STORM WATER MANAGEMENT REPORT
5574 ROCKDALE ROAD, VARS
12 UNIT APARTMENT BUILDING
JP BERGERON

STORM WATER MANAGEMENT REPORT AND SITE SERVICING STUDY

12 UNIT APARTMENT BUILDING

Located at
5574 Rockdale Road
Vars, Ontario

Report Prepared for:

JP Bergeron
880 Smith Road
Navan, Ontario
K4B 1N9

Prepared by:

931Dagenais & Assoc. Inc.
Consulting Engineers & Architect
P.O. Box 160
931 Notre-Dame Street
Embrun, Ontario
K0A1W0

December 8, 2017
September 9th, 2015
July 29, 2015
September 17, 2014
April 10th, 2014
November 11th, 2013

Our File Number: 013-286

TABLE OF CONTENTS

1.0 INTRODUCTION

A Dagenais & Assoc. Inc., Consulting Forensic Engineers, were previously retained by Rollin Development to provide site development drawings and a storm water management report for the proposed residential project. The site and project have been sold by Mr. Rollin to JP Bergeron. A Dagenais & Assoc. Inc., Consulting Forensic Engineers, were previously retained by JP Bergeron to provide revised site development drawings and a storm water management report for the proposed residential project.

This report is a summary of data, calculations, design and support documentation required for the site services of this project.

2.0 PROJECT DATA

Project Name	12 Unit Apartment Building
Owner	JP Bergeron 880 Smith Road Navan, Ontario K4B 1N9
Contact	JP Bergeron
Legal Address:	5574 Rockdale Road, Vars
Telephone Number:	613 - 223 - 7624

3.0 STORM WATER MANAGEMENT

3.1 Balance Flow Requirements

The site consists of approximately 1.777 ha of vacant land.

The site is proposed to be considered in three parts:

1- An affected area that will include a laneway, parking, proposed building and a storm water management swale;

2- An uncontrolled swale to service potential future development, will remain grass and be considered unaffected (Area A8);

3- An unaffected area to remain entirely as is (Area A9).

The unaffected area, consisting of Area A9 in the storm water management plan, is being considered for future development (such as a second building) which will require storm water management practices to be constructed along with the future building.

3.0 STORM WATER MANAGEMENT (Continued...)

3.1 Balance Flow Requirements (Continued...)

Since the unaffected area is divided from the roadside ditch by 5 residential properties and it is uncertain if any one of them will be available for use to convey a controlled flow, the uncontrolled swale (Area A8) is being proposed as an option for future storm water management design. We therefore proposed to direct stormwater from the proposed development exclusively to the swale on the south side of the laneway. Due to the proposed site layout and topography, some allowances for Phase 2 post development flow contributions to the affected area are included in the storm water management scheme.

The proposed storm water management will consider management of the affected area, controlling up the 100 year storm based on 5 year pre-development flows. Only design flows assuming contribution from post-Phase 2 developments will be used in design, however the lower interim flows have been included in the appendices for reference.

The pre-development flow was calculated using a 5 year storm and a 20 minute time of concentration for the affected area. The pre-development flows for the swale and the unaffected area were calculated using a 20 minute times of concentration, as well as 5 and 100 year storms depending on the subject design storm. From intensity duration curves established for the Ottawa area (see Appendix F) we calculated an intensity of 70.3 mm/hr for the 5yr predevelopment flow and 120mm/hr for the 100 year predevelopment flow. A run-off coefficient of 0.3 was used as per City Design Guidelines (for grass areas).

The post-development flows were based on 5 and 100 years storm events with a time concentration of 10 minutes for the affected area and 20 minutes for the unaffected areas. From intensity duration curves established for the Ottawa area, a copy included in Appendix 'F', we established rain intensities of I = 104.4 mm/hr (5 years) and I = 179.0 mm/hr (100 years) correspondingly. A runoff coefficient of 0.30 for the soft surfaces and 0.90 for the hard surfaces were used for a 5 years storm event. For the 100 year storm we have increased the coefficients by 25% as per City`s Sewer Guidelines, meaning 0.375 for soft; except for hard surfaces that were limited at 0.95.

Using the Rational Method and considering the tributary areas of the proposed development or affected area (see Appendix 'B'), we calculated the pre and post development flows. See also the Storm Sewer Design Sheet in Appendix 'D'.

3.2 One hundred Year Storm Event

In the Storm Sewer Design sheet, the pre-development flow was calculated as 181.29 L/s. The affected area was found to have a predevelopment flow of 36.28L/s. We have an uncontrolled area, (Area A7) releasing storm water at 2.45 L/s. Area's A1-A6 will surface drain to the controlled swale on the south side of the private approach. The permitted flow from the swale is 33.07L/s [35.52L/s – 2.45L/s = 33.07L/s].

3.0 STORM WATER MANAGEMENT (Continued…)

3.2 One hundred Year Storm Event (Continued…)

The proposed design flow restriction will be achieved with an IPEX ICD at CB#1, (with a head of 0.35 m) at for a restricted flow of 33.07 L/s. Therefore, the total release flow will be 33.07L/s. For IPEX chart, see Appendix "G".

3.2.1 Roof Drain calculations

The proposed roofs are pitched, therefore roof drains are not proposed.

3.2.2 Storage calculations

The total flow into CB#1 during a 100 year storm event will be the total flow from areas A1-A6. Therefore the flow is 206.82 L/s for a 100 years storm which is being limited to 33.07 L/s. The ICD by IPEX (Type D) has a head of 0.35m (77.62 (Ponding elevation) – 77.27m (outlet) = 0.35 m). Based on our Hydrographs, the accumulated volume generated by this restriction would be 131.534 cu. m. See Appendix "E" for Hydrographs.

3.2.2.1 Structure Storage

The volume is proposed to be stored in the swale. The shape of the swale is proposed to be constructed with 3H:1V side walls and a 'flat' bottom (minimum 2% cross fall from bottom of walls to centerline of swale). Average slope has been shown on the site development drawing.

Ponding capacity of the swale has been calculated as the sum of the capacity of sections of the swale. The capacity of each section has been calculated as the length of the section crossed with the average area of the section. The average area of each section was calculated using the cross sectional area of the swale at the upstream and the downstream end of each section.

The cross sectional area of the swale at section ends is dependent on ponding elevation in the swale. Through trial and error, the 100 year ponding elevation was found to be 77.62. The resulting ponding attributes have been summarized in the following table:

3.0 STORM WATER MANAGEMENT (Continued…)

3.2 One hundred Year Storm Event (Continued…)

The results are tabulated in the following table:

Section	Length (m)	Ponding Elev	Lower Area (sq m)	Upper Area (sq m)	Avg Area (sqm)	Capacity (cu m)
1	9.992	77.62	0.405	2.215	1.310	13.085
2	10.000	77.62	2.215	1.752	1.983	19.831
3	10.000	77.62	1.752	1.761	1.756	17.563
4	10.000	77.62	1.761	1.439	1.600	15.998
5	10.000	77.62	1.439	1.493	1.466	14.657
6	10.000	77.62	1.493	1.189	1.341	13.409
7	10.000	77.62	1.189	1.251	1.220	12.199
8	10.000	77.62	1.251	1.011	1.131	11.310
9	10.000	77.62	1.011	0.695	0.853	8.528
10	7.978	77.62	0.695	0.283	0.489	3.901
11	10.664	77.62	0.283	0.209	0.246	2.623
12	12.083	77.62	0.209	0.034	0.121	1.463
13	30.975	77.62	0.034	0.066	0.050	1.549
14	21.940	77.62	0.066	0.000	0.033	0.728
Total						136.846

**Note: The table was constructed beginning at the outlet. Section 14 is adjacent to the South West corner of the property.*

Therefore, the surface storage capacity is 136.846/131.534*100 = 104.0% of the required volume.

3.3 Five Year Storm Event

In the Storm Sewer Design sheet, the pre-development flow was calculated as 104.24 L/s. The affected area was found to have a predevelopment flos of 36.28L/s. We have an uncontrolled area, (Area A7) releasing storm water at 1.15 L/s. Area's A1-A6 will surface drain to the controlled swale on the south side of the private approach. The permitted flow from the swale is 34.37L/s, but will be restricted to 33.07L/s as per section 3.2 of this report.

The proposed design flow restriction will be achieved with an IPEX ICD at CB#1, (with a head of 0.23 m) at for a restricted flow of 33.07 L/s. Therefore, the total release flow will be 33.07L/s. For IPEX chart, see Appendix "G".

3.3.1 Roof Drain Calculations:

The proposed roofs are pitched, therefore roof drains are not proposed.

3.0 STORM WATER MANAGEMENT (Continued…)

3.3 Five Year Storm Event (Continued...)

3.3.2 Storage calculations

The total flow into CB#1 during a 5 year storm event will be the total flow from areas A1-A6. Therefore the flow is 106.95 L/s for a 5 years storm which is being limited to 40.34 L/s. The ICD by IPEX (Type D) has a head of 0.23m (77.50 (Ponding elevation) – 77.27m (outlet) = 0.23 m). Based on our Hydrographs, the accumulated volume generated by this restriction would be 53.413 cu. m. See Appendix "E" for Hydrographs.

3.3.2.1 Structure Storage

Refer to section 3.2.2.1 for description of pond construction and method of calculating swale capacity.

The cross sectional area of the swale at section ends is dependent on ponding elevation in the swale. Through trial and error, the 5 year ponding elevation was found to be 77.50. The resulting ponding attributes have been summarized in the following table:

Section	Length (m)	Ponding Elev	Lower Area (sq m)	Upper Area (sq m)	Avg Area (sqm)	Capacity (cu m)
1	9.992	77.5	0.235	1.221	0.728	7.278
2	10.000	77.5	1.221	0.922	1.072	10.719
3	10.000	77.5	0.922	0.855	0.889	8.888
4	10.000	77.5	0.855	0.654	0.754	7.544
5	10.000	77.5	0.654	0.584	0.619	6.189
6	10.000	77.5	0.584	0.416	0.500	4.999
7	10.000	77.5	0.416	0.310	0.363	3.627
8	10.000	77.5	0.310	0.180	0.245	2.449
9	10.000	77.5	0.180	0.077	0.129	1.287
10	7.978	77.5	0.077	0.013	0.045	0.362
11	10.664	77.5	0.013	0.000	0.007	0.072
12	12.083					
13	30.975					
14	21.940					
Total						53.413

Therefore, the surface storage capacity is 53.413/49.973*100 = 106.9% of the required volume.

3.4 Trench Drain and Pump

The proposed elevation at the bottom of the ramp will be lower than the adjacent swale elevations, and therefore must be pumped.

3.0 STORM WATER MANAGEMENT (Continued…)

3.4 Trench Drain and Pump (continued...)

The system will be designed to accommodate a 1hr storm assuming pump failure at the onset of the storm, as well as a water level in the pit at a level only just insufficient to engage the alarm.

3.4.1 Pump Selection

A 1HP sump pump by Flotec is capable of pumping 5.75L/s (5468 GPH) with a maximum head of 2.22m (7.29ft). Therefore we propose alternating Flotec 1HP pumps with float actuated control panel.

3.4.2 Pit design

The discharge pipe must exit the pump chamber above the 100 year ponding elevation. We propose a 2.0% slope on the discharge pipe, draining towards the swale. This will provide a pipe invert at the pump chamber of 77.78. We therefore propose a pump inlet elevation of 75.56m (77.78 -2.21 = 75.56). The proposed pump has a 3 1/2" clearance from bottom of pit to pump inlet, therefore the pit sump will be at an elevation of 75.49m.

We propose an OFF float at 4" (elev = 75.59), ON float at 14" (elev = 75.79), and a high alarm float at 17" (elev = 75.86).

We also propose reserve volume to accept additional flow (up to the 100 year design storm) sufficient to provide a 1hr response time in case of pump failure.

Considering flooding would begin to occur at an elevation of 75.79, there would therefore be a reserve depth of 1.32m (77.18 – 75.79 = 1.32m). Assuming a water elevation in the pit just below the high water alarm float level at the commencement of the storm would be the worst case scenario. For a 3.6m diameter pit, there would be a reserve capacity of 13.44 cu m before flooding. A 60 minute storm would generate 13.41cu m of water (Refer to hydrograph tables in Appendix "E").

We therefore propose a 3.6m diameter precast concrete manhole be used as a sump pit, or equivalent. Assuming a 1.8m monolithic base, the underside of transition slab would be at an elevation of 77.29m. A 1.2m diameter riser with a height of 0.9m, 1.2m diameter flat top, 6" leveling ring and 6" frame and grate would bring the top of grate elevation to 79.08m. Refer to site development drawings for finished grade elevations (see appendix "A").

3.5 Quality Control

A water quality control requirement of 80% TSS removal was set by the South Nation Conservation Authority. We propose to achieve this requirement by means of an "end of the line" treatment unit. We are proposing a Stormceptor unit. Using the Stormceptor sizing software, the STC 300 unit was selected. The software generated report has been attached (See Appendix "G").

3.0 STORM WATER MANAGEMENT (Continued…)

3.6 Phase 2 Considerations

Due to the anticipated Phase 2 development to follow shortly after construction of the Phase 1 development, it has been decided that the control structures for the Phase 2 development will be installed at this phase of the project. A catch basin is proposed to be installed without any ICD to allow free flow in the uncontrolled swale. An STC is also proposed. In order to assess which model to install, the Stormceptor software was employed. The factors to consider in sizing a storm captor are tributary area (known, assuming no uncontrolled areas is conservative), imperviousness (site characteristics dictate this is zero), and flow/ponding characteristics. Using numbers proportional to Phase 1, the system was sized as an STC 2000. Refer to the software generated report in Appendix "G". We propose that the STC shell only be installed, without the insert.

4.0 SANITARY SEWER DESIGN

As per Part 8 of the Ontario Building Code (See Appendix "H"), Table 8.2.1.3.A,

Apartments

Based on Occupant Load	275 L/c/d

Occupancy

Based on Subsection 3.1.17	2 people per bedroom

Therefore:

6 x 2 bedrooms x 2 people per room =	24people
6 x 1 bedrooms x 2 people per room =	12people
Total=	**36people**

Therefore the total daily design sanitary sewage flow for this development is 9900 L/d [275L/c/d x 36 people = 9900 L/d].

4.1 Septic Tank

Since the building will have a residential use, the volume of the septic tank must be at least 2 times the daily design sanitary sewage flow as per sentence 8.2.2.3.(1) of the OBC.

Tank Volume = 2 x 9900	=19 800 L

Therefore we will use a standard Boucher Precast Concrete Limited (or equivalent) 5000gal (22 500 L) concrete septic tank c/w Polylok PL122 or equivalent effluent filter. See details on plan.

4.0 SANITARY SEWER DESIGN (Continued...)

4.2 Tertiary Treatment Units

The Ottawa Septic System Office has included a requirement of tertiary treatment based on expected sewage characteristics of senior citizens. The proposed treatment unit is the EnviroSeptic Treatment System (BMEC 13-03-365).

The design parameters were provided by the EnviroSeptic product representative and attached in Appendix “M”. The proposed design parameters were reviewed and it is our professional opinion that they are suitable for the proposed site and design flow.

4.2 Area Bed Design

The area bed will be a sand layer with the EnviroSeptic pipes contained within it. The bed will have dimensions 17.38m X 9.45m and an total contact surface of 164.19 sq m.

4.2.1 Stone layer

The EnviroSeptic System does not have a stone later.

4.2.2 Extended Area (Base of the septic sand)

The proposed sand layer shall be 700mm thick and have an area not less than the greater of:

1-Area Bed (164.19 sq m);

Or

2-A=QT/850 = (9900)(6)/850 = 70 sq m

The minimum required size of the sand layer is therefore a matching area and footprint of the sand layer. (The percolation rate of the native soil "T=6" was obtained from the geotechnical report by Morey Assoc. Ltd. for this site, dated Sept. 2013, file # 013300).

4.3 Pumping Station

A pumping chamber is required for dosing purposes only. Mechanical Engineer and plumber to take note of proposed pipe invert at exterior side of foundation wall. Gravity drainage of basement fixtures or floor drains may not be possible and an internal sewage pit should be considered.

4.0 SANITARY SEWER DESIGN (Continued...)

4.3 Pumping Station (Continued...)

The EnviroSeptic system does not follow OBC requirements for dosing 75% of the volume of the distribution piping. We are proposing a demand dosing system designed to dose 1238L each cycle for approximately 8 cycles per day. We propose a dose rate of 1.25L/s for total dosing time in excess of 15 minutes in order to prevent dosing in excess of 75L/min, which is not suitable for this system.

The pump chamber is proposed to be constructed of 1.2m diameter concrete casing. With a cross sectional area of 1.131 sq m, the required working depth of the pump chamber will be 1.1m.

We are proposing a 0.1m elevation difference between the bottom of the chamber and the pump inlet, a 1.1m working depth, and a 0.16m buffer between high float and alarm float. We also propose the alarm float elevation to match the inlet elevation of 77.96. With a top of grate elevation of 78.54, we are therefore proposing a total pump chamber height of 1.93m.

With an inlet elevation of 76.76 and an outlet elevation of 78.18, the head on the pump will be 1.47m. With a flow of 1.25L/s (19.8PGM), a Meyer's SRM4 series pump is more than sufficient to be used as the dosing pump. When used in combination with EnviroSeptic, a dosing pump must be installed with a velocity reducer and differential venting.

4.4 Elevations of structures

The proposed area bed will outlet to the west at an elevation 77.65. The footer of the proposed bed will be set back from the outlet by approximately 3m. With a contact surface at a slope of 1%, the elevation of the contact surface at the footer will be 77.68m. Continuing at 1% up to the header, the elevation of the contact surface at the header (17.38m @ 1.0%) will be 77.85.Working up from there, we have the following table of elevations of structures for the septic system:

Structure	Inlet Elevation	Outlet Elevation	Underside Elevation of Structure	Top Elevation of Structure	F/G Elevation
BLDG	N/A	78.13	N/A	N/A	N/A
Tank	78.09	78.01	75.83	78.40	78.54
Pump	77.96	78.18	76.78	78.40	78.54
header	78.15	N/A	N/A	N/A	78.75
CS@header	N/A	N/A	77.85	N/A	N/A
footer	77.98	N/A	N/A	N/A	78.58
CS @footer	N/A	N/A	77.68	N/A	N/A

5.0 WATER CONNECTION DESIGN

5.1 Domestic water requirements

Based on the preliminary concept of having 12 units, 6 of which are to be 2 bedroom units and 6 of which are to be 1 bedroom units, and following the city of Ottawa design guidelines for water distribution, we have a design water demand as follows:

6 rooms at 2.1people per room for 12.6 people
6 rooms at 1.4 people per room for 8.4people

The predicted population of this building would therefore be 21people.

The guideline specifies a design flow of 350L/c/day. The total demand would therefore be 7350L/d, which translates to an average daily demand of 0.085L/s. Therefore:

ADD = 0.085L/s
MDD = 0.213L/s
MHD = 0.468L/s

5.2 Fire Flow Requirements

The required fire flow was calculated using the OBC method.

Q=KVS

-Combustible construction is assumed, therefore K=18

-Each floor is to have an area of approximately 598 sq m. Assuming a storey height of 3m, the building volume is therefore approximately 3600 cu m

-The location of the building is not within 12m of any other existing or proposed structure, therefore S = 1.

Q = (18)(3600)(1) = 64,800
Therefore, a fire flow of 45L/s is required.

5.3 Design Flow

The design flow shall be the greater of the Maximum Hourly Demand (MHD); or the combined Fire Flow plus Maximum Daily Demand. Given the scale of the required fire flow, the design flow will be the latter. Therefore:

Design Flow = 45L/s + 0.213L/s = 45.213L/s

5.0 WATER CONNECTION DESIGN (Continued...)

5.3 Design Flow (Continued...)

We are proposing a 200mm diameter private main with a 200x50x200 pre-manufactured tee servicing a private onsite fire hydrant. The branch to the building is proposed to be reduced to a 50mm service lateral between the tee and the building. Considering the flow in the building lateral will consist of the building's domestic demand only, it will be sized using the MDD alone.

5.4 Water Capacity Comments

The boundary conditions and HGL for hydraulic analysis for 5574 Rockdale Road were obtained from the city. See attached copy in Appendix "J".

From the boundary conditions, we noted that we have a minimum pressure check of 108.4 m and for the estimated water main elevation of 75.80 m, a maximum pressure estimate of 46.31 psi.

An HGL table was used to tabulate the characteristics of the private main and service (See appendix "J"), including friction and elevation losses and available pressure.

As per the table, the friction loss servicing this building is 1.79psi [46.31psi - 44.52 = 1.79psi]. There is also an approximately 0.25psi friction loss from water meter to furthest fixture, and a total elevation difference of 6.5m (21.3ft) from the water main to the shower head on the top floor. The head loss for elevation will be 9.23psi [21.3ft x 0.433 = 9.23psi], for a total pressure loss of 11.27psi to service this building. The available pressure at the furthest fixture will therefore be 35.04psi, which is adequate.

7.0 CITY OF OTTAWA DESIGN GUIDELINES

Based on the city of Ottawa design guidelines, we have completed the Development Servicing Study Checklist; please refer to Appendix "K" for checklist.

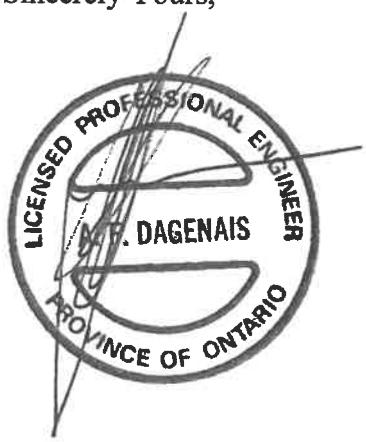
8.0 CONCLUSION

In our opinion, the proposed development project, including the design recommendations provided in this report and on the Site Development Drawings, meets the approval requirements for the applicable approval agencies as well as the 2003 MOE requirements.

The Geotechnical report is also part of this report. The project manager is to make it available to the contractors.

Should you have any questions, please do not hesitate to contact the undersigned.

Sincerely Yours,



Alain Dagenais, P.Eng.

APPENDIX "A"
Site Development Drawings

APPENDIX "B"
Tributary Areas

APPENDIX "C"
Surface Ponding

APPENDIX "D"
Storm Water Design Sheet

Storm Sewer Design Sheet - 5674 Rockdale Road, Vars
100 Year Storm - Interim

Location			Flow Data									Sewer Data					
	From	To	"A" Area Hard (ha)	"A" Area Soft (ha)	Area (ha) with infill value C= 0.50	Ind., 2.78*CA	Acc. 2.78*CA	Time of Conc.	Rainfall Int 1.	Peak Flow Q (L/S)	Accum.	Type of Pipe	Dia. (mm)	Slope (%)	Length (m)	Cap (full) (L/S)	Veloc @ fu M/s
Pre-development flow:																	
		Notes: Runoff coefficient "C" = 0.3															
(5 Year)	Affected Area		0.000	0.619		0.516	0.516	20	70.3	36.282	38.28						
(100 Year)	Proposed Swale Corridor		0.000	0.140		0.145	0.662	20	120.0	17.455	53.74						
(100 Year)	Unnaffected Area		0.000	1.020		1.063	1.725	20	120.0	127.556	181.29						
										Total	181.29						
Post-development flow: (100 year storm)		Notes: Runoff coefficient "C" = 0.95 for Hard surface & 0.375 for soft surface															
Affected Area	A1		0.090	0.273		0.523	0.523	10	179.0	93.68	93.68						
Affected Area	A2		0.003	0.018		0.028	0.551	10	179.0	4.93	98.60						
Affected Area	A3		0.024	0.018		0.082	0.633	10	179.0	14.70	113.30						
Affected Area	A4		0.085	0.010		0.234	0.867	10	179.0	41.899	155.20						
Affected Area	A5		0.022	0.000		0.057	0.924	10	179.0	10.228	165.43						
Affected Area	A6		0.027	0.036		0.108	1.032	10	179.0	19.311	184.74						
Anticipated A6 Equivalent			0.000	0.000		0.000	1.032	10	179.0	0.000	184.74						
									Reduce to		33.07						
Affected Area	A7		0.000	0.019		0.014	0.014	10	179.0	2.45	2.45						
Unaffected	A8		0.000	0.140		0.145	0.139	20	120.0	17.45	19.91						
Unaffected	A9		0.000	1.020		1.063	1.222	20	120.0	127.56	147.46						
Total Post Development Flow											180.53						

Storm Sewer Design Sheet - 5574 Rockdale Road, Vars

100 Year Storm - Post Phase 2

	Location		Flow Data									Sewer Data					
	From	To	"A" Area Hard (ha)	"A" Area Soft (ha)	Area (ha) with infill value C= 0.50	Ind.. 2.78*CA	Acc. 2.78*CA	Time of Conc.	Rainfall Int 1.	Peak Flow Q (L/S)	Accum.	Type of Pipe	Dia. (mm)	Slope (%)	Length (m)	Cap (full) (L/S)	Veloc @ fu M/s
Pre-development flow:																	
		Notes: Runoff coefficient "C" = 0.3															
(5 Year)	Affected Area		0.000	0.619		0.516	0.516	20	70.3	36.282	38.28						
(100 Year)	Proposed Swale Corridor		0.000	0.140		0.145	0.662	20	120.0	17.455	53.74						
(100 Year)	Unnaffected Area		0.000	1.020		1.063	1.725	20	120.0	127.556	181.29						
										Total	181.29						
Post-development flow: (100 year storm)		Notes: Runoff coefficient "C" = 0.95 for Hard surface & 0.375 for soft surface															
Affected Area	A1		0.090	0.269		0.518	0.518	10	179.0	92.73	92.73						
Affected Area	A2		0.003	0.018		0.028	0.546	10	179.0	4.93	97.66						
Affected Area	A3		0.024	0.018		0.082	0.628	10	179.0	14.70	112.36						
Affected Area	A4		0.085	0.010		0.234	0.862	10	179.0	41.899	154.26						
Affected Area	A5		0.026	0.000		0.070	0.932	10	179.0	12.501	166.76						
Affected Area	A6		0.027	0.036		0.108	1.039	10	179.0	19.311	186.07						
Anticipated A6 Equivalent			0.030	0.035		0.116	1.155	10	179.0	20.753	206.82						
									Reduce to		33.07						
Affected Area	A7		0.000	0.013		0.014	0.014	10	179.0	2.45	2.45						
Unaffected	A8		0.000	0.140		0.145	0.159	20	120.0	17.45	19.91						
Unaffected	A9		0.000	1.020		1.063	1.222	20	120.0	127.56	147.48						
Total Post Development Flow											180.53						

Storm Sewer Design Sheet - 5574 Rockdale Road, Vars

5 Year Storm - Interim

Location			Flow Data									Sewer Data					
	From	To	"A" Area Hard (ha)	"A" Area Soft (ha)	Area (ha) with infill value C= 0.50	Ind. 2.78*CA	Acc. 2.78*CA	Time of Conc.	Rainfall Int I.	Peak Flow Q (L/S)	Accum.	Type of Pipe	Dia. (mm)	Slope (%)	Length (m)	Cap (full) (L/S)	Veloc @ full M/s
Pre-development flow: (5 year storm)																	
		Notes: Runoff coefficient "C" = 0.3															
(5 Year)	Affected Area		0.000	0.619		0.516	0.516	20	70.3	36.282	36.28						
(5 Year)	Proposed Swale Corridor		0.000	0.140		0.116	0.632	20	70.3	8.180	44.46						
(5 Year)	Unaffected Area		0.000	1.020		0.850	1.483	20	70.3	59.781	104.24						
										Total	104.24						
Post-development flow: (100 year storm)		Notes: Runoff coefficient "C" = 0.9 for Hard surface & 0.3 for soft surface															
Affected Area	A1		0.090	0.273		0.454	0.454	10	104.4	47.38	47.38						
Affected Area	A2		0.003	0.018		0.023	0.477	10	104.4	2.43	49.81						
Affected Area	A3		0.024	0.018		0.075	0.552	10	104.4	7.83	57.64						
Affected Area	A4		0.085	0.010		0.220	0.772	10	104.4	22.98	80.63						
Affected Area	A5		0.022	0.000		0.054	0.826	10	104.4	5.65	86.28						
Affected Area	A6		0.027	0.036		0.097	0.923	10	104.4	10.10	96.38						
Anticipated A6 Equivalent			0.000	0.000		0.000	0.923	10	104.4	0.00	96.38						
			0.000	0.000					Reduce to		33.07						
Unaffected	A7		0.000	0.013		0.011	0.011	10	104.4	1.15	1.15						
Affected Area	A8		0.000	0.140		0.116	0.127	20	70.3	8.18	9.33						
Unaffected	A9		0.000	1.020		0.850	0.978	20	70.3	59.78	69.11						
Total Post Development Flow											102.18						

Storm Sewer Design Sheet - 5574 Rockdale Road, Vars

5 Year Storm - Post Phase 2

	Location		Flow Data									Sewer Data					
	From	To	"A" Area Hard (ha)	"A" Area Soft (ha)	Area (ha) with infill value C= 0.50	Ind., 2.78*CA	Acc. 2.78*CA	Time of Conc.	Rainfall Int I.	Peak Flow Q (L/S)	Accum.	Type of Pipe	Dia. (mm)	Slope (%)	Length (m)	Cap (full) (L/S)	Veloc @ full M/s
Pre-development flow: (5 year storm)																	
		Notes: Runoff coefficient "C" = 0.3															
(5 Year)	Affected Area		0.000	0.619		0.516	0.516	20	70.3	36.282	38.28						
(5 Year)	Proposed Swale Corridor		0.000	0.140		0.116	0.632	20	70.3	8.180	44.46						
(5 Year)	Unaffected Area		0.000	1.020		0.850	1.483	20	70.3	59.781	104.24						
										Total	104.24						
Post-development flow: (100 year storm)		Notes: Runoff coefficient "C" = 0.9 for Hard surface & 0.3 for soft surface															
Affected Area	A1		0.090	0.269		0.450	0.450	10	104.4	46.93	46.93						
Affected Area	A2		0.005	0.018		0.023	0.473	10	104.4	2.43	49.36						
Affected Area	A3		0.024	0.018		0.075	0.548	10	104.4	7.85	57.20						
Affected Area	A4		0.085	0.010		0.220	0.768	10	104.4	22.98	80.18						
Affected Area	A5		0.026	0.000		0.066	0.834	10	104.4	6.91	87.09						
Affected Area	A6		0.027	0.036		0.097	0.931	10	104.4	10.10	97.19						
Anticipated A6 Equivalent			0.030	0.035		0.104	1.035	10	104.4	10.91	108.09						
										Reduce to	33.07						
Unaffected	A7		0.000	0.013		0.011	0.011	10	104.4	1.15	1.15						
Affected Area	A8		0.000	0.140		0.116	0.127	20	70.3	8.18	9.33						
Unaffected	A9		0.000	1.020		0.850	0.978	20	70.3	59.78	69.11						
Total Post Development Flow											102.18						

APPENDIX "E"
Hydrograph Tables

Hydrograph Table # 1

Ponding Calculations for the Swale (Phase 1)

Hydrograph for a 5 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=0.923I (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	140	129.22	33.07	96.15		28845.000
10	104.4	96.3612	33.07	63.2912		37974.720
15	85.6	79.0088	33.07	45.9388		41344.920
20	72	66.456	33.07	33.386		40063.200
30	53.9	49.7497	33.07	16.6797		30023.460
40	45	41.535	33.07	8.465		20316.000
50	38.5	35.5355	33.07	2.4655		7396.500
60	32	29.536	33.07	-3.534		N/A
120	18.9	17.4447	33.07	N/A		N/A
360	8.4	7.7532	33.07	N/A		N/A
720	4.8	4.4304	33.07	N/A		N/A
1440	2.6	2.3998	33.07	N/A		N/A

Ponding Calculations for the Swale (Phase 1)

Hydrograph for a 100 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=1.032I (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	242.6	250.3632	33.07	217.2932		65187.960
10	179	184.728	33.07	151.658		90994.800
15	146.8	151.4976	33.07	118.4276		106584.840
30	91.9	94.8408	33.07	61.7708		111187.440
40	76	78.432	33.07	45.362		108868.800
50	65	67.08	33.07	34.01		102030.000
60	53.2	54.9024	33.07	21.8324		78596.640
120	31.5	32.508	33.07	-0.562		N/A
360	14.5	14.964	33.07	N/A		N/A
720	8	8.256	33.07	N/A		N/A
1440	4.3	4.4376	33.07	N/A		N/A

Hydrograph Table # 2

Ponding Calculations for the Pit

Hydrograph for a 5 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=0.066i (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)	Ponding (L)
5	140	9.24	0	9.24	2772.000
10	104.4	6.8904	0	6.8904	4134.240
15	85.6	5.6496	0	5.6496	5084.640
20	72	4.752	0	4.752	5702.400
30	53.9	3.5574	0	3.5574	6403.320
40	45	2.97	0	2.97	7128.000
50	38.5	2.541	0	2.541	7623.000
60	32	2.112	0	2.112	7603.200
120	18.9	1.2474	0	1.2474	8981.280
360	8.4	0.5544	0	0.5544	11975.040
720	4.8	0.3168	0	0.3168	13685.760
1440	2.6	0.1716	0	N/A	N/A

Ponding Calculations for the Pit

Hydrograph for a 100 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=0.071 (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)	Ponding (L)
5	242.6	16.982	0	16.982	5094.600
10	179	12.53	0	12.53	7518.000
15	146.8	10.276	0	10.276	9248.400
30	91.9	6.433	0	6.433	11579.400
40	76	5.32	0	5.32	12768.000
60	53.2	3.724	0	3.724	13406.400
75	47.26	3.3082	0	3.3082	14886.900
120	31.5	2.205	0	2.205	15876.000
360	14.5	1.015	0	1.015	21924.000
720	8	0.56	0	0.56	24192.000
1440	4.3	0.301	0	N/A	N/A

Hydrograph Table # 3

Ponding Calculations for the Swale (Phase 2)

Hydrograph for a 5 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=1.035i (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	140	144.9	33.07	111.83		33549.000
10	104.4	108.054	33.07	74.984		44990.400
15	85.6	88.596	33.07	55.526		49973.400
20	72	74.52	33.07	41.45		49740.000
30	53.9	55.7865	33.07	22.7165		40889.700
40	45	46.575	33.07	13.505		32412.000
50	38.5	39.8475	33.07	6.7775		20332.500
60	32	33.12	33.07	0.05		180.000
120	18.9	19.5615	33.07	-13.5085		N/A
360	8.4	8.694	33.07	N/A		N/A
720	4.8	4.968	33.07	N/A		N/A
1440	2.6	2.691	33.07	N/A		N/A

Ponding Calculations for the Swale (Phase 2)

Hydrograph for a 100 year storm

Time (min.)	Intensity (I) (mm/hr)	Q=1.155i (L/s)	Restriction (L/s)	Net Flow accumulation (L/s)		Ponding (L)
5	242.6	280.203	33.07	247.133		74139.900
10	179	206.745	33.07	173.675		104205.000
15	146.8	169.554	33.07	136.484		122835.600
30	91.9	106.1445	33.07	73.0745		131534.100
40	76	87.78	33.07	54.71		131304.000
50	65	75.075	33.07	42.005		126015.000
60	53.2	61.446	33.07	28.376		102153.600
120	31.5	36.3825	33.07	3.3125		23850.000
360	14.5	16.7475	33.07	-16.3225		N/A
720	8	9.24	33.07	N/A		N/A
1440	4.3	4.9665	33.07	N/A		N/A

APPENDIX "F"
Intensity Duration Curves

5.4.2 IDF Curves and Equations

An IDF (Intensity Duration Frequency) curve is a statistical description of the expected rainfall intensity for a given duration and storm frequency. In Ottawa, the IDF curve is derived from Meteorological Services of Canada (MSC) rainfall data taken from the Macdonald-Cartier airport. Rainfall collected from 1967 to 1997 was analyzed using the Gumbel Distribution. The following Table 5.1 shows the analysis results provided by MSC. The IDF equations have been derived on the basis of a regression equation of the form:

$$Intensity = \left[\frac{A}{(Td + C)^B} \right]$$

where:

Intensity = mm/hr

Td = time of duration (min)

A,B,C = regression constants for each return period

Table 5.1 Ottawa IDF Table: 1967 to 1997

Time (min)	2 year (mm/hr)	5 year (mm/hr)	10 year (mm/hr)	25 year (mm/hr)	50 year (mm/hr)	100 year (mm/hr)
5	102.80	140.20	165.00	196.00	219.00	242.60
10	77.10	104.40	122.50	145.30	162.20	179.00
15	63.30	85.60	100.40	119.10	133.00	146.80
30	39.90	53.90	63.10	74.70	83.40	91.90
60	24.20	32.00	37.10	43.60	48.50	53.20
120	14.30	18.90	22.00	25.80	28.70	31.50
360	6.20	8.40	9.90	11.70	13.10	14.50
720	3.60	4.80	5.60	6.60	7.30	8.00
1440	2.00	2.60	3.00	3.50	3.90	4.30

IDF curve equations (Intensity in mm/hr)

100 year Intensity	$= 1735.688 / (\text{Time in min} + 6.014)^{0.820}$
50 year Intensity	$= 1569.580 / (\text{Time in min} + 6.014)^{0.820}$
25 year Intensity	$= 1402.884 / (\text{Time in min} + 6.018)^{0.819}$
10 year Intensity	$= 1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity	$= 998.071 / (\text{Time in min} + 6.053)^{0.814}$
2 year Intensity	$= 732.951 / (\text{Time in min} + 6.199)^{0.810}$

The IDF curves based on the above equations can be found in Appendix 5-A

5.4.3 Design Storms

Computer modeling requires the input of a design storm. The design storm is then used to generate a runoff hydrograph to determine how an area will respond and perform. Numerous types of design storms can be used ranging from historical storms to IDF curve-derived storms. This section briefly discusses the various types of design storms.

5.4.3.1 Application to Hydrologic Models

The design storms presented herein are meant to be used in hydrologic models to simulate runoff from events of various return frequencies. When choosing a design storm, the designer should perform a sensitivity analysis using various storms and use the one that is most conservative.

As noted below, the Chicago distribution is one of the most used storms for urban runoff applications. When dealing with rural areas, the SCS Type II storm is preferred. The AES storm can also be used for urban applications; however, care must be taken when choosing the type of distribution. As a rule of thumb, the 30% distribution should be used unless historical data proves otherwise.

When using a design storm, the designer must be careful in choosing the right storm time step. The storm's duration should be greater than twice the basin's time of concentration. A time step that is too small may overestimate peak flows. Should it be required to maintain a storm time step less than 10 minutes, consideration should be given to averaging the peak intensities to a 10-minute or greater average.

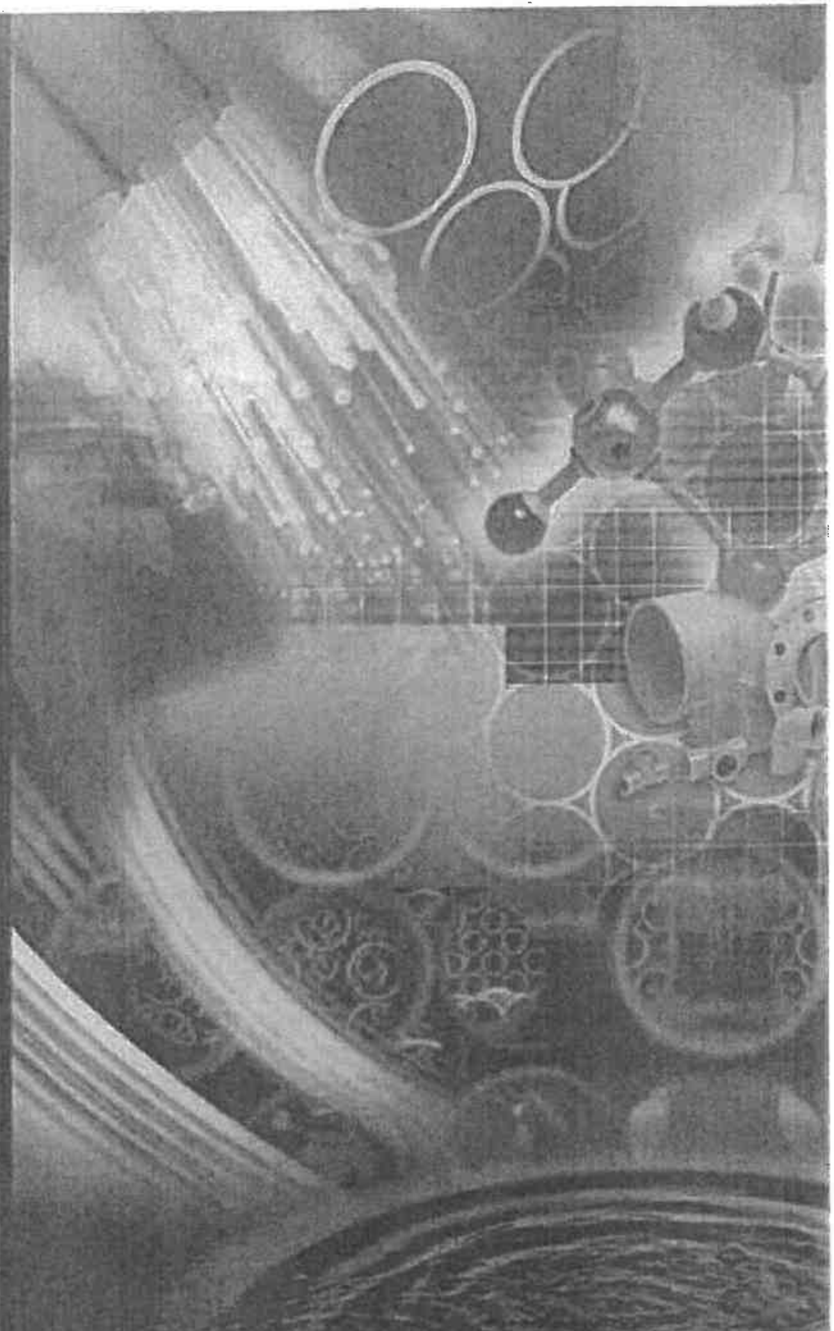
Some historical storms are also presented below and are to be used as a check of how various systems function during extreme events. It is not the intent of these guidelines to require that these storms be used for design purposes.

5.4.3.2 Chicago Design Storm

The Chicago storm distribution was developed by C.J. Keifer and H. Chu and is based on 25 years of rainfall record in the city of Chicago. This storm distribution, which is derived with IDF curves, is generally applied to urban basins where peak runoff rates are largely influenced by peak rainfall intensities.

APPENDIX "G"
ICD Data table
& STC Design Brief

Volume III: TEMPEST™ INLET CONTROL DEVICES



Municipal Technical Manual Series

SECOND EDITION

LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

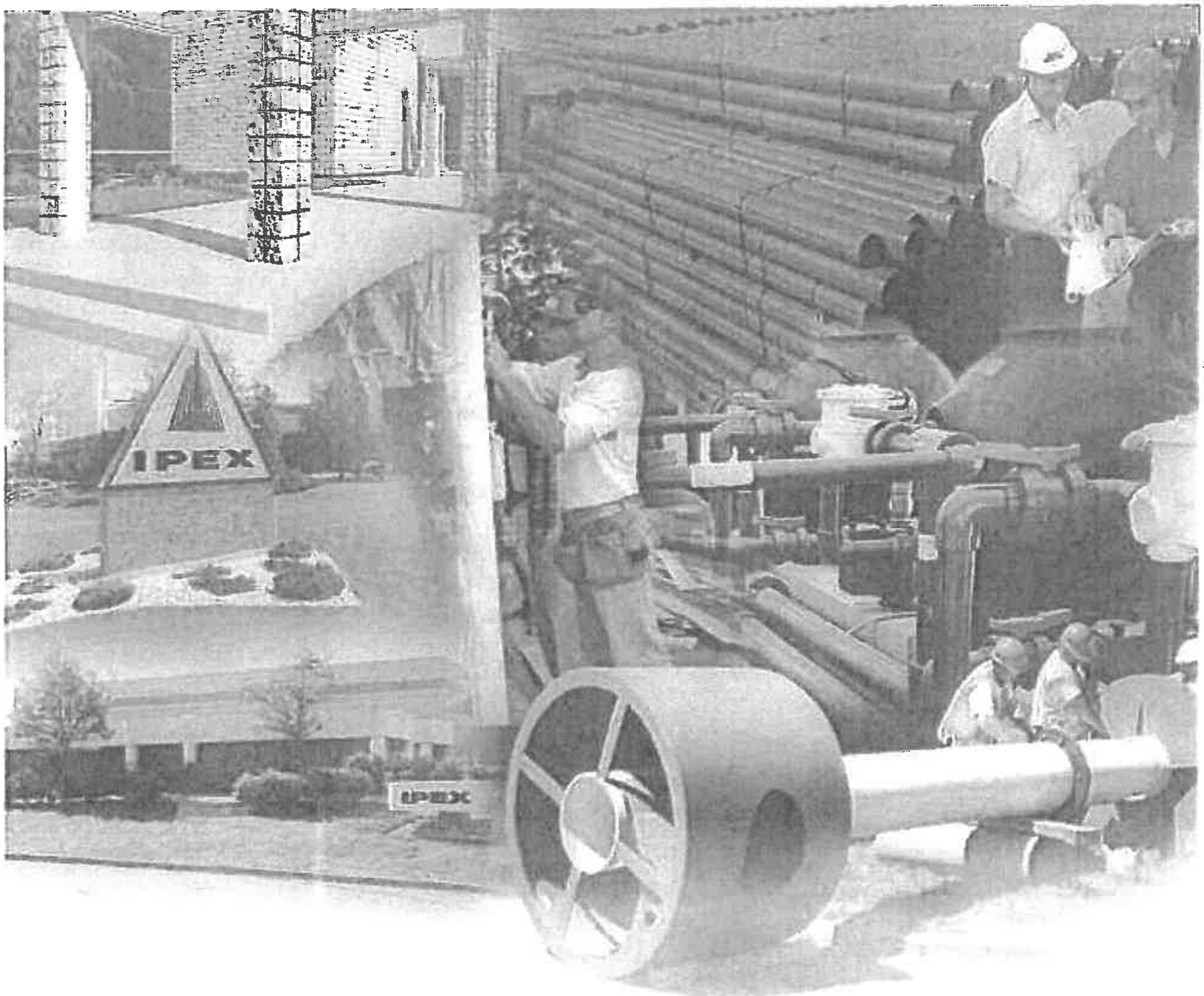
MHF (Medium to High Flow) ICD

IPEX

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition



About IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations throughout North America. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.

CONTENTS

TEMPEST INLET CONTROL DEVICES Technical Manual

About IPEX

NOTE: Do not use or test the [illegible] in this manual with compressed [illegible] or other gases including air-over-water-boosters

PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

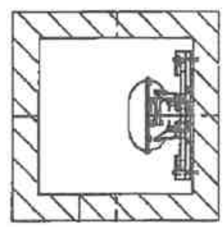
Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

Product Applications

Will accommodate both square and round applications:

Square Application

Universal Mounting Plate

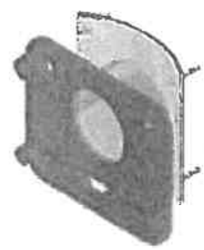


Round Application

+

Spigot CB Wall Plate

=



Universal Mounting Plate Hub Adapter

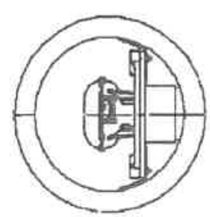


Chart 1: LMF 14 Preset Flow Curves

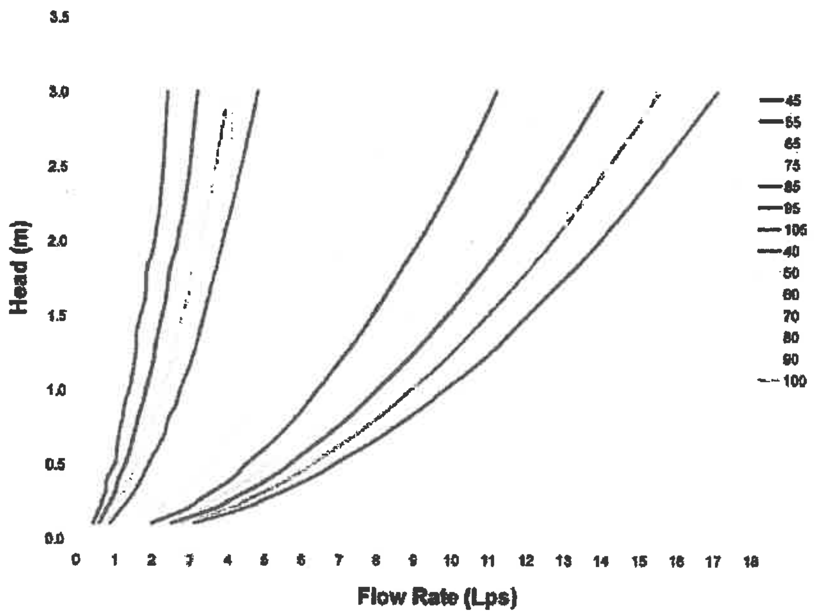
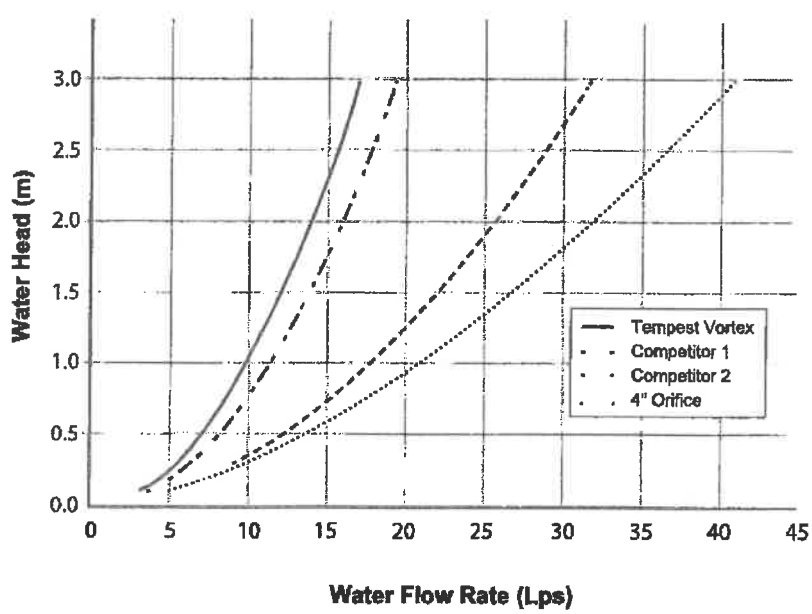


Chart 2: LMF Flow vs. ICD Alternatives



NOTE: Do not or test the products in manual with other gases including air-over-water-boosters

TEMPEST LMF ICD

PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD Into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

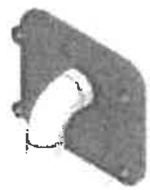
PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

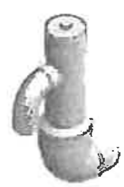
Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function



TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.



TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.

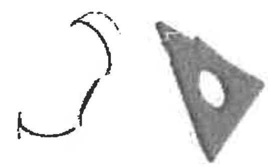
TEMPEST MHF (Medium to High Flow): The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

Product Applications

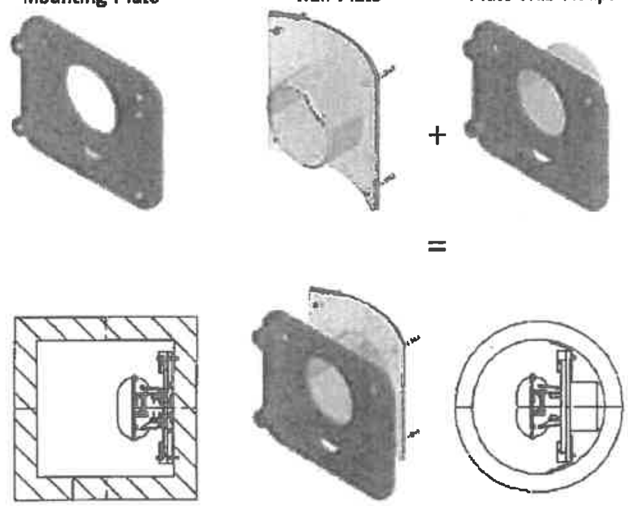
The HF and MHF ICD's are available to accommodate both square and round applications:



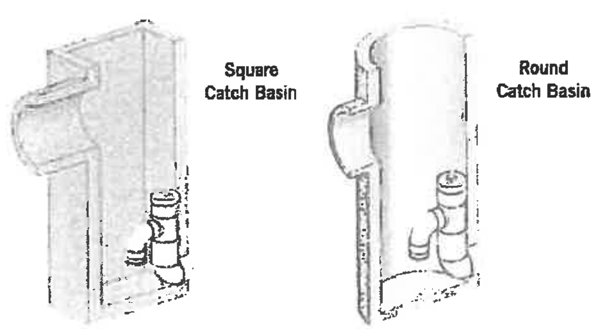
HF ICD MHF ICD

Square Application **Round Application**

Universal Mounting Plate | Spigot CB Wall Plate | Universal Mounting Plate Hub Adapter

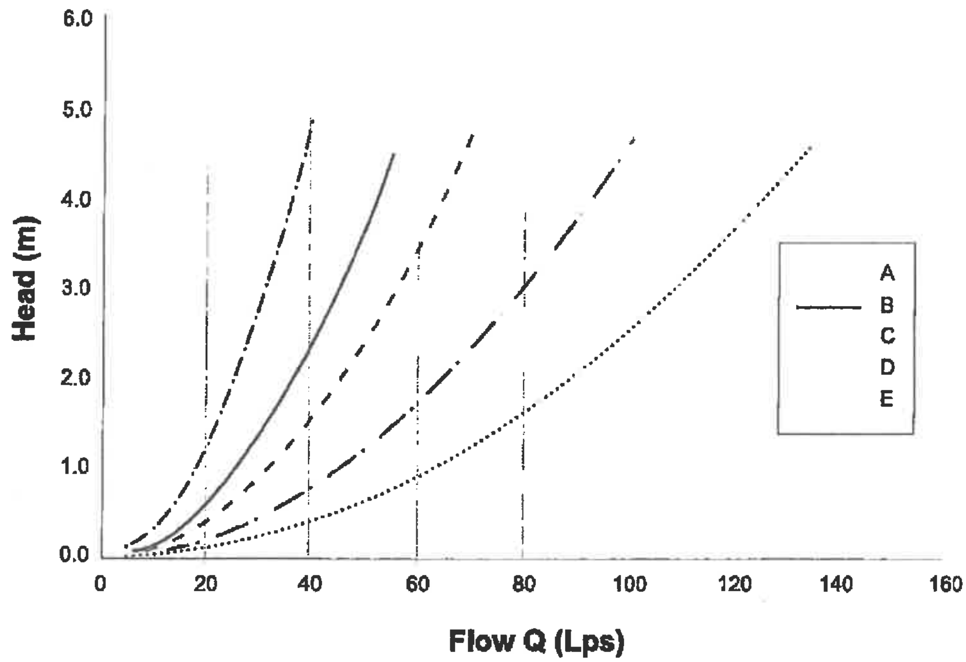


The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:



NOTE: Do not use or test the products in manual with compressed or other gases air-over-water-boosters

Chart 3: HF & MHF Preset Flow Curves



NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

TEMPEST HF & MHF ICD

PRODUCT INSTALLATION

Instructions to assemble a TEMPEST HF or MHF ICD into a Square Catch Basin:

1. Materials and tooling verification:
   - Tooling: Impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal wall mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal wall mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF or MHF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the round catch basin spigot adaptor to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the spigot CB wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot CB wall plate and the catch basin wall.
6. Put solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

PRODUCT TECHNICAL SPECIFICATION

Instructions to assemble a TEMPEST HF Sump into a Square or Round Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, mastic tape and metal strapping
   - Material: (2) concrete anchor 3/8 x 3-1/2, (2) washers, (2) nuts, HF Sump pieces (2).
2. Apply solvent cement to the spigot end of the top half of the sump. Apply solvent cement to the hub of the bottom half of the sump. Insert the spigot of the top half of the sump into the hub of the bottom half of the sump.
3. Install the 8" spigot of the device into the outlet pipe. Use the mastic tape to seal the device spigot into the outlet pipe. You should use a level to be sure that the fitting is standing at the vertical.
4. Use an impact drill with a 3/8" concrete bit to make a series of 2 holes along each side of the body throat. The depth of the hole should be between 1-1/2" to 2-1/2". Clean the concrete dust from the 2 holes.
5. Install the anchors (2) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you hit the anchors. Remove the nuts from the ends of the anchors.
6. Cut the metal strapping to length and connect each end of the strapping to the anchors. Screw the nuts in place with a maximum torque of 40 N.m (30 lbf-ft). The device should be completely flush with the catch basin wall.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook shall be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above shall not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices shall consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

SALES AND CUSTOMER SERVICE

Canadian Customers call IPEX Inc.
Toll free: (866) 473-9462
www.ipexinc.com

U.S. Customers call IPEX USA LLC
Toll free: (800) 463-9572
www.ipexamerica.com

About the IPEX Group of Companies

As leading suppliers of thermoplastic piping systems, the IPEX Group of Companies provides our customers with some of the largest and most comprehensive product lines. All IPEX products are backed by more than 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, we have established a reputation for product innovation, quality, end-user focus and performance.

Markets served by IPEX group products are:

- Electrical systems
- Telecommunications and utility piping systems
- PVC, CPVC, PP, ABS, PEX, FR-PVDF and PE pipe and fittings (1/4" to 48")
- Industrial process piping systems
- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial, plumbing and electrical cements
- Irrigation systems

Products manufactured by IPEX Inc. and distributed in the United States by IPEX USA LLC.

[illegible]

IPEX

Stormceptor®

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	23/07/2015
Project Name	12 Unit Residential
Project Number	013-286
Location	Vars

Designer Information

Company	A. Dagenais
Contact	Michael

Notes

N/A

Drainage Area

Total Area (ha)	0.61
Imperviousness (%)	41

The Stormceptor System model STC 300 achieves the water quality objective removing 85% TSS for a Fine (organics, silts and sand) particle size distribution and 99% runoff volume.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	80
Runoff Volume (%)	95

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0.000	00.000
0.013	33.070

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %	Runoff Volume %
STC 300	85	99
STC 750	89	100
STC 1000	90	100
STC 1500	90	100
STC 2000	92	100
STC 3000	93	100
STC 4000	94	100
STC 5000	94	100
STC 6000	96	100
STC 9000	97	100
STC 10000	97	100
STC 14000	98	100

Stormceptor®

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

APPENDIX "H"
Ontario Building Code

Part 8

Sewage Systems

Part 8

Sewage Systems

Section 8.1. General

8.1.1. Scope

8.1.1.1. Scope

(1) The scope of this Part shall be as described in Subsection 1.1.2. of Division A.

8.1.1.2. Definitions

(1) In this Part,

Soil means in-situ, naturally occurring, unconsolidated mineral or organic material, at the earth's surface that is at least 100 mm thick and capable of supporting plant growth, and includes material compacted or cemented by soil forming processes, but does not include displaced materials such as gravel dumps, mine spoils, or like deposits.

8.1.2. Application

8.1.2.1. Classification of Systems

(1) All *sewage systems* shall be classed as one of the following:
(a) Class 1 — a chemical toilet, an incinerating toilet, a recirculating toilet, a self-contained portable toilet and all forms of privy including a *portable privy*, an *earth pit privy*, a *pail privy*, a *privy vault* and a composting toilet system,
(b) Class 2 — a *greywater* system,
(c) Class 3 — a cesspool,
(d) Class 4 — a *leaching bed* system, or
(e) Class 5 — a system that requires or uses a *holding tank* for the retention of *hauled sewage* at the site where it is produced prior to its collection by a *hauled sewage system*.

8.1.2.2. Operation and Maintenance

(1) Operation and maintenance of *sewage systems* shall comply with Section 8.9.

8.1.3. Limitations

8.1.3.1. Discharge

(1) Except as provided in Sentences (2) to (6), the *sewage system* shall be designed and *constructed* to receive only *sanitary sewage* of domestic origin. (See Appendix A.)

(2) Where laundry waste is not more than 20% of the total daily design *sanitary sewage* flow, it may discharge to a *sewage system*.

(3) Where industrial process waste water is treated to the contaminant levels found in domestic *sanitary sewage*, it may discharge to a *leaching bed* provided the *treatment unit* and *sewage system* are designed in accordance with good engineering practice. (See Appendix A.)

(4) Where kitchen waste water from a restaurant has passed through an operating grease *interceptor*, it may discharge to a *leaching bed* provided the *sewage system* has been designed in accordance with good engineering practice.

(5) Waste water from a kitchen equipped with a garbage grinder may be directed to the *sewage system* provided the system has been designed to accept such waste water.

(6) Water softener and iron filter discharge may be directed to the *sewage system* provided the system has been designed to accept such discharges.

(7) *Storm sewage* shall not be discharged into a *sewage system*.

(8) The *interceptor* required in Sentence (4) shall,
(a) have a minimum flow rate as required by Sentence 7.4.4.3.(8) using a 60 second drain down time, and
(b) conform to,
r5 (i) CSA B481.1, "Testing and Rating of Grease Interceptors Using Lard", or
r5 (ii) CSA B481.2, "Testing and Rating of Grease Interceptors Using Oil".

Section 8.2. Design Standards

8.2.1. General Requirements

8.2.1.1. Scope

(1) This Subsection applies to the design of *sewage systems*.

8.2.1.2. Site Evaluation

(1) A site evaluation shall be conducted on every site where a new or replacement *sewage system* is to be installed. (See Appendix A.)

(2) The *percolation time* shall be determined by,
(a) conducting percolation tests, or
(b) classifying the *soil* according to one of the following methods,
(i) the Unified Soil Classification System as described in MMAH Supplementary Standard SB-6, "Percolation Time and Soil Descriptions", or
(ii) the Soil Texture Classification as described in Chapter 3 of USDA, "Soil Survey Manual".
(See Appendix A.)

(3) Where the *percolation time* is determined by a percolation test, there shall be a minimum of 3 locations selected, suitably spaced to accurately evaluate the *leaching bed* area, with the highest *percolation time* of the tests being used. (See Appendix A.)

8.2.1.3. Sewage System Design Flows

(1) For *residential occupancies*, the total daily design *sanitary sewage* flow shall be at least the value in Column 2 as determined from Table 8.2.1.3.A. (See Appendix A.)

(2) For all other *occupancies*, the total daily design *sanitary sewage* flow shall be at least the value in Column 2 as determined from Table 8.2.1.3.B. (See Appendix A.)

(3) Where a *building* contains more than one establishment, the total daily design *sanitary sewage* flow shall be the sum of the total daily design *sanitary sewage* flow for each establishment.

(4) Where an *occupancy* is not listed in Table 8.2.1.3.B., the highest of metered flow data from at least 3 similar establishments shall be acceptable for determining the total daily design *sanitary sewage* flow.

Table 8.2.1.3.A.
Residential Occupancy
Forming Part of Sentence 8.2.1.3.(1)

Residential Occupancy	Volume, litres
Apartments, Condominiums, Other Multi-family Dwellings - per person(1)	275
Boarding Houses	
(a) Per person,	
(i) with meals and laundry facilities, or,	200
(ii) without meal or laundry facilities, and	150
(b) Per non-resident staff per 8 hour shift	40
Boarding School - per person	300
Dwellings	
(a) 1 bedroom dwelling	750
(b) 2 bedroom dwelling	1 100
(c) 3 bedroom dwelling	1 600
(d) 4 bedroom dwelling	2 000
(e) 5 bedroom dwelling	2 500
(f) Additional flow for(2)	
(i) each bedroom over 5,	500
(ii) (A) each 10 m^2 (or part of it) over 200 m^2 up to 400 m^2 (3),	100
(B) each 10 m^2 (or part of it) over 400 m^2 up to 600 m^2 (3), and	75
(C) each 10 m^2 (or part of it) over 600 m^2 (3), or	50
(iii) each fixture unit over 20 fixture units	50
Hotels and Motels (excluding bars and restaurants)	
(a) Regular, per room	250
(b) Resort hotel, cottage, per person	500
(c) Self service laundry, add per machine	2 500
Work Camp/Construction Camp, semi-permanent per worker	250
Column 1	2

Notes to Table 8.2.1.3.A.:

(1) The *occupant load* shall be calculated using Subsection 3.1.17.
(2) Where multiple calculations of *sanitary sewage* volume is permitted, the calculation resulting in the highest flow shall be used in determining the design daily *sanitary sewage* flow.
(3) Total finished area, excluding the area of the finished *basement*.

Table 8.2.1.3.B.
Other Occupancies
Forming Part of Sentence 8.2.1.3.(2)

Establishments[1]	Volume, litres
Airports, Bus Terminals, Train Stations, Dock/Port Facilities (Food Services excluded)	
(a) Per passenger, and	20
(b) Per employee per 8 hour shift	40
Assembly Hall - per seat	
(a) No food service, or	8
(b) Food service provided	36
Barber Shop/Beauty Salon - per service chair	650
Bowling Alleys (Food Service not included) - per lane	400
Churches and Similar Places of Worship - per seat	
(a) No kitchen facilities, or	8
(b) Kitchen facilities provided	36
Country Club (excluding Food Service)	
(a) Per resident,	375
(b) Per employee per 8 hour shift, and	50
(c) Per member or patron	40
Day Care Facility per person (staff and children)	75
Dentist Office	
(a) Per wet service chair, and	275
(b) Per dry service chair	190
Doctors Office	
(a) Per practitioner, and	275
(b) Per employee per 8 hour shift	75
Factory (excluding process or cleaning waters) - per employee per 8 hour shift	
(a) No showers, or	75
(b) Including showers	125
Flea Markets[2] (open not more than 3 days per week)	
(a) Per non-food service vendor space,	60
(b) Per food service establishment / 9.25 m² of floor space, and	190
(c) Per limited food service outlet	95
Food Service Operations	
(a) Restaurant (not 24 hour), per seat	125
(b) Restaurant (24 hour), per seat	200
(c) Restaurant on controlled-access highway, per seat	400
(d) Paper service restaurant, per seat	60
(e) Donut shop, per seat	400
(f) Bar and cocktail lounge, per seat	125
(g) Drive-in restaurant per parking space	60
(h) Take-out restaurant (no seating area)	
(i) per 9.25 m² of floor area, and	190
(ii) per employee per 8 hour shift	75
Column 1	2

Table 8.2.1.3.B. (Cont'd)
Other Occupancies
Forming Part of Sentence 8.2.1.3.(2)

Establishments(1)	Volume, litres
(i) Cafeteria - per meal	12
(j) Food outlet	
(i) excluding delicatessen, bakery and meat department, per 9.25 m^2 of floor space,	40
(ii) per 9.25 m^2 of delicatessen floor space,	190
(iii) per 9.25 m^2 of bakery floor space,	190
(iv) per 9.25 m^2 of meat department floor space, and	380
(v) per water closet	950
Hospitals - per bed	
(a) Including laundry facilities, or	750
(b) Excluding laundry facilities	550
Long-Term Care Homes, etc. - per bed	450
Office Building(3)	
(a) Per employee per 8 hour shift, or	75
(b) Per each 9.3 m^2 of floor space	75
Public Parks	
(a) With toilets only per person, or	20
(b) With bathhouse, showers, and toilets per person	50
Recreational Vehicle or Campground Park	
(a) Per site without water or sewer hook-up, or	275
(b) Per site with water and sewer hook-up	425
Schools - per student	
(a) Day school,	30
(b) With showers,	30
(c) With cafeteria, and	30
(d) Per non-teaching employee per 8 hour shift	50
Service Stations (no vehicle washing)(3)	
(a) Per water closet, and	950
(i) per fuel outlet(4), or	560
(ii) per vehicle served	20
Shopping Centre (excluding food and laundry) - per 1.0 m^2 of floor space	5
Stadiums, Race Tracks, Ball Parks - per seat	20
Stores(3)	
(a) Per 1.0 m^2 of floor area, or	5
(b) Per water closet	1 230
Swimming and Bathing Facilities (Public) - per person	40
r3 *Theatres*	
(a) Indoor, auditoriums per seat,	20
(b) Outdoor, drive-ins per space, or	40
(c) Movie theatres per seat	15
Column 1	2

Table 8.2.1.3.B. (Cont'd)
Other Occupancies
Forming Part of Sentence 8.2.1.3.(2)

Establishments[1]	Volume, litres
Veterinary Clinics	
(a) Per practitioner,	275
(b) Per employee per 8 hour shift, and	75
(c) Per stall, kennel or cage if floor drain connected	75
Warehouse	
(a) Per water closet, and	950
(b) Per loading bay	150
Column 1	2

Notes to Table 8.2.1.3.B.:

(1) The *occupant load* shall be calculated using Subsection 3.1.17.
(2) Flea markets open more than 3 days per week shall be assessed using the volumes stated under the heading "Stores".
(3) Where multiple calculations of *sanitary sewage* volume is permitted, the calculation resulting in the highest flow shall be used in determining the design daily *sanitary sewage* flow.
(4) The number of fuel outlets is considered the maximum number of fuel nozzles that could be in use at the same time.

8.2.1.4. Clearances (See Appendix A.)

(1) Unless it can be shown to be unnecessary, where the *percolation time* is 10 minutes or greater, the location of all components within a *sewage system* shall be in conformance with the clearances listed in Article 8.2.1.5. or 8.2.1.6.

(2) Unless it can be shown to be unnecessary, where the *percolation time* is less than 10 minutes, the clearances listed in Articles 8.2.1.5. and 8.2.1.6. for wells, lakes, ponds, reservoirs, rivers, springs or streams shall be increased to compensate for the lower *percolation time*.

(3) No *building* shall be *constructed* closer to any part of a *sewage system* than the clearances listed in Article 8.2.1.5. or 8.2.1.6.

(4) If more than one *sewage system* is located on a lot or parcel of land, there shall be no overlap of any part of the systems.

8.2.1.5. Clearance Distances for Class 1, 2 and 3 Sewage Systems

(1) Except as provided in Sentences 8.2.1.4.(1) and (2), no Class 1, 2 or 3 *sewage system* shall have a horizontal distance of less than that permitted by Table 8.2.1.5.

Table 8.2.1.5.
Clearance Distances for Class 1, 2 and 3 Sewage Systems
Forming Part of Sentence 8.2.1.5.(1)

Sewage System	Minimum horizontal distance in metres from a well with watertight casing to a depth of at least 6 m	Minimum horizontal distance in metres from a spring used as a source of *potable* water or well other than a well with a watertight casing to a depth of at least 6 m	Minimum horizontal distance in metres from a lake, river, pond, stream, reservoir, or a spring not used as a source of *potable* water	Minimum horizontal distance in metres from a property line
Earth Pit Privy	15	30	15	3
Privy Vault *Pail Privy*	10	15	10	3
Greywater System	10	15	15	3
Cesspool	30	60	15	3
Column 1	2	3	4	5

8.2.1.6. Clearances for a Class 4 or 5 Sewage System

(1) Except as provided in Sentences 8.2.1.4.(1) and (2), a *treatment unit* shall not be located closer than the minimum horizontal distances set out in Table 8.2.1.6.A.

Table 8.2.1.6.A.
Minimum Clearances for Treatment Units
Forming Part of Sentence 8.2.1.6.(1)

Object	Minimum Clearance, m
Structure	1.5
Well	15
Lake	15
Pond	15
Reservoir	15
River	15
Spring	15
Stream	15
Property Line	3
Column 1	2

r6.1 **(2)** Except as provided in Sentences 8.2.1.4.(1) and (2), the centreline of a *distribution pipe* or *leaching chamber* shall not be located closer than the minimum horizontal distances set out in Table 8.2.1.6.B. and these distances shall be increased when required by Sentence 8.7.4.2.(11).

r6.1

Table 8.2.1.6.B.
Minimum Clearances for Distribution Piping and Leaching Chambers
Forming Part of Sentence 8.2.1.6.(2)

Object	Minimum Clearance, m
Structure	5
Well with a watertight casing to a depth of at least 6 m	15
Any other well	30
Lake	15
Pond	15
Reservoir	15
River	15
Spring not used as a source of *potable* water	15
Stream	15
Property Line	3
Column 1	2

(3) Except as provided in Sentences 8.2.1.4.(1) and (2), a *holding tank* shall not be located closer than the minimum horizontal distances set out in Table 8.2.1.6.C.

Table 8.2.1.6.C.
Minimum Clearances for Holding Tanks
Forming Part of Sentence 8.2.1.6.(3)

Object	Minimum Clearance, m
Structure	1.5
Well with a watertight casing to a depth of at least 6 m	15
Any other well	15
Spring	15
Property Line	3
Column 1	2

8.2.2. Treatment and Holding Tanks

8.2.2.1. Application

(1) This Subsection applies to any tank used in a *sewage system* for collecting, treating, holding or storing *sanitary sewage.*

8.2.2.2. Tanks

(1) Subject to Sentence (3), a tank that is used as a *treatment unit* in a Class 4 *sewage system* or a *holding tank* in a Class 5 *sewage system* shall conform to the requirements of CSA B66, "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks".

(2) Subject to Sentence (3), material standards, access and construction methods and practices for a tank used for other Classes of *sewage systems* shall conform to the requirements of CSA B66, "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks".

(3) Tanks referred to in Sentences (1) and (2) are not required to conform to the requirements of Clause 10.2.(j) of CSA B66 "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks".

(4) Sentence (2) does not apply to a tank that is an integral part of a prefabricated Class 1 *sewage system*.

(5) Access openings shall be located to facilitate the pumping of all compartments and the servicing of the inlet and outlet of each compartment not accessible by removal of the tank top or part of it.

(6) A tank shall not be covered by *soil* or *leaching bed fill* having a depth greater than the maximum depth of burial that the tank is designed to withstand.

(7) A tank shall be securely anchored when located in an area subject to flooding or where *ground water* levels may cause hydrostatic pressures.

8.2.2.3. Septic Tanks

(1) The minimum *working capacity* of a *septic tank* shall be the greater of 3 600 L and,
(a) in *residential occupancies*, twice the daily design *sanitary sewage* flow, or
(b) in non-*residential occupancies*, three times the daily design *sanitary sewage* flow.

(2) Every *septic tank* shall be constructed in such a manner that any *sanitary sewage* flowing through the tank will pass through at least 2 compartments.

(3) The *working capacity* of the compartments required in Sentence (2) shall be sized such that,
(a) the first compartment is at least 1.3 times the daily design *sanitary sewage* flow but in no case less than 2 400 L, and
(b) each subsequent compartment shall be at least 50% of the first compartment.

(4) Where multiple tanks are to be used to meet the requirements of Sentences (2) and (3), the tanks shall be connected in series such that,
(a) the first tank in the series shall have at least a capacity as calculated in Clause (3)(a), however at no time shall a tank having a *working capacity* of less than 3 600 L be used,
(b) all additional tanks after the first tank, excluding pump or dosing tanks shall have at least a *working capacity* equal to the volume required by Clause (3)(b),
(c) the pipe between the outlet of one tank and the inlet of the next tank in the series shall have a minimum slope of 2 percent,
(d) there shall be no partitions in the tank except where a partition is required to maintain the structural integrity of the tank, in which case openings within the partition shall be provided to allow the free movement of *sanitary sewage* throughout the tank, and
(e) all piping between tanks shall be continuous and shall be connected to the tank through the use of flexible watertight seals that will permit differential movement between the tanks.

(5) Partitions separating the *septic tank* into compartments shall extend at least 150 mm above the liquid level at the outlet, and there shall be one or more openings through or above the partition.

(6) The openings required between compartments referred to in Sentence (2) shall have a total cross-sectional area of at least three times the area of the inlet pipe and be located between the top and a level 150 mm above the liquid level at the outlet to provide for the free flow of air between compartments.

(7) *Sanitary sewage* shall pass from one compartment to another of the *septic tank* as follows:
(a) by means of a device similar to that described in CSA B66, "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks" for outlet devices, or
(b) through two or more openings through the partition located in a horizontal line, and evenly spaced across the width of the partition, centred at approximately 40% of the liquid depth below the surface of the liquid, and having a total area of between three and five times that of the cross-sectional area of the inlet pipe.

(8) A *septic tank* shall be of such design and construction as will permit the collection and holding of *sanitary sewage* in it to a depth of not less than 1 000 mm, except that a depth of not less than 900 mm is permitted where the excavation is in rock, or to avoid rupture or displacement of the tank due to *ground water* pressure.

(9) Except as provided in Sentences (10) and (11), every *septic tank* shall be installed in such a manner that the access openings are located not more than 300 mm below the ground surface.

(10) Where the top of the *septic tank* is located more than 300 mm below the ground surface, it shall be equipped with risers that extend from the access opening of the *septic tank* to within 300 mm of the ground surface.

(11) Where risers are used they shall conform to the requirements of CSA B66, "Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks", and shall have adequate access openings to allow for regular maintenance of the *septic tank*.

8.2.2.4. Holding Tanks

(1) All *holding tanks* shall be of such design and construction as will allow the complete removal of solid matter that can be expected to settle in the *holding tank* through an apparatus or device suitable for allowing the contents of the *holding tank* to be removed from the *holding tank*.

(2) A *holding tank* shall have a *working capacity* of not less than 9 000 L.

(3) Where two or more tanks are used to meet the requirement of Sentence (2), they shall be deemed to be one *holding tank* provided they are connected in such a manner as will allow the *sanitary sewage* contained in them to flow between the tanks.

(4) The *working capacity* of the tanks described in Sentence (3) shall not include any portion of any tank that cannot be completely drained due to the manner in which the connections are made.

Section 8.3. Class 1 Sewage Systems

8.3.1. General Requirements

8.3.1.1. Scope

(1) This Section applies to the *construction* of a Class 1 *sewage system*.

8.3.1.2. Application

(1) Except as provided in Sentence (2), a Class 1 *sewage system* shall be designed to receive only human body waste for disposal.

(2) Where the *sewage system* is specifically designed for the biological decomposition of non-waterborne biodegradable kitchen wastes or requires the addition of small quantities of plant matter to improve the decomposition of human body waste, it may receive such wastes in addition to human body waste.

(3) Where the *sewage system* is designed with a drain for the removal of excess liquid, then the *sewage system* shall drain to a Class 3, 4, or 5 *sewage system*.

8.3.2. Superstructure Requirements

8.3.2.1. Construction Requirements

(1) A privy as described in Subsections 8.3.3. to 8.3.5. shall be enclosed with a superstructure that,
(a) is *constructed* of strong durable weatherproof materials,
(b) has a solid floor supported by a sill *constructed* of treated timber, masonry or other material of at least equal strength and durability,
(c) is easily sanitized,
(d) unless it is equipped solely as a urinal, is equipped with one or more seats each having a cover and being supported by an enclosed bench or riser that is lined with an impervious material on all interior vertical surfaces,
(e) is equipped with a self-closing door,
(f) has one or more openings for purposes of ventilation, all of which are screened,
(g) has a ventilation duct that is screened at the top end and that extends from the underside of the bench or riser to a point above the roof of the superstructure, and
(h) shall not have any openings for the reception of human body waste, other than urinals and those *constructed* in accordance with Clause (1)(d).

8.3.3. Earth Pit Privy

8.3.3.1. Construction Requirements

(1) An *earth pit privy* shall be *constructed* in the following manner:
(a) the bottom of the pit shall be at least 900 mm above the *high ground water table*,
(b) the sides of the pit shall be reinforced so as to prevent their collapse,
(c) the pit shall be surrounded on all sides and on its bottom by not less than 600 mm of *soil* or *leaching bed fill*, and
(d) the *soil* or *leaching bed fill* around the base of the sides of the superstructure of the *earth pit privy* shall be raised or mounded to a height of at least 150 mm above ground level.

8.3.4. Privy Vaults and Pail Privy

8.3.4.1. Construction Requirements

(1) A *privy vault* or a *pail privy* shall be *constructed* in the following manner:
(a) the container or structure that is to be used for the holding or storage of *sanitary sewage* shall be watertight and made of a material that can be easily cleaned,
(b) the *soil* or *leaching bed fill* around the base of the sides of the superstructure shall be raised or mounded to a height of at least 150 mm above ground level, and
(c) the surface of the ground in the area of the *privy vault* or *pail privy* shall be so graded that surface drainage will be diverted away from the privy.

8.3.5. Portable Privy

8.3.5.1. Construction Requirements

(1) A *portable privy* shall be *constructed* in the following manner:
(a) the *portable privy* shall have a watertight receptacle that shall be suitable for the holding and storage of any *sanitary sewage* deposited in it,
(b) the receptacle for the holding and storage of sewage shall be designed and *constructed* in such a manner as to allow it to be easily emptied and cleaned, and

(c) the *portable privy* shall be *constructed* of such material and in such a manner that it can withstand the stresses to which it will be subjected during its transportation to and from sites where it is to be used and during loading and unloading from vehicles used for the transportation of the *portable privy* to and from sites where it is to be used.

Section 8.4. Class 2 Sewage Systems

8.4.1. General Requirements

8.4.1.1. Scope

(1) This Section applies to the *construction* of a Class 2 *sewage system*.

8.4.1.2. Application

(1) A Class 2 *sewage system* shall be designed only for the treatment and disposal of *greywater*.

(2) The total daily design flow for a Class 2 *sewage system* shall be calculated based on the *fixtures* discharging to the system as follows:

(a) 200 L per *fixture unit* where there is a supply of pressurized water, and
(b) 125 L per *fixture unit* where there is no supply of pressurized water.

8.4.2. Design and Construction Requirements

8.4.2.1. Construction Requirements

(1) The bottom of the pit shall be at least 900 mm above the *high ground water table*.

(2) The pit shall be *constructed* in such a manner as to prevent the collapse of its sidewalls.

(3) Any material used to support or form the sidewalls of the pit shall be an open jointed material of a type that will permit *leaching* from the pit.

(4) The pit shall be provided with a tight, strong cover that shall remain over the pit except when it is necessary to remove it for purposes of adding *greywater* to or removing *greywater* from the pit or for purposes of maintenance of the pit.

(5) The earth around the perimeter of the pit shall be raised or mounded to a height of at least 150 mm above ground level.

(6) The surface of the ground in the area of the pit shall be so graded that surface drainage in the area will be diverted away from the pit.

(7) The pit shall be surrounded on all sides and on its bottom by at least 600 mm of *soil* having a *percolation time* of less than 50 minutes.

8.4.2.2. Maximum Sewage Flow

(1) A Class 2 *sewage system* shall not be *constructed* where the daily design *greywater* flow to the system exceeds 1 000 L/day.

8.4.2.3. Sizing

(1) A Class 2 *sewage system* shall be designed and *constructed* so that the loading rate to the side walls shall be not more than the value calculated using the formula,

$$L_R = \frac{400}{T}$$

where,

L_R = *loading rate* of the sidewalls in litres per day/m^2, and

T = *percolation time.*

Section 8.5. Class 3 Sewage Systems

8.5.1. General Requirements

8.5.1.1. Scope

(1) This Section applies to the *construction* of a Class 3 *sewage system*.

8.5.1.2. Application

(1) A Class 3 *sewage system* shall not be *constructed* where the daily design *sanitary sewage* flow to the system exceeds 1 000 L/day.

(2) A Class 3 *sewage system* shall be designed to receive only the contents of a Class 1 *sewage system* or *effluent* from a Class 1 *sewage system* for disposal.

8.5.2. Design and Construction Requirements

8.5.2.1. Construction Requirements

(1) The bottom of the cesspool shall be at least 900 mm above the *high ground water table*.

(2) The cesspool shall be *constructed* in such a manner as to prevent the collapse of its sidewalls.

(3) Any material used to support or form the sidewalls of the cesspool shall be an open jointed material of a type that will permit *leaching* from the cesspool.

(4) The cesspool shall be provided with a tight strong cover that shall remain over the cesspool except when it is necessary to remove it for the purposes of adding *sanitary sewage* to or removing *sanitary sewage* from the cesspool or for purposes of maintenance of the cesspool.

(5) Where the cesspool extends to the ground surface, the cover required in Sentence (4) shall be lockable.

(6) The *soil* or *leaching bed fill* around the perimeter of the cesspool shall be raised or mounded to a height of at least 150 mm above ground level.

(7) The surface of the ground in the area of the cesspool shall be graded such that surface drainage in the area will be diverted away from the cesspool.

(8) The cesspool shall be surrounded on all sides and on its bottom by at least 600 mm of *soil* or *leaching bed fill*, except the top where the cesspool extends to the surface of the ground.

Section 8.6. Class 4 Sewage Systems

8.6.1. General Requirements

8.6.1.1. Scope

(1) This Section applies to the *construction* of a Class 4 *sewage system*.

8.6.1.2. General Requirements

(1) The *treatment unit* shall be connected to a *leaching bed constructed* in accordance with the requirements of Section 8.7.

8.6.1.3. Pumps and Siphons

r6.1 (1) Where the total length of *distribution pipe* or *leaching chamber* required is 150 m or more, the *sewage system* shall have at least one pump or a siphon contained in a dosing tank that may be a separate compartment within the tank structure, for distribution of the *effluent*.

r6.1 (1.1) Where the total length of *leaching chamber* is 150 m or more, a *distribution pipe* shall be installed at the centreline of the *leaching chamber* and extend the total length of *leaching chamber* to allow for dosing of the *effluent*.

(2) Alternating siphons shall not be installed in a *sewage system*.

(3) Where 2 or more pumps are employed within a dosing tank, the pumps shall be designed such that the pumps alternate dosing, and dosing shall continue in the event that one pump fails.

(4) Where a pump or siphon is required, the pump or siphon shall be designed to discharge a dose of at least 75% of the internal volume of the *distribution pipe* within a time period not exceeding fifteen minutes.

r6.1 (5) Where a pump or siphon is required, the pump or siphon shall be equipped with a device that shall produce an audible and visual alarm signal that indicates a high water level in the pump or siphon chamber.

8.6.2. Treatment Units

8.6.2.1. Septic Tank Systems

(1) An *effluent* filter shall be installed in the outlet flow path of every *septic tank* that discharges *effluent* to a *leaching bed*.

(2) The *septic tank effluent* filter required by Sentence (1) shall,
(a) conform to the requirements of NSF/ANSI 46, "Evaluation of Components and Devices Used in Wastewater Treatment Systems",
(b) be sized to filter particles of 1.6 mm,
(c) have a minimum area of 550 cm^2, and
(d) be installed in accordance with the manufacturer's recommendations.

(3) A secured access opening to allow for regular maintenance of the *effluent* filter shall be provided at the ground surface.

8.6.2.2. Other Treatment Units (See Appendix A.)

(1) Except as provided in Sentence (2), a *treatment unit*, other than a *septic tank*, shall be designed such that the *effluent* does not exceed, for the level of the *treatment unit* set out in Column 1 of Table 8.6.2.2., the maximum concentrations set out opposite it in Columns 2 and 3 of Table 8.6.2.2.

Table 8.6.2.2.
Other Treatment Unit Effluent Quality Criteria
Forming Part of Sentences 8.6.2.2.(1) and (2)

Classification of Treatment Unit[1]	Suspended Solids[2]	$CBOD_5$[2]
Level II	30	25
Level III	15	15
Level IV	10	10
Column 1	2	3

Notes to Table 8.6.2.2.:
(1) The classifications of *treatment units* specified in Column 1 correspond to the levels of treatment described in CAN/BNQ 3680-600, "Onsite Residential Wastewater Treatment Technologies".
(2) Maximum concentration in mg/L based on a 30 day average.

(2) A *treatment unit* that is used in conjunction with a *leaching bed constructed* as a *shallow buried trench*, *Type A dispersal bed* or *Type B dispersal bed* shall be designed such that the *effluent* does not exceed the maximum concentrations set out opposite a Level IV *treatment unit* in Columns 2 and 3 of Table 8.6.2.2.

(3) All *treatment units* referred to in Sentences (1) and (2) that contain mechanical components shall be equipped with an audible and visual warning alarm so located to warn the occupants of the *building* served or the operator of the *treatment unit* of a malfunction in the operation of the *treatment unit*.

(4) All *treatment units* referred to in Sentences (1) and (2) shall permit the sampling of the *effluent*.

e5 (5) A *treatment unit* is deemed to comply with Sentences (1) and (2) if it has been certified to CAN/BNQ 3680-600, "Onsite Residential Wastewater Treatment Technologies" using a temperature condition listed under option a) or b) of Clause 8.2.2. of that standard. (See Appendix A.)

(6) Every operator of a *treatment unit* shall obtain, from the manufacturer or distributor of the *treatment unit*, literature that describes the unit in detail and provides complete instructions regarding the operation, servicing, and maintenance requirements of the unit and its related components necessary to ensure the continued proper operation in accordance with the original design and specifications.

Section 8.7. Leaching Beds

8.7.1. General Requirements

8.7.1.1. Scope

(1) This Section applies to the *construction* of *leaching beds*.

8.7.1.2. Limitation on Installation

(1) The design and installation of a *shallow buried trench, Type A dispersal bed* or *Type B dispersal bed* shall be carried out by a person competent in this field of work.

8.7.2. Design and Construction Requirements

8.7.2.1. General Requirements

(1) A *leaching bed* shall not be located,
(a) in an area that has an average slope that exceeds one unit vertically to four units horizontally,
(b) in *soil* or *leaching bed fill* having a *percolation time of,*
  (i) less than one minute, or greater than 125 minutes if *constructed* as a *shallow buried trench*, or
  (ii) less than one minute, or greater than 50 minutes for all other *leaching beds*, or
(c) in or on an area that is subject to flooding that may be expected to cause damage to the *leaching bed* or impair the operation of the *leaching bed.*

(2) A *leaching bed* shall not be covered with any material having a hydraulic conductivity less than 0.01 m/day.

(3) The surface of the *leaching bed* shall be shaped to shed water and together with the side slopes of any raised portion, shall be protected against erosion in such a manner as to not inhibit the evaporation and transpiration of waters from the *soil* or *leaching bed fill*, and to not cause plugging of the *distribution pipe.*

(4) No part of a *leaching bed* shall be sloped steeper than 1 unit vertically to 4 units horizontally.

(5) A *leaching bed* shall be designed to be protected from compaction or any stress or pressure that may result in,
(a) the impairment or destruction of any pipe in the *leaching bed*, or
(b) the smearing of the *soil* or *leaching bed fill.*

8.7.2.2. Distribution Pipes within Leaching Beds

(1) Sentence (2) applies to the design and *construction* of a *leaching bed* with *distribution pipes* used within the *leaching bed.*

(2) The *header line* and *distribution pipes* within a *leaching bed* shall be designed and *constructed* so that they can be detected by,
(a) magnetic means,
(b) means of a 14 gauge TW solid copper light coloured plastic coated tracer wire, or
(c) other means of subsurface detection.

r6.1 8.7.2.3. Leaching Chambers within Leaching Beds

(1) *Leaching chambers* are permitted for use in conjunction with an *absorption trench, shallow buried trench*, filter bed or *Type A dispersal bed.*

(2) *Leaching chambers* shall comply with the dimension requirements for either a Type I or Type II *leaching chamber* listed in Table 8.7.2.3.

(3) *Leaching chambers* shall conform to the requirements of IAPMO PS 63, "Plastic Leaching Chambers".

(4) The *header line* and *leaching chambers* within a *leaching bed* shall be designed and *constructed* so that they can be detected by,
(a) magnetic means,
(b) means of a 14 gauge TW solid copper light coloured plastic coated tracer wire, or
(c) other means of subsurface detection.

Table 8.7.2.3.
Leaching Chamber Dimensions
Forming Part of Sentence 8.7.2.3.(2)

Type of *Leaching Chamber*	Width, mm	Height, mm
Type I	380 to 410	280 to 305
Type II	555 to 575	300 to 320
Column 1	2	3

8.7.3. Absorption Trench Construction

8.7.3.1. Length of Distribution Pipe

(1) The total length of *distribution pipe* shall,
(a) not be less than 30 m when *constructed* as a *shallow buried trench*, or
(b) not be less than 40 m for any other *absorption trench*.

(2) Except as provided in Sentences (1), (3), and (4) every *leaching bed constructed* by means of *absorption trenches* shall have a total length of *distribution pipe* not less than the value determined by the formula,

$$L = \frac{QT}{200}$$

where,

L = total length of *distribution pipe* in metres,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the design *percolation time*.

(3) Except as provided in Sentence (1), where a *leaching bed* receives *effluent* from a Level II, Level III or Level IV *treatment unit* as described in Table 8.6.2.2., the *leaching bed* may have a total length of *distribution pipe* not less than the value determined by the formula,

$$L = \frac{QT}{300}$$

where,

L = total length of *distribution pipe* in metres,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the design *percolation time*.

(4) Except as provided in Sentence (1), where the *leaching bed* is *constructed* as a *shallow buried trench*, the total length of the *distribution pipe* shall not be less than the value determined by Table 8.7.3.1.

Table 8.7.3.1.
Length of Distribution Pipe in Shallow Buried Trench
Forming Part of Sentence 8.7.3.1.(4)

Percolation Time, (T) of *Soil*, min	Length of *Distribution Pipe*, m
$1 < T \leq 20$	Q/75
$20 < T \leq 50$	Q/50
$50 < T < 125$	Q/30
Column 1	2

where,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the design *percolation time*.

r6.1 8.7.3.1A. Length of Leaching Chamber

(1) The total length of *leaching chamber* shall,
(a) not be less than 30 m when constructed as a *shallow buried trench*, or
(b) not be less than 40 m for any other *absorption trench*.

(2) Except as provided in Sentences (1) and (3), the total length of *leaching chamber* shall not be less than the value determined by the formula,

L = QT/200, for a Type I *leaching chamber*, or

L = QT/300, for a Type II *leaching chamber*,

where,

L = total length of *leaching chamber* in metres,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the design *percolation time*.

(3) When a *treatment unit* described in Article 8.6.2.2. is used in conjunction with a *leaching chamber*, the total length of *leaching chamber* shall not be less than the value determined by the formula,

L = QT/300

where,

L = total length of *leaching chamber* in metres,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the design *percolation time*.

(4) Except as provided in Sentence (1), where the *leaching bed* is constructed as a *shallow buried trench*, the total length of *leaching chamber* shall not be less than the value determined by Table 8.7.3.1A.

Table 8.7.3.1A.
Length of Leaching Chamber in Shallow Buried Trench
Forming Part of Sentence 8.7.3.1A.(4)

Percolation Time, (T) of *Soil*, min	Length of *Leaching Chamber*, m
1 < T ≤ 20	Q/75
20 < T ≤ 50	Q/50
50 < T < 125	Q/30
Column 1	2

where,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the design *percolation time*.

8.7.3.2. Absorption Trenches

(1) Except as provided in Sentence (2), *absorption trenches* shall be,
(a) approximately the same length and not more than 30 m in length,
(b) not less than 500 mm and not more than 1 000 mm in width,
(c) not less than 600 mm and not more than 900 mm in depth,
r6.1 (d) centred not less than,
(i) 1 600 mm apart where used in conjunction with a *distribution pipe* or a Type I *leaching chamber*, or
(ii) 2 400 mm apart where used in conjunction with a Type II *leaching chamber*,
(e) located so that the bottom of the *absorption trench* is not less than 900 mm above the *high ground water table*, rock or *soil* with a *percolation time* of more than 50 minutes, and
r6.1 (f) backfilled, after the installation of the *distribution pipe* or *leaching chamber* with *leaching bed fill*, so as to ensure that after the *leaching bed fill* settles, the surface of the *leaching bed* will not form any depressions.

(2) *Absorption trenches constructed* as a *shallow buried trench* shall be,
(a) approximately the same length and not more than 30 m in length,
(b) not less than 300 mm and not more than 600 mm in width,
(c) not less than 300 mm and not more than 600 mm in depth,
(d) centred not less than 2 000 mm apart,
(e) not less than 900 mm at all points on the bottom of the *absorption trench* above the *high ground water table* or rock, and
(f) backfilled, after the installation of the *distribution pipe* with *leaching bed fill*, so as to ensure that after the *leaching bed fill* settles, the surface of the *leaching bed* will not form any depressions.

8.7.3.3. Distribution Pipe

(1) Except for a *shallow buried trench*, the *distribution pipe* used in the *construction* of a *leaching bed* shall be,
(a) not less than 3 in. trade *size* for gravity flow systems,
(b) installed with a uniform downward slope from the inlet with a drop of not less than 30 mm and not more than 50 mm for each 10 m of *distribution pipe* for gravity flow systems, and
(c) installed within a layer of stone conforming to Sentence (5).

(2) Prior to backfilling, the stone layer required by Clause (1)(c) shall be protected in such a manner so as to prevent *soil* or *leaching bed fill* from entering the stone by completely covering it with,
(a) untreated building paper, or
(b) a permeable geo-textile fabric.

(3) Every pressurized *distribution pipe* shall be self-draining so as to prevent freezing of its contents.

(4) Every pressurized *distribution pipe* shall,
(a) be not less than 1 in. trade *size*, and
r6.1 (b) have orifices of at least 3 mm in diameter, spaced equally along the length of the pipe to provide even distribution of the *effluent*.

(5) The stone layer required by Clause (1)(c) shall,
(a) be comprised of washed septic stone, free of fine material, with gradation conforming to Table 8.7.3.3.,
(b) be not less than 500 mm in width,
(c) extend not less than 150 mm below the *distribution pipe*, and
(d) extend not less than 50 mm above the *distribution pipe*.

r6.1 (6) This Article does not apply to a *distribution pipe* within a *leaching chamber*.

Table 8.7.3.3.
Gradation of Septic Stone
Forming Part of Sentences 8.7.3.3.(5) and 8.7.8.2.(6)

Particle Size	Percent Passing
53 mm	100
19 mm	0 - 5
75 µm	0 - 1
Column 1	2

r6.1 8.7.3.4. Leaching Chamber

(1) Prior to backfilling, the *leaching chamber* shall be,
(a) installed level over the length of the *absorption trench*,
(b) securely connected together, section to section,
(c) free of structural damage, uncut and used full length,
(d) equipped with end caps installed on both ends,
(e) equipped with an integrated splash plate at the inlet end of each line of *leaching chamber*, to prevent soil scouring, and
(f) protected in such a manner so as to prevent *soil* or *leaching bed fill* from entering the *leaching chamber*.

(2) Except for a *shallow buried trench*, the *distribution pipe* within a *leaching chamber* shall be not less than 3 in. trade *size* for dosed systems.

(3) Every pressurized *distribution pipe* within a *leaching chamber* shall,
(a) extend over the entire length of the *leaching chamber*,
(b) be not less than 1½ in. trade *size*,
(c) have orifices of at least 6 mm in diameter, spaced equally along the length of the pipe to provide even distribution of the *effluent*,
(d) be supported,
(e) be self-draining so as to prevent freezing of its contents, and
(f) have cleanouts installed at the downstream end of each line of *leaching chamber* to allow for servicing of the system.

8.7.4. Fill Based Absorption Trenches

8.7.4.1. Loading Requirements

(1) The area described in Sentence 8.7.4.2.(1) shall be designed such that the *loading rate* does not exceed, for *soil* having a *percolation time* set out in Column 1 of Table 8.7.4.1., the maximum value set out opposite it in Column 2 of Table 8.7.4.1.

Table 8.7.4.1.
Loading Rates for Fill Based Absorption Trenches and Filter Beds
Forming Part of Sentences 8.7.4.1.(1) and 8.7.5.2.(2)

Percolation Time (T) of *Soil*, min	Loading Rates, (L/m²)/day
1 < T ≤ 20	10
20 < T ≤ 35	8
35 < T ≤ 50	6
T > 50	4
Column 1	2

8.7.4.2. Construction Requirements

(1) Except for a *shallow buried trench*, a *leaching bed* comprised of *absorption trenches* may be *constructed* in *leaching bed fill*, if unsaturated *soil* or *leaching bed fill* complying with Subclause 8.7.2.1.(1)(b)(ii) extends,
(a) to a depth of at least 250 mm over the area covered by the *leaching bed fill*, and
r6.1 (b) for at least 15 m beyond the centrelines of the outer *distribution pipes* or *leaching chambers* in any direction in which the *effluent* entering the *soil* or *leaching bed fill* will move horizontally.
(See Appendix A.)

(2) If the unsaturated *soil* or *leaching bed fill* described in Sentence (1) has a *percolation time* greater than 15 minutes, any additional *leaching bed fill* added to it to form the *leaching bed* shall have a *percolation time* not less than 75% of the *percolation time* of the unsaturated *soil* or *leaching bed fill* to which it is added.

(3) *Leaching bed fill* that does not meet the requirements of Sentence (2) may be used to form the *leaching bed* if,
(a) the distance from the bottom of the *absorption trench* to the underlying *soil* is not less than 900 mm, or
r6.1 (b) where the distance from the bottom of the *absorption trench* to the underlying *soil* is less than 900 mm, the *percolation time* of the least permeable *soil* or *leaching bed fill* within 900 mm from the bottom of the *absorption trench* is used to calculate the length of the *distribution pipe* under Article 8.7.3.1. or the *leaching chamber* under Article 8.7.3.1A.

(4) Sentence (2) does not apply to any *leaching bed fill* added as backfill above the stone layer in which the *distribution pipe* is located.

(5) All *leaching bed fill* added shall be stabilized against erosion.

(6) The site to which the *leaching bed fill* is added shall be generally clear of vegetation.

r6.1 **(7)** The *leaching bed fill* that is added shall be compacted in layers in such a manner as to avoid uneven settlement of the *distribution pipes* or *leaching chambers*.

r6.1 **(8)** Any *distribution boxes*, *header lines*, *absorption trenches*, *distribution pipes* or *leaching chambers* shall be installed only after the *leaching bed fill* has been compacted in accordance with Sentence (7).

(9) Except as provided in Sentence (10), the sides of the added *leaching bed fill* shall be sloped to ensure stability, but shall not be steeper than one unit vertically to four units horizontally.

(10) The side slope of the *leaching bed fill* may be increased up to one unit vertically to three units horizontally if measures are taken to prevent erosion and ensure stability of the *leaching bed fill*.

(11) The distances set out in Column 2 of Table 8.2.1.6.B. shall be increased by twice the height that the *leaching bed* is raised above the original grade.

8.7.5. Filter Beds

8.7.5.1. Application

(1) The total daily design *sanitary sewage* flow shall not exceed,
(a) 5 000 L where the *treatment unit* is a *septic tank*, or
(b) 10 000 L where the *treatment unit* is a Level II, Level III or Level IV *treatment unit* as described in Table 8.6.2.2.

8.7.5.2. Loading Requirements

(1) The effective area of the surface of the filter medium in each filter bed shall be at least 10 m^2 and not more than 50 m^2.

(2) The area described in Sentence 8.7.4.2.(1) shall be designed such that the *loading rate* does not exceed, for *soil* having a *percolation time* set out in Column 1 of Table 8.7.4.1., the maximum value set out opposite it in Column 2 of Table 8.7.4.1.

(3) Except as provided in Sentence (5), where the total daily design *sanitary sewage* flow does not exceed 3 000 L, the effective area shall be such that the loading on the surface of the filter medium does not exceed 75 L/m^2 per day.

(4) Except as provided in Sentence (5), where the total daily design *sanitary sewage* flow exceeds 3 000 L,
(a) the effective area shall be such that the loading on the surface of the filter medium does not exceed 50 L/m^2 per day, and
(b) the *leaching bed* shall be comprised of more than one filter bed, each of similar size and adjacent to each other.

(5) Where a Level II, Level III or Level IV *treatment unit* as described in Table 8.6.2.2. is used in conjunction with a filter bed, the effective area shall be such that the loading on the surface of the filter medium does not exceed 100 L/m^2 per day.

8.7.5.3. Construction Requirements

(1) Sentences 8.7.4.2.(1), (2) and (4) to (11) apply to the *construction* of a filter bed.

$r_{6.1}$ (2) The lines of *distribution pipes* or *leaching chambers* shall be evenly spaced over the surface of the filter medium to which the *sanitary sewage* is applied, with a maximum spacing between the centrelines of the *distribution pipes* or *leaching chambers* in accordance with Table 8.7.5.3. (See Appendix A.)

$r_{6.1}$ (3) The filter medium shall have a minimum depth of 750 mm below the stone layer or bottom of the *leaching chambers* and shall be clean sand comprised of particles ranging in size between the limits of,
(a) an effective size of 0.25 mm with a uniformity coefficient not less than 3.5,
(b) an effective size of 2.5 mm with a uniformity coefficient not greater than 1.5, and
(c) having a uniformity coefficient not greater than 4.5.

Table 8.7.5.3.
Maximum Spacing Between Lines of Distribution Pipes or Leaching Chambers
Forming Part of Sentence 8.7.5.3.(2)

Distribution Method	Maximum Centreline Spacing, mm
Distribution pipes	1 200
Type I *leaching chambers*	900
Type II *leaching chambers*	1 000
Column 1	2

(4) The filter medium shall be unsaturated for its entire depth.

r6.1 **(5)** Where there is more than one filter bed in a *leaching bed*, the filter beds shall be separated by at least 5 m between the *distribution pipes* or *leaching chambers* of the filter beds.

(6) The base of the filter medium shall extend to a thickness of at least 250 mm over an area meeting the requirements of the following formula:

$$A = \frac{QT}{850}$$

where,

A = the area of contact in square metres between the base of the filter medium and the underlying *soil*,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the lesser of 50 and the *percolation time* of the underlying *soil*.

r6.1 **(7)** The stone layer or bottom of the *leaching chambers* shall be not less than 900 mm above the *high ground water table*, rock or *soil* with a *percolation time* of more than 50 minutes.

8.7.6. Shallow Buried Trench

8.7.6.1. Construction Requirements (See Appendix A.)

(1) The *treatment unit* used in conjunction with a *leaching bed constructed* as a *shallow buried trench* shall provide an *effluent* quality that does not exceed the maximum concentrations set out opposite a Level IV *treatment unit* in Columns 2 and 3 of Table 8.6.2.2.

(2) The *effluent* shall be distributed through a *pressurized distribution system* having a pressure head of not less than 600 mm when measured to the most distant point from the pump.

(3) The pump chamber shall be sized to provide sufficient storage volume so that the *effluent* is evenly dosed on an hourly basis over a 24-hour period.

(4) A *shallow buried trench* shall not be *constructed* unless the *soil* or *leaching bed fill* is sufficiently dry to resist compaction and smearing during excavation.

r6.1 **(5)** Every *chamber* or *leaching chamber* shall be as wide as the *shallow buried trench* in which it is contained, and the cross-sectional height of the *chamber* or *leaching chamber* at its centre point shall not be less than half the width of the trench.

r6.1 **(6)** Every *chamber* or *leaching chamber* shall contain only one pressurized *distribution pipe*.

8.7.7. Type A Dispersal Beds

8.7.7.1. Construction Requirements

(1) The *treatment unit* used in conjunction with a *leaching bed constructed* as a *Type A dispersal bed* shall provide an *effluent* quality that does not exceed the maximum concentrations set out opposite a Level IV *treatment unit* in Columns 2 and 3 of Table 8.6.2.2.

(2) A *Type A dispersal bed* shall be backfilled with *leaching bed fill* so as to ensure that, after the *leaching bed fill* settles, the surface of the *leaching bed* will not form any depressions.

$r_{6.1}$ (3) The combined thickness of the sand layer and the stone layer if utilized of a *Type A dispersal bed* shall not be less than 500 mm.

(4) Except as provided in Sentence (5), the sand layer shall,

(a) be comprised of sand that has,

(i) a *percolation time* of at least 6 and not more than 10 min, and

(ii) not more than 5% fines passing through a 0.074 mm (No. 200) sieve,

(b) have a minimum thickness of 300 mm, and

(c) have an area that is not less than the lesser of,

$r_{6.1}$ (i) the area of the stone layer determined in accordance with Sentence (6) or, if *leaching chambers* are used, the area over which the *leaching chambers* are spaced determined in accordance with Sentence (6.1), and

(ii) the value determined by the formula,

$$A = \frac{QT}{850}$$

where,

A = the area of contact in square metres between the base of the sand and the underlying *soil*,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the lesser of 50 and the *percolation time* of the underlying *soil*.

(5) Where the underlying *soil* has a *percolation time* of more than 15 min, the sand layer referred to in Sentence (4) shall,

$r_{6.1}$ (a) extend to at least 15 m beyond the perimeter of the *treatment unit*, or the centrelines of the outer *distribution pipes* or *leaching chambers* if utilized, in any direction in which the *effluent* entering the *soil* or *leaching bed fill* will move horizontally, and

(b) have an area that is not less than the value determined by the formula,

$$A = \frac{QT}{400}$$

where,

A = the area of contact in square metres between the base of the sand and the underlying *soil*, or *leaching bed fill* if utilized,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the lesser of 50 and the *percolation time* of the underlying *soil*.

e_3 (See Appendix A.)

r6.1 (6) Where a stone layer is used, the stone layer shall,
(a) be rectangular in shape with the long dimension parallel to the site contours,
(b) have a minimum thickness of 200 mm,
(c) be protected in the manner described in Sentence 8.7.3.3.(2), and
(d) be *constructed* such that the bottom of the stone layer is at least 600 mm above the *high ground water table*, rock or *soil* with a *percolation time* of 1 min or less or greater than 50 min.
(e) have a minimum area not less than the value determined by the formula,

$$A = Q/B$$

where,

A = the area of the stone layer in square metres,

B = the following amount,
(i) 50, if the total daily design *sanitary sewage* flow exceeds 3 000 litres, or
(ii) 75, if the total daily design *sanitary sewage* flow does not exceed 3 000 litres, and

Q = the total daily design *sanitary sewage* flow in litres.

r6.1 (6.1) Where *leaching chambers* are used,
(a) the *Type A dispersal bed* shall be rectangular in shape with the long dimension parallel to the site contours, and
(b) the *leaching chambers* shall,
(i) be evenly spaced over the area calculated in Subclause (iv), with a maximum distance of 200 mm between the exterior edges of the lines of *leaching chamber*,
(ii) be protected in the manner described in Clause 8.7.3.4.(1)(f),
(iii) be *constructed* such that the bottom of the *leaching chambers* is at least 600 mm above the *high ground water table*, rock or *soil* with a *percolation time* of 1 min or less or greater than 50 min, and
(iv) have a minimum area not less than the value determined by the formula,

$$A = Q/B$$

where,

A = the area over which the *leaching chambers* are spaced, in square metres,

B = the following amount,
(i) 50, if the total daily design *sanitary sewage* flow exceeds 3 000 litres, or
(ii) 75, if the total daily design *sanitary sewage* flow does not exceed 3 000 litres, and

Q = the total daily design *sanitary sewage* flow in litres.

r6.1 (7) *Leaching bed fill* with a *percolation time* not exceeding 15 min may be used to satisfy the vertical separation requirements of Clause (6)(d) or Subclause (6.1)(b)(iii), provided that the *leaching bed fill* conforms to the requirements specified in Sentence (5) regardless of the *percolation time* of the underlying *soil.*

r6.1 (8) Where a stone layer is used, the *effluent* shall be evenly distributed within the stone layer to within 600 mm of the perimeter of the stone layer. (See Appendix A.)

r6.1 (8.1) Where *leaching chambers* are used, the *effluent* shall be evenly distributed within the area over which the *leaching chambers* are spaced to within 600 mm of the perimeter of that area.

r6.1 (9) The stone layer or area over which the *leaching chambers* are spaced shall not be located closer than the minimum horizontal distances set out in Table 8.2.1.6.B. and these distances shall be increased when required by Sentence 8.7.4.2.(11).

This Page

Intentionally Left Blank

8.7.8. Type B Dispersal Beds

8.7.8.1. General Requirements

(1) Except as provided in Sentence (2) and Sentence 8.7.8.2.(2), a *Type B dispersal bed* shall conform to the requirements of Article 8.7.2.1.

(2) A *Type B dispersal bed* shall not be located in an area that has an average slope that exceeds one unit vertically to seven units horizontally.

8.7.8.2. Construction Requirements

(1) The *treatment unit* used in conjunction with a *leaching bed constructed* as a *Type B dispersal bed* shall provide an *effluent* quality that does not exceed the maximum concentrations set out opposite a Level IV *treatment unit* in Columns 2 and 3 of Table 8.6.2.2.

(2) A *Type B dispersal bed* shall be,
(a) rectangular in shape with the long dimension parallel to the site contours,
(b) not more than 1 000 mm in depth measured from the bottom of the stone layer to the finished grade when installed in *soil* with a *percolation time* that exceeds 15 min, and
(c) backfilled with *leaching bed fill* so as to ensure that, after the *leaching bed fill* settles, the surface of the *leaching bed* will not form any depressions.

(3) The bottom of the stone layer shall be at least 600 mm above the *high ground water table*, rock or *soil* with a *percolation time* greater than 50 min.

(4) The *effluent* shall be distributed over the *Type B dispersal bed* through a *pressurized distribution system* having a pressure head of not less than 600 mm when measured to the most distant point from the pump.

(5) The *distribution pipes* shall,
(a) be self-draining so as to prevent freezing of their contents, and
(b) have orifices of at least 3 mm in diameter, spaced equally along the length of the pipes.

(6) The stone layer containing the *distribution pipes* shall,
(a) be comprised of washed septic stone, free of fine material, with gradation conforming to Table 8.7.3.3.,
(b) extend not less than 250 mm below the *distribution pipe*, and
(c) extend not less than 50 mm above the *distribution pipe*.

(7) The *distribution pipes* shall be spaced not more than 1.2 m apart with the outermost pipe spaced not more than 600 mm from the edge of the bed.

(8) The pump chamber shall be sized to provide sufficient storage volume so that the *effluent* is evenly dosed on an hourly basis over a 24-hour period.

(9) When there is more than one *Type B dispersal bed* in a *leaching bed*, the *Type B dispersal beds* shall be separated by at least 5 m measured from the edge of the stone layers.

(10) A *Type B dispersal bed* shall not be located closer than the minimum horizontal distances set out in Table 8.2.1.6.B. and these distances shall be increased when required by Sentence 8.7.4.2.(11).

8.7.8.3. Design Requirements (See Appendix A.)

(1) The area of a *Type B dispersal bed* shall not be less than the minimum area determined in accordance with Clause (2)(a) or (b).

(2) For the purposes of Sentence (1), the minimum area is either of the following,
(a) the area calculated based on the *loading rates* for Type 2 effluent set out in the Column headed "Type 2" found in Table 2-8 of the BCMOH, "Sewerage System Standard Practice Manual", or
(b) the value determined by the formula,

$$A = \frac{QT}{400}$$

where,

A = the area of contact in square metres between the stone layer and the underlying *soil*,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the *percolation time* of the underlying *soil*.

(3) The linear *loading rates* of the underlying *soil* shall not be greater than,
(a) the linear *loading rates* set out in Table 2-11 of BCMOH, "Sewerage System Standard Practice Manual", where the area of the *Type B dispersal bed* is determined in accordance with Clause (2)(a), or
(b) the following linear *loading rate*, where the area of the *Type B dispersal bed* is determined in accordance with Clause (2)(b),
(i) 40 L/m, for *soil* having a *percolation time* equal to or greater than 24 min, or
(ii) 50 L/m, for *soil* having a *percolation time* less than 24 min.

(4) The width of a *Type B dispersal bed* shall not exceed 4 m.

Section 8.8. Class 5 Sewage Systems

8.8.1. Application

8.8.1.1. Prohibited Installation

(1) Except as provided in Article 8.8.1.2., a Class 5 *sewage system* shall not be installed.

8.8.1.2. Acceptable Installation

(1) A Class 5 *sewage system* may be installed in the following circumstances:
(a) where the proposed use of the *sewage system* is for a temporary operation, excluding seasonal recreational use, not exceeding 12 months in duration,
(b) to remedy an unsafe *sewage system* where the remediation of the unsafe condition by the installation of a Class 4 *sewage system* is impracticable,
(c) to upgrade a *sewage system* serving an existing *building*, where upgrading through the use of a Class 4 *sewage system* is not possible due to lot size, site slope or clearance limitations, or
(d) as an interim measure for a lot or parcel of land until municipal sewers are available, provided that the municipality undertakes to ensure the continued operation of an approved *hauled sewage system* until the municipal sewers are available.

(2) Where a Class 5 *sewage system* is installed, a written agreement for the disposal of *sanitary sewage* from the *sewage system* shall be entered into with a *hauled sewage system* operator.

8.8.2. General Requirements

8.8.2.1. Construction Requirements

(1) All Class 5 *sewage systems* shall be equipped with a device that shall produce an audible and visual warning alarm so located to warn that the *sewage system* is nearing capacity.

(2) The device required in Sentence (1) shall be designed to provide suitable advance warning to the *building* occupants considering,
(a) the total daily design *sanitary sewage* flow,
(b) the location of the Class 5 *sewage system*, and
(c) the response time of the *hauled sewage system* contractor.

(3) Except as provided in Sentence (4), all *holding tanks* shall be provided with a vent that,
(a) is not less than 3 in. trade *size*,
(b) terminates at least,
  (i) 300 mm above finished grade with a vent cap, or
  (ii) 600 mm above finished grade with a vent cap when the *holding tank* is located in an area subject to flooding, and
(c) terminates at least 3.5 m away from any air inlet, window, or door.

(4) A vent from a *holding tank* may connect into the *venting system* of the *building* served by the *holding tank* provided that,
(a) the vent is not less than 3 in. trade *size*, and
(b) the installation of the vent shall conform to the requirements in Part 7.

8.8.2.2. Sizing of Holding Tanks

(1) All *holding tanks* used in residential dwellings shall have a minimum 7 day holding capacity based on the total daily design *sanitary sewage* flow.

Section 8.9. Operation and Maintenance

8.9.1. General

8.9.1.1. Scope

(1) This Section applies to the operation and maintenance of all *sewage systems*.

8.9.1.2. General Requirements for Operation and Maintenance

(1) Every *sewage system* shall be operated and maintained so that,
(a) the *sewage system* or any part of it shall not emit, discharge or deposit *sanitary sewage* or *effluent* onto the surface of the ground,
(b) *sanitary sewage* or *effluent* shall not emit, discharge, seep, leak or otherwise escape from the *sewage system* or any part of it other than from a place or part of the *sewage system* where the system is designed or intended to discharge the *sanitary sewage* or *effluent*, and
(c) except as provided in Sentence (2), *sanitary sewage* or *effluent* shall not emit, discharge, seep, leak or otherwise escape from the *sewage system* or any part of it into a piped water supply, well water supply, a watercourse, *ground water* or *surface water*.

(2) Clause (1)(c) does not apply to the use of a *sewage system* designed and operated such that properly treated *effluent* is discharged into *soil.*

8.9.2. Operation

8.9.2.1. Scope

(1) The requirements of this Subsection are in addition to the requirements of Subsection 8.9.1.

8.9.2.2. General

(1) Every *sewage system* shall be operated in accordance with,
(a) the basis on which the *construction* and use of the *sewage system* was approved or required under the Act or predecessor legislation, as the case may be, and
(b) the requirements of the manufacturer of the *sewage system.*

8.9.2.3. Class 4 Sewage Systems

(1) Every Class 4 *sewage system* shall be operated in accordance with the literature required by Sentence 8.6.2.2.(6).

(2) No person shall operate a *treatment unit* other than a *septic tank* unless the person has entered into an agreement whereby servicing and maintenance of the *treatment unit* and its related components will be carried out by a person who,
(a) possesses a copy of the literature required by Sentence 8.6.2.2.(6), and
(b) is authorized by the manufacturer to service and maintain that type of *treatment unit.*

(3) The person authorized by the manufacturer to service and maintain the *treatment unit* and who has entered into the agreement referred to in Sentence (2) with the person operating the *treatment unit* shall notify the *chief building official* if,
(a) the agreement is terminated, or
(b) access for service and maintenance of the *treatment unit* is denied by the person operating the *treatment unit.*

8.9.2.4. Sampling of Treatment Units

(1) Every person operating a *treatment unit* that is used in conjunction with a *leaching bed constructed* as a *shallow buried trench, Type A dispersal bed* or *Type B dispersal bed* shall,
(a) take a grab sample of the *effluent* to determine the level of $CBOD_5$ and suspended solids in the *effluent,*
(b) carry out the sampling required by Clause (1)(a) in accordance with the methods described in the APHA/AWWA/WEF, "Standard Methods for the Examination of Water and Wastewater", and
(c) promptly submit the results of the sampling required by Clause (a) to the *chief building official.*

(2) Except as provided in Sentence (4), the sampling required by Sentence (1) shall be conducted,
(a) initially, once during the first 12 months after the *sewage system* was put into use, and
(b) thereafter, once during every 12 month period, at least 10 months and not more than 18 months after the previous sampling has been completed.

(3) The concentration of $CBOD_5$ and suspended solids in the grab sample described in Sentences (1) and (4) is deemed to comply with the maximum concentration requirements set out in Table 8.6.2.2. when it does not exceed 20 mg/L for each of these parameters.

(4) If the results of the sampling required by Sentence (1) do not comply with Sentence (3), the person operating the *treatment unit* shall,
(a) resample the *effluent* in accordance with Clauses (1)(a) and (b) within 6 months after the previous sampling has been completed, and
(b) promptly submit the results of the resampling required by Clause (a) to the *chief building official.*

8.9.2.5. Class 5 Sewage Systems

(1) Every Class 5 *sewage system* shall be operated in accordance with the agreement referred to in Sentence 8.8.1.2.(2).

(2) No Class 5 *sewage system* shall be operated once it is filled with *sanitary sewage* until such time as the *sanitary sewage* is removed from the *sewage system.*

8.9.3. Maintenance

8.9.3.1. Scope

(1) The requirements of this Subsection are in addition to the requirements of Subsection 8.9.1.

8.9.3.2. General

(1) Every *sewage system* shall be maintained so that,
(a) the *construction* of the *sewage system* remains in accordance with,
  (i) the basis on which the *construction* and use of the *sewage system* was approved or required under the Act or predecessor legislation, as the case may be, and
  (ii) the requirements of the manufacturer of the *sewage system*, and
(b) all components of the *sewage system* function in their intended manner.

(2) The land in the vicinity of a *sewage system* shall be maintained in a condition that will not cause damage to, or impair the functioning of, the *sewage system.*

8.9.3.3. Interceptors

r5 **(1)** Every grease *interceptor* referred to in Article 8.1.3.1. shall be maintained in accordance with CSA B481.4, "Maintenance of Grease Interceptors".

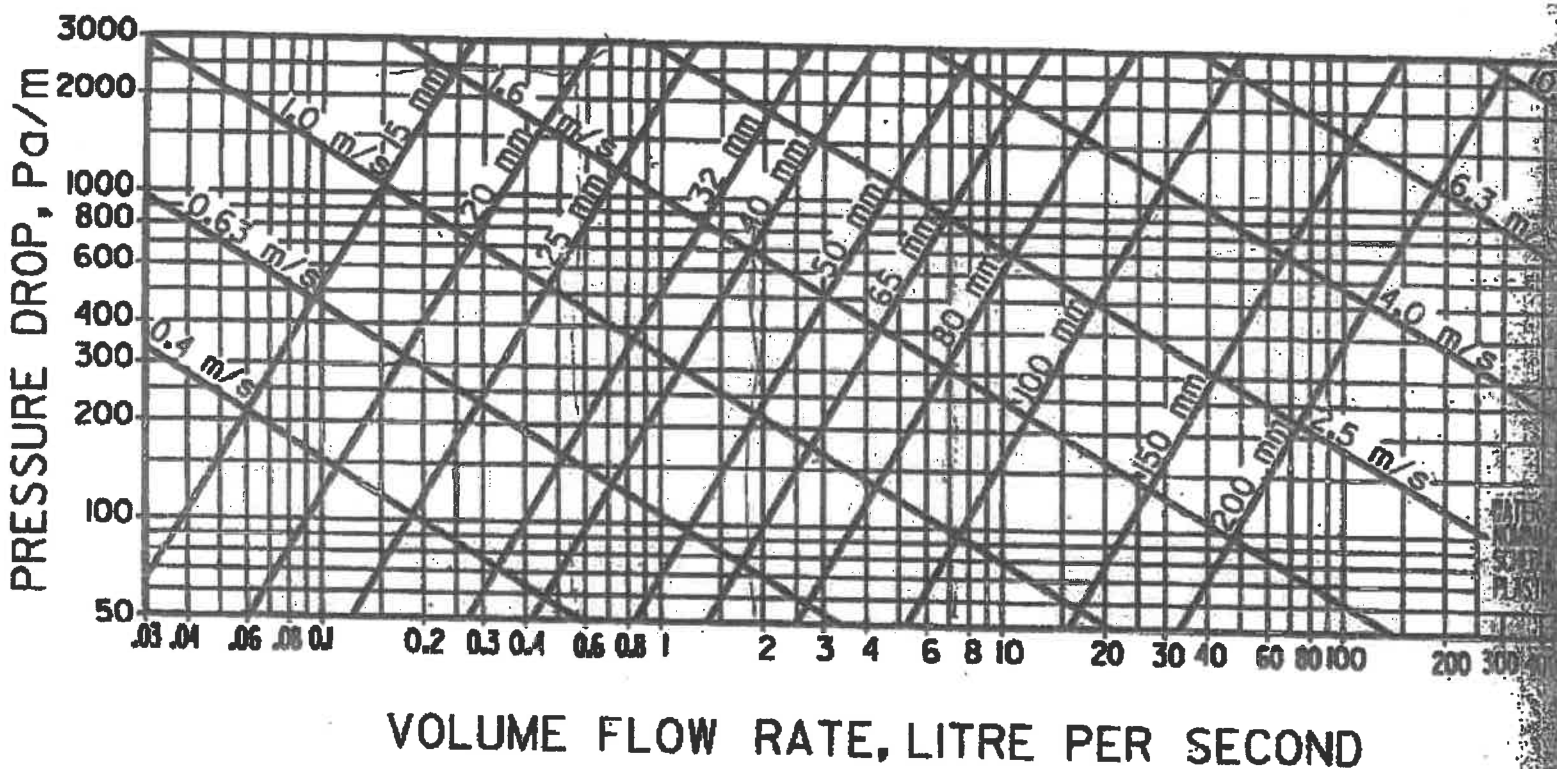
8.9.3.4. Class 4 Sewage Systems

(1) *Septic tanks* and other *treatment units* shall be cleaned whenever sludge and scum occupy one-third of the *working capacity* of the tank.

8.9.3.5. Pressurized Distribution Systems

(1) The pressure head at the furthest point from the pump in all *distribution pipes* shall be checked for compliance with Articles 8.7.6.1. and 8.7.8.2. and the design specification at least every 36 months.

APPENDIX "I"
ASHRAE TABLES & OTTAWA SEWER CAPACITY TABLES



Notes: 1. The chart is based on straight tees, i.e., branches A, B and C are the same size.

2. Pressure loss in desired circuit is obtained by selecting proper curve according to illustrations, determining the flow at the circled branch and multiplying the pressure loss for the same size elbow at the flow rate in the circled branch by the equivalent elbows indicated.

3. When the size of an outlet is reduced the equivalent [illegible] chart do not apply. Therefore, the maximum loss for any [illegible] will not exceed 2 elbow equivalents at the maximum flow [illegible] any branch of the tee.

4. The top curve of the chart is the average of 4 curves, one [illegible] circuits illustrated.

Fig. 3 Friction Loss for Water in Plastic Pipe (Schedule 80)

Hydraulic Elements of Smooth Walled Circular Sewers Flowing Full: 200 - 375 mm Diameter (n=0.013)

	FLOW (L/s)							
Actual (mm)	203.2		254		304.8		381	
Nominal (mm)	200		250		300		375	
%Sr.	Q	V	Q	V	Q	V	Q	V
8.1	97.28	[illegible]						
7	[illegible]	2.70						
6	[illegible]	2.58	151.96	[illegible]				
5	76.51	2.36	135.72	2.74				
4.7	74.16	2.29	[illegible]	2.65	[illegible]	3.00		
4	68.43	2.11	124.06	2.45	201.06	2.77		
3.5	64.01	1.97	116.06	2.29	[illegible]	2.59	342.20	[illegible]
3	59.26	1.83	107.45	2.12	174.72	2.39	316.81	2.78
2	48.39	1.49	87.74	1.73	142.67	1.96	258.68	2.27
1	34.22	1.05	62.04	1.22	100.88	1.38	182.91	1.60
0.95	33.35	1.03	60.47	1.19	98.33	1.35	178.28	1.56
0.9	32.46	1.00	58.86	1.16	95.70	1.31	173.52	1.52
0.88	32.10	0.99	58.20	1.15	94.64	1.30	171.59	1.51
0.86	31.73	0.98	57.53	1.14	93.55	1.28	169.62	1.49
0.84	31.36	0.97	56.86	1.12	92.46	1.27	167.64	1.47
0.82	30.98	0.95	56.18	1.11	91.35	1.25	165.63	1.45
0.8	30.60	0.94	55.49	1.10	90.23	1.24	163.60	1.43
0.78	30.22	0.93	54.79	1.08	89.10	1.22	161.54	1.42
0.76	29.83	0.92	54.08	1.07	87.95	1.21	159.46	1.40
0.74	29.43	0.91	53.37	1.05	86.78	1.19	157.35	1.38
0.72	29.03	0.90	52.64	1.04	85.60	1.17	155.21	1.36
0.7	28.63	0.88	51.91	1.02	84.40	1.16	153.04	1.34
0.68	28.22	0.87	51.16	1.01	83.19	1.14	150.83	1.32
0.66	27.80	0.86	50.40	0.99	81.96	1.12	148.60	1.30
0.64	27.37	0.84	49.63	0.98	80.71	1.11	146.33	1.28
0.62	26.94	0.83	48.85	0.96	79.43	1.09	144.02	1.26
0.6	26.50	0.82	48.06	0.95	78.14	1.07	141.68	1.24
0.58	26.06	0.80	47.25	0.93	76.83	1.05	139.30	1.22
0.56	25.61	0.79	46.43	0.92	75.49	1.03	136.88	1.20
0.54	25.14	0.78	45.59	0.90	74.13	1.02	134.41	1.18
0.52	24.67	0.76	44.74	0.88	72.75	1.00	131.90	1.16
0.5	24.19	0.75	43.87	0.87	71.33	0.98	129.34	1.13
0.48	23.71	0.73	42.98	0.85	69.89	0.96	126.72	1.11
0.46	23.21	0.72	42.08	0.83	68.42	0.94	124.05	1.09
[illegible]	22.70	0.69	40.76	0.80	66.91	0.91	121.32	1.06
0.42	22.17	0.68	40.21	0.79	65.38	0.90	118.54	1.04
0.40	21.64	0.67	39.24	0.77	63.80	0.87	115.68	1.01
[illegible]	21.38	0.66	38.48	0.76	62.88	0.86	112.68	1.00
[illegible]	[illegible]	0.62	[illegible]	0.72	[illegible]	0.82	106.21	0.95
0.34	[illegible]	0.61	[illegible]	0.71	[illegible]	[illegible]	[illegible]	0.93
[illegible]	19.38	0.60	[illegible]	[illegible]	57.07	0.79	103.47	0.91
[illegible]			[illegible]	0.67	[illegible]	0.75	100.60	[illegible]
[illegible]			[illegible]	[illegible]	60.44	[illegible]	91.45	[illegible]
[illegible]			[illegible]	[illegible]	48.42	[illegible]	[illegible]	[illegible]
[illegible]					46.12	0.62	[illegible]	0.72
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]
0.17							75.42	0.66
0.16							73.10	0.64
0.15							70.84	0.62
0.14							68.44	0.60

Hydraulic Elements of Smooth Walled Circular Sewers Flowing Full: 450 - 675 mm Diameter (n=0.013)

	FLOW (L/s)							
Actual (mm)	457.2		533.4		609.6		685.8	
Nominal (mm)	450		525		600		675	
%Gr.	Q	V	Q	V	Q	V	Q	V
2.75	[illegible]	[illegible]						
2.5	470.25	2.88						
2.25	444.16	2.71	[illegible]	[illegible]				
2	[illegible]	[illegible]	[illegible]	[illegible]				
1.87	[illegible]	[illegible]	613.66	2.75	576.0	3.40		
1.8	[illegible]	2.45	601.54	[illegible]	[illegible]	2.94		
1.6	376.25	[illegible]	[illegible]	[illegible]	810.3	2.70	1108.2	[illegible]
1.5	364.2	2.22	[illegible]	2.46	784.6	[illegible]	1074.8	2.91
1.4	351.8	2.14	[illegible]	[illegible]	757.9	2.80	1037.6	2.81
1.3	338.1	2.07	[illegible]	[illegible]	730.4	2.50	999.9	2.71
1.2	325.12	1.98	461.4	2.30	701.7	2.40	960.6	2.60
1.1	311.55	1.90	[illegible]	2.11	671.8	2.30	919.7	2.49
1	297.43	1.81	440.66	2.01	640.6	2.19	876.9	2.37
0.9	282.17	1.72	425.65	1.90	607.7	2.08	831.9	2.25
0.85	274.22	1.67	413.64	1.85	590.5	2.02	808.5	2.19
0.8	266.0	1.62	401.30	1.80	572.9	1.96	784.4	2.12
0.75	257.5	1.57	[illegible]	1.74	554.7	1.90	759.4	2.06
0.7	248.8	1.52	375.87	1.68	535.9	1.84	733.7	1.99
0.65	239.7	1.46	361.72	1.62	516.4	1.77	707.0	1.91
0.6	230.3	1.40	347.59	1.56	496.2	1.70	679.3	1.84
0.55	220.5	1.34	332.73	1.49	475.1	1.63	650.4	1.76
0.5	210.32	1.28	317.25	1.42	452.9	1.55	620.1	1.68
0.45	199.52	1.22	300.97	1.35	429.7	1.47	588.3	1.59
0.4	188.11	1.15	283.76	1.27	405.1	1.39	554.6	1.50
0.35	175.95	1.07	265.43	1.19	378.9	1.30	518.8	1.40
0.33	170.85	1.04	257.73	1.15	368.0	1.26	503.5	1.36
0.32	168.2	1.02	253.8	1.14	362.4	1.24	496.1	1.34
0.31	165.6	1.01	249.80	1.12	[illegible]	1.22	488.3	1.32
0.3	162.91	0.99	245.74	1.10	[illegible]	1.20	480.3	1.30
0.29	160.17	0.98	241.6	1.08	[illegible]	1.18	472.2	1.28
0.28	157.38	0.96	237.41	1.06	[illegible]	1.16	464.0	1.26
0.27	154.5	0.94	233.13	1.04	[illegible]	1.14	455.7	1.23
0.26	151.6	0.92	228.77	1.02	[illegible]	1.12	447.1	1.21
0.25	148.72	0.91	224.33	1.00	[illegible]	1.10	438.5	1.19
0.24	145.71	0.89	219.8	0.98	[illegible]	1.08	429.6	1.16
0.23	142.64	0.87	215.17	0.96	307.2	1.05	420.6	1.14
0.22	139.51	0.85	210.44	0.94	300.4	1.03	411.3	1.11
0.21	136.30	0.83	205.60	0.92	[illegible]	1.01	401.9	1.09
0.195	131.34	0.80	198.12	0.89	[illegible]	0.97	387.2	1.05
0.19	[illegible]	0.79	[illegible]	[illegible]	279.2	[illegible]	[illegible]	1.03
0.18	[illegible]	0.77	190.35	[illegible]	271.8	[illegible]	372.1	1.01
0.17	122.68	0.75	184.99	[illegible]	264.1	[illegible]	361.6	[illegible]
0.16	118.97	0.72	179.45	[illegible]	256.2	[illegible]	350.8	[illegible]
0.15	115.20	0.70	173.76	0.78	248.1	[illegible]	[illegible]	[illegible]
0.14	112.0	0.68	168.90	0.75	240.7	[illegible]	327.5	0.90
0.122	[illegible]	[illegible]	[illegible]	0.72	222.7	[illegible]	318.8	[illegible]
0.12	[illegible]	[illegible]	[illegible]	0.70	221.9	0.76	306.5	[illegible]
0.113	[illegible]	0.61	150.62	0.67	215.3	0.74	294.8	[illegible]
0.111	63.00	0.60	148.45	0.67	213.4	0.73	292.2	0.79
0.10			143.55	0.64	205.1	0.70	280.7	0.76

APPENDIX "J"
BOUNDARY CONDITIONS
& HGL

Michael Jans

From:	Alvey, Harry [Harry.Alvey@ottawa.ca]
Sent:	August-07-13 1:07 PM
To:	'Michael Jans'
Cc:	Fitzpatrick, Anne
Subject:	RE: 5574 Rockdale, vars

Good Afternoon Michael;

Here are the water boundary conditions as you requested;

The boundary conditions depend strongly on pump selection. Ignoring fires, minimum pressure actually occurs during basic (average) demand conditions when the duty pump is running. During peak hour or fire conditions, the duty pump does not operate. Larger capacity pumps with higher discharge pressures operate during these conditions.

Boundary conditions at the site are as follows:

Basic Day average= 115.4 m
Minimum pressure during Basic Day = 108.4m
Peak Hour on Max Day = 119.3 m

The system is not designed to supply the required fire demand. The development will need to consider the fire supply limitation, adjust building design accordingly, and/or provide additional on-site fire fighting measures. Below I have provided two boundary conditions based on fire flows that would result in the range of roughly 20 psi and above at the property.

FF = 95 L/s, Max Day + Fire = 93.6 m (~21 psi)
FF = 90 L/s, Max Day + Fire = 98.3 m (~28 psi)

For the record, a 3 hour fire flow of 95 L/s at max day would drop the pump station clearwells to 30% full, assuming a starting point of 75%.

If you have any questions or need any additional information let me know.

Sincerely;

Harry

Harry R. Alvey
Senior Infrastructure Approval Engineer
Development Review Rural Services

APPENDIX "K"
SITE SERVICING CHECKLIST

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- N.A. ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- N.A. ☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☒ Summary of Pre-consultation Meetings with City and other approval agencies.
- N.A. ☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.
- N.A. ☐ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- N.A. ☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

N.A. ☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.

N.A. ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.

N.A. ☐ Proposed phasing of the development, if applicable.

☒ Reference to geotechnical studies and recommendations concerning servicing.

☒ All preliminary and formal site plan submissions should have the following information:

- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

4.2 Development Servicing Report: Water

N.A. ☐ Confirm consistency with Master Servicing Study, if available

☒ Availability of public infrastructure to service proposed development

N.A. ☐ Identification of system constraints

☒ Identify boundary conditions

☒ Confirmation of adequate domestic supply and pressure

N.A. ☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.

N.A. ☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.

N.A. ☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

☒ Address reliability requirements such as appropriate location of shut-off valves

N.A. ☐ Check on the necessity of a pressure zone boundary modification.

N.A. ☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

N.A. ☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.

N.A. ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

N.A. ☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

N.A ☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).

N.A. ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.

N.A. ☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.

☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

☒ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)

N.A. ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.

N.A. ☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.

N.A. ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).

N.A. ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.

N.A. ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.

N.A. ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

N.A. ☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

☒ Analysis of available capacity in existing public infrastructure.

N.A. ☐ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

☒ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.

N.A. ☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

N.A. ☐ Set-back from private sewage disposal systems.

N.A. ☐ Watercourse and hazard lands setbacks.

N.A. ☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

N.A. ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

- [x] Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- [x] Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- [x] Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- N.A. [ ] Any proposed diversion of drainage catchment areas from one outlet to another.
- N.A. [ ] Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- N.A. [ ] If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.
- N.A. [ ] Identification of potential impacts to receiving watercourses
- [x] Identification of municipal drains and related approval requirements.
- [x] Descriptions of how the conveyance and storage capacity will be achieved for the development.
- [x] 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.
- N.A. [ ] Inclusion of hydraulic analysis including hydraulic grade line elevations.
- [x] Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- N.A. [ ] Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- N.A. [ ] Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

N.A. ☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.

N.A. ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

N.A. ☐ Changes to Municipal Drains.

N.A. ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

☒ Clearly stated conclusions and recommendations

☒ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

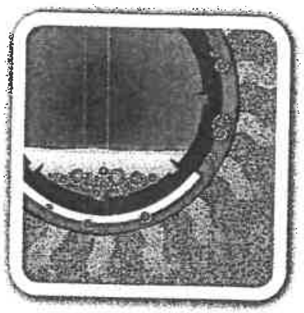
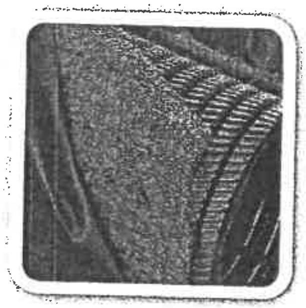
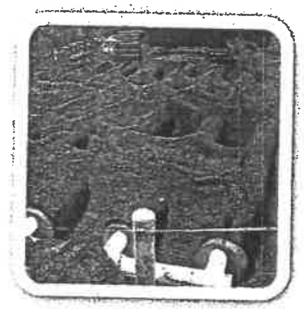
☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX "L"
EROSION AND SEDIMENT CONTROL

APPENDIX "M"
ENVIRO SEPTIC DESIGN PARAMETERS

ADVANCED ENVIRO SEPTIC®

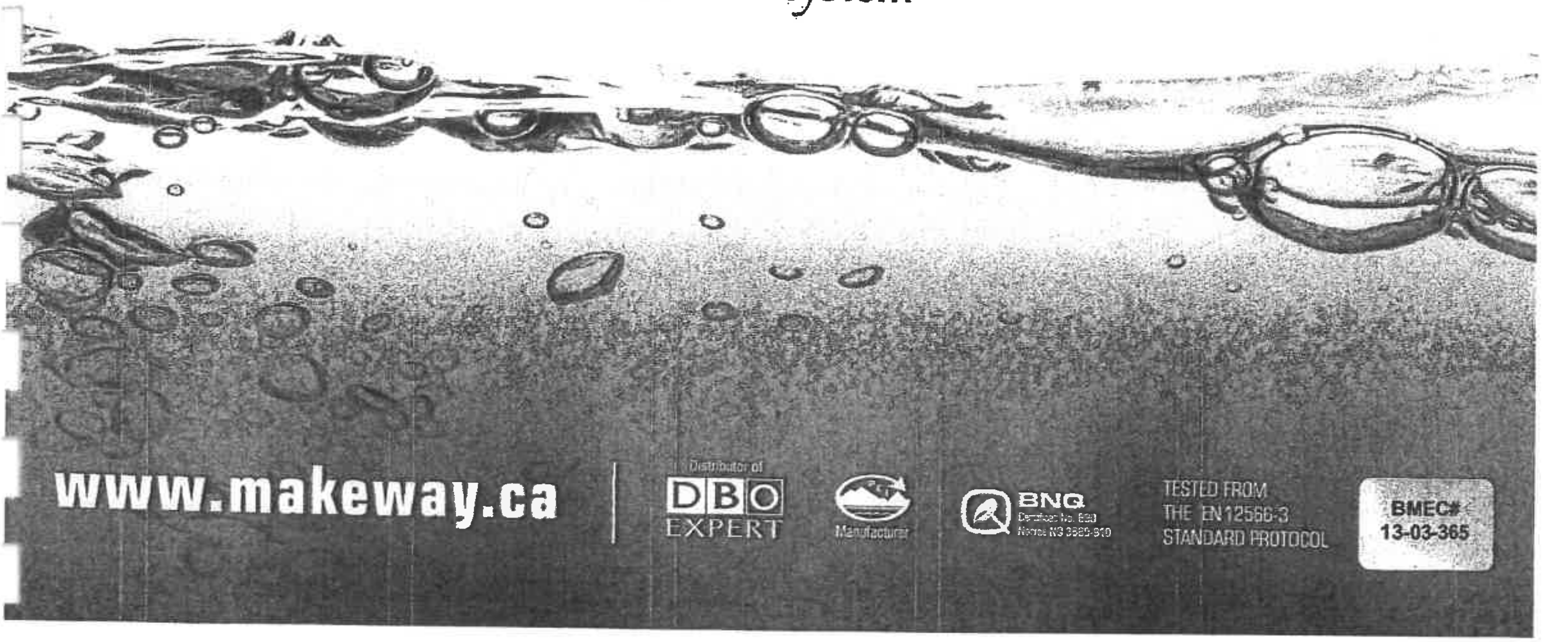
We reinvent the way to treat and evacuate wastewater

Biological and **ecological** treatment system

No moving parts | No electricity | No mantle

The simplest, most cost effecient tertiary quality
Class 4 system



Approved as an alternative to a Class 4 System producing Tertiary Quality Effluent

Over 100,000 systems installed!

Approved in Canada, the USA, Mexico and Europe

The Enviro-Septic® System is easy to install, does not require a stone layer, does not require a mantle, does not require hydro if gravity flow is achieved, no moving parts, no media to replace, and now is priced similar to that of a conventional, pipe and stone system.

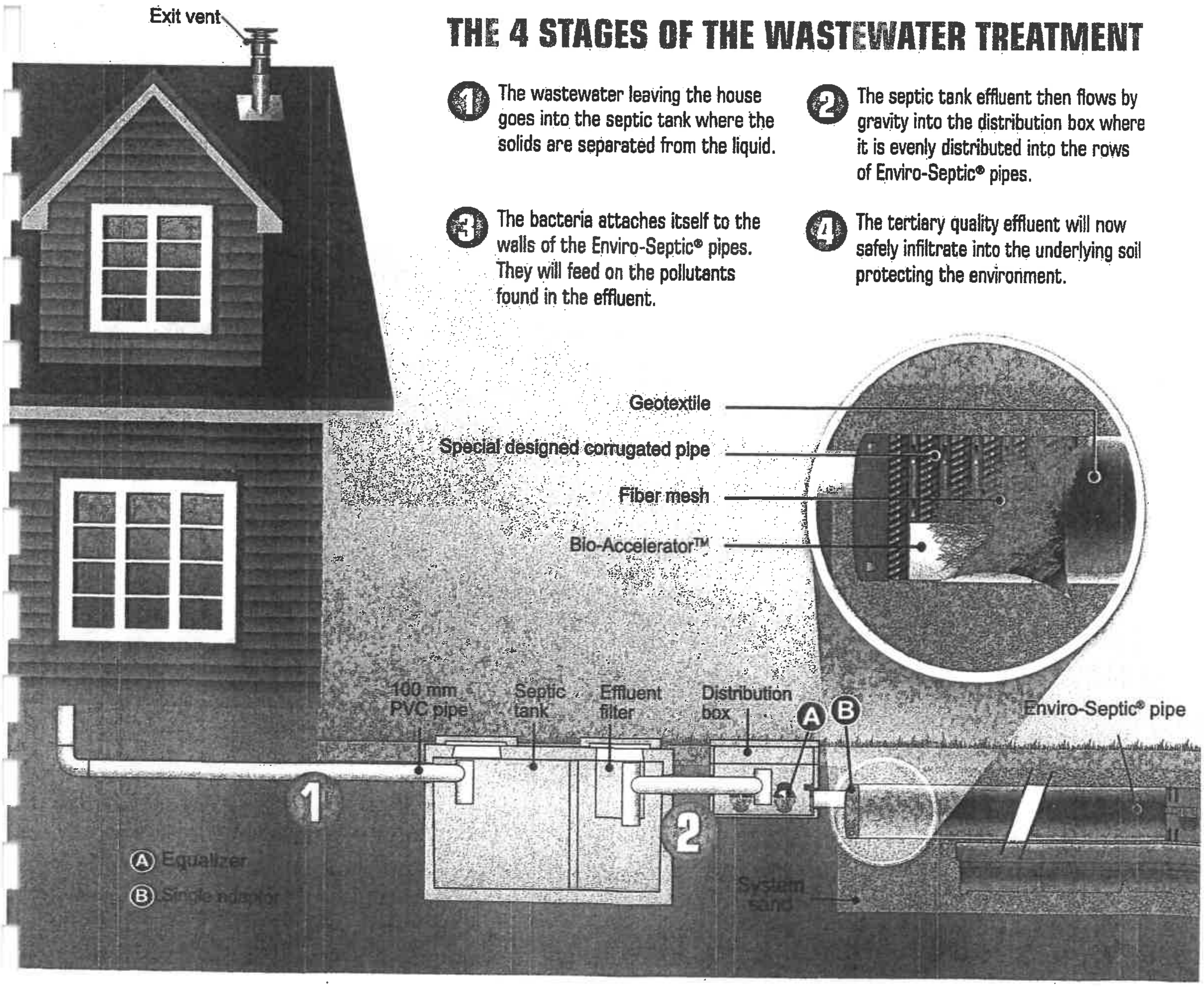
The system requires system sand which is readily available at most sand and gravel suppliers across Ontario. In some case System Sand is priced below filter sand or septic sand.

Looking for a cost effective and efficient system that produces tertiary quality effluent?

BMEC Authorization & Design Information Available

THE 4 STAGES OF THE WASTEWATER TREATMENT

1. The wastewater leaving the house goes into the septic tank where the solids are separated from the liquid.
2. The septic tank effluent then flows by gravity into the distribution box where it is evenly distributed into the rows of Enviro-Septic® pipes.
3. The bacteria attaches itself to the walls of the Enviro-Septic® pipes. They will feed on the pollutants found in the effluent.
4. The tertiary quality effluent will now safely infiltrate into the underlying soil protecting the environment.



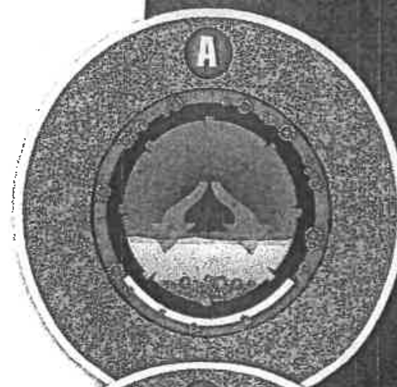
The Enviro-Septic® pipe is a patented product comprised of four components

- A cylindrical pipe made of high density polyethylene. The walls of the pipe are corrugated to increase the surface area for heat transfer. They are also perforated in order to let the effluent flow out. Each corrugation has a unique notched design which encourages the flow of air around the pipe. The flow of air is necessary for the proliferation of the bacteria that is responsible for the treatment of the wastewater.
- The Bio-Accelerator™ allows for a fast ramp-up time.
- A randomly oriented fiber mesh covers the pipe, facilitates the supply of oxygen and acts as a support structure for the biomass.
- A non-woven geotextile membrane is sewn around the pipe to prevent sand from entering the pipe.

ENVIRO-SEPTIC® PROCESS

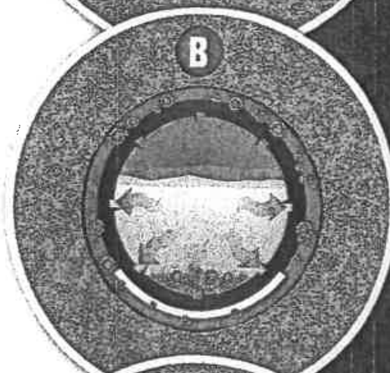
A The wastewater from the septic tank will flow by gravity into a distribution box equipped with equalizers. From the distribution box the wastewater is evenly distributed into the rows of Enviro-Septic® pipe.

The effluent arriving into the Enviro-Septic® pipe is cooled to ground temperature. The corrugations of the pipe facilitate this process by providing a large surface area for heat exchange. The system acts as an underground radiator. The cooling process encourages the separation of greases and some of the suspended solids. The solids, that are lighter than water, float to the surface as foam. The heavier solids will end up at the bottom of the pipe to create scum. These solids remain inside the pipe and helps prevent the soil from becoming clogged.

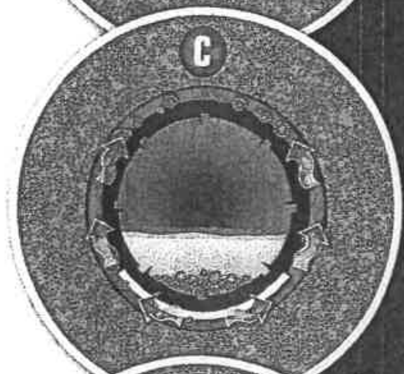


B The effluent leaves the pipe through the perforations found on the entire circumference of the pipe. Afterwards, it works its way through the mat of plastic fibers where the bacteria have settled to treat the additional amount of suspended solids. The mat of plastic fibers is conditioned by the liquid level fluctuations inside the pipe, which is caused by the peak periods of water use in the house. This aerobic/anaerobic condition encourages the proliferation of the bacteria performing the treatment.

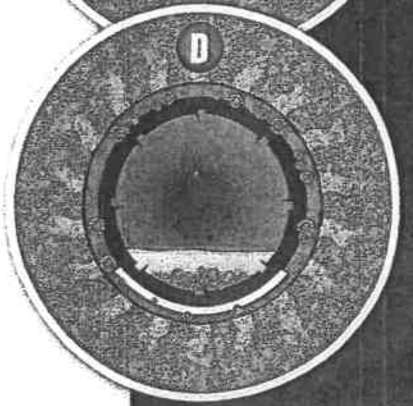
This process is similar to the deterioration of a wood picket fence. The deterioration always starts at the ground level where the humidity conditions change from day to day, and where the bacteria accelerate the wood's deterioration.

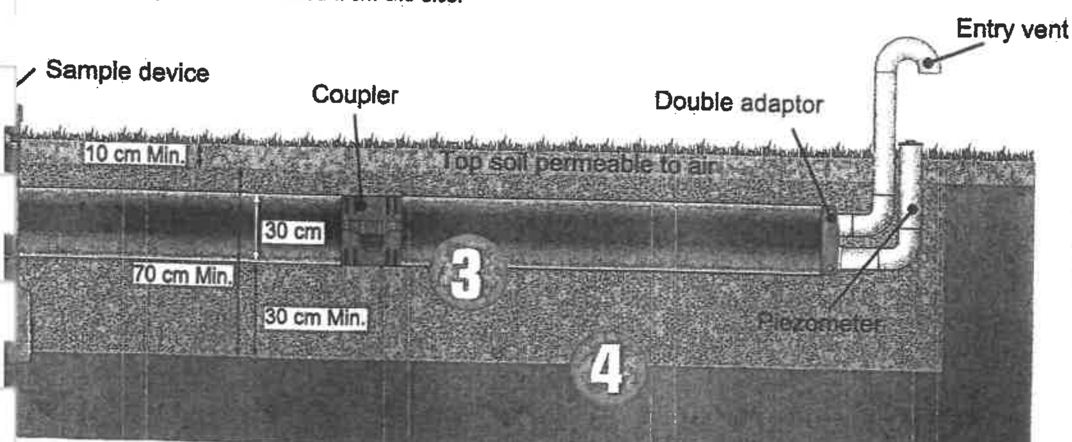


C The effluent travels through the geo-textile where another layer of bacteria is forming on the internal surface. By capillary action, the geotextile and the surrounding sand gather and distribute the effluent on the pipe's circumference, which facilitates the evacuation of water to the surrounding ground. This phenomenon can be compared to the wick of an oil lamp in which the fuel moves towards the area where the combustion occurs.



D The treatment continues as the effluent passes through the system sand that surrounds the Enviro-Septic® pipe. When the water finally reaches the receiving soil, almost all of the contaminants have been removed from the water. It thus infiltrates into the ground much more easily, to be evacuated from the site.



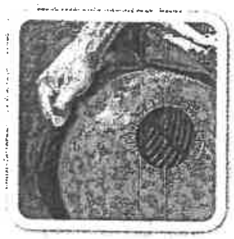


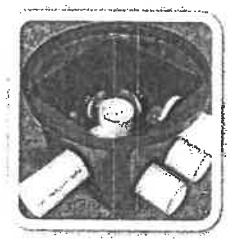
Enviro-Septic® System advantages

- Due to the multiple configurations possible, it offers a large design flexibility.
- The installation is quick, easy, and does not require any special tools or filtering media that require periodic replacement.
- It can be installed in sloped areas without the need of supplementary embankments. This reduces the costs and provides an aesthetically pleasing finished product.
- Excellent QUALITY/DURABILITY/PRICE ratio.
- No mantle required

Enviro-Septic® System characteristics

- It makes it possible to build an effective infiltration system having a longer service life compared to traditional systems.
- The installation is quick, easy, and does not require any special tools.
- A system that forgives! The round shape of the biomat which has established on the circumference of the pipe encourages the rejuvenation of the treatment and evacuation capacities following improper use of the system.
- A tested technology: more than 100 000 installations to date in North America.





MAKEWAY

ENVIRONMENTAL TECHNOLOGIES INC.

Make-Way Environmental Technologies • P.O. Box 1869, Exeter, Ontario, Canada NOM 1S7

Tel: 519 235-1176 • Toll free: 1 866 MAKEWAY (625-3929) • Cell: 519 709-0681

Fax: 519 235-0570 • Email: bert@makeway.ca • **www.makeway.ca**

PROTECTING OUR ENVIRONMENT

SYSTÈME ENVIRO)SEPTIC SYSTEM

DBO EXPERT MAKEWAY

Enviro-Septic Configuration Simulator - BMEC Authorization of September 25th 2008

For leaching bed Version 1.3

Project Name: Apartment Building

Designer Name: Bergeron Const.

21/05/2015

Line	Information required or element calculated	Enter proper information in the green cells	Units	Then validate the configuration	Instructions / comments
1	Soil percolation time (T-Time)	6	Min/cm	OK	Enter the receiving soil T-Time.
2	Enter Enviro-Septic System Design Flow	9900	L/d	OK	Enter the Enviro-Septic System Design Flow as determined from 8.2.1.3 of the Ontario On-Site Sewage Systems Code.
3	*S_{min} - Minimum Vertical Separation*	0.6	m		Minimum Vertical Separation as measured from the bottom of the Enviro-Septic System sand to: High ground water table or Bedrock or Soil with a percolation time (T) greater than 50 cm/min.
4	Dept of the receiving soil	1.2	m	OK	Enter the dept of the receiving soil from the surface (original grade) to: High ground water table or Bedrock or Soil with a percolation time (T) greater than 50 cm/min. If receiving soil has a T-Time > 50 min/cm, enter 0.
5	Dept of the excavation	0.6	m	OK	Enter the dept at which the base of the system will be installed. If imported sand is used under the Enviro-Septic System, enter the dept at which the imported sand is installed. If the system or the imported sand layer are installed at the surface (original grade), the value is 0 .
6	Natural Slope of the ground	1	%	OK	The slope must be 25 % or less. For a flat land, the slope is O%.
7	*D_s - Dept of receiving soil under the excavation*	0.6	m	OK	This value represent the thickness of receiving soil remaining after excavation before the high ground water table or bedrock or soil with a percolation time (T) greater than 50 cm/min.
8	I_S -Thickness of the imported sand layer (if used)	0	m	OK	Enter the dept of receiving soil still in place after installation between the base of the system or the imported sand layer and the high ground water table or bedrock or soil with a percolation time (T) greater than 50 cm/min.
9	*S_o - Separation distance*	0.6	m	OK	This value represent the thickness of soil and imported sand (when used) between the system base and the ground water table or bedrock or soil with a percolation time (T) greater than 50 cm/min.
10	*Minimum number of Enviro-Septic Pipes*	110	ESP		This value represent the minimum number of Enviro-Septic pipes required to treat the daily flow of Septic Tank Effluent using formula Q/90.
11	*Minimum length of Enviro-Septic Pipes*	335.5	m		This value represent the minimum length of Enviro-Septic pipes required to treat the daily flow of Septic Tank Effluent using formula 3,05*(Q/90).
12	*Minimum Enviro-Septic Contact Area*	148.5	m^2		This value represent the minimum Enviro-Septic contact Area using formula QT/400
13	Number of rows of Enviro-Septic Pipes	20	Rows	OK	Enter the number of rows of the configuration wanted.
14	Number of Enviro-Septic Pipes per row	5.5	ESP	OK	Enter the number of pipes per row for the configuration wanted. This number should equal or greater than 2 without going over 10.
15	*Total number of Enviro-Septic Pipes*	110	ESP	OK	This value represent the product of the number of rows by the number of pipes per rows (line 12 x line 13). An error message will appear if the result is smaller than the minimum number of pipes required shown at line 10.

16	*Total length of Enviro-Septic Pipes*	335.5	m		This value represent the product of the total number of pipes required by the length of one pipe.
17	*Total length of a row of Enviro-Septic Pipes*	16.78	m		This value represent the product of the number of pipes per row by the lenght of one pipe.
18	Number of sections	1	section(s)	OK	The number of section chosen must allow even distribution of rows between sections (Ex. 9 rows can be divided in 3 section of 3 rows, but 8 rows can't be divided in 3 sections).
19	*Suggested E_{CC}*	*0.5*			Suggested Center to Center spacing calculated automatically based on an equal distribution of the rows of pipes. The minimum value is 0,45 m.
20	E_{CC} - Center to Center Spacing	0.45	m	OK	Enter the Center to Center Spacing. The minimum ECC is 0,45 m
21	*Suggested E L*	*0.45*			Suggested Lateral extension spacing calculated automatically based on the Center to Center Spacing. The minimum value is 0,45 m. When Ecc is 0,9 m or above, EL is half Ecc.
22	E L - Lateral Extension Distance	0.45	m	OK	Lateral extension spacing needs to be 0,45 or more.
23	*N/A*	N/A			When slope is more than 3%, the Lateral extension spacing is larger downhill than uphill. The EL2 is calculated automatically and is equal to the Center to Center Spacing.
24	*Suggested E_E*	*0.3*			Suggested Extremity extension spacing calculated automatically based on the Center to Center Spacing. The minimum value is 0,3 m. When Ecc is 0,9 m or above, EE is half Ecc. - 0,15 m.
25	E_E - Extremity Extension Distance	0.3	m	OK	Extremity extension spacing needs to be 0,3 or more.
26	*L - Length of one section of the Enviro-Septic System*	17.38	m		This value represent the length of a row of pipes plus the two Extremity Extension Distances
27	*W - Width of one section of the Enviro-Septic System*	9.45	m		This value represent the width of a section including the Center to Center Spacing and the Lateral Spacing.
28	*Total Enviro-Septic Contact Area per section*	164.19	m^2		This value represent the total Enviro-Septic Contact Area for each independant section.
28	*Total Enviro-Septic Contact Area*	164.19	m^2	OK	This value represent the total Enviro-Septic Contact Area.
29	*Hydraulic Loading Rate (HLR)*	60.29	$L/m^2.d$		The Hydraulic Loading Rate represent the volume of water per square meter per day based on the Total Design Daily Flow and the Total Enviro-Septic Contact Area.
30	*Lateral height of the system if partially or completely above ground*	0.30	m	Partially Above Ground System	This value represents the height of the system above ground on the limit of the contact area or, in other words, where the 1:3 lateral backfill starts. The height may be a little bit more in the center of the system to keep a small slope on top for rainwater evacuation.
31	*S_E - Total length of System Sand Extension*	N/A	m		The value represents the length of the down slope sand extension when it is required (for slope above 10 %)
32	*W2 - Width of the Enviro-Septic System including System Sand Extension*	N/A			The value represents the width of the system including sand extension when it is required (for slope above 10 %)
33	*Estimation of the Volume of System Sand Required*	90.8	m^3		The volume of system sand required is the product of the length by the width by the number of section and by the thickness of the sand layer from which we subtract the volume of the Enviro-Septic Pipes.
34	*Estimation of the Volume of Imported Sand Required*	0.0	m^3		The volume of imported sand required is the product of the length by the width by the number of section and by the thickness of the imported sand layer enter on line 6.
35	**Final Configuration Validation**			OK	"OK" will be shown when all Enviro-Septic design rules of the configuration simulator have been met.

Attention: The designer is responsible to conform to all applicable laws and to all Enviro-Septic design rules. This simulator is provided free of charge as a configuration development tool and the user understands that DBO Expert inc. cannot be held responsible for errors or omissions because of this service.

SYSTÈME ENVIRO)SEPTIC SYSTEM

DBO EXPERT MAKE WAY ENVIRONMENTAL TECHNOLOGIES INC

Project:	Apartment Building		
Designer:	Bergeron Const.	Date:	21/05/2015

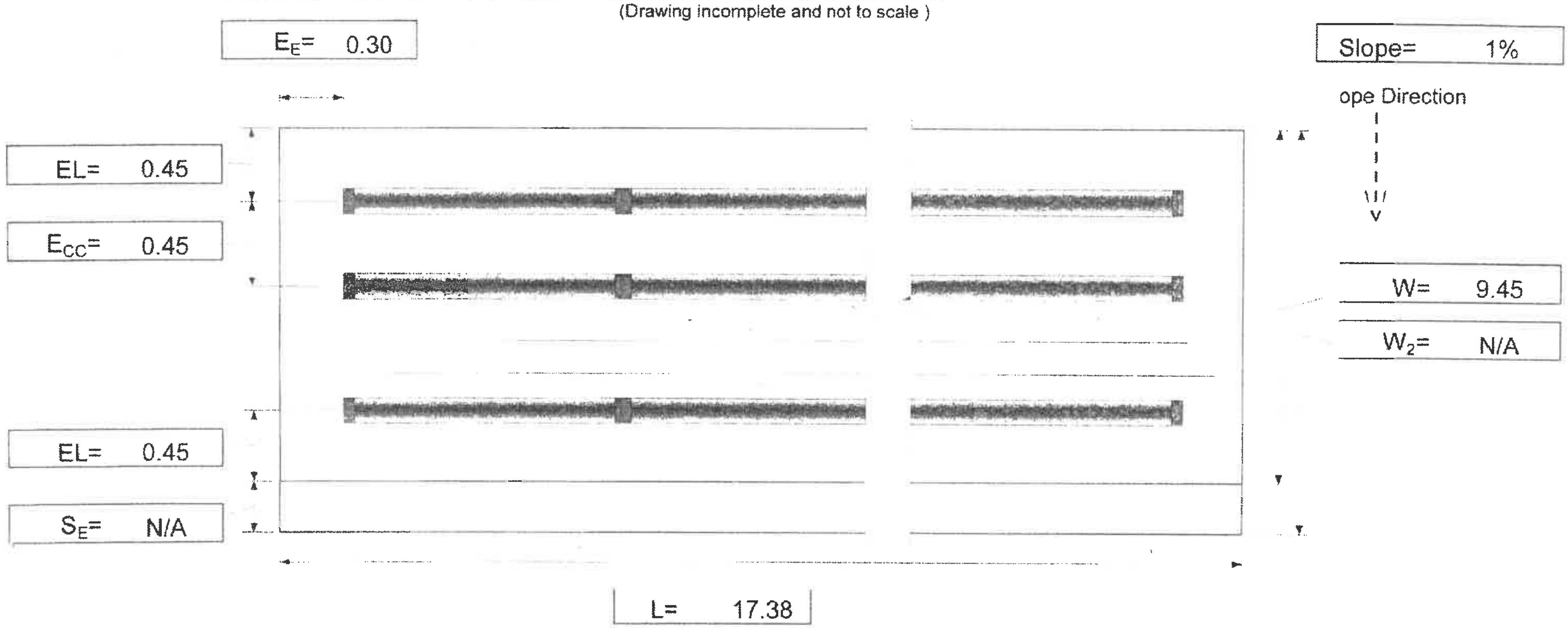
Element	Value	Units
Soil percolation time (T-Time)	6	Min/cm
Enviro-Septic System Design Flow	9900	L/d
Number of rows of Enviro-Septic Pipes	20	Rows
Number of Enviro-Septic Pipes per row	5.5	ESP
Total number of Enviro-Septic Pipes	110	ESP
Total length of Enviro-Septic Pipes	16.775	m
Number of sections	1	section(s)
Total Enviro-Septic Contact Area	164.2	m^2
Hydraulic Loading Rate (HLR)	60.3	$L/m^2.d$
Estimation of the Volume of System Sand Required	90.8	m^3
Estimation of the Volume of Imported Sand Required	0.0	m^3

Number of sections:	1

Legend	
D_S	Depth of receiving soil before limiting condition
E_{CC}	Center to Center Spacing
E_E	Extremity Extension Distance
E_L	Lateral Extension Distance
E_{L1}	Lateral Extension Distance Up-hill (Sloped system)
E_{L2}	Lateral Extension Distance Down-hill (Sloped system)
I_S	Thickness of imported sand layer
L	Length of one section of the Enviro-Septic System
S_D	Separation distance under the system
S_E	Sand Extension - Slope of more than 10%
S_{Min}	Minimum Vertical Separation distance form the base of the system to Rock, Clay or Water Table
W_1	Width of one section of the Enviro-Septic System
W_2	Width Enviro-Septic System with Sand Extension (when applicable)

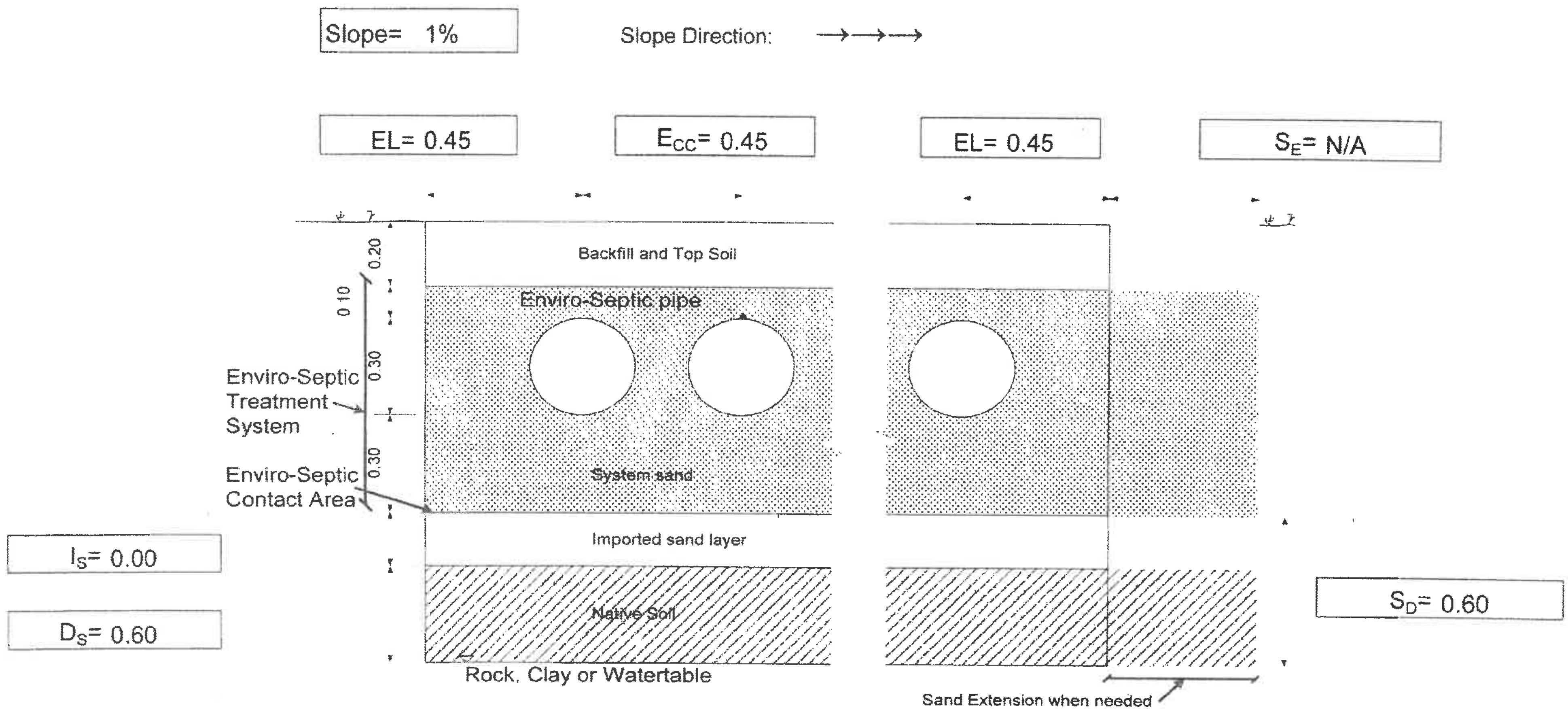
Top view of system (One section if multiple section system)

(Drawing incomplete and not to scale)



System Cross section (One section if multiple section system)

(Drawing incomplete and not to scale)



Attention: **The designer is responsible to conform to all applicable laws and to all Enviro-Septic design rules. This simulator is provided free of charge as a configuration development tool and the user understands that DBO Expert inc. cannot be held responsible for errors or omissions because of this service.**

777 Bay Street, 2nd Floor
Toronto, Ontario, M5G 2E5

Tel: 416 585 4234
Fax: 416 585 7531
Web: www.obc.mah.gov.on.

Ontario

Building Materials Evaluation Commission
Commission d'évaluation des matériaux de construction

Date of Authorization	July 26, 2001
BMEC Authorization Number	BMEC 01-08-260
BMEC Application	A2000-19
BMEC Application Number	A 2006-15
Date of Amendment	July 27, 2006

AUTHORIZATION REPORT – The Whitewater Area Bed System

1. Applicant

Delta Environmental Products
P.O. Box 969
Denham Springs, LA
USA, 70727

Tel: 800 219-9183
Fax: 225 664-9467

2. Manufacturing

Delta Environmental Products, Inc.
8285 Florida Blvd
Denham Springs, LA, USA, 70726

Canwest Tanks & Ecological Systems.
11975 Old Yale Road Surrey
BC, V3W 3X4

3. Description

The Whitewater Area Bed System primarily consists of a pre-treatment tank, a tertiary treatment unit, an effluent filter and an area bed.

Delta Environmental Products Inc.'s tertiary treatment units permitted for use with this system are referenced in the Supplementary Guidelines to the Building Code, as amended, as meeting tertiary quality effluent criteria, and include models FD 50 FF, DF 60 FF, DF 75 FF, DF 100 FF, DF 150 FF and DF 150 x 2.

An effluent filter is required downstream of the treatment unit. The specification of the effluent filter may vary depending on the area bed system design, and the filter models permitted for use with this Area Bed are located in Section 4.1. of this authorization.

The area bed is comprised of two parts: the stone layer and the sand layer. The sand layer of an area bed is sized in consideration of the soil it rests on, and under certain conditions it may be required to be laterally extended. This lateral sand extension is known as the mantle.

The effluent is sent to the stone layer, either by gravity or by a pump, via a pipe. This pipe leads from the treatment unit and terminates at the distribution box or header. From the distribution box or header, the effluent is sent to a series of perforated distribution pipes that run through the stone layer.

4. Authorization Requested

The applicant seeks to have the Whitewater Area Bed System, which incorporates a treatment unit designed so that the effluent meets the tertiary effluent quality criteria referenced in Table 8.6.2.2.A. of the Building Code, authorized for use as a Class 4 System that is connected to an absorption system other than the leaching bed as referred to in Article 8.6.1.2. of the Building Code.

5. Assessment

Reports and assessment provided by the applicant demonstrate that if the Whitewater Area Bed System is constructed, installed, operated, maintained and monitored in accordance with the limitations of the manufacturer specifications and conditions stated in this authorization, a level of performance equivalent to that required of a class 4 sewage systems will be provided.

The following reports were submitted and reviewed are:

1. Whitewater Systems Owners Manual, Models DF 50, DF 60, DF 75, DF100 or DF 150.

2. Technical Background Information Memo relating to Canwest Tanks & Ecological Systems dated September 18, 2000.

3. CAN/CSA-B66-00 - Prefabricated Septic Tanks and Sewage Holding Tanks, Plumbing Products and Materials - a National Standard of Canada.

4. Operations, Specifications & Test Data on the Free Access Sand Filter - July 1999, including a February 16, 1998, NSF International Report on the Delta Environmental Products Inc. DF-40M and Free Access Sand Filter. Tested under the provisions of ANSI/NSF Standard 40.

5. The "Supplemental (Canadian Version) Owner's / Operator's Manual" dated September 1999, which incorporates a schedule of required maintenance to be conducted on the system every six (6), twelve (12) and twenty four (24) months.

6. NSF International Report on the evaluation of Delta products Inc., model DF 40- Wastewater Treatment System.

7. Whitewater Installation Operation and Maintenance Manuals.

8. Whitewater Service / Maintenance Agreement.

9. Whitewater Inspection Work Order.

10. Whitewater Treatment Units Pre-treatment Sizes, dated July 17, 2006.

11. Sample Drawings, Gunnell Engineering Ltd, dated July 7, 2006.

6. Authorization

A. The Area Bed System is authorized as an equivalent to other Class 4 sewage systems as referenced to in Section 8.7. "Leaching Beds" of the Building Code; all other requirements pertaining to the design, installation and construction are subject to the regulations of the Building Code, and to the following terms and conditions.

1.0. Definitions

A word or phase used in this Authorization has the following meaning for the purposes of this Authorization:

Area Bed means the part of a leaching bed comprised of a stone layer and the underlying unsaturated sand layer intended to further treat and distribute the effluent, and does not include the area referred to as the mantle.

Contact Area means the area of infiltrative surface, directly below the area bed, required to absorb the treated effluent into the underlying native soil, but does not include the area where the mantle, if required, comes into contact with the native soil.

Extended Contact Area means the area of the sand bed, as extended, and mantle, where required, to meet the necessary lateral extension such that the effluent is absorbed into the underlying soil

Infiltrative Surface means the area of interface where effluent migrates downward from the sand layer of the area bed and, if necessary, the mantle and passes into the native soil or leaching bed fill.

Mantle means the lateral extension of the area bed using imported leaching bed fill having a T time of 15 min/cm or less, but does not include the area referred to as the area bed, necessary to provide an area of hydraulic catchments in any direction in which the effluent entering the leaching bed fill will move horizontally such that effluent is treated and absorbed.

Raised or Partially Raised Area Bed means a sewage system in which any part of the area bed is above the natural ground elevation.

Uniform Distribution means the even dispersal of effluent throughout all areas of an area bed and adjoining mantle, if required, as it migrates down from the stone layer to the underlying sand layer to either the native soil or mantle comprised of imported soil.

Vertical Separation means the depth of unsaturated soil below a leaching bed as measured from the bottom of the absorption trench or the bottom of the stone layer to a limiting surface such as high ground water table, rock or soil with a percolation time greater than 50 min/cm.

2.0 Installation Requirements

2.1. This Authorization is valid only for Delta Environmental Products Inc.

2.2. Only Delta Environmental Products Inc. manufacturer trained and authorized agents or employees shall install, maintain and service the area bed system.

2.3. The Area Bed System shall be installed as per the manufacturer's installation instructions.

2.4. The Service and Maintenance Agreement prescribed by Sentence 8.9.2.3.(2) of the Building Code requires that the persons authorized by the manufacturer to service and maintain Area Bed System and who have entered into the agreement with the person operating the treatment unit, and shall:

2.4.1. conduct and record at least once during every twelve month period, an inspection and servicing as specified by the manufacturer of the Delta treatment unit, and provide a copy to the person operating the Area Bed System;

2.4.2. provide a copy of the Delta Environmental Products operation and maintenance manual revised, to the person operating the Area Bed System and to the authority having jurisdiction at the time of the permit application;

2.4.3. conduct sampling and testing in accordance with the requirements of Clauses 8.9.2.4.(1)(a) and (b) of the Building Code;

2.4.3.1. once during the first 12 months after the Area Bed is put into use, and

2.4.3.2. thereafter, once during every 48 month period after the previous sampling has been completed.

2.4.4. promptly submit the sampling test results to the person operating the Area Bed System.

2.5. Delta Environmental Products Inc. shall retain records of the sampling test results for each Area Bed System received pursuant to the terms and conditions set out in 2.4. above, for a period of 10 years and shall promptly forward copies of those records to a chief building official upon request.

3.0 System Requirements

3.1. All pipe connections in the system (i.e. treatment units, accessory treatment units, tanks, pumps and filters) where incorporated, shall be flexible and watertight.

3.2. The Delta Environmental Products Inc. treatment units used in the system shall use the daily design flows as referenced in Table 3.2.1. "Daily Design Flow",

Table 3.2.1.
Daily Design Flow

Treatment Unit Models	**Flow Range** measured in Litres	**Minimum Pre-treatment Tank Size** measured in Litres
DF 50	850 to 1900	1140
DF 60	1900 to 2300	1140
DF 75	2300 to 2900	1360
DF 100	2900 to 3800	1810
DF 150	3800 to 5700	3400
DF 150 x 2	5700 to 10 000	6800
Column 1	Column 2	Column 3

4.0. Design

4.1. The Area Bed System treatment units shall be fitted with an a bottomless sand filter or a BK-2000 filter, except

4.1.1. where the distribution of the effluent to the area bed is pressurized, GAG Sim/Tech 100 micron pressure filter, model number STF-100 and STF-100AZ, or a 100 micron Vortex filter shall be used.

4.2. An absorption system comprised of a stone layer overlying a sand layer and having a total minimum depth of 500 mm, and:

4.2.1. the stone layer shall be a minimum depth of 200 mm, and

4.2.2. the sand layer shall be a minimum depth of 250 mm and have a percolation time of 6 to10 min/cm.

4.3. The stone layer required by 4.2. above, shall have a minimum area as specified by the manufacturer but not less than:

4.3.1. where the total daily design sanitary sewage flow does not exceed 3000 L, the area shall be such that the loading on the surface of the stone layer does not exceed 75 L/m² per day, or

4.3.2. where the total daily design sanitary sewage flow exceeds 3000 L, the area shall be such that the loading on the surface of the stone layer does not exceed 50 L/m² per day.

4.4. The stone layer shall be rectangular in shape, with the long dimension parallel to the site contours.

4.5. The stone layer required by the terms and conditions set out in 4.2. above, shall be protected with a permeable geo-textile fabric in such a manner so as to prevent soil or leaching bed fill from entering the stone.

4.6. The bottom of the stone layer shall be at all points vertically separated at least 600 mm from the high ground water table, rock or soil with a T time of 6 or less, or greater than 50 min/cm; except:

4.6.1. where the underlying soil has a T time of between 6 and 50 min/cm, the bottom of the stone layer at all points may be reduced to 450 mm to rock, high water table, and soil having a T time of 50 min/cm.

4.7. The effluent shall be evenly distributed over the stone layer to within 600 mm of the perimeter edge of the stone layer using distribution pipes in accordance with the Building Code Appendix A-8.7.5.3.(2); or other means that achieves even distribution to within 600 mm of the perimeter edge of the stone layer.

4.8. The sand layer shall have a minimum area that is the greater of;

4.8.1. the area of the stone layer required by the terms and conditions set out in 4.4. above,

4.8.2. where the sand layer is installed in soil having a T time of 15 min/cm or less, the loading rate at the base of the area bed, shall be calculated using the formula $A = QT/850$ ($L/m^2/day$), or

4.8.3. where the sand layer is installed in or on soil having a T time of greater than 15 min/cm, that the sand layer be extended using imported leaching bed fill having a T time of not more than 15 min/cm, the construction of the extended sand layer, including the area bed and mantle shall:

4.8.3.1. be of a depth of at least 250 mm,

4.8.3.2. extend at least 15 m beyond the perimeter of the treatment unit, or distribution pipes if utilized, in any direction that the effluent entering the soil will move horizontally,

4.8.3.3. be calculated using the formula A = QT/400 or by using the example calculations as they are provided, in Table 4.8.3.3. "Combined Area Bed and Mantle Loading Rates", and

4.8.3.4. be rectangular in shape.

Where:

A is the area of contact in m^2 between the base of the sand layer and the underlying native soil,
Q is the total daily design sanitary sewage flow in litres, and
T is the percolation time of the underlying native soil in min/cm to a maximum of 50.

Table 4.8.3.3.

Combined Area Bed and Mantle Loading Rates Example Calculations

Loading Rate A = QT/400	
T of the native soil.	Loading rate ($L/m^2/day$)
≤ 15	27
20	20
30	13
40	10
≥50	8
Column 1	Column 2

(c) the Applicant, or the material, system or building design that is the subject matter of this Authorization, has failed to comply with any of the terms and conditions set out in this Authorization; or

(d) any Building Code provision relevant to this Authorization has been amended or remade.

5. Where the BMEC receives additional information concerning the material, system or building design authorized herein, the BMEC may review this Authorization and the BMEC may after the review amend or revoke this Authorization as in the opinion of the BMEC may be necessary.

Dated at Toronto this 27 day of July 2006.

BUILDING MATERIALS EVALUATION COMMISSION

Edward Link, P. Eng.
Vice-Chair, BMEC

4.9. Any Area Bed System that must be raised to meet the vertical separation distances required by the terms and conditions set out in 4.6. of this Authorization, shall meet the mantle requirements of the terms and conditions set out in 4.8., regardless of the T time of the native soil.

B.General Conditions

1. The use of the Area Bed System and as described in the specific terms and conditions set out in 6.A. must comply with the *Building Code Act, 1992* (the "Act") as amended or re-enacted from time to time and except as specifically authorized herein, with the Building Code.

2. A copy of this Authorization shall accompany each application for a building permit and shall be maintained on the site of the construction with the building permit.

3. The Applicant named in Part 1 hereof shall promptly notify the BMEC of:

   (a) the failure of the Applicant, or of the material, system or building design that is the subject matter of this Authorization, to comply with any of the terms and conditions set out in 6.A. above; or

   (b) the occurrence of any of the events described in conditions 6.B.4.(a) and (b)(ii) below.

4. The BMEC may amend or revoke this Authorization where it determines that:

   (a) any change has been made to:

      (i) the material, system or building design that is the subject matter of this Authorization;

      (ii) the address of the applicant specified in Part 1 of this Authorization; or,

      (iii) the ownership of the applicant specified in Part 1 of this Authorization.

   (b) the use of the material, system or building design authorized herein;

      (i) does not comply with the Act any relevant legislation as they may be amended or re-enacted from time to time; or

      (ii) provides an unsatisfactory level of performance, in situ.