

## Leakage: Losses under different pressures (all are in gpm)

### Failure Type: Holes

Diameter of hole in inches	Residual Pressure (psi)						
	70	60	50	40	30	20	10
2.00	799	740	675	604	523	427	302
1.75	612	566	517	462	400	327	231
1.50	449	416	380	340	294	240	170
1.25	312	289	264	236	204	167	118
1.00	200	185	169	151	131	107	75
0.75	112	104	95	85	74	60	42
0.50	50	46	42	38	33	27	19
0.25	12	12	11	9	8	7	5

### Failure Type: Appurtenances

	Small	Average	Large
Fire Hydrant	1	3	5
Valve	3	7	10
Service (1")	5	10	25

Other acceptable methods of estimating losses include:

- \* Discharge of dewatering pumps
- \* Bucket and stop watch

### Circumferential failure (Ringer)

Failure type: ringer, 1/8" separation (heavy spray)

Size of main	Residual Pressure (psi)						
	70	60	50	40	30	20	10
12	899	832	760	679	588	480	340
10	749	693	633	566	490	400	283
8	599	555	506	453	392	320	226
6	449	416	380	340	294	240	170
4	300	277	253	226	196	160	113

Failure type: ringer, 1/16" separation (moderate spray)

Size of main	Residual Pressure (psi)						
	70	60	50	40	30	20	10
12	449	416	380	340	294	240	170
10	374	347	316	283	245	200	142
8	300	277	253	226	196	160	113
6	225	208	190	170	147	120	85
4	150	139	127	113	98	80	57

### Linear failure (Split)

Failure type: split, 1/8" wide, per 1" of length

Size of main	Residual Pressure (psi)						
	70	60	50	40	30	20	10
12	286	265	242	216	187	153	108
10	238	221	201	180	156	127	90
8	191	177	161	144	125	102	72
6	143	132	121	108	94	76	54
4	95	88	81	72	62	51	36

Failure type: split, 1/16" wide, per 1" of length

Size of main	Residual Pressure (psi)						
	70	60	50	40	30	20	10
12	143	132	121	108	94	76	54
10	119	110	101	90	78	64	45
8	95	88	81	72	62	51	36
6	72	66	60	54	47	38	27
4	48	44	40	36	31	25	18

Source: AWWA Manual 36, Third Edition, 2009