



Hydraulic Summary

Job Number: 4353CK

Report Description: Ordinary Group I (CATERING / KITCHEN)

Job											
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 5.6 K-Factor 19.50 at 12.125				Occupancy Ordinary Group I			Job Suffix				
Hose Allowance At Source 250.00				Density 0.15 gpm/ft²			Area of Application 1500 ft² (Actual 1547 ft²)				
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>				Number Of Sprinklers Calculated 17		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 225 ft²			
				AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area							
Total Hose Streams 250.00											
System Flow Demand 390.13		Total Water Required (Including Hose Allowance) 640.13									
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 22.34 between nodes 27 and 26											
Maximum Velocity Under Ground 4.00 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	79.149		640.13	57.222	21.927
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

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Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	400	19.50	19.50	5.6	12.125			
Sprinkler	401	19.76	19.50	5.6	12.447			
Sprinkler	402	19.65	16.80	5.6	12.318			
Sprinkler	403	19.91	16.80	5.6	12.646			
Sprinkler	404	20.47	16.80	5.6	13.366			
Sprinkler	405	20.80	16.80	5.6	13.802			
Sprinkler	406	21.63	16.80	5.6	14.925			
Sprinkler	407	21.86	16.80	5.6	15.242			
Sprinkler	408	22.06	16.80	5.6	15.515			
Sprinkler	409	22.30	16.80	5.6	15.864			
Sprinkler	410	21.48	14.82	5.6	14.717			
Sprinkler	411	25.11	17.85	5.6	20.099			
Sprinkler	412	26.10	14.82	5.6	21.717			
Sprinkler	413	26.55	14.82	5.6	22.481			
Sprinkler	414	26.56	14.82	5.6	22.494			
Sprinkler	415	26.77	14.82	5.6	22.857			
Sprinkler	416	29.59	17.85	5.6	27.928			

➡ Most Demanding Sprinkler Data



Node Analysis

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Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
12	2'-0	S	57.222	390.13
400	9'-0	Spr(-12.125), fd(32'-0)	12.125	19.50
401	9'-0	Spr(-12.447), fd(32'-0)	12.447	19.76
402	9'-0	Spr(-12.318), fd(32'-0)	12.318	19.65
403	9'-0	Spr(-12.646), fd(32'-0)	12.646	19.91
404	9'-0	Spr(-13.366), fd(32'-0)	13.366	20.47
405	9'-0	Spr(-13.802), fd(32'-0)	13.802	20.80
406	9'-0	Spr(-14.925), fd(32'-0)	14.925	21.63
407	9'-0	Spr(-15.242), fd(32'-0)	15.242	21.86
408	9'-0	Spr(-15.515), fd(32'-0)	15.515	22.06
409	9'-0	Spr(-15.864), fd(32'-0)	15.864	22.30
410	16'-0	Spr(-14.717), fd(32'-0)	14.717	21.48
411	25'-3	Spr(-20.099)	20.099	25.11
412	9'-0	Spr(-21.717), fd(32'-0)	21.717	26.10
413	9'-0	Spr(-22.481), fd(32'-0)	22.481	26.55
414	9'-0	Spr(-22.494), fd(32'-0)	22.494	26.56
415	9'-0	Spr(-22.857), fd(32'-0)	22.857	26.77
416	14'-5	Spr(-27.928)	27.928	29.59
4	13'-11	T(20'-2)	29.971	
5	9'-10	PO(20'-2)	45.644	
6	1'-0	BASE OF RISER	55.913	
7	-4'-0	E(14'-0)	58.198	
8	-4'-0	T(54'-11)	58.969	
9	-4'-0	E(32'-6)	59.037	
10	-4'-0	T(54'-11)	59.393	
11	-4'-0	E(25'-7½)	59.786	
20	9'-10	PO(16'-5½)	45.633	
21	-4'-0	E(32'-6)	59.080	
22	10'-3	PO(5'-0)	16.178	
23	10'-3	PO(5'-0)	16.439	
24	12'-2½	PO(5'-0)	18.006	
25	12'-2½	PO(5'-0)	19.985	
26	12'-2½	PO(5'-0)	21.904	
27	13'-11	PO(6'-0)	29.645	
28	13'-11	PO(6'-0)	30.129	
29	10'-3	PO(5'-0)	16.613	
30	10'-3	PO(5'-0)	16.880	
31	10'-3	PO(5'-0)	17.852	
32	10'-3	PO(5'-0)	19.952	
33	10'-3	PO(5'-0)	21.869	
34	25'-3	PO(5'-0)	20.174	
35	22'-7½	PO(6'-0)	26.027	
36	12'-5	PO(5'-0)	29.903	
37	12'-5	PO(6'-0)	30.520	
38	12'-5	PO(5'-0)	30.947	
39	12'-5	PO(5'-0)	29.883	
40	12'-5	PO(6'-0)	30.477	
41	11'-11	PO(5'-0)	29.850	
42	11'-0	PO(6'-0)	30.914	
43	13'-11	PO(5'-0)	29.632	



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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	
Route 1								
DY	1.0490	19.50	7.24	120		0.124174	0'-0	Pf 4.594
400	9'-0	19.50	5.6	12.125		Sprinkler,	37'-0	Pe -0.542
22	10'-3			16.178		PO(5'-0), fd(32'-0)	37'-0	Pv
BL	1.3800	19.50	4.18	120		0.032658	8'-0	Pf 0.261
22	10'-3			16.178			8'-0	Pe
23	10'-3			16.439			8'-0	Pv
BL	1.3800	39.15	8.40	120		0.118601	11'-4½	Pf 2.416
23	10'-3	19.65		16.439		Flow (q) from Route 3	9'-0	Pe -0.849
24	12'-2½			18.006		3E(3'-0)	20'-4½	Pv
BL	1.3800	59.96	12.86	120		0.260900	7'-7	Pf 1.978
24	12'-2½	20.80		18.006		Flow (q) from Route 6	7'-7	Pe
25	12'-2½			19.985			7'-7	Pv
BL	1.3800	81.82	17.55	120		0.463720	4'-1½	Pf 1.919
25	12'-2½	21.86		19.985		Flow (q) from Route 8	4'-1½	Pe
26	12'-2½			21.904			4'-1½	Pv
BL	1.3800	104.13	22.34	120		0.724328	2'-8½	Pf 8.483
26	12'-2½	22.30		21.904		Flow (q) from Route 10	9'-0	Pe -0.742
27	13'-11			29.645		E(3'-0), PO(6'-0)	11'-8½	Pv
CM	2.6350	121.98	7.18	120		0.041597	7'-10	Pf 0.326
27	13'-11	17.85		29.645		Flow (q) from Route 17	7'-10	Pe
4	13'-11			29.971			7'-10	Pv
CM	3.2600	168.56	6.48	120		0.026841	5'-10½	Pf 0.158
4	13'-11	46.59		29.971		Flow (q) from Route 11	5'-10½	Pe
28	13'-11			30.129			5'-10½	Pv
CM	3.2600	272.40	10.47	120		0.065226	170'-6	Pf 13.752
28	13'-11	103.84		30.129		Flow (q) from Route 2	40'-4	Pe 1.763
5	9'-10			45.644		3fE(6'-8½), PO(20'-2)	210'-10	Pv
CM	4.2600	390.13	8.78	120		0.034448	31'-1	Pf 6.429
5	9'-10	117.73		45.644		Flow (q) from Route 13	42'-7½	Pe 3.840
6	1'-0			55.913		4fE(8'-11½), Tr(6'-9½), 2f(-0.00 0), BFP(-3.891), BASE OF RISER	73'-8	Pv
FR	6.0650	390.13	4.33	120		0.006166	5'-0	Pf 0.117
6	1'-0			55.913			14'-0	Pe 2.168
7	-4'-0			58.198		E(14'-0)	19'-0	Pv
UG	6.3100	390.13	4.00	150		0.003365	122'-11	Pf 0.771
7	-4'-0			58.198			106'-2½	Pe
8	-4'-0			58.969		4EE(12'-10), T(54'-11)	229'-1½	Pv
UG	8.2800	197.74	1.18	150		0.000255	203'-3½	Pf 0.068
8	-4'-0			58.969			65'-0½	Pe
9	-4'-0			59.037		2EE(16'-3), E(32'-6)	268'-3½	Pv
UG	6.3100	197.74	2.03	150		0.000957	291'-4½	Pf 0.356
9	-4'-0			59.037			80'-7	Pe
10	-4'-0			59.393		2EE(12'-10), T(54'-11)	371'-11½	Pv
UG	6.3100	390.13	4.00	150		0.003365	52'-8½	Pf 0.393
10	-4'-0	192.39		59.393		Flow (q) from Route 18	64'-1	Pe
11	-4'-0			59.786		EE(12'-10), 2E(25'-7½)	116'-9½	Pv
FR	6.0650	390.13	4.33	120		0.006166	6'-0	Pf 0.037
11	-4'-0			59.786			6'-0	Pe -2.601
12	2'-0			57.222		Water Supply	6'-0	Pv
		250.00				Hose Allowance At Source		
12		640.13						
Route 2								
DY	1.0490	19.76	7.33	120		0.127224	0'-0	Pf 4.707
401	9'-0	19.76	5.6	12.447		Sprinkler,	37'-0	Pe -0.542
29	10'-3			16.613		PO(5'-0), fd(32'-0)	37'-0	Pv
BL	1.3800	19.76	4.24	120		0.033461	8'-0	Pf 0.268
29	10'-3			16.613			8'-0	Pe
30	10'-3			16.880			8'-0	Pv
BL	1.3800	39.67	8.51	120		0.121513	8'-0	Pf 0.972
30	10'-3	19.91		16.880		Flow (q) from Route 4	8'-0	Pe
31	10'-3			17.852			8'-0	Pv
BL	1.3800	60.14	12.90	120		0.262398	8'-0	Pf 2.099
31	10'-3	20.47		17.852		Flow (q) from Route 5	8'-0	Pe
32	10'-3			19.952			8'-0	Pv



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Downstream	Elevation	Discharge	K-Factor	Pt		Fittings	Eq. Length	Summary
Upstream							Total Length	
BL	1.3800	81.78	17.54	120		0.463272	4'-1½"	Pf 1.918
32	10'-3	21.63		19.952		Flow (q) from Route 7		Pe
33	10'-3			21.869			4'-1½"	Pv
BL	1.3800	103.84	22.27	120		0.720604	4'-8	Pf 9.850
33	10'-3	22.06		21.869		Flow (q) from Route 9	9'-0	Pe -1.591
28	13'-11			30.129		E(3'-0), PO(6'-0)	13'-8	Pv
Route 3								
DY	1.0490	19.65	7.30	120		0.126006	0'-0	Pf 4.662
402	9'-0	19.65	5.6	12.318		Sprinkler,	37'-0	Pe -0.542
23	10'-3			16.439		PO(5'-0), fd(32'-0)	37'-0	Pv
Route 4								
DY	1.0490	19.91	7.39	120		0.129098	0'-0	Pf 4.777
403	9'-0	19.91	5.6	12.646		Sprinkler,	37'-0	Pe -0.542
30	10'-3			16.880		PO(5'-0), fd(32'-0)	37'-0	Pv
Route 5								
DY	1.0490	20.47	7.60	120		0.135890	0'-0	Pf 5.028
404	9'-0	20.47	5.6	13.366		Sprinkler,	37'-0	Pe -0.542
31	10'-3			17.852		PO(5'-0), fd(32'-0)	37'-0	Pv
Route 6								
BL	1.0490	20.80	7.72	120		0.139982	0'-11½"	Pf 5.595
405	9'-0	20.80	5.6	13.802		Sprinkler,	39'-0	Pe -1.391
24	12'-2½"			18.006		E(2'-0), PO(5'-0), fd(32'-0)	39'-11½"	Pv
Route 7								
DY	1.0490	21.63	8.03	120		0.150490	0'-0	Pf 5.568
406	9'-0	21.63	5.6	14.925		Sprinkler,	37'-0	Pe -0.542
32	10'-3			19.952		PO(5'-0), fd(32'-0)	37'-0	Pv
Route 8								
BL	1.0490	21.86	8.12	120		0.153444	0'-11½"	Pf 6.133
407	9'-0	21.86	5.6	15.242		Sprinkler,	39'-0	Pe -1.391
25	12'-2½"			19.985		E(2'-0), PO(5'-0), fd(32'-0)	39'-11½"	Pv
Route 9								
BL	1.0490	22.06	8.19	120		0.155979	3'-2½"	Pf 6.896
408	9'-0	22.06	5.6	15.515		Sprinkler,	41'-0	Pe -0.542
33	10'-3			21.869		2E(2'-0), PO(5'-0), fd(32'-0)	44'-2½"	Pv
Route 10								
BL	1.0490	22.30	8.28	120		0.159225	5'-8	Pf 7.431
409	9'-0	22.30	5.6	15.864		Sprinkler,	41'-0	Pe -1.391
26	12'-2½"			21.904		2E(2'-0), PO(5'-0), fd(32'-0)	46'-8	Pv
Route 11								
BL	1.0490	21.48	7.98	120		0.148542	18'-8	Pf 9.459
410	16'-0	21.48	5.6	14.717		Sprinkler,	45'-0	Pe -4.002
34	25'-3			20.174		4E(2'-0), PO(5'-0), fd(32'-0)	63'-8	Pv
BL	1.3800	46.59	9.99	120		0.163592	19'-10½"	Pf 4.724
34	25'-3	25.11		20.174		Flow (q) from Route 12	9'-0	Pe 1.130
35	22'-7½"			26.027		E(3'-0), PO(6'-0)	28'-10½"	Pv
CM	3.2600	46.59	1.79	120		0.002487	21'-5	Pf 0.170
35	22'-7½"			26.027			47'-0½"	Pe 3.774
4	13'-11			29.971		4fE(6'-8½"), T(20'-2)	68'-5½"	Pv
Route 12								
BL	1.3800	25.11	5.39	120		0.052122	1'-5	Pf 0.075
411	25'-3	25.11	5.6	20.099		Sprinkler		Pe
34	25'-3			20.174			1'-5	Pv
Route 13								
BL	1.0490	26.10	9.69	120		0.212893	4'-5	Pf 9.669
412	9'-0	26.10	5.6	21.717		Sprinkler,	41'-0	Pe -1.483
36	12'-5			29.903		2E(2'-0), PO(5'-0), fd(32'-0)	45'-5	Pv
BL	1.3800	26.10	5.60	120		0.055992	5'-0½"	Pf 0.617
36	12'-5			29.903			6'-0	Pe
37	12'-5			30.520		PO(6'-0)	11'-0½"	Pv
CM	2.6350	91.17	5.36	120		0.024275	17'-7½"	Pf 0.427
37	12'-5	65.07		30.520		Flow (q) from Route 14		Pe
38	12'-5			30.947			17'-7½"	Pv
CM	2.6350	117.73	6.93	120		0.038956	261'-1½"	Pf 13.573
38	12'-5	26.56		30.947		Flow (q) from Route 15	87'-4	Pe 1.112
20	9'-10			45.633		12fE(5'-11), PO(16'-5½")	348'-5	Pv
CM	4.2600	117.73	2.65	120		0.003754	2'-9	Pf 0.010
20	9'-10			45.633				Pe 0.000
5	9'-10			45.644			2'-9	Pv



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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	
Route 14								
BL	1.0490	26.55	9.86	120		0.219812	1'-5"	Pf 8.885
413	9'-0"	26.55	5.6	22.481		Sprinkler,	39'-0"	Pe -1.483
39	12'-5"			29.883		E(2'-0"), PO(5'-0"), fd(32'-0")	40'-5"	Pv
BL	1.3800	26.55	5.70	120		0.057812	4'-3½"	Pf 0.594
39	12'-5"			29.883			6'-0"	Pe
40	12'-5"			30.477		PO(6'-0")	10'-3½"	Pv
CM	2.6350	65.07	3.83	120		0.013008	3'-3½"	Pf 0.043
40	12'-5"	38.52		30.477		Flow (q) from Route 16		Pe
37	12'-5"			30.520			3'-3½"	Pv
Route 15								
BL	1.0490	26.56	9.86	120		0.219933	4'-2"	Pf 9.936
414	9'-0"	26.56	5.6	22.494		Sprinkler,	41'-0"	Pe -1.483
38	12'-5"			30.947		2E(2'-0"), PO(5'-0"), fd(32'-0")	45'-2"	Pv
Route 16								
DY	1.0490	26.77	9.94	120		0.223213	0'-0"	Pf 8.259
415	9'-0"	26.77	5.6	22.857		Sprinkler,	37'-0"	Pe -1.266
41	11'-11"			29.850		PO(5'-0"), fd(32'-0")	37'-0"	Pv
BL	1.3800	26.77	5.74	120		0.058706	2'-4"	Pf 0.666
41	11'-11"			29.850			9'-0"	Pe 0.397
42	11'-0"			30.914		E(3'-0"), PO(6'-0")	11'-4"	Pv
CM	2.6350	38.52	2.27	120		0.004931	12'-5"	Pf 0.178
42	11'-0"	11.75		30.914		Flow (q) from Route 20	23'-7½"	Pe -0.614
40	12'-5"			30.477		4fE(5'-11")	36'-0"	Pv
Route 17								
SP	1.0490	29.59	10.99	120		0.268663	0'-6"	Pf 1.482
416	14'-5"	29.59	5.6	27.928		Sprinkler,	5'-0"	Pe 0.223
43	13'-11"			29.632		PO(5'-0")	5'-6"	Pv
CM	2.6350	17.85	1.05	120		0.001188	10'-9"	Pf 0.013
43	13'-11"			29.632				Pe
27	13'-11"			29.645			10'-9"	Pv
Route 18								
UG	6.3100	192.39	1.97	150		0.000910	344'-2½"	Pf 0.313
21	-4'-0"	192.39		59.080		Flow (q) from Route 19		Pe
10	-4'-0"			59.393			344'-2½"	Pv
Route 19								
UG	8.2800	192.39	1.15	150		0.000242	377'-8½"	Pf 0.111
8	-4'-0"	197.74		58.969		Flow (q) from Route 1	81'-3½"	Pe
21	-4'-0"			59.080		3EE(16'-3"), E(32'-6")	458'-11½"	Pv
Route 20								
CM	2.6350	11.75	0.69	120		0.000548	13'-1½"	Pf 0.017
43	13'-11"	17.85		29.632		Flow (q) from Route 17	17'-8½"	Pe 1.264
42	11'-0"			30.914		3fE(5'-11")	30'-10"	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
				Multiplying Factor	0.713	1.16	1.33
							150



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

Pipe Type Legend	Units Legend	Fittings 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	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	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 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

