Hydraulic Calculations by HydraCALC

ABL Fire Protection
300 Hoke Street
Raleigh, NC 27601
919-291-7460

Job Name	:	ILC Dover- Clean Rooms
Drawing	:	
Location	:	Lillington, NC
Remote Area	:	2
Contract	:	
Data File	:	ILC Dover Calcs- Clean Rooms.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME ILC Dover
Location Lillington, NC
Drawing #
Contract #
Date

DESIGN

Remote area # 2
Remote area location Clean Rooms
Occupancy classification Ordinary Hazard
Density .10 - Gpm/SqFt
Area of application 900 - SqFt
Coverage/sprinkler 130 - SqFt
Type of sprinkler calculated Quick Response Pendent
 # Sprinklers calculated 12
In-rack demand - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 493.918 - GPM @ 68.41 - Psi
Type of system
Volume of system (dry or pre-action) - Gal

WATER SUPPLY INFORMATION

Test date 12-16-24
Location Closest Private Hydrant
Source of info Andrew King Engineering

CONTRACTOR INFO ABL Fire Protection
Address 300 Hoke St.; Raleigh. NC 27601
Phone # 919-291-7460
Name of designer Art Lamson
Authority having jurisdiction Harnett County
NOTES:

text1(35) - invisible

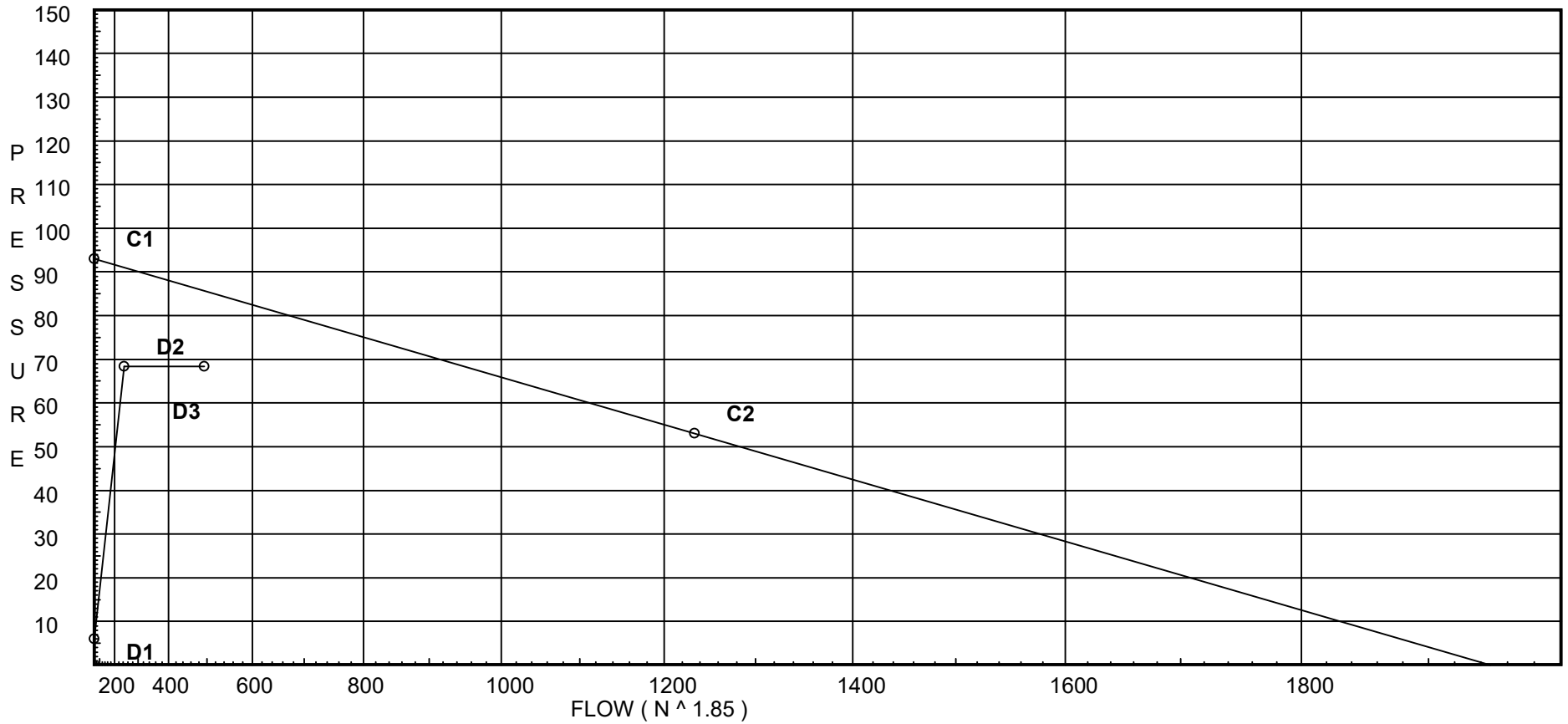
Water Supply Curve

ABL Fire Protection
ILC Dover- Clean Rooms

Date 12/18/24

City Water Supply:
- C1 - Static Pressure : 93
- C2 - Residual Pressure: 53
- C2 - Residual Flow : 1234

Demand:
- D1 - Elevation : 6.063
- D2 - System Flow : 243.918
- D2 - System Pressure : 68.410
- Hose (Demand) : 250
- D3 - System Demand : 493.918
- Safety Margin : 17.239



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
A	Alarm Rel E1 & E3							7.7	21.5		17		27	29							
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Zwc	Watts 709	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	93.0	53	1234.0	85.648	493.92	68.41

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
S2	9.0	5.6	12.13	19.5	0.15 130
S5	9.0	5.6	12.13	19.5	0.15 130
21	10.0	4.71	19.46	20.76	K=K @ EQ2
22	10.0	4.71	19.6	20.83	K=K @ EQ2
23	10.0	4.71	20.23	21.16	K=K @ EQ2
24	10.0	4.71	21.57	21.85	K=K @ EQ2
25	10.0	4.71	17.17	19.5	K=K @ EQ2
26	10.0	4.71	17.3	19.57	K=K @ EQ2
27	10.0	4.71	17.85	19.88	K=K @ EQ2
28	10.0	4.71	19.05	20.54	K=K @ EQ2
29	10.0		25.69		
30	10.0	4.71	17.32	19.58	K=K @ EQ2
31	10.0	4.71	17.44	19.65	K=K @ EQ2
32	10.0	4.71	18.0	19.97	K=K @ EQ2
33	10.0	4.71	19.2	20.62	K=K @ EQ2
C1	10.0		31.58		
C2	10.0		31.58		
C3	10.0		31.58		
C4	10.0		31.58		
C5	10.0		31.91		
A1	19.0		51.53		
A2	19.0		51.53		
A3	19.0		51.54		
A4	19.0		51.57		
A5	19.0		51.61		
A6	19.0		51.68		
A7	19.0		51.77		
A8	19.0		51.89		
A9	19.0		52.04		
TOR	2.0		59.59		
BOR	2.0		60.63		
BASE	0.0		65.3	250.0	
TEST	-4.0		68.41		
B1	19.0		37.89		
B2	19.0		37.89		
B3	19.0		37.88		
B4	19.0		37.85		
B5	19.0		37.81		
B6	19.0		37.75		
CON1	19.0		37.72		

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
B7	19.0		37.73		
B8	19.0		37.74		

Node1 / to / Node2	Elev1 / Elev2	K / Fact	Qa / Qt	Nom / Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact / Pf/Ft	Pt / Pe / Pf	******* Notes ******
S2	9	5.60	19.50	1	T	5.0	1.000	120	12.125	
to							5.000		3.898	
EQ1	0		19.5	1.049			6.000	0.1242	0.745	Vel = 7.24
			0.0							
EQ1			19.50						16.768	K Factor = 4.76
S5	9	5.60	19.50	1	E	2.0	2.250	120	12.125	
to					T	5.0	7.000		3.898	
EQ2	0		19.5	1.049			9.250	0.1242	1.149	Vel = 7.24
			0.0							
EQ2			19.50						17.172	K Factor = 4.71
21	10	4.71	20.76	1.5			8.000	120	19.461	K = K @ EQ2
to									0.0	
22	10		20.76	1.61			8.000	0.0174	0.139	Vel = 3.27
22	10	4.71	20.83	1.5			10.000	120	19.600	K = K @ EQ2
to									0.0	
23	10		41.59	1.61			10.000	0.0626	0.626	Vel = 6.55
23	10	4.71	21.17	1.5			10.000	120	20.226	K = K @ EQ2
to									0.0	
24	10		62.76	1.61			10.000	0.1340	1.340	Vel = 9.89
24	10	4.71	21.85	1.5	T	8.0	35.000	120	21.566	K = K @ EQ2
to							8.000		0.0	
C4	10		84.61	1.61			43.000	0.2329	10.013	Vel = 13.33
			0.0							
C4			84.61						31.579	K Factor = 15.06
25	10	4.71	19.50	1.5			8.000	120	17.172	K = K @ EQ2
to									0.0	
26	10		19.5	1.61			8.000	0.0154	0.123	Vel = 3.07
26	10	4.71	19.57	1.5			10.000	120	17.295	K = K @ EQ2
to									0.0	
27	10		39.07	1.61			10.000	0.0558	0.558	Vel = 6.16
27	10	4.71	19.88	1.5			10.000	120	17.853	K = K @ EQ2
to									0.0	
28	10		58.95	1.61			10.000	0.1193	1.193	Vel = 9.29
28	10	4.71	20.54	1.5	E	4.0	20.000	120	19.046	K = K @ EQ2
to					T	8.0	12.000		0.0	
29	10		79.49	1.61			32.000	0.2075	6.640	Vel = 12.53
29	10		79.82	2	T	10.0	18.000	120	25.686	
to							10.000		0.0	
C5	10		159.31	2.067			28.000	0.2224	6.226	Vel = 15.23
			0.0							
C5			159.31						31.912	K Factor = 28.20
30	10	4.71	19.58	1.5			8.000	120	17.315	K = K @ EQ2
to									0.0	
31	10		19.58	1.61			8.000	0.0156	0.125	Vel = 3.09
31	10	4.71	19.65	1.5			10.000	120	17.440	K = K @ EQ2
to									0.0	
32	10		39.23	1.61			10.000	0.0562	0.562	Vel = 6.18

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
32	10	4.71	19.97	1.5			10.000	120	18.002	K = K @ EQ2
to									0.0	
33	10		59.2	1.61			10.000	0.1202	1.202	Vel = 9.33
33	10	4.71	20.62	1.5	E	4.0	19.000	120	19.204	K = K @ EQ2
to					T	8.0	12.000		0.0	
29	10		79.82	1.61			31.000	0.2091	6.482	Vel = 12.58
			0.0							
29			79.82						25.686	K Factor = 15.75
C1	10		0.0	2			3.000	120	31.579	
to									0.0	
C2	10		0.0	2.157			3.000	0	0.0	Vel = 0
C2	10		0.0	2			12.000	120	31.579	
to									0.0	
C3	10		0.0	2.157			12.000	0	0.0	Vel = 0
C3	10		0.0	2			5.000	120	31.579	
to									0.0	
C4	10		0.0	2.157			5.000	0	0.0	Vel = 0
C4	10		84.61	2.5			15.750	120	31.579	
to									0.0	
C5	10		84.61	2.635			15.750	0.0211	0.333	Vel = 4.98
C5	10		159.31	2.5	E	8.237	40.000	120	31.912	
to					T	16.474	24.711		-3.898	
CON1	19		243.92	2.635			64.711	0.1499	9.702	Vel = 14.35
			0.0							
CON1			243.92						37.716	K Factor = 39.72
A1	19		26.85	4			13.330	120	51.529	
to									0.0	
A2	19		26.85	4.26			13.330	0.0002	0.003	Vel = 0.60
A2	19		26.86	4			13.330	120	51.532	
to									0.0	
A3	19		53.71	4.26			13.330	0.0009	0.012	Vel = 1.21
A3	19		26.88	4			13.330	120	51.544	
to									0.0	
A4	19		80.59	4.26			13.330	0.0019	0.025	Vel = 1.81
A4	19		26.94	4			13.330	120	51.569	
to									0.0	
A5	19		107.53	4.26			13.330	0.0032	0.042	Vel = 2.42
A5	19		27.03	4			13.330	120	51.611	
to									0.0	
A6	19		134.56	4.26			13.330	0.0048	0.064	Vel = 3.03
A6	19		27.16	4			13.330	120	51.675	
to									0.0	
A7	19		161.72	4.26			13.330	0.0068	0.090	Vel = 3.64
A7	19		27.27	4			13.330	120	51.765	
to									0.0	
A8	19		188.99	4.26			13.330	0.0090	0.120	Vel = 4.25

Final Calculations : Hazen-Williams

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
A8	19		27.39	4			13.330	120	51.885	
to									0.0	
A9	19		216.38	4.26			13.330	0.0116	0.155	Vel = 4.87
A9	19		27.54	4			13.330	120	52.040	
to									7.363	
TOR	2		243.92	4.26			13.330	0.0144	0.192	Vel = 5.49
TOR	2		0.0	4	A	22.384	20.000	120	59.595	
to					G	2.633	51.351		0.0	
BOR	2		243.92	4.26	T	26.334	71.351	0.0144	1.031	Vel = 5.49
BOR	2		0.0	6	Zwc	0.0	6.000	120	60.626	
to					E	17.603	17.603		4.622	* * Fixed Loss = 3.756
BASE	0		243.92	6.357			23.603	0.0021	0.049	Vel = 2.47
BASE	0	H250	250.00	6	3E	60.252	100.000	140	65.297	
to					T	43.037	107.593		1.732	
TEST	-4		493.92	6.16	G	4.304	207.593	0.0067	1.381	Vel = 5.32
			0.0							
TEST			493.92						68.410	K Factor = 59.72
B1	19		-26.85	4			13.330	120	37.894	
to									0.0	
B2	19		-26.85	4.26			13.330	-0.0002	-0.003	Vel = 0.60
B2	19		-26.86	4			13.330	120	37.891	
to									0.0	
B3	19		-53.71	4.26			13.330	-0.0009	-0.012	Vel = 1.21
B3	19		-26.88	4			13.330	120	37.879	
to									0.0	
B4	19		-80.59	4.26			13.330	-0.0019	-0.025	Vel = 1.81
B4	19		-26.94	4			13.330	120	37.854	
to									0.0	
B5	19		-107.53	4.26			13.330	-0.0032	-0.042	Vel = 2.42
B5	19		-27.03	4			13.330	120	37.812	
to									0.0	
B6	19		-134.56	4.26			13.330	-0.0048	-0.064	Vel = 3.03
B6	19		-27.16	4			4.750	120	37.748	
to									0.0	
CON1	19		-161.72	4.26			4.750	-0.0067	-0.032	Vel = 3.64
CON1	19		243.92	4			8.580	120	37.716	
to									0.0	
B7	19		82.2	4.26			8.580	0.0019	0.016	Vel = 1.85
B7	19		-27.27	4			13.330	120	37.732	
to									0.0	
B8	19		54.93	4.26			13.330	0.0010	0.013	Vel = 1.24
B8	19		-27.39	4			13.330	120	37.745	
to									8.229	
B9	0		27.54	4.26			13.330	0.0002	0.003	Vel = 0.62
			0.0							
B9			27.54						45.977	K Factor = 4.06
A1	19		-26.85	1.25	4T	24.0	207.000	120	51.529	
to							24.000		0.0	
B1	19		-26.85	1.38			231.000	-0.0590	-13.635	Vel = 5.76

Node1 / to / Node2	Elev1 / Elev2	K / Fact	Qa / Qt	Nom / Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact / Pf/Ft	Pt / Pe / Pf	******* Notes ******
			0.0							
B1			-26.85						37.894	K Factor = -4.36
A2	19		-26.86	1.25	4T	24.0	207.000	120	51.532	
to							24.000		0.0	
B2	19		-26.86	1.38			231.000	-0.0591	-13.641	Vel = 5.76
			0.0							
B2			-26.86						37.891	K Factor = -4.36
A3	19		-26.88	1.25	4T	24.0	207.000	120	51.544	
to							24.000		0.0	
B3	19		-26.88	1.38			231.000	-0.0592	-13.665	Vel = 5.77
			0.0							
B3			-26.88						37.879	K Factor = -4.37
A4	19		-26.94	1.25	4T	24.0	207.000	120	51.569	
to							24.000		0.0	
B4	19		-26.94	1.38			231.000	-0.0594	-13.715	Vel = 5.78
			0.0							
B4			-26.94						37.854	K Factor = -4.38
A5	19		-27.03	1.25	4T	24.0	207.000	120	51.611	
to							24.000		0.0	
B5	19		-27.03	1.38			231.000	-0.0597	-13.799	Vel = 5.80
			0.0							
B5			-27.03						37.812	K Factor = -4.40
A6	19		-27.16	1.25	4T	24.0	207.000	120	51.675	
to							24.000		0.0	
B6	19		-27.16	1.38			231.000	-0.0603	-13.927	Vel = 5.83
			0.0							
B6			-27.16						37.748	K Factor = -4.42
A7	19		-27.27	1.25	4T	24.0	207.000	120	51.765	
to							24.000		0.0	
B7	19		-27.27	1.38			231.000	-0.0607	-14.033	Vel = 5.85
			0.0							
B7			-27.27						37.732	K Factor = -4.44
A8	19		-27.39	1.25	4T	24.0	207.000	120	51.885	
to							24.000		0.0	
B8	19		-27.39	1.38			231.000	-0.0612	-14.140	Vel = 5.88
			0.0							
B8			-27.39						37.745	K Factor = -4.46
A9	19		-27.54	1.25	4T	24.0	207.000	120	52.040	
to							24.000		8.229	
B9	0		-27.54	1.38			231.000	-0.0619	-14.292	Vel = 5.91
			0.0							
B9			-27.54						45.977	K Factor = -4.06