

CALCULATING VACUUM DROP

Table 4.3

Vacuum Drop in In. of Mercury (in. Hg) per 100 Feet of PVC or Stainless Steel Pipe*

CFM ASME	Pipe Diameter (in.)				
	1.5	2	3	4	6
40	1.7	0.40	-	-	-
50	2.5	0.60	0.08	-	-
60	3.2	0.75	0.12	-	-
70	4.2	0.95	0.16	-	-
80	5.5	1.2	0.2	0.05	-
90	-	1.4	0.25	0.07	-
100	-	1.7	0.3	0.08	0.01
150	-	3.7	0.6	0.16	0.02
200	-	-	1.1	0.26	0.04
250	-	-	2.1	0.4	0.06
300	-	-	-	0.5	0.08
350	-	-	-	0.7	0.10
400	-	-	-	0.9	0.13

* At 15 in. Hg nominal vacuum.

Adapted from S. Spencer and G. Mein (1991) "Pipe Sizing for Milking Systems", ASAE paper No. 913509.

Table 4.4

Vacuum Drop in In. of Mercury (in.Hg) Per 100 Feet of Straight, Galvanized Standard Pipe**




CFM ASME	Pipe Diameter (in.)		
	2	3	4
40	0.5	-	-
50	0.8	0.12	-
60	1.2	0.17	-
70	1.5	0.22	-
80	-	0.28	0.07
90	-	0.35	0.09
100	-	0.42	0.11
150	-	0.9	0.22
200	-	1.5	0.37
250	-	-	0.56
300	-	-	0.8
350	-	-	1.0
400	-	-	1.3

**At 12 in. Hg, Nominal Vacuum

Adapted from Steve Spencer, "The Basics of Vacuum in Milking Systems."

Table 4.5

Equivalent Lengths of Straight Pipe for Various Fittings, expressed as the approximate length (in feet) rounded to the nearest 0.5 foot.

Fitting	Nominal Pipe Diameter (inches)				
	2	2.5	3	4	6
Elbows					
45° standard	1.5	2	2.5	3	5
90° short radius (R/D = 0.75)*	6	8	10	12	20
90° medium radius (R/D = 1.8)*	3	3.5	4	6	10
T-pieces					
Through-flow 	3	3.5	4	6	10
Side-flow 	7	8	9	15	25
Swept side-flow ("Sanitary Tee") 	3.5	4	5	7	12
Tanks and Traps					
Distribution Tank	14	-	20	40	-
S.S. Sanitary trap and Receiver	33	-	20	40	-
Plastic Sanitary trap and Receiver	33	-	50	-	-

*R/D is the outside radius of the elbow divided by the internal diameter of the pipe.

Table 4.2

Recommended minimum pipe sizes (inches internal diameter) for the regulator airline, if installed.

Manual Reserve CFM	Equivalent length of regulator airline (feet of straight pipe)				
	10	20	40	60	80
50	2	3	3	3	3
60	2	3	3	3	3
70	2	3	3	3	4
100	3	3	4	4	4
150	3	4	4	4	6
200	4	4	4	6	6
250	4	4	6	6	6
300	4	4	6	6	6
350	4	6	6	6	6
400	4	6	6	6	6

Notes: The regulator airline is the branch line connecting the regulator to the main airline, (preferably, near the receiver). These calculations are based on a maximum vacuum drop of 0.1" Hg between the regulator and the main airline.

Table 4.2 (Metric)

Recommended minimum pipe sizes (mm internal diameter) for the regulator airline, if installed.

Manual Reserve L/min	Equivalent length of regulator airline (m of straight pipe)				
	2.5	5	10	15	20
1500	50	75	75	75	75
2000	50	75	75	75	100
3000	75	75	100	100	100
4000	75	75	100	100	150
5000	75	100	100	150	150
6000	100	100	100	150	150

Notes: The regulator airline is the branch line connecting the regulator to the main airline, (preferably, near the receiver). These calculations are based on a maximum vacuum drop of 0.3 kPa between the regulator and the main airline.