

Table 4-3 Leak losses for circular holes under different pressures*

Dia- meter of Hole in.	Area of Hole in. ²	Leak Losses—gpm									
		Water Pressure—psi									
		20	40	60	80	100	120	140	160	180	200
0.1	0.007	1.067	1.510	1.850	2.136	2.388	2.616	2.825	3.021	3.204	3.337
0.2	0.031	4.271	6.041	7.399	8.544	9.522	10.464	11.302	12.083	12.816	13.509
0.3	0.070	9.611	13.593	16.648	19.224	21.493	23.544	25.430	27.186	28.835	30.395
0.4	0.125	17.087	24.165	29.597	34.175	38.209	41.856	45.209	48.331	51.263	54.036
0.5	0.196	26.699	37.758	46.245	53.399	59.702	65.400	70.640	75.518	80.098	84.431
0.6	0.282	38.477	54.372	66.593	76.894	85.971	94.176	101.721	108.745	115.341	121.581
0.7	0.384	52.331	74.007	90.640	104.662	117.010	128.184	138.454	148.014	156.993	165.485
0.8	0.502	68.350	96.662	118.387	136.701	152.840	167.424	180.839	193.325	205.052	216.144
0.9	0.636	86.506	122.338	149.833	173.012	193.434	211.896	228.874	244.676	259.519	273.557
1.0	0.785	106.798	151.035	184.979	213.596	238.807	261.600	282.561	302.070	320.394	337.725
1.1	0.950	129.225	182.752	223.825	258.451	288.957	316.536	341.898	365.505	387.676	408.647
1.2	1.131	153.789	217.490	266.870	307.578	343.882	376.704	406.887	434.981	461.367	486.323
1.3	1.327	180.488	255.249	312.615	360.977	403.584	442.104	477.527	510.498	541.465	570.755
1.4	1.539	209.324	296.028	362.559	418.648	468.062	512.737	553.819	592.057	627.972	661.941
1.5	1.767	240.295	339.829	416.203	480.590	537.317	588.601	635.762	679.658	720.886	759.880
1.6	2.011	273.402	386.649	473.547	546.805	611.347	669.697	723.355	773.299	820.208	864.575
1.7	2.270	308.646	436.491	534.590	617.292	690.153	756.025	816.600	872.983	925.938	976.024
1.8	2.545	346.025	489.353	599.333	692.050	773.736	847.585	915.496	978.707	1,038.070	1,094.220
1.9	2.836	385.540	545.237	667.776	771.081	862.095	944.378	1,020.040	1,090.470	1,156.620	1,219.180
2.0	3.142	427.191	604.140	739.918	854.383	955.230	1,046.400	1,130.240	1,208.280	1,281.570	1,350.890

*Calculated using Greeley's formula (see Eq 4-2).

Table 4-4 Leak losses for joints and cracks*

Area of Joint or Crack		Leak Losses—gpm									
Length in.	Width in.	Water Pressure—psi									
		20	40	60	80	100	120	140	160	180	200
1.0	1/32	3.2	4.5	5.5	6.4	7.1	7.8	8.4	9.0	9.6	10.1
1.0	1/16	6.4	9.0	11.0	12.7	14.2	15.6	16.9	18.0	19.1	20.1
1.0	1/8	12.7	18.0	22.1	25.5	28.5	31.2	33.7	36.0	38.2	40.3
1.0	1/4	25.5	36.0	44.1	51.0	57.0	62.4	67.4	72.1	76.5	80.6

*For leaks emitted from joints and cracked service pipes, an orifice coefficient of 0.60 is used in the following equation:

$$Q = (22.796)(A)(\sqrt{P})$$

Where: Q = flow, in gallons per minute; A = the area, in square inches; P = the pressure, in pounds per square inch.

For losses from such items as pipes or broken taps, assume an orifice coefficient of 0.80 and calculate flow in gallons per minute from the formula

$$Q = \frac{43,767}{1,440} \times A \times \sqrt{P} \quad (\text{Eq 4-2})$$

Where:

- Q = flow, in gallons per minute
 A = the cross-sectional area of the leak, in square inches
 P = pressure, in pounds per square inch

If a hole in a pipe were circular, then the area would be $A = 3.14 r^2$. Measure the diameter of the hole (to get the radius) and determine the pressure in the pipe.