Corporate
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Pembroke, North Carolina 28372
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Project: 2021024 Northwest Harnett ES
736 Rollins Road
Fuquay Varina, North Carolina 27526

Submittal #21 13 00-3.0 - 211300 - Automatic Sprinkler Systems
21 13 00 - Automatic Sprinkler Systems

Revision	0	**Submittal Manager**	Marquis Mason (Metcon, Inc.)
Status	Open	**Date Created**	Jul 28, 2021
Issue Date		**Spec Section**	21 13 00 - Automatic Sprinkler Systems
Responsible Contractor	ABL Fire Protection	**Received From**	
Received Date		**Submit By**	Sep 30, 2021
Final Due Date	May 20, 2022	**Lead Time**	
		Cost Code	
Location		**Type**	Calculations
Owner Review			

Approvers Troy Ganus Jr. (Metcon, Inc.), Marquis Mason (Metcon, Inc.), Scott Drew (Optima Engineering, PA), Drew Landen (Optima Engineering, PA), Tom Hughes (SfL+a Architects), Mahan Kick (SfL+a Architects), Jaclin Wawak (SfL+a Architects), Troy Ganus Jr. (Metcon, Inc.), Marquis Mason (Metcon, Inc.)

Ball in Court Troy Ganus Jr. (Metcon, Inc.), Marquis Mason (Metcon, Inc.)

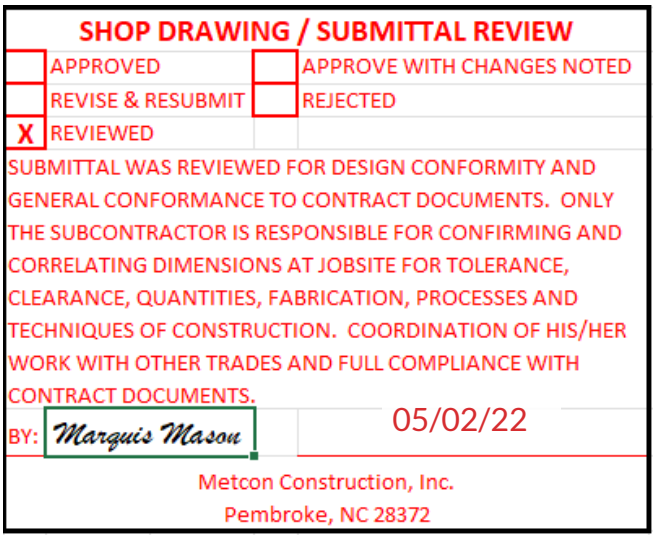
Distribution Denis Escobar (Metcon, Inc.)

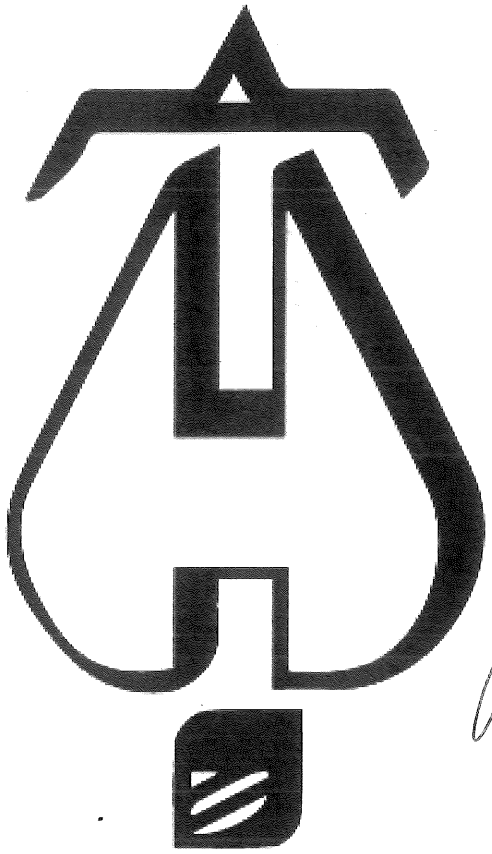
Description D. Submit hydraulic calculations in accordance with the following: 1. Hydraulic calculations shall be prepared on form sheets that include a summary sheet, a graph sheet, a water supply analysis, a node analysis, and detailed worksheets. 2. The data shall be presented in the order shown in Figure 23.3.5.1.2(a) through Figure 23.3.5.1.2(d) of NFPA 13. a. Only the order of information shall be maintained. Standard formats provided by approved calculation software shall be permitted so long as they include all required information listed in each subsequent section. Automatic Sprinkler Systems 21 13 00 - 4 3. The summary sheet shall contain the following information, where applicable: a. Project name and date. b. Location, including street address. c. Drawing number. d. Remote area number. e. Remote area location. f. Occupancy or commodity classification. g. System design requirements, as follows: 1) Design area of water application in square feet. 2) Minimum rate of water application in gpm/sf. 3) Area per sprinkler in square feet. h. Total water requirements as calculated, including allowance for inside hose and outside hydrants in gpm. i. Type of system. j. Water supply information, including the following: 1) Date. 2) Location. 3) Source. 4) Elevation relative to finished floor. k. Name and address of installing contractor. l. Name of designer. m. Authority having jurisdiction. n. Notes that include items such as peaking information for calculations performed by a computer program, limitations (dimension, flow, and pressure) on extended coverage or other listed special sprinklers. 4. A graphic representation of the complete hydraulic calculation shall be plotted on semiexponential graph paper (Q 1.85) and shall include the following: a. Water supply curve. b. Sprinkler system demand. c. Hose demand. d. Additional pressures supplied by a fire pump or other source. 5. Information summarized from the graph sheet shall include the following: a. Node tag at the source. b. Static pressure available at the source in psi. c. Residual pressure available at the source in psi. d. Total flow available at the source in gpm. e. Available pressure at the source when the total calculated demand is flowing in psi. Automatic Sprinkler Systems 21 13 00 - 5 f. Total calculated demand at the source in gpm. g. Required pressure when flowing total calculated demand in psi. 6. Organized information regarding the node tags given to each hydraulic reference point on the system as indicated on the shop drawings shall include the following information: a. Node tag for each specific point on the system used in the hydraulic calculations. b. Elevation of each node tag in feet. c. K-factor of flowing nodes. d. Hose allowance requirements for the node tag in gpm. e. Pressure at the node in psi. f. Discharge calculated at the node in gpm. g. Notes that indicate any special requirements for the node. 7. Detailed worksheets shall contain the following information: a. Sheet number. b. Hydraulic reference points used in each step. c. Elevation at each hydraulic reference point in feet. d. Sprinkler description and discharge constant for the flowing reference point. e. Flow for the flowing reference point in gpm. f. Total flow through each step in gpm. g. Nominal pipe size in inches. h. Actual internal diameter of pipe in inches. i. Quantity and length of each type of fitting and device in feet. j. Pipe lengths from center-to-center of fittings in feet. k. Equivalent pipe lengths of fittings and devices for the step in feet. l. Total equivalent length of pipes and fittings for the step in feet. m. C-factor used in each step. n. Friction loss of pipe in psi/ft. o. Sum of the pressures from the previous step (starting pressure at beginning). p. Elevation head between reference points in psi. q. Total friction loss between reference points in psi. r. Required pressure at each reference point in psi. s. Notes and other information shall include the following: 1) Velocity pressure and normal pressure if included in calculations. Automatic Sprinkler Systems 21 13 00 - 6 2) Notes to indicate starting points or reference to other sheets or to clarify data shown. 3) Diagram to

accompany gridded system calculations to indicate flow quantities and directions for lines with sprinklers operating in the remote area. 4) Combined K-factor calculations for sprinklers on drops, armovers, or sprigs where calculations do not begin at the sprinkler. 5) The pressure loss assigned to the backflow device when included on a system in psi. 6) Friction factor and Reynold's number when the Darcy-Weibach equation is used. 8. Water allowance for outside hose shall be added to the sprinkler and inside hose requirement at the connection to the city water main or a yard hydrant, whichever is closer to the system riser.

Submittal Workflow

Name	Sent Date	Due Date	Returned Date	Response	Attachments
General Information Attachments					
Art Lamson		Oct 11, 2021		Pending	
Gail Lamson		Oct 11, 2021	Apr 28, 2022	Submitted	NWHES FP HYDRAULIC CALC.pdf (Current)
Troy Ganus Jr.	May 2, 2022	Apr 29, 2022		Pending	
Marquis Mason	May 2, 2022	Apr 29, 2022	May 2, 2022	Pending	
Scott Drew	Apr 29, 2022	May 20, 2022		Pending	
Drew Landen	Apr 29, 2022	May 20, 2022		Pending	
Tom Hughes		May 20, 2022		Pending	
Mahan Kick		May 20, 2022		Pending	
Jaclin Wawak		May 20, 2022		Pending	
Troy Ganus Jr.		May 20, 2022		Pending	
Marquis Mason		May 20, 2022		Pending	





Nicet III
License #20462
5/2/22

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-1
Drawing	:	FP14
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-1
Contract	:	4070
Data File	:	NWHES 01 SYS-1 ZONE1 419 LH EC.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP14
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-1
Remote area location 1ST GRADE 419
Occupancy classification LH
Density 0.10 - Gpm/SqFt
Area of application 1037 - SqFt
Coverage/sprinkler 324 SF MAX - SqFt
Type of sprinkler calculated QR EC PENDENT 1/2" 155F 5.6K
 # Sprinklers calculated 8
In-rack demand N/A - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 340.085 - GPM @ 45.721 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:
REDUCE AREA FOR HYDRAULIC CALCULATION PER NFPA13 2013 SECTION 11.2.3.2.3

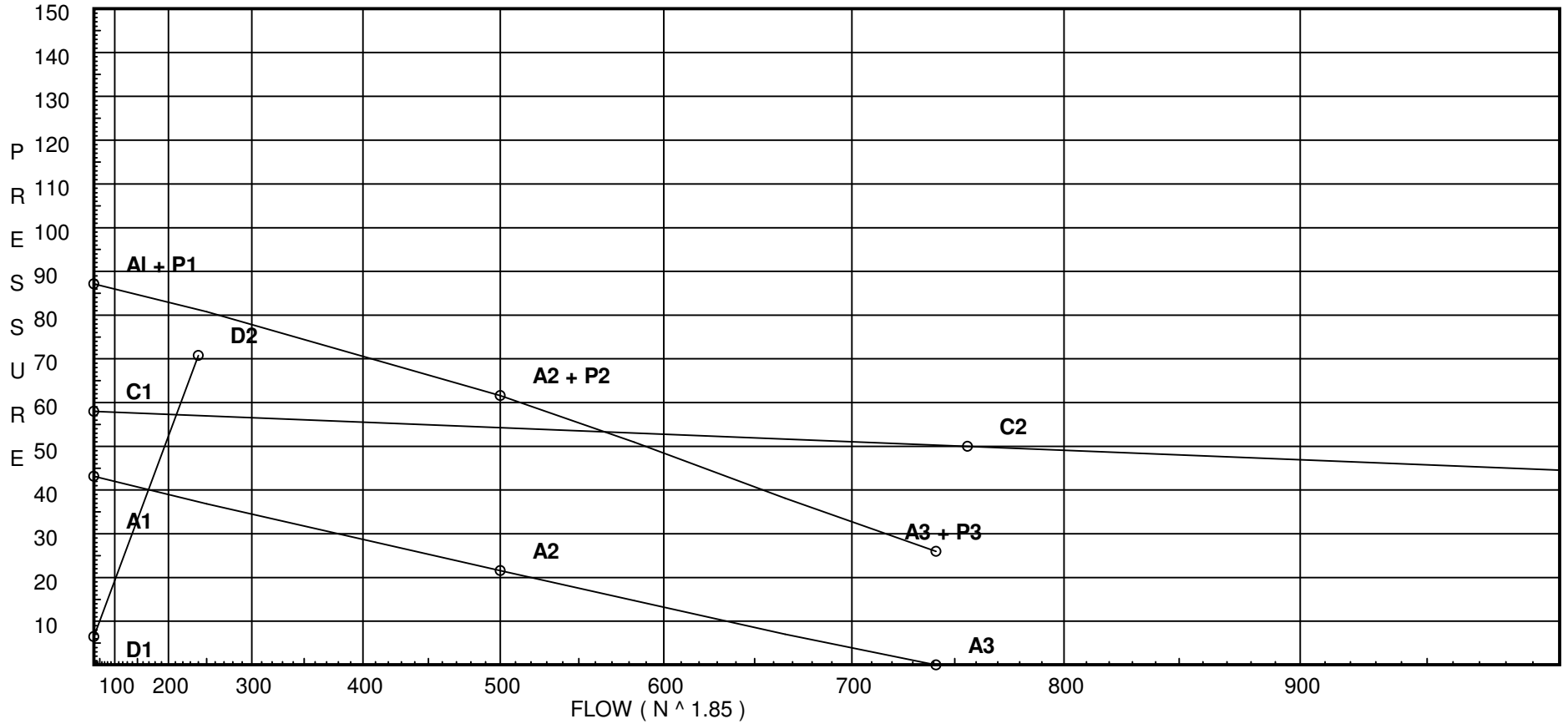
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 43.145
- A2 - Adj Resid : 21.583 @ 500
- A3 - Adj Resid : 0 @ 741.15

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 741.15
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.29

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 6.478
- D2 - System Flow : 240.085
- D2 - System Pressure : 70.790
- Hose (Demand) : _____
- D3 - System Demand : 240.085
- Hose (Adj City) : 100
- Safety Margin : 10.454



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			81.244	240.08	70.79
TEST	58.0	50	756.0	56.175	340.08	56.175

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	12.833	5.6	23.5	27.14	0.1	144
2H	12.833	5.6	23.76	27.3	0.1	120
3H	12.833	5.6	24.54	27.74	0.1	140.81
4H	12.833	5.6	25.35	28.19	0.1	141.757
5H	12.833	5.6	28.6	29.95	0.1	120
6H	11.958	5.6	34.25	32.78	0.1	168
7H	11.958	5.6	34.7	32.99	0.1	306.243
8H	11.958	5.6	36.86	34.0	0.1	246.167
1	13.375		25.42			
2	13.375		25.7			
3	13.375		26.63			
4	13.375		27.51			
5	13.375		30.95			
6	12.5		37.16			
7	12.5		37.64			
8	12.5		39.98			
400	13.375		50.64			
401	12.5		51.72			
402	11.333		57.99			
403B	11.333		61.16			
403T	16.917		59.0			
E3	16.917		59.46			
E2	9.5		63.26			
E1	9.5		63.38			
TOR1	10.0		63.49			
BOR1	2.0		70.47			
PD	2.0		70.79			
PS	2.0		37.25			
FLG	1.0		37.86			
UG1	-3.0		39.63			
UG2	-3.0		39.84			
UG0	-3.0		39.85			
UG3	-3.0		39.89			
BF1	2.0		37.98			
BF2	-3.0		52.68			
UG4	-3.0		52.74			
UG5	-3.0		54.35			
UG6	-3.0		55.69			
UG7	-3.0		55.7			
UG8	-3.0		55.83			
UG9	-3.0		56.04			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
TEST	-3.0		56.18	100.0	

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 ******
1H	12.833	5.60	27.14	1	2E	4.0	0.417	120	23.495	
to					T	5.0	9.000		-0.235	
1	13.375		27.14	1.049			9.417	0.2291	2.157	Vel = 10.08
			0.0							
1			27.14						25.417	K Factor = 5.38
2H	12.833	5.60	27.30	1	2E	4.0	0.417	120	23.757	
to					T	5.0	9.000		-0.235	
2	13.375		27.3	1.049			9.417	0.2314	2.179	Vel = 10.13
			0.0							
2			27.30						25.701	K Factor = 5.39
3H	12.833	5.60	27.74	1	2E	4.0	0.750	120	24.543	
to					T	5.0	9.000		-0.235	
3	13.375		27.74	1.049			9.750	0.2384	2.324	Vel = 10.30
			0.0							
3			27.74						26.632	K Factor = 5.38
4H	12.833	5.60	28.19	1	2E	4.0	0.750	120	25.346	
to					T	5.0	9.000		-0.235	
4	13.375		28.19	1.049			9.750	0.2456	2.395	Vel = 10.46
			0.0							
4			28.19						27.506	K Factor = 5.38
5H	12.833	5.60	29.95	1	2E	4.0	0.417	120	28.598	
to					T	5.0	9.000		-0.235	
5	13.375		29.95	1.049			9.417	0.2746	2.586	Vel = 11.12
			0.0							
5			29.95						30.949	K Factor = 5.38
6H	11.958	5.60	32.78	1	2E	4.0	0.667	120	34.254	
to					T	5.0	9.000		-0.235	
6	12.500		32.78	1.049			9.667	0.3246	3.138	Vel = 12.17
			0.0							
6			32.78						37.157	K Factor = 5.38
7H	11.958	5.60	32.99	1	2E	4.0	0.667	120	34.700	
to					T	5.0	9.000		-0.235	
7	12.500		32.99	1.049			9.667	0.3284	3.175	Vel = 12.25
			0.0							
7			32.99						37.640	K Factor = 5.38
8H	11.958	5.60	34.00	1	2E	4.0	0.667	120	36.861	
to					T	5.0	9.000		-0.235	
8	12.500		34.0	1.049			9.667	0.3474	3.358	Vel = 12.62
			0.0							
8			34.00						39.984	K Factor = 5.38
1	13.375		27.14	1.5			10.000	120	25.417	
to									0.0	
2	13.375		27.14	1.61			10.000	0.0284	0.284	Vel = 4.28
2	13.375		27.30	1.5			9.042	120	25.701	
to									0.0	
3	13.375		54.44	1.61			9.042	0.1030	0.931	Vel = 8.58
3	13.375		27.74	1.5			3.958	120	26.632	
to									0.0	
4	13.375		82.18	1.61			3.958	0.2208	0.874	Vel = 12.95

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 ******
4	13.375		28.20	1.5			9.042	120	27.506	
to									0.0	
5	13.375		110.38	1.61			9.042	0.3808	3.443	Vel = 17.40
5	13.375		29.94	1.5	T	8.0	25.167	120	30.949	
to							8.000		0.0	
400	13.375		140.32	1.61			33.167	0.5938	19.693	Vel = 22.11
			0.0							
400			140.32						50.642	K Factor = 19.72
6	12.500		32.78	1.5			12.000	120	37.157	
to									0.0	
7	12.500		32.78	1.61			12.000	0.0402	0.483	Vel = 5.17
7	12.500		32.98	1.5			16.042	120	37.640	
to									0.0	
8	12.500		65.76	1.61			16.042	0.1461	2.344	Vel = 10.36
8	12.500		34.00	1.5	T	8.0	29.167	120	39.984	
to							8.000		0.0	
401	12.500		99.76	1.61			37.167	0.3159	11.740	Vel = 15.72
			0.0							
401			99.76						51.724	K Factor = 13.87
400	13.375		140.32	2.5			13.042	120	50.642	
to									0.379	
401	12.500		140.32	2.635			13.042	0.0539	0.703	Vel = 8.26
401	12.500		99.76	2.5	2E	16.474	23.083	120	51.724	
to							16.474		0.505	
402	11.333		240.08	2.635			39.557	0.1456	5.759	Vel = 14.12
			0.0							
402			240.08						57.988	K Factor = 31.53
402	11.333		240.08	4	E	13.167	212.542	120	57.988	
to							13.167		0.0	
403B	11.333		240.08	4.26			225.709	0.0140	3.167	Vel = 5.40
			0.0							
403B			240.08						61.155	K Factor = 30.70
403B	11.333		240.08	4	E	13.167	5.333	120	61.155	
to							13.167		-2.418	
403T	16.917		240.08	4.26			18.500	0.0140	0.259	Vel = 5.40
403T	16.917		0.0	4	T	26.334	6.750	120	58.996	
to							26.334		0.0	
E3	16.917		240.08	4.26			33.084	0.0141	0.465	Vel = 5.40
			0.0							
E3			240.08						59.461	K Factor = 31.13
E3	16.917		240.08	4	2E	26.334	15.667	120	59.461	
to							26.334		3.212	
E2	9.500		240.08	4.26			42.001	0.0140	0.589	Vel = 5.40
E2	9.500		0.0	4			8.667	120	63.262	
to									0.0	
E1	9.500		240.08	4.26			8.667	0.0141	0.122	Vel = 5.40
			0.0							

Final Calculations : Hazen-Williams

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 ******
E1			240.08						63.384	K Factor = 30.16
E1	9.500		240.08	4	E	13.167	9.708	120	63.384	
to							13.167		-0.217	
TOR1	10		240.08	4.26			22.875	0.0140	0.321	Vel = 5.40
			0.0							
TOR1			240.08						63.488	K Factor = 30.13
TOR1	10		240.08	4	E	13.167	8.042	120	63.488	
to					B	15.8	28.967		6.465	* * Fixed Loss = 3
BOR1	2		240.08	4.26	Fsp	0.0	37.009	0.0140	0.519	Vel = 5.40
			0.0							
BOR1			240.08						70.472	K Factor = 28.60
BOR1	2		240.08	6	E	17.603	13.292	120	70.472	
to					2T	75.44	145.851		0.0	
PD	2		240.08	6.357	B	12.573	159.143	0.0020	0.318	Vel = 2.43
					S	40.235				
			0.0							
PD			240.08						70.790	K Factor = 28.53
System Demand Pressure									70.790	
Safety Margin									10.454	
Continuation Pressure									81.244	
Pressure @ Pump Outlet									81.244	
Pressure From Pump Curve									-43.990	
Pressure @ Pump Inlet									37.254	
PS	2		0.0	6	2T	75.44	5.458	120	37.254	
to					G	3.772	79.212		0.433	
FLG	1		240.08	6.357			84.670	0.0020	0.169	Vel = 2.43
			0.0							
FLG			240.08						37.856	K Factor = 39.02
FLG	1		240.08	6	E	20.084	4.000	140	37.856	
to							20.084		1.732	
UG1	-3		240.08	6.16			24.084	0.0017	0.042	Vel = 2.58
			0.0							
UG1			240.08						39.630	K Factor = 38.14
UG1	-3		240.08	6	T	43.037	77.000	140	39.630	
to							43.037		0.0	
UG2	-3		240.08	6.16			120.037	0.0017	0.210	Vel = 2.58
UG2	-3		-50.70	8			179.000	140	39.840	
to									0.0	
UG3	-3		189.38	8.27			179.000	0.0003	0.049	Vel = 1.13
			0.0							
UG3			189.38						39.889	K Factor = 29.99
UG2	-3		50.70	8	V	20.56	261.000	140	39.840	
to							20.560		0.0	
UG0	-3		50.7	8.27			281.560	0	0.007	Vel = 0.30
UG0	-3		0.0	8	10V	205.602	1507.000	140	39.847	
to					T	55.354	260.956		0.0	
UG3	-3		50.7	8.27			1767.956	0	0.042	Vel = 0.30

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 ******
			0.0							
UG3			50.70						39.889	K Factor = 8.03
UG3	-3		240.08	8	G	6.326	521.000	140	39.889	
to					2V	41.12	104.382		-2.166	
BF1	2		240.08	8.27	2E	56.936	625.382	0.0004	0.261	Vel = 1.43
BF1	2		0.0	8	2E	56.936	15.000	140	37.984	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		240.08	8.27			71.936	0.0004	0.029	Vel = 1.43
BF2	-3		0.0	8	V	20.56	75.000	140	52.679	
to					T	55.354	75.914		0.0	
UG4	-3		240.08	8.27			150.914	0.0004	0.063	Vel = 1.43
			0.0							
UG4			240.08						52.742	K Factor = 33.06
UG4	-3		240.08	8	4G	28.75	4156.000	150	52.742	
to					8V	186.874	215.624		0.0	
UG5	-3		240.08	8.27			4371.624	0.0004	1.605	Vel = 1.43
UG5	-3		0.0	8	8V	186.874	3360.000	150	54.347	
to					E	32.344	296.483		0.0	
UG6	-3		240.08	8.27	T	62.89	3656.483	0.0004	1.343	Vel = 1.43
					2G	14.375				
			0.0							
UG6			240.08						55.690	K Factor = 32.17
UG6	-3		240.08	12	T	106.533	47.000	150	55.690	
to							106.533		0.0	
UG7	-3		240.08	12.34			153.533	0.0001	0.008	Vel = 0.64
			0.0							
UG7			240.08						55.698	K Factor = 32.17
UG7	-3		240.08	6	E	22.818	13.000	150	55.698	
to					T	48.896	71.714		0.0	
UG8	-3		240.08	6.16			84.714	0.0015	0.130	Vel = 2.58
			0.0							
UG8			240.08						55.828	K Factor = 32.13
UG8	-3		240.08	6	T	43.037	77.000	140	55.828	
to							43.037		0.0	
UG9	-3		240.08	6.16			120.037	0.0017	0.210	Vel = 2.58
UG9	-3		0.0	12	2V	15.94	2136.000	140	56.038	
to					T	93.767	161.279		0.0	
TEST	-3		240.08	12.34	G	9.377	2297.279	0.0001	0.137	Vel = 0.64
					E	42.195				
			100.00							Qa = 100.00
TEST			340.08						56.175	K Factor = 45.37

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-2
Drawing	:	FP11
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-2
Contract	:	4070
Data File	:	NWHES 02 SYS-1 ZONE1 KITCHEN108 OH1.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP11
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-2
Remote area location KITCHEN 108
Occupancy classification OH-1
Density 0.15 - Gpm/SqFt
Area of application 993 - SqFt
Coverage/sprinkler 130 SF MAX - SqFt
Type of sprinkler calculated QR PENDENT 1/2" 155F 5.6K
 # Sprinklers calculated 10
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 477.155 - GPM @ 37.872 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:
REDUCE AREA FOR HYDRAULIC CALCULATION PER NFPA13 2013 SECTION 11.2.3.2.3

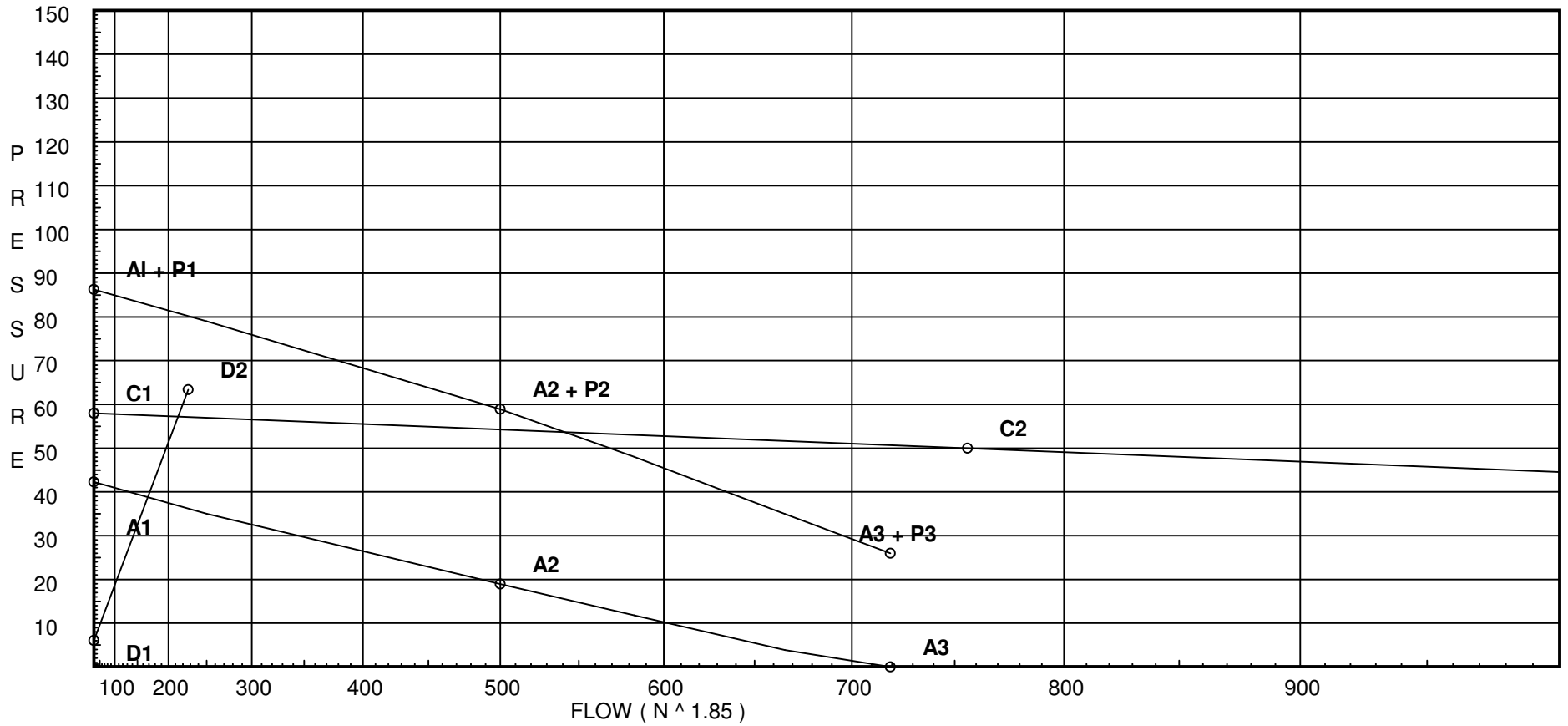
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 42.302
- A2 - Adj Resid : 18.917 @ 500
- A3 - Adj Resid : 0 @ 719.14

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 719.14
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.71

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 6.063
- D2 - System Flow : 227.155
- D2 - System Pressure : 63.356
- Hose (Demand) : _____
- D3 - System Demand : 227.155
- Hose (Adj City) : 250
- Safety Margin : 16.714



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			80.07	227.16	63.356
TEST	58.0	50	756.0	54.585	477.16	54.585

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	11.0	5.6	14.14	21.06	0.15	122.5
2H	11.0	5.6	16.23	22.56	0.15	126.667
3H	11.0	5.6	20.27	25.21	0.15	101.333
4H	11.0	5.6	28.78	30.04	0.15	99
5H	11.0	5.6	10.77	18.38	0.15	122.5
6H	11.0	5.6	11.03	18.6	0.15	122.5
7H	11.0	5.6	12.67	19.93	0.15	109.229
8H	11.0	5.6	15.27	21.88	0.15	80
9H	11.0	5.6	17.65	23.53	0.15	80
10H	11.0	5.6	21.5	25.96	0.15	76
1	12.5		14.88			
2	12.5		17.15			
3	12.5		21.55			
4	12.5		30.8			
5	12.083		11.37			
6	12.083		11.67			
N6	12.5		13.23			
7	12.5		13.3			
8	12.5		16.15			
9	12.5		18.74			
10	12.5		22.95			
F10	12.5		33.13			
F9	12.5		33.3			
F8	12.5		33.65			
F7	10.667		37.71			
F6	10.667		43.32			
F4	9.5		49.81			
E1	9.5		56.06			
TOR1	10.0		56.14			
BOR1	2.0		63.07			
PD	2.0		63.36			
PS	2.0		36.08			
FLG	1.0		36.66			
UG1	-3.0		38.43			
UG2	-3.0		38.62			
UG0	-3.0		38.63			
UG3	-3.0		38.67			
BF1	2.0		36.74			
BF2	-3.0		51.43			
UG4	-3.0		51.49			
UG5	-3.0		52.94			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
UG6	-3.0		54.15		
UG7	-3.0		54.15		
UG8	-3.0		54.27		
UG9	-3.0		54.46		
TEST	-3.0		54.59	250.0	

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 ******
1H	11	5.60	21.06	1	2E	4.0	0.708	120	14.140	
to					T	5.0	9.000		-0.650	
1	12.500		21.06	1.049			9.708	0.1432	1.390	Vel = 7.82
			0.0							
1			21.06						14.880	K Factor = 5.46
2H	11	5.60	22.56	1	2E	4.0	0.667	120	16.225	
to					T	5.0	9.000		-0.650	
2	12.500		22.56	1.049			9.667	0.1626	1.572	Vel = 8.37
			0.0							
2			22.56						17.147	K Factor = 5.45
3H	11	5.60	25.21	1	2E	4.0	0.667	120	20.270	
to					T	5.0	9.000		-0.650	
3	12.500		25.21	1.049			9.667	0.1998	1.931	Vel = 9.36
			0.0							
3			25.21						21.551	K Factor = 5.43
4H	11	5.60	30.04	1	2E	4.0	0.667	120	28.782	
to					T	5.0	9.000		-0.650	
4	12.500		30.04	1.049			9.667	0.2764	2.672	Vel = 11.15
			0.0							
4			30.04						30.804	K Factor = 5.41
5H	11	5.60	18.38	1	2E	4.0	0.667	120	10.767	
to					T	5.0	9.000		-0.469	
5	12.083		18.38	1.049			9.667	0.1112	1.075	Vel = 6.82
			0.0							
5			18.38						11.373	K Factor = 5.45
6H	11	5.60	18.60	1	2E	4.0	0.667	120	11.034	
to					T	5.0	9.000		-0.469	
6	12.083		18.6	1.049			9.667	0.1139	1.101	Vel = 6.90
			0.0							
6			18.60						11.666	K Factor = 5.45
7H	11	5.60	19.93	1	2E	4.0	0.917	120	12.670	
to					T	5.0	9.000		-0.650	
7	12.500		19.93	1.049			9.917	0.1294	1.283	Vel = 7.40
			0.0							
7			19.93						13.303	K Factor = 5.46
8H	11	5.60	21.88	1	2E	4.0	0.917	120	15.271	
to					T	5.0	9.000		-0.650	
8	12.500		21.88	1.049			9.917	0.1538	1.525	Vel = 8.12
			0.0							
8			21.88						16.146	K Factor = 5.45
9H	11	5.60	23.52	1	2E	4.0	0.917	120	17.648	
to					T	5.0	9.000		-0.650	
9	12.500		23.52	1.049			9.917	0.1758	1.743	Vel = 8.73
			0.0							
9			23.52						18.741	K Factor = 5.43
10H	11	5.60	25.96	1	2E	4.0	0.958	120	21.498	
to					T	5.0	9.000		-0.650	
10	12.500		25.96	1.049			9.958	0.2109	2.100	Vel = 9.64

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 ******
			0.0							
10			25.96						22.948	K Factor = 5.42
1	12.500		21.06	1	2E	4.0	11.833	120	14.880	
to							4.000		0.0	
2	12.500		21.06	1.049			15.833	0.1432	2.267	Vel = 7.82
2	12.500		22.56	1			8.000	120	17.147	
to									0.0	
3	12.500		43.62	1.049			8.000	0.5505	4.404	Vel = 16.19
3	12.500		25.21	1	T	5.0	4.042	120	21.551	
to							5.000		0.0	
F10	12.500		68.83	1.049			9.042	1.2804	11.577	Vel = 25.55
			0.0							
F10			68.83						33.128	K Factor = 11.96
4	12.500		30.04	1	T	5.0	4.042	120	30.804	
to							5.000		0.0	
F9	12.500		30.04	1.049			9.042	0.2762	2.497	Vel = 11.15
			0.0							
F9			30.04						33.301	K Factor = 5.21
5	12.083		18.38	1.25			10.000	120	11.373	
to									0.0	
6	12.083		18.38	1.38			10.000	0.0293	0.293	Vel = 3.94
6	12.083		18.60	1.25	E	3.0	7.375	120	11.666	
to					T	6.0	9.000		-0.181	
N6	12.500		36.98	1.38			16.375	0.1067	1.747	Vel = 7.93
			0.0							
N6			36.98						13.232	K Factor = 10.17
N6	12.500		36.98	1.25			0.667	120	13.232	
to									0.0	
7	12.500		36.98	1.38			0.667	0.1064	0.071	Vel = 7.93
7	12.500		19.93	1.25	T	6.0	6.000	120	13.303	
to							6.000		0.0	
8	12.500		56.91	1.38			12.000	0.2369	2.843	Vel = 12.21
8	12.500		21.88	1.25			6.000	120	16.146	
to									0.0	
9	12.500		78.79	1.38			6.000	0.4325	2.595	Vel = 16.90
9	12.500		23.53	1.25			6.000	120	18.741	
to									0.0	
10	12.500		102.32	1.38			6.000	0.7012	4.207	Vel = 21.95
10	12.500		25.96	1.25	T	6.0	4.042	120	22.948	
to							6.000		0.0	
F8	12.500		128.28	1.38			10.042	1.0655	10.700	Vel = 27.52
			0.0							
F8			128.28						33.648	K Factor = 22.11
F10	12.500		68.83	2.5			12.000	120	33.128	
to									0.0	
F9	12.500		68.83	2.635			12.000	0.0144	0.173	Vel = 4.05
F9	12.500		30.04	2.5			12.292	120	33.301	
to									0.0	
F8	12.500		98.87	2.635			12.292	0.0282	0.347	Vel = 5.82

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 ******
F8	12.500		128.29	2.5	2E	16.474	8.375	120	33.648	
to							16.474		0.794	
F7	10.667		227.16	2.635			24.849	0.1314	3.266	Vel = 13.36
F7	10.667		0.0	2.5	T	16.474	26.208	120	37.708	
to							16.474		0.0	
F6	10.667		227.16	2.635			42.682	0.1314	5.609	Vel = 13.36
F6	10.667		0.0	2.5	3E	24.711	20.833	120	43.317	
to							24.711		0.505	
F4	9.500		227.16	2.635			45.544	0.1314	5.985	Vel = 13.36
F4	9.500		0.0	2.5	T	16.474	31.125	120	49.807	
to							16.474		0.0	
E1	9.500		227.16	2.635			47.599	0.1314	6.256	Vel = 13.36
			0.0							
E1			227.16						56.063	K Factor = 30.34
E1	9.500		227.16	4	E	13.167	9.708	120	56.063	
to							13.167		-0.217	
TOR1	10		227.16	4.26			22.875	0.0127	0.290	Vel = 5.11
			0.0							
TOR1			227.16						56.136	K Factor = 30.32
TOR1	10		227.16	4	E	13.167	8.042	120	56.136	
to					B	15.8	28.967		6.465	* * Fixed Loss = 3
BOR1	2		227.16	4.26	Fsp	0.0	37.009	0.0126	0.468	Vel = 5.11
			0.0							
BOR1			227.16						63.069	K Factor = 28.60
BOR1	2		227.16	6	E	17.603	13.292	120	63.069	
to					2T	75.44	145.851		0.0	
PD	2		227.16	6.357	B	12.573	159.143	0.0018	0.287	Vel = 2.30
					S	40.235				
			0.0							
PD			227.16						63.356	K Factor = 28.54
System Demand Pressure									63.356	
Safety Margin									16.714	
Continuation Pressure									80.070	
Pressure @ Pump Outlet									80.070	
Pressure From Pump Curve									-43.991	
Pressure @ Pump Inlet									36.079	
PS	2		0.0	6	2T	75.44	5.458	120	36.079	
to					G	3.772	79.212		0.433	
FLG	1		227.16	6.357			84.670	0.0018	0.152	Vel = 2.30
			0.0							
FLG			227.16						36.664	K Factor = 37.52
FLG	1		227.16	6	E	20.084	4.000	140	36.664	
to							20.084		1.732	
UG1	-3		227.16	6.16			24.084	0.0016	0.039	Vel = 2.45
			0.0							
UG1			227.16						38.435	K Factor = 36.64
UG1	-3		227.16	6	T	43.037	77.000	140	38.435	
to							43.037		0.0	
UG2	-3		227.16	6.16			120.037	0.0016	0.189	Vel = 2.45

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 ******
UG2	-3		-47.98	8			179.000	140	38.624	
to									0.0	
UG3	-3		179.18	8.27			179.000	0.0002	0.044	Vel = 1.07
			0.0							
UG3			179.18						38.668	K Factor = 28.81
UG2	-3		47.97	8	V	20.56	261.000	140	38.624	
to							20.560		0.0	
UG0	-3		47.97	8.27			281.560	0	0.006	Vel = 0.29
UG0	-3		0.0	8	10V	205.602	1507.000	140	38.630	
to					T	55.354	260.956		0.0	
UG3	-3		47.97	8.27			1767.956	0	0.038	Vel = 0.29
			0.0							
UG3			47.97						38.668	K Factor = 7.71
UG3	-3		227.16	8	G	6.326	521.000	140	38.668	
to					2V	41.12	104.382		-2.166	
BF1	2		227.16	8.27	2E	56.936	625.382	0.0004	0.236	Vel = 1.36
BF1	2		0.0	8	2E	56.936	15.000	140	36.738	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		227.16	8.27			71.936	0.0004	0.026	Vel = 1.36
BF2	-3		0.0	8	V	20.56	75.000	140	51.430	
to					T	55.354	75.914		0.0	
UG4	-3		227.16	8.27			150.914	0.0004	0.057	Vel = 1.36
			0.0							
UG4			227.16						51.487	K Factor = 31.66
UG4	-3		227.16	8	4G	28.75	4156.000	150	51.487	
to					8V	186.874	215.624		0.0	
UG5	-3		227.16	8.27			4371.624	0.0003	1.449	Vel = 1.36
UG5	-3		0.0	8	8V	186.874	3360.000	150	52.936	
to					E	32.344	296.483		0.0	
UG6	-3		227.16	8.27	T	62.89	3656.483	0.0003	1.212	Vel = 1.36
					2G	14.375				
			0.0							
UG6			227.16						54.148	K Factor = 30.87
UG6	-3		227.16	12	T	106.533	47.000	150	54.148	
to							106.533		0.0	
UG7	-3		227.16	12.34			153.533	0	0.007	Vel = 0.61
			0.0							
UG7			227.16						54.155	K Factor = 30.87
UG7	-3		227.16	6	E	22.818	13.000	150	54.155	
to					T	48.896	71.714		0.0	
UG8	-3		227.16	6.16			84.714	0.0014	0.118	Vel = 2.45
			0.0							
UG8			227.16						54.273	K Factor = 30.83
UG8	-3		227.16	6	T	43.037	77.000	140	54.273	
to							43.037		0.0	
UG9	-3		227.16	6.16			120.037	0.0016	0.189	Vel = 2.45
UG9	-3		0.0	12	2V	15.94	2136.000	140	54.462	
to					T	93.767	161.279		0.0	
TEST	-3		227.16	12.34	G	9.377	2297.279	0.0001	0.124	Vel = 0.61

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	******
					E	42.195						
			250.00							Qa = 250.00		
TEST			477.16						54.586	K Factor = 64.58		

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-3
Drawing	:	FP11
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-3
Contract	:	4070
Data File	:	NWHES 03 SYS-1 ZONE1 DINING101 LH.WXF

Computer Programs by Hydratec Inc. Revision: 50.5520.727

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP11
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-3
Remote area location DINING 101
Occupancy classification LH
Density 0.1 - Gpm/SqFt
Area of application 1597 - SqFt
Coverage/sprinkler 225 SF MAX - SqFt
Type of sprinkler calculated QR UPRIGHT 1/2" 155F 5.6K
 # Sprinklers calculated 11
In-rack demand N/A - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 283.656 - GPM @ 26.831 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:

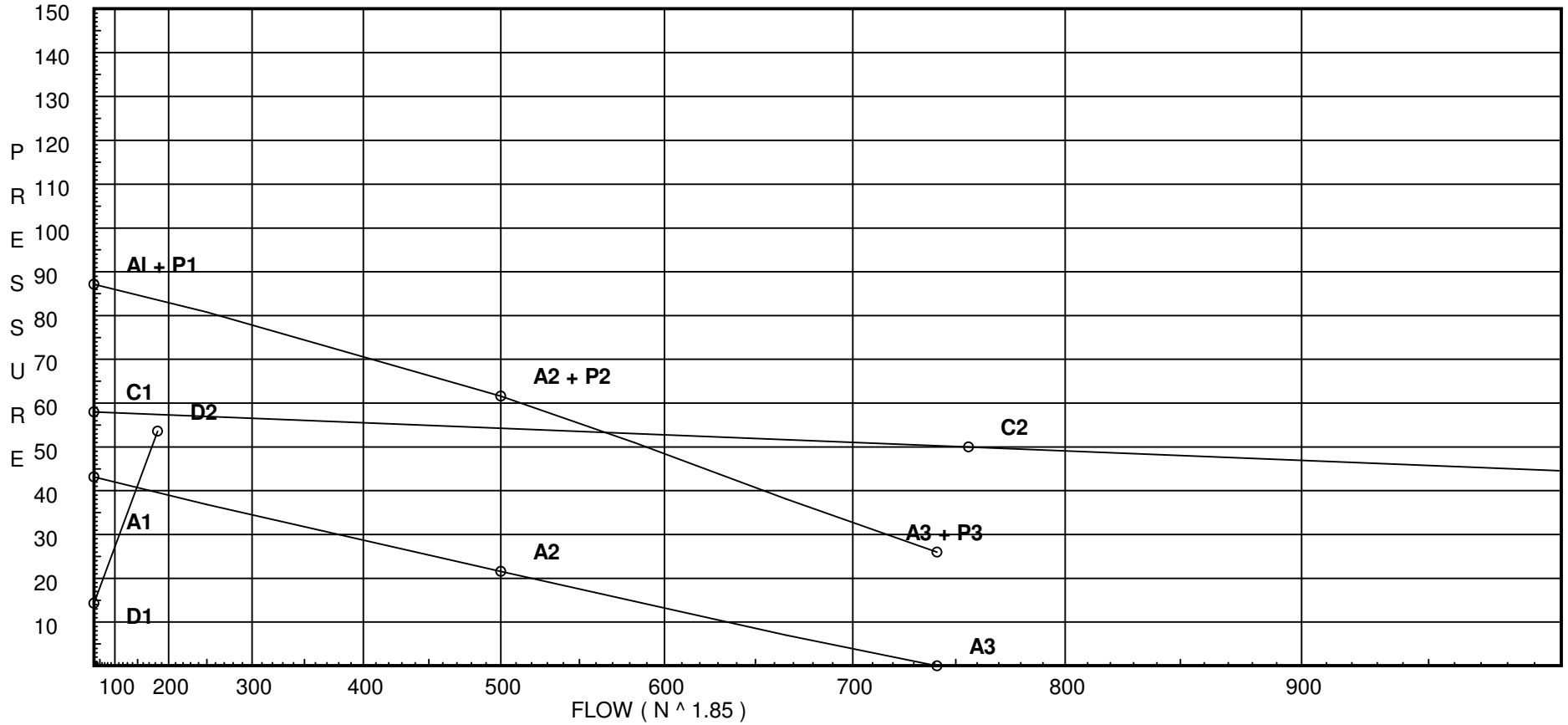
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 43.145
- A2 - Adj Resid : 21.583 @ 500
- A3 - Adj Resid : 0 @ 741.15

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 741.15
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.29

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 14.274
- D2 - System Flow : 183.656
- D2 - System Pressure : 53.567
- Hose (Demand) : _____
- D3 - System Demand : 183.656
- Hose (Adj City) : 100
- Safety Margin : 29.865



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			83.432	183.66	53.567
TEST	58.0	50	756.0	56.695	283.66	56.695

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	22.604	5.6	7.74	15.58	0.1	138.715
2H	22.604	5.6	8.0	15.84	0.1	138.715
3H	22.604	5.6	8.97	16.78	0.1	138.715
4H	22.604	5.6	11.12	18.67	0.1	138.715
5H	24.854	5.6	7.03	14.85	0.1	138.715
6H	24.854	5.6	7.29	15.12	0.1	138.715
7H	24.854	5.6	8.24	16.08	0.1	138.715
8H	24.854	5.6	10.35	18.02	0.1	138.715
9H	29.958	5.6	9.22	17.0	0.1	170
10H	29.958	5.6	9.56	17.31	0.1	170
11H	29.958	5.6	10.8	18.4	0.1	170
1	21.729		9.39			
2	21.729		9.69			
3	21.729		10.81			
4	21.729		13.28			
F14	12.5		24.74			
5	22.938		8.45			
6	22.938		8.73			
7	22.938		9.76			
8	22.938		12.02			
F12	12.5		25.82			
F13	12.5		32.08			
F11	12.5		32.18			
F7	10.667		35.82			
9	29.042		10.18			
10	29.042		10.54			
11	29.042		11.86			
G3	29.042		17.44			
G2	21.333		32.87			
G1	10.667		37.74			
F6	10.667		37.85			
F4	9.5		42.39			
E1	9.5		46.61			
TOR1	10.0		46.59			
BOR1	2.0		53.37			
PD	2.0		53.57			
PS	2.0		39.44			
FLG	1.0		39.97			
UG1	-3.0		41.73			
UG2	-3.0		41.86			
UG0	-3.0		41.86			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
UG3	-3.0		41.89		
BF1	2.0		39.88		
BF2	-3.0		54.57		
UG4	-3.0		54.6		
UG5	-3.0		55.58		
UG6	-3.0		56.4		
UG7	-3.0		56.4		
UG8	-3.0		56.48		
UG9	-3.0		56.61		
TEST	-3.0		56.69	100.0	

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 ******
1H	22.604	5.60	15.58	1	T	5.0	10.500	120	7.737	
to							5.000		0.379	
1	21.729		15.58	1.049			15.500	0.0819	1.270	Vel = 5.78
			0.0							
1			15.58						9.386	K Factor = 5.09
2H	22.604	5.60	15.84	1	T	5.0	10.500	120	8.002	
to							5.000		0.379	
2	21.729		15.84	1.049			15.500	0.0845	1.310	Vel = 5.88
			0.0							
2			15.84						9.691	K Factor = 5.09
3H	22.604	5.60	16.77	1	T	5.0	10.500	120	8.974	
to							5.000		0.379	
3	21.729		16.77	1.049			15.500	0.0940	1.457	Vel = 6.23
			0.0							
3			16.77						10.810	K Factor = 5.10
4H	22.604	5.60	18.68	1	T	5.0	10.500	120	11.121	
to							5.000		0.379	
4	21.729		18.68	1.049			15.500	0.1146	1.777	Vel = 6.93
			0.0							
4			18.68						13.277	K Factor = 5.13
5H	24.854	5.60	14.85	1	T	5.0	2.833	120	7.033	
to							5.000		0.830	
5	22.938		14.85	1.049			7.833	0.0751	0.588	Vel = 5.51
			0.0							
5			14.85						8.451	K Factor = 5.11
6H	24.854	5.60	15.12	1	T	5.0	2.833	120	7.293	
to							5.000		0.830	
6	22.938		15.12	1.049			7.833	0.0775	0.607	Vel = 5.61
			0.0							
6			15.12						8.730	K Factor = 5.12
7H	24.854	5.60	16.08	1	T	5.0	2.833	120	8.245	
to							5.000		0.830	
7	22.938		16.08	1.049			7.833	0.0868	0.680	Vel = 5.97
			0.0							
7			16.08						9.755	K Factor = 5.15
8H	24.854	5.60	18.02	1	T	5.0	2.833	120	10.354	
to							5.000		0.830	
8	22.938		18.02	1.049			7.833	0.1072	0.840	Vel = 6.69
			0.0							
8			18.02						12.024	K Factor = 5.20
9H	29.958	5.60	17.00	1	T	5.0	0.917	120	9.216	
to							5.000		0.397	
9	29.042		17.0	1.049			5.917	0.0962	0.569	Vel = 6.31
			0.0							
9			17.00						10.182	K Factor = 5.33
10H	29.958	5.60	17.31	1	T	5.0	0.917	120	9.555	
to							5.000		0.397	
10	29.042		17.31	1.049			5.917	0.0995	0.589	Vel = 6.43

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 ******
			0.0							
10			17.31						10.541	K Factor = 5.33
11H	29.958	5.60	18.40	1	T	5.0	0.917	120	10.800	
to							5.000		0.397	
11	29.042		18.4	1.049			5.917	0.1115	0.660	Vel = 6.83
			0.0							
11			18.40						11.857	K Factor = 5.34
1	21.729		15.58	1.25			14.167	120	9.386	
to									0.0	
2	21.729		15.58	1.38			14.167	0.0215	0.305	Vel = 3.34
2	21.729		15.84	1.25			14.167	120	9.691	
to									0.0	
3	21.729		31.42	1.38			14.167	0.0790	1.119	Vel = 6.74
3	21.729		16.77	1.25			14.167	120	10.810	
to									0.0	
4	21.729		48.19	1.38			14.167	0.1741	2.467	Vel = 10.34
4	21.729		18.68	1.25	2E	6.0	17.375	120	13.277	
to							6.000		3.997	
F14	12.500		66.87	1.38			23.375	0.3192	7.462	Vel = 14.34
F14	12.500		0.0	1.25	T	6.0	17.000	120	24.736	
to							6.000		0.0	
F13	12.500		66.87	1.38			23.000	0.3192	7.342	Vel = 14.34
			0.0							
F13			66.87						32.078	K Factor = 11.81
5	22.938		14.85	1.25			14.167	120	8.451	
to									0.0	
6	22.938		14.85	1.38			14.167	0.0197	0.279	Vel = 3.19
6	22.938		15.12	1.25			14.167	120	8.730	
to									0.0	
7	22.938		29.97	1.38			14.167	0.0724	1.025	Vel = 6.43
7	22.938		16.08	1.25			14.167	120	9.755	
to									0.0	
8	22.938		46.05	1.38			14.167	0.1602	2.269	Vel = 9.88
8	22.938		18.02	1.25	3E	9.0	22.458	120	12.024	
to							9.000		4.521	
F12	12.500		64.07	1.38			31.458	0.2950	9.279	Vel = 13.74
F12	12.500		0.0	1.25	T	6.0	15.542	120	25.824	
to							6.000		0.0	
F11	12.500		64.07	1.38			21.542	0.2950	6.355	Vel = 13.74
			0.0							
F11			64.07						32.179	K Factor = 11.29
F13	12.500		66.87	2.5			7.333	120	32.078	
to									0.0	
F11	12.500		66.87	2.635			7.333	0.0138	0.101	Vel = 3.93
F11	12.500		64.07	2.5	2E	16.474	43.625	120	32.179	
to							16.474		0.794	
F7	10.667		130.94	2.635			60.099	0.0474	2.850	Vel = 7.70

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 ******
F7	10.667		0.0	2.5	T	16.474	26.208	120	35.823	
to							16.474		0.0	
F6	10.667		130.94	2.635			42.682	0.0474	2.024	Vel = 7.70
			0.0							
F6			130.94						37.847	K Factor = 21.28
9	29.042		17.00	1.25			14.167	120	10.182	
to									0.0	
10	29.042		17.0	1.38			14.167	0.0253	0.359	Vel = 3.65
10	29.042		17.31	1.25			14.167	120	10.541	
to									0.0	
11	29.042		34.31	1.38			14.167	0.0929	1.316	Vel = 7.36
11	29.042		18.40	1.25	E	3.0	24.167	120	11.857	
to							3.000		0.0	
G3	29.042		52.71	1.38			27.167	0.2056	5.586	Vel = 11.31
			0.0							
G3			52.71						17.443	K Factor = 12.62
G3	29.042		52.71	1.25	T	6.0	52.792	120	17.443	
to							6.000		3.339	
G2	21.333		52.71	1.38			58.792	0.2056	12.087	Vel = 11.31
			0.0							
G2			52.71						32.869	K Factor = 9.19
G2	21.333		52.71	2.5	2E	16.474	12.667	120	32.869	
to							16.474		4.619	
G1	10.667		52.71	2.635			29.141	0.0088	0.257	Vel = 3.10
G1	10.667		0.0	2.5			11.625	120	37.745	
to									0.0	
F6	10.667		52.71	2.635			11.625	0.0088	0.102	Vel = 3.10
			0.0							
F6			52.71						37.847	K Factor = 8.57
F6	10.667		183.66	2.5	3E	24.711	20.833	120	37.847	
to							24.711		0.505	
F4	9.500		183.66	2.635			45.544	0.0887	4.040	Vel = 10.81
F4	9.500		0.0	2.5	T	16.474	31.125	120	42.392	
to							16.474		0.0	
E1	9.500		183.66	2.635			47.599	0.0887	4.221	Vel = 10.81
			0.0							
E1			183.66						46.613	K Factor = 26.90
E1	9.500		183.66	4	E	13.167	9.708	120	46.613	
to							13.167		-0.217	
TOR1	10		183.66	4.26			22.875	0.0086	0.196	Vel = 4.13
			0.0							
TOR1			183.66						46.592	K Factor = 26.91
TOR1	10		183.66	4	E	13.167	8.042	120	46.592	
to					B	15.8	28.967		6.465	* * Fixed Loss = 3
BOR1	2		183.66	4.26	Fsp	0.0	37.009	0.0085	0.316	Vel = 4.13
			0.0							
BOR1			183.66						53.373	K Factor = 25.14

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 ******
BOR1	2		183.66	6	E	17.603	13.292	120	53.373	
to					2T	75.44	145.851		0.0	
PD	2		183.66	6.357	B	12.573	159.143	0.0012	0.194	Vel = 1.86
					S	40.235				
			0.0							
PD			183.66						53.567	K Factor = 25.09
System Demand Pressure									53.567	
Safety Margin									29.865	
Continuation Pressure									83.432	
Pressure @ Pump Outlet									83.432	
Pressure From Pump Curve									-43.994	
Pressure @ Pump Inlet									39.438	
PS	2		0.0	6	2T	75.44	5.458	120	39.438	
to					G	3.772	79.212		0.433	
FLG	1		183.66	6.357			84.670	0.0012	0.103	Vel = 1.86
			0.0							
FLG			183.66						39.974	K Factor = 29.05
FLG	1		183.66	6	E	20.084	4.000	140	39.974	
to							20.084		1.732	
UG1	-3		183.66	6.16			24.084	0.0011	0.026	Vel = 1.98
			0.0							
UG1			183.66						41.732	K Factor = 28.43
UG1	-3		183.66	6	T	43.037	77.000	140	41.732	
to							43.037		0.0	
UG2	-3		183.66	6.16			120.037	0.0011	0.128	Vel = 1.98
UG2	-3		-38.79	8			179.000	140	41.860	
to									0.0	
UG3	-3		144.87	8.27			179.000	0.0002	0.029	Vel = 0.87
			0.0							
UG3			144.87						41.889	K Factor = 22.38
UG2	-3		38.78	8	V	20.56	261.000	140	41.860	
to							20.560		0.0	
UG0	-3		38.78	8.27			281.560	0	0.004	Vel = 0.23
UG0	-3		0.0	8	10V	205.602	1507.000	140	41.864	
to					T	55.354	260.956		0.0	
UG3	-3		38.78	8.27			1767.956	0	0.025	Vel = 0.23
			0.0							
UG3			38.78						41.889	K Factor = 5.99
UG3	-3		183.66	8	G	6.326	521.000	140	41.889	
to					2V	41.12	104.382		-2.166	
BF1	2		183.66	8.27	2E	56.936	625.382	0.0003	0.160	Vel = 1.10
BF1	2		0.0	8	2E	56.936	15.000	140	39.883	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		183.66	8.27			71.936	0.0002	0.017	Vel = 1.10
BF2	-3		0.0	8	V	20.56	75.000	140	54.566	
to					T	55.354	75.914		0.0	
UG4	-3		183.66	8.27			150.914	0.0003	0.039	Vel = 1.10
			0.0							

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 ******
UG4			183.66						54.605	K Factor = 24.85
UG4	-3		183.66	8	4G	28.75	4156.000	150	54.605	
to					8V	186.874	215.624		0.0	
UG5	-3		183.66	8.27			4371.624	0.0002	0.977	Vel = 1.10
UG5	-3		0.0	8	8V	186.874	3360.000	150	55.582	
to					E	32.344	296.483		0.0	
UG6	-3		183.66	8.27	T	62.89	3656.483	0.0002	0.818	Vel = 1.10
					2G	14.375				
			0.0							
UG6			183.66						56.400	K Factor = 24.46
UG6	-3		183.66	12	T	106.533	47.000	150	56.400	
to							106.533		0.0	
UG7	-3		183.66	12.34			153.533	0	0.005	Vel = 0.49
			0.0							
UG7			183.66						56.405	K Factor = 24.45
UG7	-3		183.66	6	E	22.818	13.000	150	56.405	
to					T	48.896	71.714		0.0	
UG8	-3		183.66	6.16			84.714	0.0009	0.079	Vel = 1.98
			0.0							
UG8			183.66						56.484	K Factor = 24.44
UG8	-3		183.66	6	T	43.037	77.000	140	56.484	
to							43.037		0.0	
UG9	-3		183.66	6.16			120.037	0.0011	0.128	Vel = 1.98
UG9	-3		0.0	12	2V	15.94	2136.000	140	56.612	
to					T	93.767	161.279		0.0	
TEST	-3		183.66	12.34	G	9.377	2297.279	0	0.083	Vel = 0.49
					E	42.195				
			100.00							Qa = 100.00
TEST			283.66						56.695	K Factor = 37.67

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-4
Drawing	:	FP12
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-4
Contract	:	4070
Data File	:	NWHES 04 SYS-1 ZONE1 MECH ABV 227 OH1.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP12
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-4
Remote area location MECH PLATFORM ABOVE TEACHER LOUGNE 227
Occupancy classification OH-1
Density 0.15 - Gpm/SqFt
Area of application WHOLE ROOM - SqFt
Coverage/sprinkler 130 SF MAX - SqFt
Type of sprinkler calculated QR UPRIGHT 1/2" 155F 5.6K
 # Sprinklers calculated 11
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 483.17 - GPM @ 49.229 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:

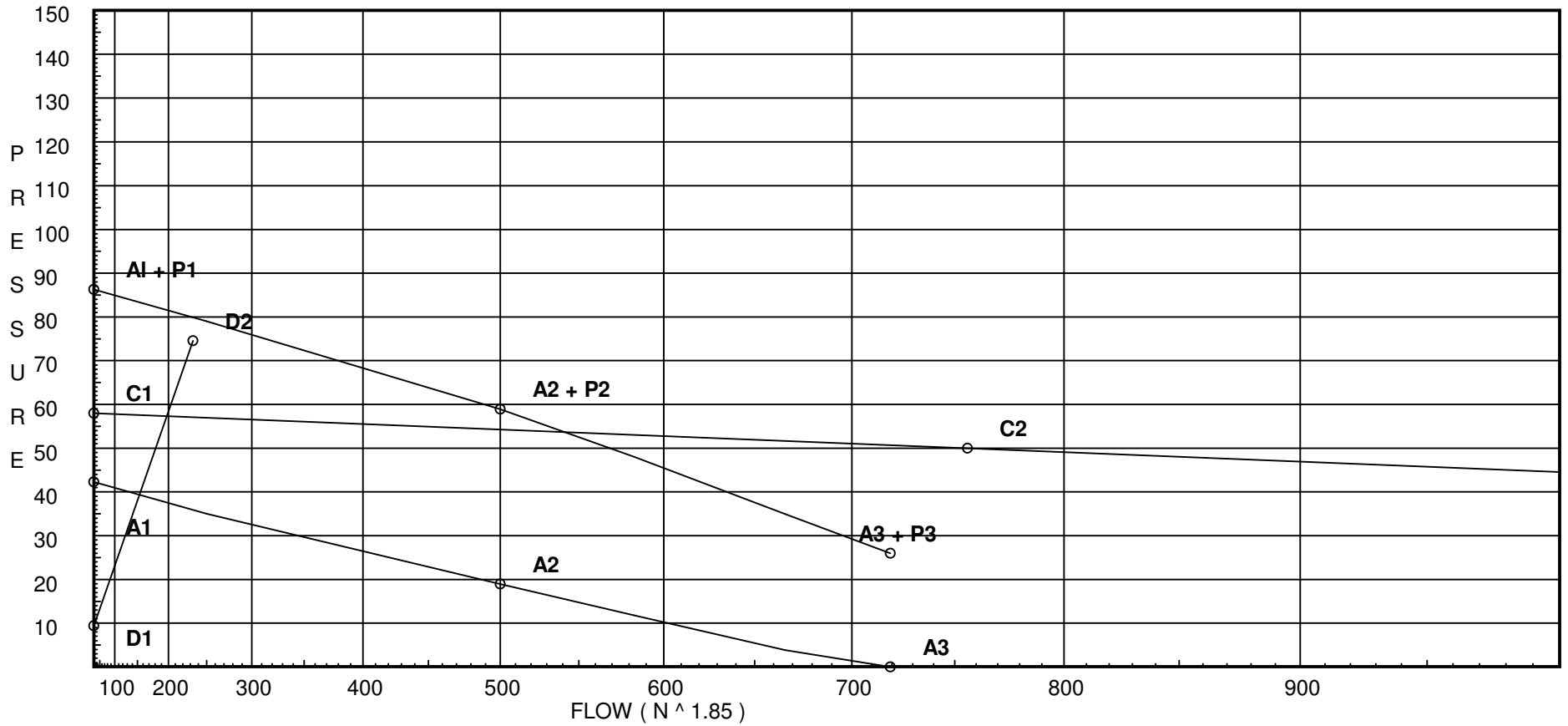
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 42.302
- A2 - Adj Resid : 18.917 @ 500
- A3 - Adj Resid : 0 @ 719.14

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 719.14
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.71

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 9.420
- D2 - System Flow : 233.17
- D2 - System Pressure : 74.523
- Hose (Demand) : _____
- D3 - System Demand : 233.17
- Hose (Adj City) : 250
- Safety Margin : 5.276



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			79.799	233.17	74.523
TEST	58.0	50	756.0	54.505	483.17	54.505

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	18.75	5.6	10.69	18.31	0.15	122.08
2H	18.75	5.6	10.96	18.54	0.15	112.08
3H	18.75	5.6	11.96	19.37	0.15	112.08
4H	18.75	5.6	10.49	18.14	0.15	80.56
5H	18.75	5.6	11.15	18.7	0.15	102.08
6H	18.75	5.6	15.82	22.28	0.15	122.08
7H	18.75	5.6	16.76	22.93	0.15	112.08
8H	18.75	5.6	18.23	23.91	0.15	112.08
9H	18.75	5.6	12.22	19.58	0.15	72.83
10H	18.75	5.6	12.52	19.82	0.15	72.83
11H	18.75	5.6	31.86	31.61	0.15	97.4
1	18.25		11.56			
2	18.25		11.85			
3	18.25		12.91			
4	17.75		11.57			
5	17.75		12.27			
6	20.0		16.22			
7	17.75		18.2			
8	17.75		19.74			
9	19.75		12.54			
10	19.75		12.86			
152T	19.75		13.82			
152B	17.75		16.51			
150	17.75		17.38			
151	17.75		22.57			
153	17.75		23.12			
11	17.75		36.47			
154	17.75		43.74			
155	10.583		63.81			
E5	11.25		64.06			
E4	16.917		63.1			
E3	16.917		63.29			
E2	9.5		67.06			
E1	9.5		67.18			
TOR1	10.0		67.26			
BOR1	2.0		74.22			
PD	2.0		74.52			
PS	2.0		35.81			
FLG	1.0		36.4			
UG1	-3.0		38.17			
UG2	-3.0		38.37			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
UG0	-3.0		38.38		
UG3	-3.0		38.42		
BF1	2.0		36.5		
BF2	-3.0		51.19		
UG4	-3.0		51.25		
UG5	-3.0		52.77		
UG6	-3.0		54.05		
UG7	-3.0		54.05		
UG8	-3.0		54.18		
UG9	-3.0		54.38		
TEST	-3.0		54.5	250.0	

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 ******
1H	18.750	5.60	18.31	1	2E	4.0	1.917	120	10.693	
to							4.000		0.217	
1	18.250		18.31	1.049			5.917	0.1105	0.654	Vel = 6.80
			0.0							
1			18.31						11.564	K Factor = 5.38
2H	18.750	5.60	18.54	1	T	5.0	1.000	120	10.959	
to							5.000		0.217	
2	18.250		18.54	1.049			6.000	0.1130	0.678	Vel = 6.88
			0.0							
2			18.54						11.854	K Factor = 5.38
3H	18.750	5.60	19.37	1	T	5.0	1.000	120	11.962	
to							5.000		0.217	
3	18.250		19.37	1.049			6.000	0.1225	0.735	Vel = 7.19
			0.0							
3			19.37						12.914	K Factor = 5.39
4H	18.750	5.60	18.14	1	T	5.0	1.000	120	10.488	
to							5.000		0.433	
4	17.750		18.14	1.049			6.000	0.1087	0.652	Vel = 6.73
			0.0							
4			18.14						11.573	K Factor = 5.33
5H	18.750	5.60	18.70	1	T	5.0	1.000	120	11.152	
to							5.000		0.433	
5	17.750		18.7	1.049			6.000	0.1148	0.689	Vel = 6.94
			0.0							
5			18.70						12.274	K Factor = 5.34
6H	18.750	5.60	22.28	1	2E	4.0	1.917	120	15.825	
to							4.000		-0.541	
6	20		22.28	1.049			5.917	0.1589	0.940	Vel = 8.27
			0.0							
6			22.28						16.224	K Factor = 5.53
7H	18.750	5.60	22.92	1	T	5.0	1.000	120	16.759	
to							5.000		0.433	
7	17.750		22.92	1.049			6.000	0.1677	1.006	Vel = 8.51
			0.0							
7			22.92						18.198	K Factor = 5.37
8H	18.750	5.60	23.91	1	T	5.0	1.000	120	18.225	
to							5.000		0.433	
8	17.750		23.91	1.049			6.000	0.1812	1.087	Vel = 8.88
			0.0							
8			23.91						19.745	K Factor = 5.38
9H	18.750	5.60	19.58	1	T	5.0	1.000	120	12.223	
to							5.000		-0.433	
9	19.750		19.58	1.049			6.000	0.1250	0.750	Vel = 7.27
			0.0							
9			19.58						12.540	K Factor = 5.53
10H	18.750	5.60	19.82	1	T	5.0	1.000	120	12.523	
to							5.000		-0.433	
10	19.750		19.82	1.049			6.000	0.1280	0.768	Vel = 7.36

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 ******
			0.0							
10			19.82						12.858	K Factor = 5.53
11H	18.750	5.60	31.61	1	2E	4.0	4.750	120	31.859	
to					T	5.0	9.000		0.433	
11	17.750		31.61	1.049			13.750	0.3035	4.173	Vel = 11.73
			0.0							
11			31.61						36.465	K Factor = 5.23
1	18.250		18.31	1.25			10.000	120	11.564	
to									0.0	
2	18.250		18.31	1.38			10.000	0.0290	0.290	Vel = 3.93
2	18.250		18.54	1.25			10.000	120	11.854	
to									0.0	
3	18.250		36.85	1.38			10.000	0.1060	1.060	Vel = 7.90
3	18.250		19.37	1.25	3E	9.0	3.333	120	12.914	
to					T	6.0	15.000		0.217	
150	17.750		56.22	1.38			18.333	0.2316	4.246	Vel = 12.06
			0.0							
150			56.22						17.377	K Factor = 13.49
4	17.750		18.14	1			6.458	120	11.573	
to									0.0	
5	17.750		18.14	1.049			6.458	0.1085	0.701	Vel = 6.73
5	17.750		18.70	1	T	5.0	7.667	120	12.274	
to							5.000		0.0	
150	17.750		36.84	1.049			12.667	0.4029	5.103	Vel = 13.68
			0.0							
150			36.84						17.377	K Factor = 8.84
6	20		22.28	1.25	3E	9.0	14.917	120	16.224	
to							9.000		0.974	
7	17.750		22.28	1.38			23.917	0.0418	1.000	Vel = 4.78
7	17.750		22.92	1.25			10.000	120	18.198	
to									0.0	
8	17.750		45.2	1.38			10.000	0.1547	1.547	Vel = 9.70
8	17.750		23.91	1.25	T	6.0	2.333	120	19.745	
to							6.000		0.0	
151	17.750		69.11	1.38			8.333	0.3393	2.827	Vel = 14.82
			0.0							
151			69.11						22.572	K Factor = 14.55
9	19.750		19.58	1	T	5.0	5.208	120	12.540	
to							5.000		0.0	
152T	19.750		19.58	1.049			10.208	0.1252	1.278	Vel = 7.27
			0.0							
152T			19.58						13.818	K Factor = 5.27
10	19.750		19.82	1	T	5.0	2.500	120	12.858	
to							5.000		0.0	
152T	19.750		19.82	1.049			7.500	0.1280	0.960	Vel = 7.36
152T	19.750		19.58	1	E	2.0	2.000	120	13.818	
to							2.000		0.866	
152B	17.750		39.4	1.049			4.000	0.4560	1.824	Vel = 14.63

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 ******
152B	17.750		0.0	1	T	5.0	9.500	120	16.508	
to							5.000		0.0	
153	17.750		39.4	1.049			14.500	0.4561	6.614	Vel = 14.63
			0.0							
153			39.40						23.122	K Factor = 8.19
150	17.750		93.06	1.5	T	8.0	10.708	120	17.377	
to							8.000		0.0	
151	17.750		93.06	1.61			18.708	0.2777	5.195	Vel = 14.67
151	17.750		69.11	1.5			0.708	120	22.572	
to									0.0	
153	17.750		162.17	1.61			0.708	0.7768	0.550	Vel = 25.56
153	17.750		39.39	1.5	E	4.0	7.500	120	23.122	
to							4.000		0.0	
11	17.750		201.56	1.61			11.500	1.1603	13.343	Vel = 31.76
11	17.750		31.61	1.5	E	4.0	0.792	120	36.465	
to							4.000		0.0	
154	17.750		233.17	1.61			4.792	1.5192	7.280	Vel = 36.75
			0.0							
154			233.17						43.745	K Factor = 35.25
154	17.750		233.17	1.5	E	4.0	7.167	120	43.745	
to							4.000		3.104	
155	10.583		233.17	1.61			11.167	1.5191	16.964	Vel = 36.75
			0.0							
155			233.17						63.813	K Factor = 29.19
155	10.583		233.17	4	2E	26.334	14.042	120	63.813	
to							26.334		-0.289	
E5	11.250		233.17	4.26			40.376	0.0133	0.537	Vel = 5.25
E5	11.250		0.0	4	2E	26.334	86.333	120	64.061	
to							26.334		-2.454	
E4	16.917		233.17	4.26			112.667	0.0133	1.497	Vel = 5.25
E4	16.917		0.0	4			14.125	120	63.104	
to									0.0	
E3	16.917		233.17	4.26			14.125	0.0133	0.188	Vel = 5.25
			0.0							
E3			233.17						63.292	K Factor = 29.31
E3	16.917		233.17	4	2E	26.334	15.667	120	63.292	
to							26.334		3.212	
E2	9.500		233.17	4.26			42.001	0.0133	0.559	Vel = 5.25
E2	9.500		0.0	4			8.667	120	67.063	
to									0.0	
E1	9.500		233.17	4.26			8.667	0.0133	0.115	Vel = 5.25
			0.0							
E1			233.17						67.178	K Factor = 28.45
E1	9.500		233.17	4	E	13.167	9.708	120	67.178	
to							13.167		-0.217	
TOR1	10		233.17	4.26			22.875	0.0133	0.304	Vel = 5.25
			0.0							

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 ******
TOR1			233.17						67.265	K Factor = 28.43
TOR1	10		233.17	4	E	13.167	8.042	120	67.265	
to					B	15.8	28.967		6.465	* * Fixed Loss = 3
BOR1	2		233.17	4.26	Fsp	0.0	37.009	0.0133	0.492	Vel = 5.25
			0.0							
BOR1			233.17						74.222	K Factor = 27.06
BOR1	2		233.17	6	E	17.603	13.292	120	74.222	
to					2T	75.44	145.851		0.0	
PD	2		233.17	6.357	B	12.573	159.143	0.0019	0.301	Vel = 2.36
					S	40.235				
			0.0							
PD			233.17						74.523	K Factor = 27.01
System Demand Pressure									74.523	
Safety Margin									5.276	
Continuation Pressure									79.799	
Pressure @ Pump Outlet									79.799	
Pressure From Pump Curve									-43.991	
Pressure @ Pump Inlet									35.808	
PS	2		0.0	6	2T	75.44	5.458	120	35.808	
to					G	3.772	79.212		0.433	
FLG	1		233.17	6.357			84.670	0.0019	0.161	Vel = 2.36
			0.0							
FLG			233.17						36.402	K Factor = 38.65
FLG	1		233.17	6	E	20.084	4.000	140	36.402	
to							20.084		1.732	
UG1	-3		233.17	6.16			24.084	0.0017	0.040	Vel = 2.51
			0.0							
UG1			233.17						38.174	K Factor = 37.74
UG1	-3		233.17	6	T	43.037	77.000	140	38.174	
to							43.037		0.0	
UG2	-3		233.17	6.16			120.037	0.0017	0.199	Vel = 2.51
UG2	-3		-49.24	8			179.000	140	38.373	
to									0.0	
UG3	-3		183.93	8.27			179.000	0.0003	0.045	Vel = 1.10
			0.0							
UG3			183.93						38.418	K Factor = 29.67
UG2	-3		49.24	8	V	20.56	261.000	140	38.373	
to							20.560		0.0	
UG0	-3		49.24	8.27			281.560	0	0.006	Vel = 0.29
UG0	-3		0.0	8	10V	205.602	1507.000	140	38.379	
to					T	55.354	260.956		0.0	
UG3	-3		49.24	8.27			1767.956	0	0.039	Vel = 0.29
			0.0							
UG3			49.24						38.418	K Factor = 7.94
UG3	-3		233.17	8	G	6.326	521.000	140	38.418	
to					2V	41.12	104.382		-2.166	
BF1	2		233.17	8.27	2E	56.936	625.382	0.0004	0.248	Vel = 1.39

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 ******
BF1	2		0.0	8	2E	56.936	15.000	140	36.500	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		233.17	8.27			71.936	0.0004	0.028	Vel = 1.39
BF2	-3		0.0	8	V	20.56	75.000	140	51.194	
to					T	55.354	75.914		0.0	
UG4	-3		233.17	8.27			150.914	0.0004	0.060	Vel = 1.39
			0.0							
UG4			233.17						51.254	K Factor = 32.57
UG4	-3		233.17	8	4G	28.75	4156.000	150	51.254	
to					8V	186.874	215.624		0.0	
UG5	-3		233.17	8.27			4371.624	0.0003	1.520	Vel = 1.39
UG5	-3		0.0	8	8V	186.874	3360.000	150	52.774	
to					E	32.344	296.483		0.0	
UG6	-3		233.17	8.27	T	62.89	3656.483	0.0003	1.272	Vel = 1.39
					2G	14.375				
			0.0							
UG6			233.17						54.046	K Factor = 31.72
UG6	-3		233.17	12	T	106.533	47.000	150	54.046	
to							106.533		0.0	
UG7	-3		233.17	12.34			153.533	0	0.007	Vel = 0.63
			0.0							
UG7			233.17						54.053	K Factor = 31.71
UG7	-3		233.17	6	E	22.818	13.000	150	54.053	
to					T	48.896	71.714		0.0	
UG8	-3		233.17	6.16			84.714	0.0015	0.124	Vel = 2.51
			0.0							
UG8			233.17						54.177	K Factor = 31.68
UG8	-3		233.17	6	T	43.037	77.000	140	54.177	
to							43.037		0.0	
UG9	-3		233.17	6.16			120.037	0.0017	0.199	Vel = 2.51
UG9	-3		0.0	12	2V	15.94	2136.000	140	54.376	
to					T	93.767	161.279		0.0	
TEST	-3		233.17	12.34	G	9.377	2297.279	0.0001	0.129	Vel = 0.63
					E	42.195				
			250.00							Qa = 250.00
TEST			483.17						54.505	K Factor = 65.45

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-5
Drawing	:	FP11
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-5
Contract	:	4070
Data File	:	NWHES 05 SYS-1 ZONE1 M100 OH2.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP11
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-5
Remote area location MECH M100
Occupancy classification OH-2
Density 0.2 - Gpm/SqFt
Area of application WHOLE AREA - SqFt
Coverage/sprinkler 130 SF MAX - SqFt
Type of sprinkler calculated QR PENDENT & UPRIGHT 1/2" 155F 5.6K
 # Sprinklers calculated 12
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 582.363 - GPM @ 39.38 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:

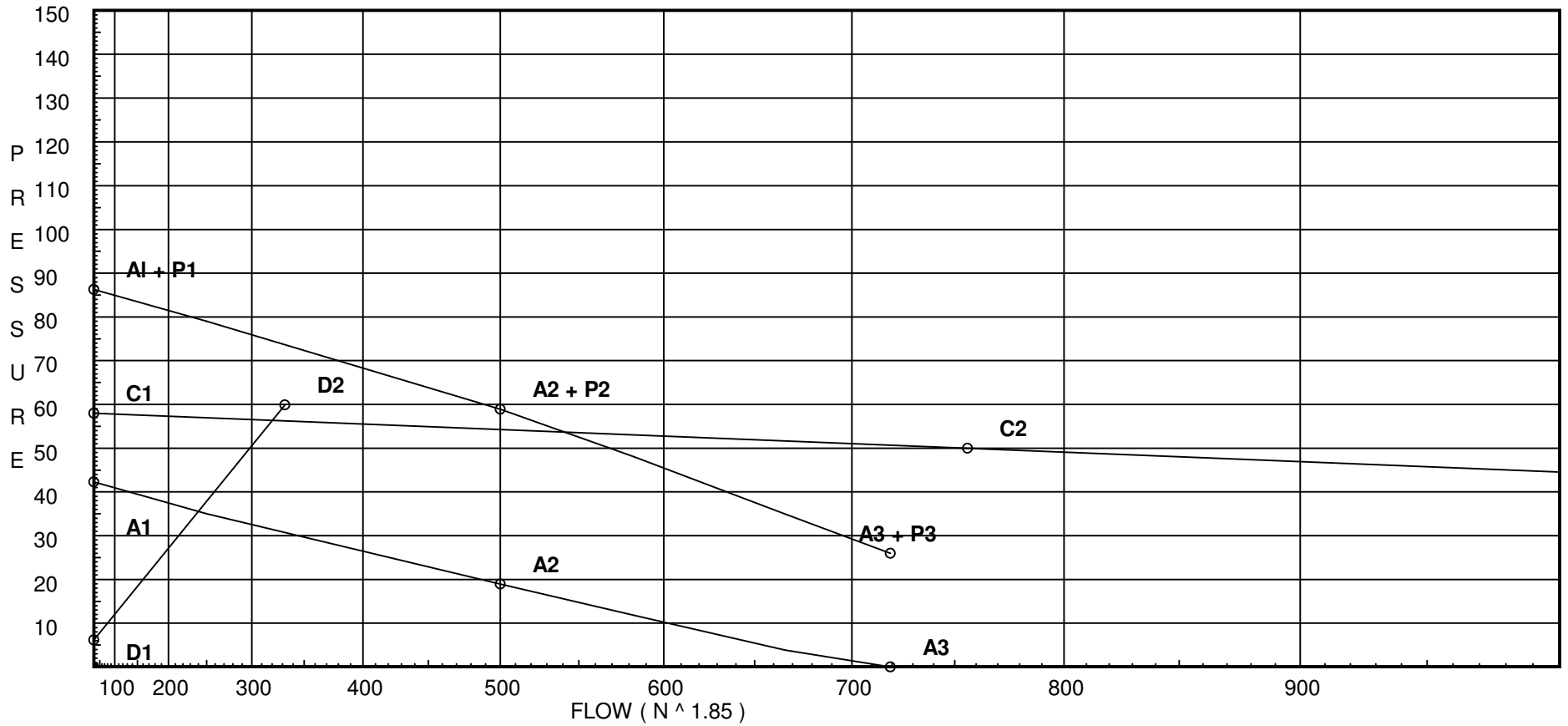
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 42.302
- A2 - Adj Resid : 18.917 @ 500
- A3 - Adj Resid : 0 @ 719.14

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 719.14
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.71

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 6.172
- D2 - System Flow : 332.363
- D2 - System Pressure : 59.875
- Hose (Demand) : _____
- D3 - System Demand : 332.363
- Hose (Adj City) : 250
- Safety Margin : 13.683



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			73.558	332.36	59.875
TEST	58.0	50	756.0	53.063	582.36	53.063

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	9.0	5.6	40.43	35.61	0.2	44
2H	9.0	5.6	39.56	35.22	0.2	120
3H	9.0	5.6	40.2	35.5	0.2	120
4H	9.0	5.6	40.02	35.43	0.2	120
5H	9.0	5.6	40.52	35.65	0.2	120
6H	9.0	5.6	40.66	35.71	0.2	120
7H	9.0	5.6	41.32	36.0	0.2	120
8H	11.25	5.6	7.0	14.82	0.2	60
9H	11.25	5.6	7.5	15.33	0.2	60
10H	11.25	5.6	9.44	17.2	0.2	76.67
11H	11.25	5.6	10.09	17.79	0.2	76.67
12H	11.25	5.6	10.46	18.11	0.2	26
1	9.5		42.73			
2	9.5		42.99			
3	9.5		43.68			
4	10.5		43.06			
5	9.5		44.03			
6	9.5		44.19			
7	9.5		44.9			
8	10.5		7.53			
9	10.5		8.28			
10	10.5		10.04			
11	10.5		11.02			
12	10.5		11.08			
J1	10.5		11.85			
J2	10.5		12.18			
J3	10.5		16.16			
J4	10.5		41.42			
F5	10.667		46.47			
F4	9.5		47.05			
F3	9.5		47.07			
F2	9.5		47.44			
F1	9.5		48.37			
E1	9.5		51.76			
TOR1	10.0		51.88			
BOR1	2.0		59.3			
PD	2.0		59.88			
PS	2.0		30.63			
FLG	1.0		31.37			
UG1	-3.0		33.18			
UG2	-3.0		33.56			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
UG0	-3.0		33.58		
UG3	-3.0		33.65		
BF1	2.0		31.96		
BF2	-3.0		46.68		
UG4	-3.0		46.8		
UG5	-3.0		49.73		
UG6	-3.0		52.18		
UG7	-3.0		52.19		
UG8	-3.0		52.43		
UG9	-3.0		52.81		
TEST	-3.0		53.06	250.0	

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 ******
1H	9	5.60	35.61	1	3E	6.0	0.667	120	40.427	
to							6.000		-0.217	
1	9.500		35.61	1.049			6.667	0.3783	2.522	Vel = 13.22
			0.0							
1			35.61						42.732	K Factor = 5.45
2H	9	5.60	35.22	1	2E	4.0	0.833	120	39.559	
to					T	5.0	9.000		-0.217	
2	9.500		35.22	1.049			9.833	0.3708	3.646	Vel = 13.07
			0.0							
2			35.22						42.988	K Factor = 5.37
3H	9	5.60	35.50	1	2E	4.0	0.833	120	40.196	
to					T	5.0	9.000		-0.217	
3	9.500		35.5	1.049			9.833	0.3764	3.701	Vel = 13.18
			0.0							
3			35.50						43.680	K Factor = 5.37
4H	9	5.60	35.43	1	2E	4.0	0.833	120	40.021	
to					T	5.0	9.000		-0.650	
4	10.500		35.43	1.049			9.833	0.3748	3.685	Vel = 13.15
			0.0							
4			35.43						43.056	K Factor = 5.40
5H	9	5.60	35.65	1	2E	4.0	0.833	120	40.518	
to					T	5.0	9.000		-0.217	
5	9.500		35.65	1.049			9.833	0.3791	3.728	Vel = 13.23
			0.0							
5			35.65						44.029	K Factor = 5.37
6H	9	5.60	35.71	1	2E	4.0	0.833	120	40.663	
to					T	5.0	9.000		-0.217	
6	9.500		35.71	1.049			9.833	0.3804	3.740	Vel = 13.26
			0.0							
6			35.71						44.186	K Factor = 5.37
7H	9	5.60	36.00	1	2E	4.0	0.833	120	41.317	
to					T	5.0	9.000		-0.217	
7	9.500		36.0	1.049			9.833	0.3859	3.795	Vel = 13.36
			0.0							
7			36.00						44.895	K Factor = 5.37
8H	11.250	5.60	14.82	1	E	2.0	0.750	120	7.000	
to							2.000		0.325	
8	10.500		14.82	1.049			2.750	0.0745	0.205	Vel = 5.50
			0.0							
8			14.82						7.530	K Factor = 5.40
9H	11.250	5.60	15.33	1	T	5.0	0.750	120	7.495	
to							5.000		0.325	
9	10.500		15.33	1.049			5.750	0.0795	0.457	Vel = 5.69
			0.0							
9			15.33						8.277	K Factor = 5.33
10H	11.250	5.60	17.20	1	E	2.0	0.750	120	9.439	
to							2.000		0.325	
10	10.500		17.2	1.049			2.750	0.0985	0.271	Vel = 6.39

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 ******
			0.0							
10			17.20						10.035	K Factor = 5.43
11H	11.250	5.60	17.79	1	T	5.0	0.750	120	10.093	
to							5.000		0.325	
11	10.500		17.79	1.049			5.750	0.1047	0.602	Vel = 6.60
			0.0							
11			17.79						11.020	K Factor = 5.36
12H	11.250	5.60	18.11	1	E	2.0	0.750	120	10.458	
to							2.000		0.325	
12	10.500		18.11	1.049			2.750	0.1080	0.297	Vel = 6.72
			0.0							
12			18.11						11.080	K Factor = 5.44
1	9.500		35.61	1	T	5.0	6.208	120	42.732	
to							5.000		-0.505	
F5	10.667		35.61	1.049			11.208	0.3782	4.239	Vel = 13.22
			0.0							
F5			35.61						46.466	K Factor = 5.22
2	9.500		35.22	1	T	5.0	6.000	120	42.988	
to							5.000		0.0	
F3	9.500		35.22	1.049			11.000	0.3707	4.078	Vel = 13.07
			0.0							
F3			35.22						47.066	K Factor = 5.13
3	9.500		35.50	1	T	5.0	4.000	120	43.680	
to							5.000		0.0	
F3	9.500		35.5	1.049			9.000	0.3762	3.386	Vel = 13.18
			0.0							
F3			35.50						47.066	K Factor = 5.17
4	10.500		35.43	1	2E	4.0	6.542	120	43.056	
to							4.000		0.433	
F2	9.500		35.43	1.049			10.542	0.3748	3.951	Vel = 13.15
			0.0							
F2			35.43						47.440	K Factor = 5.14
5	9.500		35.65	1	T	5.0	4.000	120	44.029	
to							5.000		0.0	
F2	9.500		35.65	1.049			9.000	0.3790	3.411	Vel = 13.23
			0.0							
F2			35.65						47.440	K Factor = 5.18
6	9.500		35.71	1	T	5.0	6.000	120	44.186	
to							5.000		0.0	
F1	9.500		35.71	1.049			11.000	0.3803	4.183	Vel = 13.26
			0.0							
F1			35.71						48.369	K Factor = 5.13
7	9.500		36.00	1	T	5.0	4.000	120	44.895	
to							5.000		0.0	
F1	9.500		36.0	1.049			9.000	0.3860	3.474	Vel = 13.36
			0.0							
F1			36.00						48.369	K Factor = 5.18

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 ******
8	10.500		14.82	1			10.000	120	7.530	
to									0.0	
9	10.500		14.82	1.049			10.000	0.0747	0.747	Vel = 5.50
9	10.500		15.33	1	T	5.0	9.042	120	8.277	
to							5.000		0.0	
J2	10.500		30.15	1.049			14.042	0.2780	3.904	Vel = 11.19
			0.0							
J2			30.15						12.181	K Factor = 8.64
10	10.500		17.20	1			10.000	120	10.035	
to									0.0	
11	10.500		17.2	1.049			10.000	0.0985	0.985	Vel = 6.39
11	10.500		17.80	1	T	5.0	9.042	120	11.020	
to							5.000		0.0	
J3	10.500		35.0	1.049			14.042	0.3663	5.144	Vel = 12.99
			0.0							
J3			35.00						16.164	K Factor = 8.71
12	10.500		18.11	1	E	2.0	5.083	120	11.080	
to							2.000		0.0	
J1	10.500		18.11	1.049			7.083	0.1084	0.768	Vel = 6.72
			0.0							
J1			18.11						11.848	K Factor = 5.26
J1	10.500		18.11	1			3.083	120	11.848	
to									0.0	
J2	10.500		18.11	1.049			3.083	0.1080	0.333	Vel = 6.72
J2	10.500		30.15	1			6.000	120	12.181	
to									0.0	
J3	10.500		48.26	1.049			6.000	0.6638	3.983	Vel = 17.92
J3	10.500		34.99	1	E	2.0	6.875	120	16.164	
to					T	5.0	7.000		0.0	
J4	10.500		83.25	1.049			13.875	1.8206	25.261	Vel = 30.90
J4	10.500		0.0	1	T	5.0	0.625	120	41.425	
to							5.000		0.217	
TOR1	10		83.25	1.049			5.625	1.8204	10.240	Vel = 30.90
			0.0							
TOR1			83.25						51.882	K Factor = 11.56
F5	10.667		35.61	2.5	2E	16.474	2.542	120	46.466	
to							16.474		0.505	
F4	9.500		35.61	2.635			19.016	0.0043	0.082	Vel = 2.10
F4	9.500		0.0	2.5			3.125	120	47.053	
to									0.0	
F3	9.500		35.61	2.635			3.125	0.0042	0.013	Vel = 2.10
F3	9.500		70.72	2.5			11.583	120	47.066	
to									0.0	
F2	9.500		106.33	2.635			11.583	0.0323	0.374	Vel = 6.26
F2	9.500		71.07	2.5			11.167	120	47.440	
to									0.0	
F1	9.500		177.4	2.635			11.167	0.0832	0.929	Vel = 10.44

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 ******
F1	9.500		71.71	2.5	T	16.474	5.250	120	48.369	
to							16.474		0.0	
E1	9.500		249.11	2.635			21.724	0.1559	3.386	Vel = 14.66
			0.0							
E1			249.11						51.755	K Factor = 34.63
E1	9.500		249.11	4	E	13.167	9.708	120	51.755	
to							13.167		-0.217	
TOR1	10		249.11	4.26			22.875	0.0150	0.344	Vel = 5.61
			0.0							
TOR1			249.11						51.882	K Factor = 34.58
TOR1	10		332.36	4	E	13.167	8.042	120	51.882	
to					B	15.8	28.967		6.465	* * Fixed Loss = 3
BOR1	2		332.36	4.26	Fsp	0.0	37.009	0.0256	0.948	Vel = 7.48
			0.0							
BOR1			332.36						59.295	K Factor = 43.16
BOR1	2		332.36	6	E	17.603	13.292	120	59.295	
to					2T	75.44	145.851		0.0	
PD	2		332.36	6.357	B	12.573	159.143	0.0036	0.580	Vel = 3.36
					S	40.235				
			0.0							
PD			332.36						59.875	K Factor = 42.95
System Demand Pressure									59.875	
Safety Margin									13.683	
Continuation Pressure									73.558	
Pressure @ Pump Outlet									73.558	
Pressure From Pump Curve									-42.928	
Pressure @ Pump Inlet									30.630	
PS	2		0.0	6	2T	75.44	5.458	120	30.630	
to					G	3.772	79.212		0.433	
FLG	1		332.36	6.357			84.670	0.0036	0.309	Vel = 3.36
			0.0							
FLG			332.36						31.372	K Factor = 59.34
FLG	1		332.36	6	E	20.084	4.000	140	31.372	
to							20.084		1.732	
UG1	-3		332.36	6.16			24.084	0.0032	0.077	Vel = 3.58
			0.0							
UG1			332.36						33.181	K Factor = 57.70
UG1	-3		332.36	6	T	43.037	77.000	140	33.181	
to							43.037		0.0	
UG2	-3		332.36	6.16			120.037	0.0032	0.384	Vel = 3.58
UG2	-3		-70.19	8			179.000	140	33.565	
to									0.0	
UG3	-3		262.17	8.27			179.000	0.0005	0.088	Vel = 1.57
			0.0							
UG3			262.17						33.653	K Factor = 45.19
UG2	-3		70.19	8	V	20.56	261.000	140	33.565	
to							20.560		0.0	
UG0	-3		70.19	8.27			281.560	0	0.012	Vel = 0.42

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 ******
UG0	-3		0.0	8	10V	205.602	1507.000	140	33.577	
to					T	55.354	260.956		0.0	
UG3	-3		70.19	8.27			1767.956	0	0.076	Vel = 0.42
			0.0							
UG3			70.19						33.653	K Factor = 12.10
UG3	-3		332.36	8	G	6.326	521.000	140	33.653	
to					2V	41.12	104.382		-2.166	
BF1	2		332.36	8.27	2E	56.936	625.382	0.0008	0.476	Vel = 1.99
BF1	2		0.0	8	2E	56.936	15.000	140	31.963	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		332.36	8.27			71.936	0.0008	0.055	Vel = 1.99
BF2	-3		0.0	8	V	20.56	75.000	140	46.684	
to					T	55.354	75.914		0.0	
UG4	-3		332.36	8.27			150.914	0.0008	0.115	Vel = 1.99
			0.0							
UG4			332.36						46.799	K Factor = 48.58
UG4	-3		332.36	8	4G	28.75	4156.000	150	46.799	
to					8V	186.874	215.624		0.0	
UG5	-3		332.36	8.27			4371.624	0.0007	2.929	Vel = 1.99
UG5	-3		0.0	8	8V	186.874	3360.000	150	49.728	
to					E	32.344	296.483		0.0	
UG6	-3		332.36	8.27	T	62.89	3656.483	0.0007	2.450	Vel = 1.99
					2G	14.375				
			0.0							
UG6			332.36						52.178	K Factor = 46.01
UG6	-3		332.36	12	T	106.533	47.000	150	52.178	
to							106.533		0.0	
UG7	-3		332.36	12.34			153.533	0.0001	0.014	Vel = 0.89
			0.0							
UG7			332.36						52.192	K Factor = 46.01
UG7	-3		332.36	6	E	22.818	13.000	150	52.192	
to					T	48.896	71.714		0.0	
UG8	-3		332.36	6.16			84.714	0.0028	0.239	Vel = 3.58
			0.0							
UG8			332.36						52.431	K Factor = 45.90
UG8	-3		332.36	6	T	43.037	77.000	140	52.431	
to							43.037		0.0	
UG9	-3		332.36	6.16			120.037	0.0032	0.383	Vel = 3.58
UG9	-3		0.0	12	2V	15.94	2136.000	140	52.814	
to					T	93.767	161.279		0.0	
TEST	-3		332.36	12.34	G	9.377	2297.279	0.0001	0.249	Vel = 0.89
					E	42.195				
			250.00							Qa = 250.00
TEST			582.36						53.063	K Factor = 79.95

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-6
Drawing	:	FP15
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-6
Contract	:	4070
Data File	:	NWHES 06 SYS-2 ZONE2 517 LH EC.WXF

Computer Programs by Hydratec Inc. Revision: 50.5520.727

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP15
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-6
Remote area location 2ND-3RD GRADE 517
Occupancy classification LH
Density 0.10 - Gpm/SqFt
Area of application 991 - SqFt
Coverage/sprinkler 324 SF MAX - SqFt
Type of sprinkler calculated QR EC CONCEALED PENDENT 1/2" 155F 5.6K
 # Sprinklers calculated 6
In-rack demand N/A - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 297.747 - GPM @ 53.452 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:
REDUCE AREA FOR HYDRAULIC CALCULATION PER NFPA13 2013 SECTION 11.2.3.2.3

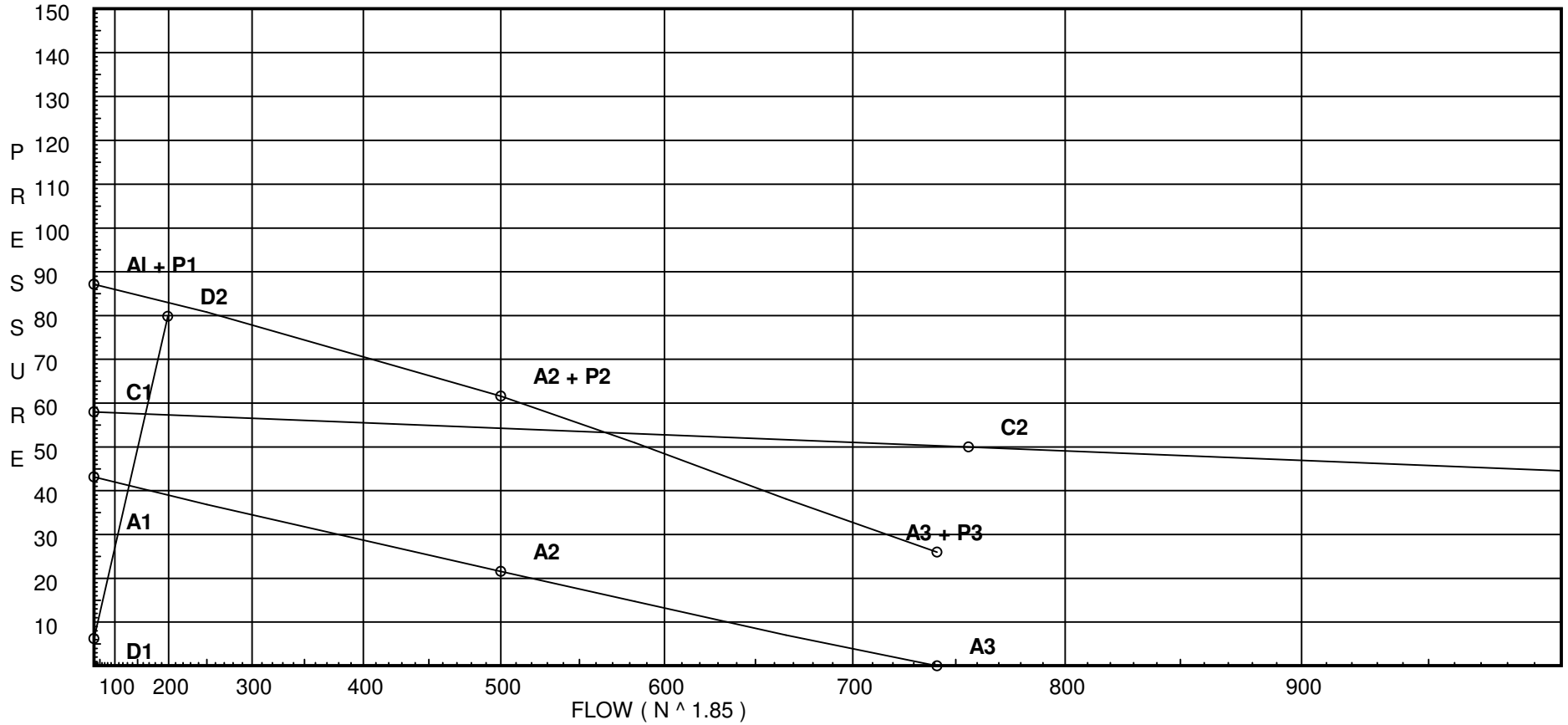
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 43.145
- A2 - Adj Resid : 21.583 @ 500
- A3 - Adj Resid : 0 @ 741.15

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 741.15
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.29

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 6.226
- D2 - System Flow : 198.747
- D2 - System Pressure : 79.780
- Hose (Demand) : _____
- D3 - System Demand : 198.747
- Hose (Adj City) : 100
- Safety Margin : 3.112



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			82.892	198.75	79.78
TEST	58.0	50	756.0	56.564	298.75	56.564

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	12.083	5.6	33.8	32.56	0.1	168
2H	12.083	5.6	34.31	32.8	0.1	168
3H	12.083	5.6	36.08	33.64	0.1	168
4H	11.375	5.6	34.27	32.78	0.1	196
5H	11.375	5.6	34.7	32.99	0.1	236
6H	11.375	5.6	36.82	33.98	0.1	236
1	12.792		36.67			
2	12.792		37.23			
3	12.792		39.15			
4	12.125		37.19			
5	12.125		37.66			
6	12.125		39.95			
500	12.792		53.5			
501	12.125		54.13			
B5	10.917		61.58			
B4	10.917		63.55			
B3	7.0		66.56			
B1	7.0		70.19			
A8	11.75		68.43			
A7	13.625		68.3			
A6	12.292		69.38			
A5	17.417		67.84			
A4	16.75		68.62			
A3	12.833		71.94			
A2	16.833		71.19			
A1	10.5		74.48			
TOR2	10.5		74.79			
BOR2	2.0		79.56			
PD	2.0		79.78			
PS	2.0		38.9			
FLG	1.0		39.45			
UG1	-3.0		41.21			
UG2	-3.0		41.36			
UG0	-3.0		41.37			
UG3	-3.0		41.39			
BF1	2.0		39.41			
BF2	-3.0		54.1			
UG4	-3.0		54.14			
UG5	-3.0		55.28			
UG6	-3.0		56.22			
UG7	-3.0		56.23			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
UG8	-3.0		56.32		
UG9	-3.0		56.47		
TEST	-3.0		56.56	100.0	

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 ******
1H	12.083	5.60	32.56	1	2E	4.0	0.917	120	33.799	
to					T	5.0	9.000		-0.307	
1	12.792		32.56	1.049			9.917	0.3205	3.178	Vel = 12.09
			0.0							
1			32.56						36.670	K Factor = 5.38
2H	12.083	5.60	32.80	1	2E	4.0	0.917	120	34.311	
to					T	5.0	9.000		-0.307	
2	12.792		32.8	1.049			9.917	0.3251	3.224	Vel = 12.18
			0.0							
2			32.80						37.228	K Factor = 5.38
3H	12.083	5.60	33.64	1	2E	4.0	0.917	120	36.084	
to					T	5.0	9.000		-0.307	
3	12.792		33.64	1.049			9.917	0.3405	3.377	Vel = 12.49
			0.0							
3			33.64						39.154	K Factor = 5.38
4H	11.375	5.60	32.78	1	2E	4.0	1.000	120	34.268	
to					T	5.0	9.000		-0.325	
4	12.125		32.78	1.049			10.000	0.3246	3.246	Vel = 12.17
			0.0							
4			32.78						37.189	K Factor = 5.38
5H	11.375	5.60	32.99	1	2E	4.0	1.000	120	34.700	
to					T	5.0	9.000		-0.325	
5	12.125		32.99	1.049			10.000	0.3284	3.284	Vel = 12.25
			0.0							
5			32.99						37.659	K Factor = 5.38
6H	11.375	5.60	33.98	1	2E	4.0	0.958	120	36.819	
to					T	5.0	9.000		-0.325	
6	12.125		33.98	1.049			9.958	0.3470	3.455	Vel = 12.61
			0.0							
6			33.98						39.949	K Factor = 5.38
1	12.792		32.56	1.5			14.000	120	36.670	
to									0.0	
2	12.792		32.56	1.61			14.000	0.0399	0.558	Vel = 5.13
2	12.792		32.80	1.5			13.333	120	37.228	
to									0.0	
3	12.792		65.36	1.61			13.333	0.1445	1.926	Vel = 10.30
3	12.792		33.64	1.5	T	8.0	38.083	120	39.154	
to							8.000		0.0	
500	12.792		99.0	1.61			46.083	0.3114	14.350	Vel = 15.60
			0.0							
500			99.00						53.504	K Factor = 13.53
4	12.125		32.78	1.5			11.667	120	37.189	
to									0.0	
5	12.125		32.78	1.61			11.667	0.0403	0.470	Vel = 5.17
5	12.125		32.99	1.5			15.667	120	37.659	
to									0.0	
6	12.125		65.77	1.61			15.667	0.1462	2.290	Vel = 10.36

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 ******
6	12.125		33.98	1.5	T	8.0	36.917	120	39.949	
to							8.000		0.0	
501	12.125		99.75	1.61			44.917	0.3158	14.184	Vel = 15.72
			0.0							
501			99.75						54.133	K Factor = 13.56
500	12.792		99.00	2.5			12.042	120	53.504	
to									0.289	
501	12.125		99.0	2.635			12.042	0.0282	0.340	Vel = 5.82
501	12.125		99.75	2.5	2E	16.474	34.542	120	54.133	
to					T	16.474	32.948		0.523	
B5	10.917		198.75	2.635			67.490	0.1026	6.927	Vel = 11.69
			0.0							
B5			198.75						61.583	K Factor = 25.33
B5	10.917		198.75	4	E	13.167	185.917	120	61.583	
to							13.167		0.0	
B4	10.917		198.75	4.26			199.084	0.0099	1.970	Vel = 4.47
B4	10.917		0.0	4	6E	79.002	53.750	120	63.553	
to							79.002		1.696	
B3	7		198.75	4.26			132.752	0.0099	1.313	Vel = 4.47
			0.0							
B3			198.75						66.562	K Factor = 24.36
B3	7		198.75	4	E	13.167	5.917	120	66.562	
to					B	15.8	57.935		3.000	* * Fixed Loss = 3
B1	7		198.75	4.26	S	28.968	63.852	0.0099	0.632	Vel = 4.47
					Fsp	0.0				
			0.0							
B1			198.75						70.194	K Factor = 23.72
B1	7		198.75	4	2E	26.334	2.875	120	70.194	
to							26.334		-2.057	
A8	11.750		198.75	4.26			29.209	0.0099	0.289	Vel = 4.47
A8	11.750		0.0	4	3E	39.501	29.750	120	68.426	
to							39.501		-0.812	
A7	13.625		198.75	4.26			69.251	0.0099	0.685	Vel = 4.47
A7	13.625		0.0	4	2E	26.334	24.167	120	68.299	
to							26.334		0.577	
A6	12.292		198.75	4.26			50.501	0.0099	0.500	Vel = 4.47
A6	12.292		0.0	4	2E	26.334	42.792	120	69.376	
to							26.334		-2.220	
A5	17.417		198.75	4.26			69.126	0.0099	0.684	Vel = 4.47
A5	17.417		0.0	4	2E	26.334	23.333	120	67.840	
to							26.334		0.289	
A4	16.750		198.75	4.26			49.667	0.0099	0.491	Vel = 4.47
			0.0							
A4			198.75						68.620	K Factor = 23.99
A4	16.750		198.75	4	4E	52.668	111.000	120	68.620	
to							52.668		1.696	
A3	12.833		198.75	4.26			163.668	0.0099	1.619	Vel = 4.47
A3	12.833		0.0	4	2E	26.334	73.875	120	71.935	
to							26.334		-1.732	
A2	16.833		198.75	4.26			100.209	0.0099	0.991	Vel = 4.47

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 ******
A2	16.833		0.0	4	2E	26.334	28.708	120	71.194	
to							26.334		2.743	
A1	10.500		198.75	4.26			55.042	0.0099	0.545	Vel = 4.47
A1	10.500		0.0	4	E	13.167	18.375	120	74.482	
to							13.167		0.0	
TOR2	10.500		198.75	4.26			31.542	0.0099	0.312	Vel = 4.47
			0.0							
TOR2			198.75						74.794	K Factor = 22.98
TOR2	10.500		198.75	6	T	37.72	9.042	120	74.794	
to					B	12.573	50.293		4.681	* * Fixed Loss = 1
BOR2	2		198.75	6.357	Fsp	0.0	59.335	0.0014	0.083	Vel = 2.01
			0.0							
BOR2			198.75						79.558	K Factor = 22.28
BOR2	2		198.75	6	E	17.603	11.542	120	79.558	
to					2T	75.44	145.851		0.0	
PD	2		198.75	6.357	B	12.573	157.393	0.0014	0.222	Vel = 2.01
					S	40.235				
			0.0							
PD			198.75						79.780	K Factor = 22.25
System Demand Pressure									79.780	
Safety Margin									3.112	
Continuation Pressure									82.892	
Pressure @ Pump Outlet									82.892	
Pressure From Pump Curve									-43.993	
Pressure @ Pump Inlet									38.899	
PS	2		0.0	6	2T	75.44	5.458	120	38.899	
to					G	3.772	79.212		0.433	
FLG	1		198.75	6.357			84.670	0.0014	0.119	Vel = 2.01
			0.0							
FLG			198.75						39.451	K Factor = 31.64
FLG	1		198.75	6	E	20.084	4.000	140	39.451	
to							20.084		1.732	
UG1	-3		198.75	6.16			24.084	0.0012	0.030	Vel = 2.14
			0.0							
UG1			198.75						41.213	K Factor = 30.96
UG1	-3		198.75	6	T	43.037	77.000	140	41.213	
to							43.037		0.0	
UG2	-3		198.75	6.16			120.037	0.0012	0.148	Vel = 2.14
UG2	-3		-41.97	8			179.000	140	41.361	
to									0.0	
UG3	-3		156.78	8.27			179.000	0.0002	0.034	Vel = 0.94
			0.0							
UG3			156.78						41.395	K Factor = 24.37
UG2	-3		41.97	8	V	20.56	261.000	140	41.361	
to							20.560		0.0	
UG0	-3		41.97	8.27			281.560	0	0.005	Vel = 0.25
UG0	-3		0.0	8	10V	205.602	1507.000	140	41.366	
to					T	55.354	260.956		0.0	
UG3	-3		41.97	8.27			1767.956	0	0.029	Vel = 0.25

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 ******
			0.0							
UG3			41.97						41.395	K Factor = 6.52
UG3	-3		198.75	8	G	6.326	521.000	140	41.395	
to					2V	41.12	104.382		-2.166	
BF1	2		198.75	8.27	2E	56.936	625.382	0.0003	0.185	Vel = 1.19
BF1	2		0.0	8	2E	56.936	15.000	140	39.414	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		198.75	8.27			71.936	0.0003	0.020	Vel = 1.19
BF2	-3		0.0	8	V	20.56	75.000	140	54.100	
to					T	55.354	75.914		0.0	
UG4	-3		198.75	8.27			150.914	0.0003	0.045	Vel = 1.19
			0.0							
UG4			198.75						54.145	K Factor = 27.01
UG4	-3		198.75	8	4G	28.75	4156.000	150	54.145	
to					8V	186.874	215.624		0.0	
UG5	-3		198.75	8.27			4371.624	0.0003	1.131	Vel = 1.19
UG5	-3		0.0	8	8V	186.874	3360.000	150	55.276	
to					E	32.344	296.483		0.0	
UG6	-3		198.75	8.27	T	62.89	3656.483	0.0003	0.946	Vel = 1.19
					2G	14.375				
			0.0							
UG6			198.75						56.222	K Factor = 26.51
UG6	-3		198.75	12	T	106.533	47.000	150	56.222	
to							106.533		0.0	
UG7	-3		198.75	12.34			153.533	0	0.006	Vel = 0.53
			0.0							
UG7			198.75						56.228	K Factor = 26.51
UG7	-3		198.75	6	E	22.818	13.000	150	56.228	
to					T	48.896	71.714		0.0	
UG8	-3		198.75	6.16			84.714	0.0011	0.092	Vel = 2.14
			0.0							
UG8			198.75						56.320	K Factor = 26.48
UG8	-3		198.75	6	T	43.037	77.000	140	56.320	
to							43.037		0.0	
UG9	-3		198.75	6.16			120.037	0.0012	0.148	Vel = 2.14
UG9	-3		0.0	12	2V	15.94	2136.000	140	56.468	
to					T	93.767	161.279		0.0	
TEST	-3		198.75	12.34	G	9.377	2297.279	0	0.096	Vel = 0.53
					E	42.195				
			100.00							Qa = 100.00
TEST			298.75						56.564	K Factor = 39.72

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-7
Drawing	:	FP13
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-7
Contract	:	4070
Data File	:	NWHES 07 SYS-2 ZONE2 MUSIC238 LH.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP13
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-7
Remote area location MUSIC 238
Occupancy classification LH
Density 0.10 - Gpm/SqFt
Area of application 1059 - SqFt
Coverage/sprinkler 225 SF MAX - SqFt
Type of sprinkler calculated QR CONCEALED PENDENT 1/2" 155F 5.6K
 # Sprinklers calculated 9
In-rack demand N/A - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 295.959 - GPM @ 46.173 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:
REDUCE AREA FOR HYDRAULIC CALCULATION PER NFPA13 2013 SECTION 11.2.3.2.3

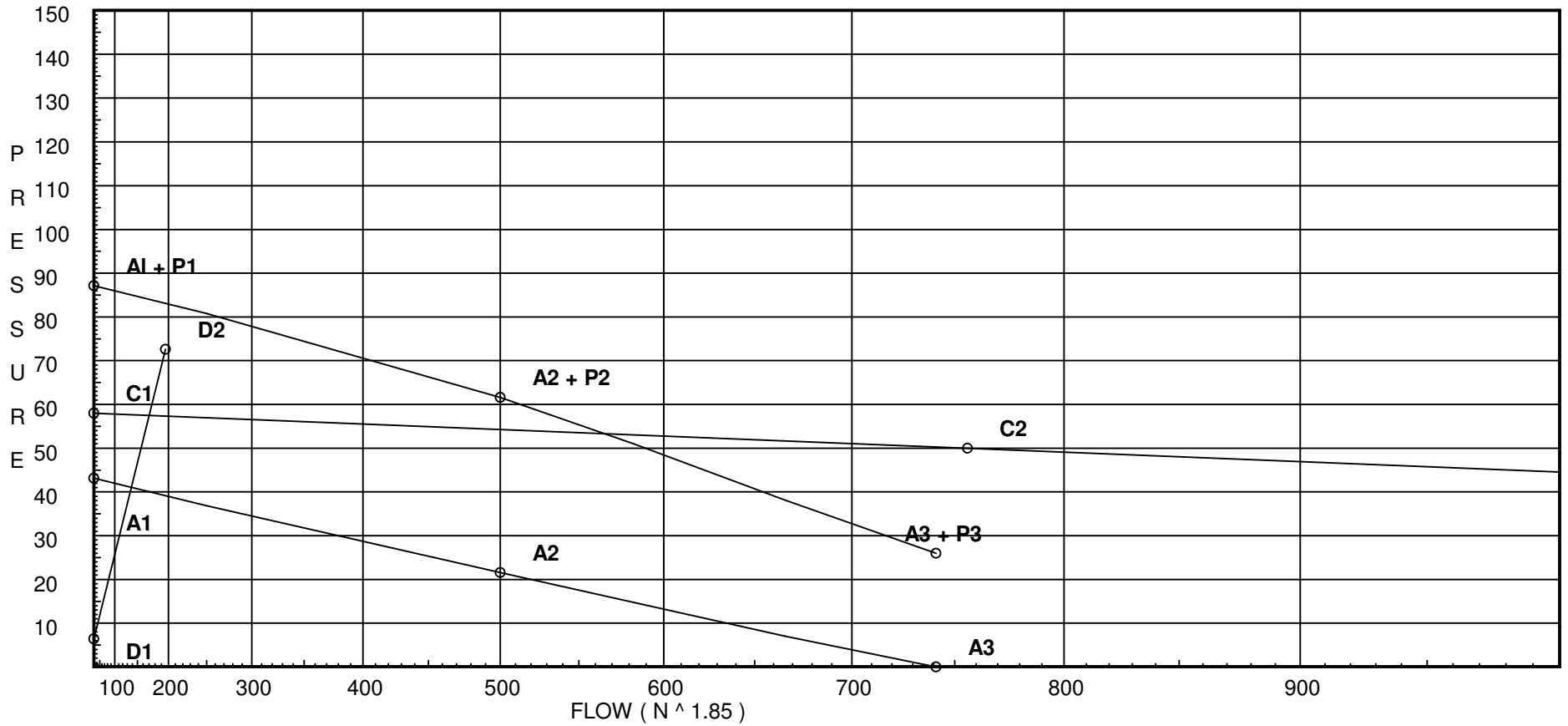
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 43.145
- A2 - Adj Resid : 21.583 @ 500
- A3 - Adj Resid : 0 @ 741.15

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 741.15
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.29

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 6.424
- D2 - System Flow : 195.959
- D2 - System Pressure : 72.578
- Hose (Demand) : _____
- D3 - System Demand : 195.959
- Hose (Adj City) : 100
- Safety Margin : 10.416



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			82.994	195.96	72.578
TEST	58.0	50	756.0	56.589	295.96	56.589

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	11.833	5.6	7.0	14.82	0.1	120
2H	11.833	5.6	7.0	14.82	0.1	140.416
3H	11.833	5.6	9.62	17.36	0.1	140
4H	13.667	5.6	12.87	20.09	0.1	168
5H	13.667	5.6	15.48	22.04	0.1	168.5
6H	13.667	5.6	17.47	23.41	0.1	168
7H	13.667	5.6	17.18	23.21	0.1	168
8H	13.667	5.6	28.76	30.03	0.1	144
9H	13.667	5.6	29.05	30.18	0.1	144
1	15.5		6.13			
2	15.5		8.99			
3	15.5		15.23			
4	15.5		13.34			
5	15.5		16.2			
6	15.5		18.36			
7	17.667		17.14			
8	15.5		30.68			
9	15.5		30.99			
390	15.5		14.76			
391	15.5		15.23			
392	15.5		16.41			
393	15.5		18.07			
394	15.5		20.02			
395	15.5		23.33			
D12	15.5		32.64			
D11	15.0		33.88			
D10	15.0		34.1			
D9	11.958		39.02			
D8	11.125		45.44			
D7	11.125		46.48			
D6	10.542		49.75			
D5	10.417		51.21			
D4	12.083		54.74			
D3	12.75		55.04			
D2	11.125		56.3			
D1	7.0		59.1			
B2	7.0		59.38			
B1	7.0		63.11			
A9	7.0		63.12			
A8	11.75		61.38			
A7	13.625		61.24			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
A6	12.292		62.3		
A5	17.417		60.75		
A4	16.75		61.52		
A3	12.833		64.79		
A2	16.833		64.02		
A1	10.5		67.3		
TOR2	10.5		67.6		
BOR2	2.0		72.36		
PD	2.0		72.58		
PS	2.0		39.0		
FLG	1.0		39.55		
UG1	-3.0		41.31		
UG2	-3.0		41.46		
UG0	-3.0		41.46		
UG3	-3.0		41.49		
BF1	2.0		39.5		
BF2	-3.0		54.19		
UG4	-3.0		54.23		
UG5	-3.0		55.33		
UG6	-3.0		56.26		
UG7	-3.0		56.26		
UG8	-3.0		56.35		
UG9	-3.0		56.5		
TEST	-3.0		56.59	100.0	

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 ******
1H	11.833	5.60	14.82	1	2E	4.0	0.667	120	7.000	
to					T	5.0	9.000		-1.588	
1	15.500		14.82	1.049			9.667	0.0747	0.722	Vel = 5.50
			0.0							
1			14.82						6.134	K Factor = 5.98
2H	11.833	5.60	14.82	1	2E	4.0	0.667	120	7.000	
to					T	5.0	9.000		-1.588	
1	15.500		14.82	1.049			9.667	0.0747	0.722	Vel = 5.50
			0.0							
1			14.82						6.134	K Factor = 5.98
3H	11.833	5.60	17.36	1	2E	4.0	0.667	120	9.615	
to					T	5.0	9.000		-1.588	
2	15.500		17.36	1.049			9.667	0.1001	0.968	Vel = 6.44
			0.0							
2			17.36						8.995	K Factor = 5.79
4H	13.667	5.60	20.09	1	2E	4.0	0.667	120	12.870	
to					T	5.0	9.000		-0.794	
4	15.500		20.09	1.049			9.667	0.1313	1.269	Vel = 7.46
			0.0							
4			20.09						13.345	K Factor = 5.50
5H	13.667	5.60	22.04	1	2E	4.0	0.667	120	15.485	
to					T	5.0	9.000		-0.794	
5	15.500		22.04	1.049			9.667	0.1558	1.506	Vel = 8.18
			0.0							
5			22.04						16.197	K Factor = 5.48
6H	13.667	5.60	23.41	1	2E	4.0	0.667	120	17.474	
to					T	5.0	9.000		-0.794	
6	15.500		23.41	1.049			9.667	0.1742	1.684	Vel = 8.69
			0.0							
6			23.41						18.364	K Factor = 5.46
7H	13.667	5.60	23.22	1	2E	4.0	0.833	120	17.185	
to					T	5.0	9.000		-1.732	
7	17.667		23.22	1.049			9.833	0.1714	1.685	Vel = 8.62
			0.0							
7			23.22						17.138	K Factor = 5.61
8H	13.667	5.60	30.03	1	2E	4.0	0.833	120	28.756	
to					T	5.0	9.000		-0.794	
8	15.500		30.03	1.049			9.833	0.2760	2.714	Vel = 11.15
			0.0							
8			30.03						30.676	K Factor = 5.42
9H	13.667	5.60	30.18	1	2E	4.0	0.833	120	29.048	
to					T	5.0	9.000		-0.794	
9	15.500		30.18	1.049			9.833	0.2787	2.740	Vel = 11.20
			0.0							
9			30.18						30.994	K Factor = 5.42
1	15.500		29.63	1			10.625	120	6.134	
to									0.0	
2	15.500		29.63	1.049			10.625	0.2693	2.861	Vel = 11.00

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 ******
2	15.500		17.37	1	T	5.0	4.125	120	8.995	
to							5.000		0.0	
390	15.500		47.0	1.049			9.125	0.6322	5.769	Vel = 17.45
			0.0							
390			47.00						14.764	K Factor = 12.23
3	15.500	.0	0.0	1	T	5.0	4.917	120	15.228	
to							5.000		0.0	
391	15.500		0.0	1.049			9.917	0	0.0	Vel = 0
			0.0							
391			0.0						15.228	K Factor = 0
4	15.500		20.09	1	T	5.0	18.375	120	13.345	
to							5.000		0.0	
392	15.500		20.09	1.049			23.375	0.1312	3.067	Vel = 7.46
			0.0							
392			20.09						16.412	K Factor = 4.96
5	15.500		22.04	1	T	5.0	7.042	120	16.197	
to							5.000		0.0	
393	15.500		22.04	1.049			12.042	0.1557	1.875	Vel = 8.18
			0.0							
393			22.04						18.072	K Factor = 5.18
6	15.500		23.41	1	T	5.0	4.500	120	18.364	
to							5.000		0.0	
394	15.500		23.41	1.049			9.500	0.1741	1.654	Vel = 8.69
			0.0							
394			23.41						20.018	K Factor = 5.23
7	17.667		23.22	1	E	2.0	23.625	120	17.138	
to					T	5.0	7.000		0.939	
395	15.500		23.22	1.049			30.625	0.1715	5.251	Vel = 8.62
			0.0							
395			23.22						23.328	K Factor = 4.81
8	15.500		30.03	1	T	5.0	6.625	120	30.676	
to							5.000		0.217	
D10	15		30.03	1.049			11.625	0.2760	3.208	Vel = 11.15
			0.0							
D10			30.03						34.101	K Factor = 5.14
9	15.500		30.18	1	T	5.0	5.375	120	30.994	
to							5.000		0.217	
D10	15		30.18	1.049			10.375	0.2786	2.890	Vel = 11.20
			0.0							
D10			30.18						34.101	K Factor = 5.17
390	15.500		47.00	1.25			2.792	120	14.764	
to									0.0	
391	15.500		47.0	1.38			2.792	0.1662	0.464	Vel = 10.08
391	15.500		0.0	1.25			7.125	120	15.228	
to									0.0	
392	15.500		47.0	1.38			7.125	0.1662	1.184	Vel = 10.08
392	15.500		20.09	1.25			5.167	120	16.412	
to									0.0	
393	15.500		67.09	1.38			5.167	0.3213	1.660	Vel = 14.39

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 ******
393	15.500		22.03	1.25			3.583	120	18.072	
to									0.0	
394	15.500		89.12	1.38			3.583	0.5431	1.946	Vel = 19.12
394	15.500		23.41	1.25			3.958	120	20.018	
to									0.0	
395	15.500		112.53	1.38			3.958	0.8363	3.310	Vel = 24.14
395	15.500		23.22	1.25	T	6.0	1.875	120	23.328	
to							6.000		0.0	
D12	15.500		135.75	1.38			7.875	1.1830	9.316	Vel = 29.12
			0.0							
D12			135.75						32.644	K Factor = 23.76
D12	15.500		135.75	2.5	2E	16.474	3.708	120	32.644	
to							16.474		0.217	
D11	15		135.75	2.635			20.182	0.0507	1.023	Vel = 7.99
D11	15		0.0	2.5			4.292	120	33.884	
to									0.0	
D10	15		135.75	2.635			4.292	0.0506	0.217	Vel = 7.99
D10	15		60.21	2.5	2E	16.474	19.542	120	34.101	
to							16.474		1.317	
D9	11.958		195.96	2.635			36.016	0.1000	3.602	Vel = 11.53
D9	11.958		0.0	2.5	E	8.237	35.833	120	39.020	
to					T	16.474	24.711		0.361	
D8	11.125		195.96	2.635			60.544	0.1000	6.054	Vel = 11.53
D8	11.125		0.0	2.5	E	8.237	2.250	120	45.435	
to							8.237		0.0	
D7	11.125		195.96	2.635			10.487	0.0999	1.048	Vel = 11.53
D7	11.125		0.0	2.5	2E	16.474	13.708	120	46.483	
to							16.474		0.252	
D6	10.542		195.96	2.635			30.182	0.1000	3.019	Vel = 11.53
			0.0							
D6			195.96						49.754	K Factor = 27.78
D6	10.542		195.96	2.5	E	8.237	5.750	120	49.754	
to							8.237		0.054	
D5	10.417		195.96	2.635			13.987	0.0999	1.398	Vel = 11.53
D5	10.417		0.0	2.5	2E	16.474	26.125	120	51.206	
to							16.474		-0.722	
D4	12.083		195.96	2.635			42.599	0.1000	4.260	Vel = 11.53
			0.0							
D4			195.96						54.744	K Factor = 26.48
D4	12.083		195.96	4	2E	26.334	34.833	120	54.744	
to							26.334		-0.289	
D3	12.750		195.96	4.26			61.167	0.0096	0.590	Vel = 4.41
D3	12.750		0.0	4	2E	26.334	31.042	120	55.045	
to							26.334		0.704	
D2	11.125		195.96	4.26			57.376	0.0096	0.553	Vel = 4.41
D2	11.125		0.0	4	4E	52.668	52.583	120	56.302	
to							52.668		1.787	
D1	7		195.96	4.26			105.251	0.0096	1.013	Vel = 4.41

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 ******
			0.0							
D1			195.96						59.102	K Factor = 25.49
D1	7		195.96	4	T	26.334	2.333	120	59.102	
to							26.334		0.0	
B2	7		195.96	4.26			28.667	0.0097	0.277	Vel = 4.41
			0.0							
B2			195.96						59.379	K Factor = 25.43
B2	7		195.96	4	T	26.334	4.958	120	59.379	
to					B	15.8	71.102		3.000	* * Fixed Loss = 3
B1	7		195.96	4.26	S	28.968	76.060	0.0096	0.733	Vel = 4.41
					Fsp	0.0				
			0.0							
B1			195.96						63.112	K Factor = 24.67
B1	7		195.96	4			1.417	120	63.112	
to									0.0	
A9	7		195.96	4.26			1.417	0.0092	0.013	Vel = 4.41
A9	7		0.0	4	2E	26.334	6.208	120	63.125	
to							26.334		-2.057	
A8	11.750		195.96	4.26			32.542	0.0096	0.314	Vel = 4.41
			0.0							
A8			195.96						61.382	K Factor = 25.01
A8	11.750		195.96	4	3E	39.501	29.750	120	61.382	
to							39.501		-0.812	
A7	13.625		195.96	4.26			69.251	0.0096	0.667	Vel = 4.41
A7	13.625		0.0	4	2E	26.334	24.167	120	61.237	
to							26.334		0.577	
A6	12.292		195.96	4.26			50.501	0.0096	0.487	Vel = 4.41
A6	12.292		0.0	4	2E	26.334	42.792	120	62.301	
to							26.334		-2.220	
A5	17.417		195.96	4.26			69.126	0.0096	0.667	Vel = 4.41
A5	17.417		0.0	4	2E	26.334	23.333	120	60.748	
to							26.334		0.289	
A4	16.750		195.96	4.26			49.667	0.0096	0.478	Vel = 4.41
			0.0							
A4			195.96						61.515	K Factor = 24.98
A4	16.750		195.96	4	4E	52.668	111.000	120	61.515	
to							52.668		1.696	
A3	12.833		195.96	4.26			163.668	0.0096	1.578	Vel = 4.41
A3	12.833		0.0	4	2E	26.334	73.875	120	64.789	
to							26.334		-1.732	
A2	16.833		195.96	4.26			100.209	0.0096	0.965	Vel = 4.41
A2	16.833		0.0	4	2E	26.334	28.708	120	64.022	
to							26.334		2.743	
A1	10.500		195.96	4.26			55.042	0.0096	0.530	Vel = 4.41
A1	10.500		0.0	4	E	13.167	18.375	120	67.295	
to							13.167		0.0	
TOR2	10.500		195.96	4.26			31.542	0.0096	0.304	Vel = 4.41

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 ******
			0.0							
TOR2			195.96						67.599	K Factor = 23.83
TOR2	10.500		195.96	6	T	37.72	9.042	120	67.599	
to					B	12.573	50.293		4.681	* * Fixed Loss = 1
BOR2	2		195.96	6.357	Fsp	0.0	59.335	0.0014	0.082	Vel = 1.98
			0.0							
BOR2			195.96						72.362	K Factor = 23.04
BOR2	2		195.96	6	E	17.603	11.542	120	72.362	
to					2T	75.44	145.851		0.0	
PD	2		195.96	6.357	B	12.573	157.393	0.0014	0.216	Vel = 1.98
					S	40.235				
			0.0							
PD			195.96						72.578	K Factor = 23.00
System Demand Pressure									72.578	
Safety Margin									10.416	
Continuation Pressure									82.994	
Pressure @ Pump Outlet									82.994	
Pressure From Pump Curve									-43.994	
Pressure @ Pump Inlet									39.000	
PS	2		0.0	6	2T	75.44	5.458	120	39.000	
to					G	3.772	79.212		0.433	
FLG	1		195.96	6.357			84.670	0.0014	0.117	Vel = 1.98
			0.0							
FLG			195.96						39.550	K Factor = 31.16
FLG	1		195.96	6	E	20.084	4.000	140	39.550	
to							20.084		1.732	
UG1	-3		195.96	6.16			24.084	0.0012	0.029	Vel = 2.11
			0.0							
UG1			195.96						41.311	K Factor = 30.49
UG1	-3		195.96	6	T	43.037	77.000	140	41.311	
to							43.037		0.0	
UG2	-3		195.96	6.16			120.037	0.0012	0.144	Vel = 2.11
UG2	-3		-41.38	8			179.000	140	41.455	
to									0.0	
UG3	-3		154.58	8.27			179.000	0.0002	0.033	Vel = 0.92
			0.0							
UG3			154.58						41.488	K Factor = 24.00
UG2	-3		41.38	8	V	20.56	261.000	140	41.455	
to							20.560		0.0	
UG0	-3		41.38	8.27			281.560	0	0.005	Vel = 0.25
UG0	-3		0.0	8	10V	205.602	1507.000	140	41.460	
to					T	55.354	260.956		0.0	
UG3	-3		41.38	8.27			1767.956	0	0.028	Vel = 0.25
			0.0							
UG3			41.38						41.488	K Factor = 6.42
UG3	-3		195.96	8	G	6.326	521.000	140	41.488	
to					2V	41.12	104.382		-2.166	
BF1	2		195.96	8.27	2E	56.936	625.382	0.0003	0.180	Vel = 1.17

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 ******
BF1	2		0.0	8	2E	56.936	15.000	140	39.502	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		195.96	8.27			71.936	0.0003	0.020	Vel = 1.17
BF2	-3		0.0	8	V	20.56	75.000	140	54.188	
to					T	55.354	75.914		0.0	
UG4	-3		195.96	8.27			150.914	0.0003	0.043	Vel = 1.17
			0.0							
UG4			195.96						54.231	K Factor = 26.61
UG4	-3		195.96	8	4G	28.75	4156.000	150	54.231	
to					8V	186.874	215.624		0.0	
UG5	-3		195.96	8.27			4371.624	0.0003	1.103	Vel = 1.17
UG5	-3		0.0	8	8V	186.874	3360.000	150	55.334	
to					E	32.344	296.483		0.0	
UG6	-3		195.96	8.27	T	62.89	3656.483	0.0003	0.921	Vel = 1.17
					2G	14.375				
			0.0							
UG6			195.96						56.255	K Factor = 26.13
UG6	-3		195.96	12	T	106.533	47.000	150	56.255	
to							106.533		0.0	
UG7	-3		195.96	12.34			153.533	0	0.006	Vel = 0.53
			0.0							
UG7			195.96						56.261	K Factor = 26.13
UG7	-3		195.96	6	E	22.818	13.000	150	56.261	
to					T	48.896	71.714		0.0	
UG8	-3		195.96	6.16			84.714	0.0011	0.090	Vel = 2.11
			0.0							
UG8			195.96						56.351	K Factor = 26.10
UG8	-3		195.96	6	T	43.037	77.000	140	56.351	
to							43.037		0.0	
UG9	-3		195.96	6.16			120.037	0.0012	0.144	Vel = 2.11
UG9	-3		0.0	12	2V	15.94	2136.000	140	56.495	
to					T	93.767	161.279		0.0	
TEST	-3		195.96	12.34	G	9.377	2297.279	0	0.094	Vel = 0.53
					E	42.195				
			100.00							Qa = 100.00
TEST			295.96						56.589	K Factor = 39.34

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-8
Drawing	:	FP12
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-8
Contract	:	4070
Data File	:	NWHES 08 SYS-2 ZONE2 MECH ABV 213 OH1.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP12
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-8
Remote area location MECH PLATFORM ABOVE OFFICE 213
Occupancy classification OH-1
Density 0.15 - Gpm/SqFt
Area of application WHOLE AREA - SqFt
Coverage/sprinkler 130 SF MAX - SqFt
Type of sprinkler calculated QR UPRIGHT 1/2" 155F 5.6K
 # Sprinklers calculated 9
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 429.199 - GPM @ 45.198 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:

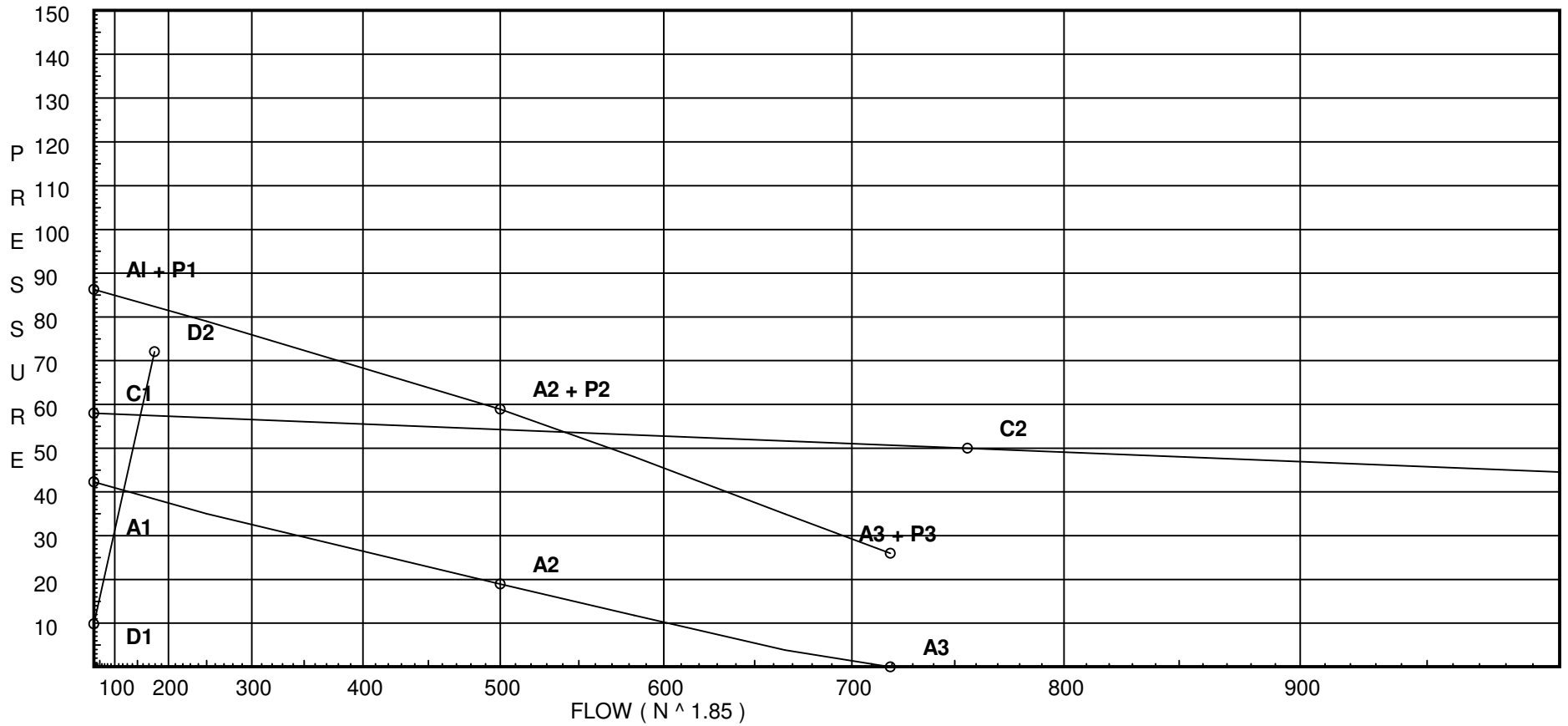
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 42.302
- A2 - Adj Resid : 18.917 @ 500
- A3 - Adj Resid : 0 @ 719.14

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 719.14
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.71

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 9.817
- D2 - System Flow : 179.199
- D2 - System Pressure : 72.049
- Hose (Demand) : _____
- D3 - System Demand : 179.199
- Hose (Adj City) : 250
- Safety Margin : 9.995



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			82.044	179.2	72.049
TEST	58.0	50	756.0	55.193	429.2	55.193

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	19.667	5.6	7.0	14.82	0.15	96.45
2H	19.667	5.6	7.0	14.82	0.15	74.06
3H	19.667	5.6	9.62	17.37	0.15	114.17
4H	20.5	5.6	13.12	20.28	0.15	72.08
5H	21.083	5.6	14.04	20.98	0.15	107.92
6H	21.208	5.6	10.03	17.73	0.15	70
7H	21.208	5.6	10.77	18.38	0.15	114.17
8H	21.167	5.6	23.77	27.3	0.15	106.16
9H	21.167	5.6	24.15	27.52	0.15	106.57
1	18.417		8.01			
2	18.417		10.79			
3	18.417		16.01			
4	19.375		14.42			
5	19.833		15.47			
6	20.125		11.13			
7	19.833		12.3			
8	20.333		25.48			
9	20.333		25.64			
210	18.333		16.04			
211	19.25		16.17			
212	19.833		16.64			
213	19.958		16.8			
214	20.333		25.07			
215	19.333		28.79			
216	19.333		29.25			
217	19.333		38.31			
218	12.083		55.72			
D3	12.75		55.87			
D2	11.125		57.04			
D1	7.0		59.69			
B2	7.0		59.92			
B1	7.0		63.54			
A9	7.0		63.56			
A8	11.75		61.76			
A7	13.625		61.52			
A6	12.292		62.51			
A5	17.417		60.85			
A4	16.75		61.55			
A3	12.833		64.58			
A2	16.833		63.67			
A1	10.5		66.86			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
TOR2	10.5		67.12		
BOR2	2.0		71.87		
PD	2.0		72.05		
PS	2.0		38.05		
FLG	1.0		38.58		
UG1	-3.0		40.34		
UG2	-3.0		40.46		
UG0	-3.0		40.47		
UG3	-3.0		40.49		
BF1	2.0		38.48		
BF2	-3.0		53.16		
UG4	-3.0		53.2		
UG5	-3.0		54.13		
UG6	-3.0		54.91		
UG7	-3.0		54.92		
UG8	-3.0		54.99		
UG9	-3.0		55.11		
TEST	-3.0		55.19	250.0	

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 ******
1H	19.667	5.60	14.82	1	T	5.0	1.250	120	7.000	
to							5.000		0.541	
1	18.417		14.82	1.049			6.250	0.0747	0.467	Vel = 5.50
			0.0							
1			14.82						8.008	K Factor = 5.24
2H	19.667	5.60	14.82	1	T	5.0	1.250	120	7.000	
to							5.000		0.541	
1	18.417		14.82	1.049			6.250	0.0747	0.467	Vel = 5.50
			0.0							
1			14.82						8.008	K Factor = 5.24
3H	19.667	5.60	17.37	1	T	5.0	1.250	120	9.623	
to							5.000		0.541	
2	18.417		17.37	1.049			6.250	0.1003	0.627	Vel = 6.45
			0.0							
2			17.37						10.791	K Factor = 5.29
4H	20.500	5.60	20.28	1	T	5.0	1.125	120	13.117	
to							5.000		0.487	
4	19.375		20.28	1.049			6.125	0.1336	0.818	Vel = 7.53
			0.0							
4			20.28						14.422	K Factor = 5.34
5H	21.083	5.60	20.98	1	T	5.0	1.250	120	14.036	
to							5.000		0.541	
5	19.833		20.98	1.049			6.250	0.1422	0.889	Vel = 7.79
			0.0							
5			20.98						15.466	K Factor = 5.33
6H	21.208	5.60	17.73	1	T	5.0	1.083	120	10.026	
to							5.000		0.469	
6	20.125		17.73	1.049			6.083	0.1042	0.634	Vel = 6.58
			0.0							
6			17.73						11.129	K Factor = 5.31
7H	21.208	5.60	18.38	1	E	2.0	1.375	120	10.770	
to					T	5.0	7.000		0.596	
7	19.833		18.38	1.049			8.375	0.1112	0.931	Vel = 6.82
			0.0							
7			18.38						12.297	K Factor = 5.24
8H	21.167	5.60	27.30	1	T	5.0	0.833	120	23.773	
to							5.000		0.361	
8	20.333		27.3	1.049			5.833	0.2314	1.350	Vel = 10.13
			0.0							
8			27.30						25.484	K Factor = 5.41
9H	21.167	5.60	27.52	1	2E	4.0	0.833	120	24.149	
to							4.000		0.361	
9	20.333		27.52	1.049			4.833	0.2348	1.135	Vel = 10.22
			0.0							
9			27.52						25.645	K Factor = 5.43
1	18.417		29.63	1			10.333	120	8.008	
to									0.0	
2	18.417		29.63	1.049			10.333	0.2693	2.783	Vel = 11.00

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 ******
2	18.417		17.37	1	T	5.0	3.250	120	10.791	
to							5.000		0.036	
210	18.333		47.0	1.049			8.250	0.6324	5.217	Vel = 17.45
			0.0							
210			47.00						16.044	K Factor = 11.73
3	18.417	.0	0.0	1	T	5.0	6.750	120	16.008	
to							5.000		0.036	
210	18.333		0.0	1.049			11.750	0	0.0	Vel = 0
			0.0							
210			0.0						16.044	K Factor = 0
4	19.375		20.28	1	T	5.0	7.708	120	14.422	
to							5.000		0.054	
211	19.250		20.28	1.049			12.708	0.1335	1.697	Vel = 7.53
			0.0							
211			20.28						16.173	K Factor = 5.04
5	19.833		20.98	1	T	5.0	3.250	120	15.466	
to							5.000		0.0	
212	19.833		20.98	1.049			8.250	0.1421	1.172	Vel = 7.79
			0.0							
212			20.98						16.638	K Factor = 5.14
6	20.125		17.73	1			10.000	120	11.129	
to									0.126	
7	19.833		17.73	1.049			10.000	0.1042	1.042	Vel = 6.58
7	19.833		18.38	1	T	5.0	6.750	120	12.297	
to							5.000		-0.054	
213	19.958		36.11	1.049			11.750	0.3883	4.562	Vel = 13.40
			0.0							
213			36.11						16.805	K Factor = 8.81
8	20.333		27.30	1	E	2.0	5.417	120	25.484	
to					T	5.0	7.000		0.433	
215	19.333		27.3	1.049			12.417	0.2315	2.875	Vel = 10.13
			0.0							
215			27.30						28.792	K Factor = 5.09
9	20.333		27.52	1	E	2.0	6.500	120	25.645	
to					T	5.0	7.000		0.433	
216	19.333		27.52	1.049			13.500	0.2349	3.171	Vel = 10.22
			0.0							
216			27.52						29.249	K Factor = 5.09
210	18.333		47.00	1.5			6.708	120	16.044	
to									-0.397	
211	19.250		47.0	1.61			6.708	0.0784	0.526	Vel = 7.41
211	19.250		20.29	1.5			4.708	120	16.173	
to									-0.252	
212	19.833		67.29	1.61			4.708	0.1523	0.717	Vel = 10.60
212	19.833		20.98	1.5			0.875	120	16.638	
to									-0.054	
213	19.958		88.27	1.61			0.875	0.2526	0.221	Vel = 13.91

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 ******
213	19.958		36.11	1.5	3E	12.0	5.750	120	16.805	
to							12.000		-0.162	
214	20.333		124.38	1.61			17.750	0.4749	8.430	Vel = 19.60
214	20.333		0.0	1.5			6.917	120	25.073	
to									0.433	
215	19.333		124.38	1.61			6.917	0.4751	3.286	Vel = 19.60
215	19.333		27.30	1.5			0.667	120	28.792	
to									0.0	
216	19.333		151.68	1.61			0.667	0.6852	0.457	Vel = 23.90
216	19.333		27.52	1.5	E	4.0	5.708	120	29.249	
to							4.000		0.0	
217	19.333		179.2	1.61			9.708	0.9335	9.062	Vel = 28.24
			0.0							
217			179.20						38.311	K Factor = 28.95
217	19.333		179.20	1.5	T	8.0	7.292	120	38.311	
to							8.000		3.140	
218	12.083		179.2	1.61			15.292	0.9334	14.274	Vel = 28.24
			0.0							
218			179.20						55.725	K Factor = 24.01
218	12.083		179.20	4	2E	26.334	26.792	120	55.725	
to							26.334		-0.289	
D3	12.750		179.2	4.26			53.126	0.0082	0.434	Vel = 4.03
D3	12.750		0.0	4	2E	26.334	31.042	120	55.870	
to							26.334		0.704	
D2	11.125		179.2	4.26			57.376	0.0082	0.468	Vel = 4.03
D2	11.125		0.0	4	4E	52.668	52.583	120	57.042	
to							52.668		1.787	
D1	7		179.2	4.26			105.251	0.0082	0.859	Vel = 4.03
			0.0							
D1			179.20						59.688	K Factor = 23.20
D1	7		179.20	4	T	26.334	2.333	120	59.688	
to							26.334		0.0	
B2	7		179.2	4.26			28.667	0.0082	0.234	Vel = 4.03
			0.0							
B2			179.20						59.922	K Factor = 23.15
B2	7		179.20	4	T	26.334	4.958	120	59.922	
to					B	15.8	71.102		3.000	* * Fixed Loss = 3
B1	7		179.2	4.26	S	28.968	76.060	0.0082	0.622	Vel = 4.03
					Fsp	0.0				
			0.0							
B1			179.20						63.544	K Factor = 22.48
B1	7		179.20	4			1.417	120	63.544	
to									0.0	
A9	7		179.2	4.26			1.417	0.0078	0.011	Vel = 4.03
A9	7		0.0	4	2E	26.334	6.208	120	63.555	
to							26.334		-2.057	
A8	11.750		179.2	4.26			32.542	0.0082	0.266	Vel = 4.03

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 ******
			0.0							
A8			179.20						61.764	K Factor = 22.80
A8	11.750		179.20	4	3E	39.501	29.750	120	61.764	
to							39.501		-0.812	
A7	13.625		179.2	4.26			69.251	0.0082	0.565	Vel = 4.03
A7	13.625		0.0	4	2E	26.334	24.167	120	61.517	
to							26.334		0.577	
A6	12.292		179.2	4.26			50.501	0.0082	0.413	Vel = 4.03
A6	12.292		0.0	4	2E	26.334	42.792	120	62.507	
to							26.334		-2.220	
A5	17.417		179.2	4.26			69.126	0.0082	0.565	Vel = 4.03
A5	17.417		0.0	4	2E	26.334	23.333	120	60.852	
to							26.334		0.289	
A4	16.750		179.2	4.26			49.667	0.0082	0.406	Vel = 4.03
			0.0							
A4			179.20						61.547	K Factor = 22.84
A4	16.750		179.20	4	4E	52.668	111.000	120	61.547	
to							52.668		1.696	
A3	12.833		179.2	4.26			163.668	0.0082	1.337	Vel = 4.03
A3	12.833		0.0	4	2E	26.334	73.875	120	64.580	
to							26.334		-1.732	
A2	16.833		179.2	4.26			100.209	0.0082	0.818	Vel = 4.03
A2	16.833		0.0	4	2E	26.334	28.708	120	63.666	
to							26.334		2.743	
A1	10.500		179.2	4.26			55.042	0.0082	0.449	Vel = 4.03
A1	10.500		0.0	4	E	13.167	18.375	120	66.858	
to							13.167		0.0	
TOR2	10.500		179.2	4.26			31.542	0.0082	0.258	Vel = 4.03
			0.0							
TOR2			179.20						67.116	K Factor = 21.87
TOR2	10.500		179.20	6	T	37.72	9.042	120	67.116	
to					B	12.573	50.293		4.681	* * Fixed Loss = 1
BOR2	2		179.2	6.357	Fsp	0.0	59.335	0.0012	0.069	Vel = 1.81
			0.0							
BOR2			179.20						71.866	K Factor = 21.14
BOR2	2		179.20	6	E	17.603	11.542	120	71.866	
to					2T	75.44	145.851		0.0	
PD	2		179.2	6.357	B	12.573	157.393	0.0012	0.183	Vel = 1.81
					S	40.235				
			0.0							
PD			179.20						72.049	K Factor = 21.11
System Demand Pressure									72.049	
Safety Margin									9.995	
Continuation Pressure									82.044	
Pressure @ Pump Outlet									82.044	
Pressure From Pump Curve									-43.994	
Pressure @ Pump Inlet									38.050	
PS	2		0.0	6	2T	75.44	5.458	120	38.050	
to					G	3.772	79.212		0.433	
FLG	1		179.2	6.357			84.670	0.0012	0.098	Vel = 1.81

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 ******
			0.0							
FLG			179.20						38.581	K Factor = 28.85
FLG	1		179.20	6	E	20.084	4.000	140	38.581	
to							20.084		1.732	
UG1	-3		179.2	6.16			24.084	0.0010	0.025	Vel = 1.93
			0.0							
UG1			179.20						40.338	K Factor = 28.22
UG1	-3		179.20	6	T	43.037	77.000	140	40.338	
to							43.037		0.0	
UG2	-3		179.2	6.16			120.037	0.0010	0.123	Vel = 1.93
UG2	-3		-37.84	8			179.000	140	40.461	
to									0.0	
UG3	-3		141.36	8.27			179.000	0.0002	0.028	Vel = 0.84
			0.0							
UG3			141.36						40.489	K Factor = 22.22
UG2	-3		37.84	8	V	20.56	261.000	140	40.461	
to							20.560		0.0	
UG0	-3		37.84	8.27			281.560	0	0.004	Vel = 0.23
UG0	-3		0.0	8	10V	205.602	1507.000	140	40.465	
to					T	55.354	260.956		0.0	
UG3	-3		37.84	8.27			1767.956	0	0.024	Vel = 0.23
			0.0							
UG3			37.84						40.489	K Factor = 5.95
UG3	-3		179.20	8	G	6.326	521.000	140	40.489	
to					2V	41.12	104.382		-2.166	
BF1	2		179.2	8.27	2E	56.936	625.382	0.0002	0.152	Vel = 1.07
BF1	2		0.0	8	2E	56.936	15.000	140	38.475	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		179.2	8.27			71.936	0.0002	0.017	Vel = 1.07
BF2	-3		0.0	8	V	20.56	75.000	140	53.158	
to					T	55.354	75.914		0.0	
UG4	-3		179.2	8.27			150.914	0.0002	0.037	Vel = 1.07
			0.0							
UG4			179.20						53.195	K Factor = 24.57
UG4	-3		179.20	8	4G	28.75	4156.000	150	53.195	
to					8V	186.874	215.624		0.0	
UG5	-3		179.2	8.27			4371.624	0.0002	0.934	Vel = 1.07
UG5	-3		0.0	8	8V	186.874	3360.000	150	54.129	
to					E	32.344	296.483		0.0	
UG6	-3		179.2	8.27	T	62.89	3656.483	0.0002	0.781	Vel = 1.07
					2G	14.375				
			0.0							
UG6			179.20						54.910	K Factor = 24.18
UG6	-3		179.20	12	T	106.533	47.000	150	54.910	
to							106.533		0.0	
UG7	-3		179.2	12.34			153.533	0	0.005	Vel = 0.48
			0.0							

Final Calculations : Hazen-Williams

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	******
UG7			179.20						54.915	K Factor = 24.18		
UG7	-3		179.20	6	E	22.818	13.000	150	54.915			
to					T	48.896	71.714		0.0			
UG8	-3		179.2	6.16			84.714	0.0009	0.076	Vel = 1.93		
			0.0									
UG8			179.20						54.991	K Factor = 24.17		
UG8	-3		179.20	6	T	43.037	77.000	140	54.991			
to							43.037		0.0			
UG9	-3		179.2	6.16			120.037	0.0010	0.122	Vel = 1.93		
UG9	-3		0.0	12	2V	15.94	2136.000	140	55.113			
to					T	93.767	161.279		0.0			
TEST	-3		179.2	12.34	G	9.377	2297.279	0	0.080	Vel = 0.48		
					E	42.195						
			250.00							Qa = 250.00		
TEST			429.20						55.193	K Factor = 57.77		

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-9
Drawing	:	FP17
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-9
Contract	:	4070
Data File	:	NWHES 09 SYS-2 ZONE3 617 LH EC.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP17
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-9
Remote area location 4TH-5TH GRADE 617
Occupancy classification LH
Density 0.10 - Gpm/SqFt
Area of application 1035 - SqFt
Coverage/sprinkler 324 SF MAX - SqFt
Type of sprinkler calculated QR EC PENDENT 1/2" 155F 5.6K
 # Sprinklers calculated 6
In-rack demand N/A - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 258.623 - GPM @ 48.547 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:
REDUCE AREA FOR HYDRAULIC CALCULATION PER NFPA13 2013 SECTION 11.2.3.2.3

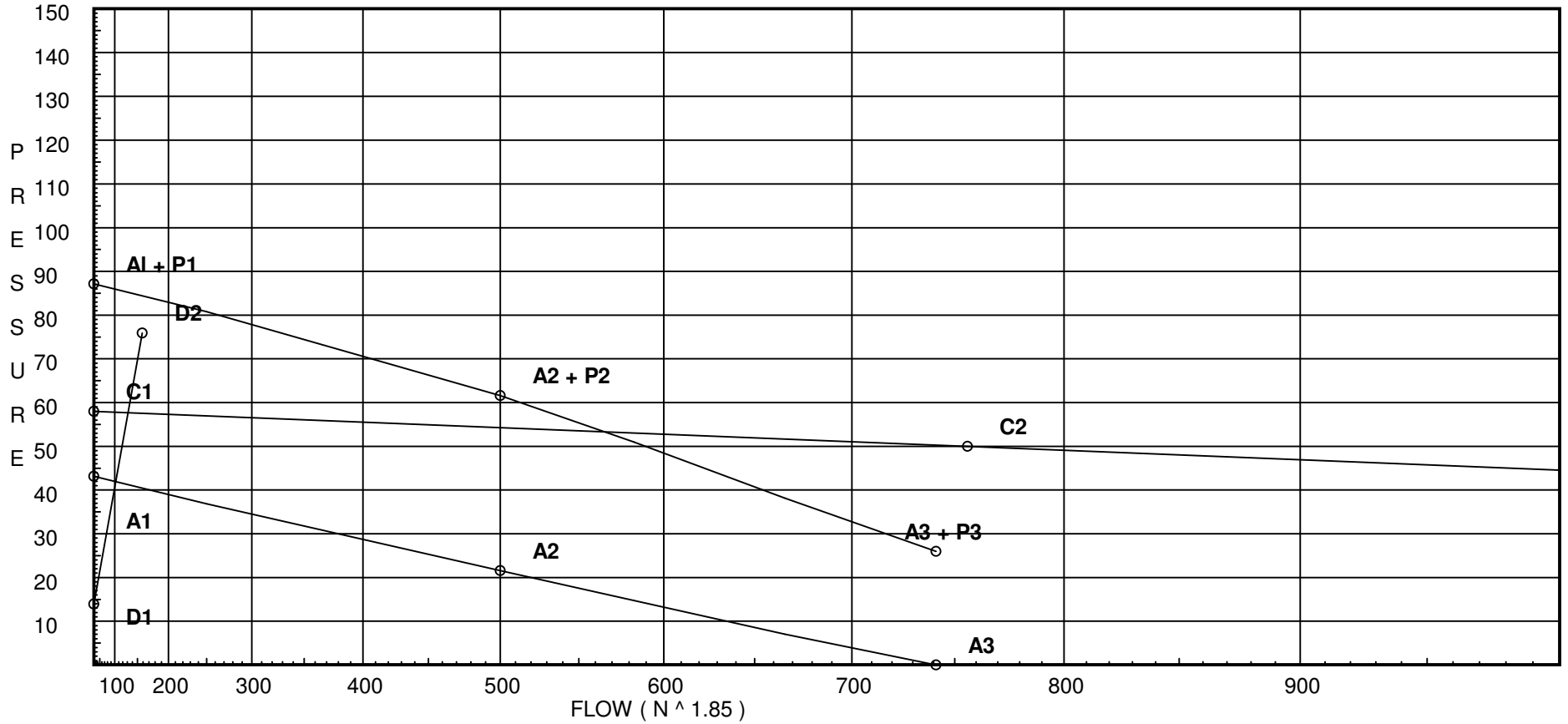
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 43.145
- A2 - Adj Resid : 21.583 @ 500
- A3 - Adj Resid : 0 @ 741.15

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 741.15
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.29

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 13.932
- D2 - System Flow : 158.623
- D2 - System Pressure : 75.900
- Hose (Demand) : _____
- D3 - System Demand : 158.623
- Hose (Adj City) : 100
- Safety Margin : 8.354



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			84.254	158.62	75.9
TEST	58.0	50	756.0	56.9	258.62	56.9

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	29.167	5.6	21.6	26.03	0.1	224
2H	29.167	5.6	21.94	26.23	0.1	224
3H	29.167	5.6	23.11	26.92	0.1	224
4H	29.167	5.6	21.75	26.12	0.1	196
5H	29.167	5.6	22.09	26.32	0.1	196
6H	29.167	5.6	23.27	27.01	0.1	196
1	29.104		23.68			
2	29.104		24.04			
3	29.104		25.32			
4	28.167		24.28			
5	28.167		24.65			
6	28.167		25.93			
600	29.104		34.14			
601	28.167		34.81			
A16	26.917		39.36			
A15	26.917		52.52			
A14T	26.917		54.48			
A14B	23.0		56.29			
A13T	23.0		56.46			
A13B	12.917		60.98			
A12	11.167		62.13			
A11	11.167		62.8			
A10	11.167		63.19			
A9	7.0		68.48			
A8	11.75		66.64			
A7	13.625		66.28			
A6	12.292		67.18			
A5	17.417		65.42			
A4	16.75		66.03			
A3	12.833		68.79			
A2	16.833		67.71			
A1	10.5		70.81			
TOR2	10.5		71.02			
BOR2	2.0		75.75			
PD	2.0		75.9			
PS	2.0		40.26			
FLG	1.0		40.77			
UG1	-3.0		42.52			
UG2	-3.0		42.62			
UG0	-3.0		42.62			
UG3	-3.0		42.64			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
BF1	2.0		40.6		
BF2	-3.0		55.28		
UG4	-3.0		55.31		
UG5	-3.0		56.05		
UG6	-3.0		56.68		
UG7	-3.0		56.68		
UG8	-3.0		56.74		
UG9	-3.0		56.84		
TEST	-3.0		56.9	100.0	

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 ******
1H	29.167	5.60	26.03	1	2E	4.0	0.667	120	21.600	
to					T	5.0	9.000		0.027	
1	29.104		26.03	1.049			9.667	0.2119	2.048	Vel = 9.66
			0.0							
1			26.03						23.675	K Factor = 5.35
2H	29.167	5.60	26.23	1	2E	4.0	0.667	120	21.938	
to					T	5.0	9.000		0.027	
2	29.104		26.23	1.049			9.667	0.2150	2.078	Vel = 9.74
			0.0							
2			26.23						24.043	K Factor = 5.35
3H	29.167	5.60	26.92	1	2E	4.0	0.667	120	23.109	
to					T	5.0	9.000		0.027	
3	29.104		26.92	1.049			9.667	0.2255	2.180	Vel = 9.99
			0.0							
3			26.92						25.316	K Factor = 5.35
4H	29.167	5.60	26.12	1	2E	4.0	0.833	120	21.749	
to					T	5.0	9.000		0.433	
4	28.167		26.12	1.049			9.833	0.2132	2.096	Vel = 9.70
			0.0							
4			26.12						24.278	K Factor = 5.30
5H	29.167	5.60	26.32	1	2E	4.0	0.833	120	22.089	
to					T	5.0	9.000		0.433	
5	28.167		26.32	1.049			9.833	0.2163	2.127	Vel = 9.77
			0.0							
5			26.32						24.649	K Factor = 5.30
6H	29.167	5.60	27.01	1	2E	4.0	0.833	120	23.266	
to					T	5.0	9.000		0.433	
6	28.167		27.01	1.049			9.833	0.2269	2.231	Vel = 10.03
			0.0							
6			27.01						25.930	K Factor = 5.30
1	29.104		26.03	1.5			14.000	120	23.675	
to									0.0	
2	29.104		26.03	1.61			14.000	0.0263	0.368	Vel = 4.10
2	29.104		26.23	1.5			13.333	120	24.043	
to									0.0	
3	29.104		52.26	1.61			13.333	0.0955	1.273	Vel = 8.24
3	29.104		26.92	1.5	T	8.0	34.833	120	25.316	
to							8.000		0.0	
600	29.104		79.18	1.61			42.833	0.2060	8.823	Vel = 12.48
			0.0							
600			79.18						34.139	K Factor = 13.55
4	28.167		26.12	1.5			14.000	120	24.278	
to									0.0	
5	28.167		26.12	1.61			14.000	0.0265	0.371	Vel = 4.12
5	28.167		26.32	1.5			13.333	120	24.649	
to									0.0	
6	28.167		52.44	1.61			13.333	0.0961	1.281	Vel = 8.26

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 ******
6	28.167		27.01	1.5	T	8.0	34.833	120	25.930	
to							8.000		0.0	
601	28.167		79.45	1.61			42.833	0.2073	8.878	Vel = 12.52
			0.0							
601			79.45						34.808	K Factor = 13.47
600	29.104		79.18	2.5			14.083	120	34.139	
to									0.406	
601	28.167		79.18	2.635			14.083	0.0187	0.263	Vel = 4.66
601	28.167		79.44	2.5	2E	16.474	26.375	120	34.808	
to					T	16.474	32.948		0.541	
A16	26.917		158.62	2.635			59.323	0.0676	4.012	Vel = 9.33
			0.0							
A16			158.62						39.361	K Factor = 25.28
A16	26.917		158.62	2.5	T	16.474	178.042	120	39.361	
to							16.474		0.0	
A15	26.917		158.62	2.635			194.516	0.0676	13.155	Vel = 9.33
A15	26.917		0.0	2.5	T	16.474	12.542	120	52.516	
to							16.474		0.0	
A14T	26.917		158.62	2.635			29.016	0.0676	1.962	Vel = 9.33
			0.0							
A14T			158.62						54.478	K Factor = 21.49
A14T	26.917		158.62	4	E	13.167	4.000	120	54.478	
to							13.167		1.696	
A14B	23		158.62	4.26			17.167	0.0066	0.113	Vel = 3.57
A14B	23		0.0	4	E	13.167	13.750	120	56.287	
to							13.167		0.0	
A13T	23		158.62	4.26			26.917	0.0065	0.175	Vel = 3.57
			0.0							
A13T			158.62						56.462	K Factor = 21.11
A13T	23		158.62	4	E	13.167	10.083	120	56.462	
to							13.167		4.367	
A13B	12.917		158.62	4.26			23.250	0.0065	0.152	Vel = 3.57
			0.0							
A13B			158.62						60.981	K Factor = 20.31
A13B	12.917		158.62	4	3E	39.501	20.708	120	60.981	
to							39.501		0.758	
A12	11.167		158.62	4.26			60.209	0.0065	0.392	Vel = 3.57
A12	11.167		0.0	4	4E	52.668	49.375	120	62.131	
to							52.668		0.0	
A11	11.167		158.62	4.26			102.043	0.0065	0.665	Vel = 3.57
A11	11.167		0.0	4	2E	26.334	33.750	120	62.796	
to							26.334		0.0	
A10	11.167		158.62	4.26			60.084	0.0065	0.392	Vel = 3.57
			0.0							
A10			158.62						63.188	K Factor = 19.95
A10	11.167		158.62	4	T	26.334	3.833	120	63.188	
to					B	15.8	71.102		4.805	* * Fixed Loss = 3
A9	7		158.62	4.26	Fsp	0.0	74.935	0.0065	0.488	Vel = 3.57

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 ******
					S	28.968				
A9	7		0.0	4	2E	26.334	6.208	120	68.481	
to							26.334		-2.057	
A8	11.750		158.62	4.26			32.542	0.0065	0.212	Vel = 3.57
			0.0							
A8			158.62						66.636	K Factor = 19.43
A8	11.750		158.62	4	3E	39.501	30.292	120	66.636	
to							39.501		-0.812	
A7	13.625		158.62	4.26			69.793	0.0065	0.455	Vel = 3.57
A7	13.625		0.0	4	2E	26.334	24.167	120	66.279	
to							26.334		0.577	
A6	12.292		158.62	4.26			50.501	0.0065	0.329	Vel = 3.57
A6	12.292		0.0	4	2E	26.334	42.792	120	67.185	
to							26.334		-2.220	
A5	17.417		158.62	4.26			69.126	0.0065	0.451	Vel = 3.57
A5	17.417		0.0	4	2E	26.334	23.333	120	65.416	
to							26.334		0.289	
A4	16.750		158.62	4.26			49.667	0.0065	0.324	Vel = 3.57
			0.0							
A4			158.62						66.029	K Factor = 19.52
A4	16.750		158.62	4	4E	52.668	110.458	120	66.029	
to							52.668		1.696	
A3	12.833		158.62	4.26			163.126	0.0065	1.063	Vel = 3.57
A3	12.833		0.0	4	2E	26.334	74.083	120	68.788	
to							26.334		-1.732	
A2	16.833		158.62	4.26			100.417	0.0065	0.654	Vel = 3.57
A2	16.833		0.0	4	2E	26.334	28.708	120	67.710	
to							26.334		2.743	
A1	10.500		158.62	4.26			55.042	0.0065	0.359	Vel = 3.57
A1	10.500		0.0	4	E	13.167	18.375	120	70.812	
to							13.167		0.0	
TOR2	10.500		158.62	4.26			31.542	0.0065	0.206	Vel = 3.57
			0.0							
TOR2			158.62						71.018	K Factor = 18.82
TOR2	10.500		158.62	6	T	37.72	9.042	120	71.018	
to					B	12.573	50.293		4.681	* * Fixed Loss = 1
BOR2	2		158.62	6.357	Fsp	0.0	59.335	0.0009	0.055	Vel = 1.60
			0.0							
BOR2			158.62						75.754	K Factor = 18.22
BOR2	2		158.62	6	E	17.603	11.542	120	75.754	
to					2T	75.44	145.851		0.0	
PD	2		158.62	6.357	B	12.573	157.393	0.0009	0.146	Vel = 1.60
					S	40.235				
			0.0							
PD			158.62						75.900	K Factor = 18.21
System Demand Pressure									75.900	
Safety Margin									8.354	
Continuation Pressure									84.254	

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 ******
Pressure @ Pump Outlet									84.254	
Pressure From Pump Curve									-43.996	
Pressure @ Pump Inlet									40.258	
PS	2		0.0	6	2T	75.44	5.458	120	40.258	
to					G	3.772	79.212		0.433	
FLG	1		158.62	6.357			84.670	0.0009	0.079	Vel = 1.60
			0.0							
FLG			158.62						40.770	K Factor = 24.84
FLG	1		158.62	6	E	20.084	4.000	140	40.770	
to							20.084		1.732	
UG1	-3		158.62	6.16			24.084	0.0008	0.020	Vel = 1.71
			0.0							
UG1			158.62						42.522	K Factor = 24.32
UG1	-3		158.62	6	T	43.037	77.000	140	42.522	
to							43.037		0.0	
UG2	-3		158.62	6.16			120.037	0.0008	0.098	Vel = 1.71
UG2	-3		-33.50	8			179.000	140	42.620	
to									0.0	
UG3	-3		125.12	8.27			179.000	0.0001	0.022	Vel = 0.75
			0.0							
UG3			125.12						42.642	K Factor = 19.16
UG2	-3		33.50	8	V	20.56	261.000	140	42.620	
to							20.560		0.0	
UG0	-3		33.5	8.27			281.560	0	0.003	Vel = 0.20
UG0	-3		0.0	8	10V	205.602	1507.000	140	42.623	
to					T	55.354	260.956		0.0	
UG3	-3		33.5	8.27			1767.956	0	0.019	Vel = 0.20
			0.0							
UG3			33.50						42.642	K Factor = 5.13
UG3	-3		158.62	8	G	6.326	521.000	140	42.642	
to					2V	41.12	104.382		-2.166	
BF1	2		158.62	8.27	2E	56.936	625.382	0.0002	0.122	Vel = 0.95
BF1	2		0.0	8	2E	56.936	15.000	140	40.598	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		158.62	8.27			71.936	0.0002	0.013	Vel = 0.95
BF2	-3		0.0	8	V	20.56	75.000	140	55.277	
to					T	55.354	75.914		0.0	
UG4	-3		158.62	8.27			150.914	0.0002	0.029	Vel = 0.95
			0.0							
UG4			158.62						55.306	K Factor = 21.33
UG4	-3		158.62	8	4G	28.75	4156.000	150	55.306	
to					8V	186.874	215.624		0.0	
UG5	-3		158.62	8.27			4371.624	0.0002	0.746	Vel = 0.95
UG5	-3		0.0	8	8V	186.874	3360.000	150	56.052	
to					E	32.344	296.483		0.0	
UG6	-3		158.62	8.27	T	62.89	3656.483	0.0002	0.624	Vel = 0.95
					2G	14.375				

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 ******
			0.0							
UG6			158.62						56.676	K Factor = 21.07
UG6	-3		158.62	12	T	106.533	47.000	150	56.676	
to							106.533		0.0	
UG7	-3		158.62	12.34			153.533	0	0.003	Vel = 0.43
			0.0							
UG7			158.62						56.679	K Factor = 21.07
UG7	-3		158.62	6	E	22.818	13.000	150	56.679	
to					T	48.896	71.714		0.0	
UG8	-3		158.62	6.16			84.714	0.0007	0.061	Vel = 1.71
			0.0							
UG8			158.62						56.740	K Factor = 21.06
UG8	-3		158.62	6	T	43.037	77.000	140	56.740	
to							43.037		0.0	
UG9	-3		158.62	6.16			120.037	0.0008	0.097	Vel = 1.71
UG9	-3		0.0	12	2V	15.94	2136.000	140	56.837	
to					T	93.767	161.279		0.0	
TEST	-3		158.62	12.34	G	9.377	2297.279	0	0.064	Vel = 0.43
					E	42.195				
			100.00							Qa = 100.00
TEST			258.62						56.901	K Factor = 34.28

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-10
Drawing	:	FP17
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-10
Contract	:	4070
Data File	:	NWHES 10 SYS-2 ZONE3 616 LH STD.WXF

Computer Programs by Hydratec Inc. Revision: 50.5520.727

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP17
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-10
Remote area location 4TH-5TH GRADE 614
Occupancy classification LH
Density 0.10 - Gpm/SqFt
Area of application 978 - SqFt
Coverage/sprinkler 225 SF MAX - SqFt
Type of sprinkler calculated QR EC PENDENT 1/2" 155F 5.6K
 # Sprinklers calculated 6
In-rack demand N/A - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 231.274 - GPM @ 41.517 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:
REDUCE AREA FOR HYDRAULIC CALCULATION PER NFPA13 2013 SECTION 11.2.3.2.3

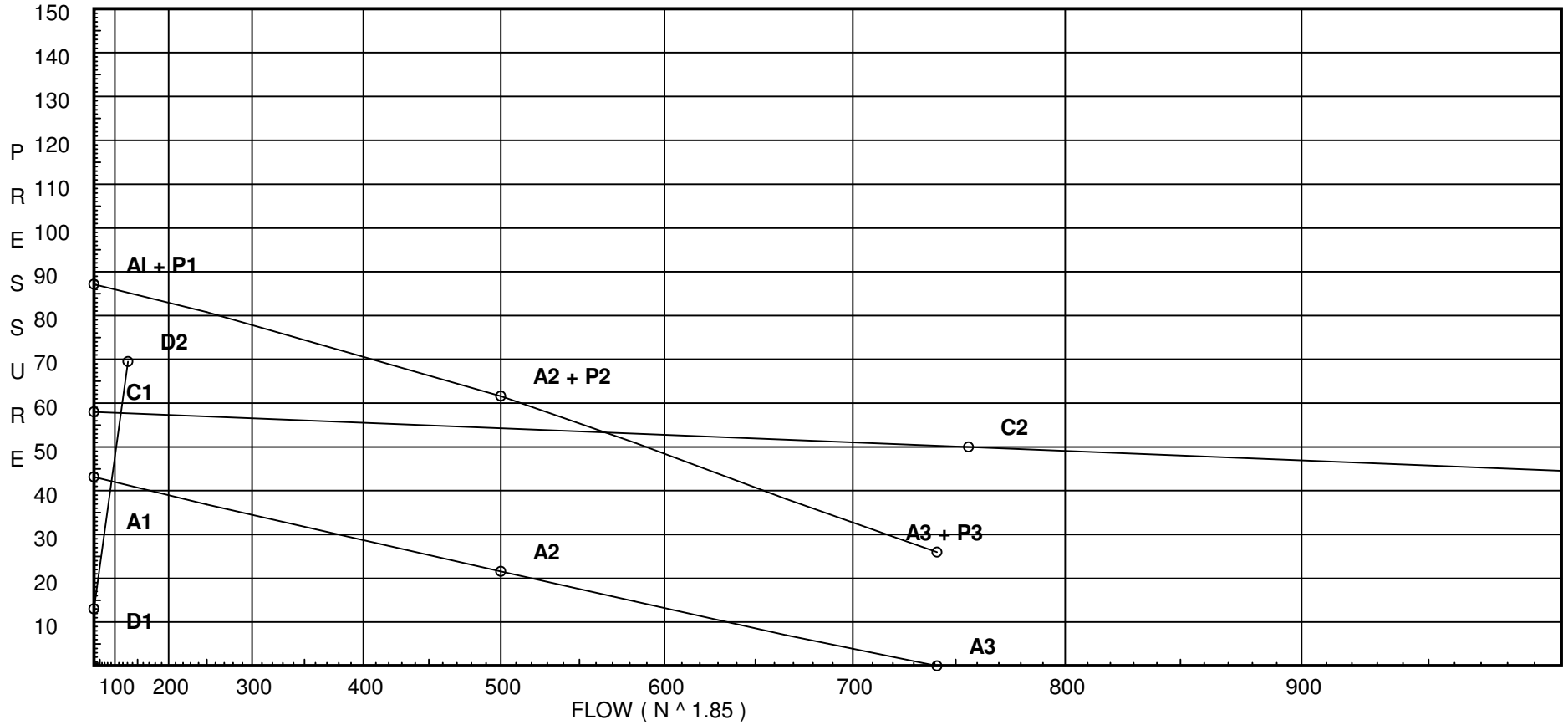
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 43.145
- A2 - Adj Resid : 21.583 @ 500
- A3 - Adj Resid : 0 @ 741.15

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 741.15
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.29

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 12.993
- D2 - System Flow : 131.274
- D2 - System Pressure : 69.456
- Hose (Demand) : _____
- D3 - System Demand : 131.274
- Hose (Adj City) : 100
- Safety Margin : 15.589



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			85.045	131.27	69.456
TEST	58.0	50	756.0	57.106	231.27	57.106

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	27.0	5.6	12.25	19.6	0.1	196
2H	27.0	5.6	13.86	20.85	0.1	196
3H	27.0	5.6	19.72	24.87	0.1	196
4H	26.646	5.6	12.5	19.8	0.1	196
5H	26.646	5.6	14.14	21.05	0.1	196
6H	26.646	5.6	20.1	25.11	0.1	196
1	27.833		13.1			
2	27.833		14.86			
3	27.833		21.24			
4	27.479		13.4			
5	27.479		15.18			
6	27.479		21.69			
610	27.833		29.57			
611	27.479		30.17			
A17	26.917		36.7			
A16	26.917		39.34			
A15	26.917		48.61			
A14T	26.917		49.99			
A14B	23.0		51.77			
A13T	23.0		51.89			
A13B	12.917		56.36			
A12	11.167		57.4			
A11	11.167		57.87			
A10	11.167		58.14			
A9	7.0		63.29			
A8	11.75		61.38			
A7	13.625		60.89			
A6	12.292		61.7			
A5	17.417		59.8			
A4	16.75		60.32			
A3	12.833		62.76			
A2	16.833		61.49			
A1	10.5		64.49			
TOR2	10.5		64.63			
BOR2	2.0		69.35			
PD	2.0		69.46			
PS	2.0		41.05			
FLG	1.0		41.54			
UG1	-3.0		43.28			
UG2	-3.0		43.35			
UG0	-3.0		43.35			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
UG3	-3.0		43.37		
BF1	2.0		41.29		
BF2	-3.0		55.96		
UG4	-3.0		55.98		
UG5	-3.0		56.51		
UG6	-3.0		56.95		
UG7	-3.0		56.95		
UG8	-3.0		56.99		
UG9	-3.0		57.06		
TEST	-3.0		57.11	100.0	

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 ******
1H	27	5.60	19.60	1	2E	4.0	0.667	120	12.250	
to					T	5.0	9.000		-0.361	
1	27.833		19.6	1.049			9.667	0.1254	1.212	Vel = 7.28
			0.0							
1			19.60						13.101	K Factor = 5.42
2H	27	5.60	20.85	1	2E	4.0	0.667	120	13.858	
to					T	5.0	9.000		-0.361	
2	27.833		20.85	1.049			9.667	0.1406	1.359	Vel = 7.74
			0.0							
2			20.85						14.856	K Factor = 5.41
3H	27	5.60	24.87	1	2E	4.0	0.667	120	19.719	
to					T	5.0	9.000		-0.361	
3	27.833		24.87	1.049			9.667	0.1948	1.883	Vel = 9.23
			0.0							
3			24.87						21.241	K Factor = 5.40
4H	26.646	5.60	19.80	1	2E	4.0	0.833	120	12.500	
to					T	5.0	9.000		-0.361	
4	27.479		19.8	1.049			9.833	0.1277	1.256	Vel = 7.35
			0.0							
4			19.80						13.395	K Factor = 5.41
5H	26.646	5.60	21.06	1	2E	4.0	0.833	120	14.136	
to					T	5.0	9.000		-0.361	
5	27.479		21.06	1.049			9.833	0.1432	1.408	Vel = 7.82
			0.0							
5			21.06						15.183	K Factor = 5.40
6H	26.646	5.60	25.11	1	2E	4.0	0.833	120	20.099	
to					T	5.0	9.000		-0.361	
6	27.479		25.11	1.049			9.833	0.1982	1.949	Vel = 9.32
			0.0							
6			25.11						21.687	K Factor = 5.39
1	27.833		19.60	1			14.000	120	13.101	
to									0.0	
2	27.833		19.6	1.049			14.000	0.1254	1.755	Vel = 7.28
2	27.833		20.85	1			13.333	120	14.856	
to									0.0	
3	27.833		40.45	1.049			13.333	0.4789	6.385	Vel = 15.02
3	27.833		24.87	1	T	5.0	2.167	120	21.241	
to							5.000		0.0	
610	27.833		65.32	1.049			7.167	1.1621	8.329	Vel = 24.25
			0.0							
610			65.32						29.570	K Factor = 12.01
4	27.479		19.80	1			14.000	120	13.395	
to									0.0	
5	27.479		19.8	1.049			14.000	0.1277	1.788	Vel = 7.35
5	27.479		21.05	1			13.333	120	15.183	
to									0.0	
6	27.479		40.85	1.049			13.333	0.4878	6.504	Vel = 15.16

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 ******
6	27.479		25.11	1	T	5.0	2.167	120	21.687	
to							5.000		0.0	
611	27.479		65.96	1.049			7.167	1.1835	8.482	Vel = 24.49
			0.0							
611			65.96						30.169	K Factor = 12.01
610	27.833		65.32	2			12.833	120	29.570	
to									0.153	
611	27.479		65.32	2.157			12.833	0.0348	0.446	Vel = 5.74
611	27.479		65.95	2	2E	12.307	25.167	120	30.169	
to					T	12.307	24.614		0.243	
A17	26.917		131.27	2.157			49.781	0.1263	6.288	Vel = 11.53
			0.0							
A17			131.27						36.700	K Factor = 21.67
A17	26.917		131.27	2.5			55.417	120	36.700	
to									0.0	
A16	26.917		131.27	2.635			55.417	0.0476	2.640	Vel = 7.72
A16	26.917		0.0	2.5	T	16.474	178.042	120	39.340	
to							16.474		0.0	
A15	26.917		131.27	2.635			194.516	0.0477	9.270	Vel = 7.72
A15	26.917		0.0	2.5	T	16.474	12.542	120	48.610	
to							16.474		0.0	
A14T	26.917		131.27	2.635			29.016	0.0476	1.382	Vel = 7.72
			0.0							
A14T			131.27						49.992	K Factor = 18.57
A14T	26.917		131.27	4	E	13.167	4.000	120	49.992	
to							13.167		1.696	
A14B	23		131.27	4.26			17.167	0.0047	0.080	Vel = 2.95
A14B	23		0.0	4	E	13.167	13.750	120	51.768	
to							13.167		0.0	
A13T	23		131.27	4.26			26.917	0.0046	0.123	Vel = 2.95
			0.0							
A13T			131.27						51.891	K Factor = 18.22
A13T	23		131.27	4	E	13.167	10.083	120	51.891	
to							13.167		4.367	
A13B	12.917		131.27	4.26			23.250	0.0046	0.107	Vel = 2.95
			0.0							
A13B			131.27						56.365	K Factor = 17.48
A13B	12.917		131.27	4	3E	39.501	20.708	120	56.365	
to							39.501		0.758	
A12	11.167		131.27	4.26			60.209	0.0046	0.277	Vel = 2.95
			0.0							
A12			131.27						57.400	K Factor = 17.33
A12	11.167		131.27	4	4E	52.668	49.375	120	57.400	
to							52.668		0.0	
A11	11.167		131.27	4.26			102.043	0.0046	0.468	Vel = 2.95
A11	11.167		0.0	4	2E	26.334	33.750	120	57.868	
to							26.334		0.0	
A10	11.167		131.27	4.26			60.084	0.0046	0.276	Vel = 2.95

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 ******
A10	11.167		0.0	4	T	26.334	3.833	120	58.144	
to					B	15.8	71.102		4.805	* * Fixed Loss = 3
A9	7		131.27	4.26	Fsp	0.0	74.935	0.0046	0.344	Vel = 2.95
					S	28.968				
A9	7		0.0	4	2E	26.334	6.208	120	63.293	
to							26.334		-2.057	
A8	11.750		131.27	4.26			32.542	0.0046	0.149	Vel = 2.95
A8	11.750		0.0	4	3E	39.501	30.292	120	61.385	
to							39.501		-0.812	
A7	13.625		131.27	4.26			69.793	0.0046	0.321	Vel = 2.95
A7	13.625		0.0	4	2E	26.334	24.167	120	60.894	
to							26.334		0.577	
A6	12.292		131.27	4.26			50.501	0.0046	0.232	Vel = 2.95
A6	12.292		0.0	4	2E	26.334	42.792	120	61.703	
to							26.334		-2.220	
A5	17.417		131.27	4.26			69.126	0.0046	0.318	Vel = 2.95
A5	17.417		0.0	4	2E	26.334	23.333	120	59.801	
to							26.334		0.289	
A4	16.750		131.27	4.26			49.667	0.0046	0.228	Vel = 2.95
			0.0							
A4			131.27						60.318	K Factor = 16.90
A4	16.750		131.27	4	4E	52.668	110.458	120	60.318	
to							52.668		1.696	
A3	12.833		131.27	4.26			163.126	0.0046	0.749	Vel = 2.95
A3	12.833		0.0	4	2E	26.334	74.083	120	62.763	
to							26.334		-1.732	
A2	16.833		131.27	4.26			100.417	0.0046	0.461	Vel = 2.95
A2	16.833		0.0	4	2E	26.334	28.708	120	61.492	
to							26.334		2.743	
A1	10.500		131.27	4.26			55.042	0.0046	0.253	Vel = 2.95
A1	10.500		0.0	4	E	13.167	18.375	120	64.488	
to							13.167		0.0	
TOR2	10.500		131.27	4.26			31.542	0.0046	0.145	Vel = 2.95
			0.0							
TOR2			131.27						64.633	K Factor = 16.33
TOR2	10.500		131.27	6	T	37.72	9.042	120	64.633	
to					B	12.573	50.293		4.681	* * Fixed Loss = 1
BOR2	2		131.27	6.357	Fsp	0.0	59.335	0.0007	0.039	Vel = 1.33
			0.0							
BOR2			131.27						69.353	K Factor = 15.76
BOR2	2		131.27	6	E	17.603	11.542	120	69.353	
to					2T	75.44	145.851		0.0	
PD	2		131.27	6.357	B	12.573	157.393	0.0007	0.103	Vel = 1.33
					S	40.235				
			0.0							
PD			131.27						69.456	K Factor = 15.75
System Demand Pressure									69.456	
Safety Margin									15.589	
Continuation Pressure									85.045	

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 ******
Pressure @ Pump Outlet									85.045	
Pressure From Pump Curve									-43.997	
Pressure @ Pump Inlet									41.048	
PS	2		0.0	6	2T	75.44	5.458	120	41.048	
to					G	3.772	79.212		0.433	
FLG	1		131.27	6.357			84.670	0.0006	0.055	Vel = 1.33
			0.0							
FLG			131.27						41.536	K Factor = 20.37
FLG	1		131.27	6	E	20.084	4.000	140	41.536	
to							20.084		1.732	
UG1	-3		131.27	6.16			24.084	0.0006	0.014	Vel = 1.41
			0.0							
UG1			131.27						43.282	K Factor = 19.95
UG1	-3		131.27	6	T	43.037	77.000	140	43.282	
to							43.037		0.0	
UG2	-3		131.27	6.16			120.037	0.0006	0.069	Vel = 1.41
UG2	-3		-27.72	8			179.000	140	43.351	
to									0.0	
UG3	-3		103.55	8.27			179.000	0.0001	0.016	Vel = 0.62
			0.0							
UG3			103.55						43.367	K Factor = 15.72
UG2	-3		27.72	8	V	20.56	261.000	140	43.351	
to							20.560		0.0	
UG0	-3		27.72	8.27			281.560	0	0.002	Vel = 0.17
UG0	-3		0.0	8	10V	205.602	1507.000	140	43.353	
to					T	55.354	260.956		0.0	
UG3	-3		27.72	8.27			1767.956	0	0.014	Vel = 0.17
			0.0							
UG3			27.72						43.367	K Factor = 4.21
UG3	-3		131.27	8	G	6.326	521.000	140	43.367	
to					2V	41.12	104.382		-2.166	
BF1	2		131.27	8.27	2E	56.936	625.382	0.0001	0.086	Vel = 0.78
BF1	2		0.0	8	2E	56.936	15.000	140	41.287	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		131.27	8.27			71.936	0.0001	0.009	Vel = 0.78
BF2	-3		0.0	8	V	20.56	75.000	140	55.962	
to					T	55.354	75.914		0.0	
UG4	-3		131.27	8.27			150.914	0.0001	0.021	Vel = 0.78
			0.0							
UG4			131.27						55.983	K Factor = 17.54
UG4	-3		131.27	8	4G	28.75	4156.000	150	55.983	
to					8V	186.874	215.624		0.0	
UG5	-3		131.27	8.27			4371.624	0.0001	0.525	Vel = 0.78
UG5	-3		0.0	8	8V	186.874	3360.000	150	56.508	
to					E	32.344	296.483		0.0	
UG6	-3		131.27	8.27	T	62.89	3656.483	0.0001	0.439	Vel = 0.78
					2G	14.375				

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 ******
			0.0							
UG6			131.27						56.947	K Factor = 17.40
UG6	-3		131.27	12	T	106.533	47.000	150	56.947	
to							106.533		0.0	
UG7	-3		131.27	12.34			153.533	0	0.003	Vel = 0.35
			0.0							
UG7			131.27						56.950	K Factor = 17.39
UG7	-3		131.27	6	E	22.818	13.000	150	56.950	
to					T	48.896	71.714		0.0	
UG8	-3		131.27	6.16			84.714	0.0005	0.043	Vel = 1.41
			0.0							
UG8			131.27						56.993	K Factor = 17.39
UG8	-3		131.27	6	T	43.037	77.000	140	56.993	
to							43.037		0.0	
UG9	-3		131.27	6.16			120.037	0.0006	0.068	Vel = 1.41
UG9	-3		0.0	12	2V	15.94	2136.000	140	57.061	
to					T	93.767	161.279		0.0	
TEST	-3		131.27	12.34	G	9.377	2297.279	0	0.045	Vel = 0.35
					E	42.195				
			100.00							Qa = 100.00
TEST			231.27						57.106	K Factor = 30.60

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-11
Drawing	:	FP16
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-11
Contract	:	4070
Data File	:	NWHES 11 SYS-2 ZONE3 M301 OH1.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP16
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-11
Remote area location MECH M301
Occupancy classification OH-1
Density 0.15 - Gpm/SqFt
Area of application WHOLE AREA - SqFt
Coverage/sprinkler 130 SF MAX - SqFt
Type of sprinkler calculated QR UPRIGHT 1/2" 155F 5.6K
 # Sprinklers calculated 10
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 445.991 - GPM @ 42.26 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:

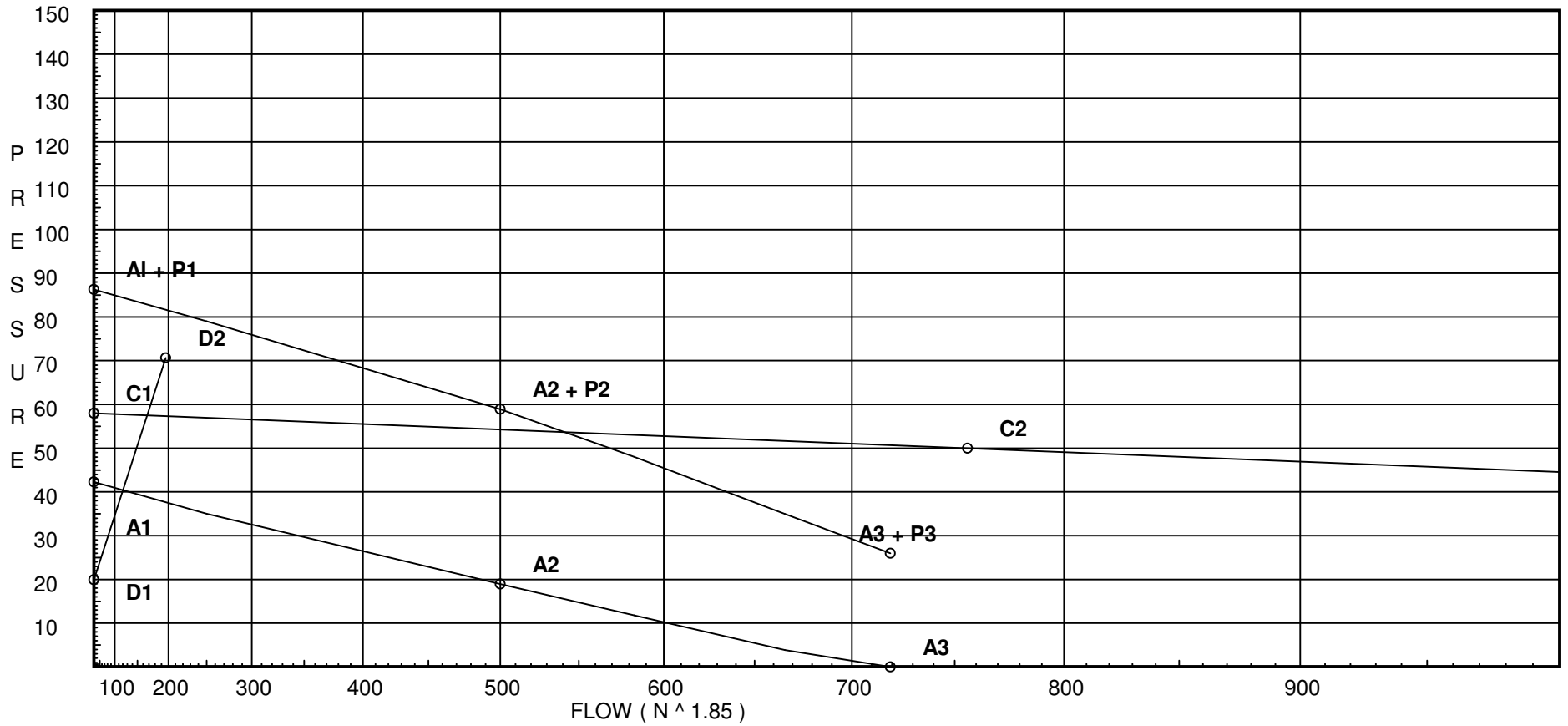
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 42.302
- A2 - Adj Resid : 18.917 @ 500
- A3 - Adj Resid : 0 @ 719.14

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 719.14
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.71

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 19.904
- D2 - System Flow : 195.991
- D2 - System Pressure : 70.664
- Hose (Demand) : _____
- D3 - System Demand : 195.991
- Hose (Adj City) : 250
- Safety Margin : 10.727



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			81.391	195.99	70.664
TEST	58.0	50	756.0	54.986	445.99	54.986

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	31.0	5.6	11.75	19.2	0.15	102.375
2H	31.0	5.6	12.75	20.0	0.15	119.438
3H	31.0	5.6	13.9	20.88	0.15	84
4H	32.917	5.6	16.7	22.88	0.15	84
5H	36.333	5.6	10.99	18.56	0.15	102.375
6H	36.333	5.6	11.93	19.34	0.15	119.438
7H	36.333	5.6	13.76	20.77	0.15	84
8H	42.958	5.6	9.42	17.19	0.15	102.375
9H	42.958	5.6	10.24	17.92	0.15	119.438
10H	42.958	5.6	11.82	19.25	0.15	84
1	30.208		13.14			
2	30.208		14.22			
3	30.208		15.46			
5	33.667		13.01			
6	33.667		14.02			
7	33.667		16.26			
8	42.542		10.42			
9	42.542		11.3			
10	42.542		13.01			
CC0	30.208		20.94			
4	31.5		20.39			
CC1	33.667		19.54			
CC2B	34.542		19.82			
CC2T	41.042		17.3			
CC3	42.542		16.87			
CC4	40.792		18.52			
CC5	39.042		20.38			
CC6	37.292		21.89			
CC7	35.583		23.09			
CC8	33.792		24.11			
CC9	32.042		24.92			
C0	30.208		26.66			
C1	33.667		25.2			
C2B	34.542		25.16			
C2T	41.042		22.5			
C4	40.792		22.72			
C5	39.042		23.76			
C6	37.292		24.95			
C7	35.583		26.29			
C8	33.792		27.9			
C9	32.042		29.74			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
C10T	31.583		31.99		
C10B	23.833		36.95		
C11T	23.833		41.26		
C11B	23.333		42.35		
C12B	23.333		43.98		
C12T	26.917		43.61		
C13	26.917		45.58		
A14T	26.917		46.07		
A14B	23.0		47.93		
A13T	23.0		48.19		
A13B	12.917		52.78		
A12	11.167		54.12		
A11	11.167		55.1		
A10	11.167		55.68		
A9	7.0		61.21		
A8	11.75		59.46		
A7	13.625		59.32		
A6	12.292		60.39		
A5	17.417		58.84		
A4	16.75		59.6		
A3	12.833		62.87		
A2	16.833		62.11		
A1	10.5		65.38		
TOR2	10.5		65.69		
BOR2	2.0		70.45		
PD	2.0		70.66		
PS	2.0		37.4		
FLG	1.0		37.95		
UG1	-3.0		39.71		
UG2	-3.0		39.85		
UG0	-3.0		39.86		
UG3	-3.0		39.89		
BF1	2.0		37.9		
BF2	-3.0		52.59		
UG4	-3.0		52.63		
UG5	-3.0		53.73		
UG6	-3.0		54.65		
UG7	-3.0		54.66		
UG8	-3.0		54.75		
UG9	-3.0		54.89		
TEST	-3.0		54.99	250.0	

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 ******
1H	31	5.60	19.20	1	E	2.0	1.667	120	11.749	
to					T	5.0	7.000		0.343	
1	30.208		19.2	1.049			8.667	0.1206	1.045	Vel = 7.13
			0.0							
1			19.20						13.137	K Factor = 5.30
2H	31	5.60	20.00	1	E	2.0	1.667	120	12.752	
to					T	5.0	7.000		0.343	
2	30.208		20.0	1.049			8.667	0.1301	1.128	Vel = 7.42
			0.0							
2			20.00						14.223	K Factor = 5.30
3H	31	5.60	20.88	1	E	2.0	1.667	120	13.896	
to					T	5.0	7.000		0.343	
3	30.208		20.88	1.049			8.667	0.1409	1.221	Vel = 7.75
			0.0							
3			20.88						15.460	K Factor = 5.31
4H	32.917	5.60	22.88	1	2T	10.0	8.458	120	16.698	
to							10.000		0.614	
4	31.500		22.88	1.049			18.458	0.1670	3.082	Vel = 8.49
			0.0							
4			22.88						20.394	K Factor = 5.07
5H	36.333	5.60	18.56	1	T	5.0	2.667	120	10.988	
to							5.000		1.155	
5	33.667		18.56	1.049			7.667	0.1132	0.868	Vel = 6.89
			0.0							
5			18.56						13.011	K Factor = 5.15
6H	36.333	5.60	19.34	1	T	5.0	2.667	120	11.930	
to							5.000		1.155	
6	33.667		19.34	1.049			7.667	0.1222	0.937	Vel = 7.18
			0.0							
6			19.34						14.022	K Factor = 5.16
7H	36.333	5.60	20.77	1	E	2.0	2.667	120	13.761	
to					T	5.0	7.000		1.155	
7	33.667		20.77	1.049			9.667	0.1395	1.349	Vel = 7.71
			0.0							
7			20.77						16.265	K Factor = 5.15
8H	42.958	5.60	17.19	1	E	2.0	1.333	120	9.423	
to					T	5.0	7.000		0.180	
8	42.542		17.19	1.049			8.333	0.0984	0.820	Vel = 6.38
			0.0							
8			17.19						10.423	K Factor = 5.32
9H	42.958	5.60	17.92	1	E	2.0	1.333	120	10.235	
to					T	5.0	7.000		0.180	
9	42.542		17.92	1.049			8.333	0.1062	0.885	Vel = 6.65
			0.0							
9			17.92						11.300	K Factor = 5.33
10H	42.958	5.60	19.25	1	E	2.0	1.333	120	11.821	
to					T	5.0	7.000		0.180	
10	42.542		19.25	1.049			8.333	0.1213	1.011	Vel = 7.15

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 ******
			0.0							
10			19.25						13.012	K Factor = 5.34
1	30.208		19.20	1			9.000	120	13.137	
to									0.0	
2	30.208		19.2	1.049			9.000	0.1207	1.086	Vel = 7.13
2	30.208		19.99	1.25			10.417	120	14.223	
to									0.0	
3	30.208		39.19	1.38			10.417	0.1187	1.237	Vel = 8.41
3	30.208		20.88	1.25	2E	6.0	8.917	120	15.460	
to					T	6.0	12.000		0.0	
CC0	30.208		60.07	1.38			20.917	0.2618	5.476	Vel = 12.89
			0.0							
CC0			60.07						20.936	K Factor = 13.13
5	33.667		18.56	1			8.917	120	13.011	
to									0.0	
6	33.667		18.56	1.049			8.917	0.1134	1.011	Vel = 6.89
6	33.667		19.34	1.25	2E	6.0	14.083	120	14.022	
to							6.000		0.0	
7	33.667		37.9	1.38			20.083	0.1117	2.243	Vel = 8.13
7	33.667		20.78	1.25	T	6.0	7.042	120	16.265	
to							6.000		0.0	
CC1	33.667		58.68	1.38			13.042	0.2507	3.270	Vel = 12.59
			0.0							
CC1			58.68						19.535	K Factor = 13.28
8	42.542		17.19	1			8.917	120	10.423	
to									0.0	
9	42.542		17.19	1.049			8.917	0.0984	0.877	Vel = 6.38
9	42.542		17.92	1.25	2E	6.0	11.667	120	11.300	
to							6.000		0.0	
10	42.542		35.11	1.38			17.667	0.0969	1.712	Vel = 7.53
10	42.542		19.25	1.25	E	3.0	8.708	120	13.012	
to					T	6.0	9.000		0.0	
CC3	42.542		54.36	1.38			17.708	0.2176	3.854	Vel = 11.66
			0.0							
CC3			54.36						16.866	K Factor = 13.24
CC0	30.208		31.02	2.5			5.250	120	20.936	
to									-0.560	
4	31.500		31.02	2.635			5.250	0.0034	0.018	Vel = 1.83
4	31.500		22.89	2.5			8.667	120	20.394	
to									-0.939	
CC1	33.667		53.91	2.635			8.667	0.0092	0.080	Vel = 3.17
CC1	33.667		29.79	2.5	3E	24.711	7.083	120	19.535	
to							24.711		-0.379	
CC2B	34.542		83.7	2.635			31.794	0.0207	0.659	Vel = 4.92
CC2B	34.542		0.0	2.5	E	8.237	6.500	120	19.815	
to							8.237		-2.815	
CC2T	41.042		83.7	2.635			14.737	0.0207	0.305	Vel = 4.92

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 ******
CC2T	41.042		0.0	2.5	E	8.237	1.917	120	17.305	
to							8.237		-0.650	
CC3	42.542		83.7	2.635			10.154	0.0208	0.211	Vel = 4.92
CC3	42.542		54.36	2.5	T	16.474	0.583	120	16.866	
to							16.474		0.758	
CC4	40.792		138.06	2.635			17.057	0.0523	0.892	Vel = 8.12
CC4	40.792		-24.58	2.5	T	16.474	14.000	120	18.516	
to							16.474		0.758	
CC5	39.042		113.48	2.635			30.474	0.0364	1.109	Vel = 6.68
CC5	39.042		-21.83	2.5	T	16.474	14.000	120	20.383	
to							16.474		0.758	
CC6	37.292		91.65	2.635			30.474	0.0245	0.747	Vel = 5.39
CC6	37.292		-20.72	2.5	T	16.474	13.667	120	21.888	
to							16.474		0.740	
CC7	35.583		70.93	2.635			30.141	0.0153	0.460	Vel = 4.17
CC7	35.583		-21.21	2.5	T	16.474	14.333	120	23.088	
to							16.474		0.776	
CC8	33.792		49.72	2.635			30.807	0.0079	0.243	Vel = 2.93
CC8	33.792		-23.25	2.5	E	8.237	14.167	120	24.107	
to							8.237		0.758	
CC9	32.042		26.47	2.635			22.404	0.0025	0.055	Vel = 1.56
			0.0							
CC9			26.47						24.920	K Factor = 5.30
CC0	30.208		29.04	1.25	T	6.0	77.833	120	20.936	
to							6.000		0.0	
C0	30.208		29.04	1.38			83.833	0.0683	5.722	Vel = 6.23
			0.0							
C0			29.04						26.658	K Factor = 5.62
CC1	33.667		28.89	1.25	T	6.0	77.833	120	19.535	
to							6.000		0.0	
C1	33.667		28.89	1.38			83.833	0.0676	5.665	Vel = 6.20
			0.0							
C1			28.89						25.200	K Factor = 5.76
CC4	40.792		24.58	1.25	T	6.0	77.833	120	18.516	
to							6.000		0.0	
C4	40.792		24.58	1.38			83.833	0.0501	4.201	Vel = 5.27
			0.0							
C4			24.58						22.717	K Factor = 5.16
CC5	39.042		21.83	1.25	T	6.0	77.833	120	20.383	
to							6.000		0.0	
C5	39.042		21.83	1.38			83.833	0.0402	3.374	Vel = 4.68
			0.0							
C5			21.83						23.757	K Factor = 4.48
CC6	37.292		20.72	1.25	T	6.0	77.833	120	21.888	
to							6.000		0.0	
C6	37.292		20.72	1.38			83.833	0.0365	3.064	Vel = 4.44
			0.0							
C6			20.72						24.952	K Factor = 4.15

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 ******
CC7	35.583		21.21	1.25	T	6.0	77.833	120	23.088	
to							6.000		0.0	
C7	35.583		21.21	1.38			83.833	0.0382	3.199	Vel = 4.55
			0.0							
C7			21.21						26.287	K Factor = 4.14
CC8	33.792		23.25	1.25	T	6.0	77.833	120	24.107	
to							6.000		0.0	
C8	33.792		23.25	1.38			83.833	0.0452	3.790	Vel = 4.99
			0.0							
C8			23.25						27.897	K Factor = 4.40
CC9	32.042		26.47	1.25	T	6.0	77.833	120	24.920	
to							6.000		0.0	
C9	32.042		26.47	1.38			83.833	0.0575	4.818	Vel = 5.68
			0.0							
C9			26.47						29.738	K Factor = 4.85
C0	30.208		29.04	2.5			13.917	120	26.658	
to									-1.498	
C1	33.667		29.04	2.635			13.917	0.0029	0.040	Vel = 1.71
C1	33.667		28.89	2.5	3E	24.711	7.083	120	25.200	
to							24.711		-0.379	
C2B	34.542		57.93	2.635			31.794	0.0105	0.334	Vel = 3.41
C2B	34.542		0.0	2.5	E	8.237	6.667	120	25.155	
to							8.237		-2.815	
C2T	41.042		57.93	2.635			14.904	0.0105	0.156	Vel = 3.41
C2T	41.042		0.0	2.5	E	8.237	2.500	120	22.496	
to							8.237		0.108	
C4	40.792		57.93	2.635			10.737	0.0105	0.113	Vel = 3.41
C4	40.792		24.58	2.5			14.000	120	22.717	
to									0.758	
C5	39.042		82.51	2.635			14.000	0.0201	0.282	Vel = 4.85
C5	39.042		21.83	2.5			14.000	120	23.757	
to									0.758	
C6	37.292		104.34	2.635			14.000	0.0312	0.437	Vel = 6.14
C6	37.292		20.72	2.5			13.667	120	24.952	
to									0.740	
C7	35.583		125.06	2.635			13.667	0.0435	0.595	Vel = 7.36
C7	35.583		21.22	2.5			14.333	120	26.287	
to									0.776	
C8	33.792		146.28	2.635			14.333	0.0582	0.834	Vel = 8.61
C8	33.792		23.24	2.5			14.167	120	27.897	
to									0.758	
C9	32.042		169.52	2.635			14.167	0.0764	1.083	Vel = 9.97
			0.0							
C9			169.52						29.738	K Factor = 31.09
C9	32.042		195.99	2.5	2E	16.474	4.083	120	29.738	
to							16.474		0.199	
C10T	31.583		195.99	2.635			20.557	0.1000	2.056	Vel = 11.53

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 ******
C10T	31.583		0.0	2.5	E	8.237	7.750	120	31.993	
to							8.237		3.357	
C10B	23.833		195.99	2.635			15.987	0.1000	1.599	Vel = 11.53
C10B	23.833		0.0	2.5	2E	16.474	26.583	120	36.949	
to							16.474		0.0	
C11T	23.833		195.99	2.635			43.057	0.1000	4.307	Vel = 11.53
			0.0							
C11T			195.99						41.256	K Factor = 30.51
C11T	23.833		195.99	2.5	E	8.237	0.500	120	41.256	
to							8.237		0.217	
C11B	23.333		195.99	2.635			8.737	0.0999	0.873	Vel = 11.53
C11B	23.333		0.0	2.5	E	8.237	8.125	120	42.346	
to							8.237		0.0	
C12B	23.333		195.99	2.635			16.362	0.1000	1.636	Vel = 11.53
			0.0							
C12B			195.99						43.982	K Factor = 29.55
C12B	23.333		195.99	2.5	E	8.237	3.583	120	43.982	
to							8.237		-1.552	
C12T	26.917		195.99	2.635			11.820	0.1000	1.182	Vel = 11.53
C12T	26.917		0.0	2.5	T	16.474	3.208	120	43.612	
to							16.474		0.0	
C13	26.917		195.99	2.635			19.682	0.1000	1.969	Vel = 11.53
			0.0							
C13			195.99						45.581	K Factor = 29.03
C13	26.917		195.99	4	T	26.334	24.083	120	45.581	
to							26.334		0.0	
A14T	26.917		195.99	4.26			50.417	0.0096	0.486	Vel = 4.41
			0.0							
A14T			195.99						46.067	K Factor = 28.88
A14T	26.917		195.99	4	E	13.167	4.000	120	46.067	
to							13.167		1.696	
A14B	23		195.99	4.26			17.167	0.0097	0.166	Vel = 4.41
A14B	23		0.0	4	E	13.167	13.750	120	47.929	
to							13.167		0.0	
A13T	23		195.99	4.26			26.917	0.0096	0.259	Vel = 4.41
			0.0							
A13T			195.99						48.188	K Factor = 28.23
A13T	23		195.99	4	E	13.167	10.083	120	48.188	
to							13.167		4.367	
A13B	12.917		195.99	4.26			23.250	0.0097	0.225	Vel = 4.41
			0.0							
A13B			195.99						52.780	K Factor = 26.98
A13B	12.917		195.99	4	3E	39.501	20.708	120	52.780	
to							39.501		0.758	
A12	11.167		195.99	4.26			60.209	0.0096	0.580	Vel = 4.41
			0.0							
A12			195.99						54.118	K Factor = 26.64

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 ******
A12	11.167		195.99	4	4E	52.668	49.375	120	54.118	
to							52.668		0.0	
A11	11.167		195.99	4.26			102.043	0.0096	0.984	Vel = 4.41
A11	11.167		0.0	4	2E	26.334	33.750	120	55.102	
to							26.334		0.0	
A10	11.167		195.99	4.26			60.084	0.0096	0.579	Vel = 4.41
A10	11.167		0.0	4	T	26.334	3.833	120	55.681	
to					B	15.8	71.102		4.805	* * Fixed Loss = 3
A9	7		195.99	4.26	Fsp	0.0	74.935	0.0096	0.722	Vel = 4.41
					S	28.968				
A9	7		0.0	4	2E	26.334	6.208	120	61.208	
to							26.334		-2.057	
A8	11.750		195.99	4.26			32.542	0.0096	0.313	Vel = 4.41
A8	11.750		0.0	4	3E	39.501	30.292	120	59.464	
to							39.501		-0.812	
A7	13.625		195.99	4.26			69.793	0.0096	0.673	Vel = 4.41
A7	13.625		0.0	4	2E	26.334	24.167	120	59.325	
to							26.334		0.577	
A6	12.292		195.99	4.26			50.501	0.0096	0.487	Vel = 4.41
A6	12.292		0.0	4	2E	26.334	42.792	120	60.389	
to							26.334		-2.220	
A5	17.417		195.99	4.26			69.126	0.0096	0.667	Vel = 4.41
A5	17.417		0.0	4	2E	26.334	23.333	120	58.836	
to							26.334		0.289	
A4	16.750		195.99	4.26			49.667	0.0096	0.479	Vel = 4.41
			0.0							
A4			195.99						59.604	K Factor = 25.39
A4	16.750		195.99	4	4E	52.668	110.458	120	59.604	
to							52.668		1.696	
A3	12.833		195.99	4.26			163.126	0.0096	1.572	Vel = 4.41
A3	12.833		0.0	4	2E	26.334	74.083	120	62.872	
to							26.334		-1.732	
A2	16.833		195.99	4.26			100.417	0.0096	0.968	Vel = 4.41
A2	16.833		0.0	4	2E	26.334	28.708	120	62.108	
to							26.334		2.743	
A1	10.500		195.99	4.26			55.042	0.0096	0.531	Vel = 4.41
A1	10.500		0.0	4	E	13.167	18.375	120	65.382	
to							13.167		0.0	
TOR2	10.500		195.99	4.26			31.542	0.0096	0.304	Vel = 4.41
			0.0							
TOR2			195.99						65.686	K Factor = 24.18
TOR2	10.500		195.99	6	T	37.72	9.042	120	65.686	
to					B	12.573	50.293		4.681	* * Fixed Loss = 1
BOR2	2		195.99	6.357	Fsp	0.0	59.335	0.0014	0.081	Vel = 1.98
			0.0							
BOR2			195.99						70.448	K Factor = 23.35
BOR2	2		195.99	6	E	17.603	11.542	120	70.448	
to					2T	75.44	145.851		0.0	
PD	2		195.99	6.357	B	12.573	157.393	0.0014	0.216	Vel = 1.98

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 ******
					S	40.235				
			0.0							
PD			195.99						70.664	K Factor = 23.31
System Demand Pressure									70.664	
Safety Margin									10.727	
Continuation Pressure									81.391	
Pressure @ Pump Outlet									81.391	
Pressure From Pump Curve									-43.993	
Pressure @ Pump Inlet									37.398	
PS	2		0.0	6	2T	75.44	5.458	120	37.398	
to					G	3.772	79.212		0.433	
FLG	1		195.99	6.357			84.670	0.0014	0.116	Vel = 1.98
			0.0							
FLG			195.99						37.947	K Factor = 31.82
FLG	1		195.99	6	E	20.084	4.000	140	37.947	
to							20.084		1.732	
UG1	-3		195.99	6.16			24.084	0.0012	0.029	Vel = 2.11
			0.0							
UG1			195.99						39.708	K Factor = 31.10
UG1	-3		195.99	6	T	43.037	77.000	140	39.708	
to							43.037		0.0	
UG2	-3		195.99	6.16			120.037	0.0012	0.145	Vel = 2.11
UG2	-3		-41.39	8			179.000	140	39.853	
to									0.0	
UG3	-3		154.6	8.27			179.000	0.0002	0.033	Vel = 0.92
			0.0							
UG3			154.60						39.886	K Factor = 24.48
UG2	-3		41.39	8	V	20.56	261.000	140	39.853	
to							20.560		0.0	
UG0	-3		41.39	8.27			281.560	0	0.004	Vel = 0.25
UG0	-3		0.0	8	10V	205.602	1507.000	140	39.857	
to					T	55.354	260.956		0.0	
UG3	-3		41.39	8.27			1767.956	0	0.029	Vel = 0.25
			0.0							
UG3			41.39						39.886	K Factor = 6.55
UG3	-3		195.99	8	G	6.326	521.000	140	39.886	
to					2V	41.12	104.382		-2.166	
BF1	2		195.99	8.27	2E	56.936	625.382	0.0003	0.179	Vel = 1.17
BF1	2		0.0	8	2E	56.936	15.000	140	37.899	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		195.99	8.27			71.936	0.0003	0.021	Vel = 1.17
BF2	-3		0.0	8	V	20.56	75.000	140	52.586	
to					T	55.354	75.914		0.0	
UG4	-3		195.99	8.27			150.914	0.0003	0.043	Vel = 1.17
			0.0							
UG4			195.99						52.629	K Factor = 27.02
UG4	-3		195.99	8	4G	28.75	4156.000	150	52.629	
to					8V	186.874	215.624		0.0	
UG5	-3		195.99	8.27			4371.624	0.0003	1.102	Vel = 1.17

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 ******
UG5	-3		0.0	8	8V	186.874	3360.000	150	53.731	
to					E	32.344	296.483		0.0	
UG6	-3		195.99	8.27	T	62.89	3656.483	0.0003	0.923	Vel = 1.17
					2G	14.375				
			0.0							
UG6			195.99						54.654	K Factor = 26.51
UG6	-3		195.99	12	T	106.533	47.000	150	54.654	
to							106.533		0.0	
UG7	-3		195.99	12.34			153.533	0	0.005	Vel = 0.53
			0.0							
UG7			195.99						54.659	K Factor = 26.51
UG7	-3		195.99	6	E	22.818	13.000	150	54.659	
to					T	48.896	71.714		0.0	
UG8	-3		195.99	6.16			84.714	0.0011	0.090	Vel = 2.11
			0.0							
UG8			195.99						54.749	K Factor = 26.49
UG8	-3		195.99	6	T	43.037	77.000	140	54.749	
to							43.037		0.0	
UG9	-3		195.99	6.16			120.037	0.0012	0.144	Vel = 2.11
UG9	-3		0.0	12	2V	15.94	2136.000	140	54.893	
to					T	93.767	161.279		0.0	
TEST	-3		195.99	12.34	G	9.377	2297.279	0	0.094	Vel = 0.53
					E	42.195				
			250.00							Qa = 250.00
TEST			445.99						54.987	K Factor = 60.14

Hydraulic Calculations by HydraCALC

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC 27612
(919)835-2225

Job Name	:	NWHES AREA-12
Drawing	:	FP16
Location	:	736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Remote Area	:	AREA-12
Contract	:	4070
Data File	:	NWHES 12 SYS-2 ZONE3 GYM301 LH.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME NORTHWEST HARNETT ELEMENTARY SCHOOL
Location 736 ROLLINS ROAD, FUQUAY VARINA, NC 27526
Drawing # FP16
Contract # 4070
Date 4/19/22

DESIGN

Remote area # AREA-12
Remote area location GYM 301
Occupancy classification LH
Density 0.10 - Gpm/SqFt
Area of application 1604 - SqFt
Coverage/sprinkler 225 SF MAX - SqFt
Type of sprinkler calculated QR UPRIGHT 1/2" 155F 5.6K
 # Sprinklers calculated 10
In-rack demand N/A - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 307.095 - GPM @ 43.130 - Psi
Type of system WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 10/7/2020
Location BETTS RD & NC 42
Source of info LKC ENGINEERING, PLLC JACKSON MAPLES

CONTRACTOR INFO ABL FIRE PROTECTION, LLC
Address 300 HOKE ST., RALEIGH, NC 27601
Phone # 919 835-2225 X107
Name of designer CHRISTY LAMSON
Authority having jurisdiction HARNETT COUNTY FIRE MARSHALL
NOTES:

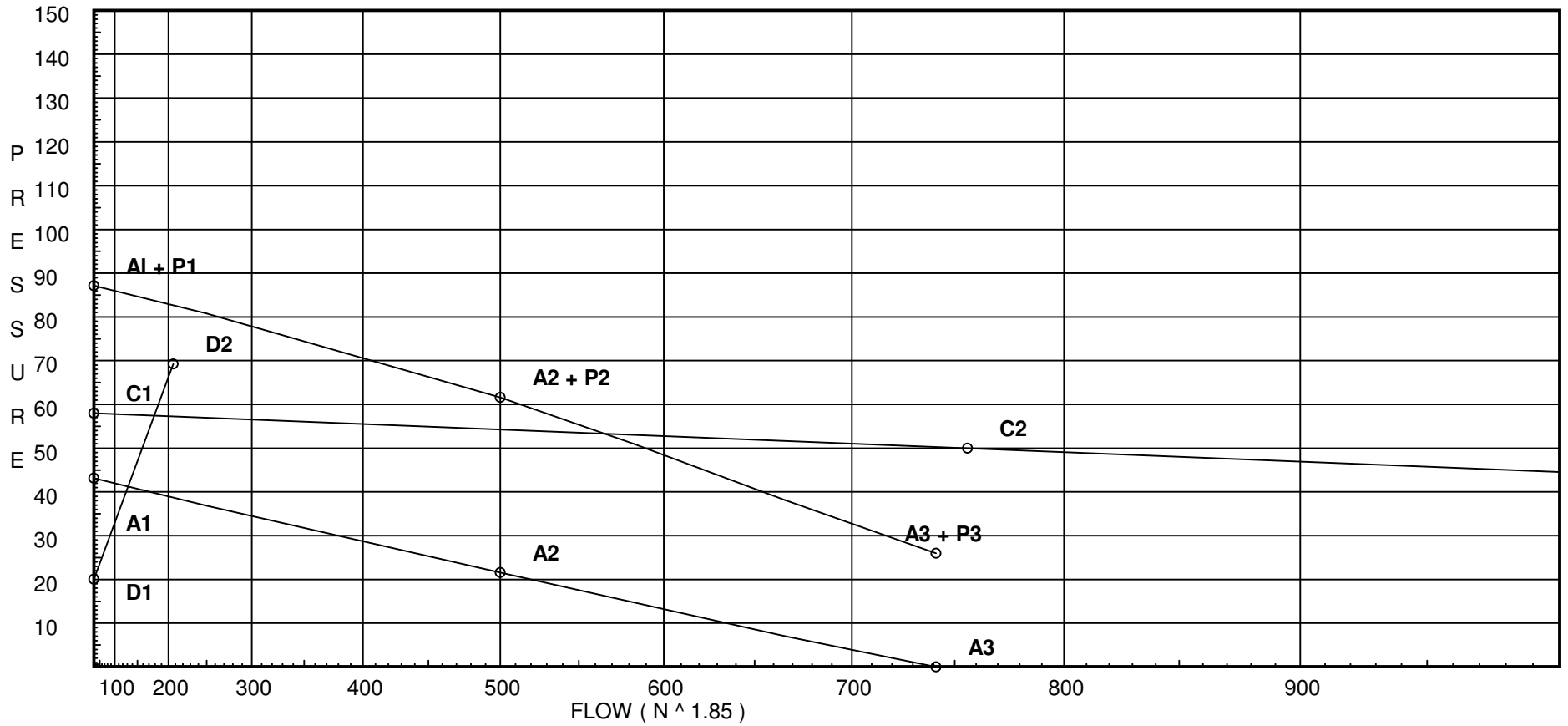
City Water Supply:
- C1 - Static Pressure : 58
- C2 - Residual Pressure: 50
- C2 - Residual Flow : 756

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 43.145
- A2 - Adj Resid : 21.583 @ 500
- A3 - Adj Resid : 0 @ 741.15

Pump Data:
- P1 - Pump Churn Pressure : 44
- P2 - Pump Rated Pressure : 40
- P2 - Pump Rated Flow : 500
- P3 - Pump Pressure @ Max Flow : 26
- P3 - Pump Max Flow : 741.15
- City Residual Flow @ 0 = 2205.82
- City Residual Flow @ 20 = 1755.10
- City Water @ 150% of Pump = 50.29

Pump flow terminated at adjusted curve 0 psi

Demand:
- D1 - Elevation : 20.013
- D2 - System Flow : 207.095
- D2 - System Pressure : 69.220
- Hose (Demand) : _____
- D3 - System Demand : 207.095
- Hose (Adj City) : 100
- Safety Margin : 13.359



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0

Units Summary

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

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

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PD	See Information on Pump Curve			82.579	207.1	69.22
TEST	58.0	50	756.0	56.489	307.1	56.489

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1H	31.708	5.6	14.71	21.48	0.1	194.833
2H	31.708	5.6	14.39	21.24	0.1	194.833
3H	31.708	5.6	14.41	21.26	0.1	194.833
4H	31.708	5.6	15.14	21.79	0.1	194.833
5H	36.833	5.6	13.77	20.78	0.1	194.833
6H	36.833	5.6	13.69	20.72	0.1	194.833
7H	36.833	5.6	13.86	20.85	0.1	194.833
8H	43.208	5.6	12.31	19.65	0.1	196
9H	43.208	5.6	12.25	19.6	0.1	196
10H	43.208	5.6	12.42	19.73	0.1	196
1	30.208		16.33			
2	30.208		15.98			
3	30.208		16.01			
4	30.208		16.78			
5	33.667		16.05			
6	33.667		15.97			
7	33.667		16.15			
8	40.792		14.27			
9	40.792		14.21			
10	40.792		14.39			
CC5	39.042		17.14			
CC6	37.292		18.45			
CC7	35.583		19.55			
CC8	33.792		20.52			
CC9	32.042		21.35			
CC0	30.208		19.12			
CC1	33.667		17.69			
CC2B	34.542		17.75			
CC2T	41.042		15.14			
CC3	42.542		14.62			
CC4	40.792		15.61			
C0	30.208		21.08			
C1	33.667		19.69			
C2B	34.542		19.93			
C2T	41.042		17.41			
C4	40.792		17.73			
C5	39.042		19.0			
C6	37.292		20.41			
C7	35.583		21.93			
C8	33.792		23.72			
C9	32.042		25.73			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
C10T	31.583		28.2		
C10B	23.833		33.33		
C11T	23.833		38.1		
C11B	23.333		39.28		
C12B	23.333		41.1		
C12T	26.917		40.85		
C13	26.917		43.03		
A14T	26.917		43.57		
A14B	23.0		45.45		
A13T	23.0		45.74		
A13B	12.917		50.35		
A12	11.167		51.75		
A11	11.167		52.84		
A10	11.167		53.48		
A9	7.0		59.09		
A8	11.75		57.38		
A7	13.625		57.31		
A6	12.292		58.43		
A5	17.417		56.95		
A4	16.75		57.76		
A3	12.833		61.2		
A2	16.833		60.54		
A1	10.5		63.87		
TOR2	10.5		64.21		
BOR2	2.0		68.98		
PD	2.0		69.22		
PS	2.0		38.59		
FLG	1.0		39.15		
UG1	-3.0		40.91		
UG2	-3.0		41.07		
UG0	-3.0		41.08		
UG3	-3.0		41.11		
BF1	2.0		39.14		
BF2	-3.0		53.83		
UG4	-3.0		53.88		
UG5	-3.0		55.1		
UG6	-3.0		56.12		
UG7	-3.0		56.13		
UG8	-3.0		56.23		
UG9	-3.0		56.39		
TEST	-3.0		56.49	100.0	

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 ******
1H	31.708	5.60	21.48	1	T	5.0	1.500	120	14.711	
to							5.000		0.650	
1	30.208		21.48	1.049			6.500	0.1485	0.965	Vel = 7.97
			0.0							
1			21.48						16.326	K Factor = 5.32
2H	31.708	5.60	21.24	1	T	5.0	1.500	120	14.388	
to							5.000		0.650	
2	30.208		21.24	1.049			6.500	0.1455	0.946	Vel = 7.88
			0.0							
2			21.24						15.984	K Factor = 5.31
3H	31.708	5.60	21.26	1	T	5.0	1.500	120	14.413	
to							5.000		0.650	
3	30.208		21.26	1.049			6.500	0.1457	0.947	Vel = 7.89
			0.0							
3			21.26						16.010	K Factor = 5.31
4H	31.708	5.60	21.79	1	T	5.0	1.500	120	15.138	
to							5.000		0.650	
4	30.208		21.79	1.049			6.500	0.1523	0.990	Vel = 8.09
			0.0							
4			21.79						16.778	K Factor = 5.32
5H	36.833	5.60	20.78	1	T	5.0	1.542	120	13.768	
to							5.000		1.371	
5	33.667		20.78	1.049			6.542	0.1397	0.914	Vel = 7.71
			0.0							
5			20.78						16.053	K Factor = 5.19
6H	36.833	5.60	20.72	1	T	5.0	1.542	120	13.689	
to							5.000		1.371	
6	33.667		20.72	1.049			6.542	0.1389	0.909	Vel = 7.69
			0.0							
6			20.72						15.969	K Factor = 5.19
7H	36.833	5.60	20.85	1	T	5.0	1.542	120	13.858	
to							5.000		1.371	
7	33.667		20.85	1.049			6.542	0.1405	0.919	Vel = 7.74
			0.0							
7			20.85						16.148	K Factor = 5.19
8H	43.208	5.60	19.65	1	T	5.0	2.292	120	12.308	
to							5.000		1.046	
8	40.792		19.65	1.049			7.292	0.1260	0.919	Vel = 7.29
			0.0							
8			19.65						14.273	K Factor = 5.20
9H	43.208	5.60	19.60	1	T	5.0	2.292	120	12.250	
to							5.000		1.046	
9	40.792		19.6	1.049			7.292	0.1253	0.914	Vel = 7.28
			0.0							
9			19.60						14.210	K Factor = 5.20
10H	43.208	5.60	19.74	1	T	5.0	2.292	120	12.419	
to							5.000		1.046	
10	40.792		19.74	1.049			7.292	0.1270	0.926	Vel = 7.33

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 ******
			0.0							
10			19.74						14.391	K Factor = 5.20
1	30.208		38.16	1.25	T	6.0	18.750	120	16.326	
to							6.000		0.0	
CC0	30.208		38.16	1.38			24.750	0.1131	2.799	Vel = 8.19
			0.0							
CC0			38.16						19.125	K Factor = 8.73
1	30.208		-16.68	1.25			14.000	120	16.326	
to									0.0	
2	30.208		-16.68	1.38			14.000	-0.0244	-0.342	Vel = 3.58
2	30.208		21.24	1.25			11.750	120	15.984	
to									0.0	
3	30.208		4.56	1.38			11.750	0.0022	0.026	Vel = 0.98
3	30.208		21.26	1.25			14.000	120	16.010	
to									0.0	
4	30.208		25.82	1.38			14.000	0.0549	0.768	Vel = 5.54
4	30.208		21.79	1.25	T	6.0	19.292	120	16.778	
to							6.000		0.0	
C0	30.208		47.61	1.38			25.292	0.1703	4.307	Vel = 10.21
			0.0							
C0			47.61						21.085	K Factor = 10.37
5	33.667		28.60	1.25	T	6.0	18.750	120	16.053	
to							6.000		0.0	
CC1	33.667		28.6	1.38			24.750	0.0663	1.641	Vel = 6.13
			0.0							
CC1			28.60						17.694	K Factor = 6.80
5	33.667		-7.82	1.25			14.000	120	16.053	
to									0.0	
6	33.667		-7.82	1.38			14.000	-0.0060	-0.084	Vel = 1.68
6	33.667		20.72	1.25			11.750	120	15.969	
to									0.0	
7	33.667		12.9	1.38			11.750	0.0152	0.179	Vel = 2.77
7	33.667		20.85	1.25	T	6.0	33.292	120	16.148	
to							6.000		0.0	
C1	33.667		33.75	1.38			39.292	0.0901	3.540	Vel = 7.24
			0.0							
C1			33.75						19.688	K Factor = 7.61
8	40.792		26.27	1.25	T	6.0	17.667	120	14.273	
to							6.000		0.0	
CC4	40.792		26.27	1.38			23.667	0.0567	1.341	Vel = 5.63
			0.0							
CC4			26.27						15.614	K Factor = 6.65
8	40.792		-6.63	1.25			14.000	120	14.273	
to									0.0	
9	40.792		-6.63	1.38			14.000	-0.0045	-0.063	Vel = 1.42
9	40.792		19.60	1.25			11.750	120	14.210	
to									0.0	
10	40.792		12.97	1.38			11.750	0.0154	0.181	Vel = 2.78

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 ******
10	40.792		19.74	1.25	T	6.0	33.292	120	14.391	
to							6.000		0.0	
C4	40.792		32.71	1.38			39.292	0.0850	3.341	Vel = 7.02
			0.0							
C4			32.71						17.732	K Factor = 7.77
CC5	39.042		15.26	1.25	2T	12.0	77.833	120	17.140	
to							12.000		0.0	
C5	39.042		15.26	1.38			89.833	0.0207	1.864	Vel = 3.27
			0.0							
C5			15.26						19.004	K Factor = 3.50
CC6	37.292		15.69	1.25	2T	12.0	77.833	120	18.450	
to							12.000		0.0	
C6	37.292		15.69	1.38			89.833	0.0218	1.961	Vel = 3.37
			0.0							
C6			15.69						20.411	K Factor = 3.47
CC7	35.583		17.43	1.25	2T	12.0	77.833	120	19.549	
to							12.000		0.0	
C7	35.583		17.43	1.38			89.833	0.0265	2.385	Vel = 3.74
			0.0							
C7			17.43						21.934	K Factor = 3.72
CC8	33.792		20.43	1.25	2T	12.0	77.833	120	20.524	
to							12.000		0.0	
C8	33.792		20.43	1.38			89.833	0.0356	3.199	Vel = 4.38
			0.0							
C8			20.43						23.723	K Factor = 4.19
CC9	32.042		24.22	1.25	2T	12.0	77.833	120	21.346	
to							12.000		0.0	
C9	32.042		24.22	1.38			89.833	0.0488	4.381	Vel = 5.20
			0.0							
C9			24.22						25.727	K Factor = 4.78
CC0	30.208		38.16	2.5			13.917	120	19.125	
to									-1.498	
CC1	33.667		38.16	2.635			13.917	0.0048	0.067	Vel = 2.25
CC1	33.667		28.60	2.5	3E	24.711	7.083	120	17.694	
to							24.711		-0.379	
CC2B	34.542		66.76	2.635			31.794	0.0137	0.434	Vel = 3.93
CC2B	34.542		0.0	2.5	E	8.237	6.500	120	17.749	
to							8.237		-2.815	
CC2T	41.042		66.76	2.635			14.737	0.0136	0.201	Vel = 3.93
CC2T	41.042		0.0	2.5	E	8.237	1.917	120	15.135	
to							8.237		-0.650	
CC3	42.542		66.76	2.635			10.154	0.0137	0.139	Vel = 3.93
CC3	42.542		0.0	2.5	T	16.474	0.583	120	14.624	
to							16.474		0.758	
CC4	40.792		66.76	2.635			17.057	0.0136	0.232	Vel = 3.93
CC4	40.792		26.27	2.5	T	16.474	14.000	120	15.614	
to							16.474		0.758	
CC5	39.042		93.03	2.635			30.474	0.0252	0.768	Vel = 5.47

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 ******
CC5	39.042		-15.26	2.5	T	16.474	14.000	120	17.140	
to							16.474		0.758	
CC6	37.292		77.77	2.635			30.474	0.0181	0.552	Vel = 4.58
CC6	37.292		-15.69	2.5	T	16.474	13.667	120	18.450	
to							16.474		0.740	
CC7	35.583		62.08	2.635			30.141	0.0119	0.359	Vel = 3.65
CC7	35.583		-17.43	2.5	T	16.474	14.333	120	19.549	
to							16.474		0.776	
CC8	33.792		44.65	2.635			30.807	0.0065	0.199	Vel = 2.63
CC8	33.792		-20.43	2.5	T	16.474	14.167	120	20.524	
to							16.474		0.758	
CC9	32.042		24.22	2.635			30.641	0.0021	0.064	Vel = 1.42
			0.0							
CC9			24.22						21.346	K Factor = 5.24
C0	30.208		47.61	2.5			13.917	120	21.085	
to									-1.498	
C1	33.667		47.61	2.635			13.917	0.0073	0.101	Vel = 2.80
C1	33.667		33.75	2.5	3E	24.711	7.083	120	19.688	
to							24.711		-0.379	
C2B	34.542		81.36	2.635			31.794	0.0197	0.625	Vel = 4.79
C2B	34.542		0.0	2.5	E	8.237	6.667	120	19.934	
to							8.237		-2.815	
C2T	41.042		81.36	2.635			14.904	0.0197	0.293	Vel = 4.79
C2T	41.042		0.0	2.5	E	8.237	2.500	120	17.412	
to							8.237		0.108	
C4	40.792		81.36	2.635			10.737	0.0197	0.212	Vel = 4.79
C4	40.792		32.70	2.5			14.000	120	17.732	
to									0.758	
C5	39.042		114.06	2.635			14.000	0.0367	0.514	Vel = 6.71
C5	39.042		15.26	2.5			14.000	120	19.004	
to									0.758	
C6	37.292		129.32	2.635			14.000	0.0464	0.649	Vel = 7.61
C6	37.292		15.69	2.5			13.667	120	20.411	
to									0.740	
C7	35.583		145.01	2.635			13.667	0.0573	0.783	Vel = 8.53
C7	35.583		17.43	2.5			14.333	120	21.934	
to									0.776	
C8	33.792		162.44	2.635			14.333	0.0707	1.013	Vel = 9.56
C8	33.792		20.44	2.5			14.167	120	23.723	
to									0.758	
C9	32.042		182.88	2.635			14.167	0.0880	1.246	Vel = 10.76
			0.0							
C9			182.88						25.727	K Factor = 36.06
C9	32.042		207.10	2.5	2E	16.474	4.083	120	25.727	
to							16.474		0.199	
C10T	31.583		207.1	2.635			20.557	0.1108	2.277	Vel = 12.18
C10T	31.583		0.0	2.5	E	8.237	7.750	120	28.203	
to							8.237		3.357	
C10B	23.833		207.1	2.635			15.987	0.1107	1.770	Vel = 12.18

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 ******
C10B	23.833		0.0	2.5	2E	16.474	26.583	120	33.330	
to							16.474		0.0	
C11T	23.833		207.1	2.635			43.057	0.1108	4.769	Vel = 12.18
C11T	23.833		0.0	2.5	E	8.237	0.500	120	38.099	
to							8.237		0.217	
C11B	23.333		207.1	2.635			8.737	0.1107	0.967	Vel = 12.18
C11B	23.333		0.0	2.5	E	8.237	8.125	120	39.283	
to							8.237		0.0	
C12B	23.333		207.1	2.635			16.362	0.1107	1.812	Vel = 12.18
			0.0							
C12B			207.10						41.095	K Factor = 32.31
C12B	23.333		207.10	2.5	E	8.237	3.583	120	41.095	
to							8.237		-1.552	
C12T	26.917		207.1	2.635			11.820	0.1107	1.309	Vel = 12.18
C12T	26.917		0.0	2.5	T	16.474	3.208	120	40.852	
to							16.474		0.0	
C13	26.917		207.1	2.635			19.682	0.1108	2.180	Vel = 12.18
			0.0							
C13			207.10						43.032	K Factor = 31.57
C13	26.917		207.10	4	T	26.334	24.083	120	43.032	
to							26.334		0.0	
A14T	26.917		207.1	4.26			50.417	0.0107	0.538	Vel = 4.66
			0.0							
A14T			207.10						43.570	K Factor = 31.38
A14T	26.917		207.10	4	E	13.167	4.000	120	43.570	
to							13.167		1.696	
A14B	23		207.1	4.26			17.167	0.0107	0.184	Vel = 4.66
A14B	23		0.0	4	E	13.167	13.750	120	45.450	
to							13.167		0.0	
A13T	23		207.1	4.26			26.917	0.0107	0.287	Vel = 4.66
			0.0							
A13T			207.10						45.737	K Factor = 30.62
A13T	23		207.10	4	E	13.167	10.083	120	45.737	
to							13.167		4.367	
A13B	12.917		207.1	4.26			23.250	0.0107	0.248	Vel = 4.66
			0.0							
A13B			207.10						50.352	K Factor = 29.19
A13B	12.917		207.10	4	3E	39.501	20.708	120	50.352	
to							39.501		0.758	
A12	11.167		207.1	4.26			60.209	0.0107	0.643	Vel = 4.66
			0.0							
A12			207.10						51.753	K Factor = 28.79
A12	11.167		207.10	4	4E	52.668	49.375	120	51.753	
to							52.668		0.0	
A11	11.167		207.1	4.26			102.043	0.0107	1.089	Vel = 4.66
A11	11.167		0.0	4	2E	26.334	33.750	120	52.842	
to							26.334		0.0	
A10	11.167		207.1	4.26			60.084	0.0107	0.641	Vel = 4.66

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 ******
A10	11.167		0.0	4	T	26.334	3.833	120	53.483	
to					B	15.8	71.102		4.805	* * Fixed Loss = 3
A9	7		207.1	4.26	Fsp	0.0	74.935	0.0107	0.800	Vel = 4.66
					S	28.968				
A9	7		0.0	4	2E	26.334	6.208	120	59.088	
to							26.334		-2.057	
A8	11.750		207.1	4.26			32.542	0.0107	0.347	Vel = 4.66
A8	11.750		0.0	4	3E	39.501	30.292	120	57.378	
to							39.501		-0.812	
A7	13.625		207.1	4.26			69.793	0.0107	0.745	Vel = 4.66
A7	13.625		0.0	4	2E	26.334	24.167	120	57.311	
to							26.334		0.577	
A6	12.292		207.1	4.26			50.501	0.0107	0.540	Vel = 4.66
A6	12.292		0.0	4	2E	26.334	42.792	120	58.428	
to							26.334		-2.220	
A5	17.417		207.1	4.26			69.126	0.0107	0.738	Vel = 4.66
A5	17.417		0.0	4	2E	26.334	23.333	120	56.946	
to							26.334		0.289	
A4	16.750		207.1	4.26			49.667	0.0107	0.530	Vel = 4.66
			0.0							
A4			207.10						57.765	K Factor = 27.25
A4	16.750		207.10	4	4E	52.668	110.458	120	57.765	
to							52.668		1.696	
A3	12.833		207.1	4.26			163.126	0.0107	1.741	Vel = 4.66
A3	12.833		0.0	4	2E	26.334	74.083	120	61.202	
to							26.334		-1.732	
A2	16.833		207.1	4.26			100.417	0.0107	1.072	Vel = 4.66
A2	16.833		0.0	4	2E	26.334	28.708	120	60.542	
to							26.334		2.743	
A1	10.500		207.1	4.26			55.042	0.0107	0.587	Vel = 4.66
A1	10.500		0.0	4	E	13.167	18.375	120	63.872	
to							13.167		0.0	
TOR2	10.500		207.1	4.26			31.542	0.0107	0.337	Vel = 4.66
			0.0							
TOR2			207.10						64.209	K Factor = 25.85
TOR2	10.500		207.10	6	T	37.72	9.042	120	64.209	
to					B	12.573	50.293		4.681	* * Fixed Loss = 1
BOR2	2		207.1	6.357	Fsp	0.0	59.335	0.0015	0.090	Vel = 2.09
			0.0							
BOR2			207.10						68.980	K Factor = 24.94
BOR2	2		207.10	6	E	17.603	11.542	120	68.980	
to					2T	75.44	145.851		0.0	
PD	2		207.1	6.357	B	12.573	157.393	0.0015	0.240	Vel = 2.09
					S	40.235				
			0.0							
PD			207.10						69.220	K Factor = 24.89
System Demand Pressure									69.220	
Safety Margin									13.359	
Continuation Pressure									82.579	

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 ******
Pressure @ Pump Outlet									82.579	
Pressure From Pump Curve									-43.993	
Pressure @ Pump Inlet									38.586	
PS	2		0.0	6	2T	75.44	5.458	120	38.586	
to					G	3.772	79.212		0.433	
FLG	1		207.1	6.357			84.670	0.0015	0.128	Vel = 2.09
			0.0							
FLG			207.10						39.147	K Factor = 33.10
FLG	1		207.10	6	E	20.084	4.000	140	39.147	
to							20.084		1.732	
UG1	-3		207.1	6.16			24.084	0.0014	0.033	Vel = 2.23
			0.0							
UG1			207.10						40.912	K Factor = 32.38
UG1	-3		207.10	6	T	43.037	77.000	140	40.912	
to							43.037		0.0	
UG2	-3		207.1	6.16			120.037	0.0013	0.160	Vel = 2.23
UG2	-3		-43.74	8			179.000	140	41.072	
to									0.0	
UG3	-3		163.36	8.27			179.000	0.0002	0.037	Vel = 0.98
			0.0							
UG3			163.36						41.109	K Factor = 25.48
UG2	-3		43.73	8	V	20.56	261.000	140	41.072	
to							20.560		0.0	
UG0	-3		43.73	8.27			281.560	0	0.005	Vel = 0.26
UG0	-3		0.0	8	10V	205.602	1507.000	140	41.077	
to					T	55.354	260.956		0.0	
UG3	-3		43.73	8.27			1767.956	0	0.032	Vel = 0.26
			0.0							
UG3			43.73						41.109	K Factor = 6.82
UG3	-3		207.10	8	G	6.326	521.000	140	41.109	
to					2V	41.12	104.382		-2.166	
BF1	2		207.1	8.27	2E	56.936	625.382	0.0003	0.198	Vel = 1.24
BF1	2		0.0	8	2E	56.936	15.000	140	39.141	
to							56.936		14.666	* * Fixed Loss = 12.5
BF2	-3		207.1	8.27			71.936	0.0003	0.023	Vel = 1.24
BF2	-3		0.0	8	V	20.56	75.000	140	53.830	
to					T	55.354	75.914		0.0	
UG4	-3		207.1	8.27			150.914	0.0003	0.048	Vel = 1.24
			0.0							
UG4			207.10						53.878	K Factor = 28.21
UG4	-3		207.10	8	4G	28.75	4156.000	150	53.878	
to					8V	186.874	215.624		0.0	
UG5	-3		207.1	8.27			4371.624	0.0003	1.221	Vel = 1.24
UG5	-3		0.0	8	8V	186.874	3360.000	150	55.099	
to					E	32.344	296.483		0.0	
UG6	-3		207.1	8.27	T	62.89	3656.483	0.0003	1.021	Vel = 1.24
					2G	14.375				

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 ******
			0.0							
UG6			207.10						56.120	K Factor = 27.65
UG6	-3		207.10	12	T	106.533	47.000	150	56.120	
to							106.533		0.0	
UG7	-3		207.1	12.34			153.533	0	0.006	Vel = 0.56
			0.0							
UG7			207.10						56.126	K Factor = 27.64
UG7	-3		207.10	6	E	22.818	13.000	150	56.126	
to					T	48.896	71.714		0.0	
UG8	-3		207.1	6.16			84.714	0.0012	0.099	Vel = 2.23
			0.0							
UG8			207.10						56.225	K Factor = 27.62
UG8	-3		207.10	6	T	43.037	77.000	140	56.225	
to							43.037		0.0	
UG9	-3		207.1	6.16			120.037	0.0013	0.160	Vel = 2.23
UG9	-3		0.0	12	2V	15.94	2136.000	140	56.385	
to					T	93.767	161.279		0.0	
TEST	-3		207.1	12.34	G	9.377	2297.279	0	0.104	Vel = 0.56
					E	42.195				
			100.00							Qa = 100.00
TEST			307.10						56.489	K Factor = 40.86

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FIRE FLOW TEST RESULTS:

Test Number	2
Test Date & Time	10/7/20 1:00 PM
Client	
Location	NW Harnett Co, NC
Performed by	J Maples Logan Willams

Static Pressure	68	psi	Location:	Betts Rd & NC 42
Residual Pressure	60	psi	Location:	
Nozzle inside Diameter		inches	(measure nozzle used)	
Pitot Tube Pressure	25	psi	Location:	Betts Rd & Christian Light Rd
Discharge rate (measured)	840	gpm	Flow Measuring Device:	PollardWater Pitot Gauge
Required Residual Pressure	30	psi	(varies - 20psi minimum)	

Formula: $$Q_R = Q_F \times \left({}^{H_R}/_{H_F}\right)^{0.54}$$

$Q_{(R)}$ = Rated Capacity (in gpm) at 20 psi residual
$Q_{(F)}$ = Total test flow (gpm) from at pitot pressure
$H_{(R)}$ = Static Pressure - Required Pressure (psi)
$H_{(F)}$ = Static Pressure - Residual Pressure

$Q_{(R)}$ =	840	38	8
	$Q_{(F)}$	$H_{(R)}$	$H_{(F)}$

Available Fire Flow $Q_{(R)}$ =	**1,948**	gpm at	30	psi residual (calculated)

Performed By: Jackson Maples 10/7/2020
Date

Certified By: _____ _____
Date

Notes: