Design Calculations For Class 2, 4, & 5 ON-SITE Sewage Systems

Ontario Rural Wastewater Centre By: Rebecca Turbitt

Owner: Greg Willsie	Designer: Steven Derbyshire	Installer: Steven Derbyshire BCIN #: 106181

STEP 1 - DAILY SEWAGE FLOW (Based on Hydraulic Loads for Fixtures, Floor Area, and Bedrooms)

Plumbing Fixture Description	Existing Number of Fixtures	Proposed Number of Fixtures	Hydraulic Load	Fixture Units
Bathroom group (toilet, sink, bathtub)	3	0	6	18
Toilet	1		4	4
Washbasin	1	0	1.5	2
Bathtub or Shower			1.5	
Kitchen Sink(s)	1	0	1.5	2
Bar Sink	1		1.5	2
Dishwasher	1	0	1.5	2
Washing Machine	1	0	1.5	2
Bidet			1	
Laundry Tub	1	0	1.5	2
Other:				
			TOTAL FIXTURE UNITS	31

Proposed(m^2):	230.00
Proposed(ft^2):	2475.72
Existing(m^2):	
Existing(ft^2):	

Total Finished Floor Area Excluding Area of Finished Basement:

m^2:	230.00
ft^2:	2475.72

Below, please calculate the expected daily sewage flow and mark in the space provided. For non-residential occupancies see Table 8.2.1.3 (B)

Residential Occupancy

Number of bedrooms	1	2	3	4	5
Q (L/day)	750	1100	1600	2000	2500

If you have more than 5 bedrooms, put 5 in the exisitng number of bedrooms and add additional bedrooms under addional flow for each bedroom over 5

Existing Number of Bedrooms	Additional Bedrooms	Hydraulic Load, Q (L)	Calculation
4		2000	2000

Additional Flow For:	Existing	Proposed	Q (L/day)	Calculation
Each Bedroom over 5 **OR***			500	
Floor space for each $10m^2$ over $200m^2$ up to $400m^2$		3	100	300
Floor space for each $10m^2$ over $400m^2$ up to $600m^2$			75	
Floor Space for each $10m^2$ over $600m^2$ **OR***			50	
Each fixture unit over 20 fixture units total	11.0		50	550
			TOTAL (L) =	2550

*NOTE: where you need to do multiple calculations, signified by the "OR" in the table, do the calculation for daily sewage flow based on bedrooms and floor space first, then fixture units, and use the larger of the two calculations.

Other Occupancy (Table 8.2.1.3 (B)

Establishment:eg,24hr restaurant	Volume/Unit :	Occupant Load :	Volume (L) :

EXPECTED DAILY DESIGN SEWAGE FLOW(Q):	2550

Please refer to page 5 for additional information on the use of this design tool

STEP 2 - PROPERTY SOIL PROFILE AND PERCOLATION RATE (T) DESCRIPTION

Please refer to the APH website pages title Property Soil Profile & Percolation Rate to find how to determine the percolation rate of the soil on your site. Percolation rate(T) is measured as minutes/centimetre, and measures the rate at which water drains into the soil. Please indicate the T-time of your site below.

Soil Type	(1) Coarse Gravel, no fines	(2) Gravel, some small rocks	(3) Gravel, sand mix, some fines	(4) Sand, farily uniform, some fines	(5) Sandy, Loam mix	(6) Silty, Loam, almost clay	(7) Clay, smears well, rolls into ribbon
T-time (min/cm)	0 to 1	1 to 5	5 to 10	10 to 15	15 to 25	25 to 50	> 50

ON_SITE PROFILE (SUBTRACT USEABLE DEPTH OF SOIL FROM 1.5m FOR DEPTH OF IMPORTED FILL)

Select largest percolation rate (T) for appropriate soil type and insert below

Soil Depth (m)	Percolation Rate T	Soil Type
0.2	5	4
0.4	6	4
0.6	7	4
0.8	8	4
1.0	9	4.0
1.2	10	4
1.4	10	4
1.6	10	4

Fill in the following:

Depth of Soil / Impervious Soil / Groundwater Table(m):	1.6

Fill in the following information on your soil

	Depth (m)	Depth (ft)	Rate (min/cm)
Topsoil to be removed:	0.08	0.26	———
Usable Existing Soil:	1.60	5.25	———
Imported Fill:			———
Percolation Rate (T):	———	———	10
Excavation of existing soil:			———

CONTACT AREA CALCULATION

If you do not have a minimum of 250mm of useable soil on the property, you will need to import the mantle or contact area. Choose T and, divide Q by Loading Rate for T

Percolation Time (T) of soil (min/cm)	Loading Rate (L/m^2/day)
1 < T ≤ 20	10
20 < T ≤ 35	8
35 < T ≤ 50	6
T > 50	4

DAILY SEWAGE FLOW (Q):	÷	Loading Rate (L/m^2/day)	=	CONTACT AREA (m^2)
2550	÷	10	=	255.00

Please refer to page 5 for additional information on the use of this design tool

STEP 3 - A) SEPTIC TANK SIZE CALCULATION

To calculate the minimum capacity of your septic tank, use the following formulas. Minimum tank size is 3600L.

Residential:	Q=	2550	2XQ=	5100	Tank Size:	5100
Other Occupants:	Q=		3XQ=		Tank Size:	

B) LEACHING BED LENGTH CALCULATION (conventional)

Length (m)= (Q X T)/200	127.50	**Length of Pipe (ft)=**	1372.41		
Number of Runs (m):	4.25	**D-BOX (Y/N):**	y	**Header (Y/N):**	N

C) FILTER BED - Where you may not have sufficient area on your property to install a leaching bed, you may install a filter bed for your distribution system

FILTER BED CALCULATION - If your daily sewage flow is less than 3000L/day, perform calculation 1), or if your daily sewage flow exceeds 3000L/day, perform calculation 2).

Calculation 1) - Filter Bed Surface Area

Surface Area (m^2) = Q ÷ 75

Q = 2550

SA = 34.00

FILTER BED SURFACE AREA (m^2) = 34.00

FILTER BED SURFACE AREA (ft^2) = 365.976

Calculation 2) - Filter Bed Surface Area

Surface Area (m^2) = Q ÷ 50

Q = 0.00

SA = 0.00

FILTER BED SURFACE AREA (m^2) = 0.00

FILTER BED SURFACE AREA (ft^2) = 0.00

Select a desired length for the filter bed

Filter Bed Loading Area (m^2):	34.00	**Length (m):**	10.00	**Width (m):**	3.40
Filter Bed Loading Area (ft^2):	365.98	**Length (ft):**	32.81	**Width (ft):**	11.15

EXTENDED CONTACT AREA - T>11.5

Contact Area = (QXT)/850

Q = 2550

T= 10

EXTENDED CONTACT AREA (m^2) = 30.00

EXTENDED CONTACT AREA (ft^2) = 322.92

Please refer to page 5 for additional information on the use of this design tool

DESIGN CALCULATIONS FOR A CLASS 2 SEWAGE SYSTEM

Refer to Sizing a Grey Water System located at the end of the description for a Class 2 - Leaching Pit system located on the APH website at www.algomapublichealth.com

D) GREYWATER SYSTEM -CLASS 2

1) How much Grey Water Waste?

Do you have presurized(P) or non-presurized(N) water? (P/N)	**n**

Type of System	Number of Fixture Units	Volume/Unit (L)	Grey Water Waste, Q (L)
No Pressurized Water	31	125	3875

IF Grey Water Waste(Q) is greater than 1000L, a grey water system cannot be used.

2) Loading Rate (LR)

Loading Rate = 400/T

T = 10

Loading Rate = 40

LOADING RATE (L/m^2/day) = 40.00

3) Size of System

Size of System = Q / LR

Q = 3875

LR = 40

SIZE OF SYSTEM (m^2) = 96.875

DESIGN CALCULATIONS FOR A CLASS 5 SEWAGE SYSTEM

E) Holding Tank - Class 5

In order to calculated the capacity of your proposed holding tank, you must perform the following two calculations, and install a holding tank(s) with a capacity of the greater volume

Minimum Holding Tank Capacity (L) =	9000
Seven(7) X Daily Sewage Flow, Q (L) =	17850
MINIMUM HOLDING TANK CAPACITY (L)=	17850

Comments:

Please refer to page 5 for additional information on the use of this design tool

Legend

Areas to be filled in by user that are applicable to their specific area
Conditional formatting to help with the understanding of this design tool

The Ontario Rural Wastewater Center(ORWC) does not take any responsibility for errors that may occur while using this design tool. This is a suggestive design tool using criteria and values from the 2006 Building Code. Please refer to the buidling code for any additional information you may require.

Credits

Sault Ste. Marie
99 Foster Drive 6th floor Civic Center
Ste. Marie, ON P6A5X6

Blind River
15 Hanes Avenue Box 194
Blind River, ON P0R 1B0

Elliot Lake
Algo Centre Mall 151 Ontario Avenue
Elliot Lake, ON P5A 2T2

WAWA
PO BOX 1908
18 Ganley Street
Wawa, ON P0S 1K0

Please refer to page 5 for additional information on the use of this design tool