



Hydraulic Overview

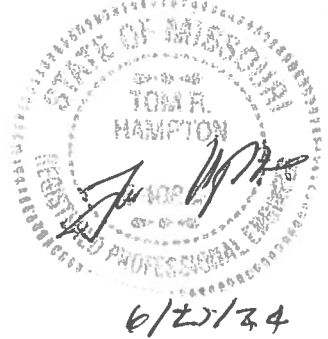
Job Number: 4353CK

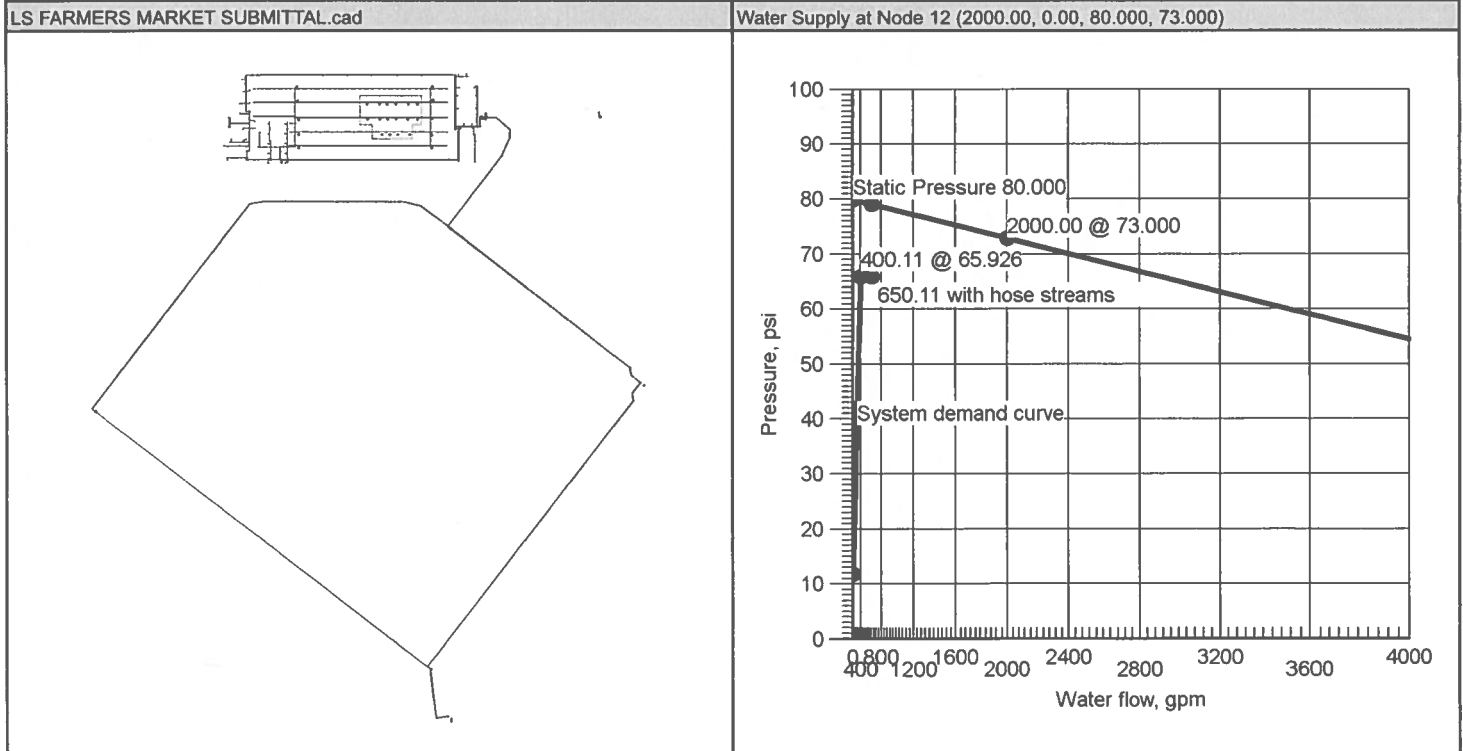
Report Description: Ordinary Group II (OVERHEAD GRID)

Job		
Job Number 4353CK	Designer JONATHAN THOMPSON	
Job Name LEE'S SUMMIT FARMERS MARKET	Phone 913-722-6900	FAX 913-722-6969
Address 1 209 SE GREEN ST	State Certification/License Number	
Address 2 LEE'S SUMMIT, MISSOURI 64063	AHJ	
Address 3	Job Site/Building	

System	
Density 0.20 gpm/ft ²	Area of Application 1500 ft ² (Actual 1549 ft ²)
Most Demanding Sprinkler Data 8 K-Factor 24.00 at 9.000	Hose Streams 250.00
Coverage Per Sprinkler 225 ft ²	Number Of Sprinklers Calculated 16 0
System Pressure Demand 65.926	System Flow Demand 400.11
Total Demand 650.11 @ 65.926	Pressure Result +13.199 (16.7%)

Supplies						Check Point Gauges			
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)	Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)
12	Water Supply	2000.00	250.00	80.000	73.000	BASE OF RISER (6)	64.533	49.81	400.11







Hydraulic Summary

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Job Number 4353CK				Designer JONATHAN THOMPSON							
Job Name: LEE'S SUMMIT FARMERS MARKET				State Certification/License Number							
Address 1 209 SE GREEN ST				AHJ							
Address 2 LEE'S SUMMIT, MISSOURI 64063				Job Site/Building							
Address 3				Drawing Name LS FARMERS MARKET SUBMITTAL.cad							
System				Remote Area(s)							
Most Demanding Sprinkler Data 8 K-Factor 24.00 at 9.000				Occupancy Ordinary Group II			Job Suffix				
Hose Allowance At Source 250.00				Density 0.20 gpm/ft²			Area of Application 1500 ft² (Actual 1549 ft²)				
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>				Number Of Sprinklers Calculated 16		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 225 ft²			
				AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area							
				Left: 65.756 Right: 66.042							
Total Hose Streams 250.00											
System Flow Demand 400.11		Total Water Required (Including Hose Allowance) 650.11									
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 15.38 between nodes 4 and 3											
Maximum Velocity Under Ground 4.10 between nodes 8 and 7											
Volume capacity of Wet Pipes 3444.08 gal		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)
12	Water Supply	250.00	80.000	73.000		2000.00	79.125		650.11	65.926	13.199
Contractor											
Contractor Number		Contact Name				Contact Title					
Name of Contractor:		Phone				Extension					
Address 1		FAX									
Address 2		E-mail									
Address 3		Web-Site									



Summary Of Outflowing Devices

Job Number: 4353CK

Report Description: Ordinary Group II (OVERHEAD GRID)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	100	24.00	24.00	8	9.000			
Sprinkler	101	24.04	24.00	8	9.028			
Sprinkler	102	24.20	24.00	8	9.147			
Sprinkler	103	24.79	24.00	8	9.599			
Sprinkler	104	24.00	24.00	8	9.004			
Sprinkler	105	24.10	24.00	8	9.075			
Sprinkler	106	24.64	23.80	8	9.486			
Sprinkler	107	24.67	23.80	8	9.506			
Sprinkler	108	24.80	23.80	8	9.614			
Sprinkler	109	25.35	23.80	8	10.044			
Sprinkler	110	24.65	23.80	8	9.496			
Sprinkler	111	24.77	23.80	8	9.587			
Sprinkler	112	26.41	24.00	8	10.895			
Sprinkler	113	26.41	24.00	8	10.901			
Sprinkler	114	26.51	24.00	8	10.981			
Sprinkler	115	26.77	24.00	8	11.198			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4353CK

Report Description: Ordinary Group II (OVERHEAD GRID)

Node	Elevation(Feet)	Fittings	Pressure(psi)	Discharge(gpm)
12	2'-0	S	65.926	400.11
100	29'-4½	Spr(-9.000)	9.000	24.00
101	29'-4½	Spr(-9.028)	9.028	24.04
102	29'-4½	Spr(-9.147)	9.147	24.20
103	29'-4½	Spr(-9.599)	9.599	24.79
104	29'-4½	Spr(-9.004)	9.004	24.00
105	29'-4½	Spr(-9.075)	9.075	24.10
106	27'-6	Spr(-9.486)	9.486	24.64
107	27'-6	Spr(-9.506)	9.506	24.67
108	27'-6	Spr(-9.614)	9.614	24.80
109	27'-6	Spr(-10.044)	10.044	25.35
110	27'-6	Spr(-9.496)	9.496	24.65
111	27'-6	Spr(-9.587)	9.587	24.77
112	27'-6	Spr(-10.895)	10.895	26.41
113	27'-6	Spr(-10.901)	10.901	26.41
114	27'-6	Spr(-10.981)	10.981	26.51
115	27'-6	Spr(-11.198)	11.198	26.77
1	22'-7½	PO(10'-0)	19.345	
2	22'-7½	PO(10'-0)	19.980	
3	22'-7½	PO(10'-0)	21.011	
4	13'-11	T(20'-2)	36.456	
5	9'-10	PO(20'-2)	54.032	
6	1'-0	BASE OF RISER	64.533	
7	-4'-0	E(14'-0)	66.824	
8	-4'-0	T(54'-11)	67.632	
9	-4'-0	E(32'-6)	67.703	
10	-4'-0	T(54'-11)	68.076	
11	-4'-0	E(25'-7½)	68.488	
13	22'-7½	PO(10'-0)	13.133	
14	22'-7½	PO(10'-0)	13.242	
15	22'-7½	PO(10'-0)	13.387	
16	22'-7½	PO(10'-0)	19.054	
17	22'-7½	PO(10'-0)	13.133	
18	22'-7½	PO(10'-0)	13.245	
19	22'-7½	PO(10'-0)	19.015	
20	9'-10	PO(16'-5½)	54.022	
21	-4'-0	E(32'-6)	67.748	



Hydraulic Analysis

Job Number: 4353CK

Report Description: Ordinary Group II (OVERHEAD GRID)

Pipe Type	Diameter	Flow	Velocity	HWC	Pn	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt		Fittings	Eq. Length	Summary
Upstream							Total Length	
Route 1								
BL	2.0670	19.05	1.82	120		0.004374	6'-6"	Pf 0.028
100	29'-4½"	24.00	8	9.000		Sprinkler		Pe
101	29'-4½"			9.028			6'-6"	Pv
BL	2.0670	43.09	4.12	120		0.019795	6'-0"	Pf 0.119
101	29'-4½"	24.04	8	9.028		Sprinkler		Pe
102	29'-4½"			9.147			6'-0"	Pv
BL	2.0670	67.29	6.43	120		0.045144	10'-0"	Pf 0.451
102	29'-4½"	24.20	8	9.147		Sprinkler		Pe
103	29'-4½"			9.599			10'-0"	Pv
BL	2.0670	92.07	8.80	120		0.080644	64'-6½"	Pf 6.819
103	29'-4½"	24.79	8	9.599		Sprinkler,	20'-0"	Pe 2.927
1	22'-7½"			19.345		T(10'-0), PO(10'-0)	84'-6½"	Pv
CM	3.2600	243.40	9.36	120		0.052963	12'-0"	Pf 0.636
1	22'-7½"	151.33		19.345		Flow (q) from Route 3		Pe
2	22'-7½"			19.980			12'-0"	Pv
CM	3.2600	329.91	12.68	120		0.092964	11'-1"	Pf 1.030
2	22'-7½"	86.51		19.980		Flow (q) from Route 5		Pe
3	22'-7½"			21.011			11'-1"	Pv
CM	3.2600	400.11	15.38	120		0.132835	34'-1½"	Pf 11.672
3	22'-7½"	70.20		21.011		Flow (q) from Route 2	53'-9"	Pe 3.774
4	13'-11"			36.456		5fE(6'-8½"), T(20'-2)	87'-10½"	Pv
CM	3.2600	289.43	11.12	120		0.072969	176'-4½"	Pf 15.812
4	13'-11"			36.456			40'-4"	Pe 1.763
5	9'-10"			54.032		3fE(6'-8½"), PO(20'-2)	216'-8½"	Pv
CM	4.2600	400.11	9.01	120		0.036096	31'-1"	Pf 6.661
5	9'-10"	110.68		54.032		Flow (q) from Route 7	42'-7½"	Pe 3.840
6	1'-0"			64.533		4fE(8'-11½"), Tr(6'-9½"), 2f(-0.000), BFP(-4.001), BASE OF RISER	73'-8"	Pv
FR	6.0650	400.11	4.44	120		0.006461	5'-0"	Pf 0.123
6	1'-0"			64.533			14'-0"	Pe 2.168
7	-4'-0"			66.824		E(14'-0)	19'-0"	Pv
UG	6.3100	400.11	4.10	150		0.003526	122'-11"	Pf 0.808
7	-4'-0"			66.824			106'-2½"	Pe
8	-4'-0"			67.632		4EE(12'-10), T(54'-11)	229'-1½"	Pv
UG	8.2800	202.80	1.21	150		0.000267	203'-3½"	Pf 0.072
8	-4'-0"			67.632			65'-0½"	Pe
9	-4'-0"			67.703		2EE(16'-3), E(32'-6)	268'-3½"	Pv
UG	6.3100	202.80	2.08	150		0.001003	291'-4½"	Pf 0.373
9	-4'-0"			67.703			80'-7"	Pe
10	-4'-0"			68.076		2EE(12'-10), T(54'-11)	371'-11½"	Pv
UG	6.3100	400.11	4.10	150		0.003526	52'-8½"	Pf 0.412
10	-4'-0"	197.31		68.076		Flow (q) from Route 8	64'-1"	Pe
11	-4'-0"			68.488		EE(12'-10), 2E(25'-7½)	116'-9½"	Pv
FR	6.0650	400.11	4.44	120		0.006461	6'-0"	Pf 0.039
11	-4'-0"			68.488				Pe -2.601
12	2'-0"			65.926		Water Supply	6'-0"	Pv
		250.00				Hose Allowance At Source		
12		650.11						
Route 2								
BL	2.0670	4.95	0.47	120		0.000361	10'-0"	Pf 0.004
100	29'-4½"	24.00	8	9.000		Sprinkler		Pe
104	29'-4½"			9.004			10'-0"	Pv
BL	2.0670	28.95	2.77	120		0.009486	7'-6"	Pf 0.071
104	29'-4½"	24.00	8	9.004		Sprinkler		Pe
105	29'-4½"			9.075			7'-6"	Pv
BL	2.0670	53.05	5.07	120		0.029083	18'-10½"	Pf 1.131
105	29'-4½"	24.10	8	9.075		Sprinkler,	20'-0"	Pe 2.927
13	22'-7½"			13.133		T(10'-0), PO(10'-0)	38'-10½"	Pv
CM	2.6350	50.61	2.98	120		0.008172	13'-5"	Pf 0.110
13	22'-7½"			13.133				Pe
14	22'-7½"			13.242			13'-5"	Pv
CM	2.6350	70.20	4.13	120		0.014968	9'-8"	Pf 0.145
14	22'-7½"	19.59		13.242		Flow (q) from Route 6		Pe
15	22'-7½"			13.387			9'-8"	Pv



Hydraulic Analysis

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Report Description: Ordinary Group II (OVERHEAD GRID)

Pipe Type	Diameter	Flow	Velocity	HWC	Pn	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt		Fittings	Eq. Length	Summary
Upstream							Total Length	
RN	2.0670	70.20	6.71	120		0.048826	116'-1½"	Pf 7.623
15	22'-7½"			13.387		PO(10'-0)	40'-0"	Pe
3	22'-7½"			21.011		2T(10'-0), PO(10'-0)	156'-1½"	Pv
Route 3								
BL	2.0670	16.11	1.54	120		0.003207	6'-6"	Pf 0.021
106	27'-6"	24.64	8	9.486		Sprinkler	6'-6"	Pe
107	27'-6"			9.506			6'-6"	Pv
BL	2.0670	40.78	3.90	120		0.017872	6'-0"	Pf 0.107
107	27'-6"	24.67	8	9.506		Sprinkler	6'-0"	Pe
108	27'-6"			9.614			6'-0"	Pv
BL	2.0670	65.58	6.27	120		0.043050	10'-0"	Pf 0.431
108	27'-6"	24.80	8	9.614		Sprinkler	10'-0"	Pe
109	27'-6"			10.044			10'-0"	Pv
BL	2.0670	90.93	8.69	120		0.078812	64'-0"	Pf 6.897
109	27'-6"	25.35	8	10.044		Sprinkler,	23'-6"	Pe 2.113
16	22'-7½"			19.054		T(10'-0), fE(3'-6), PO(10'-0)	87'-6"	Pv
CM	3.2600	151.33	5.82	120		0.021985	13'-2½"	Pf 0.290
16	22'-7½"	60.39		19.054		Flow (q) from Route 4	13'-2½"	Pe
1	22'-7½"			19.345			13'-2½"	Pv
Route 4								
BL	2.0670	8.53	0.82	120		0.000989	10'-0"	Pf 0.010
106	27'-6"	24.64	8	9.486		Sprinkler	10'-0"	Pe
110	27'-6"			9.496			10'-0"	Pv
BL	2.0670	33.18	3.17	120		0.012207	7'-6"	Pf 0.092
110	27'-6"	24.65	8	9.496		Sprinkler	7'-6"	Pe
111	27'-6"			9.587			7'-6"	Pv
BL	2.0670	57.95	5.54	120		0.034247	18'-4"	Pf 1.433
111	27'-6"	24.77	8	9.587		Sprinkler,	23'-6"	Pe 2.113
17	22'-7½"			13.133		T(10'-0), fE(3'-6), PO(10'-0)	41'-10"	Pv
CM	2.6350	60.39	3.55	120		0.011331	9'-10½"	Pf 0.112
17	22'-7½"	2.44		13.133		Flow (q) from Route 10	9'-10½"	Pe
18	22'-7½"			13.245			9'-10½"	Pv
RN	2.0670	60.39	5.77	120		0.036963	116'-1"	Pf 5.769
18	22'-7½"			13.245		PO(10'-0)	40'-0"	Pe
19	22'-7½"			19.015		2T(10'-0), PO(10'-0)	156'-1"	Pv
CM	3.2600	60.39	2.32	120		0.004019	9'-10½"	Pf 0.040
19	22'-7½"			19.015			9'-10½"	Pe
16	22'-7½"			19.054			9'-10½"	Pv
Route 5								
BL	2.0670	6.82	0.65	120		0.000654	10'-0"	Pf 0.007
112	27'-6"	26.41	8	10.895		Sprinkler	10'-0"	Pe
113	27'-6"			10.901			10'-0"	Pv
BL	2.0670	33.23	3.18	120		0.012241	6'-6"	Pf 0.080
113	27'-6"	26.41	8	10.901		Sprinkler	6'-6"	Pe
114	27'-6"			10.981			6'-6"	Pv
BL	2.0670	59.74	5.71	120		0.036229	6'-0"	Pf 0.217
114	27'-6"	26.51	8	10.981		Sprinkler	6'-0"	Pe
115	27'-6"			11.198			6'-0"	Pv
BL	2.0670	86.51	8.27	120		0.071869	72'-8½"	Pf 6.662
115	27'-6"	26.77	8	11.198		Sprinkler,	20'-0"	Pe 2.120
2	22'-7½"			19.980		T(10'-0), PO(10'-0)	92'-8½"	Pv
Route 6								
BL	2.0670	19.59	1.87	120		0.004604	25'-11½"	Pf 0.228
112	27'-6"	26.41	8	10.895		Sprinkler,	23'-6"	Pe 2.120
14	22'-7½"			13.242		T(10'-0), fE(3'-6), PO(10'-0)	49'-5½"	Pv
Route 7								
CM	4.2600	110.68	2.49	120		0.003349	2'-9"	Pf 0.009
20	9'-10"	110.68		54.022		Flow (q) from Route 11	2'-9"	Pe 0.000
5	9'-10"			54.032			2'-9"	Pv
Route 8								
UG	6.3100	197.31	2.02	150		0.000953	344'-2½"	Pf 0.328
21	-4'-0"	197.31		67.748		Flow (q) from Route 9	344'-2½"	Pe
10	-4'-0"			68.076			344'-2½"	Pv
Route 9								
UG	8.2800	197.31	1.18	150		0.000254	377'-8½"	Pf 0.117
8	-4'-0"	202.80		67.632		Flow (q) from Route 1	81'-3½"	Pe
21	-4'-0"			67.748		3EE(16'-3), E(32'-6)	458'-11½"	Pv
Route 10								



Hydraulic Analysis

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Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss		Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
CM	2.6350	2.44	0.14	120		0.000030	13'-2½"	Pf 0.000
13	22'-7½"	50.61		13.133		Flow (q) from Route 2		Pe
17	22'-7½"			13.133			13'-2½"	Pv
Route 11								
CM	2.6350	110.68	6.51	120		0.034751	326'-1½"	Pf 15.803
4	13'-11"	289.43		36.456		Flow (q) from Route 1	128'-7½"	Pe 1.763
20	9'-10"			54.022		19fE(5'-11"), PO(16'-5½")	454'-9"	Pv

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

C Value Multiplier

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

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

Pipe Type Legend

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
BaIV	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 Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

