

Part 2 GENERAL DESIGN CONSIDERATIONS

Introduction

This Part applies to:

- (a) **Public Community** water systems; and
- (b) **Domestic Bottled** water systems.

2.0 General

The design of a water system or treatment process encompasses a broad area. Application of this part is dependent upon the type of system or process involved.

2.1 Design Basis

The water treatment plant, water system sources, and pump stations shall be designed for maximum day demand at the design year, recommended 20 years hence. Water system treatment plants, for water systems planning on future growth, shall be designed for maximum day demands expected at least 10 years hence. Water mains and transmission lines shall be designed for 50 years projected growth. **Public** water systems serving fewer than 100 connections, such as condominiums or subdivisions, need only plan for known projected demand. Specific per capita per day demands as outlined in Subpart 2.2, Table A2-1, shall be used to establish initial average day demand.

When a water system, expecting future growth, reaches 90% of the capacity of treatment or pumping systems capacity, it shall commence planning for the required additional capacity. When pumping or treatment capacities reach 100%, the water system shall initiate construction of these facilities.

2.2 Water Demand

Source yields will be compared against the maximum demands of the water systems to determine the adequacy of the source(s) to meet the expected demand.

2.2.1 Average Day Demands

The source's ability to meet the average day demand is based on pumping 12 hours per day.

2.2.1.1 For design of new systems or modification to systems without metered data records, the average day demands shall be based on the average day flow quantities in Table A2-1.

2.2.1.2 Reduction in average day demands determined using Table A2-1 may be made based on the results of metered data. Reductions below 60 gal/person/day will not be permitted in residential dwellings. A 10% leakage/aging factor will be added to empirically derived

average day demands. Four types of proposals may be presented to determine reductions in the average day demands.

- (a) Meter readings on the existing water system:
 - (1) Must be tabulated on a daily basis for at least one year and readings must represent current usage;
 - (2) Must include daily population figures or occupancy data when appropriate; and
 - (3) On seasonally occupied dwellings, average day demands must be taken for period of maximum occupancy.
- (b) Meter readings on existing similar water systems:
 - (1) must be similar in population type and usage and must be approved for study by the Secretary, and
 - (2) two similar water systems should be monitored for at least one year prior to analysis.
- (c) Installation of low flow plumbing fixtures, 3.5 gallon or less flush toilets, 3.0 gallon per minute or fewer showerheads, and faucet aerators will allow for a 10% reduction in design flows as calculated from Table A2-1.
- (d) Other proposals, acceptable to the Secretary, on a case by case basis.

2.2.2 Maximum Day Demand

When the peaking factor is two (2), meeting the maximum day demand is based on finished water production when pumping 24 hours per day at the same rate (GPM) as needed to meet the average day demand.

Maximum day demands are determined as follows:

Average day demands x peaking factor = maximum day demands. In the absence of site specific data the peaking factor shall be two (2).

Please note that the basis of design, including the definitions for average day demand and maximum day demand differ in Part 11, Small Scale Systems.

2.2.3 Peaking factor

2.2.3.1 The peaking factor on new projects and non-metered existing projects is two (2).

2.2.3.2 The peaking factor, if based on metered data, must be based on the same information and conditions outlined in Appendix A Subpart 2.2.1.2, and is the ratio of the metered maximum day demand to the metered average day demand. The maximum day demand is the greatest amount of water produced by the water system on a single day during a 12 month period, or other appropriate time period.

**Table A2-1 - UNITIZED AVERAGE DAY FLOWS
Engineering Design Criteria
Unitized Average Day Flow Quantities**

ESTABLISHMENT	DESIGN VALUE	Gallons Per Person Per Day (Unless otherwise noted below)
Assembly Areas, Conference Rooms	5	
Airports	5	
Bathhouses	5	
Bowling Alley (no food service)	75	Per Lane
Camps:		
Campground with central comfort stations (4 people per site)	100	Per Site
With flush toilets, no showers (4 people per site)	75	Per Site
Construction Camps (semi-permanent)	50	
Day camps (no meals served)	15	
Day Care Centers	15	Per Child or Employee, Per Shift
Resort camps (night & day) with limited plumbing	50	
Cafeterias	50	Per Seat
Churches Sanctuary seating x 25%	5	
Church Suppers	8	
Cottages	50	
Country Clubs	100	Per Resident Member
Country Clubs	25	Per Non-Resident Member Present
Dairy Farms	20	per tie-up
Dentists' Office	35	Per Staff Member
Plus	200	Per Chair
Doctors' Office	35	Per Staff Member
Plus	10	Per Patient
Dwellings		
Apartments	75	Per Person with Minimum of 2 People Per Bedroom

Vermont Water Supply Rule

April 25, 2005

ESTABLISHMENT	DESIGN VALUE	Gallons Per Person Per Day (Unless otherwise noted below)
Boarding Houses	50	
Plus Addition for non-resident boarders	10	
Multiple dwelling (condominiums, town houses, clustered housing)	75	Per Person with Minimum of 2 People/Bedroom
Den with Couch	55	
Rooming House	40	Per Occupant Bed Space
Single Family Dwellings	150	Per Bedroom
Factories	15	Gallons Per Person, Per Shift, exclusive of Industrial Wastes
Gyms	10	Per Participant
	3	Per Spectator
Hairdressers	10	Per Operator
Plus	150	Per Chair
Hotels** with Private Baths	50	Per Sleeping Space
Hospitals	250	Per Bed
Institutions other than hospitals	125	Per Bed
Laundries, self-service	500	Per Machine
Mobile Home Parks		
Systems Serving 4 or fewer trailers	450	Per Space
Systems Serving 5 or more trailers	250	Per Space
Motels** with private baths	50	Per Sleeping Space
Nursing Homes	125	
Picnic Parks (toilet waste only/picnickers)	5	
Restaurants (toilet and kitchen wastes, including restaurant and bar seats)	30	Per Seat
Additional for restaurant serving 3 meals per day	15	Per Seat
Restaurants (fast food-see Cafeteria)		
Schools		
Boarding	100	

Vermont Water Supply Rule

April 25, 2005

ESTABLISHMENT	DESIGN VALUE	Gallons Per Person Per Day (Unless otherwise noted below)
Day, without gyms, cafeterias & showers	15	
Day, with gyms, cafeterias & showers	25	
Day, with cafeteria, but without gyms and showers	20	
Service Stations	500	First set of gas pumps
Plus	300	Each set thereafter
Shopping Centers/Stores;		
Large Dry Goods	5	Per 100 Square Feet
Large supermarkets with meat department, without garbage grinder	7.5	Per 100 Square Feet
Large supermarkets with meat department, with garbage grinder	11	Per 100 Square Feet
Small Dry Goods (in shopping centers)	100	Per Store
Subdivision	450	Per Lot or 150 Gallons Per Day Per Bedroom, whichever is larger
Theaters		
Movie	5	Per Auditorium Seat
Drive-in	5	Per Car Space
Travel trailer parks without individual water & sewer hookups		
Comfort Station	90	Per Trailer Space
Dumping Station	35	Per Trailer Space
Travel trailer parks with individual water & sewer hookups	125	Per Trailer Space
Veterinary clinic (3 or fewer doctors)		
Without animal boarding	750	Per Clinic
With animal boarding	1500	Per Clinic
Workers		
Construction (at semi-permanent camp)	50	
Day at schools and offices	15	Per Person Per Shift

*Elderly housing may be calculated at 1.5 people per bedroom.

**Does not include laundry or restaurant demand.

Also see
Sewer Ordinance
Tab

§1-504 Design Flow Table 1 continued

Campgrounds (also see camps)	Open 7 mo/yr Or Less	Open more than 7 mo/yr
Campgrounds that allow only tents and camping units with no interior plumbing Central toilets and showers 4 people per site	75 gpd/site	100 gpd/site
Campgrounds that allow only tents and camping units with no interior plumbing Central toilets without showers 4 people per site	60 gpd/site	75 gpd/site
Campground sites that allow camping units with interior plumbing Served by central toilet facilities and dumping stations	50 gpd/site for central facilities plus 25 gpd/site for the dumping station	90 gpd/site for central facilities plus 35 gpd/site for the dumping station
Served by an individual sewer hook-up	75 gpd/site	125 gpd/site
Seasonal RV site with individual sewer hook-up RV owned by the occupant	75 gpd/site	125 gpd/site
RV not owned by the occupant	125 gpd/site	175 gpd/site
Cabins with RV type plumbing 4 people per site	125 gpd/site	175 gpd/site
Cabins with conventional plumbing Minimum of 4 people per site With or without kitchen	50 gpd/person	50 gpd/person
With or without kitchen but with laundry facilities	70 gpd/person	70 gpd/person

§1-504 Design Flow Table 1 continued

Campgrounds	Open 7 mo/yr Or Less	Open more than 7 mo/yr
Park Model RV		
For first bedroom	140 gpd/site	140 gpd/site
For additional bedrooms	100 gpd/site	140 gpd/site
Mobile home used as vacation facilities		
For first bedroom	140 gpd/site	140 gpd/site
For additional bedrooms	100 gpd/site	140 gpd/site

Table 1 continued

<u>OTHER ESTABLISHMENTS</u>	<u>GALLONS/PERSON/DAY^{a,b}</u> (unless otherwise noted)
Assembly Areas, Conference Room	5
Airports (per passenger)	5
Bathhouses and Swimming Pools	5
Bowling Alley (no food service)(per lane)	75
Cafeterias (per seat)	50
Camps: Construction camps (semi-permanent)	50
Day camps (no meals served)	15
Resort Camps (Night & Day) with limited plumbing ...	50
Churches: Sanctuary seating x 25%	5
Church suppers	8
Country Clubs (per resident member)	100
Country Clubs (per non-resident member present)	25

<u>GALLONS/PERSON/DAY^{a,b}</u>	
Day Care Centers:	unless otherwise noted
Without meals:	15
With one meal:	20
With two meals:	25
Dentists:	
Staff Member	35
Per Chair	200
Doctor's Office:	
Staff Member	35
Patient.....	10
Room Rentals:	
Boarding Houses	50
Addition for non-resident boarders	10
Rooming Houses (per occupant bed space)	40
Factories (gallons per person, per shift, exclusive of industrial waste).....	15
Gyms:	
Per Participant.....	10
Spectator	3
Hairdressers:	
Operator	10
Per Chair	150
Hospitals (per bed space)	250
Hotels with Private Baths(per person sleeping space) ^c	50
Institutions other than hospitals (per bed).....	125
Laundries, self service (gallons per machine)	500

	<u>GALLONS/PERSON/DAY^{a,b}</u>
Mobile Home Parks:	
For wastewater systems serving 4 or fewer trailers (per space)	450
For wastewater systems serving 5 or more trailers (per space)	250
Motels with bath, toilet (per person sleeping space) ^c	50
Picnic Parks (toilet wastes only/picnicker)	5
Restaurants (toilet and kitchen wastes/seat, including restaurant and bar seats)	30
Additional per seat for restaurant serving 3 meals per day	15
Restaurants (fast food - see cafeterias)	50
Schools:	
Boarding	100
Day, without gyms, cafeterias, or showers	15
Day, with gyms, cafeterias, and showers	25
Day, with cafeteria, but without gyms or showers	20
Service Stations (first set of gas pumps)	500
(each set thereafter)	300
Sewer Line Infiltration (where applicable) 300 gal/in pipe/dia/mile/day	
Shopping Centers/Stores:^c	
Large Dry Goods	5 GPD/100 ft ²
Large Supermarkets with meat department without garbage grinder	7.5 GPD/100 ft ²
Large Supermarkets with meat department with garbage grinder	11 GPD/100 ft ²
Small Dry Good Stores (in shopping centers)	100 GPD/store
Theaters:	
Movie (per auditorium seat)	5
Drive-in (per car space)	5

§1-504 Design Flow

Table 1 - continued

	<u>GALLONS/PERSON/DAY^{a,b}</u>
Veterinary Clinic (3 or less doctors):	
without animal boarding	750/clinic
with animal boarding	1,500/clinic
Workers:	
Construction (at semi-permanent camps)	50
Day at schools and offices (per shift)	15

Note: These rules change design flows for certain categories. It may be possible to add more residential or camping units to an existing potable water supply and/or wastewater system when the supply and/or system conform to current design requirements.

^a Use eighty (80) percent of design flows for projects to be connected to a wastewater system with a design capacity of 50,000 gallons per day or greater. Note that this design flow reduction applies only to the wastewater flow and DOES NOT apply to a project's associated potable water supply design flows if the water supply is regulated as a public transient, non-transient, or community water supply.

^b A 10% reduction in the design flow, except for single family residences and campgrounds, may be used when the plumbing includes standard water saving designs. Toilets must be 3.5 gallons per flush or less and showers and faucets must be 2 gallons per minute or less. This reduction does not apply to single family residences or campgrounds as those numbers have already been adjusted.

^c Does not include laundry or restaurant waste.

Elderly housing may be calculated at 1.5 people per bedroom