



AMERICAN

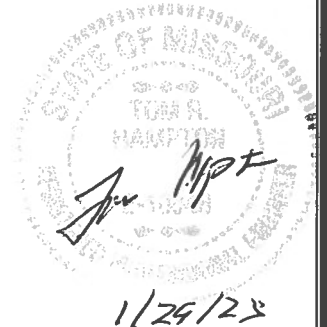
FIRE SPRINKLER

MCC AUTOMOTIVE INSTITUTE

500 SW LONGVIEW RD.
LEE'S SUMMIT, MO 64081

HYDRAULIC CALCULATIONS INDEX

LEVEL 1 AREA 1 REV2
LEVEL 1 AREA 2 REV2
LEVEL 1 AREA 3 REV2
LEVEL 1 AREA 4 REV2
LEVEL 1 AREA 5 REV2
LEVEL 2 AREA 6 REV2
LEVEL 2 AREA 7 REV2
LEVEL 2 AREA 8 REV2
LEVEL 2 AREA 9 REV2



1/29/28



Hydraulic Overview

Job Number: 4352CK - COLLISION CENTER
Report Description: Ordinary Group II - AREA 1 -

Job									
Job Number 4352CK			Designer						
Job Name: MCC AUTO SHOP			Phone		FAX				
Address 1 500 SW LONGVIEW RD			State Certification/License Number						
Address 2 LEE'S SUMMIT, MO 64081			AHJ						
Address 3			Job Site/Building						
System									
Density 0.20gpm/ft ²			Area of Application 1500ft ² (Actual 1546ft ²)						
Most Demanding Sprinkler Data 5.6 K-Factor 24.00 at 18.367			Hose Streams 250.00						
Coverage Per Sprinkler 120ft ²			Number Of Sprinklers Calculated 14		Number Of Nozzles Calculated 0				
System Pressure Demand 68.426			System Flow Demand 346.55						
Total Demand 596.55 @ 68.426			Pressure Result +22.577 (24.8%)						
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	1682.00	250.00	96.000	62.000	BOR (4)	60.107	44.7	346.55
						BOR 2 (5)	69.208	0	0.00
4352CK MCC AUTO SHOP.cad						Supply at Node 1 (1682.00, 250.00, 96.000, 62.000)			

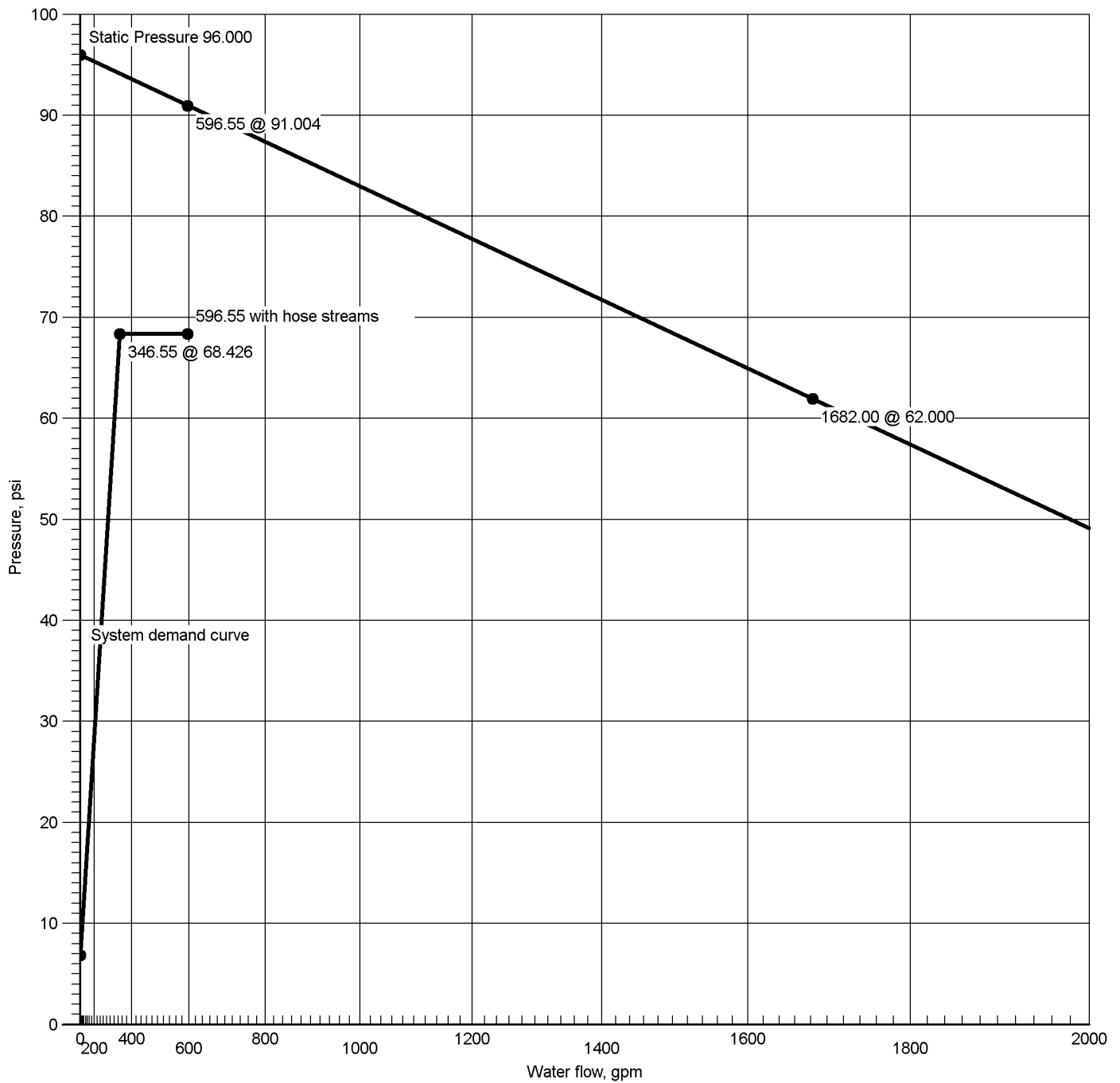


Report Description: Ordinary Group II - AREA 1 -

Page 2



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
91.004 @ 596.55

Required Pressure at System Demand
68.426 @ 346.55

Required Pressure at System Demand (Including Hose Allowance at Source)
68.426 @ 596.55



Summary Of Outflowing Devices

Job Number: 4352CK - COLLISION CENTER
Report Description: Ordinary Group II - AREA 1 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	100	24.00	24.00	5.6	18.367			
Sprinkler	101	24.00	24.00	5.6	18.371			
Sprinkler	102	24.15	24.00	5.6	18.590			
Sprinkler	103	24.61	24.00	5.6	19.312			
Sprinkler	104	25.54	24.00	5.6	20.808			
Sprinkler	105	24.09	24.00	5.6	18.510			
Sprinkler	106	24.48	24.00	5.6	19.112			
Sprinkler	107	24.69	24.00	5.6	19.443			
Sprinkler	108	24.81	24.00	5.6	19.635			
Sprinkler	109	25.25	24.00	5.6	20.325			
Sprinkler	110	26.15	24.00	5.6	21.798			
Sprinkler	111	24.69	24.00	5.6	19.444			
Sprinkler	112	24.81	24.00	5.6	19.630			
Sprinkler	113	25.27	24.00	5.6	20.362			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK - COLLISION CENTER
Report Description: Ordinary Group II - AREA 1 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	68.426	346.55
100	18'-10½	Spr(-18.367)	18.367	24.00
101	18'-10½	Spr(-18.371)	18.371	24.00
102	18'-10½	Spr(-18.590)	18.590	24.15
103	18'-10½	Spr(-19.312)	19.312	24.61
104	18'-10½	Spr(-20.808)	20.808	25.54
105	18'-10½	Spr(-18.510)	18.510	24.09
106	18'-10½	Spr(-19.112)	19.112	24.48
107	17'-7½	Spr(-19.443)	19.443	24.69
108	17'-7½	Spr(-19.635)	19.635	24.81
109	17'-7½	Spr(-20.325)	20.325	25.25
110	17'-7½	Spr(-21.798)	21.798	26.15
111	17'-7½	Spr(-19.444)	19.444	24.69
112	17'-7½	Spr(-19.630)	19.630	24.81
113	17'-7½	Spr(-20.362)	20.362	25.27
2	-6'-0	E(22'-1)	72.300	
3	-6'-0		67.898	
4	1'-4	BOR	60.107	
5	0'-0	BOR 2	69.208	
1000	14'-2	PO(8'-0)	47.946	
1001	14'-2	PO(8'-0)	47.988	
1002	18'-10½	PO(8'-0)	19.371	
1003	17'-7½	PO(8'-0)	20.637	
1004	16'-4½	PO(10'-0)	25.811	
1005	14'-2	PO(8'-0)	48.078	
1006	14'-2	PO(8'-0)	48.057	
1007	15'-1½	PO(10'-0)	28.084	
50072	14'-2	ft(21'-1)	48.250	



Hydraulic Analysis

Job Number: 4352CK - COLLISION CENTER
Report Description: Ordinary Group II - 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 1								
BL	1.6100	2.81	0.44	120		0.000429	7'-11"	Pf 0.003
100	18'-10½"	24.00	5.6	18.367		Sprinkler		Pe -0.000
101	18'-10½"			18.371			7'-11"	Pv
BL	1.6100	26.82	4.23	120		0.027792	7'-11"	Pf 0.220
101	18'-10½"	24.00	5.6	18.371		Sprinkler		Pe -0.000
102	18'-10½"			18.590			7'-11"	Pv
BL	1.6100	50.96	8.03	120		0.091158	7'-11"	Pf 0.722
102	18'-10½"	24.15	5.6	18.590		Sprinkler		Pe -0.000
103	18'-10½"			19.312			7'-11"	Pv
BL	1.6100	75.57	11.91	120		0.188955	7'-11"	Pf 1.496
103	18'-10½"	24.61	5.6	19.312		Sprinkler		Pe -0.000
104	18'-10½"			20.808			7'-11"	Pv
BL	1.6100	101.11	15.94	120		0.323831	61'-6"	Pf 25.098
104	18'-10½"	25.54	5.6	20.808		Sprinkler,	16'-0"	Pe 2.040
1000	14'-2"			47.946		T(8'-0"), PO(8'-0")	77'-6"	Pv
CM	4.2600	101.11	2.28	120		0.002834	14'-11½"	Pf 0.042
1000	14'-2"			47.946				Pe 0.000
1001	14'-2"			47.988			14'-11½"	Pv
CM	4.2600	202.23	4.55	120		0.010215	4'-7"	Pf 0.262
1001	14'-2"	101.11		47.988		Flow (q) from Route 4	21'-1"	Pe 0.000
50072	14'-2"			48.250		ft(21'-1")	25'-8"	Pv
CM	4.2600	346.55	7.80	120		0.027669	18'-5"	Pf 6.291
50072	14'-2"	144.32		48.250		Flow (q) from Route 2	84'-9½"	Pe 5.566
4	1'-4"			60.107		fE(8'-11½"), CV(23'-2"), 2PO(26'-4") , BFP(-3.435), BOR	103'-2½"	Pv
UG	4.2200	346.55	7.95	140		0.021782	164'-9"	Pf 4.609
4	1'-4"			60.107			46'-10"	Pe 3.182
3	-6'-0"			67.898		2E(16'-8½"), 2EE(6'-8½")	211'-7"	Pv
UG	6.2800	346.55	3.59	140		0.003143	1148'-8"	Pf 4.402
3	-6'-0"			67.898			252'-1½"	Pe
2	-6'-0"			72.300		4GV(4'-8½"), 2E(22'-1"), 3EE(11'-0") ½), LtE(14'-2"), 3T(47'-3½")	1400'-9½"	Pv
UG	6.2800	346.55	3.59	140		0.003143	9'-0"	Pf 0.028
2	-6'-0"			72.300				Pe -3.902
1	3'-0"			68.426		S	9'-0"	Pv
		250.00				Hose Allowance At Source		
1		596.55						
Route 2								
BL	1.6100	21.19	3.34	120		0.017974	7'-11"	Pf 0.142
100	18'-10½"	24.00	5.6	18.367		Sprinkler		Pe 0.000
105	18'-10½"			18.510			7'-11"	Pv
BL	1.6100	45.28	7.14	120		0.073254	3'-9"	Pf 0.861
105	18'-10½"	24.09	5.6	18.510		Sprinkler,	8'-0"	Pe 0.000
1002	18'-10½"			19.371		PO(8'-0")	11'-9"	Pv
BL	2.0670	69.76	6.67	120		0.048265	15'-0"	Pf 0.725
1002	18'-10½"	24.48		19.371		Flow (q) from Route 3		Pe 0.542
1003	17'-7½"			20.637			15'-0"	Pv
BL	2.0670	144.32	13.80	120		0.185234	15'-0"	Pf 4.633
1003	17'-7½"	49.29 + 25.27		20.637		Flow (q) from Route 6 and 7	10'-0"	Pe 0.541
1004	16'-4½"			25.811		PO(10'-0")	25'-0"	Pv
BL	1.6100	73.63	11.60	120		0.180077	102'-4"	Pf 21.311
1004	16'-4½"			25.811			16'-0"	Pe 0.957
1005	14'-2"			48.078		T(8'-0"), PO(8'-0")	118'-4"	Pv
CM	4.2600	144.32	3.25	120		0.005473	10'-4½"	Pf 0.172
1005	14'-2"	70.69		48.078		Flow (q) from Route 8	21'-1"	Pe
50072	14'-2"			48.250		ft(21'-1")	31'-5½"	Pv
Route 3								
BL	1.6100	24.48	3.86	120		0.023484	3'-0½"	Pf 0.259
106	18'-10½"	24.48	5.6	19.112		Sprinkler,	8'-0"	Pe -0.000
1002	18'-10½"			19.371		PO(8'-0")	11'-0½"	Pv
Route 4								
BL	1.6100	24.90	3.92	120		0.024240	7'-11"	Pf 0.192
107	17'-7½"	24.69	5.6	19.443		Sprinkler		Pe -0.000
108	17'-7½"			19.635			7'-11"	Pv



Hydraulic Analysis

Job Number: 4352CK - COLLISION CENTER
Report Description: Ordinary Group II - AREA 1 -

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	1.6100	49.72	7.84	120	0.087092	7'-11	Pf 0.689
108	17'-7½	24.81	5.6	19.635	Sprinkler		Pe -0.000
109	17'-7½			20.325		7'-11	Pv
BL	1.6100	74.97	11.81	120	0.186167	7'-11	Pf 1.474
109	17'-7½	25.25	5.6	20.325	Sprinkler		Pe -0.000
110	17'-7½			21.798		7'-11	Pv
BL	1.6100	101.11	15.93	120	0.323808	60'-3	Pf 24.692
110	17'-7½	26.15	5.6	21.798	Sprinkler,	16'-0	Pe 1.498
1001	14'-2			47.988	T(8'-0), PO(8'-0)	76'-3	Pv
Route 5							
BL	1.6100	0.21	0.03	120	0.000004	7'-11	Pf 0.000
111	17'-7½	24.69	5.6	19.444	Sprinkler		Pe -0.000
107	17'-7½			19.443		7'-11	Pv
Route 6							
BL	1.6100	24.48	3.86	120	0.023483	7'-11	Pf 0.186
111	17'-7½	24.69	5.6	19.444	Sprinkler		Pe 0.000
112	17'-7½			19.630		7'-11	Pv
BL	1.6100	49.29	7.77	120	0.085715	3'-9	Pf 1.008
112	17'-7½	24.81	5.6	19.630	Sprinkler,	8'-0	Pe 0.000
1003	17'-7½			20.637	PO(8'-0)	11'-9	Pv
Route 7							
BL	1.6100	25.27	3.98	120	0.024902	3'-0½	Pf 0.275
113	17'-7½	25.27	5.6	20.362	Sprinkler,	8'-0	Pe 0.000
1003	17'-7½			20.637	PO(8'-0)	11'-0½	Pv
Route 8							
CM	4.2600	70.69	1.59	120	0.001461	14'-11½	Pf 0.022
1006	14'-2	70.69		48.057	Flow (q) from Route 9		Pe
1005	14'-2			48.078		14'-11½	Pv
Route 9							
BL	2.0670	70.69	6.76	120	0.049466	15'-0	Pf 1.732
1004	16'-4½			25.811	PO(10'-0)	20'-0	Pe 0.542
1007	15'-1½			28.084	PO(10'-0)	35'-0	Pv
BL	1.6100	70.69	11.14	120	0.167021	101'-1	Pf 19.557
1007	15'-1½			28.084		16'-0	Pe 0.415
1006	14'-2			48.057	T(8'-0), PO(8'-0)	117'-1	Pv

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

C Value Multiplier

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

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



Hydraulic Analysis

Job Number: 4352CK - COLLISION CENTER
Report Description: Ordinary Group II - 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	BaIV	Ball Valve
DR	Drop	Velocity	fps	BFP	Backflow Preventer
DY	Dynamic	Pressure	psi	BV	Butterfly Valve
FM	Feed Main	Length	Foot	C	Cross Flow Turn 90°
FR	Feed Riser	Friction Loss	psi/Foot	cplg	Coupling
MS	Miscellaneous	HWC	Hazen-Williams Constant	Cr	Cross Run
OR	Outrigger	Pt	Total pressure at a point in a pipe	CV	Check Valve
RN	Riser Nipple	Pn	Normal pressure at a point in a pipe	DeIV	Deluge Valve
SN	Swing Nipple	Pf	Pressure loss due to friction between points	DPV	Dry Pipe Valve
SP	Sprig	Pe	Pressure due to elevation difference between indicated points	E	90° Elbow
ST	Stand Pipe	Pv	Velocity pressure at a point in a pipe	EE	45° Elbow
UG	Underground			Ee1	11¼° Elbow
				Ee2	22½° Elbow
				f	Flow Device
				fd	Flex Drop
				FDC	Fire Department Connection
				fE	90° FireLock(TM) Elbow
				fEE	45° FireLock(TM) Elbow
				flg	Flange
				FN	Floating Node
				fT	FireLock(TM) Tee
				g	Gauge
				GloV	Globe Valve
				GV	Gate Valve
				Ho	Hose
				Hose	Hose
				HV	Hose Valve
				Hyd	Hydrant
				LtE	Long Turn Elbow
				mecT	Mechanical Tee
				Noz	Nozzle
				P1	Pump In
				P2	Pump Out
				PIV	Post Indicating Valve
				PO	Pipe Outlet
				PrV	Pressure Relief Valve
				PRV	Pressure Reducing Valve
				red	Reducer/Adapter
				S	Supply
				sCV	Swing Check Valve
				SFx	Seismic Flex
				Spr	Sprinkler
				St	Strainer
				T	Tee Flow Turn 90°
				Tr	Tee Run
				U	Union
				WirF	Wirsbo
				WMV	Water Meter Valve
				Z	Cap



Hydraulic Overview

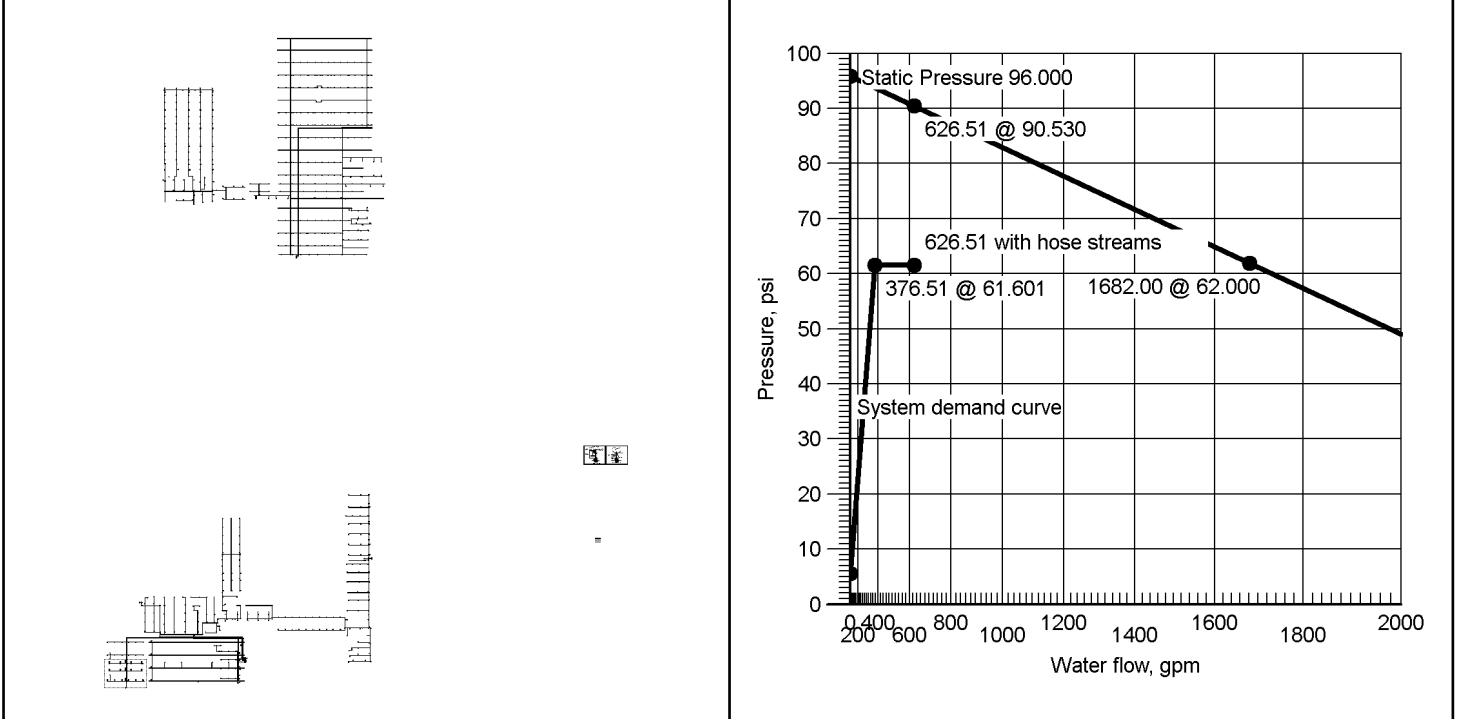
Job Number: 4352CK - MCC AUTO SHOP
Report Description: Ordinary Group II - AREA 2 - (TWO)

Job		
Job Number 4352CK	Designer	
Job Name: MCC AUTO SHOP	Phone	FAX
Address 1 500 SW LONGVIEW RD	State Certification/License Number	
Address 2 LEE'S SUMMIT, MO 64081	AHJ	
Address 3	Job Site/Building	

System		
Density 0.20gpm/ft ²	Area of Application 1500ft ² (Actual 1617ft ²)	
Most Demanding Sprinkler Data 5.6 K-Factor 25.60 at 20.898	Hose Streams 250.00	
Coverage Per Sprinkler 128ft ²	Number Of Sprinklers Calculated 14	Number Of Nozzles Calculated 0
System Pressure Demand 61.601	System Flow Demand 376.51	
Total Demand 626.51 @ 61.601	Pressure Result +28.929 (32.0%)	

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	1682.00	250.00	96.000	62.000	BOR (4)	51.783	52.32	376.51
						BOR 2 (5)	61.865	0	0.00

4352CK MCC AUTO SHOP.cad Supply at Node 1 (1682.00, 250.00, 96.000, 62.000)





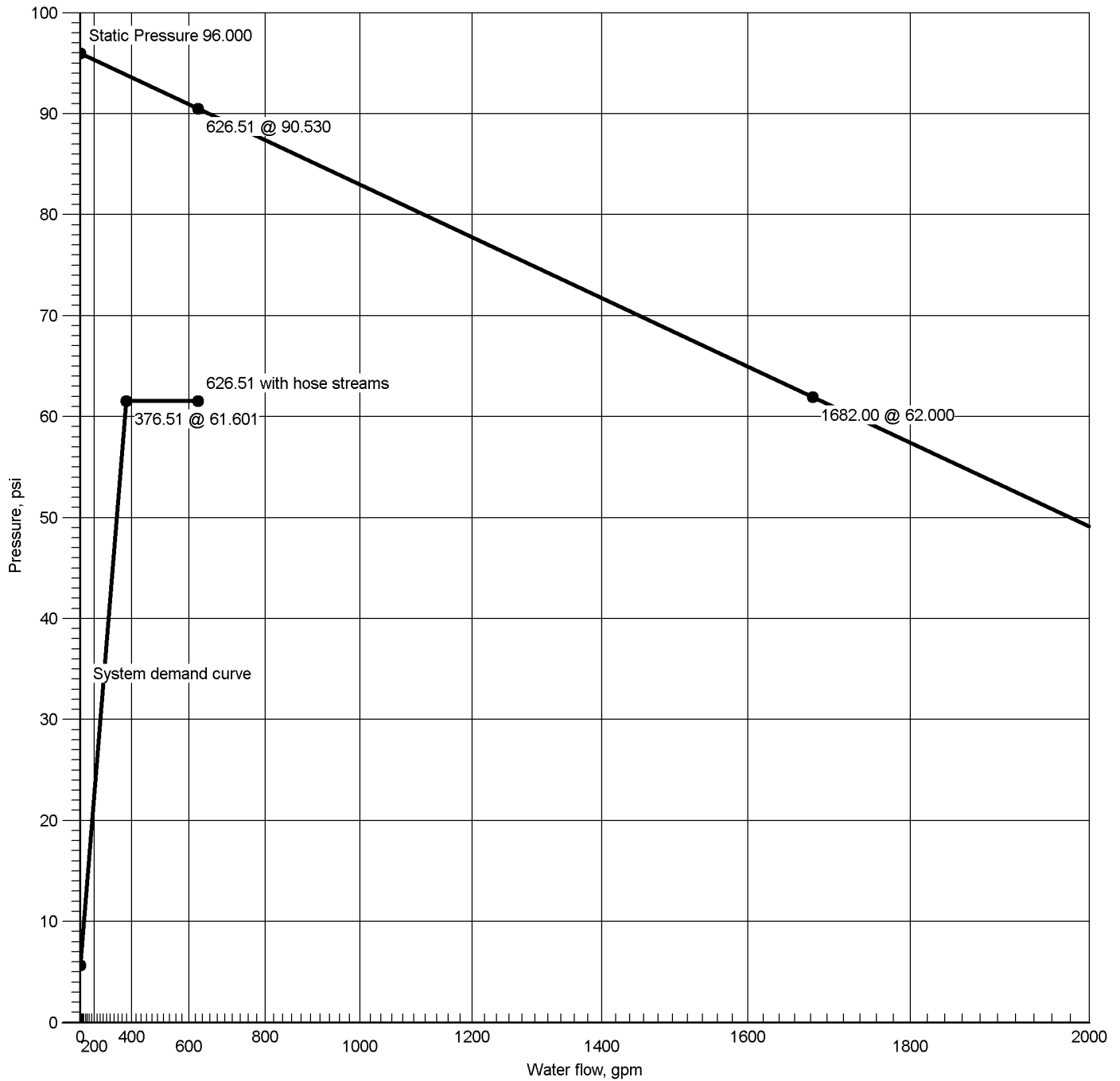
Hydraulic Summary

Job Number: 4352CK - MCC AUTO SHOP
Report Description: Ordinary Group II - AREA 2 - (TWO)

Job											
Job Number 4352CK					Designer						
Job Name: MCC AUTO SHOP					State Certification/License Number						
Address 1 500 SW LONGVIEW RD					AHJ						
Address 2 LEE'S SUMMIT, MO 64081					Job Site/Building						
Address 3					Drawing Name 4352CK MCC AUTO SHOP.cad						
System					Remote Area(s)						
Most Demanding Sprinkler Data 5.6 K-Factor 25.60 at 20.898					Occupancy Ordinary Group II - AREA 2 -			Job Suffix MCC AUTO SHOP			
Hose Allowance At Source 250.00					Density 0.20gpm/ft ²			Area of Application 1500ft ² (Actual 1617ft ²)			
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>					Number Of Sprinklers Calculated 14		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 128ft ²		
					AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area						
					Left: 61.601 Right: 61.601						
Total Hose Streams 250.00											
System Flow Demand 376.51			Total Water Required (Including Hose Allowance) 626.51								
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 24.60 between nodes 2001 and 2000											
Maximum Velocity Under Ground 8.64 between nodes 3 and 4											
Volume capacity of Wet Pipes 3912.97gal			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	Water Supply	250.00	96.000	62.000		1682.00	90.530		626.51	61.601	28.929
Contractor											
Contractor Number		Contact Name			Contact Title						
Name of Contractor:		Phone			Extension						
Address 1		FAX									
Address 2		E-mail									
Address 3		Web-Site									



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
90.530 @ 626.51

Required Pressure at System Demand
61.601 @ 376.51

Required Pressure at System Demand (Including Hose Allowance at Source)
61.601 @ 626.51



Summary Of Outflowing Devices

Job Number: 4352CK - MCC AUTO SHOP
Report Description: Ordinary Group II - AREA 2 - (TWO)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	200	25.60	25.60	5.6	20.898			
Sprinkler	201	25.73	25.60	5.6	21.112			
Sprinkler	202	26.20	25.60	5.6	21.888			
Sprinkler	203	25.95	25.60	5.6	21.474			
Sprinkler	204	26.08	25.60	5.6	21.693			
Sprinkler	205	26.56	25.60	5.6	22.489			
Sprinkler	206	26.72	25.60	5.6	22.771			
Sprinkler	207	26.93	25.60	5.6	23.123			
Sprinkler	208	26.87	25.60	5.6	23.023			
Sprinkler	209	27.07	25.60	5.6	23.369			
Sprinkler	210	28.02	25.60	5.6	25.029			
Sprinkler	211	28.23	25.60	5.6	25.412			
Sprinkler	212	28.17	25.60	5.6	25.303			
Sprinkler	213	28.38	25.60	5.6	25.681			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK - MCC AUTO SHOP
Report Description: Ordinary Group II - AREA 2 - (TWO)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	61.601	376.51
200	14'-6	Spr(-20.898)	20.898	25.60
201	14'-6	Spr(-21.112)	21.112	25.73
202	14'-6	Spr(-21.888)	21.888	26.20
203	14'-6	Spr(-21.474)	21.474	25.95
204	14'-6	Spr(-21.693)	21.693	26.08
205	14'-6	Spr(-22.489)	22.489	26.56
206	15'-5	Spr(-22.771)	22.771	26.72
207	15'-5	Spr(-23.123)	23.123	26.93
208	15'-5	Spr(-23.023)	23.023	26.87
209	15'-5	Spr(-23.369)	23.369	27.07
210	16'-2	Spr(-25.029)	25.029	28.02
211	16'-2	Spr(-25.412)	25.412	28.23
212	16'-2	Spr(-25.303)	25.303	28.17
213	16'-2	Spr(-25.681)	25.681	28.38
2	-6'-0	E(22'-1)	65.469	
3	-6'-0		60.337	
4	1'-4	BOR	51.783	
5	0'-0	BOR 2	61.865	
1000	14'-2	PO(8'-0)	37.929	
1001	14'-2	PO(8'-0)	38.386	
1002	18'-10½	PO(8'-0)	36.569	
1003	17'-7½	PO(8'-0)	37.134	
1004	16'-4½	PO(10'-0)	37.766	
1005	14'-2	PO(8'-0)	39.142	
1006	14'-2	PO(8'-0)	39.141	
1007	15'-1½	PO(10'-0)	38.341	
2000	14'-6	T(8'-0)	24.565	
2001	13'-2½	PO(8'-0)	31.854	
2002	14'-1½	PO(8'-0), C(8'-0)	31.520	
2003	14'-10½	PO(8'-0)	31.353	
2004	15'-5	T(8'-0)	24.673	
2005	16'-2	T(8'-0)	27.104	
50072	14'-2	fT(21'-1)	39.145	



Hydraulic Analysis

Job Number: 4352CK - MCC AUTO SHOP
Report Description: Ordinary Group II - AREA 2 - (TWO)

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	1.6100	25.60	4.03	120		0.025507	8'-5"	Pf 0.214
200	14'-6"	25.60	5.6	20.898		Sprinkler		Pe 0.000
201	14'-6"			21.112			8'-5"	Pv
BL	1.6100	51.33	8.09	120		0.092387	8'-5"	Pf 0.776
201	14'-6"	25.73	5.6	21.112		Sprinkler		Pe 0.000
202	14'-6"			21.888			8'-5"	Pv
BL	1.6100	77.53	12.22	120		0.198122	5'-6"	Pf 2.677
202	14'-6"	26.20	5.6	21.888		Sprinkler,	8'-0"	Pe 0.000
2000	14'-6"			24.565		T(8'-0)	13'-6"	Pv
BL	1.6100	156.12	24.60	120		0.723284	1'-3½"	Pf 6.727
2000	14'-6"	78.59		24.565		Flow (q) from Route 2	8'-0"	Pe 0.562
2001	13'-2½"			31.854		PO(8'-0)	9'-3½"	Pv
CM	4.2600	156.12	3.51	120		0.006329	11'-11½"	Pf 0.076
2001	13'-2½"			31.854				Pe -0.410
2002	14'-1½"			31.520			11'-11½"	Pv
CM	4.2600	263.71	5.94	120		0.016692	8'-7½"	Pf 0.144
2002	14'-1½"	107.59		31.520		Flow (q) from Route 3		Pe -0.310
2003	14'-10½"			31.353			8'-7½"	Pv
CM	4.2600	376.51	8.48	120		0.032256	167'-9"	Pf 6.278
2003	14'-10½"	112.79		31.353		Flow (q) from Route 5	26'-10½"	Pe 0.299
1000	14'-2"			37.929		3FE(8'-11½")	194'-7½"	Pv
CM	4.2600	365.59	8.23	120		0.030547	14'-11½"	Pf 0.457
1000	14'-2"			37.929				Pe 0.000
1001	14'-2"			38.386			14'-11½"	Pv
CM	4.2600	359.26	8.09	120		0.029575	4'-7"	Pf 0.759
1001	14'-2"			38.386			21'-1"	Pe 0.000
50072	14'-2"			39.145		ft(21'-1)	25'-8"	Pv
CM	4.2600	376.51	8.48	120		0.032256	18'-5"	Pf 7.072
50072	14'-2"	17.25		39.145		Flow (q) from Route 7	84'-9½"	Pe 5.566
4	1'-4"			51.783		fE(8'-11½"), CV(23'-2), 2PO(26'-4), BFP(-3.743), BOR	103'-2½"	Pv
UG	4.2200	376.51	8.64	140		0.025393	164'-9"	Pf 5.373
4	1'-4"			51.783			46'-10"	Pe 3.182
3	-6'-0"			60.337		2E(16'-8½"), 2EE(6'-8½")	211'-7"	Pv
UG	6.2800	376.51	3.90	140		0.003664	1148'-8"	Pf 5.132
3	-6'-0"			60.337			252'-1½"	Pe
2	-6'-0"			65.469		4GV(4'-8½"), 2E(22'-1), 3EE(11'-0½"), LtE(14'-2), 3T(47'-3½")	1400'-9½"	Pv
UG	6.2800	376.51	3.90	140		0.003664	9'-0"	Pf 0.033
2	-6'-0"			65.469				Pe -3.902
1	3'-0"			61.601		S	9'-0"	Pv
		250.00				Hose Allowance At Source		
1		626.51						
Route 2								
BL	1.6100	25.95	4.09	120		0.026157	8'-4½"	Pf 0.219
203	14'-6"	25.95	5.6	21.474		Sprinkler		Pe -0.000
204	14'-6"			21.693			8'-4½"	Pv
BL	1.6100	52.03	8.20	120		0.094739	8'-5"	Pf 0.795
204	14'-6"	26.08	5.6	21.693		Sprinkler		Pe -0.000
205	14'-6"			22.489			8'-5"	Pv
BL	1.6100	78.59	12.39	120		0.203160	2'-2½"	Pf 2.076
205	14'-6"	26.56	5.6	22.489		Sprinkler,	8'-0"	Pe -0.000
2000	14'-6"			24.565		T(8'-0)	10'-2½"	Pv
Route 3								
BL	1.6100	26.72	4.21	120		0.027615	12'-9"	Pf 0.352
206	15'-5"	26.72	5.6	22.771		Sprinkler		Pe 0.000
207	15'-5"			23.123			12'-9"	Pv
BL	1.6100	53.65	8.46	120		0.100261	7'-5½"	Pf 1.550
207	15'-5"	26.93	5.6	23.123		Sprinkler,	8'-0"	Pe 0.000
2004	15'-5"			24.673		T(8'-0)	15'-5½"	Pv
BL	1.6100	107.59	16.96	120		0.363250	1'-3½"	Pf 6.285
2004	15'-5"	53.94		24.673		Flow (q) from Route 4	16'-0"	Pe 0.562
2002	14'-1½"			31.520		PO(8'-0), C(8'-0)	17'-3½"	Pv
Route 4								



Hydraulic Analysis

Job Number: 4352CK - MCC AUTO SHOP
Report Description: Ordinary Group II - AREA 2 - (TWO)

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	1.6100	26.87	4.23	120		0.027897	12'-5	Pf 0.346
208	15'-5	26.87	5.6	23.023		Sprinkler		Pe -0.000
209	15'-5			23.369			12'-5	Pv
BL	1.6100	53.94	8.50	120		0.101266	4'-10½	Pf 1.305
209	15'-5	27.07	5.6	23.369		Sprinkler,	8'-0	Pe -0.000
2004	15'-5			24.673		T(8'-0)	12'-10½	Pv
Route 5								
BL	1.6100	28.02	4.42	120		0.030138	12'-9	Pf 0.384
210	16'-2	28.02	5.6	25.029		Sprinkler		Pe 0.000
211	16'-2			25.412			12'-9	Pv
BL	1.6100	56.25	8.86	120		0.109416	7'-5½	Pf 1.692
211	16'-2	28.23	5.6	25.412		Sprinkler,	8'-0	Pe 0.000
2005	16'-2			27.104		T(8'-0)	15'-5½	Pv
BL	1.6100	112.79	17.78	120		0.396406	1'-3½	Pf 3.687
2005	16'-2	56.55		27.104		Flow (q) from Route 6	8'-0	Pe 0.562
2003	14'-10½			31.353		PO(8'-0)	9'-3½	Pv
Route 6								
BL	1.6100	28.17	4.44	120		0.030444	12'-5	Pf 0.377
212	16'-2	28.17	5.6	25.303		Sprinkler		Pe -0.000
213	16'-2			25.681			12'-5	Pv
BL	1.6100	56.55	8.91	120		0.110505	4'-10½	Pf 1.424
213	16'-2	28.38	5.6	25.681		Sprinkler,	8'-0	Pe -0.000
2005	16'-2			27.104		T(8'-0)	12'-10½	Pv
Route 7								
CM	4.2600	8.45	0.19	120		0.000029	14'-11½	Pf 0.000
1006	14'-2	8.45		39.141		Flow (q) from Route 9		Pe
1005	14'-2			39.142			14'-11½	Pv
CM	4.2600	17.25	0.39	120		0.000108	10'-4½	Pf 0.003
1005	14'-2	8.80		39.142		Flow (q) from Route 8	21'-1	Pe
50072	14'-2			39.145		ft(21'-1)	31'-5½	Pv
Route 8								
BL	1.6100	8.80	1.39	120		0.003538	102'-4	Pf 0.419
1004	16'-4½	17.25		37.766		Flow (q) from Route 10	16'-0	Pe 0.957
1005	14'-2			39.142		T(8'-0), PO(8'-0)	118'-4	Pv
Route 9								
BL	2.0670	8.45	0.81	120		0.000972	15'-0	Pf 0.034
1004	16'-4½	17.25		37.766		PO(10'-0), Flow (q) from Route	20'-0	Pe 0.542
1007	15'-1½			38.341		10	35'-0	Pv
						PO(10'-0)		
BL	1.6100	8.45	1.33	120		0.003281	101'-1	Pf 0.384
1007	15'-1½			38.341			16'-0	Pe 0.415
1006	14'-2			39.141		T(8'-0), PO(8'-0)	117'-1	Pv
Route 10								
BL	2.0670	17.25	1.65	120		0.003639	15'-0	Pf 0.091
1003	17'-7½	10.92 + 6.33		37.134		Flow (q) from Route 11 and 12	10'-0	Pe 0.541
1004	16'-4½			37.766		PO(10'-0)	25'-0	Pv
Route 11								
BL	2.0670	10.92	1.04	120		0.001561	15'-0	Pf 0.023
1002	18'-10½	10.92		36.569		Flow (q) from Route 13		Pe 0.542
1003	17'-7½			37.134			15'-0	Pv
Route 12								
BL	1.6100	6.33	1.00	120		0.001925	103'-7	Pf 0.246
1001	14'-2			38.386		PO(8'-0)	24'-0	Pe -1.498
1003	17'-7½			37.134		T(8'-0), PO(8'-0)	127'-7	Pv
Route 13								
BL	1.6100	10.92	1.72	120		0.005271	104'-10	Pf 0.679
1000	14'-2			37.929		PO(8'-0)	24'-0	Pe -2.039
1002	18'-10½			36.569		T(8'-0), PO(8'-0)	128'-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	150
Multiplying Factor	0.713	1.16	1.33	1.51



Hydraulic Analysis

Job Number: 4352CK - MCC AUTO SHOP
Report Description: Ordinary Group II - AREA 2 - (TWO)

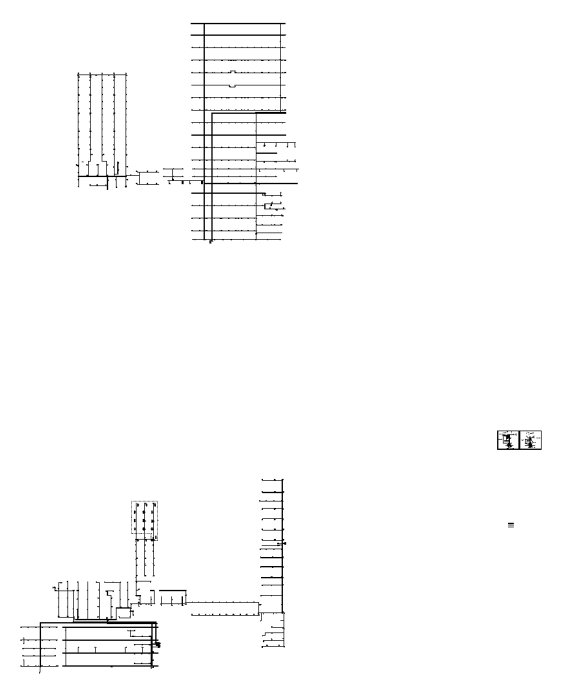
Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Summary
Upstream							

Pipe Type Legend	Units Legend	Fittings Legend
AO Arm-Over	Diameter Inch	ALV Alarm Valve
BL Branch Line	Elevation Foot	AngV Angle Valve
CM Cross Main	Flow gpm	b Bushing
DN Drain	Discharge gpm	BaIV Ball Valve
DR Drop	Velocity fps	BFP Backflow Preventer
DY Dynamic	Pressure psi	BV Butterfly Valve
FM Feed Main	Length Foot	C Cross Flow Turn 90°
FR Feed Riser	Friction Loss psi/Foot	cplg Coupling
MS Miscellaneous	HWC Hazen-Williams Constant	Cr Cross Run
OR Outrigger	Pt Total pressure at a point in a pipe	CV Check Valve
RN Riser Nipple	Pn Normal pressure at a point in a pipe	DeIV Deluge Valve
SN Swing Nipple	Pf Pressure loss due to friction between points	DPV Dry Pipe Valve
SP Sprig	Pe Pressure due to elevation difference between indicated points	E 90° Elbow
ST Stand Pipe	Pv Velocity pressure at a point in a pipe	EE 45° Elbow
UG Underground		Ee1 11¼° Elbow
		Ee2 22½° Elbow
		f Flow Device
		fd Flex Drop
		FDC Fire Department Connection
		fE 90° FireLock(TM) Elbow
		fEE 45° FireLock(TM) Elbow
		flg Flange
		FN Floating Node
		fT FireLock(TM) Tee
		g Gauge
		GloV Globe Valve
		GV Gate Valve
		Ho Hose
		Hose Hose
		HV Hose Valve
		Hyd Hydrant
		LtE Long Turn Elbow
		mecT Mechanical Tee
		Noz Nozzle
		P1 Pump In
		P2 Pump Out
		PIV Post Indicating Valve
		PO Pipe Outlet
		PRV Pressure 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



Hydraulic Overview

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 3 -

Job									
Job Number 4352CK					Designer				
Job Name: MCC AUTO SHOP					Phone			FAX	
Address 1 500 SW LONGVIEW RD					State Certification/License Number				
Address 2 LEE'S SUMMIT, MO 64081					AHJ				
Address 3					Job Site/Building				
System									
Density 0.20gpm/ft ²					Area of Application 1500ft ² (Actual 1197ft ²)				
Most Demanding Sprinkler Data 5.6 K-Factor 19.67 at 12.333					Hose Streams 250.00				
Coverage Per Sprinkler 98ft ²					Number Of Sprinklers Calculated 13			Number Of Nozzles Calculated 0	
System Pressure Demand 67.565					System Flow Demand 266.36				
Total Demand 516.36 @ 67.565					Pressure Result +24.610 (26.7%)				
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	1682.00	250.00	96.000	62.000	BOR (4)	62.730	33.63	266.36
						BOR 2 (5)	69.549	0	0.00
4352CK MCC AUTO SHOP.cad					Supply at Node 1 (1682.00, 250.00, 96.000, 62.000)				
									



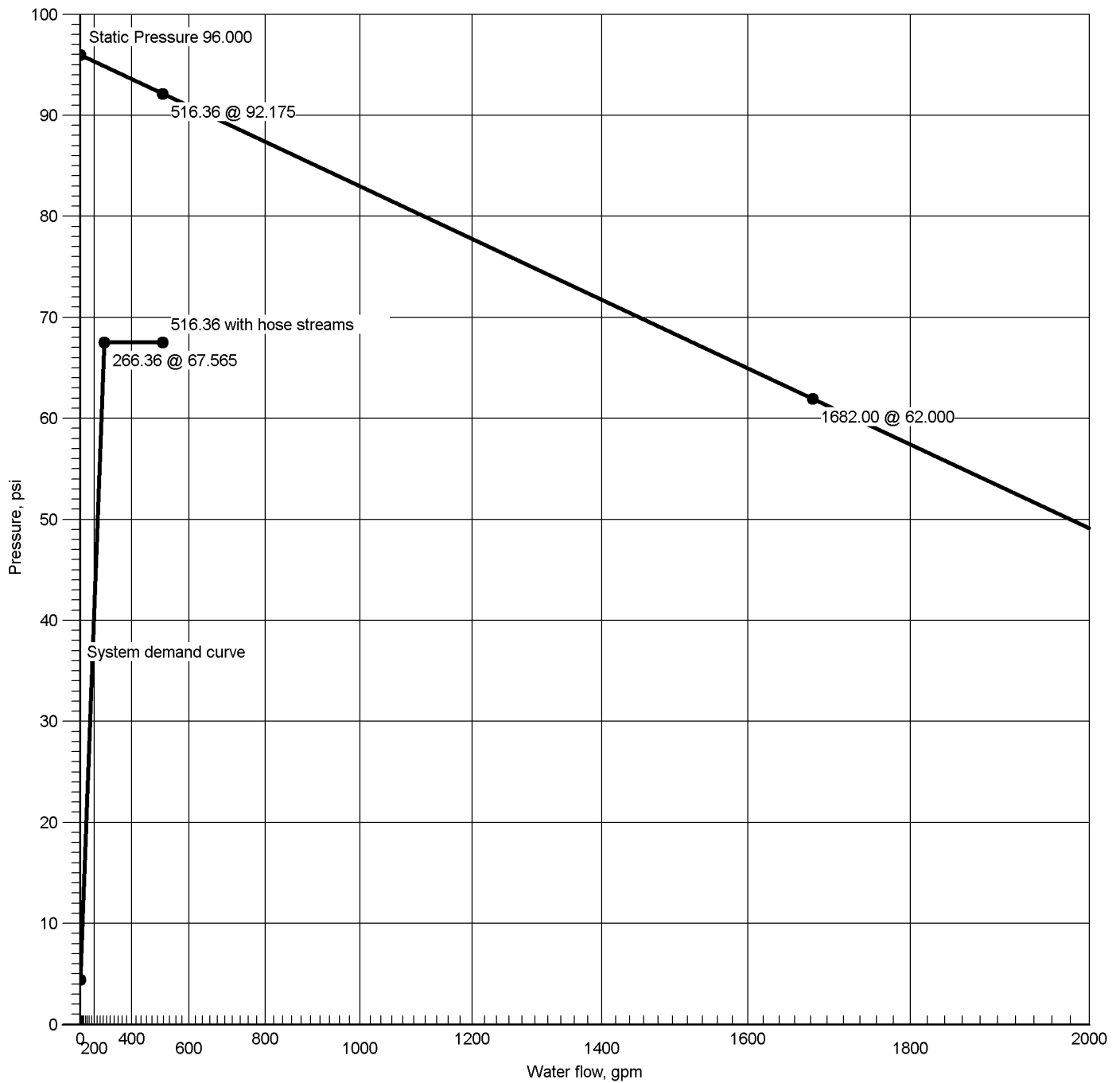
Hydraulic Summary

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 3 -

Job											
Job Number 4352CK				Designer							
Job Name: MCC AUTO SHOP				State Certification/License Number							
Address 1 500 SW LONGVIEW RD				AHJ							
Address 2 LEE'S SUMMIT, MO 64081				Job Site/Building							
Address 3				Drawing Name 4352CK MCC AUTO SHOP.cad							
System				Remote Area(s)							
Most Demanding Sprinkler Data 5.6 K-Factor 19.67 at 12.333				Occupancy Ordinary Group II - AREA 3 -			Job Suffix				
Hose Allowance At Source 250.00				Density 0.20gpm/ft²			Area of Application 1500ft² (Actual 1197ft²)				
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>				Number Of Sprinklers Calculated 13		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 98ft²			
				AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area Right: 66.561							
Total Hose Streams 250.00											
System Flow Demand 266.36		Total Water Required (Including Hose Allowance) 516.36									
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 16.40 between nodes 3013 and 3012											
Maximum Velocity Under Ground 6.11 between nodes 3 and 4											
Volume capacity of Wet Pipes 3912.97gal		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	Water Supply	250.00	96.000	62.000		1682.00	92.175		516.36	67.565	24.610
Contractor											
Contractor Number		Contact Name				Contact Title					
Name of Contractor:		Phone				Extension					
Address 1		FAX									
Address 2		E-mail									
Address 3		Web-Site									



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
92.175 @ 516.36

Required Pressure at System Demand
67.565 @ 266.36

Required Pressure at System Demand (Including Hose Allowance at Source)
67.565 @ 516.36



Summary Of Outflowing Devices

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 3 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
⇒ Sprinkler	300	19.67	19.67	5.6	12.333			
Sprinkler	301	19.78	19.67	5.6	12.478			
Sprinkler	302	19.84	19.67	5.6	12.548			
Sprinkler	303	19.89	19.67	5.6	12.616			
Sprinkler	304	19.95	19.67	5.6	12.695			
Sprinkler	305	20.01	19.67	5.6	12.763			
Sprinkler	306	20.19	19.67	5.6	13.004			
Sprinkler	307	20.37	19.67	5.6	13.229			
Sprinkler	308	20.42	19.67	5.6	13.297			
Sprinkler	309	21.05	19.67	5.6	14.134			
Sprinkler	310	21.23	19.67	5.6	14.377			
Sprinkler	311	21.28	19.67	5.6	14.445			

⇒ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 3 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	67.565	266.36
300	12'-5½	Spr(-12.333)	12.333	19.67
301	12'-5½	Spr(-12.478)	12.478	19.78
302	11'-7½	Spr(-12.548)	12.548	19.84
303	13'-3½	Spr(-12.616)	12.616	19.89
304	11'-7½	Spr(-12.695)	12.695	19.95
305	13'-3½	Spr(-12.763)	12.763	20.01
306	12'-5½	Spr(-13.004)	13.004	20.19
307	11'-7½	Spr(-13.229)	13.229	20.37
308	13'-3½	Spr(-13.297)	13.297	20.42
309	12'-5½	Spr(-14.134)	14.134	21.05
310	11'-7½	Spr(-14.377)	14.377	21.23
311	13'-3½	Spr(-14.445)	14.445	21.28
312	11'-7½	Spr(-16.385)	16.385	22.67
2	-6'-0	E(22'-1)	71.449	
3	-6'-0		68.744	
4	1'-4	BOR	62.730	
5	0'-0	BOR 2	69.549	
3000	10'-11	PO(5'-0)	13.828	
3001	10'-11	PO(5'-0)	13.982	
3002	10'-11	PO(5'-0)	14.540	
3003	10'-11	PO(5'-0)	15.739	
3004	10'-0½	PO(8'-0)	21.897	
3005	10'-0½	PO(8'-0)	22.727	
3006	8'-6	PO(16'-5½)	44.928	
3007	10'-4	fT(21'-11½)	51.608	
3008	10'-0½	PO(5'-0)	14.090	
3009	10'-0½	PO(5'-0)	14.246	
3010	10'-0½	PO(5'-0)	14.813	
3011	10'-0½	PO(5'-0)	16.032	
3012	10'-0½	PO(5'-0)	18.163	
3013	10'-0½	PO(8'-0)	21.587	
3014	11'-2	PO(5'-0)	14.445	
3015	11'-2	PO(5'-0)	14.603	
3016	11'-2	PO(5'-0)	15.173	
3017	11'-2	PO(5'-0)	16.397	



Hydraulic Analysis

Job Number: 4352CK

Report Description: Ordinary Group II - 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								
AO	1.0490	19.67	7.30	120		0.126147	1'-6½"	Pf 0.825
300	12'-5½"	19.67	5.6	12.333		Sprinkler,	5'-0"	Pe 0.669
3000	10'-11"			13.828		PO(5'-0)	6'-6½"	Pv
BL	1.6100	19.67	3.10	120		0.015661	9'-10"	Pf 0.154
3000	10'-11"			13.828			9'-10"	Pe
3001	10'-11"			13.982			9'-10"	Pv
BL	1.6100	39.45	6.22	120		0.056764	9'-10"	Pf 0.558
3001	10'-11"	19.78		13.982		Flow (q) from Route 2	9'-10"	Pe
3002	10'-11"			14.540			9'-10"	Pv
BL	1.6100	59.64	9.40	120		0.121954	9'-10"	Pf 1.199
3002	10'-11"	20.19		14.540		Flow (q) from Route 7	9'-10"	Pe
3003	10'-11"			15.739			9'-10"	Pv
BL	1.6100	80.70	12.72	120		0.213349	12'-9"	Pf 5.778
3003	10'-11"	21.05		15.739		Flow (q) from Route 10	14'-4"	Pe 0.379
3004	10'-0½"			21.897		T(6'-4), PO(8'-0)	27'-1"	Pv
CM	2.6350	184.76	10.87	120		0.089672	9'-3"	Pf 0.830
3004	10'-0½"	104.06		21.897		Flow (q) from Route 3	9'-3"	Pe
3005	10'-0½"			22.727			9'-3"	Pv
CM	2.6350	266.36	15.67	120		0.176425	81'-11½"	Pf 21.533
3005	10'-0½"	81.60		22.727		Flow (q) from Route 4	40'-1"	Pe 0.668
3006	8'-6"			44.928		4fE(5'-11), PO(16'-5½)	122'-0½"	Pv
CM	3.2600	266.36	10.24	120		0.062574	57'-7½"	Pf 7.474
3006	8'-6"			44.928			61'-10"	Pe -0.795
3007	10'-4"			51.608		6fE(6'-8½), fT(21'-11½)	119'-5½"	Pv
FR	4.2600	266.36	6.00	120		0.017003	110'-6"	Pf 7.218
3007	10'-4"			51.608			159'-6½"	Pe 3.904
4	1'-4"			62.730		7fE(8'-11½), fT(21'-1), CV(23'-2), 2PO(26'-4), BFP(-2.626), BOR	270'-0½"	Pv
UG	4.2200	266.36	6.11	140		0.013386	164'-9"	Pf 2.832
4	1'-4"			62.730			46'-10"	Pe 3.182
3	-6'-0"			68.744		2E(16'-8½), 2EE(6'-8½)	211'-7"	Pv
UG	6.2800	266.36	2.76	140		0.001931	1148'-8"	Pf 2.705
3	-6'-0"			68.744			252'-1½"	Pe
2	-6'-0"			71.449		4GV(4'-8½), 2E(22'-1), 3EE(11'-0½), LtE(14'-2), 3T(47'-3½)	1400'-9½"	Pv
UG	6.2800	266.36	2.76	140		0.001931	9'-0"	Pf 0.017
2	-6'-0"			71.449			9'-0"	Pe -3.902
1	3'-0"			67.565		S	9'-0"	Pv
		250.00				Hose Allowance At Source		
1		516.36						
Route 2								
AO	1.0490	19.78	7.34	120		0.127519	1'-6½"	Pf 0.834
301	12'-5½"	19.78	5.6	12.478		Sprinkler,	5'-0"	Pe 0.669
3001	10'-11"			13.982		PO(5'-0)	6'-6½"	Pv
Route 3								
AO	1.0490	19.84	7.36	120		0.128176	1'-7"	Pf 0.846
302	11'-7½"	19.84	5.6	12.548		Sprinkler,	5'-0"	Pe 0.695
3008	10'-0½"			14.090		PO(5'-0)	6'-7"	Pv
BL	1.6100	19.84	3.13	120		0.015913	9'-10"	Pf 0.156
3008	10'-0½"			14.090			9'-10"	Pe
3009	10'-0½"			14.246			9'-10"	Pv
BL	1.6100	39.79	6.27	120		0.057676	9'-10"	Pf 0.567
3009	10'-0½"	19.95		14.246		Flow (q) from Route 5	9'-10"	Pe
3010	10'-0½"			14.813			9'-10"	Pv
BL	1.6100	60.16	9.48	120		0.123911	9'-10"	Pf 1.218
3010	10'-0½"	20.37		14.813		Flow (q) from Route 8	9'-10"	Pe
3011	10'-0½"			16.032			9'-10"	Pv
BL	1.6100	81.39	12.83	120		0.216763	9'-10"	Pf 2.131
3011	10'-0½"	21.23		16.032		Flow (q) from Route 11	9'-10"	Pe
3012	10'-0½"			18.163			9'-10"	Pv
BL	1.6100	104.06	16.40	120		0.341493	2'-0½"	Pf 3.424
3012	10'-0½"	22.67		18.163		Flow (q) from Route 13	8'-0"	Pe
3013	10'-0½"			21.587		PO(8'-0)	10'-0½"	Pv
CM	2.6350	104.06	6.12	120		0.031004	10'-0"	Pf 0.310
3013	10'-0½"			21.587			10'-0"	Pe
3004	10'-0½"			21.897			10'-0"	Pv



Hydraulic Analysis

Job Number: 4352CK

Report Description: Ordinary Group II - 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	
Route 4								
AO	1.0490	19.89	7.38	120		0.128817	2'-1½"	Pf 0.916
303	13'-3½"	19.89	5.6	12.616		Sprinkler,	5'-0"	Pe 0.914
3014	11'-2"			14.445		PO(5'-0)	7'-1½"	Pv
BL	1.6100	19.89	3.13	120		0.015992	9'-10"	Pf 0.157
3014	11'-2"			14.445			9'-10"	Pe
3015	11'-2"			14.603			9'-10"	Pv
BL	1.6100	39.90	6.29	120		0.057963	9'-10"	Pf 0.570
3015	11'-2"	20.01		14.603		Flow (q) from Route 6	9'-10"	Pe
3016	11'-2"			15.173			9'-10"	Pv
BL	1.6100	60.32	9.51	120		0.124518	9'-10"	Pf 1.224
3016	11'-2"	20.42		15.173		Flow (q) from Route 9	9'-10"	Pe
3017	11'-2"			16.397			9'-10"	Pv
BL	1.6100	81.60	12.86	120		0.217797	13'-8½"	Pf 5.843
3017	11'-2"	21.28		16.397		Flow (q) from Route 12	13'-1"	Pe 0.488
3005	10'-0½"			22.727		2E(2'-6½"), PO(8'-0)	26'-10"	Pv
Route 5								
AO	1.0490	19.95	7.41	120		0.129567	1'-7"	Pf 0.856
304	11'-7½"	19.95	5.6	12.695		Sprinkler,	5'-0"	Pe 0.695
3009	10'-0½"			14.246		PO(5'-0)	6'-7"	Pv
Route 6								
AO	1.0490	20.01	7.43	120		0.130208	2'-1½"	Pf 0.926
305	13'-3½"	20.01	5.6	12.763		Sprinkler,	5'-0"	Pe 0.914
3015	11'-2"			14.603		PO(5'-0)	7'-1½"	Pv
Route 7								
AO	1.0490	20.19	7.50	120		0.132481	1'-6½"	Pf 0.867
306	12'-5½"	20.19	5.6	13.004		Sprinkler,	5'-0"	Pe 0.669
3002	10'-11"			14.540		PO(5'-0)	6'-6½"	Pv
Route 8								
AO	1.0490	20.37	7.56	120		0.134600	1'-7"	Pf 0.889
307	11'-7½"	20.37	5.6	13.229		Sprinkler,	5'-0"	Pe 0.695
3010	10'-0½"			14.813		PO(5'-0)	6'-7"	Pv
Route 9								
AO	1.0490	20.42	7.58	120		0.135241	2'-1½"	Pf 0.961
308	13'-3½"	20.42	5.6	13.297		Sprinkler,	5'-0"	Pe 0.914
3016	11'-2"			15.173		PO(5'-0)	7'-1½"	Pv
Route 10								
AO	1.0490	21.05	7.82	120		0.143093	1'-6½"	Pf 0.936
309	12'-5½"	21.05	5.6	14.134		Sprinkler,	5'-0"	Pe 0.669
3003	10'-11"			15.739		PO(5'-0)	6'-6½"	Pv
Route 11								
AO	1.0490	21.23	7.88	120		0.145364	1'-7"	Pf 0.960
310	11'-7½"	21.23	5.6	14.377		Sprinkler,	5'-0"	Pe 0.695
3011	10'-0½"			16.032		PO(5'-0)	6'-7"	Pv
Route 12								
AO	1.0490	21.28	7.90	120		0.146006	2'-1½"	Pf 1.038
311	13'-3½"	21.28	5.6	14.445		Sprinkler,	5'-0"	Pe 0.914
3017	11'-2"			16.397		PO(5'-0)	7'-1½"	Pv
Route 13								
AO	1.0490	22.67	8.41	120		0.164052	1'-7"	Pf 1.083
312	11'-7½"	22.67	5.6	16.385		Sprinkler,	5'-0"	Pe 0.695
3012	10'-0½"			18.163		PO(5'-0)	6'-7"	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: 4352CK

Report Description: Ordinary Group II - 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



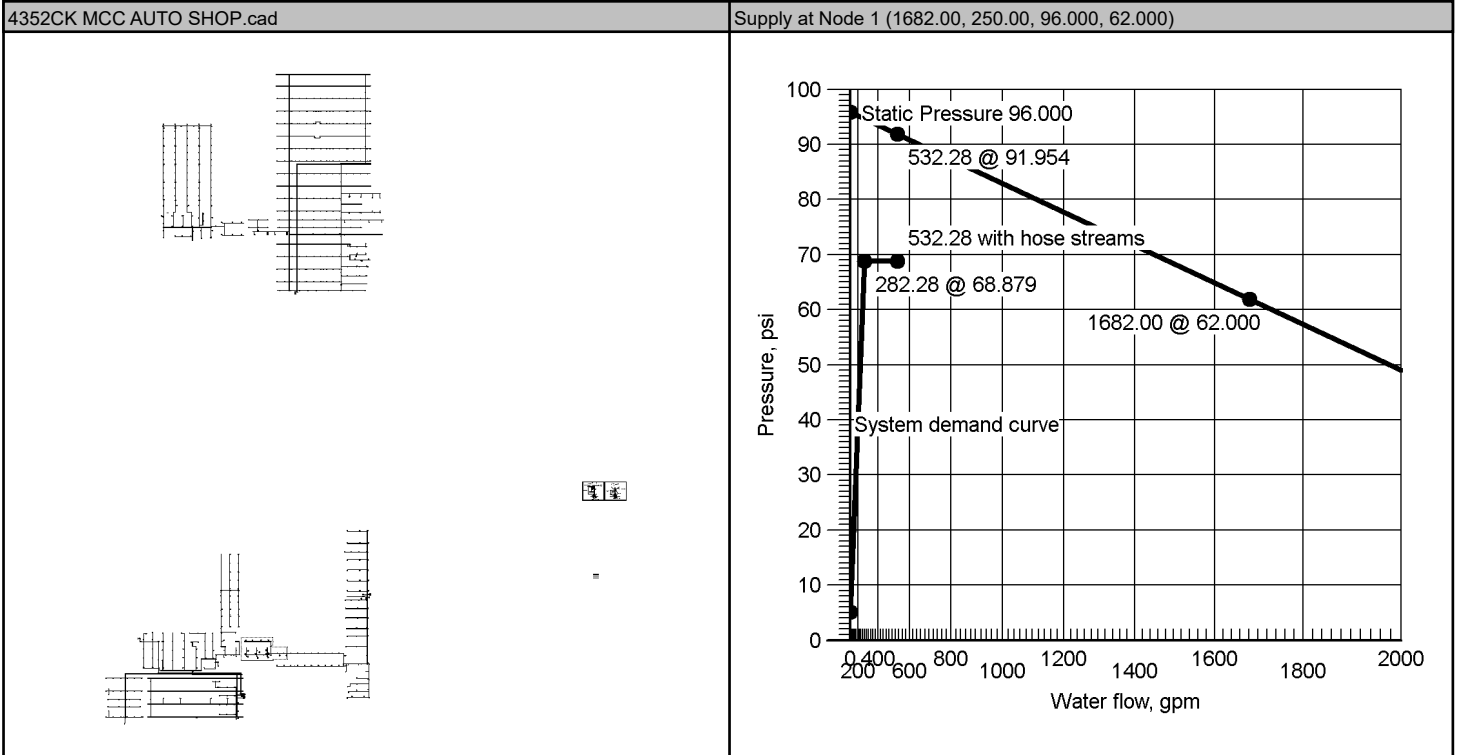
Hydraulic Overview

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 4 -

Job		
Job Number 4352CK	Designer	
Job Name: MCC AUTO SHOP	Phone	FAX
Address 1 500 SW LONGVIEW RD	State Certification/License Number	
Address 2 LEE'S SUMMIT, MO 64081	AHJ	
Address 3	Job Site/Building	

System		
Density 0.20gpm/ft ²	Area of Application 1500ft ² (Actual 1235ft ²)	
Most Demanding Sprinkler Data 5.6 K-Factor 19.60 at 12.250	Hose Streams 250.00	
Coverage Per Sprinkler 112ft ²	Number Of Sprinklers Calculated 12	Number Of Nozzles Calculated 0
System Pressure Demand 68.879	System Flow Demand 282.28	
Total Demand 532.28 @ 68.879	Pressure Result +23.075 (25.1%)	

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	1682.00	250.00	96.000	62.000	BOR (4)	70.646	0	0.00
						BOR 2 (5)	66.036	34.74	282.28





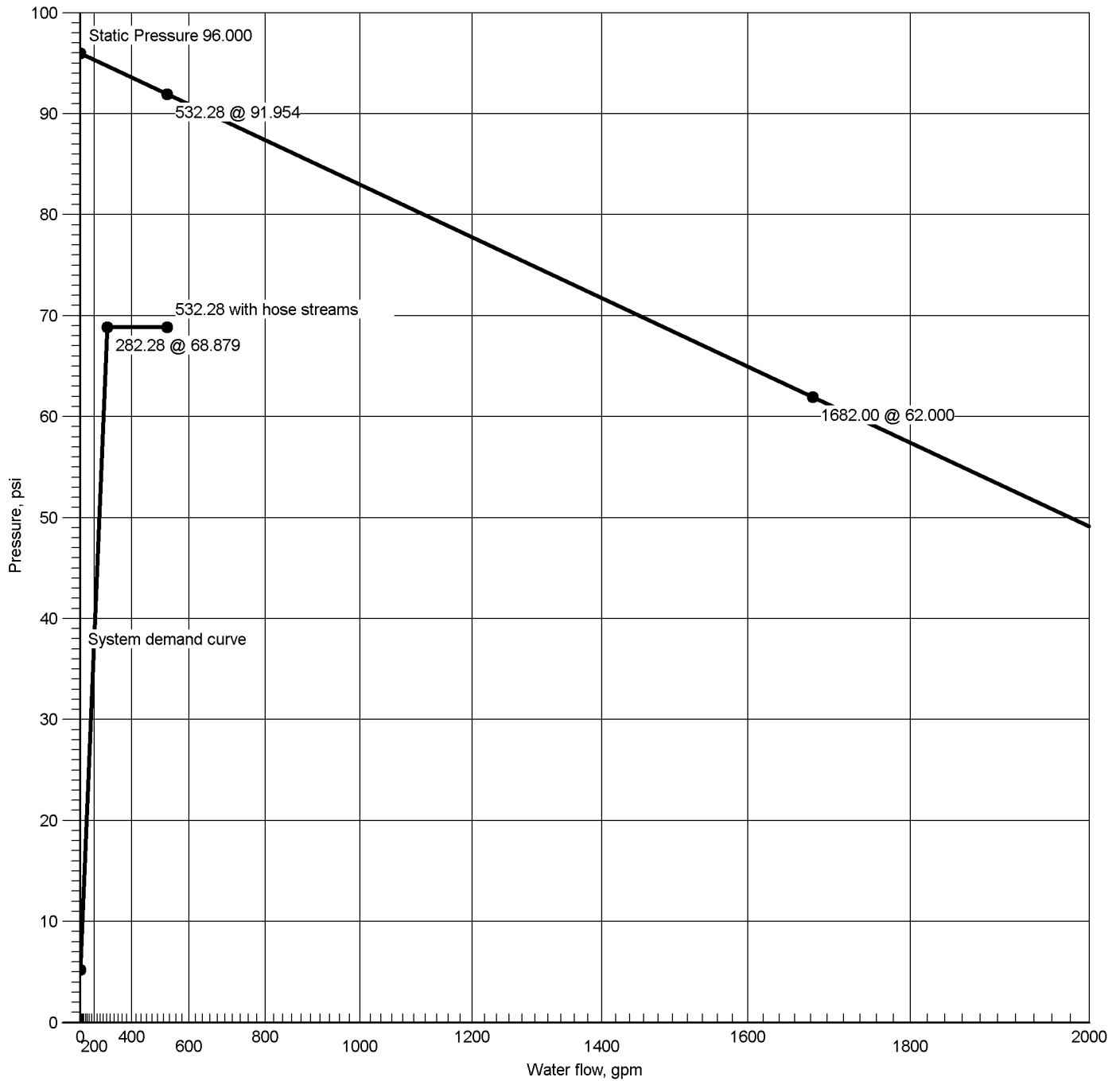
Hydraulic Summary

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 4 -

Job											
Job Number 4352CK					Designer						
Job Name: MCC AUTO SHOP					State Certification/License Number						
Address 1 500 SW LONGVIEW RD					AHJ						
Address 2 LEE'S SUMMIT, MO 64081					Job Site/Building						
Address 3					Drawing Name 4352CK MCC AUTO SHOP.cad						
System					Remote Area(s)						
Most Demanding Sprinkler Data 5.6 K-Factor 19.60 at 12.250					Occupancy Ordinary Group II - AREA 4 -			Job Suffix			
Hose Allowance At Source 250.00					Density 0.20gpm/ft ²			Area of Application 1500ft ² (Actual 1235ft ²)			
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>					Number Of Sprinklers Calculated 12		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 112ft ²		
					AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area						
					Left: 68.879				Right: 68.879		
Total Hose Streams 250.00											
System Flow Demand 282.28			Total Water Required (Including Hose Allowance) 532.28								
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 16.61 between nodes 4001 and 405											
Maximum Velocity Under Ground 6.48 between nodes 17 and 5											
Volume capacity of Wet Pipes 3912.97gal			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	Water Supply	250.00	96.000	62.000		1682.00	91.954		532.28	68.879	23.075
Contractor											
		Contractor Number				Contact Name				Contact Title	
Name of Contractor:						Phone				Extension	
Address 1						FAX					
Address 2						E-mail					
Address 3						Web-Site					



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
91.954 @ 532.28

Required Pressure at System Demand
68.879 @ 282.28

Required Pressure at System Demand (Including Hose Allowance at Source)
68.879 @ 532.28



Summary Of Outflowing Devices

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 4 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	400	19.60	19.60	5.6	12.250			
Sprinkler	401	19.71	19.60	5.6	12.393			
Sprinkler	402	20.12	19.60	5.6	12.910			
Sprinkler	403	20.97	19.60	5.6	14.020			
Sprinkler	404	28.69	22.40	5.6	26.240			
Sprinkler	405	29.38	22.40	5.6	27.517			
Sprinkler	406	23.46	18.60	5.6	17.545			
Sprinkler	407	23.63	18.60	5.6	17.807			
Sprinkler	408	23.83	18.60	5.6	18.107			
Sprinkler	409	24.01	18.60	5.6	18.377			
Sprinkler	410	24.25	18.60	5.6	18.756			
Sprinkler	411	24.64	18.60	5.6	19.354			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 4 -

Node	Elevation(foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	68.879	282.28
400	15'-1½	Spr(-12.250)	12.250	19.60
401	15'-1½	Spr(-12.393)	12.393	19.71
402	15'-1½	Spr(-12.910)	12.910	20.12
403	15'-1½	Spr(-14.020)	14.020	20.97
404	9'-1½	Spr(-26.240)	26.240	28.69
405	9'-1½	Spr(-27.517)	27.517	29.38
406	9'-9½	Spr(-17.545)	17.545	23.46
407	9'-9½	Spr(-17.807)	17.807	23.63
408	9'-9½	Spr(-18.107)	18.107	23.83
409	9'-9½	Spr(-18.377)	18.377	24.01
410	9'-9½	Spr(-18.756)	18.756	24.25
411	9'-9½	Spr(-19.354)	19.354	24.64
2	-6'-0	E(22'-1)	72.761	
3	-6'-0		70.646	
4	1'-4	BOR	70.646	
5	0'-0	BOR 2	66.036	
17	-6'-0	T(33'-5½)	70.646	
4000	9'-9½	PO(10'-0)	24.211	
4001	9'-1½	PO(8'-0)	47.931	
4002	9'-1½	fT(21'-6)	58.036	
4003	7'-6	PO(6'-0)	59.365	
4004	4'-0	fT(21'-1), Tr(6'-9½)	61.428	
4005	9'-9½	PO(5'-0)	19.329	
4006	9'-9½	PO(5'-0)	19.615	
4007	9'-9½	PO(5'-0)	20.654	



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - 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	1.6100	19.60	3.09	120		0.015563	9'-2	Pf 0.143
400	15'-1½	19.60	5.6	12.250		Sprinkler		Pe
401	15'-1½			12.393			9'-2	Pv
BL	1.6100	39.31	6.20	120		0.056405	9'-2	Pf 0.517
401	15'-1½	19.71	5.6	12.393		Sprinkler		Pe
402	15'-1½			12.910			9'-2	Pv
BL	1.6100	59.43	9.37	120		0.121167	9'-2	Pf 1.111
402	15'-1½	20.12	5.6	12.910		Sprinkler		Pe
403	15'-1½			14.020			9'-2	Pv
BL	1.6100	80.40	12.67	120		0.211917	21'-6	Pf 7.872
403	15'-1½	20.97	5.6	14.020		Sprinkler,	15'-8	Pe 2.318
4000	9'-9½			24.211		3E(2'-6½), PO(8'-0)	37'-2	Pv
CM	2.6350	224.22	13.19	120		0.128287	7'-7½	Pf 1.750
4000	9'-9½	143.81		24.211		Flow (q) from Route 2	6'-0½	Pe 0.279
404	9'-1½			26.240		2fEE(3'-0)	13'-7½	Pv
CM	2.6350	252.90	14.88	120		0.160291	7'-11½	Pf 1.277
404	9'-1½	28.69	5.6	26.240		Sprinkler		Pe
405	9'-1½			27.517			7'-11½	Pv
CM	2.6350	282.28	16.61	120		0.196427	81'-6½	Pf 20.414
405	9'-1½	29.38	5.6	27.517		Sprinkler,	22'-4½	Pe -0.000
4001	9'-1½			47.931		fE(5'-11), PO(16'-5½)	103'-11	Pv
CM	3.2600	282.28	10.85	120		0.069668	106'-1	Pf 10.105
4001	9'-1½			47.931			38'-11½	Pe
4002	9'-1½			58.036		fT(17'-5½), fT(21'-6)	145'-0½	Pv
CM	4.2600	282.28	6.35	120		0.018931	6'-4	Pf 0.618
4002	9'-1½			58.036			26'-4	Pe 0.711
4003	7'-6			59.365		PO(26'-4)	32'-8	Pv
CM	4.2600	266.08	5.99	120		0.016971	2'-4	Pf 0.548
4003	7'-6			59.365			29'-11½	Pe 1.515
4004	4'-0			61.428		CV(23'-2), Tr(6'-9½)	32'-3½	Pv
CM	4.2600	282.28	6.35	120		0.018931	4'-0	Pf 2.874
4004	4'-0	16.19		61.428		Flow (q) from Route 8		Pe 1.734
5	0'-0			66.036		BFP(-2.798), BOR 2	4'-0	Pv
UG	4.2200	282.28	6.48	140		0.014903	64'-2	Pf 2.003
5	0'-0			66.036			70'-3	Pe 2.606
17	-6'-0			70.646		2E(16'-8½), GV(3'-4), T(33'-5½)	134'-5	Pv
UG	6.2800	282.28	2.92	140		0.002150	790'-0	Pf 2.115
17	-6'-0			70.646			193'-10	Pe
2	-6'-0			72.761		GV(4'-8½), EE(11'-0½), LtE(14'-2), 3T(47'-3½), E(22'-1)	983'-10	Pv
UG	6.2800	282.28	2.92	140		0.002150	9'-0	Pf 0.019
2	-6'-0			72.761				Pe -3.902
1	3'-0			68.879		S	9'-0	Pv
		250.00				Hose Allowance At Source		
1		532.28						
Route 2								
AO	1.0490	23.46	8.71	120		0.174773	5'-2½	Pf 1.784
406	9'-9½	23.46	5.6	17.545		Sprinkler,	5'-0	Pe
4005	9'-9½			19.329		PO(5'-0)	10'-2½	Pv
BL	2.0670	47.29	4.52	120		0.023507	12'-2	Pf 0.286
4005	9'-9½	23.83		19.329		Flow (q) from Route 4		Pe
4006	9'-9½			19.615			12'-2	Pv
BL	2.0670	94.92	9.08	120		0.085327	12'-2	Pf 1.038
4006	9'-9½	23.63 + 24.01		19.615		Flow (q) from Route 3 and 5		Pe
4007	9'-9½			20.654			12'-2	Pv
BL	2.0670	143.81	13.75	120		0.184020	5'-10	Pf 3.557
4007	9'-9½	24.25 + 24.64		20.654		Flow (q) from Route 6 and 7	13'-6	Pe
4000	9'-9½			24.211		fE(3'-6), PO(10'-0)	19'-4	Pv
Route 3								
AO	1.0490	23.63	8.77	120		0.177181	5'-2½	Pf 1.809
407	9'-9½	23.63	5.6	17.807		Sprinkler,	5'-0	Pe
4006	9'-9½			19.615		PO(5'-0)	10'-2½	Pv
Route 4								
AO	1.0490	23.83	8.85	120		0.179945	1'-9½	Pf 1.222
408	9'-9½	23.83	5.6	18.107		Sprinkler,	5'-0	Pe
4005	9'-9½			19.329		PO(5'-0)	6'-9½	Pv



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 4 -

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream					Fittings	Total Length	
Route 5							
AO	1.0490	24.01	8.91	120	0.182418	1'-9½"	Pf 1.239
409	9'-9½"	24.01	5.6	18.377	Sprinkler,	5'-0"	Pe
4006	9'-9½"			19.615	PO(5'-0)	6'-9½"	Pv
Route 6							
AO	1.0490	24.25	9.00	120	0.185899	5'-2½"	Pf 1.898
410	9'-9½"	24.25	5.6	18.756	Sprinkler,	5'-0"	Pe
4007	9'-9½"			20.654	PO(5'-0)	10'-2½"	Pv
Route 7							
AO	1.0490	24.64	9.15	120	0.191374	1'-9½"	Pf 1.300
411	9'-9½"	24.64	5.6	19.354	Sprinkler,	5'-0"	Pe
4007	9'-9½"			20.654	PO(5'-0)	6'-9½"	Pv
Route 8							
CM	4.2600	16.19	0.36	120	0.000096	4'-5"	Pf 0.003
4008	7'-6"	16.19		59.910	Flow (q) from Route 9	30'-0½"	Pe 1.515
4004	4'-0"			61.428	fE(8'-11½"), fT(21'-1)	34'-5"	Pv
Route 9							
AO	1.3800	16.19	3.47	120	0.023159	2'-6½"	Pf 0.545
4003	7'-6"			59.365	PO(6'-0)	21'-0"	Pe
4008	7'-6"			59.910	E(3'-0), T(6'-0), PO(6'-0)	23'-6½"	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: 4352CK

Report Description: Ordinary Group II - 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	

Pipe Type Legend	Units Legend		Fittings Legend	
AO Arm-Over	Diameter	Inch	ALV Alarm Valve	
BL Branch Line	Elevation	Foot	AngV Angle Valve	
CM Cross Main	Flow	gpm	b Bushing	
DN Drain	Discharge	gpm	BaIV Ball Valve	
DR Drop	Velocity	fps	BFP Backflow Preventer	
DY Dynamic	Pressure	psi	BV Butterfly Valve	
FM Feed Main	Length	Foot	C Cross Flow Turn 90°	
FR Feed Riser	Friction Loss	psi/Foot	cplg Coupling	
MS Miscellaneous	HWC	Hazen-Williams Constant	Cr Cross Run	
OR Outrigger	Pt	Total pressure at a point in a pipe	CV Check Valve	
RN Riser Nipple	Pn	Normal pressure at a point in a pipe	DeIV Deluge Valve	
SN Swing Nipple	Pf	Pressure loss due to friction between points	DPV Dry Pipe Valve	
SP Sprig	Pe	Pressure due to elevation difference between indicated points	E 90° Elbow	
ST Stand Pipe	Pv	Velocity pressure at a point in a pipe	EE 45° Elbow	
UG Underground			Ee1 11¼° Elbow	
			Ee2 22½° Elbow	
			f Flow Device	
			fd Flex Drop	
			FDC Fire Department Connection	
			fE 90° FireLock(TM) Elbow	
			fEE 45° FireLock(TM) Elbow	
			flg Flange	
			FN Floating Node	
			fT FireLock(TM) Tee	
			g Gauge	
			GloV Globe Valve	
			GV Gate Valve	
			Ho Hose	
			Hose Hose	
			HV Hose Valve	
			Hyd Hydrant	
			LtE Long Turn Elbow	
			mecT Mechanical Tee	
			Noz Nozzle	
			P1 Pump In	
			P2 Pump Out	
			PIV Post Indicating Valve	
			PO Pipe Outlet	
			PrV Pressure Relief Valve	
			PRV Pressure Reducing Valve	
			red Reducer/Adapter	
			S Supply	
			sCV Swing Check Valve	
			SFx Seismic Flex	
			Spr Sprinkler	
			St Strainer	
			T Tee Flow Turn 90°	
			Tr Tee Run	
			U Union	
			WirF Wirsbo	
			WMV Water Meter Valve	
			Z Cap	



Hydraulic Overview

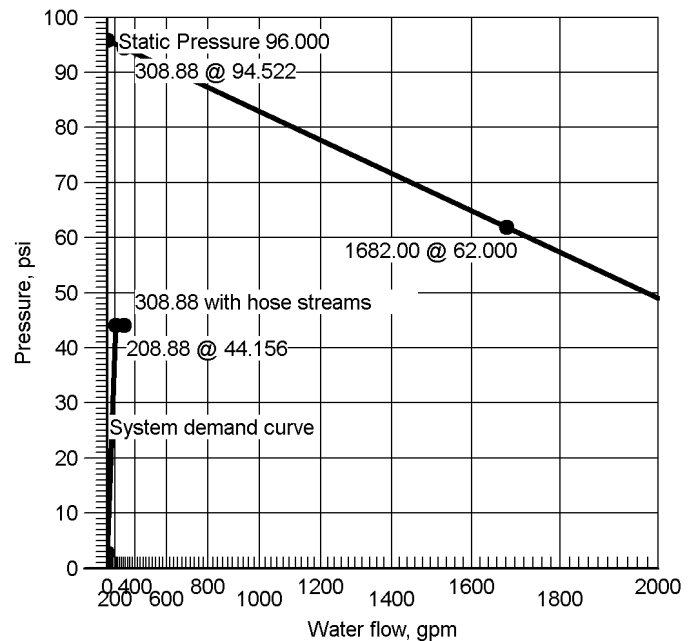
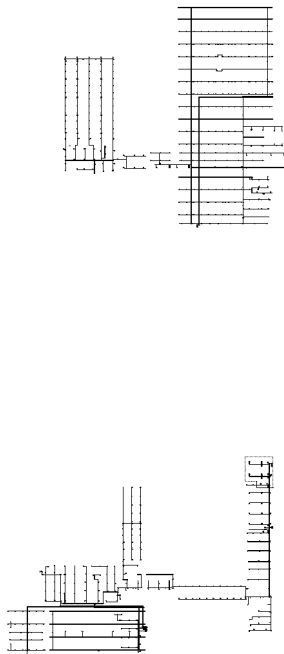
Job Number: 4352CK
Report Description: Light Hazard - AREA 5 -

Job		
Job Number 4352CK	Designer	
Job Name: MCC AUTO SHOP	Phone	FAX
Address 1 500 SW LONGVIEW RD	State Certification/License Number	
Address 2 LEE'S SUMMIT, MO 64081	AHJ	
Address 3	Job Site/Building	

System		
Density 0.10gpm/ft ²	Area of Application 1500ft ² (Actual 1058ft ²)	
Most Demanding Sprinkler Data 5.6 K-Factor 22.50 at 16.143	Hose Streams 100.00	
Coverage Per Sprinkler 225ft ²	Number Of Sprinklers Calculated 8	Number Of Nozzles Calculated 0
System Pressure Demand 44.156	System Flow Demand 208.88	
Total Demand 308.88 @ 44.156	Pressure Result +50.365 (53.3%)	

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	1682.00	100.00	96.000	62.000	BOR (4)	46.835	0	0.00
						BOR 2 (5)	43.081	31.82	208.88

4352CK MCC AUTO SHOP.cad Supply at Node 1 (1682.00, 250.00, 96.000, 62.000)





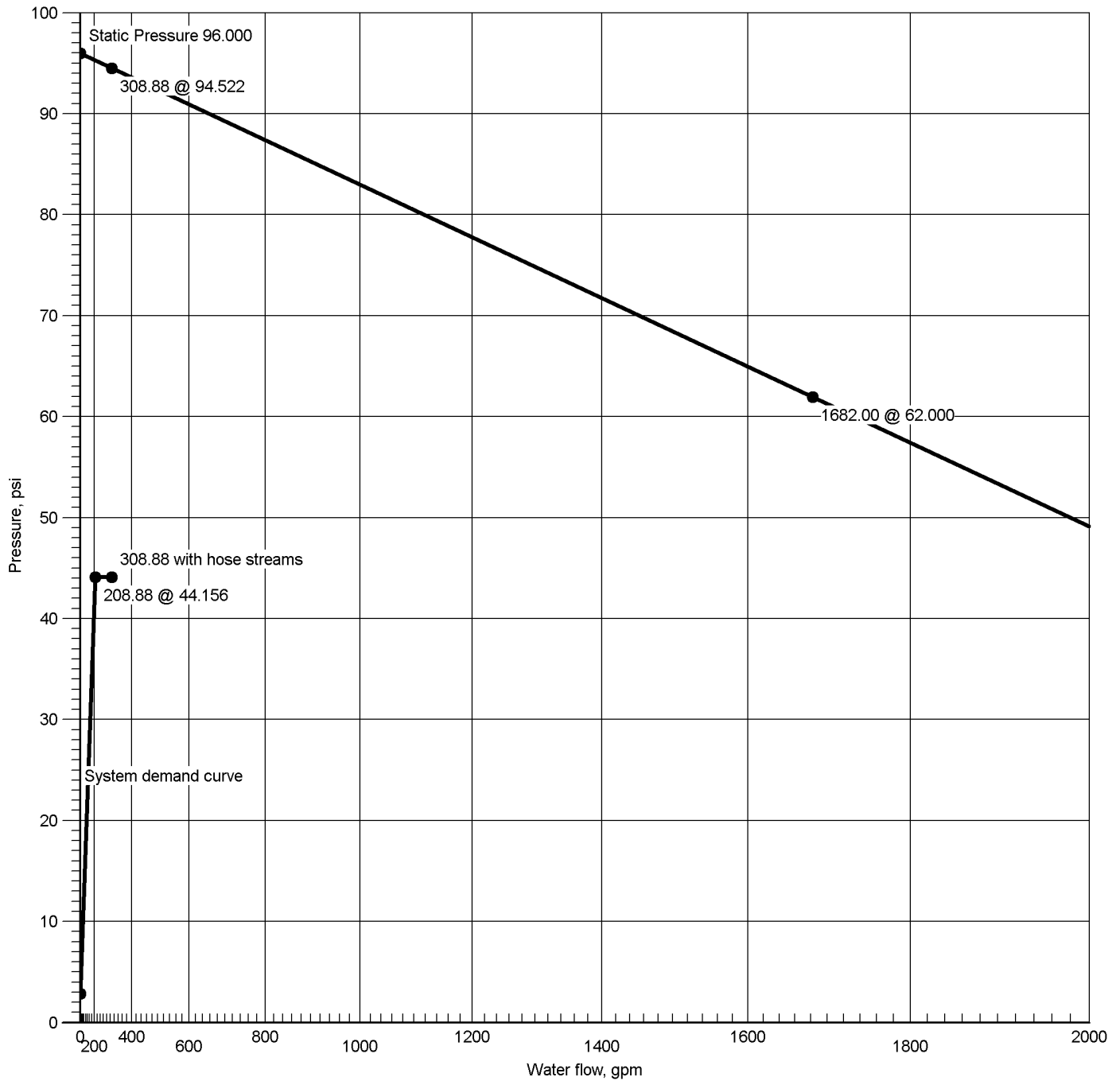
Hydraulic Summary

Job Number: 4352CK
Report Description: Light Hazard - AREA 5 -

Job											
Job Number 4352CK				Designer							
Job Name: MCC AUTO SHOP				State Certification/License Number							
Address 1 500 SW LONGVIEW RD				AHJ							
Address 2 LEE'S SUMMIT, MO 64081				Job Site/Building							
Address 3				Drawing Name 4352CK MCC AUTO SHOP.cad							
System				Remote Area(s)							
Most Demanding Sprinkler Data 5.6 K-Factor 22.50 at 16.143				Occupancy Light Hazard - AREA 5 -			Job Suffix				
Hose Allowance At Source 100.00				Density 0.10gpm/ft ²			Area of Application 1500ft ² (Actual 1058ft ²)				
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>				Number Of Sprinklers Calculated 8		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 225ft ²			
				AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area							
Total Hose Streams 100.00											
System Flow Demand 208.88		Total Water Required (Including Hose Allowance) 308.88									
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 17.21 between nodes 5003 and 5006											
Maximum Velocity Under Ground 4.79 between nodes 17 and 5											
Volume capacity of Wet Pipes 3912.97gal		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	Water Supply	100.00	96.000	62.000		1682.00	94.522		308.88	44.156	50.365
Contractor											
Contractor Number		Contact Name				Contact Title					
Name of Contractor:				Phone				Extension			
Address 1				FAX							
Address 2				E-mail							
Address 3				Web-Site							



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
94.522 @ 308.88

Required Pressure at System Demand
44.156 @ 208.88

Required Pressure at System Demand (Including Hose Allowance at Source)
44.156 @ 308.88



Summary Of Outflowing Devices

Job Number: 4352CK
Report Description: Light Hazard - AREA 5 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	500	22.50	22.50	5.6	16.143			
Sprinkler	501	22.60	22.50	5.6	16.288			
Sprinkler	502	23.66	22.50	5.6	17.845			
Sprinkler	503	23.76	22.50	5.6	18.004			
Sprinkler	504	29.57	22.50	5.6	27.878			
Sprinkler	505	29.68	22.50	5.6	28.098			
Sprinkler	506	27.96	19.50	5.6	24.925			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK

Report Description: Light Hazard - AREA 5 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	44.156	208.88
500	8'-6	Spr(-16.143), fd	16.143	22.50
501	8'-6	Spr(-16.288), fd	16.288	22.60
502	8'-6	Spr(-17.845), fd	17.845	23.66
503	8'-6	Spr(-18.004), fd	18.004	23.76
504	8'-6	Spr(-27.878), fd	27.878	29.57
505	8'-6	Spr(-28.098), fd	28.098	29.68
506	9'-7½	Spr(-24.925)	24.925	27.96
507	9'-7½	Spr(-27.102)	27.102	29.15
2	-6'-0	E(22'-1)	48.047	
3	-6'-0		46.835	
4	1'-4	BOR	46.835	
5	0'-0	BOR 2	43.081	
17	-6'-0	T(33'-5½)	46.835	
4003	7'-6	PO(6'-0)	37.400	
4004	4'-0	fT(21'-1), Tr(6'-9½)	39.228	
4008	7'-6	PO(6'-0)	37.712	
5000	10'-2½	T(5'-0)	17.992	
5001	9'-1½	PO(5'-0)	28.947	
5002	9'-1½	PO(5'-0)	29.174	
5003	9'-1½	PO(5'-0)	29.200	
5004	9'-1½	PO(6'-0)	29.820	
5005	9'-1½	fT(21'-1), Tr(6'-9½)	36.080	
5006	10'-2½	T(5'-0)	18.158	
5007	9'-1½	PO(5'-0)	28.944	



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 5 -

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								
AO	1.0490	22.50	8.35	120		0.161813	14'-0"	Pf 2.589
500	8'-6"	22.50	5.6	16.143		Sprinkler,	2'-0"	Pe -0.741
5000	10'-2½"			17.992		E(2'-0"), fd	16'-0"	Pv
AO	1.0490	46.16	17.13	120		0.611362	10'-2"	Pf 10.490
5000	10'-2½"	23.66		17.992		Flow (q) from Route 3	7'-0"	Pe 0.466
5001	9'-1½"			28.947		E(2'-0"), PO(5'-0)	17'-2"	Pv
CM	2.6350	75.72	4.46	120		0.017220	13'-2"	Pf 0.227
5001	9'-1½"	29.57		28.947		Flow (q) from Route 5		Pe
5002	9'-1½"			29.174			13'-2"	Pv
CM	2.6350	105.41	6.20	120		0.031752	0'-10"	Pf 0.026
5002	9'-1½"	29.68		29.174		Flow (q) from Route 6		Pe
5003	9'-1½"			29.200			0'-10"	Pv
CM	2.6350	151.77	8.93	120		0.062322	9'-11½"	Pf 0.620
5003	9'-1½"	46.36		29.200		Flow (q) from Route 2		Pe
5004	9'-1½"			29.820			9'-11½"	Pv
CM	2.6350	208.88	12.29	120		0.112529	48'-10"	Pf 6.260
5004	9'-1½"	57.11		29.820		Flow (q) from Route 7	6'-9½"	Pe
5005	9'-1½"			36.080		Tr(6'-9½")	55'-7½"	Pv
CM	4.2600	208.88	4.70	120		0.010845	8'-8½"	Pf 0.609
5005	9'-1½"			36.080			47'-5"	Pe 0.711
4003	7'-6"			37.400		ft(21'-6"), PO(26'-4)	56'-1½"	Pv
CM	4.2600	196.90	4.43	120		0.009722	2'-4"	Pf 0.314
4003	7'-6"			37.400			29'-11½"	Pe 1.515
4004	4'-0"			39.228		CV(23'-2"), Tr(6'-9½")	32'-3½"	Pv
CM	4.2600	208.88	4.70	120		0.010845	4'-0"	Pf 2.118
4004	4'-0"	11.98		39.228		Flow (q) from Route 8		Pe 1.734
5	0'-0"			43.081		BFP(-2.075), BOR 2	4'-0"	Pv
UG	4.2200	208.88	4.79	140		0.008538	64'-2"	Pf 1.148
5	0'-0"			43.081			70'-3"	Pe 2.606
17	-6'-0"			46.835		2E(16'-8½"), GV(3'-4"), T(33'-5½")	134'-5"	Pv
UG	6.2800	208.88	2.16	140		0.001232	790'-0"	Pf 1.212
17	-6'-0"			46.835			193'-10"	Pe
2	-6'-0"			48.047		GV(4'-8½"), EE(11'-0½"), LtE(14'-2), 3T(47'-3½"), E(22'-1)	983'-10"	Pv
UG	6.2800	208.88	2.16	140		0.001232	9'-0"	Pf 0.011
2	-6'-0"			48.047				Pe -3.902
1	3'-0"			44.156		S	9'-0"	Pv
		100.00				Hose Allowance At Source		
1		308.88						
Route 2								
AO	1.0490	22.60	8.39	120		0.163157	14'-0"	Pf 2.611
501	8'-6"	22.60	5.6	16.288		Sprinkler,	2'-0"	Pe -0.741
5006	10'-2½"			18.158		E(2'-0"), fd	16'-0"	Pv
AO	1.0490	46.36	17.21	120		0.616419	10'-2"	Pf 10.576
5006	10'-2½"	23.76		18.158		Flow (q) from Route 4	7'-0"	Pe 0.466
5003	9'-1½"			29.200		E(2'-0"), PO(5'-0)	17'-2"	Pv
Route 3								
DY	1.0490	23.66	8.78	120		0.177528	0'-0"	Pf 0.888
502	8'-6"	23.66	5.6	17.845		Sprinkler,	5'-0"	Pe -0.741
5000	10'-2½"			17.992		T(5'-0"), fd	5'-0"	Pv
Route 4								
DY	1.0490	23.76	8.82	120		0.178992	0'-0"	Pf 0.895
503	8'-6"	23.76	5.6	18.004		Sprinkler,	5'-0"	Pe -0.741
5006	10'-2½"			18.158		T(5'-0"), fd	5'-0"	Pv
Route 5								
DY	1.0490	29.57	10.98	120		0.268222	0'-0"	Pf 1.341
504	8'-6"	29.57	5.6	27.878		Sprinkler,	5'-0"	Pe -0.275
5007	9'-1½"			28.944		PO(5'-0), fd	5'-0"	Pv
CM	2.6350	29.57	1.74	120		0.003023	0'-10"	Pf 0.003
5007	9'-1½"			28.944				Pe
5001	9'-1½"			28.947			0'-10"	Pv
Route 6								
DY	1.0490	29.68	11.02	120		0.270174	0'-0"	Pf 1.351
505	8'-6"	29.68	5.6	28.098		Sprinkler,	5'-0"	Pe -0.275
5002	9'-1½"			29.174		PO(5'-0), fd	5'-0"	Pv
Route 7								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 5 -

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream					Fittings	Total Length	
AO	1.0490	27.96	10.38	120	0.241831	9'-0	Pf 2.176
506	9'-7½	27.96	5.6	24.925	Sprinkler		Pe
507	9'-7½			27.102		9'-0	Pv
AO	1.3800	57.11	12.25	120	0.238438	1'-6	Pf 2.502
507	9'-7½	29.15	5.6	27.102	Sprinkler,	9'-0	Pe 0.217
5004	9'-1½			29.820	E(3'-0), PO(6'-0)	10'-6	Pv

Route 8

CM	4.2600	11.98	0.27	120	0.000055	4'-5	Pf 0.002
4008	7'-6	11.98		37.712	Flow (q) from Route 9	30'-0½	Pe 1.515
4004	4'-0			39.228	fE(8'-11½), fT(21'-1)	34'-5	Pv

Route 9

AO	1.3800	11.98	2.57	120	0.013268	2'-6½	Pf 0.312
4003	7'-6			37.400	PO(6'-0)	21'-0	Pe
4008	7'-6			37.712	E(3'-0), T(6'-0), PO(6'-0)	23'-6½	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

Pipe Type Legend		Units Legend		Fittings Legend	
AO	Arm-Over	Diameter	Inch	ALV	Alarm Valve
BL	Branch Line	Elevation	Foot	AngV	Angle Valve
CM	Cross Main	Flow	gpm	b	Bushing
DN	Drain	Discharge	gpm	BaIV	Ball Valve
DR	Drop	Velocity	fps	BFP	Backflow Preventer
DY	Dynamic	Pressure	psi	BV	Butterfly Valve
FM	Feed Main	Length	Foot	C	Cross Flow Turn 90°
FR	Feed Riser	Friction Loss	psi/Foot	cplg	Coupling
MS	Miscellaneous	HWC	Hazen-Williams Constant	Cr	Cross Run
OR	Outrigger	Pt	Total pressure at a point in a pipe	CV	Check Valve
RN	Riser Nipple	Pn	Normal pressure at a point in a pipe	DeIV	Deluge Valve
SN	Swing Nipple	Pf	Pressure loss due to friction between points	DPV	Dry Pipe Valve
SP	Sprig	Pe	Pressure due to elevation difference between indicated points	E	90° Elbow
ST	Stand Pipe	Pv	Velocity pressure at a point in a pipe	EE	45° Elbow
UG	Underground			Ee1	11¼° Elbow
				Ee2	22½° Elbow
				f	Flow Device
				fd	Flex Drop
				FDC	Fire Department Connection
				fE	90° FireLock(TM) Elbow
				fEE	45° FireLock(TM) Elbow
				flg	Flange
				FN	Floating Node
				fT	FireLock(TM) Tee
				g	Gauge
				GloV	Globe Valve
				GV	Gate Valve
				Ho	Hose
				Hose	Hose
				HV	Hose Valve
				Hyd	Hydrant
				LtE	Long Turn Elbow
				mecT	Mechanical Tee
				Noz	Nozzle
				P1	Pump In
				P2	Pump Out
				PIV	Post Indicating Valve
				PO	Pipe Outlet
				PrV	Pressure Relief Valve
				PRV	Pressure Reducing Valve
				red	Reducer/Adapter
				S	Supply
				sCV	Swing Check Valve
				SFx	Seismic Flex
				Spr	Sprinkler
				St	Strainer
				T	Tee Flow Turn 90°
				Tr	Tee Run
				U	Union
				WirF	Wirsbo
				WMV	Water Meter Valve
				Z	Cap



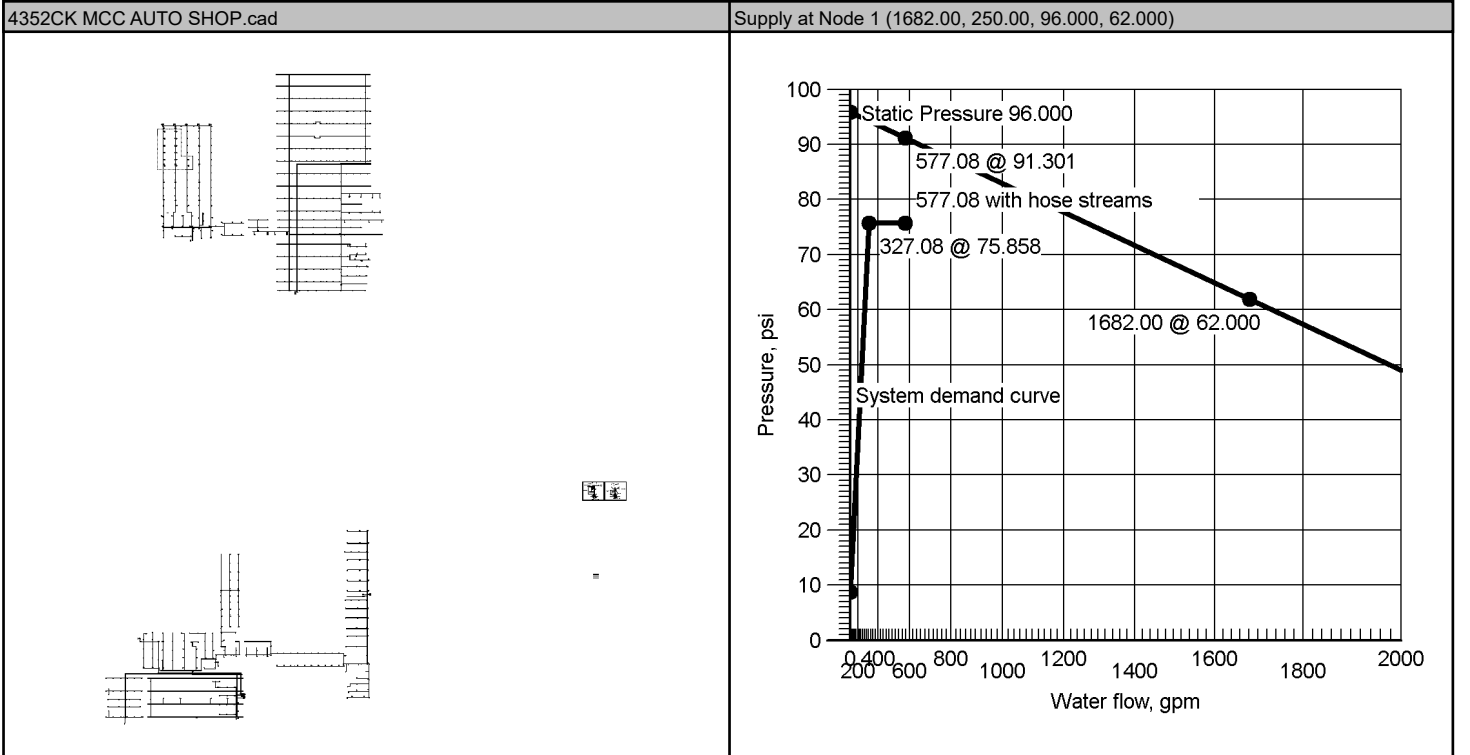
Hydraulic Overview

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 6 -

Job		
Job Number 4352CK	Designer	
Job Name: MCC AUTO SHOP	Phone	FAX
Address 1 500 SW LONGVIEW RD	State Certification/License Number	
Address 2 LEE'S SUMMIT, MO 64081	AHJ	
Address 3	Job Site/Building	

System		
Density 0.20gpm/ft ²	Area of Application 1500ft ² (Actual 1517ft ²)	
Most Demanding Sprinkler Data 5.6 K-Factor 22.59 at 16.279	Hose Streams 250.00	
Coverage Per Sprinkler 113ft ²	Number Of Sprinklers Calculated 14	Number Of Nozzles Calculated 0
System Pressure Demand 75.858	System Flow Demand 327.08	
Total Demand 577.08 @ 75.858	Pressure Result +15.443 (16.9%)	

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	1682.00	250.00	96.000	62.000	BOR (4)	68.456	39.53	327.08
						BOR 2 (5)	76.957	0	0.00





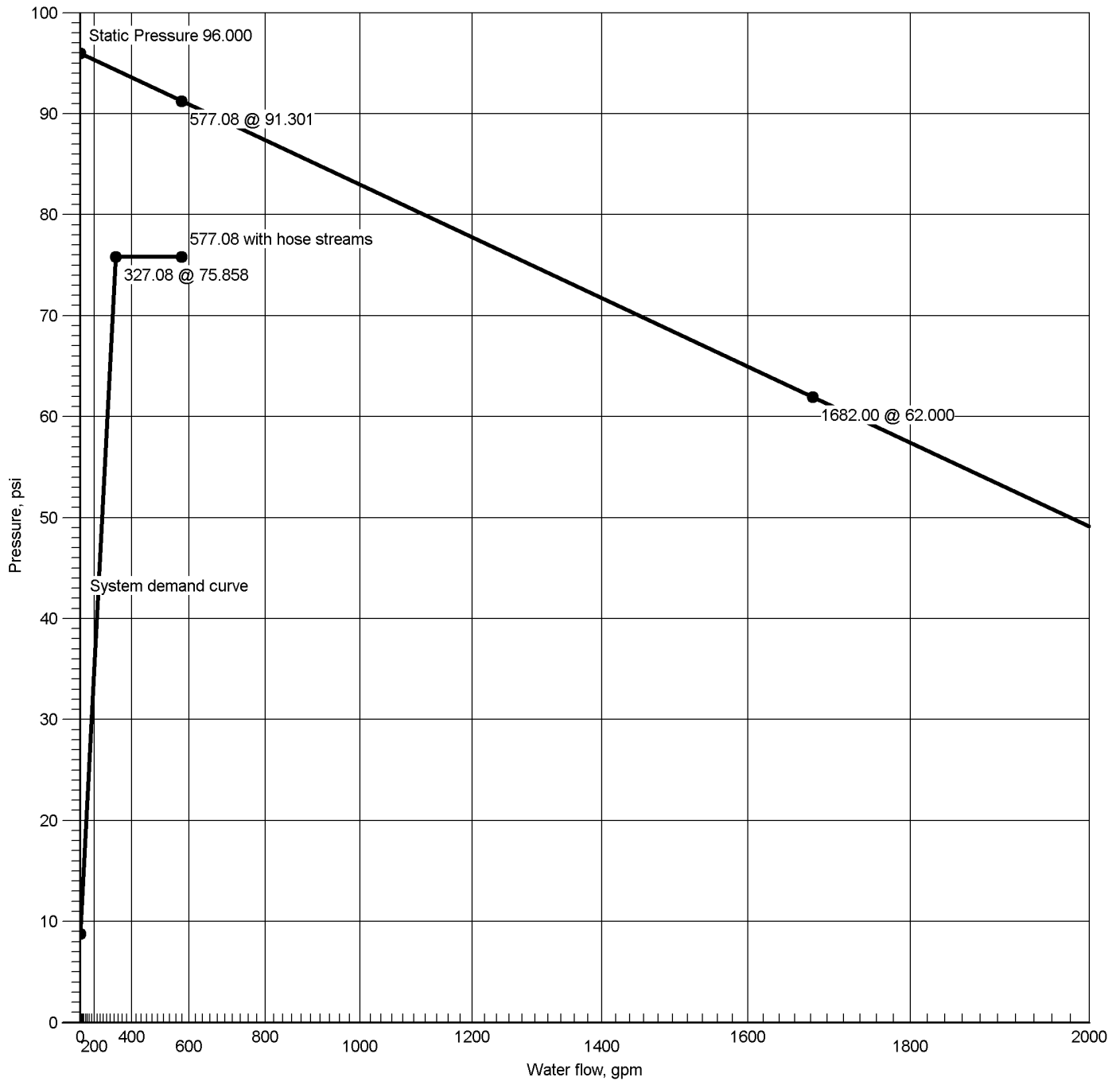
Hydraulic Summary

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 6 -

Job											
Job Number 4352CK					Designer						
Job Name: MCC AUTO SHOP					State Certification/License Number						
Address 1 500 SW LONGVIEW RD					AHJ						
Address 2 LEE'S SUMMIT, MO 64081					Job Site/Building						
Address 3					Drawing Name 4352CK MCC AUTO SHOP.cad						
System					Remote Area(s)						
Most Demanding Sprinkler Data 5.6 K-Factor 22.59 at 16.279					Occupancy Ordinary Group II - AREA 6 -			Job Suffix			
Hose Allowance At Source 250.00					Density 0.20gpm/ft²			Area of Application 1500ft² (Actual 1517ft²)			
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>					Number Of Sprinklers Calculated 14		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 113ft²		
					AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area						
					Left: 75.496 Right: 76.214						
Total Hose Streams 250.00											
System Flow Demand 327.08		Total Water Required (Including Hose Allowance) 577.08									
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 19.24 between nodes 6004 and 6003											
Maximum Velocity Under Ground 7.50 between nodes 3 and 4											
Volume capacity of Wet Pipes 3912.97gal		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	Water Supply	250.00	96.000	62.000		1682.00	91.301		577.08	75.858	15.443
Contractor											
Contractor Number		Contact Name				Contact Title					
Name of Contractor:		Phone				Extension					
Address 1		FAX									
Address 2		E-mail									
Address 3		Web-Site									



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
91.301 @ 577.08

Required Pressure at System Demand
75.858 @ 327.08

Required Pressure at System Demand (Including Hose Allowance at Source)
75.858 @ 577.08



Summary Of Outflowing Devices

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 6 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	600	22.59	22.59	5.6	16.279			
Sprinkler	601	22.61	22.59	5.6	16.305			
Sprinkler	602	22.82	22.59	5.6	16.600			
Sprinkler	603	23.31	22.59	5.6	17.322			
Sprinkler	604	22.64	22.59	5.6	16.350			
Sprinkler	605	22.93	22.59	5.6	16.762			
Sprinkler	606	22.81	22.59	5.6	16.589			
Sprinkler	607	22.87	22.59	5.6	16.678			
Sprinkler	608	23.18	22.59	5.6	17.134			
Sprinkler	609	22.82	22.59	5.6	16.606			
Sprinkler	610	23.01	22.59	5.6	16.877			
Sprinkler	611	23.47	22.59	5.6	17.567			
Sprinkler	612	25.88	22.59	5.6	21.356			
Sprinkler	613	26.14	22.59	5.6	21.793			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 6 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	75.858	327.08
600	23'-4½	Spr(-16.279)	16.279	22.59
601	23'-4½	Spr(-16.305)	16.305	22.61
602	23'-4½	Spr(-16.600)	16.600	22.82
603	23'-4½	Spr(-17.322)	17.322	23.31
604	23'-4½	Spr(-16.350)	16.350	22.64
605	23'-4½	Spr(-16.762)	16.762	22.93
606	23'-4½	Spr(-16.589)	16.589	22.81
607	23'-4½	Spr(-16.678)	16.678	22.87
608	23'-4½	Spr(-17.134)	17.134	23.18
609	23'-4½	Spr(-16.606)	16.606	22.82
610	23'-4½	Spr(-16.877)	16.877	23.01
611	23'-4½	Spr(-17.567)	17.567	23.47
612	23'-4½	Spr(-21.356)	21.356	25.88
613	23'-4½	Spr(-21.793)	21.793	26.14
2	-6'-0	E(22'-1)	79.735	
3	-6'-0		75.779	
4	1'-4	BOR	68.456	
5	0'-0	BOR 2	76.957	
6000	23'-4½	PO(8'-0)	33.883	
6001	23'-4½	PO(8'-0)	34.084	
6002	23'-4½	PO(8'-0)	35.415	
6003	23'-4½	fT(14'-10)	37.387	
6004	20'-9	PO(16'-5½)	50.428	
6005	23'-4½	PO(8'-0)	18.522	
6006	23'-4½	PO(8'-0)	19.025	
6007	23'-4½	PO(8'-0)	20.904	
6008	23'-4½	PO(10'-0)	23.443	
6009	23'-4½	PO(8'-0)	36.655	
6010	23'-4½	PO(8'-0)	36.536	
6011	23'-4½	PO(10'-0)	24.391	



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 6 -

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	1.6100	8.29	1.31	120		0.003164	8'-2	Pf 0.026
600	23'-4½	22.59	5.6	16.279		Sprinkler		Pe
601	23'-4½			16.305			8'-2	Pv
BL	1.6100	30.90	4.87	120		0.036122	8'-2	Pf 0.296
601	23'-4½	22.61	5.6	16.305		Sprinkler		Pe
602	23'-4½			16.600			8'-2	Pv
BL	1.6100	53.71	8.46	120		0.100478	7'-2	Pf 0.722
602	23'-4½	22.82	5.6	16.600		Sprinkler		Pe
603	23'-4½			17.322			7'-2	Pv
BL	1.6100	77.02	12.14	120		0.195721	71'-6	Pf 16.561
603	23'-4½	23.31	5.6	17.322		Sprinkler,	13'-1	Pe
6000	23'-4½			33.883		2E(2'-6½), PO(8'-0)	84'-7½	Pv
CM	2.6350	77.02	4.53	120		0.017770	11'-3½	Pf 0.201
6000	23'-4½			33.883				Pe
6001	23'-4½			34.084			11'-3½	Pv
CM	2.6350	152.94	9.00	120		0.063214	21'-0½	Pf 1.330
6001	23'-4½	75.92		34.084		Flow (q) from Route 4		Pe
6002	23'-4½			35.415			21'-0½	Pv
CM	2.6350	220.05	12.95	120		0.123914	1'-1	Pf 1.972
6002	23'-4½	67.11		35.415		Flow (q) from Route 5	14'-10	Pe
6003	23'-4½			37.387		FT(14'-10)	15'-11	Pv
CM	2.6350	327.08	19.24	120		0.257963	17'-10½	Pf 11.904
6003	23'-4½	107.03		37.387		Flow (q) from Route 2	28'-3½	Pe
6004	20'-9			50.428		2fE(5'-11), PO(16'-5½)	46'-1½	Pv
FR	4.2600	327.08	7.36	120		0.024862	105'-3	Pf 9.608
6004	20'-9			50.428			150'-7½	Pe 8.420
4	1'-4			68.456		FT(21'-1), 6fE(8'-11½), CV(23'-2), 2PO(26'-4), BFP(-3.247), BOR	255'-10	Pv
UG	4.2200	327.08	7.50	140		0.019572	164'-9	Pf 4.141
4	1'-4			68.456			46'-10	Pe 3.182
3	-6'-0			75.779		2E(16'-8½), 2EE(6'-8½)	211'-7	Pv
UG	6.2800	327.08	3.39	140		0.002824	1148'-8	Pf 3.956
3	-6'-0			75.779			252'-1½	Pe
2	-6'-0			79.735		4GV(4'-8½), 2E(22'-1), 3EE(11'-0½), LtE(14'-2), 3T(47'-3½)	1400'-9½	Pv
UG	6.2800	327.08	3.39	140		0.002824	9'-0	Pf 0.025
2	-6'-0			79.735				Pe -3.902
1	3'-0			75.858		S	9'-0	Pv
		250.00				Hose Allowance At Source		
1		577.08						
Route 2								
BL	1.6100	14.31	2.26	120		0.008696	8'-2	Pf 0.071
600	23'-4½	22.59	5.6	16.279		Sprinkler		Pe
604	23'-4½			16.350			8'-2	Pv
BL	1.6100	36.95	5.82	120		0.050300	8'-2	Pf 0.412
604	23'-4½	22.64	5.6	16.350		Sprinkler		Pe
605	23'-4½			16.762			8'-2	Pv
BL	1.6100	59.88	9.44	120		0.122853	6'-4	Pf 1.760
605	23'-4½	22.93	5.6	16.762		Sprinkler,	8'-0	Pe
6005	23'-4½			18.522		PO(8'-0)	14'-4	Pv
BL	2.0670	59.88	5.73	120		0.036385	13'-10	Pf 0.503
6005	23'-4½			18.522				Pe
6006	23'-4½			19.025			13'-10	Pv
BL	2.0670	122.12	11.68	120		0.135982	13'-10	Pf 1.880
6006	23'-4½	62.24		19.025		Flow (q) from Route 3		Pe
6007	23'-4½			20.904			13'-10	Pv
BL	2.0670	107.03	10.23	120		0.106540	13'-10	Pf 2.538
6007	23'-4½			20.904			10'-0	Pe
6008	23'-4½			23.443		PO(10'-0)	23'-10	Pv
BL	1.6100	55.03	8.67	120		0.105070	117'-9	Pf 13.213
6008	23'-4½			23.443			8'-0	Pe
6009	23'-4½			36.655		PO(8'-0)	125'-9	Pv
CM	2.6350	107.03	6.30	120		0.032660	7'-7	Pf 0.731
6009	23'-4½	52.00		36.655		Flow (q) from Route 6	14'-10	Pe
6003	23'-4½			37.387		FT(14'-10)	22'-5	Pv
Route 3								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 6 -

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	1.6100	16.19	2.55	120	0.010923	8'-2	Pf 0.089
606	23'-4½	22.81	5.6	16.589	Sprinkler	8'-2	Pe
607	23'-4½			16.678			Pv
BL	1.6100	39.06	6.16	120	0.055724	8'-2	Pf 0.456
607	23'-4½	22.87	5.6	16.678	Sprinkler	8'-2	Pe
608	23'-4½			17.134			Pv
BL	1.6100	62.24	9.81	120	0.131947	6'-4	Pf 1.890
608	23'-4½	23.18	5.6	17.134	Sprinkler,	8'-0	Pe
6006	23'-4½			19.025	PO(8'-0)	14'-4	Pv
Route 4							
BL	1.6100	6.62	1.04	120	0.002091	8'-2	Pf 0.017
606	23'-4½	22.81	5.6	16.589	Sprinkler	8'-2	Pe
609	23'-4½			16.606			Pv
BL	1.6100	29.44	4.64	120	0.033038	8'-2	Pf 0.270
609	23'-4½	22.82	5.6	16.606	Sprinkler	8'-2	Pe
610	23'-4½			16.877			Pv
BL	1.6100	52.45	8.27	120	0.096141	7'-2	Pf 0.690
610	23'-4½	23.01	5.6	16.877	Sprinkler	7'-2	Pe
611	23'-4½			17.567			Pv
BL	1.6100	75.92	11.96	120	0.190574	73'-7	Pf 16.517
611	23'-4½	23.47	5.6	17.567	Sprinkler,	13'-1	Pe
6001	23'-4½			34.084	2E(2'-6½), PO(8'-0)	86'-8	Pv
Route 5							
BL	1.6100	40.97	6.46	120	0.060875	7'-2	Pf 0.437
612	23'-4½	25.88	5.6	21.356	Sprinkler	7'-2	Pe
613	23'-4½			21.793			Pv
BL	1.6100	67.11	10.58	120	0.151696	76'-8½	Pf 13.622
613	23'-4½	26.14	5.6	21.793	Sprinkler,	13'-1	Pe
6002	23'-4½			35.415	2E(2'-6½), PO(8'-0)	89'-9½	Pv
Route 6							
CM	2.6350	52.00	3.06	120	0.008591	13'-10	Pf 0.119
6010	23'-4½	52.00		36.536	Flow (q) from Route 7	13'-10	Pe
6009	23'-4½			36.655			Pv
Route 7							
BL	2.0670	52.00	4.97	120	0.028026	13'-10	Pf 0.948
6008	23'-4½			23.443	PO(10'-0)	20'-0	Pe
6011	23'-4½			24.391	PO(10'-0)	33'-10	Pv
BL	1.6100	52.00	8.19	120	0.094630	117'-9	Pf 12.146
6011	23'-4½			24.391		10'-7	Pe
6010	23'-4½			36.536	Tr(2'-7), PO(8'-0)	128'-4	Pv
Route 8							
BL	1.6100	15.09	2.38	120	0.009593	39'-0½	Pf 0.451
6007	23'-4½			20.904	PO(8'-0)	8'-0	Pe
612	23'-4½			21.356		47'-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: 4352CK

Report Description: Ordinary Group II - AREA 6 -

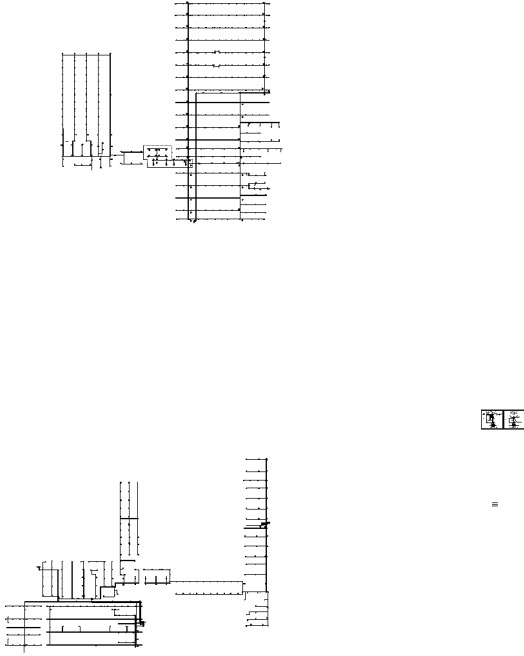
Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss		Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

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	BaIV Ball Valve	
DR Drop	Velocity	fps	BFP Backflow Preventer	
DY Dynamic	Pressure	psi	BV Butterfly Valve	
FM Feed Main	Length	Foot	C Cross Flow Turn 90°	
FR Feed Riser	Friction Loss	psi/Foot	cplg Coupling	
MS Miscellaneous	HWC	Hazen-Williams Constant	Cr Cross Run	
OR Outrigger	Pt	Total pressure at a point in a pipe	CV Check Valve	
RN Riser Nipple	Pn	Normal pressure at a point in a pipe	DeIV Deluge Valve	
SN Swing Nipple	Pf	Pressure loss due to friction between points	DPV Dry Pipe Valve	
SP Sprig	Pe	Pressure due to elevation difference between indicated points	E 90° Elbow	
ST Stand Pipe	Pv	Velocity pressure at a point in a pipe	EE 45° Elbow	
UG Underground			Ee1 11¼° Elbow	
			Ee2 22½° Elbow	
			f Flow Device	
			fd Flex Drop	
			FDC Fire Department Connection	
			fE 90° FireLock(TM) Elbow	
			fEE 45° FireLock(TM) Elbow	
			flg Flange	
			FN Floating Node	
			fT FireLock(TM) Tee	
			g Gauge	
			GloV Globe Valve	
			GV Gate Valve	
			Ho Hose	
			Hose Hose	
			HV Hose Valve	
			Hyd Hydrant	
			LtE Long Turn Elbow	
			mecT Mechanical Tee	
			Noz Nozzle	
			P1 Pump In	
			P2 Pump Out	
			PIV Post Indicating Valve	
			PO Pipe Outlet	
			PRV Pressure 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	



Hydraulic Overview

Job Number: 4352CK
Report Description: Light Hazard - AREA 7 -

Job									
Job Number 4352CK					Designer				
Job Name: MCC AUTO SHOP					Phone			FAX	
Address 1 500 SW LONGVIEW RD					State Certification/License Number				
Address 2 LEE'S SUMMIT, MO 64081					AHJ				
Address 3					Job Site/Building				
System									
Density 0.10gpm/ft ²					Area of Application 1500ft ² (Actual 1000ft ²)				
Most Demanding Sprinkler Data 5.6 K-Factor 14.82 at 7.000					Hose Streams 100.00				
Coverage Per Sprinkler 225ft ²					Number Of Sprinklers Calculated 10			Number Of Nozzles Calculated 0	
System Pressure Demand 47.529					System Flow Demand 194.79				
Total Demand 294.79 @ 47.529					Pressure Result +47.115 (49.8%)				
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	1682.00	100.00	96.000	62.000	BOR (4)	50.356	0	0.00
						BOR 2 (5)	46.741	28.49	194.79
4352CK MCC AUTO SHOP.cad						Supply at Node 1 (1682.00, 250.00, 96.000, 62.000)			
									



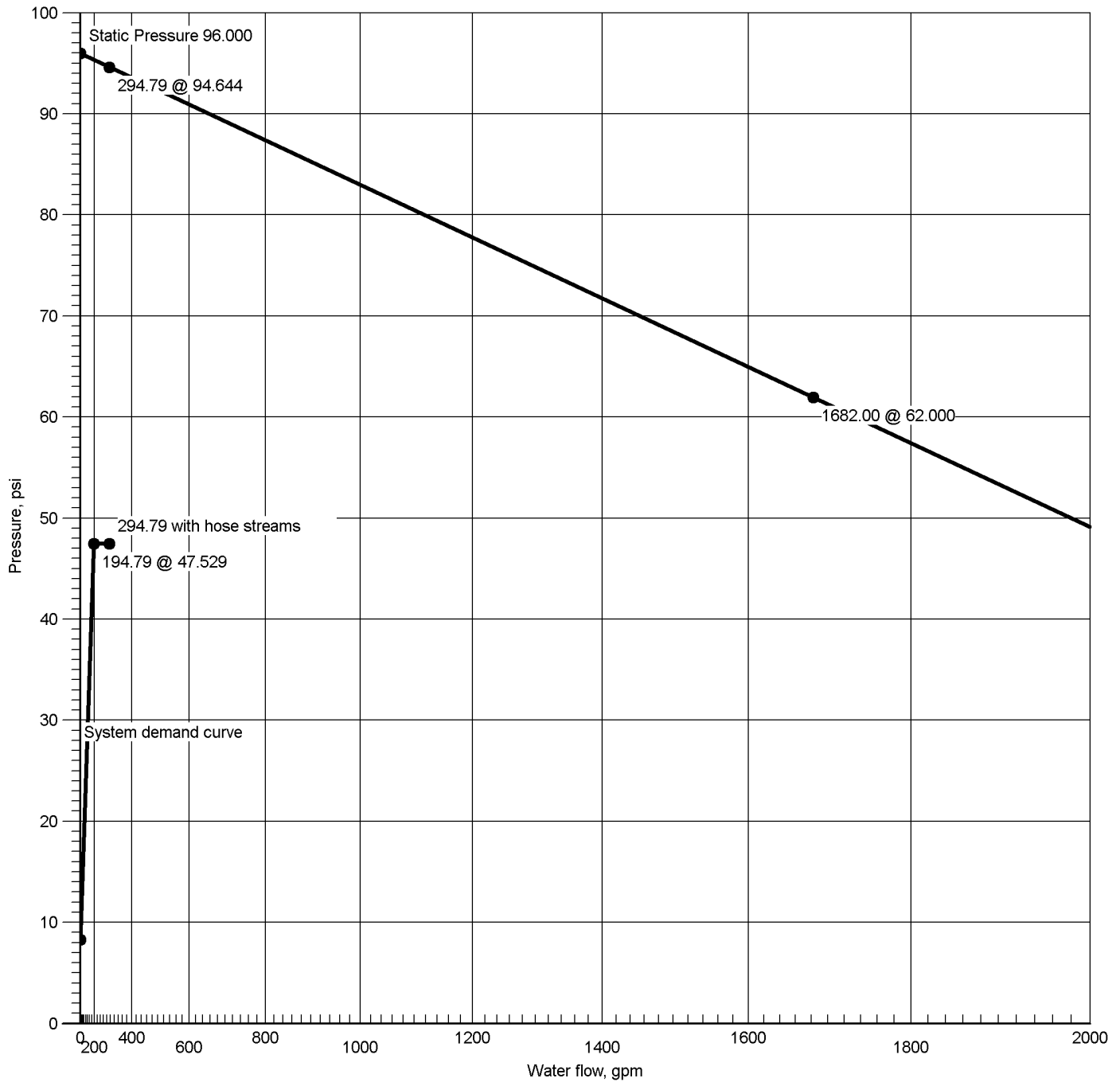
Job Number: 4352CK

Report Description: Light Hazard - AREA 7 -

Job											
Job Number 4352CK					Designer						
Job Name: MCC AUTO SHOP					State Certification/License Number						
Address 1 500 SW LONGVIEW RD					AHJ						
Address 2 LEE'S SUMMIT, MO 64081					Job Site/Building						
Address 3					Drawing Name 4352CK MCC AUTO SHOP.cad						
System					Remote Area(s)						
Most Demanding Sprinkler Data 5.6 K-Factor 14.82 at 7.000					Occupancy Light Hazard - AREA 7 -			Job Suffix			
Hose Allowance At Source 100.00					Density 0.10gpm/ft²			Area of Application 1500ft² (Actual 1000ft²)			
Additional Hose Supplies NodeFlow(gpm)					Number Of Sprinklers Calculated 10		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 225ft²		
					AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area						
Total Hose Streams 100.00											
System Flow Demand 194.79			Total Water Required (Including Hose Allowance) 294.79								
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 18.62 between nodes 7006 and 7005											
Maximum Velocity Under Ground 4.47 between nodes 17 and 5											
Volume capacity of Wet Pipes 3912.97gal			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	Water Supply	100.00	96.000	62.000		1682.00	94.644		294.79	47.529	47.115
Contractor											
		Contractor Number				Contact Name			Contact Title		
Name of Contractor:						Phone			Extension		
Address 1						FAX					
Address 2						E-mail					
Address 3						Web-Site					



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
94.644 @ 294.79

Required Pressure at System Demand
47.529 @ 194.79

Required Pressure at System Demand (Including Hose Allowance at Source)
47.529 @ 294.79



Summary Of Outflowing Devices

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	700	14.82	14.82	5.6	7.000			
Sprinkler	701	15.66	14.82	5.6	7.817			
Sprinkler	702	15.36	14.82	5.6	7.522			
Sprinkler	703	16.22	14.82	5.6	8.394			
Sprinkler	704	16.04	14.82	5.6	8.203			
Sprinkler	705	16.62	14.82	5.6	8.808			
Sprinkler	706	23.37	14.82	5.6	17.412			
Sprinkler	707	24.29	14.82	5.6	18.817			
Sprinkler	708	25.25	14.82	5.6	20.324			
Sprinkler	709	27.17	14.82	5.6	23.541			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK

Report Description: Light Hazard - AREA 7 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	47.529	194.79
700	22'-2	Spr(-7.000)	7.000	14.82
701	22'-2	Spr(-7.817)	7.817	15.66
702	22'-2	Spr(-7.522)	7.522	15.36
703	22'-2	Spr(-8.394)	8.394	16.22
704	22'-2	Spr(-8.203)	8.203	16.04
705	22'-2	Spr(-8.808)	8.808	16.62
706	20'-6	Spr(-17.412), fd	17.412	23.37
707	20'-6	Spr(-18.817), fd	18.817	24.29
708	20'-6	Spr(-20.324), fd	20.324	25.25
709	20'-6	Spr(-23.541), fd	23.541	27.17
2	-6'-0	E(22'-1)	51.421	
3	-6'-0		50.356	
4	1'-4	BOR	50.356	
5	0'-0	BOR 2	46.741	
17	-6'-0	T(33'-5½)	50.356	
4003	7'-6	PO(6'-0)	41.145	
4004	4'-0	fT(21'-1), Tr(6'-9½)	42.936	
4008	7'-6	PO(6'-0)	41.420	
7000	22'-2	T(5'-0)	9.500	
7001	22'-2	C(5'-0)	10.193	
7002	21'-0	PO(8'-0)	18.088	
7003	21'-0	PO(5'-0)	19.535	
7004	21'-0	PO(5'-0)	21.113	
7005	21'-0	PO(5'-0)	24.478	
7006	23'-11	PO(10'-0)	29.442	
7007	20'-2½	fE(9'-1½)	34.685	
7008	21'-0	PO(5'-0)	18.064	
7009	21'-1½	PO(6'-0)	32.050	
7010	23'-11	PO(6'-0)	29.702	
8000	20'-2½	PO(6'-0)	33.946	
8001	20'-2½	PO(6'-0)	33.947	
8002	20'-2½	PO(6'-0)	33.951	
8003	20'-2½	PO(6'-0)	33.961	
8004	20'-2½	PO(6'-0)	33.976	
8005	20'-2½	PO(6'-0)	34.000	
8006	20'-2½	PO(6'-0)	34.035	
8007	20'-2½	PO(6'-0)	34.086	
8008	20'-2½	PO(20'-2)	34.188	
8009	23'-11	PO(6'-0)	31.695	
8010	23'-11	PO(6'-0)	31.691	
8011	23'-11	PO(6'-0)	31.679	
8012	23'-11	PO(6'-0)	31.653	
8013	23'-11	PO(6'-0)	31.609	
8014	21'-1½	PO(6'-0)	32.084	
8015	21'-1½	PO(6'-0)	32.124	
8016	21'-1½	PO(6'-0)	32.167	
8017	21'-1½	PO(6'-0)	32.232	
8018	21'-1½	PO(6'-0)	32.326	
8019	21'-1½	PO(6'-0)	32.488	
8020	21'-1½	PO(6'-0)	32.675	
8021	21'-1½	PO(6'-0)	32.889	
8022	23'-11	PO(6'-0)	31.542	
8023	23'-11	PO(6'-0)	31.444	
8024	23'-11	PO(6'-0)	31.307	
8025	23'-11	PO(6'-0)	31.118	
8026	23'-11	PO(6'-0)	30.885	
8027	23'-11	PO(6'-0)	30.601	
8028	23'-11	PO(6'-0)	30.257	
8029	23'-11	PO(6'-0)	29.958	
8030	23'-11	PO(6'-0)	29.639	
8031	23'-11	PO(6'-0)	29.492	



Node Analysis

Job Number: 4352CK

Report Description: Light Hazard - AREA 7 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
8032	23'-11	PO(6'-0)	29.606		
8033	23'-11	PO(6'-0)	29.759		
8034	23'-11	PO(6'-0)	29.785		
8035	23'-11	PO(6'-0)	29.790		
8036	21'-1½	PO(6'-0)	32.019		
8037	21'-1½	PO(6'-0)	32.021		



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 7 -

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								
AO	1.0490	14.82	5.50	120		0.074703	10'-11"	Pf 0.817
700	22'-2"	14.82	5.6	7.000		Sprinkler		Pe
701	22'-2"			7.817			10'-11"	Pv
AO	1.0490	30.47	11.31	120		0.283604	0'-11"	Pf 1.684
701	22'-2"	15.66	5.6	7.817		Sprinkler,	5'-0"	Pe
7000	22'-2"			9.500		T(5'-0)	5'-11"	Pv
AO	1.6100	46.51	7.33	120		0.076985	9'-0"	Pf 0.693
7000	22'-2"	16.04		9.500		Flow (q) from Route 3		Pe
7001	22'-2"			10.193			9'-0"	Pv
AO	1.6100	94.71	14.93	120		0.286935	5'-9"	Pf 7.388
7001	22'-2"	31.58 + 16.62		10.193		Flow (q) from Route 2 and 4	20'-0"	Pe 0.507
7002	21'-0"			18.088		E(4'-0), T(8'-0), PO(8'-0)	25'-9"	Pv
BL	2.0670	118.08	11.29	120		0.127788	11'-3½"	Pf 1.445
7002	21'-0"	23.37		18.088		Flow (q) from Route 5		Pe 0.002
7003	21'-0"			19.535			11'-3½"	Pv
BL	2.0670	142.37	13.61	120		0.180631	8'-8½"	Pf 1.576
7003	21'-0"	24.29		19.535		Flow (q) from Route 6		Pe 0.001
7004	21'-0"			21.113			8'-8½"	Pv
BL	2.0670	167.62	16.03	120		0.244314	13'-9"	Pf 3.363
7004	21'-0"	25.25		21.113		Flow (q) from Route 7		Pe 0.002
7005	21'-0"			24.478			13'-9"	Pv
BL	2.0670	194.79	18.62	120		0.322588	5'-9½"	Pf 6.228
7005	21'-0"	27.17		24.478		Flow (q) from Route 8	13'-6"	Pe -1.264
7006	23'-11"			29.442		fE(3'-6), PO(10'-0)	19'-3½"	Pv
CM	2.6350	124.43	7.32	120		0.043158	4'-7"	Pf 0.198
7006	23'-11"			29.442				Pe
8030	23'-11"			29.639			4'-7"	Pv
CM	2.6350	111.74	6.57	120		0.035372	9'-0"	Pf 0.318
8030	23'-11"			29.639				Pe
8029	23'-11"			29.958			9'-0"	Pv
CM	2.6350	100.44	5.91	120		0.029037	10'-3½"	Pf 0.299
8029	23'-11"			29.958				Pe
8028	23'-11"			30.257			10'-3½"	Pv
CM	2.6350	90.16	5.30	120		0.023782	14'-6"	Pf 0.345
8028	23'-11"			30.257				Pe
8027	23'-11"			30.601			14'-6"	Pv
BL	1.3800	9.02	1.94	120		0.007848	66'-9½"	Pf 0.676
8027	23'-11"			30.601		PO(6'-0)	19'-4½"	Pe 1.210
8019	21'-1½"			32.488		T(5'-3½), E(2'-1), PO(6'-0)	86'-2"	Pv
CM	3.2600	113.65	4.37	120		0.012945	14'-6"	Pf 0.188
8019	21'-1½"	104.63		32.488		Flow (q) from Route 9		Pe
8020	21'-1½"			32.675			14'-6"	Pv
CM	3.2600	121.79	4.68	120		0.014713	14'-6"	Pf 0.213
8020	21'-1½"	8.14		32.675		Flow (q) from Route 30		Pe
8021	21'-1½"			32.889			14'-6"	Pv
CM	3.2600	129.79	4.99	120		0.016548	41'-1"	Pf 0.902
8021	21'-1½"	7.99		32.889		Flow (q) from Route 29	13'-5½"	Pe 0.397
8008	20'-2½"			34.188		2fE(6'-8½)	54'-6½"	Pv
CM	3.2600	194.79	7.49	120		0.035074	5'-0½"	Pf 0.497
8008	20'-2½"	65.01		34.188		Flow (q) from Route 10	9'-1½"	Pe
7007	20'-2½"			34.685		fE(9'-1½)	14'-2"	Pv
CM	4.2600	194.79	4.38	120		0.009531	22'-9"	Pf 0.955
7007	20'-2½"			34.685			77'-5"	Pe 5.505
4003	7'-6"			41.145		fE(8'-11½), fT(21'-1), fT(21'-6), PO(26'-4)	100'-2"	Pv
CM	4.2600	183.62	4.13	120		0.008544	2'-4"	Pf 0.276
4003	7'-6"			41.145			29'-11½"	Pe 1.515
4004	4'-0"			42.936		CV(23'-2), Tr(6'-9½)	32'-3½"	Pv
CM	4.2600	194.79	4.38	120		0.009531	4'-0"	Pf 2.071
4004	4'-0"	11.17		42.936		Flow (q) from Route 25		Pe 1.734
5	0'-0"			46.741		BFP(-2.033), BOR 2	4'-0"	Pv
UG	4.2200	194.79	4.47	140		0.007503	64'-2"	Pf 1.009
5	0'-0"			46.741			70'-3"	Pe 2.606
17	-6'-0"			50.356		2E(16'-8½), GV(3'-4), T(33'-5½)	134'-5"	Pv



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 7 -

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
UG	6.2800	194.79	2.02	140		0.001083	790'-0	Pf 1.065
17	-6'-0			50.356			193'-10	Pe
2	-6'-0			51.421		GV(4'-8½), EE(11'-0½), LtE(14'-2), 3T(47'-3½), E(22'-1)	983'-10	Pv
UG	6.2800	194.79	2.02	140		0.001083	9'-0	Pf 0.010
2	-6'-0			51.421				Pe -3.902
1	3'-0			47.529		S	9'-0	Pv
		100.00				Hose Allowance At Source		
1		294.79						
Route 2								
AO	1.0490	15.36	5.70	120		0.079837	10'-11	Pf 0.873
702	22'-2	15.36	5.6	7.522		Sprinkler		Pe
703	22'-2			8.394			10'-11	Pv
AO	1.0490	31.58	11.72	120		0.303014	0'-11	Pf 1.799
703	22'-2	16.22	5.6	8.394		Sprinkler,	5'-0	Pe
7001	22'-2			10.193		C(5'-0)	5'-11	Pv
Route 3								
AO	1.0490	16.04	5.95	120		0.086510	10'-0	Pf 1.297
704	22'-2	16.04	5.6	8.203		Sprinkler,	5'-0	Pe
7000	22'-2			9.500		T(5'-0)	15'-0	Pv
Route 4								
AO	1.0490	16.62	6.17	120		0.092393	10'-0	Pf 1.385
705	22'-2	16.62	5.6	8.808		Sprinkler,	5'-0	Pe
7001	22'-2			10.193		C(5'-0)	15'-0	Pv
Route 5								
DY	1.0490	23.37	8.67	120		0.173547	0'-0	Pf 0.868
706	20'-6	23.37	5.6	17.412		Sprinkler,	5'-0	Pe -0.216
7008	21'-0			18.064		PO(5'-0), fd	5'-0	Pv
BL	2.0670	23.37	2.23	120		0.006381	3'-8½	Pf 0.024
7008	21'-0			18.064				Pe 0.001
7002	21'-0			18.088			3'-8½	Pv
Route 6								
DY	1.0490	24.29	9.02	120		0.186455	0'-0	Pf 0.932
707	20'-6	24.29	5.6	18.817		Sprinkler,	5'-0	Pe -0.213
7003	21'-0			19.535		PO(5'-0), fd	5'-0	Pv
Route 7								
DY	1.0490	25.25	9.37	120		0.200230	0'-0	Pf 1.001
708	20'-6	25.25	5.6	20.324		Sprinkler,	5'-0	Pe -0.212
7004	21'-0			21.113		PO(5'-0), fd	5'-0	Pv
Route 8								
DY	1.0490	27.17	10.09	120		0.229386	0'-0	Pf 1.147
709	20'-6	27.17	5.6	23.541		Sprinkler,	5'-0	Pe -0.210
7005	21'-0			24.478		PO(5'-0), fd	5'-0	Pv
Route 9								
CM	3.2600	45.04	1.73	120		0.002336	14'-6	Pf 0.034
7009	21'-1½	33.96 + 11.08		32.050		Flow (q) from Route 24 and 36		Pe
8014	21'-1½			32.084			14'-6	Pv
CM	3.2600	56.88	2.19	120		0.003597	11'-3	Pf 0.040
8014	21'-1½	11.84		32.084		Flow (q) from Route 35		Pe
8015	21'-1½			32.124			11'-3	Pv
CM	3.2600	70.36	2.70	120		0.005332	7'-11½	Pf 0.042
8015	21'-1½	13.48		32.124		Flow (q) from Route 34		Pe
8016	21'-1½			32.167			7'-11½	Pv
CM	3.2600	83.05	3.19	120		0.007245	9'-0	Pf 0.065
8016	21'-1½	12.69		32.167		Flow (q) from Route 33		Pe
8017	21'-1½			32.232			9'-0	Pv
CM	3.2600	94.35	3.63	120		0.009175	10'-3½	Pf 0.094
8017	21'-1½	11.31		32.232		Flow (q) from Route 32		Pe
8018	21'-1½			32.326			10'-3½	Pv
CM	3.2600	104.63	4.02	120		0.011108	14'-6	Pf 0.161
8018	21'-1½	10.27		32.326		Flow (q) from Route 31		Pe
8019	21'-1½			32.488			14'-6	Pv
Route 10								
CM	3.2600	22.17	0.85	120		0.000629	14'-6	Pf 0.009
8002	20'-2½	14.88 + 7.28		33.951		Flow (q) from Route 11 and 27		Pe
8003	20'-2½			33.961			14'-6	Pv



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 7 -

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	3.2600	29.65	1.14	120		0.001078	14'-6	Pf 0.016
8003	20'-2½	7.49		33.961		Flow (q) from Route 28		Pe
8004	20'-2½			33.976			14'-6	Pv
CM	3.2600	37.35	1.44	120		0.001652	14'-6	Pf 0.024
8004	20'-2½	7.69		33.976		Flow (q) from Route 15		Pe
8005	20'-2½			34.000			14'-6	Pv
CM	3.2600	45.53	1.75	120		0.002383	14'-6	Pf 0.035
8005	20'-2½	8.18		34.000		Flow (q) from Route 17		Pe
8006	20'-2½			34.035			14'-6	Pv
CM	3.2600	54.87	2.11	120		0.003365	15'-2	Pf 0.051
8006	20'-2½	9.34		34.035		Flow (q) from Route 20		Pe
8007	20'-2½			34.086			15'-2	Pv
CM	3.2600	65.01	2.50	120		0.004605	2'-1½	Pf 0.103
8007	20'-2½	10.14		34.086		Flow (q) from Route 19	20'-2	Pe
8008	20'-2½			34.188		PO(20'-2)	22'-3½	Pv
Route 11								
CM	3.2600	7.43	0.29	120		0.000083	13'-6	Pf 0.001
8000	20'-2½	7.43		33.946		Flow (q) from Route 13		Pe
8001	20'-2½			33.947			13'-6	Pv
CM	3.2600	14.88	0.57	120		0.000301	14'-6	Pf 0.004
8001	20'-2½	7.46		33.947		Flow (q) from Route 12		Pe
8002	20'-2½			33.951			14'-6	Pv
Route 12								
BL	1.3800	7.46	1.60	120		0.005514	95'-0½	Pf 0.648
8010	23'-11	14.88		31.691		PO(6'-0), Flow (q) from Route 14	22'-6½	Pe 1.607
8001	20'-2½			33.947		2T(5'-3½), PO(6'-0)	117'-7	Pv
Route 13								
CM	2.6350	7.43	0.44	120		0.000235	13'-6	Pf 0.003
8010	23'-11	14.88		31.691		Flow (q) from Route 14		Pe
8009	23'-11			31.695			13'-6	Pv
BL	1.3800	7.43	1.59	120		0.005478	95'-0½	Pf 0.644
8009	23'-11			31.695		PO(6'-0)	22'-6½	Pe 1.607
8000	20'-2½			33.946		2T(5'-3½), PO(6'-0)	117'-7	Pv
Route 14								
CM	2.6350	14.88	0.88	120		0.000849	14'-6	Pf 0.012
8011	23'-11	22.17		31.679		Flow (q) from Route 16		Pe
8010	23'-11			31.691			14'-6	Pv
Route 15								
BL	1.3800	7.69	1.65	120		0.005847	99'-0½	Pf 0.760
8013	23'-11	37.35		31.609		PO(6'-0), Flow (q) from Route 18	30'-10½	Pe 1.607
8004	20'-2½			33.976		2T(5'-3½), 4E(2'-1), PO(6'-0)	129'-11	Pv
Route 16								
CM	2.6350	29.65	1.74	120		0.003040	14'-6	Pf 0.044
8013	23'-11	37.35		31.609		Flow (q) from Route 18		Pe
8012	23'-11			31.653			14'-6	Pv
CM	2.6350	22.17	1.30	120		0.001774	14'-6	Pf 0.026
8012	23'-11			31.653				Pe
8011	23'-11			31.679			14'-6	Pv
Route 17								
BL	1.3800	8.18	1.76	120		0.006551	99'-0½	Pf 0.851
8022	23'-11	45.53		31.542		PO(6'-0), Flow (q) from Route 21	30'-10½	Pe 1.607
8005	20'-2½			34.000		2T(5'-3½), 4E(2'-1), PO(6'-0)	129'-11	Pv
Route 18								
CM	2.6350	37.35	2.20	120		0.004658	14'-6	Pf 0.068
8022	23'-11	45.53		31.542		Flow (q) from Route 21		Pe
8013	23'-11			31.609			14'-6	Pv
Route 19								
BL	1.3800	10.14	2.17	120		0.009737	95'-8½	Pf 1.172
8024	23'-11	65.01		31.307		PO(6'-0), Flow (q) from Route 22	24'-7½	Pe 1.607
8007	20'-2½			34.086		2T(5'-3½), E(2'-1), PO(6'-0)	120'-4	Pv
Route 20								
CM	2.6350	54.87	3.23	120		0.009488	14'-6	Pf 0.138
8024	23'-11	65.01		31.307		Flow (q) from Route 22		Pe
8023	23'-11			31.444			14'-6	Pv
BL	1.3800	9.34	2.00	120		0.008361	95'-0½	Pf 0.983
8023	23'-11			31.444		PO(6'-0)	22'-6½	Pe 1.607
8006	20'-2½			34.035		2T(5'-3½), PO(6'-0)	117'-7	Pv
Route 21								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 7 -

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	45.53	2.68	120		0.006720	14'-6	Pf 0.097
8023	23'-11	9.34		31.444		Flow (q) from Route 20		Pe
8022	23'-11			31.542			14'-6	Pv
Route 22								
CM	2.6350	65.01	3.82	120		0.012984	14'-6	Pf 0.188
8025	23'-11	73.00		31.118		Flow (q) from Route 23		Pe
8024	23'-11			31.307			14'-6	Pv
Route 23								
CM	2.6350	81.14	4.77	120		0.019568	14'-6	Pf 0.284
8027	23'-11	9.02		30.601		Flow (q) from Route 1		Pe
8026	23'-11			30.885			14'-6	Pv
CM	2.6350	73.00	4.29	120		0.016090	14'-6	Pf 0.233
8026	23'-11			30.885				Pe
8025	23'-11			31.118			14'-6	Pv
Route 24								
CM	2.6350	70.36	4.14	120		0.015032	3'-4½	Pf 0.051
7006	23'-11	124.43		29.442		Flow (q) from Route 1		Pe
8031	23'-11			29.492			3'-4½	Pv
CM	2.6350	56.88	3.35	120		0.010141	11'-3	Pf 0.114
8031	23'-11			29.492				Pe
8032	23'-11			29.606			11'-3	Pv
CM	2.6350	45.04	2.65	120		0.006585	14'-6	Pf 0.095
8032	23'-11			29.606				Pe
7010	23'-11			29.702			14'-6	Pv
CM	2.6350	33.96	2.00	120		0.003905	14'-6	Pf 0.057
7010	23'-11			29.702				Pe
8033	23'-11			29.759			14'-6	Pv
CM	2.6350	22.44	1.32	120		0.001816	14'-6	Pf 0.026
8033	23'-11			29.759				Pe
8034	23'-11			29.785			14'-6	Pv
CM	2.6350	11.14	0.66	120		0.000497	10'-1	Pf 0.005
8034	23'-11			29.785				Pe
8035	23'-11			29.790			10'-1	Pv
BL	1.3800	11.14	2.39	120		0.011599	65'-3½	Pf 1.019
8035	23'-11			29.790		PO(6'-0)	22'-6½	Pe 1.210
8036	21'-1½			32.019		2T(5'-3½), PO(6'-0)	87'-10½	Pv
CM	3.2600	11.14	0.43	120		0.000176	10'-1	Pf 0.002
8036	21'-1½			32.019				Pe
8037	21'-1½			32.021			10'-1	Pv
CM	3.2600	22.44	0.86	120		0.000644	14'-6	Pf 0.009
8037	21'-1½	11.30		32.021		Flow (q) from Route 38		Pe
8038	21'-1½			32.030			14'-6	Pv
CM	3.2600	33.96	1.31	120		0.001385	14'-6	Pf 0.020
8038	21'-1½	11.51		32.030		Flow (q) from Route 37		Pe
7009	21'-1½			32.050			14'-6	Pv
Route 25								
CM	4.2600	11.17	0.25	120		0.000048	4'-5	Pf 0.002
4008	7'-6	11.17		41.420		Flow (q) from Route 26	30'-0½	Pe 1.515
4004	4'-0			42.936		fE(8'-11½), fT(21'-1)	34'-5	Pv
Route 26								
AO	1.3800	11.17	2.40	120		0.011660	2'-6½	Pf 0.274
4003	7'-6			41.145		PO(6'-0)	21'-0	Pe
4008	7'-6			41.420		E(3'-0), T(6'-0), PO(6'-0)	23'-6½	Pv
Route 27								
BL	1.3800	7.28	1.56	120		0.005282	95'-0½	Pf 0.665
8011	23'-11	22.17		31.679		PO(6'-0), Flow (q) from Route 16	30'-10½	Pe 1.607
8002	20'-2½			33.951		2T(5'-3½), 4E(2'-1), PO(6'-0)	125'-11	Pv
Route 28								
BL	1.3800	7.49	1.61	120		0.005558	95'-0½	Pf 0.700
8012	23'-11			31.653		PO(6'-0)	30'-10½	Pe 1.607
8003	20'-2½			33.961		2T(5'-3½), 4E(2'-1), PO(6'-0)	125'-11	Pv
Route 29								
BL	1.3800	7.99	1.71	120		0.006270	66'-9½	Pf 0.560
8025	23'-11	73.00		31.118		PO(6'-0), Flow (q) from Route 23	22'-6½	Pe 1.210
8021	21'-1½			32.889		2T(5'-3½), PO(6'-0)	89'-4½	Pv
Route 30								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 7 -

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	1.3800	8.14	1.75	120		0.006493	66'-9½"	Pf 0.580
8026	23'-11"			30.885		PO(6'-0)	22'-6½"	Pe 1.210
8020	21'-1½"			32.675		2T(5'-3½"), PO(6'-0)	89'-4½"	Pv
Route 31								
BL	1.3800	10.27	2.20	120		0.009981	66'-9½"	Pf 0.860
8028	23'-11"			30.257		PO(6'-0)	19'-4½"	Pe 1.210
8018	21'-1½"			32.326		T(5'-3½"), E(2'-1), PO(6'-0)	86'-2"	Pv
Route 32								
BL	1.3800	11.31	2.43	120		0.011913	66'-9½"	Pf 1.065
8029	23'-11"			29.958		PO(6'-0)	22'-6½"	Pe 1.210
8017	21'-1½"			32.232		2T(5'-3½"), PO(6'-0)	89'-4½"	Pv
Route 33								
BL	1.3800	12.69	2.72	120		0.014746	66'-9½"	Pf 1.318
8030	23'-11"			29.639		PO(6'-0)	22'-6½"	Pe 1.210
8016	21'-1½"			32.167		2T(5'-3½"), PO(6'-0)	89'-4½"	Pv
Route 34								
BL	1.3800	13.48	2.89	120		0.016504	66'-9½"	Pf 1.422
8031	23'-11"			29.492		PO(6'-0)	19'-4½"	Pe 1.210
8015	21'-1½"			32.124		E(2'-1), T(5'-3½"), PO(6'-0)	86'-2"	Pv
Route 35								
BL	1.3800	11.84	2.54	120		0.012975	66'-9½"	Pf 1.268
8032	23'-11"			29.606		PO(6'-0)	30'-10½"	Pe 1.210
8014	21'-1½"			32.084		2T(5'-3½"), 4E(2'-1), PO(6'-0)	97'-8½"	Pv
Route 36								
BL	1.3800	11.08	2.38	120		0.011480	66'-2"	Pf 1.138
7010	23'-11"			29.702		PO(6'-0)	32'-11½"	Pe 1.210
7009	21'-1½"			32.050		2T(5'-3½"), 5E(2'-1), PO(6'-0)	99'-2"	Pv
Route 37								
BL	1.3800	11.51	2.47	120		0.012319	66'-9½"	Pf 1.061
8033	23'-11"			29.759		PO(6'-0)	19'-4½"	Pe 1.210
8038	21'-1½"			32.030		T(5'-3½"), E(2'-1), PO(6'-0)	86'-2"	Pv
Route 38								
BL	1.3800	11.30	2.42	120		0.011905	66'-9½"	Pf 1.026
8034	23'-11"			29.785		PO(6'-0)	19'-4½"	Pe 1.210
8037	21'-1½"			32.021		T(5'-3½"), E(2'-1), PO(6'-0)	86'-2"	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: 4352CK
Report Description: Light Hazard - AREA 7 -

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	



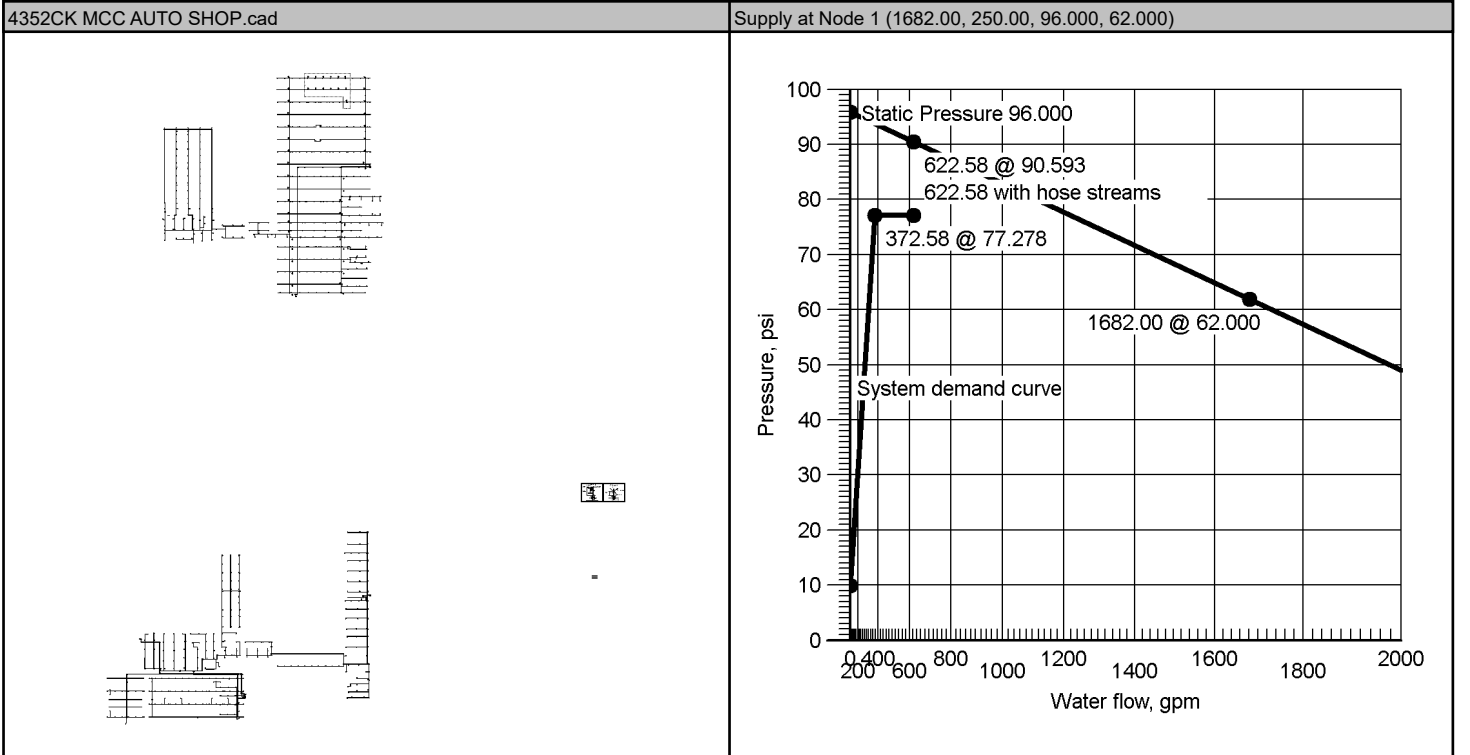
Hydraulic Overview

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 8 -

Job		
Job Number 4352CK	Designer	
Job Name: MCC AUTO SHOP	Phone	FAX
Address 1 500 SW LONGVIEW RD	State Certification/License Number	
Address 2 LEE'S SUMMIT, MO 64081	AHJ	
Address 3	Job Site/Building	

System		
Density 0.20gpm/ft ²	Area of Application 1500ft ² (Actual 1542ft ²)	
Most Demanding Sprinkler Data 5.6 K-Factor 27.31 at 23.780	Hose Streams 250.00	
Coverage Per Sprinkler 137ft ²	Number Of Sprinklers Calculated 13	Number Of Nozzles Calculated 0
System Pressure Demand 77.278	System Flow Demand 372.58	
Total Demand 622.58 @ 77.278	Pressure Result +13.315 (14.7%)	

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	1682.00	250.00	96.000	62.000	BOR (4)	77.612	0	0.00
						BOR 2 (5)	71.658	44.01	372.58





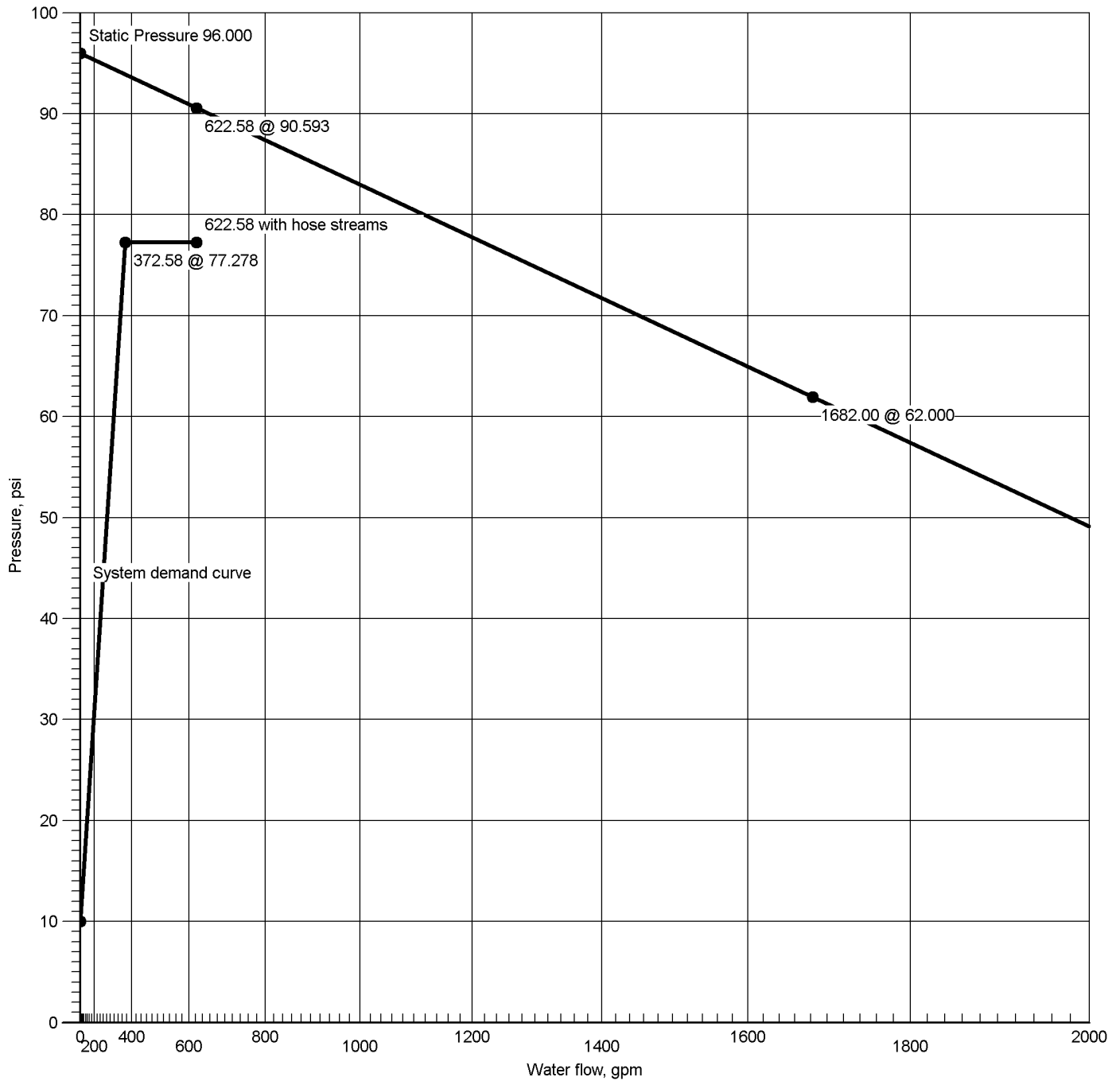
Hydraulic Summary

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 8 -

Job											
Job Number 4352CK					Designer						
Job Name: MCC AUTO SHOP					State Certification/License Number						
Address 1 500 SW LONGVIEW RD					AHJ						
Address 2 LEE'S SUMMIT, MO 64081					Job Site/Building						
Address 3					Drawing Name 4352CK MCC AUTO SHOP.cad						
System					Remote Area(s)						
Most Demanding Sprinkler Data 5.6 K-Factor 27.31 at 23.780					Occupancy Ordinary Group II - AREA 8 -			Job Suffix			
Hose Allowance At Source 250.00					Density 0.20gpm/ft²			Area of Application 1500ft² (Actual 1542ft²)			
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>					Number Of Sprinklers Calculated 13		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 137ft²		
					AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area						
					Left: 76.443 Right: 77.132						
Total Hose Streams 250.00											
System Flow Demand 372.58			Total Water Required (Including Hose Allowance) 622.58								
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 18.38 between nodes 8001 and 809											
Maximum Velocity Under Ground 8.55 between nodes 17 and 5											
Volume capacity of Wet Pipes 3912.97gal			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	Water Supply	250.00	96.000	62.000		1682.00	90.593		622.58	77.278	13.315
Contractor											
		Contractor Number				Contact Name				Contact Title	
Name of Contractor:						Phone				Extension	
Address 1						FAX					
Address 2						E-mail					
Address 3						Web-Site					



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
90.593 @ 622.58

Required Pressure at System Demand
77.278 @ 372.58

Required Pressure at System Demand (Including Hose Allowance at Source)
77.278 @ 622.58



Summary Of Outflowing Devices

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 8 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
➡ Sprinkler	800	27.31	27.31	5.6	23.780			
Sprinkler	801	27.40	27.31	5.6	23.940			
Sprinkler	802	27.83	27.31	5.6	24.692			
Sprinkler	803	29.06	27.31	5.6	26.928			
Sprinkler	804	27.50	27.31	5.6	24.112			
Sprinkler	805	28.46	27.31	5.6	25.821			
Sprinkler	806	27.37	27.31	5.6	23.888			
Sprinkler	807	27.46	27.31	5.6	24.047			
Sprinkler	808	27.88	27.31	5.6	24.795			
Sprinkler	809	29.11	27.31	5.6	27.027			
Sprinkler	810	27.56	27.31	5.6	24.228			
Sprinkler	811	28.53	27.31	5.6	25.956			
Sprinkler	812	37.11	27.31	5.6	43.904			

➡ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 8 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
8004	20'-2½	PO(6'-0)	49.711	
8005	20'-2½	PO(6'-0)	50.389	
8006	20'-2½	PO(6'-0)	51.130	
8007	20'-2½	PO(6'-0)	51.977	
8008	20'-2½	PO(20'-2)	53.341	
8009	23'-11	PO(6'-0)	43.063	
8010	23'-11	PO(6'-0)	43.331	
8011	23'-11	PO(6'-0)	44.376	
8012	23'-11	PO(6'-0)	45.490	
8013	23'-11	PO(6'-0)	46.449	
8014	21'-1½	PO(6'-0)	51.890	
8015	21'-1½	PO(6'-0)	51.905	
8016	21'-1½	PO(6'-0)	51.920	
8017	21'-1½	PO(6'-0)	51.945	
8018	21'-1½	PO(6'-0)	51.984	
8019	21'-1½	PO(6'-0)	52.057	
8020	21'-1½	PO(6'-0)	52.155	
8021	21'-1½	PO(6'-0)	52.286	
8022	23'-11	PO(6'-0)	47.280	
8023	23'-11	PO(6'-0)	47.996	
8024	23'-11	PO(6'-0)	48.600	
8025	23'-11	PO(6'-0)	49.093	
8026	23'-11	PO(6'-0)	49.462	
8027	23'-11	PO(6'-0)	49.739	
8028	23'-11	PO(6'-0)	49.945	
8029	23'-11	PO(6'-0)	50.054	
8030	23'-11	PO(6'-0)	50.124	
8031	23'-11	PO(6'-0)	50.168	
8032	23'-11	PO(6'-0)	50.211	
8033	23'-11	PO(6'-0)	50.267	
8034	23'-11	PO(6'-0)	50.277	
8035	23'-11	PO(6'-0)	50.278	
8036	21'-1½	PO(6'-0)	51.865	
8037	21'-1½	PO(6'-0)	51.866	
1	3'-0	S	77.278	372.58
800	25'-5	Spr(-23.780)	23.780	27.31
801	25'-1	Spr(-23.940)	23.940	27.40
802	24'-8½	Spr(-24.692)	24.692	27.83
803	24'-4	Spr(-26.928)	26.928	29.06
804	25'-9½	Spr(-24.112)	24.112	27.50
805	26'-2	Spr(-25.821)	25.821	28.46
806	25'-5	Spr(-23.888)	23.888	27.37
807	25'-1	Spr(-24.047)	24.047	27.46
808	24'-8½	Spr(-24.795)	24.795	27.88
809	24'-4	Spr(-27.027)	27.027	29.11
810	25'-9½	Spr(-24.228)	24.228	27.56
811	26'-2	Spr(-25.956)	25.956	28.53
812	24'-3½	Spr(-43.904)	43.904	37.11
2	-6'-0	E(22'-1)	81.147	
3	-6'-0		77.612	
4	1'-4	BOR	77.612	
5	0'-0	BOR 2	71.658	
17	-6'-0	T(33'-5½)	77.612	
4003	7'-6	PO(6'-0)	63.665	
4004	4'-0	fT(21'-1), Tr(6'-9½)	66.095	
4008	7'-6	PO(6'-0)	64.575	
7007	20'-2½	fE(9'-1½)	54.991	
7009	21'-1½	PO(6'-0)	51.877	
7010	23'-11	PO(6'-0)	50.246	
8000	20'-2½	PO(6'-0)	48.044	
8001	20'-2½	PO(6'-0)	48.148	
8002	20'-2½	PO(6'-0)	48.549	



Report Description: Ordinary Group II - AREA 8 -

Node	Elevation(foot)	Fittings	Pressure(psi)	Discharge(gpm)
8003	20'-2½"	PO(6'-0")	49.096	



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 8 -

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	1.3800	1.38	0.30	120		0.000245	8'-10½"	Pf 0.002
800	25'-5	27.31	5.6	23.780		Sprinkler		Pe 0.158
801	25'-1			23.940			8'-10½"	Pv
BL	1.3800	28.78	6.17	120		0.067121	8'-10½"	Pf 0.595
801	25'-1	27.40	5.6	23.940		Sprinkler		Pe 0.158
802	24'-8½"			24.692			8'-10½"	Pv
BL	1.3800	56.61	12.14	120		0.234586	8'-10½"	Pf 2.078
802	24'-8½"	27.83	5.6	24.692		Sprinkler		Pe 0.158
803	24'-4			26.928			8'-10½"	Pv
BL	1.3800	85.67	18.38	120		0.504865	27'-0	Pf 19.320
803	24'-4	29.06	5.6	26.928		Sprinkler,	11'-3½"	Pe 1.797
8000	20'-2½"			48.044		T(5'-3½"), PO(6'-0)	38'-3	Pv
CM	3.2600	85.67	3.29	120		0.007674	13'-6	Pf 0.104
8000	20'-2½"			48.044				Pe
8001	20'-2½"			48.148			13'-6	Pv
CM	3.2600	171.35	6.59	120		0.027667	14'-6	Pf 0.401
8001	20'-2½"	85.68		48.148		Flow (q) from Route 3		Pe
8002	20'-2½"			48.549			14'-6	Pv
CM	3.2600	202.64	7.79	120		0.037733	14'-6	Pf 0.547
8002	20'-2½"	31.29		48.549		Flow (q) from Route 5		Pe
8003	20'-2½"			49.096			14'-6	Pv
CM	3.2600	215.84	8.30	120		0.042407	14'-6	Pf 0.615
8003	20'-2½"	13.20		49.096		Flow (q) from Route 15		Pe
8004	20'-2½"			49.711			14'-6	Pv
CM	3.2600	227.56	8.75	120		0.046765	14'-6	Pf 0.678
8004	20'-2½"	11.72		49.711		Flow (q) from Route 2		Pe
8005	20'-2½"			50.389			14'-6	Pv
CM	3.2600	238.69	9.17	120		0.051082	14'-6	Pf 0.741
8005	20'-2½"	11.12		50.389		Flow (q) from Route 8		Pe
8006	20'-2½"			51.130			14'-6	Pv
CM	3.2600	250.53	9.63	120		0.055869	15'-2	Pf 0.847
8006	20'-2½"	11.84		51.130		Flow (q) from Route 9		Pe
8007	20'-2½"			51.977			15'-2	Pv
CM	3.2600	263.20	10.12	120		0.061207	2'-1½"	Pf 1.364
8007	20'-2½"	12.67		51.977		Flow (q) from Route 10	20'-2	Pe
8008	20'-2½"			53.341		PO(20'-2)	22'-3½"	Pv
CM	3.2600	372.58	14.32	120		0.116422	5'-0½"	Pf 1.650
8008	20'-2½"	109.38		53.341		Flow (q) from Route 7	9'-1½"	Pe
7007	20'-2½"			54.991		fE(9'-1½")	14'-2	Pv
CM	4.2600	372.58	8.39	120		0.031636	22'-9	Pf 3.168
7007	20'-2½"			54.991			77'-5	Pe 5.505
4003	7'-6			63.665		fE(8'-11½"), fT(21'-1), fT(21'-6), PO(26'-4)	100'-2	Pv
CM	4.2600	351.20	7.91	120		0.028361	2'-4	Pf 0.916
4003	7'-6			63.665			29'-11½"	Pe 1.515
4004	4'-0			66.095		CV(23'-2), Tr(6'-9½")	32'-3½"	Pv
CM	4.2600	372.58	8.39	120		0.031636	4'-0	Pf 3.828
4004	4'-0	21.37		66.095		Flow (q) from Route 13		Pe 1.734
5	0'-0			71.658		BFP(-3.702), BOR 2	4'-0	Pv
UG	4.2200	372.58	8.55	140		0.024905	64'-2	Pf 3.348
5	0'-0			71.658			70'-3	Pe 2.606
17	-6'-0			77.612		2E(16'-8½"), GV(3'-4), T(33'-5½")	134'-5	Pv
UG	6.2800	372.58	3.86	140		0.003593	790'-0	Pf 3.535
17	-6'-0			77.612			193'-10	Pe
2	-6'-0			81.147		GV(4'-8½"), EE(11'-0½"), LtE(14'- 2), 3T(47'-3½"), E(22'-1)	983'-10	Pv
UG	6.2800	372.58	3.86	140		0.003593	9'-0	Pf 0.032
2	-6'-0			81.147				Pe -3.902
1	3'-0			77.278		S	9'-0	Pv
		250.00				Hose Allowance At Source		
1		622.58						
Route 2								
BL	1.3800	25.92	5.56	120		0.055311	8'-10½"	Pf 0.490
800	25'-5	27.31	5.6	23.780		Sprinkler		Pe -0.158
804	25'-9½"			24.112			8'-10½"	Pv



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 8 -

Pipe Type	Diameter	Flow	Velocity	HWC	Pn	Friction Loss	Length	Pressure Summary
Downstream	Elevation	Discharge	K-Factor	Pt		Fittings	Eq. Length	
Upstream							Total Length	
BL	1.3800	53.42	11.46	120		0.210737	8'-10½"	Pf 1.867
804	25'-9½"	27.50	5.6	24.112		Sprinkler		Pe -0.158
805	26'-2"			25.821			8'-10½"	Pv
BL	1.3800	81.88	17.56	120		0.464318	23'-9"	Pf 16.264
805	26'-2"	28.46	5.6	25.821		Sprinkler,	11'-3½"	Pe 0.977
8009	23'-11"			43.063		T(5'-3½"), PO(6'-0)	35'-0½"	Pv
CM	2.6350	81.88	4.82	120		0.019899	13'-6"	Pf 0.269
8009	23'-11"			43.063				Pe
8010	23'-11"			43.331			13'-6"	Pv
CM	2.6350	164.12	9.66	120		0.072031	14'-6"	Pf 1.044
8010	23'-11"	82.24		43.331		Flow (q) from Route 4		Pe
8011	23'-11"			44.376			14'-6"	Pv
CM	2.6350	169.94	10.00	120		0.076823	14'-6"	Pf 1.114
8011	23'-11"	5.81		44.376		Flow (q) from Route 6		Pe
8012	23'-11"			45.490			14'-6"	Pv
CM	2.6350	156.74	9.22	120		0.066147	14'-6"	Pf 0.959
8012	23'-11"			45.490				Pe
8013	23'-11"			46.449			14'-6"	Pv
BL	1.3800	11.72	2.51	120		0.012735	99'-0½"	Pf 1.655
8013	23'-11"			46.449		PO(6'-0)	30'-10½"	Pe 1.607
8004	20'-2½"			49.711		2T(5'-3½"), 4E(2'-1), PO(6'-0)	129'-11"	Pv
Route 3								
BL	1.3800	1.22	0.26	120		0.000194	8'-10½"	Pf 0.002
806	25'-5"	27.37	5.6	23.888		Sprinkler		Pe 0.158
807	25'-1"			24.047			8'-10½"	Pv
BL	1.3800	28.68	6.15	120		0.066677	8'-10½"	Pf 0.591
807	25'-1"	27.46	5.6	24.047		Sprinkler		Pe 0.158
808	24'-8½"			24.795			8'-10½"	Pv
BL	1.3800	56.57	12.13	120		0.234241	8'-10½"	Pf 2.075
808	24'-8½"	27.88	5.6	24.795		Sprinkler		Pe 0.158
809	24'-4"			27.027			8'-10½"	Pv
BL	1.3800	85.68	18.38	120		0.504961	27'-0"	Pf 19.324
809	24'-4"	29.11	5.6	27.027		Sprinkler,	11'-3½"	Pe 1.797
8001	20'-2½"			48.148		T(5'-3½"), PO(6'-0)	38'-3"	Pv
Route 4								
BL	1.3800	26.15	5.61	120		0.056205	8'-10½"	Pf 0.498
806	25'-5"	27.37	5.6	23.888		Sprinkler		Pe -0.158
810	25'-9½"			24.228			8'-10½"	Pv
BL	1.3800	53.71	11.52	120		0.212869	8'-10½"	Pf 1.885
810	25'-9½"	27.56	5.6	24.228		Sprinkler		Pe -0.158
811	26'-2"			25.956			8'-10½"	Pv
BL	1.3800	82.24	17.64	120		0.468157	23'-9"	Pf 16.398
811	26'-2"	28.53	5.6	25.956		Sprinkler,	11'-3½"	Pe 0.977
8010	23'-11"			43.331		T(5'-3½"), PO(6'-0)	35'-0½"	Pv
Route 5								
BL	1.3800	31.29	6.71	120		0.078340	25'-5"	Pf 2.876
812	24'-3½"	37.11	5.6	43.904		Sprinkler,	11'-3½"	Pe 1.769
8002	20'-2½"			48.549		T(5'-3½"), PO(6'-0)	36'-8½"	Pv
Route 6								
BL	1.3800	5.81	1.25	120		0.003481	69'-7"	Pf 0.311
812	24'-3½"	37.11	5.6	43.904		Sprinkler,	19'-7½"	Pe 0.162
8011	23'-11"			44.376		4E(2'-1), T(5'-3½"), PO(6'-0)	89'-2½"	Pv
Route 7								
CM	3.2600	26.32	1.01	120		0.000864	14'-6"	Pf 0.013
7009	21'-1½"	19.84 + 6.48		51.877		Flow (q) from Route 12 and 23		Pe
8014	21'-1½"			51.890			14'-6"	Pv
CM	3.2600	33.23	1.28	120		0.001331	11'-3"	Pf 0.015
8014	21'-1½"	6.92		51.890		Flow (q) from Route 22		Pe
8015	21'-1½"			51.905			11'-3"	Pv
CM	3.2600	41.11	1.58	120		0.001973	7'-11½"	Pf 0.016
8015	21'-1½"	7.88		51.905		Flow (q) from Route 21		Pe
8016	21'-1½"			51.920			7'-11½"	Pv
CM	3.2600	49.30	1.90	120		0.002761	9'-0"	Pf 0.025
8016	21'-1½"	8.19		51.920		Flow (q) from Route 20		Pe
8017	21'-1½"			51.945			9'-0"	Pv
CM	3.2600	58.18	2.24	120		0.003751	10'-3½"	Pf 0.039
8017	21'-1½"	8.88		51.945		Flow (q) from Route 19		Pe
8018	21'-1½"			51.984			10'-3½"	Pv



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 8 -

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	3.2600	68.25	2.62	120		0.005040		14'-6	Pf 0.073
8018	21'-1½	10.07		51.984		Flow (q) from Route 18		Pe	
8019	21'-1½			52.057				Pv	
CM	3.2600	80.04	3.08	120		0.006766		14'-6	Pf 0.098
8019	21'-1½	11.78		52.057		Flow (q) from Route 11		Pe	
8020	21'-1½			52.155				Pv	
CM	3.2600	93.56	3.60	120		0.009032		14'-6	Pf 0.131
8020	21'-1½	13.52		52.155		Flow (q) from Route 17		Pe	
8021	21'-1½			52.286				Pv	
CM	3.2600	109.38	4.20	120		0.012060		41'-1	Pf 0.658
8021	21'-1½	15.82		52.286		Flow (q) from Route 16		Pe	0.397
8008	20'-2½			53.341		2fE(6'-8½)		Pv	
Route 8									
CM	2.6350	145.01	8.53	120		0.057288		14'-6	Pf 0.831
8013	23'-11	11.72		46.449		Flow (q) from Route 2		Pe	
8022	23'-11			47.280				Pv	
BL	1.3800	11.12	2.39	120		0.011561		99'-0½	Pf 1.502
8022	23'-11			47.280		PO(6'-0)		Pe	1.607
8005	20'-2½			50.389		2T(5'-3½), 4E(2'-1), PO(6'-0)		Pv	
Route 9									
CM	2.6350	133.89	7.88	120		0.049424		14'-6	Pf 0.717
8022	23'-11	11.12		47.280		Flow (q) from Route 8		Pe	
8023	23'-11			47.996				Pv	
BL	1.3800	11.84	2.54	120		0.012978		95'-0½	Pf 1.526
8023	23'-11			47.996		PO(6'-0)		Pe	1.607
8006	20'-2½			51.130		2T(5'-3½), PO(6'-0)		Pv	
Route 10									
CM	2.6350	122.05	7.18	120		0.041643		14'-6	Pf 0.604
8023	23'-11	11.84		47.996		Flow (q) from Route 9		Pe	
8024	23'-11			48.600				Pv	
BL	1.3800	12.67	2.72	120		0.014705		95'-8½	Pf 1.769
8024	23'-11			48.600		PO(6'-0)		Pe	1.607
8007	20'-2½			51.977		2T(5'-3½), E(2'-1), PO(6'-0)		Pv	
Route 11									
CM	2.6350	109.38	6.44	120		0.034002		14'-6	Pf 0.493
8024	23'-11	12.67		48.600		Flow (q) from Route 10		Pe	
8025	23'-11			49.093				Pv	
CM	2.6350	93.56	5.50	120		0.025466		14'-6	Pf 0.369
8025	23'-11			49.093				Pe	
8026	23'-11			49.462				Pv	
CM	2.6350	80.04	4.71	120		0.019078		14'-6	Pf 0.277
8026	23'-11			49.462				Pe	
8027	23'-11			49.739				Pv	
BL	1.3800	11.78	2.53	120		0.012857		66'-9½	Pf 1.108
8027	23'-11			49.739		PO(6'-0)		Pe	1.210
8019	21'-1½			52.057		T(5'-3½), E(2'-1), PO(6'-0)		Pv	
Route 12									
CM	2.6350	68.25	4.02	120		0.014210		14'-6	Pf 0.206
8027	23'-11	11.78		49.739		Flow (q) from Route 11		Pe	
8028	23'-11			49.945				Pv	
CM	2.6350	58.18	3.42	120		0.010577		10'-3½	Pf 0.109
8028	23'-11			49.945				Pe	
8029	23'-11			50.054				Pv	
CM	2.6350	49.30	2.90	120		0.007785		9'-0	Pf 0.070
8029	23'-11			50.054				Pe	
8030	23'-11			50.124				Pv	
CM	2.6350	41.11	2.42	120		0.005563		7'-11½	Pf 0.044
8030	23'-11			50.124				Pe	
8031	23'-11			50.168				Pv	
CM	2.6350	33.23	1.96	120		0.003753		11'-3	Pf 0.042
8031	23'-11			50.168				Pe	
8032	23'-11			50.211				Pv	
CM	2.6350	26.32	1.55	120		0.002437		14'-6	Pf 0.035
8032	23'-11			50.211				Pe	
7010	23'-11			50.246				Pv	
CM	2.6350	19.84	1.17	120		0.001445		14'-6	Pf 0.021
7010	23'-11			50.246				Pe	
8033	23'-11			50.267				Pv	



Hydraulic Analysis

Job Number: 4352CK
Report Description: Ordinary Group II - AREA 8 -

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	13.11	0.77	120		0.000672	14'-6	Pf 0.010
8033	23'-11			50.267				Pe
8034	23'-11			50.277			14'-6	Pv
CM	2.6350	6.51	0.38	120		0.000184	10'-1	Pf 0.002
8034	23'-11			50.277				Pe
8035	23'-11			50.278			10'-1	Pv
BL	1.3800	6.51	1.40	120		0.004293	65'-3½	Pf 0.377
8035	23'-11			50.278		PO(6'-0)	22'-6½	Pe 1.210
8036	21'-1½			51.865		2T(5'-3½), PO(6'-0)	87'-10½	Pv
CM	3.2600	6.51	0.25	120		0.000065	10'-1	Pf 0.001
8036	21'-1½			51.865				Pe
8037	21'-1½			51.866			10'-1	Pv
CM	3.2600	13.11	0.50	120		0.000238	14'-6	Pf 0.003
8037	21'-1½	6.60		51.866		Flow (q) from Route 25		Pe
8038	21'-1½			51.870			14'-6	Pv
CM	3.2600	19.84	0.76	120		0.000513	14'-6	Pf 0.007
8038	21'-1½	6.73		51.870		Flow (q) from Route 24		Pe
7009	21'-1½			51.877			14'-6	Pv
Route 13								
CM	4.2600	21.37	0.48	120		0.000160	4'-5	Pf 0.006
4008	7'-6	21.37		64.575		Flow (q) from Route 14	30'-0½	Pe 1.515
4004	4'-0			66.095		1E(8'-11½), 1T(21'-1)	34'-5	Pv
Route 14								
AO	1.3800	21.37	4.58	120		0.038702	2'-6½	Pf 0.911
4003	7'-6			63.665		PO(6'-0)	21'-0	Pe
4008	7'-6			64.575		E(3'-0), T(6'-0), PO(6'-0)	23'-6½	Pv
Route 15								
BL	1.3800	13.20	2.83	120		0.015874	95'-0½	Pf 1.999
8012	23'-11			45.490		PO(6'-0)	30'-10½	Pe 1.607
8003	20'-2½			49.096		2T(5'-3½), 4E(2'-1), PO(6'-0)	125'-11	Pv
Route 16								
BL	1.3800	15.82	3.39	120		0.022190	66'-9½	Pf 1.983
8025	23'-11			49.093		PO(6'-0)	22'-6½	Pe 1.210
8021	21'-1½			52.286		2T(5'-3½), PO(6'-0)	89'-4½	Pv
Route 17								
BL	1.3800	13.52	2.90	120		0.016592	66'-9½	Pf 1.483
8026	23'-11			49.462		PO(6'-0)	22'-6½	Pe 1.210
8020	21'-1½			52.155		2T(5'-3½), PO(6'-0)	89'-4½	Pv
Route 18								
BL	1.3800	10.07	2.16	120		0.009618	66'-9½	Pf 0.829
8028	23'-11			49.945		PO(6'-0)	19'-4½	Pe 1.210
8018	21'-1½			51.984		T(5'-3½), E(2'-1), PO(6'-0)	86'-2	Pv
Route 19								
BL	1.3800	8.88	1.91	120		0.007623	66'-9½	Pf 0.681
8029	23'-11			50.054		PO(6'-0)	22'-6½	Pe 1.210
8017	21'-1½			51.945		2T(5'-3½), PO(6'-0)	89'-4½	Pv
Route 20								
BL	1.3800	8.19	1.76	120		0.006561	66'-9½	Pf 0.586
8030	23'-11			50.124		PO(6'-0)	22'-6½	Pe 1.210
8016	21'-1½			51.920		2T(5'-3½), PO(6'-0)	89'-4½	Pv
Route 21								
BL	1.3800	7.88	1.69	120		0.006108	66'-9½	Pf 0.526
8031	23'-11			50.168		PO(6'-0)	19'-4½	Pe 1.210
8015	21'-1½			51.905		E(2'-1), T(5'-3½), PO(6'-0)	86'-2	Pv
Route 22								
BL	1.3800	6.92	1.48	120		0.004802	66'-9½	Pf 0.469
8032	23'-11			50.211		PO(6'-0)	30'-10½	Pe 1.210
8014	21'-1½			51.890		2T(5'-3½), 4E(2'-1), PO(6'-0)	97'-8½	Pv
Route 23								
BL	1.3800	6.48	1.39	120		0.004249	66'-2	Pf 0.421
7010	23'-11			50.246		PO(6'-0)	32'-11½	Pe 1.210
7009	21'-1½			51.877		2T(5'-3½), 5E(2'-1), PO(6'-0)	99'-2	Pv
Route 24								
BL	1.3800	6.73	1.44	120		0.004559	66'-9½	Pf 0.393
8033	23'-11			50.267		PO(6'-0)	19'-4½	Pe 1.210
8038	21'-1½			51.870		T(5'-3½), E(2'-1), PO(6'-0)	86'-2	Pv
Route 25								



Hydraulic Analysis

Job Number: 4352CK

Report Description: Ordinary Group II - AREA 8 -

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	1.3800	6.60	1.42	120		0.004406	66'-9½"	Pf 0.380
8034	23'-11"			50.277		PO(6'-0)	19'-4½"	Pe 1.210
8037	21'-1½"			51.866		T(5'-3½"), E(2'-1), PO(6'-0)	86'-2"	Pv

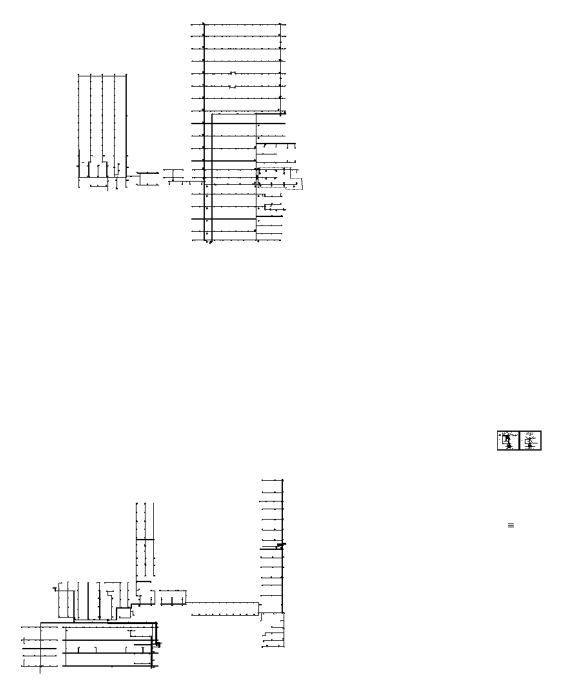
Equivalent Pipe Lengths of Valves and Fittings (C=120 only)				C Value Multiplier			
$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$				Value Of C	100	130	140
				Multiplying Factor	0.713	1.16	1.33
							150

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: 4352CK
Report Description: Light Hazard - AREA 9 -

Job									
Job Number 4352CK					Designer				
Job Name: MCC AUTO SHOP					Phone			FAX	
Address 1 500 SW LONGVIEW RD					State Certification/License Number				
Address 2 LEE'S SUMMIT, MO 64081					AHJ				
Address 3					Job Site/Building				
System									
Density 0.10gpm/ft ²					Area of Application 1500ft ² (Actual 1076ft ²)				
Most Demanding Sprinkler Data 5.6 K-Factor 22.50 at 16.143					Hose Streams 100.00				
Coverage Per Sprinkler 225ft ²					Number Of Sprinklers Calculated 10			Number Of Nozzles Calculated 0	
System Pressure Demand 55.852					System Flow Demand 260.06				
Total Demand 360.06 @ 55.852					Pressure Result +38.185 (40.6%)				
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	1682.00	100.00	96.000	62.000	BOR (4)	57.919	0	0.00
						BOR 2 (5)	53.591	35.52	260.06
4352CK MCC AUTO SHOP.cad					Supply at Node 1 (1682.00, 250.00, 96.000, 62.000)				
									



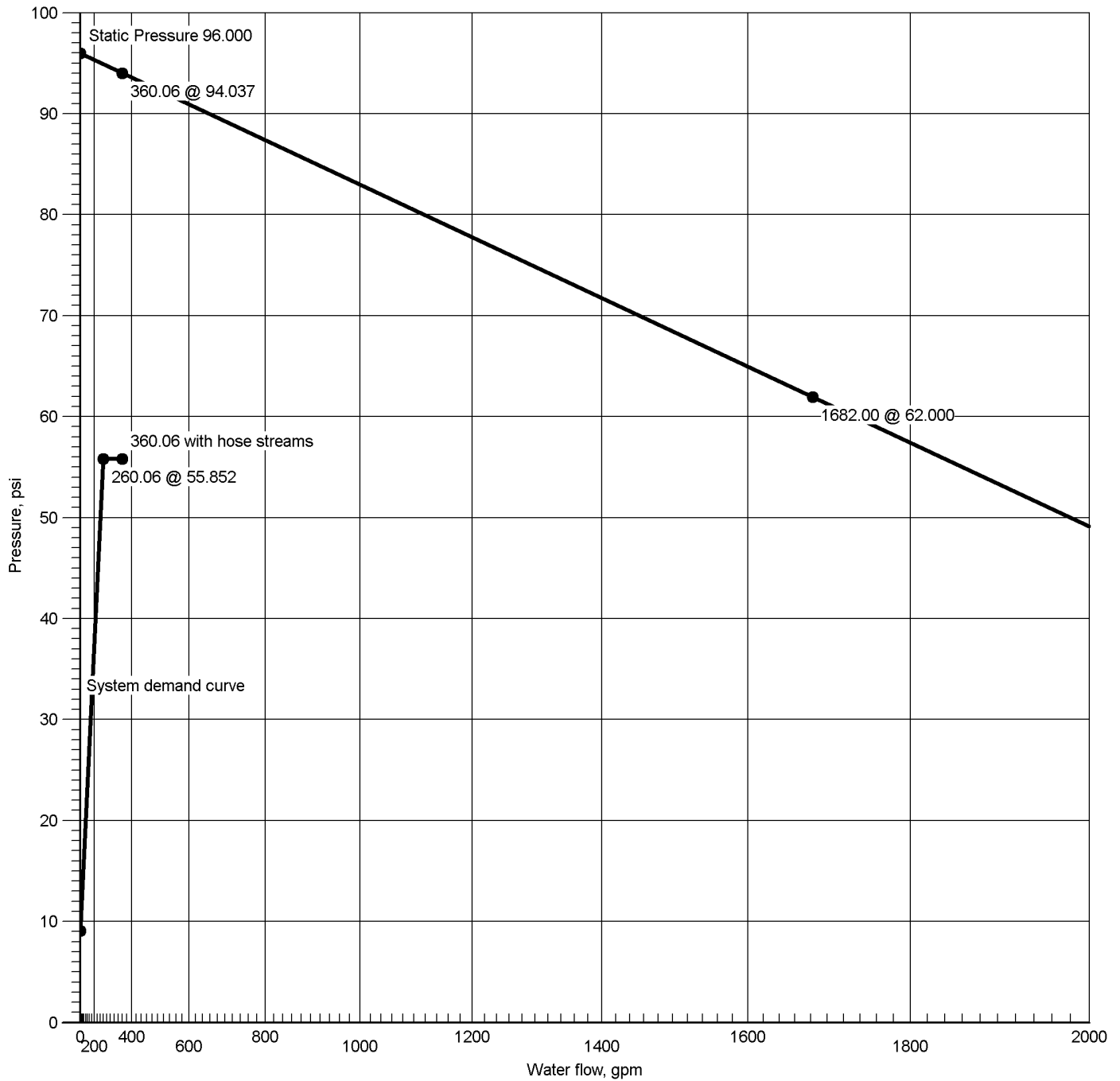
Hydraulic Summary

Job Number: 4352CK
Report Description: Light Hazard - AREA 9 -

Job											
Job Number 4352CK				Designer							
Job Name: MCC AUTO SHOP				State Certification/License Number							
Address 1 500 SW LONGVIEW RD				AHJ							
Address 2 LEE'S SUMMIT, MO 64081				Job Site/Building							
Address 3				Drawing Name 4352CK MCC AUTO SHOP.cad							
System				Remote Area(s)							
Most Demanding Sprinkler Data 5.6 K-Factor 22.50 at 16.143				Occupancy Light Hazard - AREA 9 -			Job Suffix				
Hose Allowance At Source 100.00				Density 0.10gpm/ft²			Area of Application 1500ft² (Actual 1076ft²)				
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>				Number Of Sprinklers Calculated 10		Number Of Nozzles Calculated 0		Coverage Per Sprinkler 225ft²			
				AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area Right: 55.852							
Total Hose Streams 100.00											
System Flow Demand 260.06		Total Water Required (Including Hose Allowance) 360.06									
Maximum Pressure Unbalance In Loops 0.000											
Maximum Velocity Above Ground 21.79 between nodes 9007 and 9006											
Maximum Velocity Under Ground 5.97 between nodes 17 and 5											
Volume capacity of Wet Pipes 3912.97gal		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	Water Supply	100.00	96.000	62.000		1682.00	94.037		360.06	55.852	38.185
Contractor											
Contractor Number		Contact Name				Contact Title					
Name of Contractor:		Phone				Extension					
Address 1		FAX									
Address 2		E-mail									
Address 3		Web-Site									



Supply at Node 1



Hydraulic Graph

Supply at Node 1

Static: Pressure
96.000

Residual: Pressure
62.000 @ 1682.00

Available Flow @ 20 PSI:
2596.97

Available Pressure at System Demand
94.037 @ 360.06

Required Pressure at System Demand
55.852 @ 260.06

Required Pressure at System Demand (Including Hose Allowance at Source)
55.852 @ 360.06



Summary Of Outflowing Devices

Job Number: 4352CK
Report Description: Light Hazard - AREA 9 -

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
⇒ Sprinkler	900	22.50	22.50	5.6	16.143			
Sprinkler	901	23.73	22.50	5.6	17.956			
Sprinkler	902	24.16	22.50	5.6	18.608			
Sprinkler	903	24.63	22.50	5.6	19.346			
Sprinkler	904	25.74	22.50	5.6	21.132			
Sprinkler	905	25.02	22.50	5.6	19.961			
Sprinkler	906	27.05	22.50	5.6	23.336			
Sprinkler	907	27.74	22.50	5.6	24.541			
Sprinkler	908	29.59	22.50	5.6	27.920			
Sprinkler	909	29.90	22.50	5.6	28.509			

⇒ Most Demanding Sprinkler Data



Node Analysis

Job Number: 4352CK

Report Description: Light Hazard - AREA 9 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	3'-0	S	55.852	260.06
900	20'-0	Spr(-16.143), fd	16.143	22.50
901	20'-0	Spr(-17.956), fd	17.956	23.73
902	20'-0	Spr(-18.608), fd	18.608	24.16
903	23'-7	Spr(-19.346)	19.346	24.63
904	24'-0½	Spr(-21.132)	21.132	25.74
905	20'-6	Spr(-19.961), fd	19.961	25.02
906	20'-6	Spr(-23.336), fd	23.336	27.05
907	20'-6	Spr(-24.541), fd	24.541	27.74
908	23'-7	Spr(-27.920)	27.920	29.59
909	24'-0½	Spr(-28.509)	28.509	29.90
2	-6'-0	E(22'-1)	59.737	
3	-6'-0		57.919	
4	1'-4	BOR	57.919	
5	0'-0	BOR 2	53.591	
17	-6'-0	T(33'-5½)	57.919	
4003	7'-6	PO(6'-0)	47.247	
4004	4'-0	fT(21'-1), Tr(6'-9½)	49.232	
4008	7'-6	PO(6'-0)	47.715	
7007	20'-2½	fE(9'-1½)	40.112	
7009	21'-1½	PO(6'-0)	35.471	
7010	23'-11	PO(6'-0)	34.399	
8000	20'-2½	PO(6'-0)	38.937	
8001	20'-2½	PO(6'-0)	38.938	
8002	20'-2½	PO(6'-0)	38.944	
8003	20'-2½	PO(6'-0)	38.956	
8004	20'-2½	PO(6'-0)	38.977	
8005	20'-2½	PO(6'-0)	39.010	
8006	20'-2½	PO(6'-0)	39.056	
8007	20'-2½	PO(6'-0)	39.125	
8008	20'-2½	PO(20'-2)	39.264	
8009	23'-11	PO(6'-0)	36.461	
8010	23'-11	PO(6'-0)	36.456	
8011	23'-11	PO(6'-0)	36.440	
8012	23'-11	PO(6'-0)	36.405	
8013	23'-11	PO(6'-0)	36.345	
8014	21'-1½	PO(6'-0)	35.467	
8015	21'-1½	PO(6'-0)	35.462	
8016	21'-1½	PO(6'-0)	35.490	
8017	21'-1½	PO(6'-0)	35.583	
8018	21'-1½	PO(6'-0)	35.887	
8019	21'-1½	PO(6'-0)	36.302	
8020	21'-1½	PO(6'-0)	36.719	
8021	21'-1½	PO(6'-0)	37.151	
8022	23'-11	PO(6'-0)	36.254	
8023	23'-11	PO(6'-0)	36.123	
8024	23'-11	PO(6'-0)	35.937	
8025	23'-11	PO(6'-0)	35.683	
8026	23'-11	PO(6'-0)	35.396	
8027	23'-11	PO(6'-0)	35.087	
8028	23'-11	PO(6'-0)	34.773	
8029	23'-11	PO(6'-0)	34.565	
8030	23'-11	PO(6'-0)	34.471	
8031	23'-11	PO(6'-0)	34.424	
8032	23'-11	PO(6'-0)	34.410	
8033	23'-11	PO(6'-0)	34.392	
8034	23'-11	PO(6'-0)	34.389	
8035	23'-11	PO(6'-0)	34.388	
8036	21'-1½	PO(6'-0)	35.475	
8037	21'-1½	PO(6'-0)	35.474	
8038	21'-1½	PO(6'-0)	35.473	
9000	22'-10	PO(5'-0)	17.244	



Node Analysis

Job Number: 4352CK

Report Description: Light Hazard - AREA 9 -

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
9001	23'-2½	PO(5'-0)	17.461		
9002	23'-9½	PO(5'-0)	19.519		
9003	24'-4½	PO(5'-0)	24.297		
9004	24'-6½	T(5'-3½)	30.312		
9005	23'-2½	PO(5'-0)	19.042		
9006	24'-4½	PO(5'-0)	23.904		
9007	24'-6½	T(5'-3½)	30.218		
9008	24'-6½	T(5'-3½)	32.592		



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 9 -

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								
AO	1.0490	22.50	8.35	120		0.161813	5'-5"	Pf 2.333
900	20'-0"	22.50	5.6	16.143		Sprinkler,	9'-0"	Pe -1.232
9000	22'-10"			17.244		2E(2'-0"), PO(5'-0"), fd	14'-5"	Pv
BL	1.3800	22.50	4.83	120		0.042558	8'-9"	Pf 0.373
9000	22'-10"			17.244				Pe -0.156
9001	23'-2½"			17.461			8'-9"	Pv
BL	1.3800	46.23	9.92	120		0.161267	14'-4"	Pf 2.313
9001	23'-2½"	23.73		17.461		Flow (q) from Route 2		Pe -0.255
9002	23'-9½"			19.519			14'-4"	Pv
BL	1.3800	71.25	15.28	120		0.358991	14'-0"	Pf 5.027
9002	23'-9½"	25.02		19.519		Flow (q) from Route 4		Pe -0.249
9003	24'-4½"			24.297			14'-0"	Pv
BL	1.3800	98.99	21.23	120		0.659617	3'-11½"	Pf 6.086
9003	24'-4½"	27.74		24.297		Flow (q) from Route 6	5'-3½"	Pe -0.070
9004	24'-6½"			30.312		T(5'-3½")	9'-2½"	Pv
BL	1.3800	74.44	15.97	120		0.389252	3'-5"	Pf 3.667
9004	24'-6½"			30.312			6'-0"	Pe 1.482
8015	21'-1½"			35.462		PO(6'-0")	9'-5"	Pv
CM	3.2600	56.27	2.16	120		0.003526	7'-11½"	Pf 0.028
8015	21'-1½"			35.462				Pe
8016	21'-1½"			35.490			7'-11½"	Pv
CM	3.2600	100.76	3.87	120		0.010360	9'-0"	Pf 0.093
8016	21'-1½"	44.49		35.490		Flow (q) from Route 7		Pe
8017	21'-1½"			35.583			9'-0"	Pv
CM	3.2600	177.54	6.82	120		0.029543	10'-3½"	Pf 0.304
8017	21'-1½"	76.77		35.583		Flow (q) from Route 3		Pe
8018	21'-1½"			35.887			10'-3½"	Pv
CM	3.2600	174.40	6.70	120		0.028585	14'-6"	Pf 0.414
8018	21'-1½"			35.887				Pe
8019	21'-1½"			36.302			14'-6"	Pv
CM	3.2600	175.03	6.73	120		0.028777	14'-6"	Pf 0.417
8019	21'-1½"	0.63		36.302		Flow (q) from Route 8		Pe
8020	21'-1½"			36.719			14'-6"	Pv
CM	3.2600	178.39	6.86	120		0.029807	14'-6"	Pf 0.432
8020	21'-1½"	3.36		36.719		Flow (q) from Route 31		Pe
8021	21'-1½"			37.151			14'-6"	Pv
CM	3.2600	183.64	7.06	120		0.031451	41'-1"	Pf 1.715
8021	21'-1½"	5.25		37.151		Flow (q) from Route 30	13'-5½"	Pe 0.397
8008	20'-2½"			39.264		2fE(6'-8½")	54'-6½"	Pv
CM	3.2600	260.06	10.00	120		0.059866	5'-0½"	Pf 0.848
8008	20'-2½"	76.42		39.264		Flow (q) from Route 9	9'-1½"	Pe
7007	20'-2½"			40.112		fE(9'-1½")	14'-2"	Pv
CM	4.2600	260.06	5.85	120		0.016268	22'-9"	Pf 1.629
7007	20'-2½"			40.112			77'-5"	Pe 5.505
4003	7'-6"			47.247		fE(8'-11½"), fT(21'-1"), fT(21'-6"), PO(26'-4")	100'-2"	Pv
CM	4.2600	245.14	5.52	120		0.014583	2'-4"	Pf 0.471
4003	7'-6"			47.247			29'-11½"	Pe 1.515
4004	4'-0"			49.232		CV(23'-2"), Tr(6'-9½")	32'-3½"	Pv
CM	4.2600	260.06	5.85	120		0.016268	4'-0"	Pf 2.625
4004	4'-0"	14.92		49.232		Flow (q) from Route 26		Pe 1.734
5	0'-0"			53.591		BFP(-2.560), BOR 2	4'-0"	Pv
UG	4.2200	260.06	5.97	140		0.012806	64'-2"	Pf 1.722
5	0'-0"			53.591			70'-3"	Pe 2.606
17	-6'-0"			57.919		2E(16'-8½"), GV(3'-4"), T(33'-5½")	134'-5"	Pv
UG	6.2800	260.06	2.69	140		0.001848	790'-0"	Pf 1.818
17	-6'-0"			57.919			193'-10"	Pe
2	-6'-0"			59.737		GV(4'-8½"), EE(11'-0½"), LtE(14'-2"), 3T(47'-3½"), E(22'-1")	983'-10"	Pv
UG	6.2800	260.06	2.69	140		0.001848	9'-0"	Pf 0.017
2	-6'-0"			59.737				Pe -3.902
1	3'-0"			55.852		S	9'-0"	Pv
		100.00				Hose Allowance At Source		
1		360.06						
Route 2								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 9 -

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	23.73	8.81	120		0.178553		0'-0" Pf 0.893
901	20'-0"	23.73	5.6	17.956		Sprinkler,		5'-0" Pe -1.388
9001	23'-2½"			17.461		PO(5'-0), fd		5'-0" Pv
Route 3								
AO	1.0490	24.16	8.97	120		0.184540		2'-10½" Pf 1.820
902	20'-0"	24.16	5.6	18.608		Sprinkler,		7'-0" Pe -1.386
9005	23'-2½"			19.042		E(2'-0), PO(5'-0), fd		9'-10½" Pv
BL	1.3800	24.16	5.18	120		0.048535		9'-11" Pf 0.481
9005	23'-2½"			19.042				9'-11" Pe -0.176
903	23'-7"			19.346				Pv
BL	1.3800	48.79	10.47	120		0.178163		11'-1½" Pf 1.984
903	23'-7"	24.63	5.6	19.346		Sprinkler		11'-1½" Pe -0.198
904	24'-0½"			21.132				Pv
BL	1.3800	74.53	15.99	120		0.390176		7'-5½" Pf 2.905
904	24'-0½"	25.74	5.6	21.132		Sprinkler		7'-5½" Pe -0.132
9006	24'-4½"			23.904				Pv
BL	1.3800	101.58	21.79	120		0.691922		3'-11½" Pf 6.384
9006	24'-4½"	27.05		23.904		Flow (q) from Route 5		5'-3½" Pe -0.070
9007	24'-6½"			30.218		T(5'-3½)		9'-2½" Pv
BL	1.3800	76.77	16.47	120		0.412185		3'-5" Pf 3.883
9007	24'-6½"			30.218				6'-0" Pe 1.482
8017	21'-1½"			35.583		PO(6'-0)		9'-5" Pv
Route 4								
DY	1.0490	25.02	9.29	120		0.196918		0'-0" Pf 0.985
905	20'-6"	25.02	5.6	19.961		Sprinkler,		5'-0" Pe -1.427
9002	23'-9½"			19.519		PO(5'-0), fd		5'-0" Pv
Route 5								
AO	1.0490	27.05	10.04	120		0.227534		2'-10½" Pf 2.244
906	20'-6"	27.05	5.6	23.336		Sprinkler,		7'-0" Pe -1.676
9006	24'-4½"			23.904		E(2'-0), PO(5'-0), fd		9'-10½" Pv
Route 6								
AO	1.0490	27.74	10.30	120		0.238381		1'-0" Pf 1.432
907	20'-6"	27.74	5.6	24.541		Sprinkler,		5'-0" Pe -1.676
9003	24'-4½"			24.297		PO(5'-0), fd		6'-0" Pv
Route 7								
BL	1.3800	29.59	6.35	120		0.070642		11'-1½" Pf 0.787
908	23'-7"	29.59	5.6	27.920		Sprinkler		11'-1½" Pe -0.198
909	24'-0½"			28.509				Pv
BL	1.3800	59.49	12.76	120		0.257139		11'-4½" Pf 4.287
909	24'-0½"	29.90	5.6	28.509		Sprinkler,		5'-3½" Pe -0.203
9008	24'-6½"			32.592		T(5'-3½)		16'-8" Pv
BL	1.3800	44.49	9.54	120		0.150219		3'-5" Pf 1.415
9008	24'-6½"			32.592				6'-0" Pe 1.482
8016	21'-1½"			35.490		PO(6'-0)		9'-5" Pv
Route 8								
CM	2.6350	14.38	0.85	120		0.000797		14'-6" Pf 0.012
7010	23'-11"	10.84 + 3.54		34.399		Flow (q) from Route 10 and 11		14'-6" Pe
8032	23'-11"			34.410				Pv
CM	2.6350	18.16	1.07	120		0.001227		11'-3" Pf 0.014
8032	23'-11"	3.78		34.410		Flow (q) from Route 36		11'-3" Pe
8031	23'-11"			34.424				Pv
CM	2.6350	42.72	2.51	120		0.005972		7'-11½" Pf 0.047
8031	23'-11"	24.56		34.424		Flow (q) from Route 35		7'-11½" Pe
8030	23'-11"			34.471				Pv
CM	2.6350	57.72	3.40	120		0.010421		9'-0" Pf 0.094
8030	23'-11"	15.00		34.471		Flow (q) from Route 34		9'-0" Pe
8029	23'-11"			34.565				Pv
CM	2.6350	82.53	4.86	120		0.020191		10'-3½" Pf 0.208
8029	23'-11"	24.81		34.565		Flow (q) from Route 33		10'-3½" Pe
8028	23'-11"			34.773				Pv
CM	2.6350	85.67	5.04	120		0.021634		14'-6" Pf 0.314
8028	23'-11"	3.14		34.773		Flow (q) from Route 32		14'-6" Pe
8027	23'-11"			35.087				Pv
BL	1.3800	0.63	0.14	120		0.000058		66'-9½" Pf 0.005
8027	23'-11"			35.087		PO(6'-0)		19'-4½" Pe 1.210
8019	21'-1½"			36.302		T(5'-3½), E(2'-1), PO(6'-0)		86'-2" Pv
Route 9								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 9 -

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	3.2600	26.06	1.00	120		0.000849	14'-6	Pf 0.012
8002	20'-2½	17.50 + 8.56		38.944		Flow (q) from Route 12 and 28		Pe
8003	20'-2½			38.956			14'-6	Pv
CM	3.2600	34.86	1.34	120		0.001454	14'-6	Pf 0.021
8003	20'-2½	8.80		38.956		Flow (q) from Route 29		Pe
8004	20'-2½			38.977			14'-6	Pv
CM	3.2600	43.91	1.69	120		0.002228	14'-6	Pf 0.032
8004	20'-2½	9.05		38.977		Flow (q) from Route 16		Pe
8005	20'-2½			39.010			14'-6	Pv
CM	3.2600	53.53	2.06	120		0.003215	14'-6	Pf 0.047
8005	20'-2½	9.62		39.010		Flow (q) from Route 18		Pe
8006	20'-2½			39.056			14'-6	Pv
CM	3.2600	64.50	2.48	120		0.004539	15'-2	Pf 0.069
8006	20'-2½	10.98		39.056		Flow (q) from Route 21		Pe
8007	20'-2½			39.125			15'-2	Pv
CM	3.2600	76.42	2.94	120		0.006212	2'-1½	Pf 0.138
8007	20'-2½	11.92		39.125		Flow (q) from Route 20	20'-2	Pe
8008	20'-2½			39.264		PO(20'-2)	22'-3½	Pv
Route 10								
CM	3.2600	10.84	0.42	120		0.000168	14'-6	Pf 0.002
7009	21'-1½	14.38		35.471		Flow (q) from Route 25		Pe
8038	21'-1½			35.473			14'-6	Pv
CM	3.2600	7.17	0.28	120		0.000078	14'-6	Pf 0.001
8038	21'-1½			35.473				Pe
8037	21'-1½			35.474			14'-6	Pv
CM	3.2600	3.56	0.14	120		0.000021	10'-1	Pf 0.000
8037	21'-1½			35.474				Pe
8036	21'-1½			35.475			10'-1	Pv
BL	1.3800	3.56	0.76	120		0.001404	65'-3½	Pf 0.123
8036	21'-1½			35.475		PO(6'-0)	22'-6½	Pe -1.210
8035	23'-11			34.388		2T(5'-3½), PO(6'-0)	87'-10½	Pv
CM	2.6350	3.56	0.21	120		0.000060	10'-1	Pf 0.001
8035	23'-11			34.388				Pe
8034	23'-11			34.389			10'-1	Pv
CM	2.6350	7.17	0.42	120		0.000220	14'-6	Pf 0.003
8034	23'-11	3.61		34.389		Flow (q) from Route 38		Pe
8033	23'-11			34.392			14'-6	Pv
CM	2.6350	10.84	0.64	120		0.000473	14'-6	Pf 0.007
8033	23'-11	3.68		34.392		Flow (q) from Route 37		Pe
7010	23'-11			34.399			14'-6	Pv
Route 11								
BL	1.3800	3.54	0.76	120		0.001389	66'-2	Pf 0.138
7009	21'-1½	14.38		35.471		PO(6'-0), Flow (q) from Route 25	32'-11½	Pe -1.210
7010	23'-11			34.399		5E(2'-1), 2T(5'-3½), PO(6'-0)	99'-2	Pv
Route 12								
CM	3.2600	8.73	0.34	120		0.000112	13'-6	Pf 0.002
8000	20'-2½	8.73		38.937		Flow (q) from Route 14		Pe
8001	20'-2½			38.938			13'-6	Pv
CM	3.2600	17.50	0.67	120		0.000406	14'-6	Pf 0.006
8001	20'-2½	8.76		38.938		Flow (q) from Route 13		Pe
8002	20'-2½			38.944			14'-6	Pv
Route 13								
BL	1.3800	8.76	1.88	120		0.007438	95'-0½	Pf 0.875
8010	23'-11	17.50		36.456		PO(6'-0), Flow (q) from Route 15	22'-6½	Pe 1.607
8001	20'-2½			38.938		2T(5'-3½), PO(6'-0)	117'-7	Pv
Route 14								
CM	2.6350	8.73	0.51	120		0.000317	13'-6	Pf 0.004
8010	23'-11	17.50		36.456		Flow (q) from Route 15		Pe
8009	23'-11			36.461			13'-6	Pv
BL	1.3800	8.73	1.87	120		0.007389	95'-0½	Pf 0.869
8009	23'-11			36.461		PO(6'-0)	22'-6½	Pe 1.607
8000	20'-2½			38.937		2T(5'-3½), PO(6'-0)	117'-7	Pv
Route 15								
CM	2.6350	17.50	1.03	120		0.001145	14'-6	Pf 0.017
8011	23'-11	26.06		36.440		Flow (q) from Route 17		Pe
8010	23'-11			36.456			14'-6	Pv
Route 16								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 9 -

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	9.05	1.94	120		0.007887	99'-0½	Pf 1.025
8013	23'-11	43.91		36.345		PO(6'-0), Flow (q) from Route 19	30'-10½	Pe 1.607
8004	20'-2½			38.977		2T(5'-3½), 4E(2'-1), PO(6'-0)	129'-11	Pv
Route 17								
CM	2.6350	34.86	2.05	120		0.004100	14'-6	Pf 0.059
8013	23'-11	43.91		36.345		Flow (q) from Route 19		Pe
8012	23'-11			36.405			14'-6	Pv
CM	2.6350	26.06	1.53	120		0.002393	14'-6	Pf 0.035
8012	23'-11			36.405				Pe
8011	23'-11			36.440			14'-6	Pv
Route 18								
BL	1.3800	9.62	2.06	120		0.008837	99'-0½	Pf 1.148
8022	23'-11	53.53		36.254		PO(6'-0), Flow (q) from Route 22	30'-10½	Pe 1.607
8005	20'-2½			39.010		2T(5'-3½), 4E(2'-1), PO(6'-0)	129'-11	Pv
Route 19								
CM	2.6350	43.91	2.58	120		0.006283	14'-6	Pf 0.091
8022	23'-11	53.53		36.254		Flow (q) from Route 22		Pe
8013	23'-11			36.345			14'-6	Pv
Route 20								
BL	1.3800	11.92	2.56	120		0.013134	95'-8½	Pf 1.580
8024	23'-11	76.42		35.937		PO(6'-0), Flow (q) from Route 23	24'-7½	Pe 1.607
8007	20'-2½			39.125		2T(5'-3½), E(2'-1), PO(6'-0)	120'-4	Pv
Route 21								
CM	2.6350	64.50	3.79	120		0.012799	14'-6	Pf 0.186
8024	23'-11	76.42		35.937		Flow (q) from Route 23		Pe
8023	23'-11			36.123			14'-6	Pv
BL	1.3800	10.98	2.35	120		0.011278	95'-0½	Pf 1.326
8023	23'-11			36.123		PO(6'-0)	22'-6½	Pe 1.607
8006	20'-2½			39.056		2T(5'-3½), PO(6'-0)	117'-7	Pv
Route 22								
CM	2.6350	53.53	3.15	120		0.009064	14'-6	Pf 0.131
8023	23'-11	10.98		36.123		Flow (q) from Route 21		Pe
8022	23'-11			36.254			14'-6	Pv
Route 23								
CM	2.6350	76.42	4.50	120		0.017514	14'-6	Pf 0.254
8025	23'-11	81.67		35.683		Flow (q) from Route 24		Pe
8024	23'-11			35.937			14'-6	Pv
Route 24								
CM	2.6350	85.03	5.00	120		0.021340	14'-6	Pf 0.309
8027	23'-11	0.63		35.087		Flow (q) from Route 8		Pe
8026	23'-11			35.396			14'-6	Pv
CM	2.6350	81.67	4.81	120		0.019806	14'-6	Pf 0.287
8026	23'-11			35.396				Pe
8025	23'-11			35.683			14'-6	Pv
Route 25								
CM	3.2600	18.16	0.70	120		0.000435	11'-3	Pf 0.005
8015	21'-1½	56.27		35.462		Flow (q) from Route 1		Pe
8014	21'-1½			35.467			11'-3	Pv
CM	3.2600	14.38	0.55	120		0.000283	14'-6	Pf 0.004
8014	21'-1½			35.467				Pe
7009	21'-1½			35.471			14'-6	Pv
Route 26								
CM	4.2600	14.92	0.34	120		0.000082	4'-5	Pf 0.003
4008	7'-6	14.92		47.715		Flow (q) from Route 27	30'-0½	Pe 1.515
4004	4'-0			49.232		fE(8'-11½), fT(21'-1)	34'-5	Pv
Route 27								
AO	1.3800	14.92	3.20	120		0.019901	2'-6½	Pf 0.468
4003	7'-6			47.247		PO(6'-0)	21'-0	Pe
4008	7'-6			47.715		E(3'-0), T(6'-0), PO(6'-0)	23'-6½	Pv
Route 28								
BL	1.3800	8.56	1.84	120		0.007124	95'-0½	Pf 0.897
8011	23'-11	26.06		36.440		PO(6'-0), Flow (q) from Route 17	30'-10½	Pe 1.607
8002	20'-2½			38.944		2T(5'-3½), 4E(2'-1), PO(6'-0)	125'-11	Pv
Route 29								
BL	1.3800	8.80	1.89	120		0.007498	95'-0½	Pf 0.944
8012	23'-11			36.405		PO(6'-0)	30'-10½	Pe 1.607
8003	20'-2½			38.956		2T(5'-3½), 4E(2'-1), PO(6'-0)	125'-11	Pv
Route 30								



Hydraulic Analysis

Job Number: 4352CK
Report Description: Light Hazard - AREA 9 -

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	1.3800	5.25	1.13	120		0.002885	66'-9½"	Pf 0.258
8025	23'-11"	81.67		35.683		PO(6'-0), Flow (q) from Route 24	22'-6½"	Pe 1.210
8021	21'-1½"			37.151		2T(5'-3½"), PO(6'-0)	89'-4½"	Pv
Route 31								
BL	1.3800	3.36	0.72	120		0.001262	66'-9½"	Pf 0.113
8026	23'-11"			35.396		PO(6'-0)	22'-6½"	Pe 1.210
8020	21'-1½"			36.719		2T(5'-3½"), PO(6'-0)	89'-4½"	Pv
Route 32								
BL	1.3800	3.14	0.67	120		0.001112	66'-9½"	Pf 0.096
8018	21'-1½"			35.887		PO(6'-0)	19'-4½"	Pe -1.210
8028	23'-11"			34.773		E(2'-1), T(5'-3½"), PO(6'-0)	86'-2"	Pv
Route 33								
BL	1.3800	24.81	5.32	120		0.050985	63'-4½"	Pf 4.075
9007	24'-6½"			30.218		T(5'-3½")	16'-6½"	Pe 0.272
8029	23'-11"			34.565		T(5'-3½"), PO(6'-0)	79'-11"	Pv
Route 34								
BL	1.3800	15.00	3.22	120		0.020102	63'-4½"	Pf 1.607
9008	24'-6½"			32.592		T(5'-3½")	16'-6½"	Pe 0.272
8030	23'-11"			34.471		T(5'-3½"), PO(6'-0)	79'-11"	Pv
Route 35								
BL	1.3800	24.56	5.27	120		0.050029	63'-4½"	Pf 3.839
9004	24'-6½"			30.312		T(5'-3½")	13'-4½"	Pe 0.272
8031	23'-11"			34.424		E(2'-1), PO(6'-0)	76'-9"	Pv
Route 36								
BL	1.3800	3.78	0.81	120		0.001570	66'-9½"	Pf 0.153
8014	21'-1½"			35.467		PO(6'-0)	30'-10½"	Pe -1.210
8032	23'-11"			34.410		2T(5'-3½"), 4E(2'-1), PO(6'-0)	97'-8½"	Pv
Route 37								
BL	1.3800	3.68	0.79	120		0.001491	66'-9½"	Pf 0.128
8038	21'-1½"			35.473		PO(6'-0)	19'-4½"	Pe -1.210
8033	23'-11"			34.392		E(2'-1), T(5'-3½"), PO(6'-0)	86'-2"	Pv
Route 38								
BL	1.3800	3.61	0.77	120		0.001441	66'-9½"	Pf 0.124
8037	21'-1½"			35.474		PO(6'-0)	19'-4½"	Pe -1.210
8034	23'-11"			34.389		E(2'-1), T(5'-3½"), PO(6'-0)	86'-2"	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: 4352CK
Report Description: Light Hazard - AREA 9 -

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