

Hydraulic Summary

Job Number: NC-1429
Report Description: Residential (4th Floor - 13R)

Job

Job Number
NC-1429
Job Name:
Residences at Blackwell
Address 1
2840 SE Blue Pkwy
Address 2
Lee's Summit, MO 64063
Address 3

Designer

State Certification/License Number

AHJ
LS Codes
Job Site/Building
4th Floor - 13R
Drawing Name
RB-Calc-ALL-06-18-2024

System

Most Demanding Sprinkler Data
4 K-Factor 18.00 at 20.250
Hose Allowance At Source
100.00
Additional Hose Supplies

Remote Area(s)
Occupancy
Residential
Density
0.10gpm/ft²
Area of Application
438ft² (Actual 417ft²)
Number Of Sprinklers Calculated
4
Number Of Nozzles Calculated
0
Coverage Per Sprinkler
288ft²

NodeFlow(gpm)

Total Hose Streams
100.00
System Flow Demand
67.81
Maximum Pressure Unbalance In Loops
0.000
Maximum Velocity Above Ground
16.53 between nodes 420 and 110
Maximum Velocity Under Ground
1.66 between nodes 1 and 4
Volume capacity of Wet Pipes
1289.16gal
Total Water Required (Including Hose Allowance)
167.81
Volume capacity of Dry Pipes

Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Flow Test	100.00	86.000	78.000		2000.00	85.918		167.81	74.120	11.799

Contractor

Contractor Number
01
Name of Contractor:
Alliance Fire Protection
Address 1
130 W 9th Ave #101
Address 2
North Kansas City, MO 64116
City

Contact Name

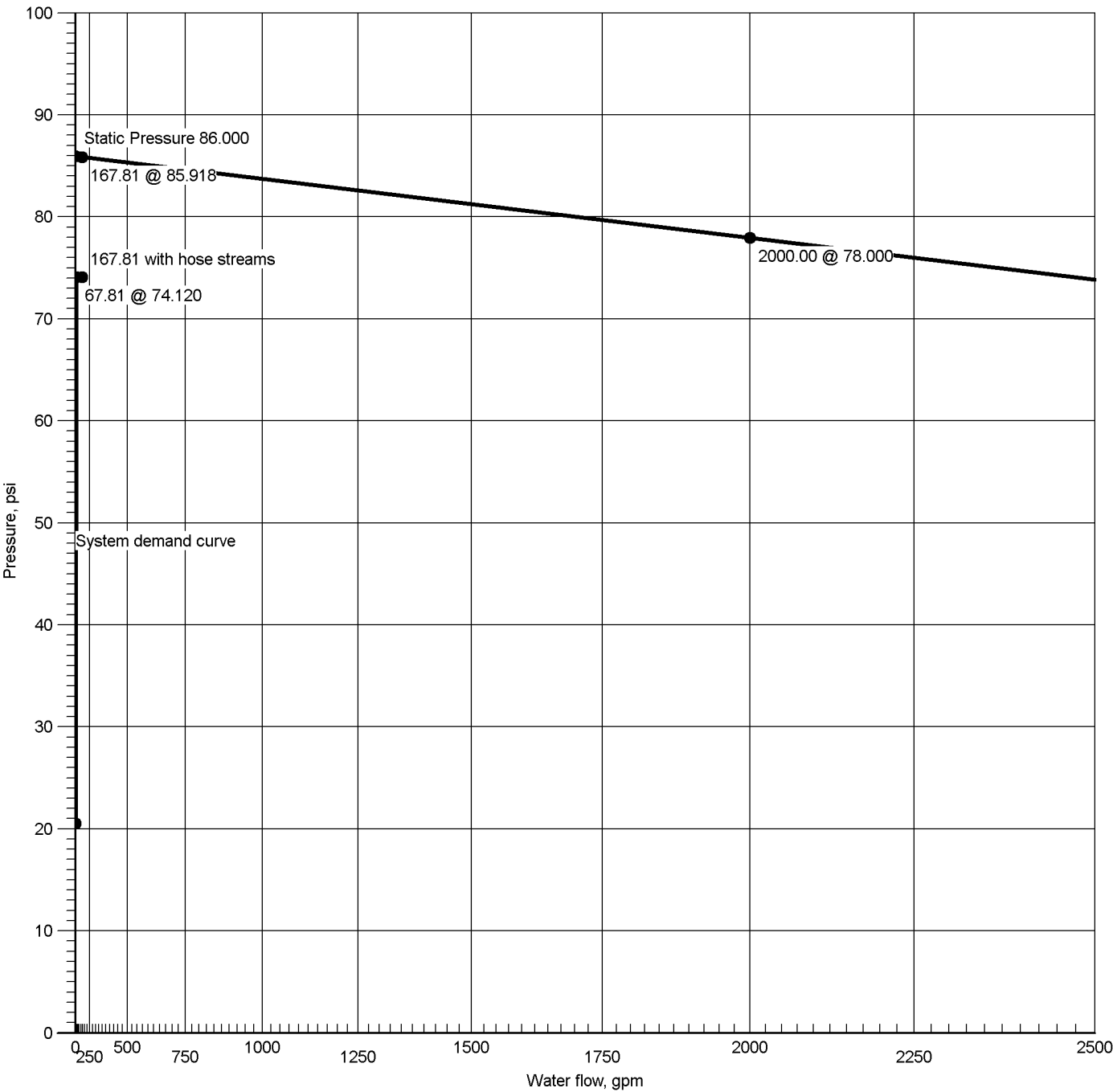
Phone
913-888-0647
FAX
913-888-0618
E-mail

Contact Title

Extension

Web-Site

Flow Test at Node 1



Hydraulic Graph
Flow Test at Node 1
Static: Pressure
86.000
Residual: Pressure
78.000 @ 2000.00
Available Pressure at (?lbTestTime)
85.918 @ 167.81
System Demand
74.120 @ 67.81
System Demand (Including Hose Allowance at Source)
74.120 @ 167.81

Summary Of Outflowing Devices

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Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)
⇒ Sprinkler	1812	18.00	18.00	4	20.250
Sprinkler	1833	18.90	16.00	4	22.314
Sprinkler	1858	15.46	11.00	4	14.936
Sprinkler	1859	15.46	11.00	4	14.936

⇒ Most Demanding Sprinkler Data

Node Analysis

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Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-7'-0	S	74.120	67.81
1812	40'-6	Spr(-20.250)	20.250	18.00
1833	40'-6	Spr(-22.314)	22.314	18.90
1858	40'-6	Spr(-14.936)	14.936	15.46
1859	40'-6	Spr(-14.936)	14.936	15.46
4	1'-5½	GV(2'-9½)	69.989	
110	40'-6	T(3'-0)	15.363	
419	29'-5	T(3'-0), Tr(1'-0)	32.308	
420	29'-5	C(3'-0)	32.298	
468	29'-5	T(6'-0)	39.445	
505	29'-5	T(6'-0)	38.632	
859	18'-9	T(6'-0), Tr(1'-0)	45.546	
884	18'-9	T(6'-0)	45.253	
923	18'-9	T(6'-0)	48.330	
958	18'-9	T(6'-0)	49.436	
1171	8'-0	T(6'-0), Tr(1'-0)	55.174	
1201	8'-0	Tr(1'-0), T(6'-0)	54.144	
1237	8'-0	T(6'-0)	53.585	
1269	8'-0	T(6'-0), Tr(1'-0)	55.496	
1283	8'-0	PO(10'-0)	61.212	

Hydraulic Analysis

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Report Description: Residential (4th Floor - 13R)

Pipe Type Downstream Upstream	Diameter Elevation	Flow Discharge	Velocity K-Factor	HWC Pt	Pn	Friction Loss Fittings	Length Eq. Length Total Length	Pressure Summary
..... Route 1								
BL	0.8740	18.00	9.63	150		0.172371	33'-0"	Pf 7.243
1812	40'-6"	18.00	4	20.250		Sprinkler,	9'-0"	Pe 4.805
420	29'-5"			32.298		2C(3'-0), T(3'-0)	42'-0"	Pv
BL	1.3940	5.81	1.22	150		0.002188	3'-6½"	Pf 0.010
420	29'-5"			32.298			1'-0"	Pe -0.000
419	29'-5"			32.308		Tr(1'-0)	4'-6½"	Pv
BL	1.3940	24.70	5.19	150		0.031867	164'-11½"	Pf 7.137
419	29'-5"	18.90		32.308		Flow (q) from Route 2	59'-0"	Pe -0.000
468	29'-5"			39.445		23Tr(1'-0), 5E(6'-0), T(6'-0)	223'-11½"	Pv
BL	1.3940	31.17	6.55	150		0.049010	18'-1½"	Pf 1.477
468	29'-5"	6.47		39.445		Flow (q) from Route 12	12'-0"	Pe 4.624
859	18'-9"			45.546		E(6'-0), T(6'-0)	30'-1½"	Pv
BL	1.3940	35.28	7.42	150		0.061620	47'-1½"	Pf 3.890
859	18'-9"	4.11		45.546		Flow (q) from Route 3	16'-0"	Pe
958	18'-9"			49.436		4Tr(1'-0), 2T(6'-0)	63'-1½"	Pv
BL	1.3940	41.59	8.74	150		0.083548	10'-9"	Pf 1.399
958	18'-9"	6.31		49.436		Flow (q) from Route 9	6'-0"	Pe 4.660
1269	8'-0"			55.496		T(6'-0)	16'-9"	Pv
BL	1.3940	55.97	11.77	150		0.144703	2'-8½"	Pf 1.263
1269	8'-0"	14.38		55.496		Flow (q) from Route 5	6'-0"	Pe -0.000
1293	8'-0"			56.759		T(6'-0)	8'-8½"	Pv
FM	2.0670	67.81	6.48	120		0.045800	4'-9"	Pf 4.453
1293	8'-0"	11.85		56.759		Flow (q) from Route 11	27'-0"	Pe
1283	8'-0"			61.212		f(-3.000), BV(6'-0), sCV(11'-0), PO (10'-0)	31'-9"	Pv
FR	4.3100	67.81	1.49	120		0.001278	5'-5"	Pf 5.932
1283	8'-0"			61.212			19'-6"	Pe 2.845
4	1'-5½"			69.989		BV(16'-8½), BFP(-5.900), GV(2'-9 ½)	24'-11"	Pv
UG	4.0800	67.81	1.66	150		0.001105	382'-7½"	Pf 0.473
4	1'-5½"			69.989			45'-1½"	Pe 3.658
1	-7'-0"			74.120		2E(16'-1½), 2EE(6'-5½), S	427'-9"	Pv
..... Route 2								
BL	0.8740	18.90	10.10	150		0.188561	17'-6"	Pf 5.189
1833	40'-6"	18.90	4	22.314		Sprinkler,	10'-0"	Pe 4.805
419	29'-5"			32.308		3T(3'-0), Tr(1'-0)	27'-6"	Pv
..... Route 3								
BL	0.8740	15.46	8.27	150		0.130071	0'-3½"	Pf 0.427
1859	40'-6"	15.46	4	14.936		Sprinkler,	3'-0"	Pe
110	40'-6"			15.363		T(3'-0)	3'-3½"	Pv
BL	0.8740	30.92	16.53	150		0.468905	18'-10½"	Pf 12.130
110	40'-6"	15.46		15.363		Flow (q) from Route 4	7'-0"	Pe 4.805
420	29'-5"			32.298		T(3'-0), Tr(1'-0), C(3'-0)	25'-10½"	Pv
BL	1.3940	43.11	9.06	150		0.089289	51'-11½"	Pf 6.334
420	29'-5"	5.81		32.298		Flow (q) from Route 1	19'-0"	Pe -0.000
505	29'-5"			38.632		7Tr(1'-0), E(6'-0), T(6'-0)	70'-11½"	Pv
BL	1.3940	36.64	7.70	150		0.066089	18'-2½"	Pf 1.997
505	29'-5"			38.632			12'-0"	Pe 4.624
884	18'-9"			45.253		E(6'-0), T(6'-0)	30'-2½"	Pv
BL	1.3940	4.11	0.86	150		0.001153	205'-4½"	Pf 0.293
884	18'-9"			45.253			49'-0"	Pe -0.000
859	18'-9"			45.546		25Tr(1'-0), 4E(6'-0)	254'-4½"	Pv
..... Route 4								
BL	0.8740	15.46	8.27	150		0.130071	0'-3½"	Pf 0.427
1858	40'-6"	15.46	4	14.936		Sprinkler,	3'-0"	Pe
110	40'-6"			15.363		T(3'-0)	3'-3½"	Pv
..... Route 5								
BL	1.3940	14.38	3.02	150		0.011708	18'-5½"	Pf 0.321
1171	8'-0"	7.56 + 6.82		55.174		Flow (q) from Route 6 and 7	9'-0"	Pe -0.000
1269	8'-0"			55.496		3Tr(1'-0), T(6'-0)	27'-5½"	Pv
..... Route 6								
BL	1.3940	7.56	1.59	150		0.003562	237'-5"	Pf 1.031
1201	8'-0"	14.38		54.144		Tr(1'-0), Flow (q) from Route 8	52'-0"	Pe 0.000
1171	8'-0"			55.174		27Tr(1'-0), T(6'-0), 3E(6'-0)	289'-5"	Pv
..... Route 7								

Hydraulic Analysis

Pipe Type Downstream Upstream	Diameter Elevation	Flow Discharge	Velocity K-Factor	HWC Pt	Pn	Friction Loss Fittings	Length Eq. Length Total Length	Pressure Summary
BL 1201 1171	1.3940 8'-0 8'-0	6.82 14.38	1.43	150 54.144 55.174		0.002947 T(6'-0), Flow (q) from Route 8 3T(6'-0), 26Tr(1'-0), 6E(6'-0), cplg(1'-0)	262'-9 87'-0 349'-9	Pf 1.031 Pe 0.000 Pv
..... Route 8								
BL 923 1237	1.3940 18'-9 8'-0	26.22 32.53	5.51	150 48.330 53.585		0.035592 Flow (q) from Route 10 T(6'-0)	10'-8½ 6'-0 16'-8½	Pf 0.595 Pe 4.660 Pv
BL 1237 1201	1.3940 8'-0 8'-0	14.38	3.02	150 53.585 54.144		0.011708 T(6'-0), 5Tr(1'-0)	36'-8 11'-0 47'-8	Pf 0.558 Pe 0.000 Pv
..... Route 9								
BL 923 958	1.3940 18'-9 18'-9	6.31 32.53	1.33	150 48.330 49.436		0.002552 T(6'-0), Flow (q) from Route 10 38Tr(1'-0), 3T(6'-0), 8E(6'-0)	323'-1 110'-0 433'-1	Pf 1.105 Pe Pv
..... Route 10								
BL 884 923	1.3940 18'-9 18'-9	32.53 4.11	6.84	150 45.253 48.330		0.053041 Flow (q) from Route 3 6Tr(1'-0), 2T(6'-0)	40'-0½ 18'-0 58'-0½	Pf 3.078 Pe Pv
..... Route 11								
BL 1237 1293	1.3940 8'-0 8'-0	11.85 14.38	2.49	150 53.585 56.759		0.008183 Flow (q) from Route 8 38Tr(1'-0), 3T(6'-0), 6E(6'-0)	295'-9½ 92'-0 387'-9½	Pf 3.173 Pe -0.000 Pv
..... Route 12								
BL 505 468	1.3940 29'-5 29'-5	6.47	1.36	150 38.632 39.445		0.002674 T(6'-0) 5E(6'-0), 38Tr(1'-0), 2cplg(1'-0), 2T(6'-0)	216'-2 88'-0 304'-2	Pf 0.813 Pe -0.000 Pv

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

C Value Multiplier

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

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

Hydraulic Analysis

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

