

Raw Water - Quantity

Before recommending a softener it is important to determine soft water service flow requirements and volume in a given time period. Water meters are the best source for such data. Where meters are not used, flow rates and total requirements may be estimated using the basic information, tables and graphs presented in this manual. After determining this information, a properly sized softening unit may be recommended.

Use FIXTURE UNIT TABLE (Figure 2) and INTERMITTENT FLOW RATE TABLE (Figure 3) for average and maximum flow rates in private and public

buildings in gpm (l/min). The unit flow rates are to be used when actual continuous and peak flow rates are not known.

The "average" rates may be used when line pressure less the conditioner pressure drop is at least 30 psi (2.04 BAR) at the highest point of use in the building. [Approximately 4 psi (0.3 BAR) loss per story.]

The "maximum" rates are equal to the fixture count figures commonly used to size drains and are applicable especially in low water pressure areas where pressure drop is critical.

DETERMINE FLOW RATE

FIXTURE UNIT TABLE ①

TYPE OF FIXTURE ②	UNIT FACTOR ③	
	PRIVATE	PUBLIC
Bar Sink	1	2
Bathtub/Shower	2	4
Bedpan Washer	—	10
Bidet	2	4
Combination Sink and Tray	3	—
Dental Unit or Cuspidor	—	1
Dental Lavatory	1	2
Drinking Fountain	1	2
House Bibb or Sill Cock (Std. type)	3	5
House Trailer (Each)	6	6
Laundry Tub or Washer	2	4
Lavatory	1	2
Lawn Sprinkler (Each head)	1	1
Kitchen Sink	2	4
Sink, Service (Janitor's)	2	4
Sink or Domestic Type Dishwasher	2	4
Sink (Flushing rim, clinic)	—	10
Sink (Wash up, each set of fixtures)	—	2
Sink (Circular spray)	—	4
Urinal (Wall or stall)	—	5
Urinal (Flush tank)	—	3
Water Closet (Toilet):		
Flush Valve	6	10*
Tank Type	3	5*

*Double these for schools

Figure 2

NOTES

- For equipment not listed and likely to impose continuous demands (air conditioners, boilers, commercial dishwashers, etc.), estimate continuous supply and add to total flow rate for fixtures.
- For fixtures not listed, unit factors may be estimated by comparing the fixture to a listed one using water at a similar rate.
- The given unit factors are for total demand for fixtures with both hot and cold water supplies. The unit factors for maximum hot water demand may be taken as 60% of the total unit factors.

DIRECTIONS:

- Multiply the quantity of each type of fixture by its unit factor given in the UNIT TABLE (Figure 2).
PRIVATE — Apartments, trailers, homes, dormitories, etc.
PUBLIC — Hospitals, motels, nursing homes, schools, etc.
- Add the values found in step 1 to determine the total fixture units.

INTERMITTENT FLOW RATE TABLE

FIXTURE COUNT FACTOR	AVERAGE		MAXIMUM	
	gpm	(l/min)	gpm	(l/min)
5	4	(15)	5	(19)
10	6	(23)	8	(30)
15	8	(30)	12	(45)
20	10	(38)	15	(57)
25	12	(45)	18	(68)
30	14	(53)	21	(80)
40	17	(64)	25	(95)
50	20	(76)	29	(110)
75	24	(91)	37	(140)
100	31	(117)	44	(166)
150	40	(151)	56	(212)
200	50	(189)	65	(246)
250	58	(219)	75	(284)
300	65	(246)	84	(318)
350	72	(272)	93	(352)
400	79	(299)	110	(416)
450	85	(322)	120	(454)
500	91	(344)	130	(492)
600	103	(390)	150	(568)
700	114	(431)	165	(624)
800	124	(469)	180	(681)
900	134	(507)	200	(757)
1,000	143	(541)	210	(795)
1,200	162	(613)	240	(908)
1,400	181	(685)	260	(984)
1,600	198	(749)	285	(1078)
1,800	216	(817)	310	(1173)
2,000	240	(908)	330	(1249)
2,200	260	(984)	355	(1343)
2,400	280	(1060)	375	(1419)
2,600	300	(1135)	395	(1495)
2,800	340	(1287)	420	(1590)
3,000	380	(1438)	440	(1665)

Figure 3

- Determine flow rates required from INTERMITTENT FLOW RATE TABLE (Figure 3).

EXAMPLE — School (public)

Type of Fixture	Quantity	Unit Factor	Total
Water Closet (Toilet),			
Flush Valve	15	10*	300
Lavatory	15	2	30
Shower	5	4	20

Total units 350

Flow Rate (from Table) Average — 72 gpm (272 l/min.); maximum — 93 gpm (352 l/min.)

DETERMINE TOTAL WATER USAGE

APARTMENTS AND TRAILER PARKS

Figures are based on 50 gallons (189 l) per person per day, 3 people per unit, each unit containing a bathroom, kitchen sink, and laundry tub.

NUMBER OF UNITS	5	10	15	20	30	40	50
Total water usage (except sprinkling) gal/day (m ³ /day)	750 (2.8)	1,500 (5.7)	2,250 (8.5)	3,000 (11.4)	4,500 (17.0)	6,000 (22.7)	7,500 (28.4)
Peak gpm (l/sec.) with flush valves	50 (3.2)	68 (4.3)	80 (5.1)	90 (5.7)	109 (6.9)	128 (8.1)	145 (9.2)
Peak gpm (l/sec.) with flush tanks	23 (1.5)	35 (2.2)	45 (2.8)	53 (3.3)	67 (4.2)	80 (5.0)	93 (5.9)
Toilets by-passed gal/day (m ³ /day) [Estimate 30 gal (113.6 l)/person]	450 (1.7)	900 (3.4)	1,350 (5.1)	1,800 (6.8)	2,700 (10.2)	3,600 (13.6)	4,500 (17.0)
Toilets by-passed, flow gpm (l/sec.)	20 (1.3)	32 (2.0)	42 (2.7)	49 (3.1)	61 (3.9)	73 (4.6)	84 (5.3)
Hot water only gal/day (m ³ /day) [Estimate 20 gal (75.7 l)/person]	300 (1.1)	600 (2.3)	900 (3.4)	1,200 (4.5)	1,800 (6.8)	2,400 (9.1)	3,000 (11.4)
Hot water only, flow gpm (l/sec.)	13 (.8)	23 (1.5)	31 (2.0)	36 (2.3)	46 (3.0)	54 (3.4)	62 (4.0)

Figure 4

MOTELS

Figures are based on 40 gallons (151 l) per person per day, 2½ people per unit, each unit containing a bathroom group. Estimate water usage for restaurant or cocktail bar facilities separately.

NUMBER OF UNITS	10	20	30	40	50	75	100	125	150
Total water usage gal/day (m ³ /day)	1,000 (3.8)	2,000 (7.6)	3,000 (11.4)	4,000 (15.1)	5,000 (18.9)	7,500 (28.4)	10,000 (37.9)	12,500 (47.3)	15,000 (56.8)
Peak gpm (l/sec.) with flush valves	68 (4.3)	90 (5.7)	109 (6.9)	128 (8.1)	145 (9.2)	180 (11.4)	210 (13.2)	240 (15.1)	270 (17.0)
Peak gpm (l/sec.) with flush tanks	28 (1.8)	43 (2.7)	55 (3.5)	65 (4.1)	75 (4.7)	105 (6.6)	130 (8.2)	152 (9.6)	172 (10.9)
Toilets by-passed gal/day (m ³ /day) [Estimate 25 gal (94.6 l)/person]	625 (2.4)	1,250 (4.7)	1,875 (7.1)	2,500 (9.5)	3,125 (11.8)	4,690 (17.8)	6,250 (23.7)	7,815 (29.6)	9,375 (35.5)
Toilets by-passed, flow gpm (l/sec.)	25 (1.6)	38 (2.4)	48 (3.0)	58 (3.7)	67 (4.2)	84 (5.3)	105 (6.6)	125 (7.9)	145 (9.2)
Hot water only gal/day (m ³ /day) [Estimate 16 gal (60.6 l)/person]	400 (1.6)	800 (3.0)	1,200 (4.5)	1,600 (6.1)	2,000 (7.6)	3,000 (11.4)	4,000 (15.1)	5,000 (18.9)	6,000 (22.7)
Hot water only, flow gpm (l/sec.)	17 (1.1)	28 (1.8)	36 (2.3)	43 (2.7)	48 (3.0)	62 (4.0)	73 (4.6)	85 (5.4)	96 (6.1)

Figure 5

OTHER ESTABLISHMENTS

Because of the wide variation in number and type of fixtures used for the following establishments, water usage figures only are given. To determine flow in gpm, see Fixture Unit Factors (Figure 2).

SCHOOLS	With cafeteria and showers, estimate 25 gal (94.6 l)/day per student (total water usage), or estimate 10 gal (37.9 l)/day per student (hot only). With cafeteria, no showers, estimate 15 gal (56.8 l)/day per student (total water usage), or estimate 4 gal (15.1 l)/day per student (hot only).
RESTAURANTS	Estimate 10 gallons (37.9 l) per person per day (total water usage), or estimate 4 gallons (15.1 l) per person per day (hot only). Add 30% water usage for 24 hour restaurants, add 2 gal (7.6 l)/person/day for cocktail bar facilities.
HOSPITALS	Estimate 250 gallons (946.3 l) per day per bed (total water usage), or estimate 170 gallons (643.5 l) per day per bed (hot only).
NURSING HOMES	Estimate 75 gallons (283.9 l) per day per bed (total water usage), or estimate 50 gallons (189.3 l) per day per bed (hot only).
DORMITORIES	Estimate 40 gallons (151.4 l) per person per day (total water usage), or estimate 16 gallons (60.6 l) per person per day (hot only).
OFFICE BUILDING	Estimate 15 gallons (56.8 l) per person per day (total water usage), or estimate 2 gallons (7.6 l) per person per day (hot only).
BOILERS	To determine daily make up in gallons: 1. Multiply boiler horsepower by 4.25. 2. Then multiply (1) by hours per day operation. 3. Then multiply by the % operating rating. 4. Then subtract the % of condensate return.
COOLING TOWERS	To determine daily make up in gallons: 1. Multiply the tonnage by 4. (This includes 2 gal (7.6 l)/hour/ton evaporation and 2 gal (7.6 l)/hour/ton bleed off). 2. Then multiply (1) by the hours per day operation.

Figure 6