Water Flow Rate & Sizing Guide

for Commercial & Industrial Use

Hellenbrand

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Manufacturers of Water Conditioning Systems Since 1967

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Sizing Procedures

1. **Obtain a properly taken water analysis**
   A. Analyze water with portable test kit.
   B. Check with local water utility department for their water analysis records.
   C. Send water sample to Hellenbrand for analysis.
2. **Analysis should at least test for the following**
   A. Hardness as $CaCo_3$ in grains per gallon (gpg) or convert parts per million (ppm) to gpg by dividing ppm by 17.1.
   B. Total Iron in ppm or mg/l.
   C. Total Dissolved Solids (TDS) in ppm or mg/l.
   D. pH
3. **Determine the daily water usage amount to be softened**
   A. Use consumption figures from water utility billings. (To convert billings in cubic feet to gallons multiply by 7.5)
   B. Take water meter readings.
   C. Use sizing tables when Steps A or B are not available.
4. **Determine continuous and peak flow rates in gpm**
   A. Use the Water Supply Fixture Units (WSFU) from your State Plumbing Codes and Flow Rate Tables on pages 6 and 7 to determine required flow rate.
   B. Obtain flow rates for continuous equipment which requires softened water, such as boilers, reverse osmosis units…etc. from equipment specifications or manufacturer. (If flow rate data is given in pounds per hour, divide by 500 to convert to gallons per minute.)
   C. Install a digital readout water meter in gpm and record peak gpms during peak consumption.
5. **Private water supplies**
   A. Find out the pump's capacity in continuous gpm.
   B. Check the pump start and stop settings.
   C. Install a working pressure gauge if needed.
6. **Now determine daily water to be conditioned**
   A. All water conditioned.
   B. Hot water only.
7. **Determine capacity required per day**
   A. Capacity = (Gallons Per Day x Grains Per Gallon) Add 3 grains per gallon for each ppm of **ferrous clear water** iron present. If ferrous iron content is above 2 ppm, consult factory for pretreatment recommendation. If ferric iron is present, an Iron Curtain iron filter is required.
8. **Selecting the proper unit for capacity per day**
   A. To properly select the correct unit, go to the capacity specifications chart and find the unit which will handle the peak daily capacity (grains per day) when regenerated on low or medium salt dosages.
   B. Select a unit that will not regenerate any more often than every 2 - 3 days on low or medium salting.
   C. **Sizing systems on low or medium salting levels save up to 40% on annual salt costs plus additional water usage savings.**

EXAMPLE: Grains per Day required: 64,000

The TN-60 will produce 64,000 grains when regenerated with 30 lbs. of salt. The TN-90 will produce 64,000 grains when regenerated with 18 lbs of salt. Over the course of one year when regenerating every day, the TN-60 would use 10,950 lbs. of salt; the TN-90 would use 6,570 lbs. of salt or 4,380 lbs. of salt less. If salt costs the operator $5.15 per 50-pound bag, that would mean a savings of $451.14 per year.

9. **Selecting the proper unit for flow rates required**
   A. When sizing for continuous flow rate, subtract the pressure drop at the operating gpm flow across the softener from line pressure. At least 30 psi should be left for working pressure.
   B. When sizing for peak flow rate, subtract the pressure drop across the softener from line pressure. At least 20 psi should be left for working pressure.
   NOTE: Some automatic fixtures (such as Flushometer type toilets) have specific pressure requirements by the manufacturer which may be greater than 20 psi.
   C. If either (A) or (B) above is lower than the minimum allowable working pressure for the unit selected in Step #8, select a larger softener which has a lower pressure drop at the gpm demand and capacity needed.
   D. Always conform to all local and state plumbing codes.

Other Important Checks

1. **Available Space** – Compare dimensions of unit(s) selected with the installation space provided.
2. **Doorways** – Make sure all equipment will fit through all doorways, hallways and elevators leading from the delivery area to installation site.
3. **Backwash Rates** – If unit is operated on a private water supply, make sure the pump will be able to maintain the backwash rate required. Drains on all installations must be able to handle the backwash flow rates of the unit(s) selected.
4. **Special Applications** – While most commercial equipment will produce satisfactory softened water at 1 to 2 grains hardness leakage for apartment buildings, hotels, laundries, and similar applications, some applications such as boiler, reverse osmosis…etc. may require higher quality water of less than 3-5 ppm of hardness leakage. Consult the factory on these applications.

Maximum Allowable Flow Rate for Copper Tube Type M-ASTM B88*

1/2"	8.0 gpm
3/4"	13.5 gpm
1"	21.0 gpm
1.25"	32.0 gpm
1.5"	46.0 gpm
2"	80.0 gpm
2.5"	120.0 gpm
3"	175.0 gpm
4"	280.0 gpm
5"	500.0 gpm
6"	700.0 gpm

*Velocities not to exceed 8 feet per second

Water Consumption Estimating Guide

This guide is provided for estimations only when actual meter reading are unavailable. Estimate peak gpm using "Supply Fixture Units" on page 6.

APARTMENTS

One Bedroom Units – 1.75 People/Apt
Two Bedroom Units – 3 People/Apt
Three Bedroom Units – 5 People/Apt
Full Line – 60 G.P.D./Person
Hot Only – 25 G.P.D./Person

BARBER SHOPS

55 G.P.D./Chair Full Line

BEAUTY SHOPS

200 G.P.D./Per Operator

BOILERS

Steam boilers require 4.25 gallons of water per hour for each horsepower rating of the boiler. Many boilers have a condensate return and this percentage should be subtracted from the full demand to determine actual requirement.

BOILERS (CONT)

The amount remaining is your "makeup" per hour. The makeup water requires further softening. Multiply the % of operation rating to determine actual makeup per hour. Multiply this number times hours of operation per day.

Example:

50 H.P. Boiler
60% Condensate Return
75% Operation Rating
24 Hours/Day

50 H.P. x 4.25 Gallons/Hour = 212 Gallons
212 Gallons x 60% Condensate = 127 Gallons
212 Gallons – 127 Condensate Return = 85 Gallons Makeup
80 Gallons Makeup x 75% Operating Rating = 63.75 Gallons Of Actual Makeup
63.75 Gallons x 24 Hours/Day = 1,530 Gallons/Day

Boiler Ratings	Factors used to convert to horsepower
Pounds of steam per hour	Divide by 34.5
BTU's	Divide by 33,475
Square foot area - water tube	Divide by 10
Square foot area - fire tube	Divide by 12

Boiler Feedwater (Makeup Requirements)

4 gal/hr per Horsepower = Gallons of water evaporated/hr

Lbs. evaporation/hr x .12 = Gallons of water evaporated /hr

Feedwater makeup requirements:

1. Rated in horsepower = 4 gallons of water evaporated per hour. This is then multiplied by the percentage rating at which the boiler is operated.
   Example: A 300 HP boiler operated at 75% of rating = 300 x 4 x 75% / 100% = 900 gal. of water evaporated/hr. Gallons per hour x hours/day = gallons/day of makeup.
2. Lbs. of evaporation/hr x 0.12 = Gallons of water evaporated per hour.
   Example: 25,000 lbs. x 0.12 = 3000 gallons of water evaporated /hr. Gallons/hr. x hours/day = gallons per day of makeup.

Adjustment for Percentage of Condensate Returns:

If the boiler systems doesn't use condensate return, then the feedwater makeup requirements above are used to determine sizing. When condensate returns are used, the feedwater makeup is the difference between the number of gallons of water evaporated per hour and the number of gallons of condensate return.

Example: 3600 gallons of water evaporated per hour and condensate return of 50%; the amount of boiler feedwater makeup required is: 3600 - (50% of 3600) = 1800 gallons per hour of boiler operation for feedwater makeup. Gallons per hour x hours per day = gallons per day of makeup.

BOWLING ALLEYS

75 G.P.D./Lane

CARWASH

With the variety of number of different types of carwash systems available in today's market, we advise you to consult the specific carwash manufacturer for your application.

GPM Estimate:

1. Multiply the number of Self Serve Bays by 4.
2. Multiply the number of Automatic Bays by 38.
3. Add together the answers from step 1 and 2.
4. Add the Spot Free Rinse demand (from the manufacturer) to the total in step 3 to calculate the total G.P.M.
   6-15 Gallons for Automatic Bay
   6 Gallons for Self Serve Bay

Consumption Guideline:

Avg Gallons Per Day Automatic Bay - 6,840
Avg Gallons Per Day Self Serve Bay - 600
"Modern Car Care 2000" states: Average gallons for Self Serve Bay 150-1000 and Automatic Bay up to 10,000 Gallons

COOLING TOWERS

To determine daily makeup in gallons:

1. Multiply the tonnage by 4. (This includes 2 gal/hour/ton evaporation and 2 gal/hour/ton/bleed off.)
2. Next multiply the answer in step 1 by the hours per day of operation.

DORMITORIES

40 G.P.D./Person Full Line
16 G.P.D./Person Hot Only

FACTORIES

35 G.P.D./Person/Shift w/Showers Full Line
25 G.P.D./Person/Shift w/o Showers Full Line
Note: Estimate any process water separately.

FARM ANIMALS

Dairy Cow – 35 G.P.D.
Beef Cow – 12 G.P.D.
Goat – 2 G.P.D.
Hog – 3 G.P.D.
Horse – 12 G.P.D.
Sheep – 2 G.P.D.
Chickens – 5 G.P.D./100 Birds
Turkeys – 18 G.P.D./100 Birds

HOSPITALS

250 G.P.D./Bed Full Line
170 G.P.D./Bed Hot Only
NOTE: Estimate air conditioning and laundry separately.

LAUNDRY

1. Obtain capacity (lbs) from customer or capacity table on next page.
2. Calculate usage and flow from formulas A & B
   Formula A – Capacity (lbs) x 2.5 = Gallons/Cycle
   Formula B – Capacity (lbs) x 10% = Flow Rate (gpm)
   Total daily usage = Gallons/Cycle x 2
   Loads/hrs x hrs of operation x # of machines.

COMMERCIAL LAUNDRY CAPACITY TABLE							
Tumbler Size (inches)	**Clothes Capacity** (lbs)	**Tumbler Size** (inches)	**Clothes Capacity** (lbs)	**Tumbler Size** (inches)	**Clothes Capacity** (lbs)	**Tumbler Size** (inches)	**Clothes Capacity** (lbs)
30 x 16	25	36 x 42	125	42 x 96	400	44 x 126	575
24 x 36	48	36 x 54	165	42 x 108	450	48 x 84	460
30 x 30	60	42 x 42	175	42 x 126	510	48 x 96	535
30 x 36	70	42 x 48	200	44 x 54	245	48 x 120	680
30 x 42	80	42 x 54	225	44 x 64	300	48 x 126	715
30 x 48	95	42 x 64	265	44 x 72	330	54 x 84	600
36 x 30	90	42 x 72	300	44 x 84	385	54 x 96	680
36 x 36	110	42 x 84	350	44 x 96	440	60 x 96	900

MOTEL

100 G.P.D./Room Full Line
40 G.P.D./Room Hot Only
NOTE: Estimate the restaurant, bar, air conditioning, swimming pool, and laundry facilities separately and add to room total.

MOBILE HOME COURT

Estimate 3 People/Home
60 G.P.D./Person
NOTE: Estimate outside water for sprinkling, washing cars, separately.

NURSING HOMES

100 G.P.D./Bed Full Line
50 G.P.D./Bed Hot Only
NOTE: Estimate laundry separately.

OFFICE BUILDING

15 G.P.D./Person Full Line
2 G.P.D./Person Hot Only

RESTAURANTS

10 G.P.D./Person Full Line
4 G.P.D./Person Hot Only
2 G.P.D./Person Cocktail Bar Facilities
Add 30% Water Usage for 24 hour facilities

SCHOOLS

25 G.P.D./Student Full Line w/Showers
10 G.P.D./Student Full Line w/o Showers
10 G.P.D./Student Hot Only w/Showers
4 G.P.D./Student Hot Only w/o Showers

TRAILER PARKS - 100 G.P.D./Space

CHURCH - 2 G.P.D./Person

DAYCARE - 12 G.P.D./Child

Flow Rate Estimating Chart in U.S. Gallons

Instructions For Use:

1. Count and total the number of each type of fixture to be serviced by water conditioning equipment.
2. Multiply the number of each type of fixture by the unit count given for the appropriate water supply fixture table.

   Private – Apartment Buildings, Trailer Parks, Group Homes, Houses, etc.

   Public – Office Buildings, Hospitals, Motels, Clubs, Schools, etc.

   NOTE: Make sure you use the correct values for hot, cold or hot & cold.
3. Find the total fixture count by adding the values found in Step 2.
4. Using the correct chart on page 6, find your total supply fixture count value in the left hand column and read across to the right to find the gpm demand.

   Make sure you use the correct gpm column for "private" or "public".

Example:

10 Unit Apartment (Hot Only)	
10 Kitchen Sinks @ 1	= 10
10 Dishwashers @ 1	= 10
10 Bathroom Groups @ 2	= 20
10 Automatic Clothes Washers @ 1	= 10
Total SFUs	50
GPM Demand	28

When both private and public fixtures are present, use the "predominately" higher percentage of private or public to obtain your gpm demand.

WATER SUPPLY FIXTURE UNITS FOR PUBLIC USE FIXTURES

TYPE OF FIXTURE[a]	WATER SUPPLY FIXTURE UNITS (WSFU)		
	Hot	Cold	Total
Automatic Clothes Washer, Individual	2.0	2.0	3.0
Automatic Clothes Washer, Large Capacity	b	b	b
Bathtub, with or without Shower Head	2.0	2.0	3.0
Coffeemaker		0.5	0.5
Dishwasher, Commercial	b	b	b
Drink Dispenser		0.5	0.5
Drinking Fountain		0.25	0.25
Glass Filler		0.5	0.5
Hose Bibb: 1/2" diameter		3.0	3.0
3/4" diameter		4.0	4.0
Icemaker		0.5	0.5
Lavatory	0.5	0.5	1.0
Shower, per Head	2.0	2.0	3.0
Sinks: Bar and Fountain	1.5	1.5	2.0
Barber and Shampoo	1.5	1.5	2.0
Cup		0.5	0.5
Flushing Rim		7.0	7.0
Kitchen and Food Preparation per faucet	2.0	2.0	3.0
Laboratory	1.0	1.0	1.5
Medical Exam and Treatment	.5	.5	1.0
Service	2.0	2.0	3.0
Surgeon Washup	1.5	1.5	2.0
Urinal: Siphon Jet		4.0	4.0
Washdown		2.0	2.0
Wall Hydrant, Hot and Cold Mix: 1/2" diamter	2.0	2.0	3.0
3/4" diameter	3.0	3.0	4.0
Wash Fountain: Semicircular	1.5	1.5	2.0
Circular	2.0	2.0	3.0
Water Closet: Flushometer		6.5	6.5
Gravity Type Flush Tank		3.0	3.0

WATER SUPPLY FIXTURE UNITS FOR NONPUBLIC USE FIXTURES

TYPE OF FIXTURE[a]	WATER SUPPLY FIXTURE UNITS (WSFU)		
	Hot	Cold	Total
Automatic Clothes Washer	1.0	1.0	1.5
Bar Sink	0.5	0.5	1.0
Bathtub, with or without Shower Head	1.5	1.5	2.0
Bidet	1.0	1.0	1.5
Dishwasher Machine	1.0		1.0
Glass Filler		0.5	0.5
Hose Bibb: 1/2" diameter		3.0	3.0
3/4" diameter		4.0	4.0
Kitchen Sink	1.0	1.0	1.5
Laundry Tray, 1 or 2 Compartment	1.0	1.0	1.5
Lavatory	0.5	0.5	1.0
Shower, per Head	1.0	1.0	1.5
Water Closet: Flushometer		6.0	6.0
Gravity Type Flush Tank		2.0	2.0
Bathroom Groups:			
Bathtub, Lavatory and Water Closet – Flushometer	2.0	7.5	8.0
Bathtub, Lavatory and Water Closet – Flush Tank	2.0	3.5	4.0
Shower Stall, Lavatory and Water Closet – Flushometer	1.5	7.0	7.5
Shower Stall, Lavatory and Water Closet – Flush Tank	1.5	3.0	3.5

Note a: For fixtures not listed, factors may be assumed by comparing the fixture to a listed fixture which uses water in similar quantities and at similar rates.

Note b: Load factors in gallons per minute, gpm, based on manufacturer's requirements.

Source: Wisconsin Administrative Code, October, 2004, 82.40-2-3

CONVERSION OF WATER SUPPLY FIXTURE UNITS TO GALLONS PER MINUTES

Water Supply Fixture Units	GALLONS PER MINUTE	
	Predominately Flush Meter Type Water Closets	Predominately Flush Tank Type Water Closets
	Or Siphon Jet Urinals	Or Washdown Urinals
1	—	1
2	—	2
3	—	3
4	10	4
5	15	4.5
6	18	5
7	21	6
8	24	6.5
9	26	7
10	27	8
20	35	14
30	40	20
40	46	24
50	51	28
60	54	32
70	58	35
80	62	38
90	65	41
100	68	42
120	73	48
140	78	53
160	83	57
180	87	61
200	92	65
250	101	75
300	110	85
400	126	105
500	142	125
600	157	143
700	170	161
800	183	178
900	197	195
1000	208	208
1250	240	240
1500	267	267
1750	294	294
2000	321	321
2250	348	348
2500	375	375
2750	402	402
3000	432	432
4000	525	525
5000	593	593

Note: Values not specified in the table may be calculated by interpolation.

Source: Wisconsin Administrative Code, 2004 82.40-2-3

Alternate Plumbing, Point-of-Entry Water Treatment Device Sizing Method/ Wisconsin Department of Commerce

This approval is valid until the end of Dec. 2012.

- A point-of-entry water treatment device sized in accordance with this alternative method shall not serve exterior wall hydrants.
- Water supply fixture unit values, and the corresponding flow rates, for exterior wall hydrants shall be calculated using s. Comm 82.40 (6), converted using Table 82.40-3, and shall be added to the flow rate calculated using the alternate method.
- This alternate sizing method shall be used for sizing point-of-entry water treatment devices up to a maximum water supply fixture unit (WSFU) value of 40. For WSFU values exceeding 40, the load factors for water supply systems shall be calculated using s. Comm 82.40 (6).
- The maximum rated service flow rate(s) of a point-of-entry water treatment device, or multiple water treatment device's installed in parallel, shall be greater than or equal to the design flow rate derived by using this alternate sizing method.
- This alternate sizing method for point-of-entry water treatment devices shall be limited to single family homes and individual dwelling units in a multi-family dwelling.
- The flow rate calculated using this alternative sizing method for point-of-entry water treatment device's shall not be less than any minimum flow rate or corresponding pressure required by a fixture as specified by the fixture manufacturer.

Alternate Sizing	
Water Supply Fixture Units (WSFU's)	Gallons per Minute for Sizing
1	1
2	2
3	3
4	4
5	4.5
6	5
7	6
8	6.5
25	7
35	8
40	9

Hellenbrand

• Worksheet •

Sizing for Hellenbrand Commercial Systems

Prospect Name: _____ Date: _____

Address: _____

Contact Person: _____ Telephone: _____Cell: _____Fax:_____

Prepared by: _____Email: _____

A. **Water to be used for**

☐ School ☐ Restaurant ☐ Motel ☐ Boiler ☐ RO
☐ Laundry ☐ Dishwasher ☐ Farm ___ Water Livestock ___ Washdown in Parlor
☐ Other _____

B. **Hours per day operation** _____ Days per week _____

C. **Water requirements**

(a) Constant flow rate _____ gpm Peak flow _____ gpm
(b) Daily usage/24 hour _____ gal Days per week – 5, 6, 7 _____?
(c) Was usage determined by ☐ fixture count? ☐ flow meter? ☐ water bill?

D. **Water quality required**

Permissible hardness leakage _____ ppm?

E. **Water, Influent**

(a) Source: ☐ Municipal ☐ Private Well ☐ Surface Water Supply ☐ Other _____ (Please Specify)
(b) Composition:

Total Hardness	_____ gpg	Color	_____
Manganese	_____ ppm	Turbidity	_____
Iron	_____ ppm	H_2S (rotten egg odor)	_____ ppm
pH	_____	Other	_____
T.D.S.	_____ ppm		_____

F. **Facilities** ☐ Existing Facility ☐ Expansion ☐ Future Construction

Supply pipe size _____ inches Operating pressure _____ to _____ psi
Pump capacity _____ gpm Pressure at point of installation _____ psi
_____ Constant pressure pump
rated at _____ gpm, Set at _____ psi Number of floors in building _____
Drain line size _____ Minimum pressure allowed after unit _____ psi

G. **Installation details or limitations**

Available floor space _____" length x _____" width x _____" height
What floor _____ Weight versus floor support _____

H. **Installation details or limitations** (Cont'd)

Door openings _____ Stairways _____ Elevators _____
Remote brine tank location _____
Any other unusual installation requirements _____
_____
_____

I. **Existing equipment at this prospect?**

Tank size _____" diameter x _____" height
Valve size _____ Capacity _____ cu. ft. Resin _____
Make _____ Model # _____ Approx. age _____

J. **Notes:** _____
_____

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