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-06-11-2024

System

Most Demanding Sprinkler Data
4 K-Factor 18.00 at 20.250

Hose Allowance At Source
100.00

Additional Hose Supplies

Node	Flow(gpm)

Remote Area(s)

Occupancy
Residential

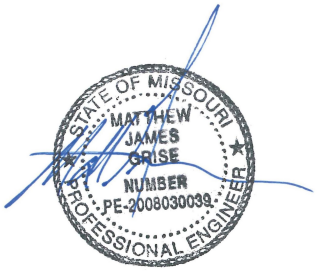
Density
0.10gpm/ft²

Area of Application
438ft² (Actual 417ft²)

Number Of Sprinklers Calculated
4

Number Of Nozzles Calculated
0

Coverage Per Sprinkler
288ft²



Total Hose Streams
100.00

System Flow Demand
67.81

Total Water Required (Including Hose Allowance)
167.81

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

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	72.000	13.919

Contractor

Contractor Number
01

Contact Name

Contact Title

Name of Contractor:
Alliance Fire Protection

Phone
913-888-0647

Extension

Address 1
130 W 9th Ave #101

FAX
913-888-0618

Address 2
North Kansas City, MO 64116

E-mail

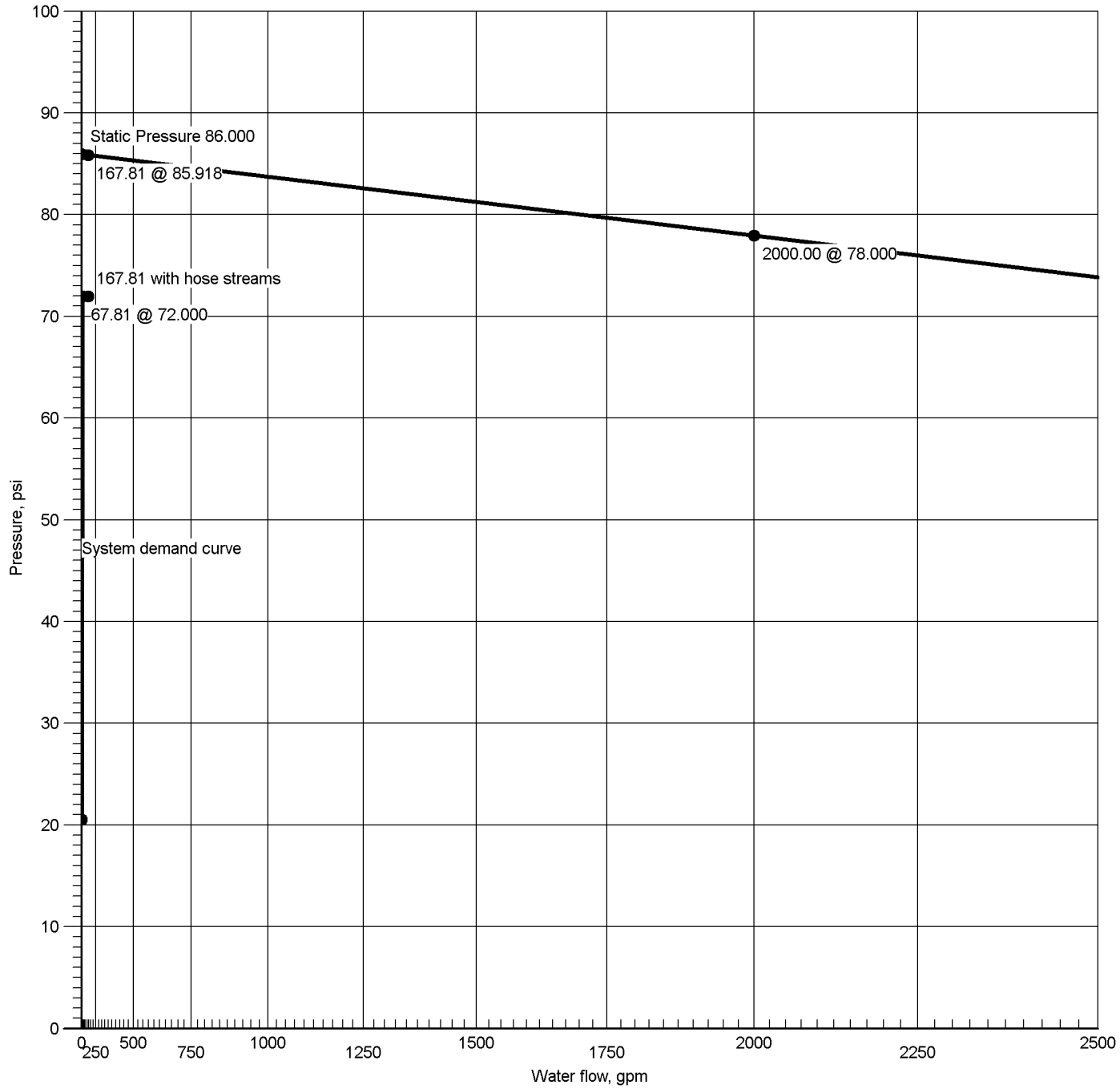
City

State

Zip Code

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 {?lblTestTime}
85.918 @ 167.81

System Demand
72.000 @ 67.81

System Demand (Including Hose Allowance at Source)
72.000 @ 167.81

Summary Of Outflowing Devices

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

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-7'-0	S	72.000	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)	67.869	
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	
1293	8'-0	T(6'-0)	56.759	

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**	3.812
1283	8'-0			61.212			19'-6 **Pe**	2.845
4	1'-5½			67.869		BV(16'-8½), BFP(-3.780), 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			67.869			45'-1½ **Pe**	3.658
1	-7'-0			72.000		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

Job Number: NC-1429

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

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

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

C Value Multiplier

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

Hydraulic Analysis

Job Number: NC-1429

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

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

Pipe Type Legend

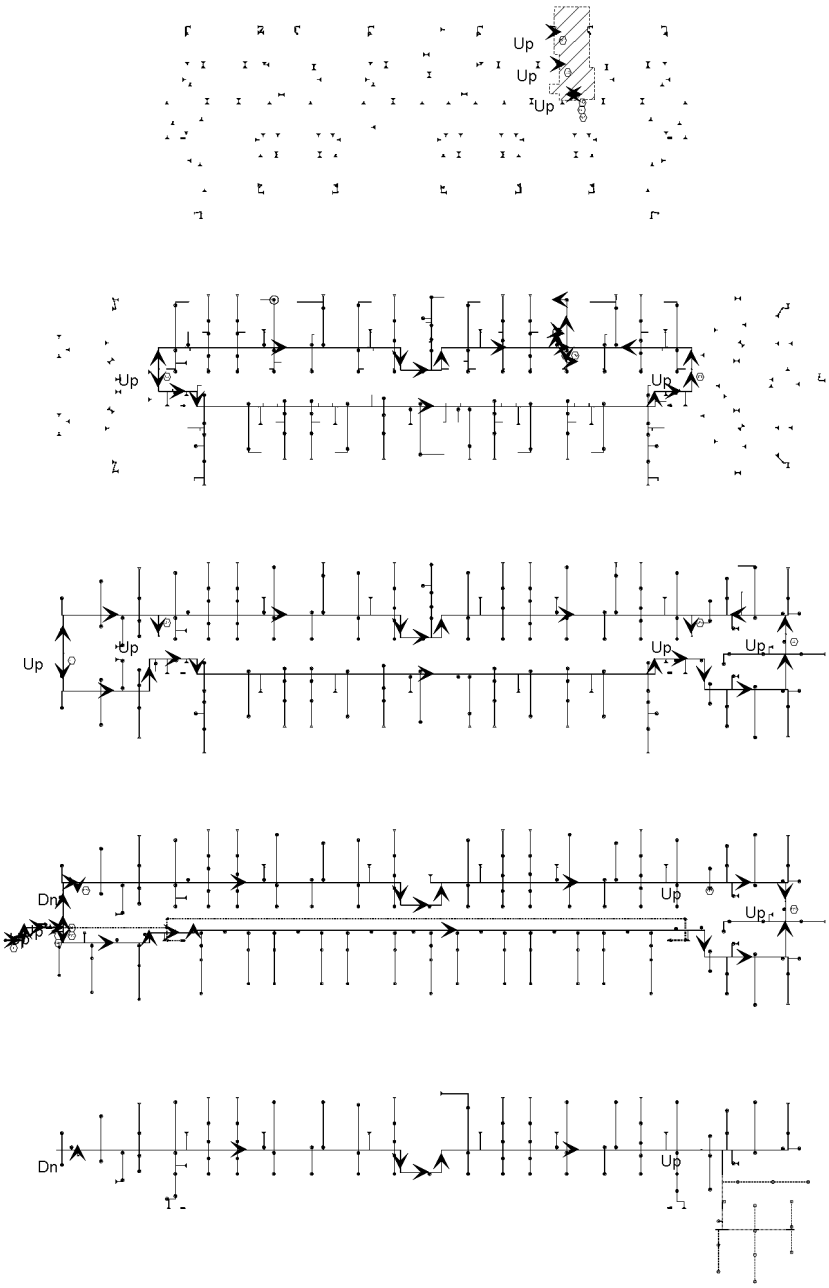
AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SN	Swing Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend

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

Fittings Legend

ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PrV	Pressure 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


Up
Up
Up
Up
Up
Up
Up
Up
Up
Up
Dn
Up
Up
Up
Dn
Up