

Pipe diameter calculations for Lbs. of force on a closed valve and for velocity to GPM

Calculations on a Pipeline (right cylinder) Area= 0.785x(D)² or 0.785x(D/12)².

Pipe diameter calculations for force, velocity, flow, & PSI					Flow in cubic feet per sec. at 2.5 FPS (Area in Square feet) X FPS	Flow in GPM at 2.5 FPS 448.8 gpm per cfs	Flow in cubic feet per sec. at 5 FPS (Area in Square feet) X FPS	Flow in GPM at 5 FPS 448.8 gpm per cfs
Pipe I.D.	Area in square Inches 0.785x(D) ²	Force in Total Lbs. at 50 psi (Area in inches ²) X PSI	Force in Total Lbs. at 100 psi (Area in inches ²) X PSI	Area in square Feet 0.785x(D/12) ²				
2	3.14 inches ²	157.00 LBS	314.00 LBS	0.02181 Ft ²	0.0545 Ft ³ /sec or CFS	24.4658 gpm	0.1090 Ft ³ /sec or CFS	48.93 gpm
3	7.07 inches ²	353.25 LBS	706.50 LBS	0.049 Ft ²	0.1227 Ft ³ /sec or CFS	55.0481 gpm	0.2453 Ft ³ /sec or CFS	110.10 gpm
4	12.56 inches ²	628.00 LBS	1,256.00 LBS	0.087 Ft ²	0.2181 Ft ³ /sec or CFS	97.8633 gpm	0.4361 Ft ³ /sec or CFS	195.73 gpm
5	19.63 inches ²	981.25 LBS	1,962.50 LBS	0.136 Ft ²	0.3407 Ft ³ /sec or CFS	152.9115 gpm	0.6814 Ft ³ /sec or CFS	305.82 gpm
6	28.26 inches ²	1,413.00 LBS	2,826.00 LBS	0.196 Ft ²	0.4906 Ft ³ /sec or CFS	220.1925 gpm	0.9813 Ft ³ /sec or CFS	440.39 gpm
8	50.24 inches ²	2,512.00 LBS	5,024.00 LBS	0.349 Ft ²	0.8722 Ft ³ /sec or CFS	391.4533 gpm	1.7444 Ft ³ /sec or CFS	782.91 gpm
10	78.50 inches ²	3,925.00 LBS	7,850.00 LBS	0.545 Ft ²	1.3628 Ft ³ /sec or CFS	611.6458 gpm	2.7257 Ft ³ /sec or CFS	1,223.29 gpm
12	113.04 inches ²	5,652.00 LBS	11,304.00 LBS	0.785 Ft ²	1.9625 Ft ³ /sec or CFS	880.77 gpm	3.9250 Ft ³ /sec or CFS	1,761.54 gpm
14	153.86 inches ²	7,693.00 LBS	15,386.00 LBS	1.068 Ft ²	2.6712 Ft ³ /sec or CFS	1,198.83 gpm	5.3424 Ft ³ /sec or CFS	2,397.65 gpm
16	200.96 inches ²	10,048.00 LBS	20,096.00 LBS	1.396 Ft ²	3.4889 Ft ³ /sec or CFS	1,565.81 gpm	6.9778 Ft ³ /sec or CFS	3,131.63 gpm
18	254.34 inches ²	12,717.00 LBS	25,434.00 LBS	1.766 Ft ²	4.4156 Ft ³ /sec or CFS	1,981.73 gpm	8.8313 Ft ³ /sec or CFS	3,963.47 gpm
24	452.16 inches ²	22,608.00 LBS	45,216.00 LBS	3.140 Ft ²	7.8500 Ft ³ /sec or CFS	3,523.08 gpm	15.7000 Ft ³ /sec or CFS	7,046.16 gpm
28	615.44 inches ²	30,772.00 LBS	61,544.00 LBS	4.274 Ft ²	10.6847 Ft ³ /sec or CFS	4,795.30 gpm	21.3694 Ft ³ /sec or CFS	9,590.61 gpm
30	706.50 inches ²	35,325.00 LBS	70,650.00 LBS	4.906 Ft ²	12.2656 Ft ³ /sec or CFS	5,504.81 gpm	24.5313 Ft ³ /sec or CFS	11,009.63 gpm
32	803.84 inches ²	40,192.00 LBS	80,384.00 LBS	5.582 Ft ²	13.9556 Ft ³ /sec or CFS	6,263.25 gpm	27.9111 Ft ³ /sec or CFS	12,526.51 gpm
36	1,017.36 inches ²	50,868.00 LBS	101,736.00 LBS	7.065 Ft ²	17.6625 Ft ³ /sec or CFS	7,926.93 gpm	35.3250 Ft ³ /sec or CFS	15,853.86 gpm
40	1,256.00 inches ²	62,800.00 LBS	125,600.00 LBS	8.722 Ft ²	21.8056 Ft ³ /sec or CFS	9,786.33 gpm	43.6111 Ft ³ /sec or CFS	19,572.67 gpm
42	1,384.74 inches ²	69,237.00 LBS	138,474.00 LBS	9.616 Ft ²	24.0406 Ft ³ /sec or CFS	10,789.43 gpm	48.0813 Ft ³ /sec or CFS	21,578.87 gpm
48	1,808.64 inches ²	90,432.00 LBS	180,864.00 LBS	12.560 Ft ²	31.4000 Ft ³ /sec or CFS	14,092.32 gpm	62.8000 Ft ³ /sec or CFS	28,184.64 gpm
60	2,826.00 inches ²	141,300.00 LBS	282,600.00 LBS	19.625 Ft ²	49.0625 Ft ³ /sec or CFS	22,019.25 gpm	98.1250 Ft ³ /sec or CFS	44,038.50 gpm
62	3,017.54 inches ²	150,877.00 LBS	301,754.00 LBS	20.955 Ft ²	52.3878 Ft ³ /sec or CFS	23,511.67 gpm	104.7757 Ft ³ /sec or CFS	47,023.33 gpm
64	3,215.36 inches ²	160,768.00 LBS	321,536.00 LBS	22.329 Ft ²	55.8222 Ft ³ /sec or CFS	25,053.01 gpm	111.6444 Ft ³ /sec or CFS	50,106.03 gpm
72	4,069.44 inches ²	203,472.00 LBS	406,944.00 LBS	28.260 Ft ²	70.6500 Ft ³ /sec or CFS	31,707.72 gpm	141.3000 Ft ³ /sec or CFS	63,415.44 gpm
96	7,234.56 inches ²	361,728.00 LBS	723,456.00 LBS	50.240 Ft ²	125.6000 Ft ³ /sec or CFS	56,369.28 gpm	251.2000 Ft ³ /sec or CFS	112,738.56 gpm

Note: Feet per second (FPS) is exactly what the name implies. For a channel, or flume (a rectangle) it is how fast that stick someone threw into the flow is moving down the channel measured in linear ft per unit of time. If you know the area then this becomes an easy calculation (Length Ft. X Width Ft) X FPS. The product of that will always be Cubic Feet per second. **FPS X Square Ft=CFS**
Ft² X FPS=Ft³/sec. We use it to calculate stream flows, or for pipe flushing.



Note: Velocity questions in the exam usually center around how to convert FPS into a flow one can use in the field. The conversion factor is 448.8 Gallons per minute per 1 CFS. In Distribution systems we use this to calculate flows for flushing, where 2.5 FPS is the minimum flow for flushing and 5 FPS is sometimes called a scouring velocity.