.93
598	21'-0	Spr(-12.250)	12.250	19.60
600	21'-0	Spr(-13.587)	13.587	20.64
626	21'-0	Spr(-12.850)	12.850	20.07
627	21'-0	Spr(-12.429)	12.429	19.74
629	21'-0	Spr(-13.785)	13.785	20.79
3	1'-0		-7.161	
168	21'-6	T(6'-0)	20.420	
171	21'-6	T(5'-0), Tr(1'-0)	14.335	
172	21'-6	T(5'-0), Tr(1'-0)	13.347	
173	21'-6	E(7'-0)	13.035	
174	21'-6	E(8'-0)	45.032	
226	21'-6	T(10'-0)	45.063	
231	9'-10	T(12'-3½)	52.687	
233	16'-1		47.978	
245	21'-6	C(6'-0), Tr(2'-0)	20.875	
249	21'-6	T(5'-0), Tr(1'-0)	14.541	
250	21'-6	T(5'-0), Tr(1'-0)	13.539	
251	21'-6	E(7'-0)	13.223	
313	21'-6	Tr(2'-0), T(6'-0)	42.957	
411	1'-0	P1	-7.232	
413	0'-0		-6.728	
416	0'-11½	PO(12'-3½)	67.285	
423	0'-11½	P2(-72.942)	67.325	



Hydraulic Analysis

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (2)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
Route 1							
DR	1.1010	19.60	6.60	150	0.065545	1'-3½"	Pf 1.002
598	21'-0	19.60	5.6	12.250	Sprinkler,	14'-0"	Pe -0.217
173	21'-6			13.035	2E(7'-0)	15'-3½"	Pv
BL	1.3940	19.60	4.12	150	0.020772	14'-0"	Pf 0.312
173	21'-6			13.035		1'-0"	Pe
172	21'-6			13.347	Tr(1'-0)	15'-0"	Pv
BL	1.3940	39.53	8.31	150	0.076053	12'-0"	Pf 0.989
172	21'-6	19.93		13.347	Flow (q) from Route 3	1'-0"	Pe
171	21'-6			14.335	Tr(1'-0)	13'-0"	Pv
BL	1.3940	60.17	12.65	150	0.165458	28'-9½"	Pf 6.085
171	21'-6	20.64		14.335	Flow (q) from Route 5	8'-0"	Pe
168	21'-6			20.420	2Tr(1'-0), T(6'-0)	36'-9½"	Pv
CM	2.0030	60.17	6.13	150	0.028318	14'-1"	Pf 0.455
168	21'-6			20.420		2'-0"	Pe
245	21'-6			20.875	Tr(2'-0)	16'-1"	Pv
CM	2.0030	120.78	12.30	150	0.102772	182'-10½"	Pf 22.082
245	21'-6	60.61		20.875	Flow (q) from Route 2	32'-0"	Pe
313	21'-6			42.957	6Tr(2'-0), 2T(10'-0)	214'-10½"	Pv
CM	2.0030	108.87	11.08	150	0.084811	12'-10"	Pf 2.106
313	21'-6			42.957	Tr(2'-0)	12'-0"	Pe
226	21'-6			45.063	T(10'-0)	24'-10"	Pv
CM	2.0030	120.78	12.30	150	0.102772	5'-5"	Pf 0.559
226	21'-6	11.91		45.063	Flow (q) from Route 7		Pe 2.356
233	16'-1			47.978		5'-5"	Pv
BL	2.1570	120.78	10.60	120	0.108266	6'-3"	Pf 2.007
233	16'-1			47.978		12'-3½"	Pe 2.702
231	9'-10			52.687	T(12'-3½)	18'-6½"	Pv
CM	2.0030	120.78	12.30	150	0.102772	46'-10"	Pf 7.691
231	9'-10			52.687		28'-0"	Pe 0.119
425	9'-6½			60.496	3Tr(2'-0), 2E(11'-0)	74'-10"	Pv
BL	2.1570	120.78	10.60	120	0.108266	8'-6"	Pf 3.051
425	9'-6½			60.496		19'-8½"	Pe 3.738
416	0'-11½			67.285	BV(7'-4½), PO(12'-3½)	28'-2"	Pv
CM	3.2600	120.78	4.64	120	0.014487	2'-9½"	Pf 0.040
416	0'-11½			67.285			Pe 0.000
423	0'-11½			67.325		2'-9½"	Pv
Pump		Velocity					
423		120.78		67.325	Rating: 70.000 @ 250.00		
411		Q=120.78	2.72	-7.232	Fire Pump Churn Pressure: 75.00		
					0		
FR	4.2600	120.78	2.72	120	0.003937	2'-1½"	Pf 0.071
411	1'-0			-7.232		15'-9½"	Pe 0.434
413	0'-0			-6.728	GV(2'-7½), E(13'-2)	17'-11"	Pv
	6.2800	120.78	1.25	120	0.000595	0'-0"	Pf 0.000
413	0'-0			-6.728			Pe -0.434
3	1'-0			-7.161		0'-0"	Pv
UG	6.2800	120.78	1.25	120	0.000595	212'-10"	Pf 12.650
3	1'-0			-7.161		68'-8½"	Pe 1.301
1	-2'-0			6.789	E(16'-7), 2EE(8'-3½), BFP(-12.42	281'-6½"	Pv
					4), S, T(35'-6½)		
		100.00			Hose Allowance At Source		
1		220.78					
Route 2							
DR	1.1010	19.74	6.65	150	0.066429	1'-2½"	Pf 1.011
627	21'-0	19.74	5.6	12.429	Sprinkler,	14'-0"	Pe -0.217
251	21'-6			13.223	2E(7'-0)	15'-2½"	Pv
BL	1.3940	19.74	4.15	150	0.021052	14'-0"	Pf 0.316
251	21'-6			13.223		1'-0"	Pe
250	21'-6			13.539	Tr(1'-0)	15'-0"	Pv
BL	1.3940	39.82	8.37	150	0.077078	12'-0"	Pf 1.002
250	21'-6	20.07		13.539	Flow (q) from Route 4	1'-0"	Pe
249	21'-6			14.541	Tr(1'-0)	13'-0"	Pv
BL	1.3940	60.61	12.74	150	0.167685	28'-9½"	Pf 6.334
249	21'-6	20.79		14.541	Flow (q) from Route 6	9'-0"	Pe
245	21'-6			20.875	3Tr(1'-0), C(6'-0)	37'-9½"	Pv
Route 3							



Hydraulic Analysis

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (2)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
DR	1.1010	19.93	6.72	150	0.067598	1'-3½"	Pf 0.898
597	21'-0	19.93	5.6	12.665	Sprinkler,	12'-0	Pe -0.217
172	21'-6			13.347	E(7'-0), T(5'-0)	13'-3½"	Pv
Route 4							
DR	1.1010	20.07	6.76	150	0.068509	1'-2½"	Pf 0.906
626	21'-0	20.07	5.6	12.850	Sprinkler,	12'-0	Pe -0.217
250	21'-6			13.539	E(7'-0), T(5'-0)	13'-2½"	Pv
Route 5							
DR	1.1010	20.64	6.96	150	0.072138	1'-4½"	Pf 0.965
600	21'-0	20.64	5.6	13.587	Sprinkler,	12'-0	Pe -0.217
171	21'-6			14.335	E(7'-0), T(5'-0)	13'-4½"	Pv
Route 6							
DR	1.1010	20.79	7.01	150	0.073107	1'-3½"	Pf 0.973
629	21'-0	20.79	5.6	13.785	Sprinkler,	12'-0	Pe -0.217
249	21'-6			14.541	E(7'-0), T(5'-0)	13'-3½"	Pv
Route 7							
CM	2.0030	11.91	1.21	150	0.001415	11'-10"	Pf 0.031
174	21'-6	11.91		45.032	Flow (q) from Route 8	10'-0	Pe
226	21'-6			45.063	T(10'-0)	21'-10"	Pv
Route 8							
BL	1.3940	11.91	2.50	150	0.008267	202'-0½"	Pf 2.076
313	21'-6			42.957	T(6'-0)	49'-0	Pe
174	21'-6			45.032	3E(8'-0), 7Tr(1'-0), C(6'-0), T(6'-0)	251'-0½"	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51



Hydraulic Analysis

Job Number: 3896-21 Carolina Charter
Report Description: Light Hazard (2)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss		Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend	
AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend	
Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend	
ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DeV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap