

Hydraulic Summary

Job Number: NC-1429
Report Description: Light Hazard (Basement - Refuge Area - Light Haz)

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

System
Most Demanding Sprinkler Data
5.6 K-Factor 14.82 at 7.000
Hose Allowance At Source
100.00
Additional Hose Supplies
Node Flow(gpm)

Total Hose Streams
100.00
System Flow Demand
124.16
Maximum Pressure Unbalance In Loops
0.000
Maximum Velocity Above Ground
26.10 between nodes 1572 and 1608
Maximum Velocity Under Ground
3.05 between nodes 1 and 4
Volume capacity of Wet Pipes
1026.62gal
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	85.860		224.16	71.226	14.634

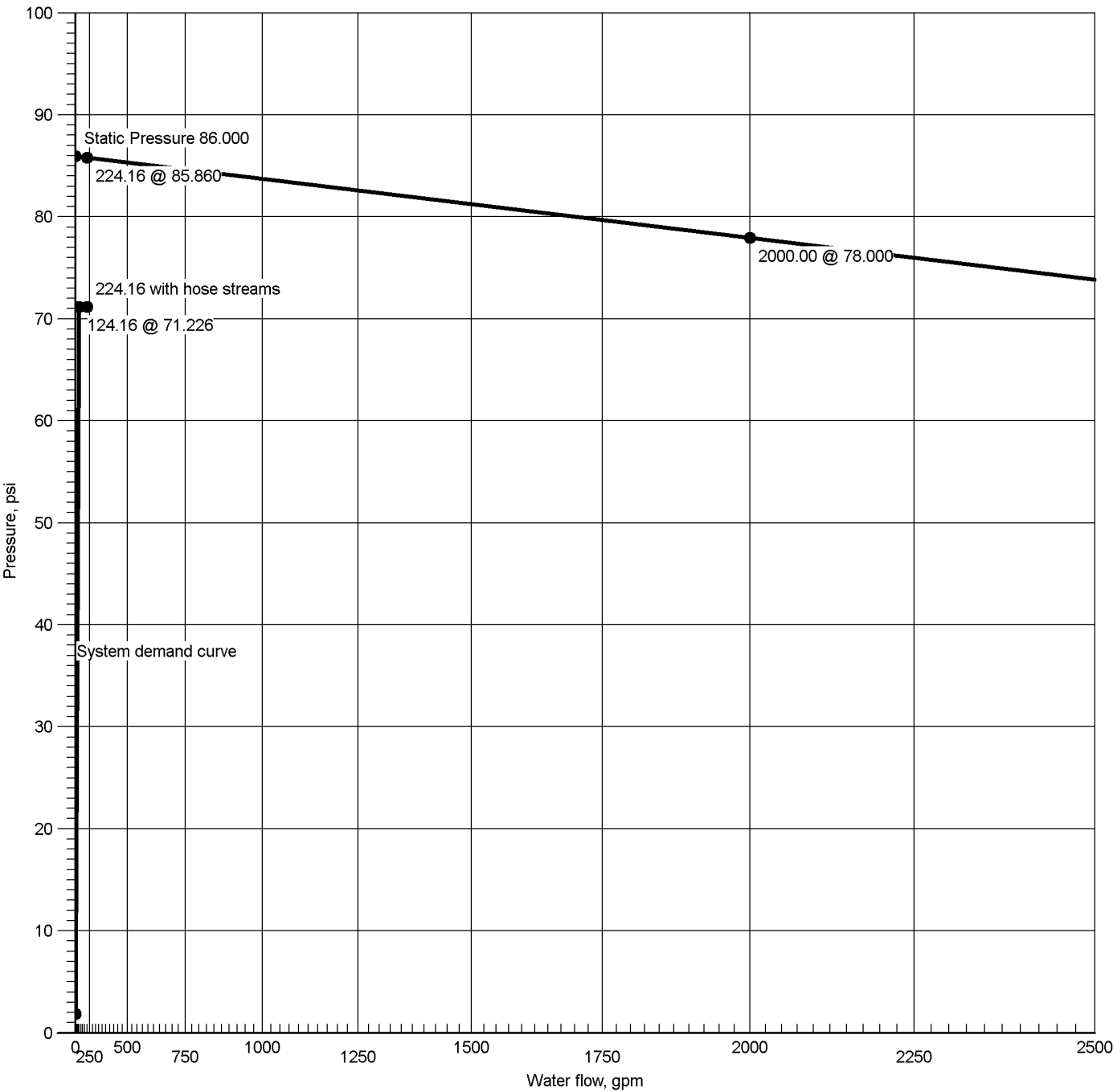
Contractor
Contractor Number
01
Name of Contractor:
Alliance Fire Protection
Address 1
130 W 9th Ave #101
Address 2
North Kansas City, MO 64116
City

Designer
State Certification/License Number
AHJ
LS Codes
Job Site/Building
Basement - Refuge Area - Light Haz
Drawing Name
RB-Calc-ALL-06-11-2024

Remote Area(s)
Occupancy
Light Hazard
Density
0.10gpm/ft²
Area of Application
900ft² (Actual 901ft²)
Number Of Sprinklers Calculated
8
Number Of Nozzles Calculated
0
Coverage Per Sprinkler
130ft²



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
85.860 @ 224.16
System Demand
71.226 @ 124.16
System Demand (Including Hose Allowance at Source)
71.226 @ 224.16

Summary Of Outflowing Devices

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)
Sprinkler	2584	15.19	13.00	5.6	7.356
Sprinkler	2585	15.62	13.00	5.6	7.779
Sprinkler	2589	15.38	13.00	5.6	7.541
Sprinkler	2590	15.31	13.00	5.6	7.474
Sprinkler	2592	15.40	13.00	5.6	7.560
Sprinkler	2593	15.01	13.00	5.6	7.187
Sprinkler	2594	17.43	13.00	5.6	9.693
➡ Sprinkler	2595	14.82	13.00	5.6	7.000
➡ Most Demanding Sprinkler Data					

Node Analysis

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Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-7'-0	S	71.226	124.16
2584	-2'-8	Spr(-7.356)	7.356	15.19
2585	-2'-8	Spr(-7.779)	7.779	15.62
2589	-2'-8	Spr(-7.541)	7.541	15.38
2590	-2'-8	Spr(-7.474)	7.474	15.31
2592	-2'-8	Spr(-7.560)	7.560	15.40
2593	-2'-8	Spr(-7.187)	7.187	15.01
2594	-2'-8	Spr(-9.693)	9.693	17.43
2595	-2'-8	Spr(-7.000)	7.000	14.82
4	1'-5½	GV(2'-9½)	66.121	
468	29'-5	T(6'-0)	35.462	
505	29'-5	T(6'-0)	34.555	
859	18'-9	T(6'-0), Tr(1'-0)	40.418	
884	18'-9	T(6'-0)	38.847	
923	18'-9	T(6'-0)	37.098	
958	18'-9	T(6'-0)	42.321	
1171	8'-0	T(6'-0), Tr(1'-0)	43.405	
1201	8'-0	T(6'-0)	31.108	
1237	8'-0	T(6'-0)	40.537	
1269	8'-0	T(6'-0), Tr(1'-0)	48.205	
1283	8'-0	PO(10'-0)	59.399	
1293	8'-0	T(6'-0)	51.949	
1572	-2'-8	T(6'-0)	29.797	
1608	-2'-8	cplg(1'-0)	12.743	
1745	-2'-8	T(8'-0)	10.114	
1746	-2'-8	T(12'-3½)	10.156	
1747	-2'-8	C(6'-0)	8.093	
1748	-2'-8	C(8'-0)	7.857	
2591	-2'-8	Spr	9.945	Sprinkler

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
***** Route 1 *****								
BL	1.3800	14.82	3.18	120		0.019647	9'-6"	Pf 0.187
2595	-2'-8	14.82	5.6	7.000		Sprinkler		Pe
2593	-2'-8			7.187			9'-6"	Pv
BL	1.6100	29.83	4.70	120		0.033844	8'-6"	Pf 0.288
2593	-2'-8	15.01	5.6	7.187		Sprinkler		Pe
2590	-2'-8			7.474			8'-6"	Pv
BL	1.6100	45.14	7.11	120		0.072832	0'-6"	Pf 0.619
2590	-2'-8	15.31	5.6	7.474		Sprinkler,	8'-0"	Pe
1747	-2'-8			8.093		C(8'-0)	8'-6"	Pv
CM	2.1570	106.72	9.37	120		0.086114	11'-7½"	Pf 2.063
1747	-2'-8	45.96 + 15.62		8.093		Flow (q) from Route 2 and 4	12'-3½"	Pe
1746	-2'-8			10.156		T(12'-3½)	23'-11½"	Pv
CM	2.1570	124.16	10.90	120		0.113933	22'-8½"	Pf 2.588
1746	-2'-8	17.43		10.156		Flow (q) from Route 5		Pe
1608	-2'-8			12.743			22'-8½"	Pv
BL	1.3940	124.16	26.10	150		0.631913	13'-0"	Pf 17.054
1608	-2'-8			12.743		cplg(1'-0)	14'-0"	Pe
1572	-2'-8			29.797		2T(6'-0), Tr(1'-0)	27'-0"	Pv
BL	1.3940	91.06	19.14	150		0.356126	10'-8"	Pf 5.935
1572	-2'-8			29.797			6'-0"	Pe -4.624
1201	8'-0			31.108		T(6'-0)	16'-8"	Pv
BL	1.3940	28.91	6.08	150		0.042639	237'-5"	Pf 12.297
1201	8'-0			31.108			51'-0"	Pe 0.000
1171	8'-0			43.405		27Tr(1'-0), T(6'-0), 3E(6'-0)	288'-5"	Pv
BL	1.3940	62.01	13.03	150		0.174904	18'-5½"	Pf 4.800
1171	8'-0	33.09		43.405		Flow (q) from Route 13	9'-0"	Pe -0.000
1269	8'-0			48.205		3Tr(1'-0), T(6'-0)	27'-5½"	Pv
BL	1.3940	100.69	21.17	150		0.428894	2'-8½"	Pf 3.744
1269	8'-0	38.69		48.205		Flow (q) from Route 6	6'-0"	Pe -0.000
1293	8'-0			51.949		T(6'-0)	8'-8½"	Pv
FM	2.0670	124.16	11.87	120		0.140214	4'-9"	Pf 7.450
1293	8'-0	23.47		51.949		Flow (q) from Route 10	27'-0"	Pe
1283	8'-0			59.399		f(-3.000), BV(6'-0), sCV(11'-0), PO (10'-0)	31'-9"	Pv
FR	4.3100	124.16	2.73	120		0.003914	5'-5"	Pf 3.878
1283	8'-0			59.399			19'-6"	Pe 2.845
4	1'-5½			66.121		BV(16'-8½), BFP(-3.780), GV(2'-9 ½)	24'-11"	Pv
UG	4.0800	124.16	3.05	150		0.003383	382'-7½"	Pf 1.447
4	1'-5½			66.121			45'-1½"	Pe 3.658
1	-7'-0			71.226		2E(16'-1½), 2EE(6'-5½), S	427'-9"	Pv
***** Route 2 *****								
BL	1.3800	15.19	3.26	120		0.020571	9'-0"	Pf 0.185
2584	-2'-8	15.19	5.6	7.356		Sprinkler		Pe
2589	-2'-8			7.541			9'-0"	Pv
BL	1.6100	30.57	4.82	120		0.035410	0'-11"	Pf 0.316
2589	-2'-8	15.38	5.6	7.541		Sprinkler,	8'-0"	Pe
1748	-2'-8			7.857		C(8'-0)	8'-11"	Pv
CM	2.1570	45.96	4.04	120		0.018126	13'-0"	Pf 0.236
1748	-2'-8	15.40		7.857		Flow (q) from Route 3		Pe
1747	-2'-8			8.093			13'-0"	Pv
***** Route 3 *****								
BL	1.3800	15.40	3.30	120		0.021098	8'-1"	Pf 0.297
2592	-2'-8	15.40	5.6	7.560		Sprinkler,	6'-0"	Pe
1748	-2'-8			7.857		C(6'-0)	14'-1"	Pv
***** Route 4 *****								
BL	1.3800	15.62	3.35	120		0.021661	8'-6"	Pf 0.314
2585	-2'-8	15.62	5.6	7.779		Sprinkler,	6'-0"	Pe
1747	-2'-8			8.093		C(6'-0)	14'-6"	Pv
***** Route 5 *****								
BL	1.3800	17.43	3.74	120		0.026550	9'-6"	Pf 0.252
2594	-2'-8	17.43	5.6	9.693		Sprinkler		Pe
2591	-2'-8			9.945			9'-6"	Pv
BL	1.6100	17.43	2.75	120		0.012532	5'-6"	Pf 0.169
2591	-2'-8		5.6	9.945			8'-0"	Pe
1745	-2'-8			10.114		T(8'-0)	13'-6"	Pv

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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
CM	2.1570	17.43	1.53	120		0.003016		1'-4½ Pf 0.041
1745	-2'-8			10.114				12'-3½ Pe
1746	-2'-8			10.156		T(12'-3½)		13'-8 Pv
***** Route 6 *****								
BL	1.3940	38.69	8.13	150		0.073080		10'-9 Pf 1.224
958	18'-9	23.97 + 14.72		42.321		Flow (q) from Route 7 and 12		6'-0 Pe 4.660
1269	8'-0			48.205		T(6'-0)		16'-9 Pv
***** Route 7 *****								
BL	1.3940	13.92	2.93	150		0.011027		18'-1½ Pf 0.332
468	29'-5	6.94 + 6.98		35.462		Flow (q) from Route 9 and 11		12'-0 Pe 4.624
859	18'-9			40.418		E(6'-0), T(6'-0)		30'-1½ Pv
BL	1.3940	23.97	5.04	150		0.030139		47'-1½ Pf 1.903
859	18'-9	10.05		40.418		Flow (q) from Route 8		16'-0 Pe
958	18'-9			42.321		4Tr(1'-0), 2T(6'-0)		63'-1½ Pv
***** Route 8 *****								
BL	1.3940	38.69	8.13	150		0.073080		10'-8½ Pf 1.221
1237	8'-0			40.537				6'-0 Pe -4.660
923	18'-9			37.098		T(6'-0)		16'-8½ Pv
BL	1.3940	23.97	5.04	150		0.030139		40'-0½ Pf 1.749
923	18'-9			37.098				18'-0 Pe
884	18'-9			38.847		2T(6'-0), 6Tr(1'-0)		58'-0½ Pv
BL	1.3940	10.05	2.11	150		0.006036		205'-4½ Pf 1.572
884	18'-9			38.847		T(6'-0)		55'-0 Pe -0.000
859	18'-9			40.418		25Tr(1'-0), 4E(6'-0)		260'-4½ Pv
***** Route 9 *****								
BL	1.3940	13.92	2.93	150		0.011027		18'-2½ Pf 0.333
884	18'-9	10.05		38.847		Flow (q) from Route 8		12'-0 Pe -4.624
505	29'-5			34.555		E(6'-0), T(6'-0)		30'-2½ Pv
BL	1.3940	6.94	1.46	150		0.003040		216'-2 Pf 0.906
505	29'-5			34.555				82'-0 Pe -0.000
468	29'-5			35.462		5E(6'-0), 38Tr(1'-0), 2cplg(1'-0), 2T(6'-0)		298'-2 Pv
***** Route 10 *****								
BL	1.3940	62.15	13.07	150		0.175672		36'-8 Pf 9.429
1201	8'-0	28.91		31.108		Flow (q) from Route 1		17'-0 Pe
1237	8'-0			40.537		5Tr(1'-0), 2T(6'-0)		53'-8 Pv
BL	1.3940	23.47	4.93	150		0.028980		295'-9½ Pf 11.412
1237	8'-0			40.537		T(6'-0)		98'-0 Pe -0.000
1293	8'-0			51.949		38Tr(1'-0), 3T(6'-0), 6E(6'-0)		393'-9½ Pv
***** Route 11 *****								
BL	1.3940	6.98	1.47	150		0.003078		220'-5½ Pf 0.906
505	29'-5	6.94		34.555		Flow (q) from Route 9		74'-0 Pe -0.000
468	29'-5			35.462		6E(6'-0), 32Tr(1'-0), T(6'-0)		294'-5½ Pv
***** Route 12 *****								
BL	1.3940	14.72	3.09	150		0.012229		323'-1 Pf 5.223
923	18'-9	23.97		37.098		Flow (q) from Route 8		104'-0 Pe
958	18'-9			42.321		38Tr(1'-0), 3T(6'-0), 8E(6'-0)		427'-1 Pv
***** Route 13 *****								
BL	1.3940	33.09	6.96	150		0.054742		252'-1 Pf 18.233
1572	-2'-8			29.797		T(6'-0)		81'-0 Pe -4.624
1171	8'-0			43.405		26Tr(1'-0), 6E(6'-0), cplg(1'-0), 2T(6'-0)		333'-1 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

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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	

