

# Hydraulic Calculations for

Project:  
Drawing no.:  
Date: 01/06/2021

## Design

Remote area number: -  
Remote area location: 10 pavimento  
Occupancy classification: light hazard  
Density: 4,1 l/min/m<sup>2</sup>  
Area of application: 141,6 m<sup>2</sup>  
Coverage per sprinkler: 12,1m  
Type of sprinklers calculated:  
No. of sprinklers calculated: 14  
In rack demand:  
Hose streams: none outside + 0 inside  
Total water required (including hose streams): 1055,27 lpm at -0,493 bar [ 0,593 bar safety margin (593,4%) ]  
Total water required at base of system riser: 1055,27 lpm at 2,296 bar  
Type of system: wet pipe  
Volume of dry or preaction system:

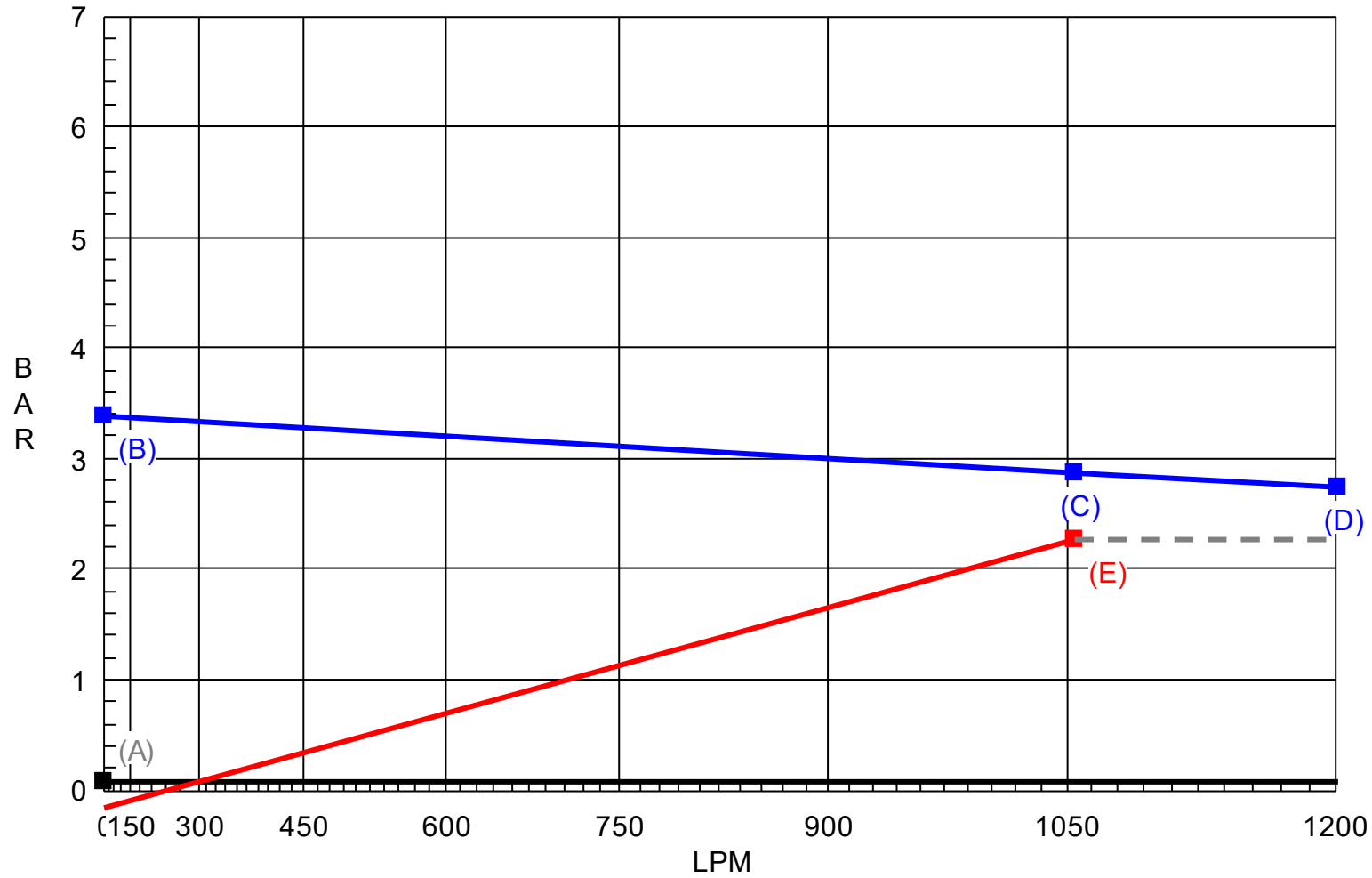
## Water Supply Information

Date:  
Location:  
Source:

Contractor: Engepoint  
Name of designer: LANNER  
Authority having jurisdiction:

## Notes

### Hydraulic Demand Graph



Water Source:  
A) 0,1 bar Static

Source at BOR:  
B) 3,4 bar Static  
C) 1055,3 lpm at 2,89 bar  
D) 1200 lpm at 2,75 bar

Demand at BOR:  
E) 1055,3 lpm at 2,3 bar

## Supply Analysis

Node at	Static Pressure [bar]	Residual Pressure [bar]	Flow [lpm]	Available Pressure [bar]	Total Demand [lpm]	Required Pressure [bar]
RI	0,1			0,1	1055,27	-0,49

## Node Analysis

Node Tag	Elev [M]	Type	Pressure [bar]	Discharge [lpm]
RI	42,200	source	-0,493	-1055,27
EB	42,200	ref	-0,505	0,000
SB	42,200	ref	2,397	0,000
R1	41,350	K=80,00	0,508	57,000
R2	41,350	K=80,00	0,604	62,159
R3	41,350	K=80,00	0,762	69,851
R4	41,350	K=80,00	0,905	76,088
R5	41,350	K=80,00	0,685	66,195
R6	41,350	K=80,00	0,783	70,811
R7	41,350	K=80,00	1,007	80,269
R8	41,350	K=80,00	0,832	72,985
R9	41,350	K=80,00	0,955	78,173
R10	41,350	K=80,00	1,169	86,501
R11	41,350	K=80,00	1,172	86,601
R12	41,350	K=80,00	0,918	76,658
R13	41,350	K=80,00	1,029	81,151
R14	41,350	K=80,00	1,289	90,833
A1	41,550	ref	0,846	0,000
A2	41,550	ref	1,006	0,000
A3	41,550	ref	1,063	0,000
A4	41,550	ref	1,120	0,000
A5	41,550	ref	1,133	0,000
A6	41,550	ref	1,306	0,000
A7	41,550	ref	1,398	0,000
A8	41,550	ref	1,437	0,000
A9	41,550	ref	1,914	0,000
A10	41,550	ref	2,180	0,000
D1	41,550	ref	0,492	0,000
D2	41,550	ref	0,588	0,000
D3	41,550	ref	0,748	0,000
D4	41,550	ref	0,891	0,000
D5	41,550	ref	0,670	0,000
D6	41,550	ref	0,769	0,000
D7	41,550	ref	0,994	0,000
D8	41,550	ref	0,818	0,000
D9	41,550	ref	0,941	0,000
D10	41,550	ref	1,157	0,000
D11	41,550	ref	1,160	0,000
D12	41,550	ref	0,905	0,000
D13	41,550	ref	1,016	0,000
D14	41,550	ref	1,278	0,000
CS10	39,850	ref	2,417	0,000

Node Analysis, cont.

<b>Node Tag</b>	<b>Elev [M]</b>	<b>Type</b>	<b>Pressure [bar]</b>	<b>Discharge [lpm]</b>
VGA	43,000	ref	2,296	0,000

## Pipe Information

negative pipe flow (Q) indicates flow is from node 2 towards node 1

Node 1	Elev [M]	K-factor	Discharge & Flow [lpm]	Nom i.d. [in]	Fittings num & length [M]	L [M] F [M] T [M]	C factor bar/M	total (Pt) elev (Pe) frict (Pf)	Notes
EB	42,200		Pump inlet pressure =			-0,505 bar			
			Net gain across pump =			2,902 bar			
SB	42,200		Pump outlet pressure =			2,397 bar			
R1	41,350	80	q= 57,000	1		0,200		Pt= 0,508	Mat="S40"
			Q= -57,000	1,049		0,000	C=120	Pe= 0,020	
D1	41,550					0,200	0,017	Pf= -0,003	
D1	41,550		q= 0,000	1	2E=1,220	3,720		Pt= 0,492	Mat="S40"
			Q= -57,000	1,049	1TR=0,610	1,830	C=120	Pe= 0,000	
D2	41,550					5,550	0,017	Pf= -0,097	
R2	41,350	80	q= 62,159	1		0,200		Pt= 0,604	Mat="S40"
			Q= -62,159	1,049		0,000	C=120	Pe= 0,020	
D2	41,550					0,200	0,02	Pf= -0,004	
D2	41,550		q= 0,000	1	1E=0,610	2,560		Pt= 0,588	Mat="S40"
			Q=-119,159	1,049	1TN=0,610	1,220	C=120	Pe= 0,000	
A1	41,550					3,780	0,068	Pf= -0,258	
R3	41,350	80	q= 69,851	1		0,200		Pt= 0,762	Mat="S40"
			Q= -69,851	1,049		0,000	C=120	Pe= 0,020	
D3	41,550					0,200	0,025	Pf= -0,005	
D3	41,550		q= 0,000	1	1E=0,610	1,730		Pt= 0,748	Mat="S40"
			Q= -69,851	1,049	1T=1,520	2,130	C=120	Pe= 0,000	
A1	41,550					3,860	0,025	Pf= -0,098	
A1	41,550		q= 0,000	1,25		3,800		Pt= 0,846	Mat="S40"
			Q=-189,009	1,38		0,000	C=120	Pe= 0,000	
A2	41,550					3,800	0,042	Pf= -0,160	
R4	41,350	80	q= 76,088	1		0,200		Pt= 0,905	Mat="S40"
			Q= -76,088	1,049		0,000	C=120	Pe= 0,020	
D4	41,550					0,200	0,03	Pf= -0,006	
D4	41,550		q= 0,000	1	1E=0,610	1,730		Pt= 0,891	Mat="S40"
			Q= -76,088	1,049	1T=1,520	2,130	C=120	Pe= 0,000	
A2	41,550					3,860	0,03	Pf= -0,115	
A2	41,550		q= 0,000	1,5		1,540		Pt= 1,006	Mat="S40"
			Q=-265,097	1,61		0,000	C=120	Pe= 0,000	
A3	41,550					1,540	0,037	Pf= -0,057	
R5	41,350	80	q= 66,195	1		0,200		Pt= 0,685	Mat="S40"
			Q= -66,195	1,049		0,000	C=120	Pe= 0,020	
D5	41,550					0,200	0,023	Pf= -0,005	
D5	41,550		q= 0,000	1	2E=1,220	2,500		Pt= 0,670	Mat="S40"
			Q= -66,195	1,049	1TR=0,610	1,830	C=120	Pe= 0,000	
D6	41,550					4,330	0,023	Pf= -0,099	
R6	41,350	80	q= 70,811	1		0,200		Pt= 0,783	Mat="S40"
			Q= -70,811	1,049		0,000	C=120	Pe= 0,020	
D6	41,550					0,200	0,026	Pf= -0,005	
D6	41,550		q= 0,000	1	1T=1,520	1,810		Pt= 0,769	Mat="S40"
			Q=-137,006	1,049		1,520	C=120	Pe= 0,000	
A3	41,550					3,330	0,088	Pf= -0,294	

Pipe Information, cont.

Node 1	Elev	Discharge	Nom	Fittings	L [M]	C factor	total (Pt)		
Node 2	[M]	& Flow	i.d.	num & length	F [M]	bar/M	elev (Pe)	frict (Pf)	Notes
		[lpm]	[in]	[M]	T [M]				
A3	41,550	q= 0,000	2		2,420		Pt= 1,063	Mat="S40"	
		Q=-402,102	2,067		0,000	C=120	Pe= 0,000		
A4	41,550				2,420	0,024	Pf= -0,058		
R7	41,350	80 q= 80,269	1		0,200		Pt= 1,007	Mat="S40"	
		Q= -80,269	1,049		0,000	C=120	Pe= 0,020		
D7	41,550				0,200	0,033	Pf= -0,007		
D7	41,550	q= 0,000	1	1E=0,610	1,730		Pt= 0,994	Mat="S40"	
		Q= -80,269	1,049	1T=1,520	2,130	C=120	Pe= 0,000		
A4	41,550				3,860	0,033	Pf= -0,127		
A4	41,550	q= 0,000	2		0,380		Pt= 1,120	Mat="S40"	
		Q=-482,372	2,067		0,000	C=120	Pe= 0,000		
A5	41,550				0,380	0,033	Pf= -0,013		
R8	41,350	80 q= 72,985	1		0,200		Pt= 0,832	Mat="S40"	
		Q= -72,985	1,049		0,000	C=120	Pe= 0,020		
D8	41,550				0,200	0,028	Pf= -0,006		
D8	41,550	q= 0,000	1	1E=0,610	3,260		Pt= 0,818	Mat="S40"	
		Q= -72,985	1,049	1TR=0,610	1,220	C=120	Pe= 0,000		
D9	41,550				4,480	0,028	Pf= -0,123		
D9	41,550	q= 0,000	1		0,200		Pt= 0,941	Mat="S40"	
		Q= 78,173	1,049		0,000	C=120	Pe= -0,020		
R9	41,350				0,200	0,031	Pf= 0,006		
D9	41,550	q= 0,000	1		1,810		Pt= 0,941	Mat="S40"	
		Q=-151,158	1,049		0,000	C=120	Pe= 0,000		
A5	41,550				1,810	0,106	Pf= -0,192		
A5	41,550	q= 0,000	2		3,130		Pt= 1,133	Mat="S40"	
		Q=-633,530	2,067		0,000	C=120	Pe= 0,000		
A6	41,550				3,130	0,055	Pf= -0,173		
R10	41,350	80 q= 86,501	1		0,200		Pt= 1,169	Mat="S40"	
		Q= -86,501	1,049		0,000	C=120	Pe= 0,020		
D10	41,550				0,200	0,038	Pf= -0,008		
D10	41,550	q= 0,000	1	1E=0,610	1,810		Pt= 1,157	Mat="S40"	
		Q= -86,501	1,049	1T=1,520	2,130	C=120	Pe= 0,000		
A6	41,550				3,940	0,038	Pf= -0,148		
R11	41,350	80 q= 86,601	1		0,200		Pt= 1,172	Mat="S40"	
		Q= -86,601	1,049		0,000	C=120	Pe= 0,020		
D11	41,550				0,200	0,038	Pf= -0,008		
D11	41,550	q= 0,000	1	1E=0,610	1,730		Pt= 1,160	Mat="S40"	
		Q= -86,601	1,049	1T=1,520	2,130	C=120	Pe= 0,000		
A6	41,550				3,860	0,038	Pf= -0,146		
A6	41,550	q= 0,000	2,5		2,540		Pt= 1,306	Mat="S40"	
		Q=-806,632	2,469		0,000	C=120	Pe= 0,000		
A7	41,550				2,540	0,036	Pf= -0,092		
R12	41,350	80 q= 76,658	1		0,200		Pt= 0,918	Mat="S40"	
		Q= -76,658	1,049		0,000	C=120	Pe= 0,020		
D12	41,550				0,200	0,03	Pf= -0,006		

Pipe Information, cont.

Node 1	Elev	Discharge	Nom	Fittings	L [M]	C factor	total (Pt)		
Node 2	[M]	& Flow	i.d.	num & length	F [M]	bar/M	elev (Pe)	frict (Pf)	Notes
		[lpm]	[in]	[M]	T [M]				
D12	41,550	q= 0,000	1	1E=0,610	2,480		Pt= 0,905	Mat="S40"	
		Q= -76,658	1,049	1TR=0,610	1,220	C=120	Pe= 0,000		
D13	41,550				3,700	0,03	Pf= -0,111		
R13	41,350	80 q= 81,151	1		0,200		Pt= 1,029	Mat="S40"	
		Q= -81,151	1,049		0,000	C=120	Pe= 0,020		
D13	41,550				0,200	0,033	Pf= -0,007		
D13	41,550	q= 0,000	1	1T=1,520	1,810		Pt= 1,016	Mat="S40"	
		Q=-157,809	1,049		1,520	C=120	Pe= 0,000		
A7	41,550				3,330	0,115	Pf= -0,382		
A7	41,550	q= 0,000	2,5		0,780		Pt= 1,398	Mat="S40"	
		Q=-964,441	2,469		0,000	C=120	Pe= 0,000		
A8	41,550				0,780	0,05	Pf= -0,039		
R14	41,350	80 q= 90,833	1		0,200		Pt= 1,289	Mat="S40"	
		Q= -90,833	1,049		0,000	C=120	Pe= 0,020		
D14	41,550				0,200	0,041	Pf= -0,008		
D14	41,550	q= 0,000	1	1E=0,610	1,730		Pt= 1,278	Mat="S40"	
		Q= -90,833	1,049	1T=1,520	2,130	C=120	Pe= 0,000		
A8	41,550				3,860	0,041	Pf= -0,159		
A8	41,550	q= 0,000	3		23,040		Pt= 1,437	Mat="S40"	
		Q=-1055,27	3,068		0,000	C=120	Pe= 0,000		
A9	41,550				23,040	0,021	Pf= -0,477		
A9	41,550	q= 0,000	3		12,860		Pt= 1,914	Mat="S40"	
		Q=-1055,27	3,068		0,000	C=120	Pe= 0,000		
A10	41,550				12,860	0,021	Pf= -0,266		
A10	41,550	q= 0,000	4	1T=6,100	3,050		Pt= 2,180	Mat="S40"	
		Q=-1055,27	4,026	1E=3,050	9,760	C=120	Pe= -0,167		
CS10	39,850			1G=0,610	12,810	0,006	Pf= -0,071		
CS10	39,850	q= 0,000	4	1T=6,100	9,000		Pt= 2,417	Mat="S40"	
		Q=-1055,27	4,026	5E=15,250	25,010	C=120	Pe= 0,309		
VGA	43,000			1A=3,660	34,010	0,006	Pf= -0,187		
VGA	43,000	q= 0,000	6	1G=0,920	6,760		Pt= 2,296	Mat="S40"	
		Q=-1055,27	6,065	3E=12,810	22,830	C=120	Pe= -0,078		
SB	42,200			1T=9,100	29,590	0,001	Pf= -0,022		
RI	42,200	q=-1055,27	6	1T=9,100	1,210		Pt= -0,493	Mat="S40"	
		Q=1055,274	6,065	1E=4,270	14,290	C=120	Pe= 0,000		
EB	42,200			1G=0,920	15,500	0,001	Pf= 0,012		

**Material Codes**

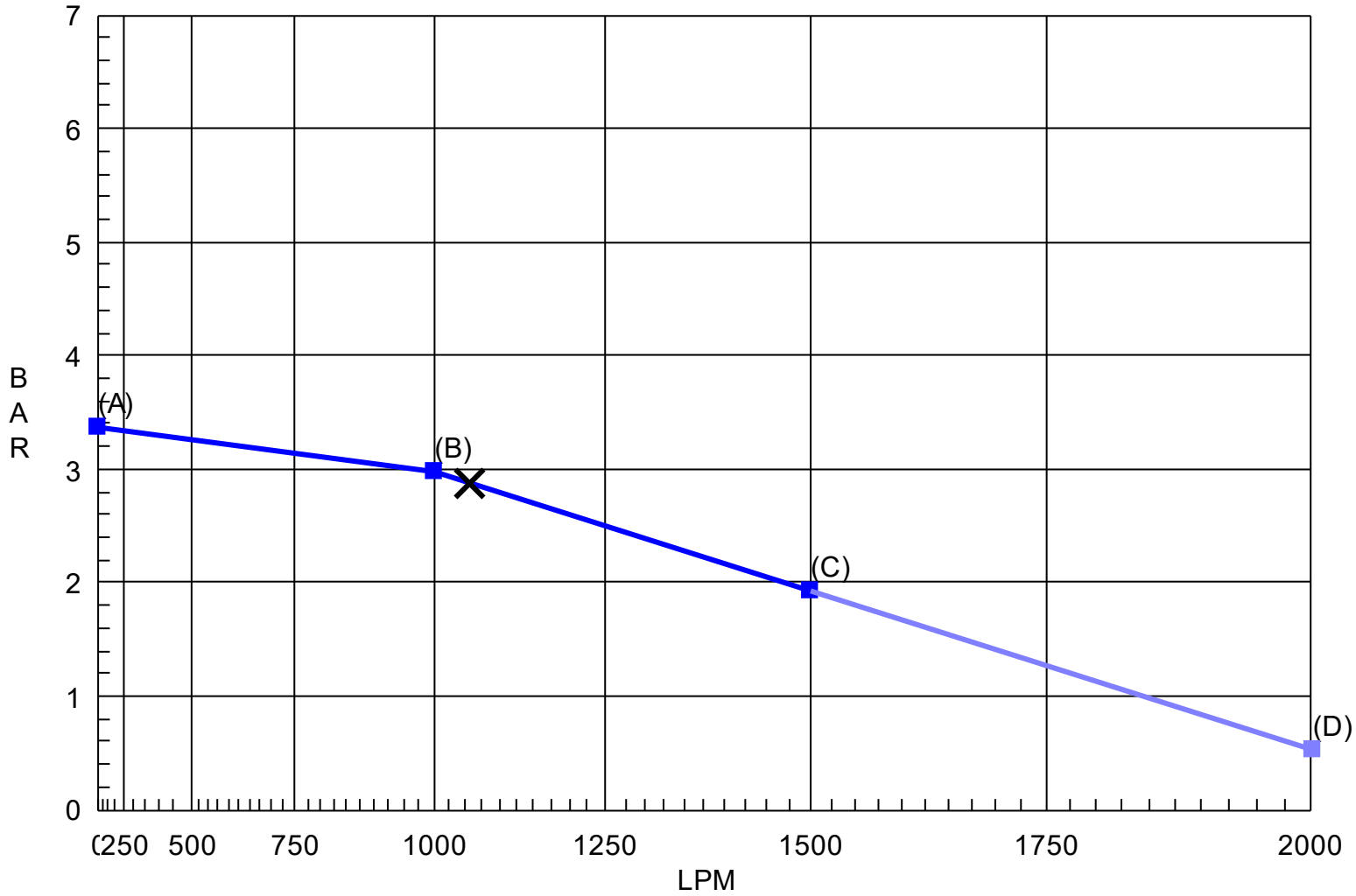
Pipe Material

S40 - Schedule 40 Steel

Fittings

- A - Alarm Valve
- E - Standard 90 degree elbow
- G - Gate Valve
- T - Tee - Flow turn 90 degrees
- TN - Tee - Straight thru path
- TR - Tee - Straight thru path with 50% Size reduction

### Pump #1 in Pipe "Pump1"



Given Values:

- A) 3,38 bar at 0.0 lpm
- B) 1000 lpm at 3 bar
- C) 1500 lpm at 1,95 bar

Extrapolated:

- D) 2000 lpm at 0,55 bar

Calculated:

- X) 1055,3 lpm at 2,9 bar