



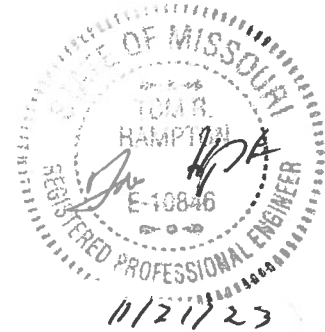
AMERICAN

FIRE SPRINKLER

HCA – SURGERY CENTER OF LEE’S SUMMIT
1950 SE SHENANDOAH DRIVE
LEE’S SUMMIT, MO 64063

HYDRAULIC CALCULATIONS INDEX

- **WET SYSTEM**
 - **AREA 1**
 - **AREA 2**
- **DRY SYSTEM**
 - **AREA 3**
 - **AREA 4**





Hydraulic Overview

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

Job									
Job Number 4333CK					Designer ALEC MOBLEY				
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT					Phone 913-722-6900			FAX	
Address 1 1950 SE SHENANDOAH DR					State Certification/License Number				
Address 2 LEE'S SUMMIT, MO 64063					AHJ				
Address 3					Job Site/Building				
System									
Density 0.10 gpm/ft²					Area of Application 1500 ft² (Actual 1056 ft²)				
Most Demanding Sprinkler Data 5.6 K-Factor 14.82 at 7.000					Hose Streams 100.00				
Coverage Per Sprinkler 225 ft²					Number Of Sprinklers Calculated 12			Number Of Nozzles Calculated 0	
System Pressure Demand 46.303					System Flow Demand 187.27				
Total Demand 287.27 @ 46.303					Pressure Result +43.305 (48.3%)				
Supplies					Check Point Gauges				
<u>Node</u>	<u>Name</u>	<u>Flow(gpm)</u>	<u>Hose Flow(gpm)</u>	<u>Static(psi)</u>	<u>Residual(psi)</u>	<u>Identifier</u>	<u>Pressure(psi)</u>	<u>K-Factor(K)</u>	<u>Flow(gpm)</u>
1	Water Supply	2275.00	100.00	90.000	72.000	BOR (254)	32.655	32.77	187.27
LS ASC.cad					Water Supply at Node 1 (2275.00, 0.00, 90.000, 72.000)				



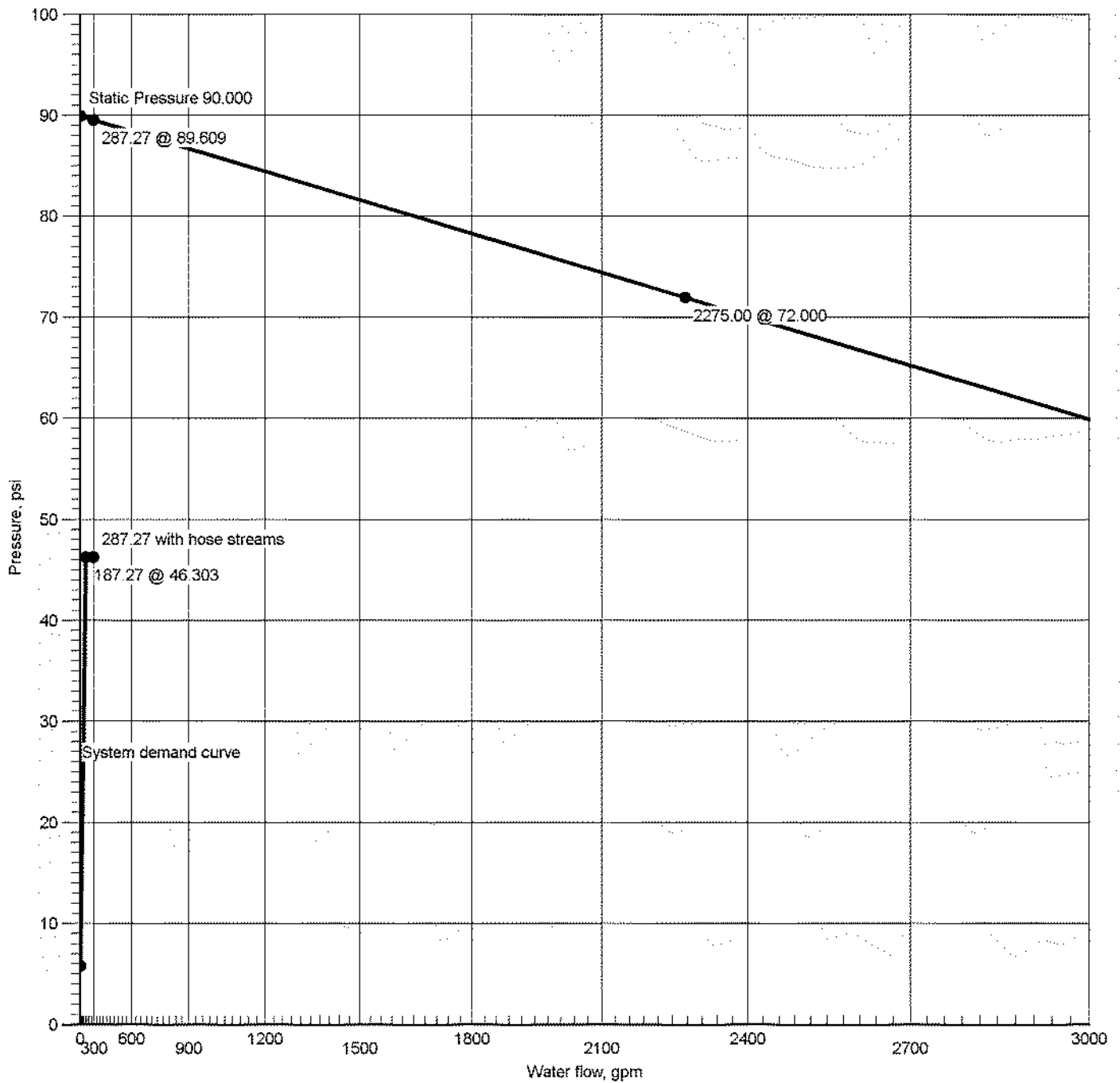
Hydraulic Summary

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

Job											
Job Number 4333CK				Designer ALEC MOBLEY							
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT				State Certification/License Number							
Address 1 1950 SE SHENANDOAH DR				AHJ							
Address 2 LEE'S SUMMIT, MO 64063				Job Site/Building							
Address 3				Drawing Name LS ASC.cad							
System				Remote Area(s)							
Most Demanding Sprinkler Data 5.6 K-Factor 14.82 at 7.000				Occupancy Light Hazard - AREA 1 -			Job Suffix				
Hose Allowance At Source 100.00				Density 0.10 gpm/ft²			Area of Application 1500 ft² (Actual 1056 ft²)				
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>				Number Of Sprinklers Calculated 12		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 100.00											
System Flow Demand 187.27		Total Water Required (Including Hose Allowance) 287.27									
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 12.55 between nodes 344 and 252											
Maximum Velocity Under Ground 1.94 between nodes 9 and 3											
Volume capacity of Wet Pipes 852.26 gal		Volume capacity of Dry Pipes 292.91 gal									
Supplies											
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	100.00	90.000	72.000		2275.00	89.609		287.27	46.303	43.305
Contractor											
Contractor Number		Contact Name				Contact Title					
Name of Contractor:		Phone				Extension					
Address 1		FAX									
Address 2		E-mail									
Address 3		Web-Site									



Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
90.000

Residual: Pressure
72.000 @ 2275.00

Available Flow @ 20 PSI:
4034.37

Available Pressure at System Demand
89.609 @ 287.27

Required Pressure at System Demand
46.303 @ 187.27

Required Pressure at System Demand (Including Hose Allowance at Source)
46.303 @ 287.27



Summary Of Outflowing Devices

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Sprinkler	601	15.44	14.82	5.6	7.602			
Sprinkler	602	15.17	14.82	5.6	7.334			
Sprinkler	603	15.17	14.82	5.6	7.337			
Sprinkler	606	16.06	14.82	5.6	8.228			
Sprinkler	608	16.19	14.82	5.6	8.356			
➡ Sprinkler	609	14.82	14.82	5.6	7.000			
Sprinkler	610	14.86	14.82	5.6	7.040			
Sprinkler	613	15.24	14.82	5.6	7.409			
Sprinkler	614	15.01	14.82	5.6	7.186			
Sprinkler	627	16.61	14.82	5.6	8.794			
Sprinkler	628	16.50	14.82	5.6	8.676			
Sprinkler	629	16.22	14.82	5.6	8.387			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4333CK

Report Description: Light Hazard - AREA 1 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-4'-0	S	46.303	187.27
601	9'-0	Spr(-7.602), fd(43'-0)	7.602	15.44
602	9'-6	Spr(-7.334), fd(43'-0)	7.334	15.17
603	9'-6	Spr(-7.337), fd(43'-0)	7.337	15.17
606	9'-0	Spr(-8.228), fd(43'-0)	8.228	16.06
608	8'-0	Spr(-8.356), fd(43'-0)	8.356	16.19
609	9'-6	Spr(-7.000), fd(43'-0)	7.000	14.82
610	9'-6	Spr(-7.040), fd(43'-0)	7.040	14.86
613	9'-0	Spr(-7.409), fd(43'-0)	7.409	15.24
614	9'-0	Spr(-7.186), fd(43'-0)	7.186	15.01
627	8'-0	Spr(-8.794), fd(43'-0)	8.794	16.61
628	8'-0	Spr(-8.676), fd(43'-0)	8.676	16.50
629	9'-0	Spr(-8.387), fd(43'-0)	8.387	16.22
3	-4'-0	LT(11'-11½)	34.843	
9	-4'-0	T(47'-3½)	46.303	
20	10'-2	PO(6'-0)	14.148	
21	10'-2	PO(5'-0)	11.886	
22	10'-2	PO(5'-0)	10.967	
23	10'-2	PO(5'-0)	10.788	
24	10'-2	PO(5'-0)	10.794	
32	10'-2	PO(6'-0)	14.219	
33	10'-2	PO(5'-0)	11.640	
34	10'-2	PO(5'-0)	10.682	
35	10'-2	PO(5'-0)	10.354	
36	10'-2	PO(5'-0)	10.297	
37	10'-2	PO(5'-0)	10.356	
40	13'-2	T(6'-0)	10.511	
51	13'-2	T(6'-0)	11.809	
69	10'-2	PO(6'-0)	14.469	
71	10'-2	PO(5'-0)	12.283	
72	10'-2	PO(5'-0)	12.111	
73	10'-2	PO(5'-0)	12.119	
77	13'-2	T(6'-0)	11.889	
92	13'-2	PO(6'-0)	19.338	
116	13'-2	PO(6'-0)	19.347	
130	10'-2	PO(6'-0)	15.316	
167	13'-2	PO(6'-0)	19.522	
181	10'-2	PO(5'-0)	15.692	
208	10'-2	T(6'-0)	17.514	
216	10'-2	PO(6'-0)	21.398	
244	10'-2	PO(6'-0)	16.144	
252	10'-2	fT(10'-9½)	23.014	
254	1'-0	BOR	32.655	
276	10'-2	PO(6'-0)	22.563	
298	10'-2	PO(6'-0)	16.419	
316	10'-2	PO(6'-0)	16.517	
344	2'-8	PO(37'-8½)	31.880	
347	10'-2	PO(6'-0)	22.354	
348	1'-6½	sCV(40'-3)	32.425	
364	10'-2	PO(6'-0)	16.700	
381	11'-2	PO(6'-0)	21.800	
407	11'-2	PO(6'-0)	21.773	
418	10'-2	PO(6'-0)	16.729	
423	10'-2	PO(10'-0)	16.958	
452	10'-2	PO(6'-0)	16.736	
458	13'-2	PO(6'-0)	15.591	
481	10'-2	PO(6'-0)	16.742	
487	13'-2	PO(6'-0)	15.576	
503	10'-2	PO(6'-0)	16.743	



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

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	14.82	5.50	120		0.074703	0'-0	Pf 3.586
609	9'-6	14.82	5.6	7.000		Sprinkler,	48'-0	Pe -0.289
36	10'-2			10.297		PO(5'-0), fd(43'-0)	48'-0	Pv
BL	1.3800	7.78	1.67	120		0.005963	10'-0	Pf 0.060
36	10'-2			10.297				Pe
37	10'-2			10.356			10'-0	Pv
BL	1.3800	22.64	4.86	120		0.043035	21'-10	Pf 1.455
37	10'-2	14.86		10.356		Flow (q) from Route 2	12'-0	Pe -1.301
40	13'-2			10.511		2E(3'-0), T(6'-0)	33'-10	Pv
BL	1.3800	39.97	8.57	120		0.123202	4'-6½	Pf 1.298
40	13'-2	17.33		10.511		Flow (q) from Route 4	6'-0	Pe
51	13'-2			11.809		T(6'-0)	10'-6½	Pv
BL	1.3800	29.74	6.38	120		0.071310	84'-7	Pf 7.529
51	13'-2			11.809			21'-0	Pe
92	13'-2			19.338		5E(3'-0), PO(6'-0)	105'-7	Pv
CM	2.4690	29.74	1.99	120		0.004196	2'-1½	Pf 0.009
92	13'-2			19.338				Pe
116	13'-2			19.347			2'-1½	Pv
CM	2.4690	58.88	3.95	120		0.014841	11'-10	Pf 0.176
116	13'-2	29.13		19.347		Flow (q) from Route 10		Pe
167	13'-2			19.522			11'-10	Pv
CM	2.4690	78.26	5.24	120		0.025127	14'-3½	Pf 0.575
167	13'-2	19.39		19.522		Flow (q) from Route 22	8'-7	Pe 1.301
216	10'-2			21.398		2fE(4'-3½)	22'-10½	Pv
CM	2.4690	105.14	7.05	120		0.043388	17'-10½	Pf 1.617
216	10'-2	26.88		21.398		Flow (q) from Route 3	19'-5	Pe
252	10'-2			23.014		2fE(4'-3½), fT(10'-9½)	37'-3	Pv
CM	2.4690	187.27	12.55	120		0.126230	20'-7½	Pf 5.616
252	10'-2	82.13		23.014		Flow (q) from Route 13	23'-10½	Pe 3.249
344	2'-8			31.880		fE(4'-3½), CV(19'-7)	44'-6	Pv
DY	6.3570	187.27	1.89	120		0.001262	0'-0	Pf 0.051
344	2'-8			31.880			40'-3	Pe 0.494
348	1'-6½			32.425		sCV(40'-3)	40'-3	Pv
DY	6.0650	187.27	2.08	140		0.001193	0'-0	Pf 0.000
348	1'-6½			32.425				Pe 0.230
254	1'-0			32.655		BOR	0'-0	Pv
FR	6.0650	187.27	2.08	140		0.001193	5'-0	Pf 0.020
254	1'-0			32.655			11'-11½	Pe 2.168
3	-4'-0			34.843		LtE(11'-11½)	16'-11½	Pv
UG	6.2800	187.27	1.94	140		0.001007	302'-11½	Pf 11.460
3	-4'-0			34.843			99'-3½	Pe
9	-4'-0			46.303		LtE(14'-2), 2EE(11'-0½), Ee2(11'-0½), BFP(-11.055), GV(4'-8½), T(47'-3½)	402'-3	Pv
UG	12.4600	187.27	0.49	140		0.000036	4'-0	Pf 0.000
9	-4'-0			46.303				Pe
1	-4'-0			46.303		Water Supply	4'-0	Pv
		100.00				Hose Allowance At Source		
1		287.27						
Route 2								
DY	1.0490	14.86	5.52	120		0.075103	0'-0	Pf 3.605
610	9'-6	14.86	5.6	7.040		Sprinkler,	48'-0	Pe -0.289
37	10'-2			10.356		PO(5'-0), fd(43'-0)	48'-0	Pv
Route 3								
DY	1.0490	15.01	5.57	120		0.076539	0'-0	Pf 3.674
614	9'-0	15.01	5.6	7.186		Sprinkler,	48'-0	Pe -0.506
35	10'-2			10.354		PO(5'-0), fd(43'-0)	48'-0	Pv
BL	1.3800	22.05	4.73	120		0.041000	8'-0	Pf 0.328
35	10'-2	7.04		10.354		Flow (q) from Route 24		Pe
34	10'-2			10.682			8'-0	Pv
BL	1.3800	37.29	8.00	120		0.108385	8'-10	Pf 0.958
34	10'-2	15.24		10.682		Flow (q) from Route 6		Pe
33	10'-2			11.640			8'-10	Pv
BL	1.3800	53.48	11.47	120		0.211162	6'-2½	Pf 2.578
33	10'-2	16.19		11.640		Flow (q) from Route 9	6'-0	Pe
32	10'-2			14.219		PO(6'-0)	12'-2½	Pv



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

Pipe Type	Diameter	Flow	Velocity	HWC	Pn	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt		Fittings	Eq. Length	Summary
Upstream							Total Length	
CM	2.4690	97.99	6.57	120		0.038084	6'-7	Pf 0.250
32	10'-2	44.51		14.219		Flow (q) from Route 7		Pe
69	10'-2			14.469			6'-7	Pv
CM	2.4690	128.40	8.60	120		0.062794	13'-6	Pf 0.847
69	10'-2	30.41		14.469		Flow (q) from Route 12		Pe
130	10'-2			15.316			13'-6	Pv
CM	2.4690	109.01	7.31	120		0.046389	8'-1	Pf 0.376
130	10'-2			15.316				Pe
181	10'-2			15.692			8'-1	Pv
BL	1.3800	14.30	3.07	120		0.018410	83'-11½	Pf 1.822
181	10'-2			15.692		PO(6'-0)	15'-0	Pe
208	10'-2			17.514		E(3'-0), T(6'-0)	98'-11½	Pv
BL	1.3800	26.88	5.77	120		0.059147	59'-8	Pf 3.884
208	10'-2	12.58		17.514		Flow (q) from Route 21	6'-0	Pe
216	10'-2			21.398		PO(6'-0)	65'-8	Pv
Route 4								
DY	1.0490	15.17	5.63	120		0.077990	0'-0	Pf 3.744
602	9'-6	15.17	5.6	7.334		Sprinkler,	48'-0	Pe -0.289
23	10'-2			10.788		PO(5'-0), fd(43'-0)	48'-0	Pv
BL	1.3800	2.16	0.46	120		0.000559	10'-0	Pf 0.006
23	10'-2			10.788				Pe
24	10'-2			10.794			10'-0	Pv
BL	1.3800	17.33	3.72	120		0.026262	29'-9	Pf 1.018
24	10'-2	15.17		10.794		Flow (q) from Route 5	9'-0	Pe -1.301
40	13'-2			10.511		3E(3'-0)	38'-9	Pv
Route 5								
DY	1.0490	15.17	5.63	120		0.078028	0'-0	Pf 3.745
603	9'-6	15.17	5.6	7.337		Sprinkler,	48'-0	Pe -0.289
24	10'-2			10.794		PO(5'-0), fd(43'-0)	48'-0	Pv
Route 6								
DY	1.0490	15.24	5.66	120		0.078731	0'-0	Pf 3.779
613	9'-0	15.24	5.6	7.409		Sprinkler,	48'-0	Pe -0.506
34	10'-2			10.682		PO(5'-0), fd(43'-0)	48'-0	Pv
Route 7								
DY	1.0490	15.44	5.73	120		0.080632	0'-0	Pf 3.870
601	9'-0	15.44	5.6	7.602		Sprinkler,	48'-0	Pe -0.506
22	10'-2			10.967		PO(5'-0), fd(43'-0)	48'-0	Pv
BL	1.3800	28.44	6.10	120		0.065657	14'-0	Pf 0.919
22	10'-2	13.00		10.967		Flow (q) from Route 25		Pe
21	10'-2			11.886			14'-0	Pv
BL	1.3800	44.51	9.55	120		0.150318	9'-0½	Pf 2.262
21	10'-2	16.06		11.886		Flow (q) from Route 8	6'-0	Pe
20	10'-2			14.148		PO(6'-0)	15'-0½	Pv
CM	2.4690	44.51	2.98	120		0.008844	7'-11½	Pf 0.070
20	10'-2			14.148				Pe
32	10'-2			14.219			7'-11½	Pv
Route 8								
DY	1.0490	16.06	5.96	120		0.086750	0'-0	Pf 4.164
606	9'-0	16.06	5.6	8.228		Sprinkler,	48'-0	Pe -0.506
21	10'-2			11.886		PO(5'-0), fd(43'-0)	48'-0	Pv
Route 9								
DY	1.0490	16.19	6.01	120		0.087995	0'-0	Pf 4.224
608	8'-0	16.19	5.6	8.356		Sprinkler,	48'-0	Pe -0.939
33	10'-2			11.640		PO(5'-0), fd(43'-0)	48'-0	Pv
Route 10								
DY	1.0490	16.22	6.02	120		0.088298	0'-0	Pf 4.238
629	9'-0	16.22	5.6	8.387		Sprinkler,	48'-0	Pe -0.506
73	10'-2			12.119		PO(5'-0), fd(43'-0)	48'-0	Pv
BL	1.3800	18.91	4.06	120		0.030845	22'-8½	Pf 1.070
73	10'-2	2.69		12.119		Flow (q) from Route 11	12'-0	Pe -1.301
77	13'-2			11.889		2E(3'-0), T(6'-0)	34'-8½	Pv
BL	1.3800	29.13	6.25	120		0.068641	84'-8	Pf 7.458
77	13'-2	10.23		11.889		Flow (q) from Route 31	24'-0	Pe
116	13'-2			19.347		6E(3'-0), PO(6'-0)	108'-8	Pv
Route 11								
DY	1.0490	16.50	6.12	120		0.091115	0'-0	Pf 4.374
628	8'-0	16.50	5.6	8.676		Sprinkler,	48'-0	Pe -0.939
72	10'-2			12.111		PO(5'-0), fd(43'-0)	48'-0	Pv



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

Pipe Type	Diameter	Flow	Velocity	HWC	Pn	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt		Fittings	Eq. Length	Summary
Upstream							Total Length	
BL	1.3800	2.69	0.58	120		0.000836	10'-4½"	Pf 0.009
72	10'-2			12.111				Pe
73	10'-2			12.119			10'-4½"	Pv
Route 12								
DY	1.0490	16.61	6.16	120		0.092257	0'-0"	Pf 4.428
627	8'-0	16.61	5.6	8.794		Sprinkler,	48'-0"	Pe -0.939
71	10'-2			12.283		PO(5'-0), fd(43'-0)	48'-0"	Pv
BL	1.3800	30.41	6.52	120		0.074318	23'-5"	Pf 2.186
71	10'-2	13.81		12.283		Flow (q) from Route 23	6'-0"	Pe
69	10'-2			14.469		PO(6'-0)	29'-5"	Pv
Route 13								
BL	2.0670	14.12	1.35	120		0.002513	9'-5½"	Pf 0.067
458	13'-2	9.13 + 4.99		15.591		Flow (q) from Route 14 and 29	17'-0"	Pe 1.301
423	10'-2			16.958		2fE(3'-6), PO(10'-0)	26'-5½"	Pv
BL	1.3800	21.32	4.57	120		0.038515	112'-3"	Pf 5.248
423	10'-2	7.20		16.958		Flow (q) from Route 16	24'-0"	Pe -0.434
407	11'-2			21.773		6E(3'-0), PO(6'-0)	136'-3"	Pv
CM	2.4690	21.32	1.43	120		0.002266	12'-3"	Pf 0.028
407	11'-2			21.773				Pe
381	11'-2			21.800			12'-3"	Pv
CM	2.4690	41.35	2.77	120		0.007718	7'-0"	Pf 0.120
381	11'-2	20.03		21.800		Flow (q) from Route 17	8'-7"	Pe 0.434
347	10'-2			22.354		2fE(4'-3½)	15'-7"	Pv
CM	2.4690	61.42	4.12	120		0.016050	13'-0"	Pf 0.209
347	10'-2	20.08		22.354		Flow (q) from Route 30		Pe
276	10'-2			22.563			13'-0"	Pv
CM	2.4690	82.13	5.50	120		0.027474	5'-7½"	Pf 0.451
276	10'-2	20.71		22.563		Flow (q) from Route 19	10'-9½"	Pe
252	10'-2			23.014		fT(10'-9½)	16'-5"	Pv
Route 14								
BL	2.0670	4.52	0.43	120		0.000306	10'-4"	Pf 0.003
509	13'-2	4.52		15.573		Flow (q) from Route 15		Pe
487	13'-2			15.576			10'-4"	Pv
BL	2.0670	9.13	0.87	120		0.001122	13'-5"	Pf 0.015
487	13'-2	4.61		15.576		Flow (q) from Route 28		Pe
458	13'-2			15.591			13'-5"	Pv
Route 15								
CM	2.4690	14.12	0.95	120		0.001058	6'-5½"	Pf 0.007
418	10'-2	21.32		16.729		Flow (q) from Route 26		Pe
452	10'-2			16.736			6'-5½"	Pv
CM	2.4690	9.13	0.61	120		0.000472	13'-5"	Pf 0.006
452	10'-2			16.736				Pe
481	10'-2			16.742			13'-5"	Pv
CM	2.4690	4.52	0.30	120		0.000129	10'-4"	Pf 0.001
481	10'-2			16.742				Pe
503	10'-2			16.743			10'-4"	Pv
BL	1.3800	4.52	0.97	120		0.002188	41'-4"	Pf 0.130
503	10'-2			16.743		PO(6'-0)	18'-0"	Pe -1.301
509	13'-2			15.573		2E(3'-0), PO(6'-0)	59'-4"	Pv
Route 16								
BL	1.3800	7.20	1.54	120		0.005166	38'-4"	Pf 0.229
418	10'-2	21.32		16.729		PO(6'-0), Flow (q) from Route 26	6'-0"	Pe
423	10'-2			16.958			44'-4"	Pv
Route 17								
BL	1.3800	20.03	4.30	120		0.034317	143'-3"	Pf 5.534
364	10'-2	41.35		16.700		PO(6'-0), Flow (q) from Route 18	18'-0"	Pe -0.434
381	11'-2			21.800		2E(3'-0), PO(6'-0)	161'-3"	Pv
Route 18								
CM	2.4690	61.42	4.12	120		0.016050	6'-1"	Pf 0.098
298	10'-2	82.13		16.419		Flow (q) from Route 20		Pe
316	10'-2			16.517			6'-1"	Pv
CM	2.4690	41.35	2.77	120		0.007718	15'-1½"	Pf 0.183
316	10'-2			16.517			8'-7"	Pe
364	10'-2			16.700		2fE(4'-3½)	23'-8½"	Pv
Route 19								
BL	1.3800	20.71	4.44	120		0.036504	150'-3½"	Pf 6.144
298	10'-2	82.13		16.419		PO(6'-0), Flow (q) from Route 20	18'-0"	Pe
276	10'-2			22.563		2E(3'-0), PO(6'-0)	168'-3½"	Pv



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

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 20								
CM	2.4690	82.13	5.50	120		0.027474	10'-0½	Pf 0.276
244	10'-2	94.71		16.144		Flow (q) from Route 27		Pe
298	10'-2			16.419			10'-0½	Pv
Route 21								
BL	1.3800	12.58	2.70	120		0.014510	82'-5	Pf 1.370
244	10'-2	94.71		16.144		PO(6'-0), Flow (q) from Route 27	12'-0	Pe
208	10'-2			17.514		2E(3'-0)	94'-5	Pv
Route 22								
BL	1.3800	19.39	4.16	120		0.032307	143'-5½	Pf 5.507
130	10'-2			15.316		PO(6'-0)	27'-0	Pe -1.301
167	13'-2			19.522		5E(3'-0), PO(6'-0)	170'-5½	Pv
Route 23								
BL	1.3800	13.81	2.96	120		0.017241	10'-0	Pf 0.172
72	10'-2	2.69		12.111		Flow (q) from Route 11		Pe
71	10'-2			12.283			10'-0	Pv
Route 24								
BL	1.3800	7.04	1.51	120		0.004958	11'-7	Pf 0.057
36	10'-2	7.78		10.297		Flow (q) from Route 1		Pe
35	10'-2			10.354			11'-7	Pv
Route 25								
BL	1.3800	13.00	2.79	120		0.015429	11'-7	Pf 0.179
23	10'-2	2.16		10.788		Flow (q) from Route 4		Pe
22	10'-2			10.967			11'-7	Pv
Route 26								
CM	2.4690	21.32	1.43	120		0.002266	12'-8½	Pf 0.029
364	10'-2	41.35		16.700		Flow (q) from Route 18		Pe
418	10'-2			16.729			12'-8½	Pv
Route 27								
CM	2.4690	94.71	6.35	120		0.035760	12'-7½	Pf 0.452
181	10'-2	14.30		15.692		Flow (q) from Route 3		Pe
244	10'-2			16.144			12'-7½	Pv
Route 28								
BL	1.3800	4.61	0.99	120		0.002264	41'-4	Pf 0.134
481	10'-2			16.742		PO(6'-0)	18'-0	Pe -1.301
487	13'-2			15.576		2E(3'-0), PO(6'-0)	59'-4	Pv
Route 29								
BL	1.3800	4.99	1.07	120		0.002624	41'-4	Pf 0.156
452	10'-2			16.736		PO(6'-0)	18'-0	Pe -1.301
458	13'-2			15.591		2E(3'-0), PO(6'-0)	59'-4	Pv
Route 30								
BL	1.3800	20.08	4.31	120		0.034466	151'-4½	Pf 5.837
316	10'-2			16.517		PO(6'-0)	18'-0	Pe
347	10'-2			22.354		2E(3'-0), PO(6'-0)	169'-4½	Pv
Route 31								
BL	1.3800	10.23	2.19	120		0.009897	2'-0½	Pf 0.080
51	13'-2			11.809		T(6'-0)	6'-0	Pe
77	13'-2			11.889			8'-0½	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

Job Number: 4333CK
Report Description: Light Hazard - AREA 1 -

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	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	BaV 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	DeV 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	



Hydraulic Overview

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

Job									
Job Number 4333CK			Designer ALEC MOBLEY						
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT			Phone 913-722-6900		FAX				
Address 1 1950 SE SHENANDOAH DR			State Certification/License Number						
Address 2 LEE'S SUMMIT, MO 64063			AHJ						
Address 3			Job Site/Building						
System									
Density 0.10 gpm/ft²			Area of Application 1500 ft² (Actual 1122 ft²)						
Most Demanding Sprinkler Data 5.6 K-Factor 16.30 at 8.472			Hose Streams 100.00						
Coverage Per Sprinkler 225 ft²			Number Of Sprinklers Calculated 11		Number Of Nozzles Calculated 0				
System Pressure Demand 50.363			System Flow Demand 186.47						
Total Demand 286.47 @ 50.363			Pressure Result +39.248 (43.8%)						
Supplies			Check Point Gauges						
<u>Node</u>	<u>Name</u>	<u>Flow(gpm)</u>	<u>Hose Flow(gpm)</u>	<u>Static(psi)</u>	<u>Residual(psi)</u>	<u>Identifier</u>	<u>Pressure(psi)</u>	<u>K-Factor(K)</u>	<u>Flow(gpm)</u>
1	Water Supply	2275.00	100.00	90.000	72.000	BOR (254)	36.714	30.78	186.47
LS ASC.cad						Water Supply at Node 1 (2275.00, 0.00, 90.000, 72.000)			



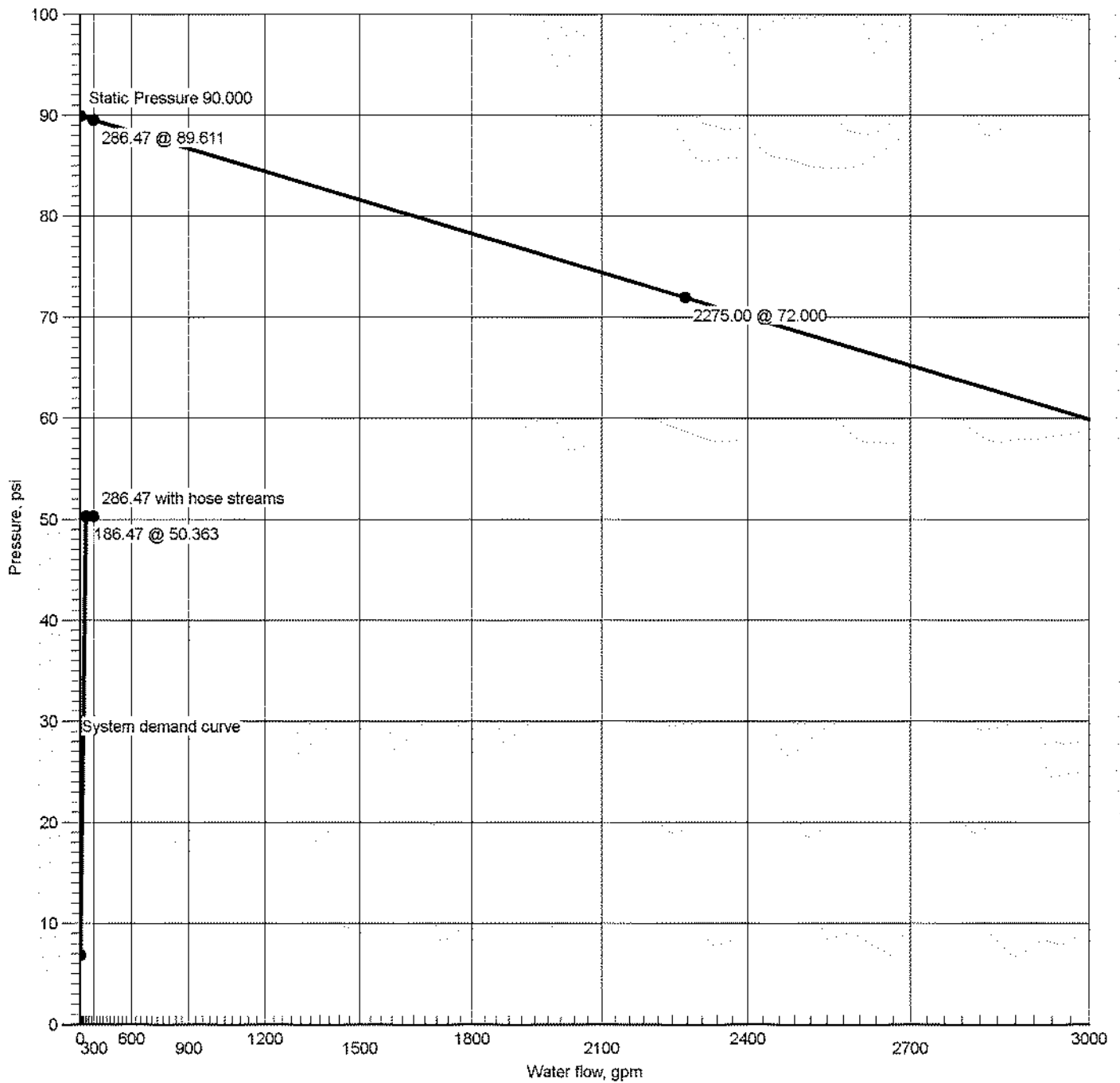
Hydraulic Summary

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

Job											
Job Number 4333CK					Designer ALEC MOBLEY						
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT					State Certification/License Number						
Address 1 1950 SE SHENANDOAH DR					AHJ						
Address 2 LEE'S SUMMIT, MO 64063					Job Site/Building						
Address 3					Drawing Name LS ASC.cad						
System					Remote Area(s)						
Most Demanding Sprinkler Data 5.6 K-Factor 16.30 at 8.472					Occupancy Light Hazard - AREA 2 -			Job Suffix			
Hose Allowance At Source 100.00					Density 0.10 gpm/ft²			Area of Application 1500 ft² (Actual 1122 ft²)			
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>					Number Of Sprinklers Calculated 11		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 100.00											
System Flow Demand 186.47			Total Water Required (Including Hose Allowance) 286.47								
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 12.50 between nodes 344 and 252											
Maximum Velocity Under Ground 1.93 between nodes 9 and 3											
Volume capacity of Wet Pipes 852.26 gal			Volume capacity of Dry Pipes 292.91 gal								
Supplies											
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	100.00	90.000	72.000		2275.00	89.611		286.47	50.363	39.248
Contractor											
Contractor Number		Contact Name					Contact Title				
Name of Contractor:						Phone			Extension		
Address 1						FAX					
Address 2						E-mail					
Address 3						Web-Site					



Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
90.000

Residual: Pressure
72.000 @ 2275.00

Available Flow @ 20 PSI:
4034.37

Available Pressure at System Demand
89.611 @ 286.47

Required Pressure at System Demand
50.363 @ 186.47

Required Pressure at System Demand (Including Hose Allowance at Source)
50.363 @ 286.47



Summary Of Outflowing Devices

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Sprinkler	769	16.79	16.30	5.6	8.994			
Sprinkler	774	18.46	14.82	5.6	10.866			
Sprinkler	775	16.02	14.82	5.6	8.179			
Sprinkler	778	16.37	16.30	5.6	8.548			
Sprinkler	779	16.54	16.30	5.6	8.725			
Sprinkler	780	16.95	16.30	5.6	9.163			
Sprinkler	781	18.17	14.82	5.6	10.523			
Sprinkler	782	17.53	14.82	5.6	9.799			
⇒ Sprinkler	785	16.30	16.30	5.6	8.472			
Sprinkler	786	16.47	16.30	5.6	8.649			

⇒ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4333CK

Report Description: Light Hazard - AREA 2 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-4'-0	S	50.363	186.47
769	12'-0	Spr(-8.994), fd(43'-0)	8.994	16.79
774	9'-0	Spr(-10.866), fd(43'-0)	10.866	18.46
775	9'-0	Spr(-8.179), fd(72'-0)	8.179	16.02
778	12'-0	Spr(-8.548), fd(43'-0)	8.548	16.37
779	12'-0	Spr(-8.725), fd(43'-0)	8.725	16.54
780	10'-0	Spr(-9.163), fd(43'-0)	9.163	16.95
781	9'-0	Spr(-10.523), fd(43'-0)	10.523	18.17
782	9'-0	Spr(-9.799), fd(43'-0)	9.799	17.53
785	12'-0	Spr(-8.472), fd(43'-0)	8.472	16.30
786	12'-0	Spr(-8.649), fd(43'-0)	8.649	16.47
787	10'-0	Spr(-9.082), fd(43'-0)	9.082	16.88
3	-4'-0	LtE(11'-11½)	38.902	
9	-4'-0	T(47'-3½)	50.363	
20	10'-2	PO(6'-0)	20.398	
32	10'-2	PO(6'-0)	20.392	
40	13'-2	T(6'-0)	20.253	
51	13'-2	T(6'-0)	20.760	
69	10'-2	PO(6'-0)	20.373	
77	13'-2	T(6'-0)	20.776	
92	13'-2	PO(6'-0)	24.274	
116	13'-2	PO(6'-0)	24.278	
130	10'-2	PO(6'-0)	20.279	
167	13'-2	PO(6'-0)	24.360	
181	10'-2	PO(5'-0)	20.161	
208	10'-2	T(6'-0)	21.757	
216	10'-2	PO(6'-0)	25.994	
244	10'-2	PO(6'-0)	19.893	
252	10'-2	FT(10'-9½)	27.117	
254	1'-0	BOR	36.714	
276	10'-2	PO(6'-0)	26.467	
298	10'-2	PO(6'-0)	19.590	
316	10'-2	PO(6'-0)	19.310	
344	2'-8	PO(37'-8½)	35.939	
347	10'-2	PO(6'-0)	26.141	
348	1'-6½	sCV(40'-3)	36.484	
364	10'-2	PO(6'-0)	17.781	
381	11'-2	PO(6'-0)	25.495	
407	11'-2	PO(6'-0)	25.438	
418	10'-2	PO(6'-0)	16.651	
423	10'-2	PO(10'-0)	15.043	
452	10'-2	PO(6'-0)	16.210	
458	13'-2	PO(6'-0)	12.996	
460	13'-2	PO(5'-0)	13.009	
470	10'-2	PO(5'-0)	15.746	
479	13'-2	PO(5'-0)	12.615	
481	10'-2	PO(6'-0)	15.597	
485	10'-2	PO(5'-0)	14.317	
487	13'-2	PO(6'-0)	12.588	
489	13'-2	PO(5'-0)	12.390	
490	13'-2	PO(5'-0)	12.355	
499	10'-2	PO(5'-0)	15.245	
500	10'-2	PO(6'-0)	15.488	
502	13'-2	PO(5'-0)	12.503	
503	10'-2	PO(6'-0)	15.470	
507	10'-2	PO(5'-0)	14.187	
509	13'-2	PO(6'-0)	12.502	
511	13'-2	PO(5'-0)	12.272	
512	13'-2	PO(5'-0)	12.244	



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

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	16.30	6.05	120		0.089127	0'-0	Pf 4.278
785	12'-0	16.30	5.6	8.472		Sprinkler,	48'-0	Pe -0.506
512	13'-2			12.244		PO(5'-0), fd(43'-0)	48'-0	Pv
BL	1.3800	4.53	0.97	120		0.002198	12'-6	Pf 0.027
512	13'-2			12.244				Pe
511	13'-2			12.272			12'-6	Pv
BL	1.3800	21.41	4.59	120		0.038826	9'-10	Pf 0.615
511	13'-2	16.88		12.272		Flow (q) from Route 6	6'-0	Pe 1.301
507	10'-2			14.187		2E(3'-0)	15'-10	Pv
BL	1.3800	38.94	8.35	120		0.117405	4'-11	Pf 1.283
507	10'-2	17.53		14.187		Flow (q) from Route 9	6'-0	Pe
503	10'-2			15.470		PO(6'-0)	10'-11	Pv
CM	2.4690	38.94	2.61	120		0.006907	2'-6½	Pf 0.018
503	10'-2			15.470				Pe
500	10'-2			15.488			2'-6½	Pv
CM	2.4690	57.11	3.83	120		0.014026	7'-9½	Pf 0.109
500	10'-2	18.17		15.488		Flow (q) from Route 10		Pe
481	10'-2			15.597			7'-9½	Pv
CM	2.4690	95.10	6.37	120		0.036036	4'-1½	Pf 0.149
481	10'-2	38.00		15.597		Flow (q) from Route 2		Pe
470	10'-2			15.746			4'-1½	Pv
CM	2.4690	113.56	7.61	120		0.050033	9'-3½	Pf 0.464
470	10'-2	18.46		15.746		Flow (q) from Route 11		Pe
452	10'-2			16.210			9'-3½	Pv
CM	2.4690	134.30	9.00	120		0.068238	6'-5½	Pf 0.441
452	10'-2	20.74		16.210		Flow (q) from Route 3		Pe
418	10'-2			16.651			6'-5½	Pv
CM	2.4690	154.94	10.38	120		0.088896	12'-8½	Pf 1.130
418	10'-2	20.64		16.651		Flow (q) from Route 12		Pe
364	10'-2			17.781			12'-8½	Pv
BL	1.3800	24.69	5.30	120		0.050528	143'-3	Pf 8.148
364	10'-2			17.781		PO(6'-0)	18'-0	Pe -0.434
381	11'-2			25.495		2E(3'-0), PO(6'-0)	161'-3	Pv
CM	2.4690	56.22	3.77	120		0.013627	7'-0	Pf 0.213
381	11'-2	31.53		25.495		Flow (q) from Route 15	8'-7	Pe 0.434
347	10'-2			26.141		2fE(4'-3½)	15'-7	Pv
CM	2.4690	78.08	5.23	120		0.025019	13'-0	Pf 0.326
347	10'-2	21.86		26.141		Flow (q) from Route 26		Pe
276	10'-2			26.467			13'-0	Pv
CM	2.4690	100.09	6.71	120		0.039609	5'-7½	Pf 0.650
276	10'-2	22.01		26.467		Flow (q) from Route 17	10'-9½	Pe
252	10'-2			27.117		fT(10'-9½)	16'-5	Pv
CM	2.4690	186.47	12.50	120		0.125234	20'-7½	Pf 5.572
252	10'-2	86.39		27.117		Flow (q) from Route 16	23'-10½	Pe 3.249
344	2'-8			35.939		fE(4'-3½), CV(19'-7)	44'-6	Pv
DY	6.3570	186.47	1.88	120		0.001252	0'-0	Pf 0.050
344	2'-8			35.939			40'-3	Pe 0.494
348	1'-6½			36.484		sCV(40'-3)	40'-3	Pv
DY	6.0650	186.47	2.07	140		0.001183	0'-0	Pf 0.000
348	1'-6½			36.484				Pe 0.230
254	1'-0			36.714		BOR	0'-0	Pv
FR	6.0650	186.47	2.07	140		0.001183	5'-0	Pf 0.020
254	1'-0			36.714			11'-11½	Pe 2.168
3	-4'-0			38.902		LtE(11'-11½)	16'-11½	Pv
UG	6.2800	186.47	1.93	140		0.000999	302'-11½	Pf 11.461
3	-4'-0			38.902			99'-3½	Pe
9	-4'-0			50.363		LtE(14'-2), 2EE(11'-0½), Ee2(11'-0½), BFP(-11.060), GV(4'-8½), T(47'-3½)	402'-3	Pv
UG	12.4600	186.47	0.49	140		0.000036	4'-0	Pf 0.000
9	-4'-0			50.363				Pe
1	-4'-0			50.363		Water Supply	4'-0	Pv
		100.00				Hose Allowance At Source		
1		286.47						
Route 2								



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss		Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
DY	1.0490	16.37	6.08	120		0.089864		0'-0 Pf 4.313
778	12'-0	16.37	5.6	8.548		Sprinkler,		48'-0 Pe -0.506
490	13'-2			12.355		PO(5'-0), fd(43'-0)		48'-0 Pv
BL	1.3800	5.03	1.08	120		0.002662		13'-2 Pf 0.035
490	13'-2			12.355				Pe
489	13'-2			12.390				13'-2 Pv
BL	1.3800	21.98	4.71	120		0.040759		9'-4 Pf 0.626
489	13'-2	16.95		12.390		Flow (q) from Route 7		6'-0 Pe 1.301
485	10'-2			14.317		2E(3'-0)		15'-4 Pv
BL	1.3800	38.00	8.15	120		0.112194		5'-5 Pf 1.280
485	10'-2	16.02		14.317		Flow (q) from Route 8		6'-0 Pe
481	10'-2			15.597		PO(6'-0)		11'-5 Pv
Route 3								
DY	1.0490	16.47	6.11	120		0.090846		0'-0 Pf 4.361
786	12'-0	16.47	5.6	8.649		Sprinkler,		48'-0 Pe -0.506
502	13'-2			12.503		PO(5'-0), fd(43'-0)		48'-0 Pv
BL	2.0670	28.23	2.70	120		0.009055		9'-4 Pf 0.084
502	13'-2	11.77		12.503		Flow (q) from Route 13		Pe
487	13'-2			12.588				9'-4 Pv
BL	2.0670	39.58	3.78	120		0.016913		1'-7 Pf 0.027
487	13'-2	11.34		12.588		Flow (q) from Route 14		Pe
479	13'-2			12.615				1'-7 Pv
BL	2.0670	56.12	5.37	120		0.032269		11'-10 Pf 0.381
479	13'-2	16.54		12.615		Flow (q) from Route 4		Pe
458	13'-2			12.996				11'-10 Pv
BL	1.3800	3.95	0.85	120		0.001699		1'-5 Pf 0.013
458	13'-2			12.996		PO(6'-0)		6'-0 Pe
460	13'-2			13.009				7'-5 Pv
BL	1.3800	20.74	4.45	120		0.036602		39'-11 Pf 1.901
460	13'-2	16.79		13.009		Flow (q) from Route 5		12'-0 Pe 1.301
452	10'-2			16.210		2E(3'-0), PO(6'-0)		51'-11 Pv
Route 4								
DY	1.0490	16.54	6.14	120		0.091583		0'-0 Pf 4.396
779	12'-0	16.54	5.6	8.725		Sprinkler,		48'-0 Pe -0.506
479	13'-2			12.615		PO(5'-0), fd(43'-0)		48'-0 Pv
Route 5								
DY	1.0490	16.79	6.23	120		0.094191		0'-0 Pf 4.521
769	12'-0	16.79	5.6	8.994		Sprinkler,		48'-0 Pe -0.506
460	13'-2			13.009		PO(5'-0), fd(43'-0)		48'-0 Pv
Route 6								
DY	1.0490	16.88	6.27	120		0.095050		0'-0 Pf 4.562
787	10'-0	16.88	5.6	9.082		Sprinkler,		48'-0 Pe -1.373
511	13'-2			12.272		PO(5'-0), fd(43'-0)		48'-0 Pv
Route 7								
DY	1.0490	16.95	6.29	120		0.095834		0'-0 Pf 4.600
780	10'-0	16.95	5.6	9.163		Sprinkler,		48'-0 Pe -1.373
489	13'-2			12.390		PO(5'-0), fd(43'-0)		48'-0 Pv
Route 8								
DY	1.0490	16.02	5.95	120		0.086276		0'-0 Pf 6.643
775	9'-0	16.02	5.6	8.179		Sprinkler,		77'-0 Pe -0.506
485	10'-2			14.317		PO(5'-0), fd(72'-0)		77'-0 Pv
Route 9								
DY	1.0490	17.53	6.51	120		0.101965		0'-0 Pf 4.894
782	9'-0	17.53	5.6	9.799		Sprinkler,		48'-0 Pe -0.506
507	10'-2			14.187		PO(5'-0), fd(43'-0)		48'-0 Pv
Route 10								
DY	1.0490	18.17	6.74	120		0.108915		0'-0 Pf 5.228
781	9'-0	18.17	5.6	10.523		Sprinkler,		48'-0 Pe -0.506
499	10'-2			15.245		PO(5'-0), fd(43'-0)		48'-0 Pv
BL	1.3800	18.17	3.90	120		0.028645		2'-6 Pf 0.243
499	10'-2			15.245				6'-0 Pe
500	10'-2			15.488		PO(6'-0)		8'-6 Pv
Route 11								
DY	1.0490	18.46	6.85	120		0.112200		0'-0 Pf 5.386
774	9'-0	18.46	5.6	10.866		Sprinkler,		48'-0 Pe -0.506
470	10'-2			15.746		PO(5'-0), fd(43'-0)		48'-0 Pv
Route 12								



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss		Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
BL	2.0670	52.17	4.99	120		0.028198	9'-5½"	Pf 0.746
458	13'-2	3.95		12.996		Flow (q) from Route 3	17'-0	Pe 1.301
423	10'-2			15.043		2fE(3'-6), PO(10'-0)	26'-5½"	Pv
BL	1.3800	20.64	4.43	120		0.036276	38'-4	Pf 1.608
423	10'-2			15.043			6'-0	Pe
418	10'-2			16.651		PO(6'-0)	44'-4	Pv
Route 13								
BL	1.3800	11.77	2.52	120		0.012825	14'-1	Pf 0.257
512	13'-2	4.53		12.244		Flow (q) from Route 1	6'-0	Pe
509	13'-2			12.502		PO(6'-0)	20'-1	Pv
BL	2.0670	11.77	1.12	120		0.001793	1'-0	Pf 0.002
509	13'-2			12.502				Pe
502	13'-2			12.503			1'-0	Pv
Route 14								
BL	1.3800	11.34	2.43	120		0.011987	13'-5	Pf 0.233
490	13'-2	5.03		12.355		Flow (q) from Route 2	6'-0	Pe
487	13'-2			12.588		PO(6'-0)	19'-5	Pv
Route 15								
CM	2.4690	31.53	2.11	120		0.004675	12'-3	Pf 0.057
407	11'-2	31.53		25.438		Flow (q) from Route 25		Pe
381	11'-2			25.495			12'-3	Pv
Route 16								
CM	2.4690	86.39	5.79	120		0.030164	10'-0½"	Pf 0.303
298	10'-2	108.40		19.590		Flow (q) from Route 23		Pe
244	10'-2			19.893			10'-0½"	Pv
CM	2.4690	71.53	4.79	120		0.021274	12'-7½"	Pf 0.269
244	10'-2			19.893				Pe
181	10'-2			20.161			12'-7½"	Pv
BL	1.3800	13.32	2.86	120		0.016126	83'-11½"	Pf 1.596
181	10'-2			20.161		PO(6'-0)	15'-0	Pe
208	10'-2			21.757		E(3'-0), T(6'-0)	98'-11½"	Pv
BL	1.3800	28.17	6.04	120		0.064511	59'-8	Pf 4.236
208	10'-2	14.86		21.757		Flow (q) from Route 18	6'-0	Pe
216	10'-2			25.994		PO(6'-0)	65'-8	Pv
CM	2.4690	86.39	5.79	120		0.030164	17'-10½"	Pf 1.124
216	10'-2	58.21		25.994		Flow (q) from Route 19	19'-5	Pe
252	10'-2			27.117		2fE(4'-3½), fT(10'-9½)	37'-3	Pv
Route 17								
BL	1.3800	22.01	4.72	120		0.040860	150'-3½"	Pf 6.877
298	10'-2	108.40		19.590		PO(6'-0), Flow (q) from Route 23	18'-0	Pe
276	10'-2			26.467		2E(3'-0), PO(6'-0)	168'-3½"	Pv
Route 18								
BL	1.3800	14.86	3.19	120		0.019748	82'-5	Pf 1.865
244	10'-2			19.893		PO(6'-0)	12'-0	Pe
208	10'-2			21.757		2E(3'-0)	94'-5	Pv
Route 19								
CM	2.4690	39.07	2.62	120		0.006948	13'-6	Pf 0.094
130	10'-2	58.21		20.279		Flow (q) from Route 24		Pe
69	10'-2			20.373			13'-6	Pv
CM	2.4690	24.04	1.61	120		0.002829	6'-7	Pf 0.019
69	10'-2			20.373				Pe
32	10'-2			20.392			6'-7	Pv
CM	2.4690	11.82	0.79	120		0.000761	7'-11½"	Pf 0.006
32	10'-2			20.392				Pe
20	10'-2			20.398			7'-11½"	Pv
BL	1.3800	11.82	2.53	120		0.012929	74'-5	Pf 1.156
20	10'-2			20.398		PO(6'-0)	15'-0	Pe
40	13'-2			20.253		3E(3'-0)	89'-5	Pv
BL	1.3800	24.04	5.16	120		0.048092	4'-6½"	Pf 0.507
40	13'-2	12.22		20.253		Flow (q) from Route 22	6'-0	Pe
51	13'-2			20.760		T(6'-0)	10'-6½"	Pv
BL	1.3800	19.70	4.23	120		0.033289	84'-7	Pf 3.514
51	13'-2			20.760			21'-0	Pe
92	13'-2			24.274		5E(3'-0), PO(6'-0)	105'-7	Pv
CM	2.4690	19.70	1.32	120		0.001959	2'-1½"	Pf 0.004
92	13'-2			24.274				Pe
116	13'-2			24.278			2'-1½"	Pv



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Fittings	Eq. Length	Summary
Upstream						Total Length	
CM	2.4690	39.07	2.62	120	0.006948	11'-10"	Pf 0.082
116	13'-2	19.36		24.278	Flow (q) from Route 21		Pe
167	13'-2			24.360		11'-10"	Pv
CM	2.4690	58.21	3.90	120	0.014533	14'-3½"	Pf 0.332
167	13'-2	19.15		24.360	Flow (q) from Route 20	8'-7"	Pe 1.301
216	10'-2			25.994	2fE(4'-3½")	22'-10½"	Pv
Route 20							
BL	1.3800	19.15	4.11	120	0.031574	143'-5½"	Pf 5.382
130	10'-2	58.21		20.279	PO(6'-0), Flow (q) from Route 24	27'-0"	Pe -1.301
167	13'-2			24.360	5E(3'-0), PO(6'-0)	170'-5½"	Pv
Route 21							
BL	1.3800	15.03	3.22	120	0.020170	66'-5½"	Pf 1.704
69	10'-2			20.373	PO(6'-0)	18'-0"	Pe -1.301
77	13'-2			20.776	2E(3'-0), T(6'-0)	84'-5½"	Pv
BL	1.3800	19.36	4.15	120	0.032235	84'-8"	Pf 3.502
77	13'-2	4.33		20.776	Flow (q) from Route 27	24'-0"	Pe
116	13'-2			24.278	6E(3'-0), PO(6'-0)	108'-8"	Pv
Route 22							
BL	1.3800	12.22	2.62	120	0.013758	66'-5½"	Pf 1.162
32	10'-2			20.392	PO(6'-0)	18'-0"	Pe -1.301
40	13'-2			20.253	2E(3'-0), T(6'-0)	84'-5½"	Pv
Route 23							
CM	2.4690	130.25	8.73	120	0.064481	15'-1½"	Pf 1.529
364	10'-2	24.69		17.781	Flow (q) from Route 1	8'-7"	Pe
316	10'-2			19.310	2fE(4'-3½")	23'-8½"	Pv
CM	2.4690	108.40	7.26	120	0.045903	6'-1"	Pf 0.280
316	10'-2			19.310			Pe
298	10'-2			19.590		6'-1"	Pv
Route 24							
CM	2.4690	58.21	3.90	120	0.014533	8'-1"	Pf 0.118
181	10'-2	13.32		20.161	Flow (q) from Route 16		Pe
130	10'-2			20.279		8'-1"	Pv
Route 25							
BL	1.3800	31.53	6.76	120	0.079468	112'-3"	Pf 10.828
423	10'-2	20.64		15.043	Flow (q) from Route 12	24'-0"	Pe -0.434
407	11'-2			25.438	6E(3'-0), PO(6'-0)	136'-3"	Pv
Route 26							
BL	1.3800	21.86	4.69	120	0.040337	151'-4½"	Pf 6.831
316	10'-2			19.310	PO(6'-0)	18'-0"	Pe
347	10'-2			26.141	2E(3'-0), PO(6'-0)	169'-4½"	Pv
Route 27							
BL	1.3800	4.33	0.93	120	0.002022	2'-0½"	Pf 0.016
51	13'-2			20.760	T(6'-0)	6'-0"	Pe
77	13'-2			20.776		8'-0½"	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	1.51



Hydraulic Analysis

Job Number: 4333CK
Report Description: Light Hazard - AREA 2 -

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 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



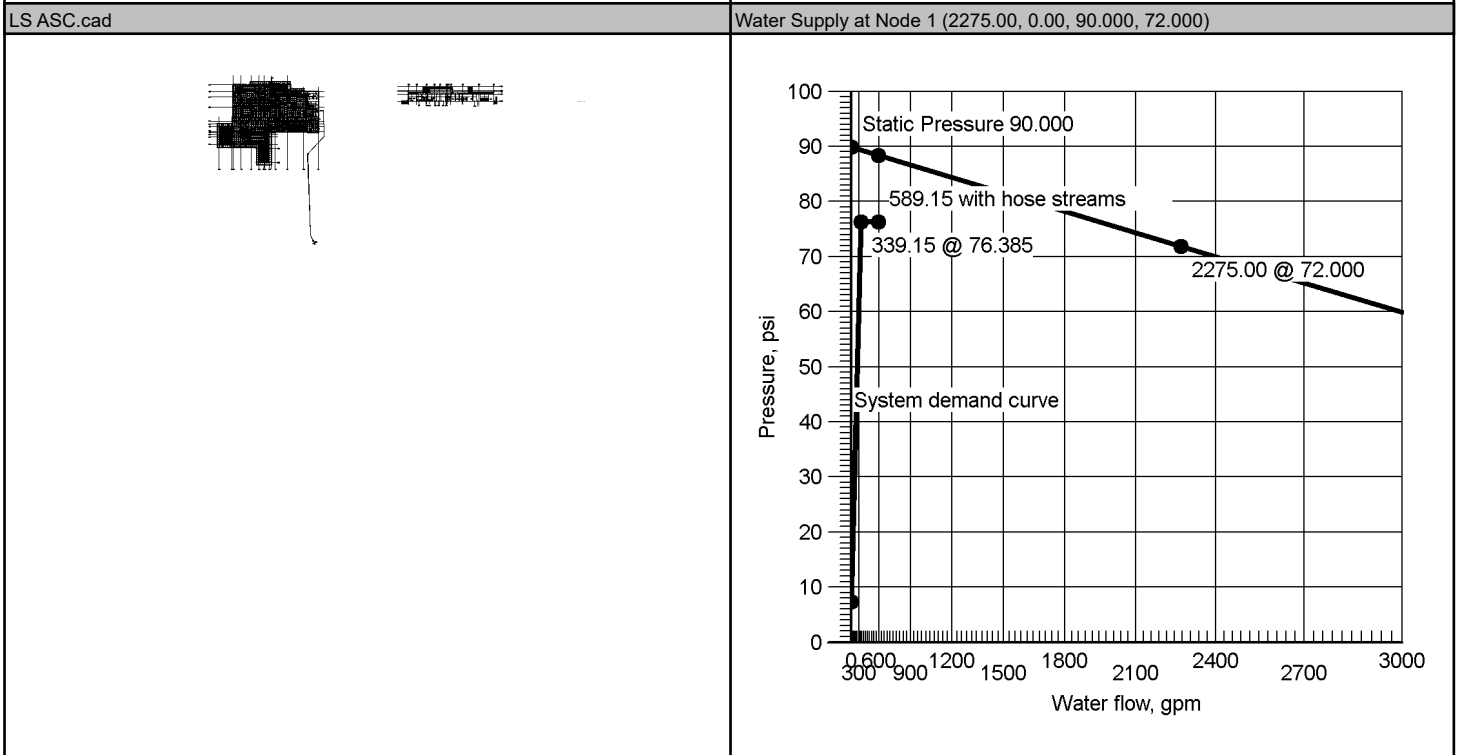
Hydraulic Overview

Job Number: 4333CK
Report Description: Ordinary Group I - AREA 3 -

Job		
Job Number 4333CK	Designer ALEC MOBLEY	
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT	Phone 913-722-6900	FAX
Address 1 1950 SE SHENANDOAH DR	State Certification/License Number	
Address 2 LEE'S SUMMIT, MO 64063	AHJ	
Address 3	Job Site/Building	

System		
Density 0.15 gpm/ft²	Area of Application 1500 ft² (Actual 1077 ft²)	
Most Demanding Sprinkler Data 5.6 K-Factor 18.80 at 11.270	Hose Streams 250.00	
Coverage Per Sprinkler 127 ft²	Number Of Sprinklers Calculated 14	Number Of Nozzles Calculated 0
System Pressure Demand 76.385	System Flow Demand 339.15	
Total Demand 589.15 @ 76.385	Pressure Result +12.137 (13.7%)	

Supplies						Check Point Gauges			
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)	Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)
1	Water Supply	2275.00	250.00	90.000	72.000	BOR (254)	62.976	42.74	339.15





Job Number: 4333CK

Job Number 4333CK	Designer ALEC MOBLEY
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT	State Certification/License Number
Address 1 1950 SE SHENANDOAH DR	AHJ
Address 2 LEE'S SUMMIT, MO 64063	Job Site/Building
Address 3	Drawing Name LS ASC.cad

Remote Area(s)

Most Demanding Sprinkler Data 5.6 K-Factor 18.80 at 11.270		Occupancy Ordinary Group I - AREA 3 -		Job Suffix			
Hose Allowance At Source 250.00		Density 0.15 gpm/ft²		Area of Application 1500 ft² (Actual 1077 ft²)			
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>		Number Of Sprinklers Calculated 14		Number Of Nozzles Calculated 0			
		Coverage Per Sprinkler 127 ft²		AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area			
Total Hose Streams 250.00							
System Flow Demand 339.15						Total Water Required (Including Hose Allowance) 589.15	
Maximum Pressure Unbalance In Loops 0.000							
Maximum Velocity Above Ground 22.21 between nodes 42 and 623							
Maximum Velocity Under Ground 3.51 between nodes 9 and 3							
Volume capacity of Wet Pipes 852.26 gal		Volume capacity of Dry Pipes 292.91 gal					

Supplies

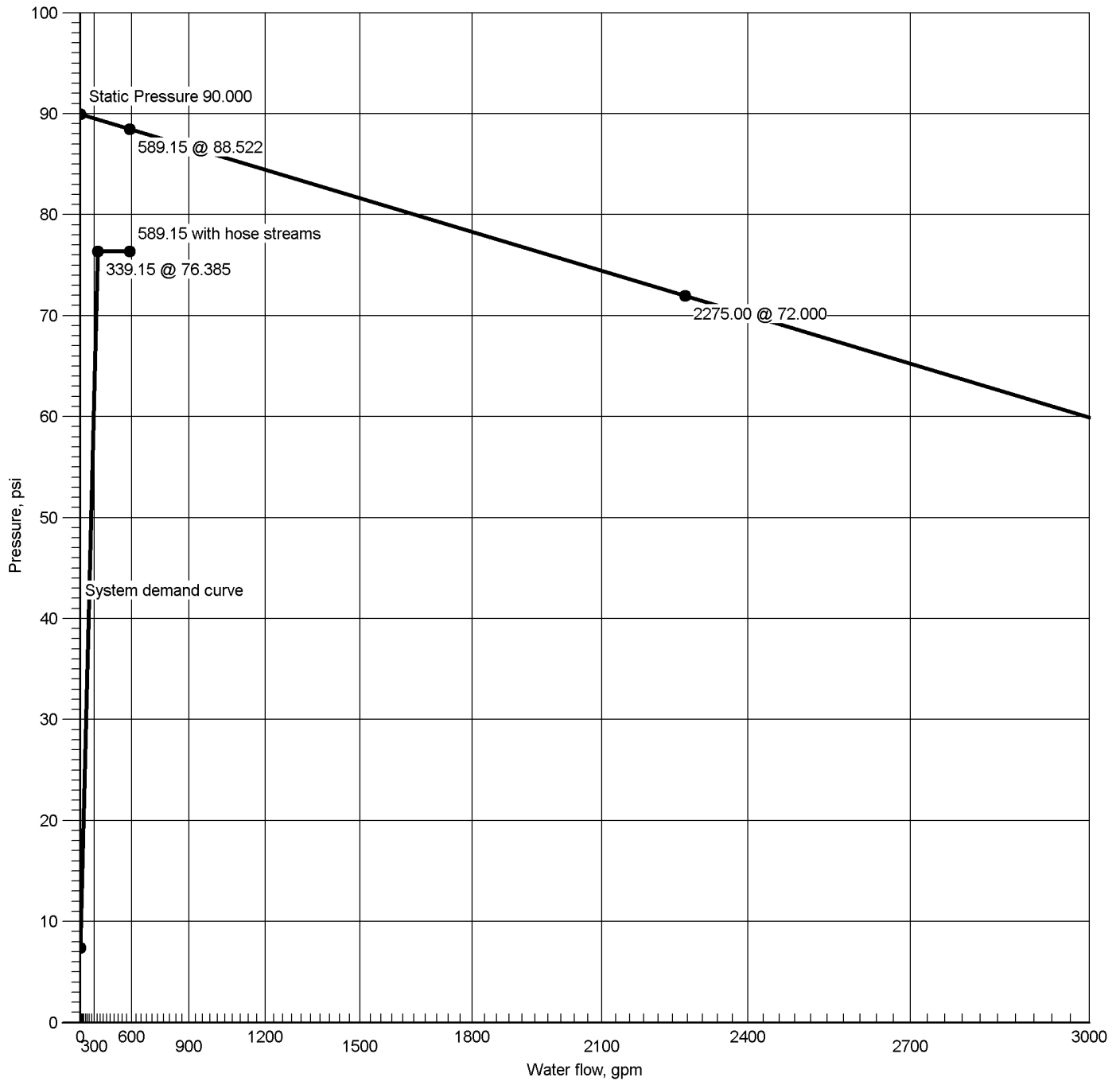
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@ Flow (gpm)	Available (psi)	@ Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	250.00	90.000	72.000	2275.00	88.522	589.15	76.385	12.137

Contractor

	Contractor Number	Contact Name	Contact Title
Name of Contractor:		Phone	Extension
Address 1		FAX	
Address 2		E-mail	
Address 3		Web-Site	



Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
90.000

Residual: Pressure
72.000 @ 2275.00

Available Flow @ 20 PSI:
4034.37

Available Pressure at System Demand
88.522 @ 589.15

Required Pressure at System Demand
76.385 @ 339.15

Required Pressure at System Demand (Including Hose Allowance at Source)
76.385 @ 589.15



Summary Of Outflowing Devices

Job Number: 4333CK

Report Description: Ordinary Group I - AREA 3 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Sprinkler	604	16.91	14.82	5.6	9.117			
Sprinkler	605	18.32	14.82	5.6	10.703			
Sprinkler	607	19.64	14.82	5.6	12.304			
Sprinkler	611	22.37	14.82	5.6	15.957			
Sprinkler	612	23.82	18.80	5.6	18.100			
Sprinkler	615	21.32	18.80	5.6	14.491			
Sprinkler	616	20.09	18.80	5.6	12.873			
➡ Sprinkler	617	18.80	18.80	5.6	11.270			
Sprinkler	621	28.20	18.80	5.6	25.355			
Sprinkler	622	28.91	18.80	5.6	26.656			
Sprinkler	623	31.15	14.82	5.6	30.950			
Sprinkler	624	28.68	14.82	5.6	26.221			
Sprinkler	625	29.81	18.80	5.6	28.343			
Sprinkler	626	31.12	18.80	5.6	30.883			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4333CK

Report Description: Ordinary Group I - AREA 3 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-4'-0	S	76.385	339.15
604	13'-2	Spr(-9.117)	9.117	16.91
605	13'-1½	Spr(-10.703)	10.703	18.32
607	13'-1½	Spr(-12.304)	12.304	19.64
611	13'-1	Spr(-15.957)	15.957	22.37
612	13'-0½	Spr(-18.100)	18.100	23.82
615	13'-1	Spr(-14.491)	14.491	21.32
616	13'-1½	Spr(-12.873)	12.873	20.09
617	13'-2	Spr(-11.270)	11.270	18.80
621	12'-11½	Spr(-25.355)	25.355	28.20
622	12'-11	Spr(-26.656)	26.656	28.91
623	12'-9½	Spr(-30.950)	30.950	31.15
624	12'-10½	Spr(-26.221)	26.221	28.68
625	12'-10½	Spr(-28.343)	28.343	29.81
626	12'-10	Spr(-30.883)	30.883	31.12
3	-4'-0	LtE(11'-11½)	65.205	
9	-4'-0	T(47'-3½)	76.384	
11	13'-0½	PO(5'-8½)	20.210	
12	13'-0½	PO(5'-8½)	20.286	
42	12'-9½	T(3'-7)	37.156	
43	12'-11½	fE(2'-6)	25.248	
80	11'-0	cpIlg(3'-7½), fE(4'-2½)	42.843	
250	10'-10½	fT(15'-0½)	55.945	
254	1'-0	BOR	62.976	
341	2'-8	PO(18'-9½)	61.948	
348	1'-6½	sCV(40'-3)	62.746	



Hydraulic Analysis

Job Number: 4333CK
Report Description: Ordinary Group I - AREA 3 -

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	1.0490	18.80	6.98	100		0.162607	9'-9"	Pf 1.585
617	13'-2	18.80	5.6	11.270		Sprinkler		Pe 0.018
616	13'-1½			12.873			9'-9"	Pv
BL	1.3800	38.89	8.34	100		0.164122	9'-9"	Pf 1.600
616	13'-1½	20.09	5.6	12.873		Sprinkler		Pe 0.018
615	13'-1			14.491			9'-9"	Pv
BL	1.3800	60.21	12.92	100		0.368388	9'-9"	Pf 3.592
615	13'-1	21.32	5.6	14.491		Sprinkler		Pe 0.018
612	13'-0½			18.100			9'-9"	Pv
BL	1.6100	84.03	13.24	100		0.322211	1'-1"	Pf 2.183
612	13'-0½	23.82	5.6	18.100		Sprinkler,	5'-8½"	Pe 0.002
12	13'-0½			20.286		PO(5'-8½")	6'-9½"	Pv
BL	2.0670	161.28	15.42	100		0.318742	13'-0"	Pf 4.939
12	13'-0½	77.24		20.286		Flow (q) from Route 2	2'-6"	Pe 0.023
43	12'-11½			25.248		fE(2'-6")	15'-6"	Pv
CM	2.6350	161.28	9.49	100		0.097712	1'-1"	Pf 0.105
43	12'-11½			25.248				Pe 0.002
621	12'-11½			25.355			1'-1"	Pv
CM	2.6350	189.48	11.15	100		0.131646	9'-9"	Pf 1.284
621	12'-11½	28.20	5.6	25.355		Sprinkler		Pe 0.018
622	12'-11			26.656			9'-9"	Pv
CM	2.6350	218.39	12.85	100		0.171202	9'-9"	Pf 1.669
622	12'-11	28.91	5.6	26.656		Sprinkler		Pe 0.018
625	12'-10½			28.343			9'-9"	Pv
CM	2.6350	248.20	14.60	100		0.216932	9'-9"	Pf 2.522
625	12'-10½	29.81	5.6	28.343		Sprinkler,	1'-10½"	Pe 0.018
626	12'-10			30.883		cplg(1'-10½")	11'-7½"	Pv
CM	2.6350	279.32	16.43	100		0.269917	11'-5"	Pf 6.253
626	12'-10	31.12	5.6	30.883		Sprinkler,	11'-9"	Pe 0.021
42	12'-9½			37.156		T(11'-9")	23'-2"	Pv
CM	2.6350	339.15	19.95	100		0.386514	4'-3½"	Pf 4.910
42	12'-9½	59.83		37.156		Flow (q) from Route 3	8'-5"	Pe 0.777
80	11'-0			42.843		2fE(4'-2½")	12'-8½"	Pv
CM	3.2600	339.15	13.04	100		0.137087	66'-7"	Pf 13.042
80	11'-0			42.843		cplg(3'-7½")	28'-6½"	Pe 0.060
250	10'-10½			55.945		2fE(4'-9½"), fT(15'-0½")	95'-1½"	Pv
CM	4.2600	339.15	7.63	100		0.037251	27'-10½"	Pf 2.451
250	10'-10½			55.945			37'-11"	Pe 3.552
341	2'-8			61.948		3fE(6'-4½"), PO(18'-9½")	65'-9½"	Pv
CM	6.3570	339.15	3.43	120		0.003785	2'-0"	Pf 0.303
341	2'-8			61.948			77'-11½"	Pe 0.495
348	1'-6½			62.746		PO(37'-8½"), sCV(40'-3")	79'-11½"	Pv
DY	6.0650	339.15	3.77	140		0.003578	0'-0"	Pf 0.000
348	1'-6½			62.746				Pe 0.230
254	1'-0			62.976		BOR	0'-0"	Pv
FR	6.0650	339.15	3.77	140		0.003578	5'-0"	Pf 0.061
254	1'-0			62.976			11'-11½"	Pe 2.168
3	-4'-0			65.205		LtE(11'-11½")	16'-11½"	Pv
UG	6.2800	339.15	3.51	140		0.003020	302'-11½"	Pf 11.180
3	-4'-0			65.205			99'-3½"	Pe
9	-4'-0			76.384		LtE(14'-2"), 2EE(11'-0½"), Ee2(11'-0½"), BFP(-9.965), GV(4'-8½"), T(47'-3½")	402'-3"	Pv
UG	12.4600	339.15	0.89	140		0.000107	4'-0"	Pf 0.000
9	-4'-0			76.384				Pe
1	-4'-0			76.385		Water Supply	4'-0"	Pv
		250.00				Hose Allowance At Source		
1		589.15						
Route 2								
BL	1.0490	16.91	6.28	100		0.133655	11'-8½"	Pf 1.565
604	13'-2	16.91	5.6	9.117		Sprinkler		Pe 0.021
605	13'-1½			10.703			11'-8½"	Pv
BL	1.3800	35.23	7.56	100		0.136683	11'-8½"	Pf 1.600
605	13'-1½	18.32	5.6	10.703		Sprinkler		Pe
607	13'-1½			12.304			11'-8½"	Pv



Hydraulic Analysis

Job Number: 4333CK
Report Description: Ordinary Group I - AREA 3 -

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream					Fittings	Total Length	
BL	1.3800	54.87	11.77	100	0.310268	11'-8½"	Pf 3.633
607	13'-1½"	19.64	5.6	12.304	Sprinkler		Pe 0.021
611	13'-1"			15.957		11'-8½"	Pv
BL	1.6100	77.24	12.17	100	0.275698	9'-8"	Pf 4.234
611	13'-1"	22.37	5.6	15.957	Sprinkler,	5'-8½"	Pe 0.018
11	13'-0½"			20.210	PO(5'-8½")	15'-4½"	Pv
BL	2.0670	77.24	7.39	100	0.081652	0'-11"	Pf 0.075
11	13'-0½"			20.210			Pe 0.001
12	13'-0½"			20.286		0'-11"	Pv
Route 3							
BL	1.0490	28.68	10.65	100	0.355108	13'-3"	Pf 4.705
624	12'-10½"	28.68	5.6	26.221	Sprinkler		Pe 0.024
623	12'-9½"			30.950		13'-3"	Pv
BL	1.0490	59.83	22.21	100	1.384402	0'-11"	Pf 6.204
623	12'-9½"	31.15	5.6	30.950	Sprinkler,	3'-7"	Pe 0.002
42	12'-9½"			37.156	T(3'-7")	4'-6"	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

Job Number: 4333CK
Report Description: Ordinary Group I - AREA 3 -

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	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	BaV 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	DeV 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	



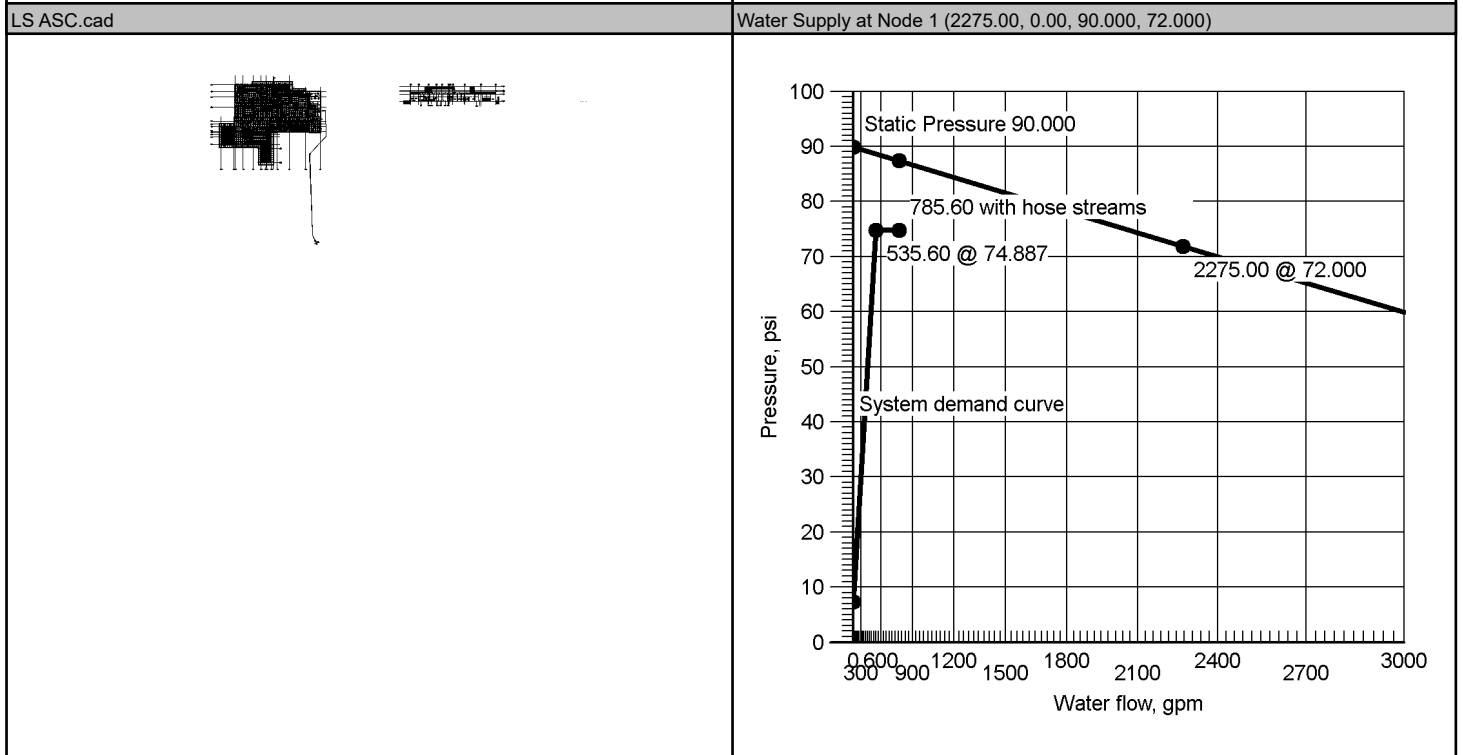
Hydraulic Overview

Job Number: 4333CK
Report Description: Ordinary Group I - AREA 4 -

Job		
Job Number 4333CK	Designer ALEC MOBLEY	
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT	Phone 913-722-6900	FAX
Address 1 1950 SE SHENANDOAH DR	State Certification/License Number	
Address 2 LEE'S SUMMIT, MO 64063	AHJ	
Address 3	Job Site/Building	

System	
Density 0.15 gpm/ft²	Area of Application 1500 ft² (Actual 1986 ft²)
Most Demanding Sprinkler Data 11.2 K-Factor 48.95 at 19.100	Hose Streams 250.00
Coverage Per Sprinkler 225 ft²	Number Of Sprinklers Calculated 10
	Number Of Nozzles Calculated 0
System Pressure Demand 74.887	System Flow Demand 535.60
Total Demand 785.60 @ 74.887	Pressure Result +12.596 (14.4%)

Supplies						Check Point Gauges			
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)	Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)
1	Water Supply	2275.00	250.00	90.000	72.000	BOR (254)	61.019	68.57	535.60





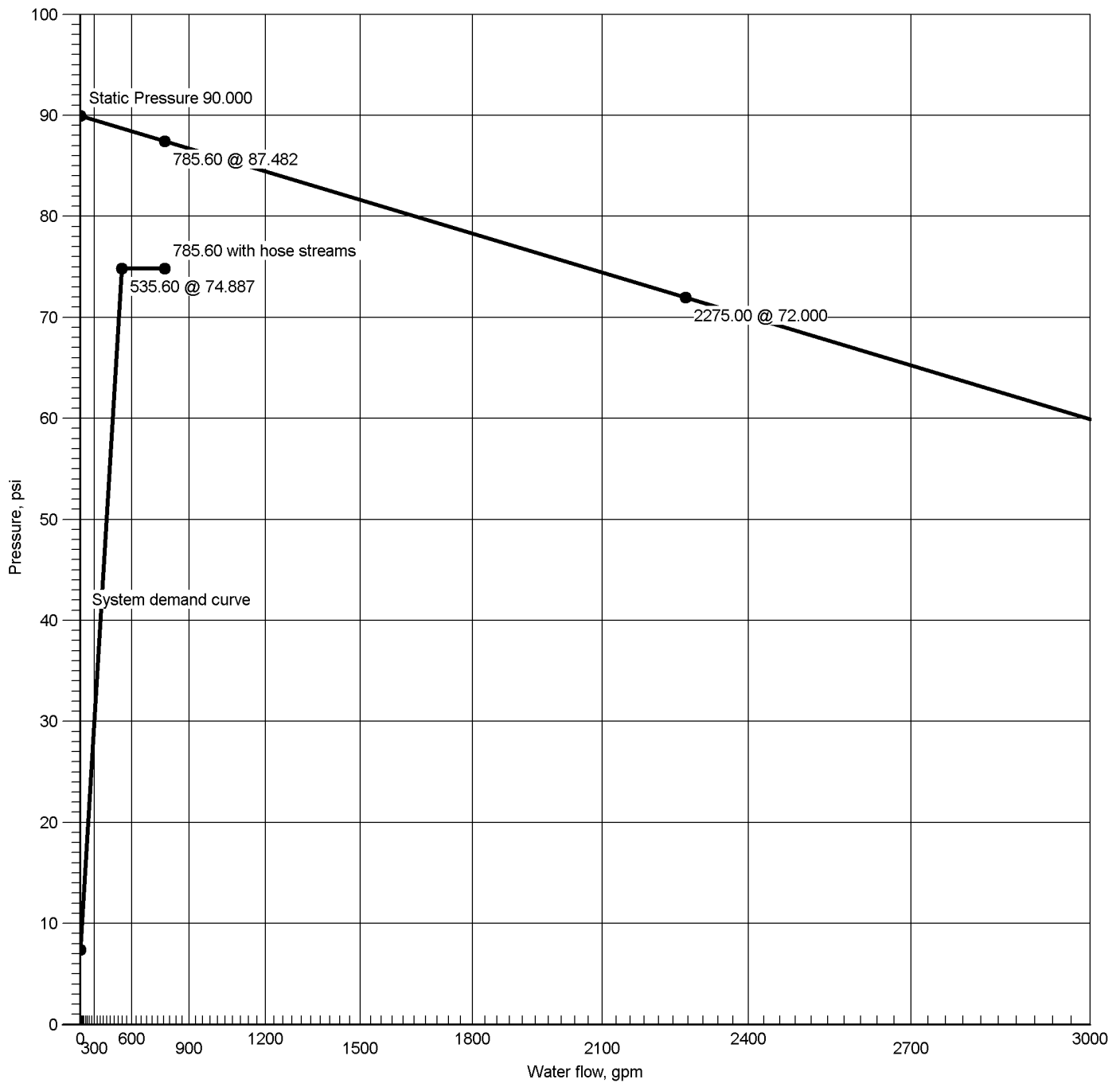
Hydraulic Summary

Job Number: 4333CK
Report Description: Ordinary Group I - AREA 4 -

Job											
Job Number 4333CK					Designer ALEC MOBLEY						
Job Name: HCA - SURGERY CENTER OF LEE'S SUMMIT					State Certification/License Number						
Address 1 1950 SE SHENANDOAH DR					AHJ						
Address 2 LEE'S SUMMIT, MO 64063					Job Site/Building						
Address 3					Drawing Name LS ASC.cad						
System					Remote Area(s)						
Most Demanding Sprinkler Data 11.2 K-Factor 48.95 at 19.100					Occupancy Ordinary Group I - AREA 4 -			Job Suffix			
Hose Allowance At Source 250.00					Density 0.15 gpm/ft²			Area of Application 1500 ft² (Actual 1986 ft²)			
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>					Number Of Sprinklers Calculated 10		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 535.60			Total Water Required (Including Hose Allowance) 785.60								
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 14.51 between nodes 570 and 806											
Maximum Velocity Under Ground 5.55 between nodes 9 and 3											
Volume capacity of Wet Pipes 852.26 gal			Volume capacity of Dry Pipes 292.91 gal								
Supplies											
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	250.00	90.000	72.000		2275.00	87.482		785.60	74.887	12.596
Contractor											
Contractor Number		Contact Name			Contact Title						
Name of Contractor:		Phone			Extension						
Address 1		FAX									
Address 2		E-mail									
Address 3		Web-Site									



Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
90.000

Residual: Pressure
72.000 @ 2275.00

Available Flow @ 20 PSI:
4034.37

Available Pressure at System Demand
87.482 @ 785.60

Required Pressure at System Demand
74.887 @ 535.60

Required Pressure at System Demand (Including Hose Allowance at Source)
74.887 @ 785.60



Summary Of Outflowing Devices

Job Number: 4333CK

Report Description: Ordinary Group I - AREA 4 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Sprinkler	759	49.07	48.95	11.2	19.199			
➡ Sprinkler	763	48.95	48.95	11.2	19.100			
Sprinkler	798	49.88	48.95	11.2	19.832			
Sprinkler	799	49.74	48.95	11.2	19.724			
Sprinkler	806	52.76	48.95	11.2	22.194			
Sprinkler	807	52.61	48.95	11.2	22.068			
Sprinkler	809	56.78	48.95	11.2	25.705			
Sprinkler	810	57.61	48.95	11.2	26.454			
Sprinkler	811	58.66	48.95	11.2	27.435			
Sprinkler	812	59.53	48.95	11.2	28.252			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4333CK

Report Description: Ordinary Group I - AREA 4 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-4'-0	S	74.887	535.60
759	13'-2	Spr(-19.199)	19.199	49.07
763	13'-2	Spr(-19.100)	19.100	48.95
798	13'-1	Spr(-19.832)	19.832	49.88
799	13'-1	Spr(-19.724)	19.724	49.74
806	13'-0	Spr(-22.194)	22.194	52.76
807	13'-0½	Spr(-22.068)	22.068	52.61
809	12'-11½	Spr(-25.705)	25.705	56.78
810	12'-11	Spr(-26.454)	26.454	57.61
811	12'-10½	Spr(-27.435)	27.435	58.66
812	12'-10½	Spr(-28.252)	28.252	59.53
3	-4'-0	LtE(11'-11½)	63.328	
9	-4'-0	T(47'-3½)	74.886	
254	1'-0	BOR	61.019	
341	2'-8	PO(18'-9½)	59.589	
348	1'-6½	sCV(40'-3)	60.788	
569	12'-10	PO(7'-1½)	28.803	
570	13'-0	PO(7'-1½)	24.766	
572	13'-0	PO(7'-1½)	24.626	



Hydraulic Analysis

Job Number: 4333CK
Report Description: Ordinary Group I - AREA 4 -

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	48.95	4.68	100		0.035111	16'-11"	Pf 0.594
763	13'-2	48.95	11.2	19.100		Sprinkler		Pe 0.031
799	13'-1			19.724			16'-11"	Pv
BL	2.0670	98.69	9.44	100		0.128479	18'-0"	Pf 2.311
799	13'-1	49.74	11.2	19.724		Sprinkler		Pe 0.032
807	13'-0½			22.068			18'-0"	Pv
BL	2.0670	151.30	14.47	100		0.283235	1'-10½"	Pf 2.555
807	13'-0½	52.61	11.2	22.068		Sprinkler,	7'-1½"	Pe 0.003
572	13'-0			24.626		PO(7'-1½")	9'-0½"	Pv
CM	4.2600	151.30	3.41	100		0.008368	15'-0"	Pf 0.126
572	13'-0			24.626				Pe 0.014
570	13'-0			24.766			15'-0"	Pv
CM	4.2600	303.02	6.82	100		0.030243	17'-10½"	Pf 0.927
570	13'-0	151.72		24.766		Flow (q) from Route 2	12'-9"	Pe 0.012
809	12'-11½			25.705		2fE(6'-4½")	30'-8"	Pv
CM	4.2600	359.80	8.10	100		0.041556	17'-7½"	Pf 0.733
809	12'-11½	56.78	11.2	25.705		Sprinkler		Pe 0.016
810	12'-11			26.454			17'-7½"	Pv
CM	4.2600	417.41	9.40	100		0.054695	17'-7½"	Pf 0.965
810	12'-11	57.61	11.2	26.454		Sprinkler		Pe 0.016
811	12'-10½			27.435			17'-7½"	Pv
CM	4.2600	476.07	10.72	100		0.069760	19'-4½"	Pf 1.350
811	12'-10½	58.66	11.2	27.435		Sprinkler		Pe 0.017
569	12'-10			28.803			19'-4½"	Pv
CM	4.2600	535.60	12.06	100		0.086750	206'-5"	Pf 26.376
569	12'-10	59.53		28.803		Flow (q) from Route 3	97'-7½"	Pe 4.410
341	2'-8			59.589		10fE(6'-4½"), fT(15'-0½"), PO(18'-9½")	304'-0½"	Pv
CM	6.3570	535.60	5.41	120		0.008814	2'-0"	Pf 0.705
341	2'-8			59.589			77'-11½"	Pe 0.495
348	1'-6½			60.788		PO(37'-8½"), sCV(40'-3")	79'-11½"	Pv
DY	6.0650	535.60	5.95	140		0.008332	0'-0"	Pf 0.000
348	1'-6½			60.788				Pe 0.230
254	1'-0			61.019		BOR	0'-0"	Pv
FR	6.0650	535.60	5.95	140		0.008332	5'-0"	Pf 0.141
254	1'-0			61.019			11'-11½"	Pe 2.168
3	-4'-0			63.328		LtE(11'-11½")	16'-11½"	Pv
UG	6.2800	535.60	5.55	140		0.007032	302'-11½"	Pf 11.558
3	-4'-0			63.328			99'-3½"	Pe
9	-4'-0			74.886		LtE(14'-2"), 2EE(11'-0½"), Ee2(11'-0½"), BFP(-8.730), GV(4'-8½"), T(47'-3½")	402'-3"	Pv
UG	12.4600	535.60	1.41	140		0.000250	4'-0"	Pf 0.001
9	-4'-0			74.886				Pe
1	-4'-0			74.887		Water Supply	4'-0"	Pv
		250.00				Hose Allowance At Source		
1		785.60						
Route 2								
BL	2.0670	49.07	4.69	100		0.035278	16'-11"	Pf 0.597
759	13'-2	49.07	11.2	19.199		Sprinkler		Pe 0.037
798	13'-1			19.832			16'-11"	Pv
BL	2.0670	98.95	9.46	100		0.129111	18'-0"	Pf 2.322
798	13'-1	49.88	11.2	19.832		Sprinkler		Pe 0.039
806	13'-0			22.194			18'-0"	Pv
BL	2.0670	151.72	14.51	100		0.284665	1'-10½"	Pf 2.568
806	13'-0	52.76	11.2	22.194		Sprinkler,	7'-1½"	Pe 0.004
570	13'-0			24.766		PO(7'-1½")	9'-0½"	Pv
Route 3								
BL	2.0670	59.53	5.69	100		0.050431	3'-8"	Pf 0.544
812	12'-10½	59.53	11.2	28.252		Sprinkler,	7'-1½"	Pe 0.007
569	12'-10			28.803		PO(7'-1½")	10'-9½"	Pv



Hydraulic Analysis

Job Number: 4333CK

Report Description: Ordinary Group I - AREA 4 -

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

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
							1.51

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	BaV 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	DeV 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	