Section 2.4. Drainage Systems

2.4.1. Application

2.4.1.1. General

1) This Section applies to *sanitary drainage systems*, *storm drainage systems*, *combined building drains* or *combined building sewers*.

2.4.2. Connections to Drainage Systems

2.4.2.1. Connections to Sanitary Drainage Systems

1) *Fixtures* shall be *directly connected* to a *sanitary drainage system*, except that

a) drinking fountains are permitted to be

i) *indirectly connected* to a *sanitary drainage system*, or

ii) connected to a *storm drainage system* provided that where the system is subject to *backflow*, a *backwater valve* is installed in the fountain *waste pipe* (See Note A-2.4.2.1.(1)(a)(ii) and (e)(vi).),

b) drainage pans on heating/cooling units are permitted to be connected to a *storm drainage system*, provided that where the system is subject to *backflow*, a *backwater valve* is installed,

c) a floor drain is permitted to be connected to a *storm drainage system*, provided it is located where it can receive only *clear-water waste* or *storm water*,

d) *fixtures* or appliances that discharge only *clear-water waste* are permitted to be connected to a *storm drainage system* or be drained onto a roof, and

e) the following devices shall be *indirectly connected* to a *drainage system:*

i) a device for the display, storage, preparation or processing of food or drink,

ii) a sterilizer,

iii) a device that uses water as a cooling or heating medium,

iv) a water operated device,

v) a water treatment device, or

vi) a drain or overflow from a *water system* or a heating system. (See Note A-2.4.2.1.(1)(a)(ii) and (e)(vi).)

2) The connection of a *soil-or-waste pipe* to a *nominally horizontal soil-or-waste pipe* or to a *nominally horizontal offset* in a *soil-or-waste stack* shall be not less than 1.5 m measured horizontally from the bottom of a *soil-or-waste stack* or from the bottom of the upper vertical section of the *soil-or-waste stack* that

a) receives a discharge of 30 or more *fixture units*, or

b) receives a discharge from *fixtures* located on 2 or more *storeys*.

(See Note A-2.4.2.1.(2).)

3) No other *fixture* shall be connected to a lead bend or stub that serves a water closet.

4) Where a change in direction of more than 45° occurs in a *soil-or-waste pipe* that serves more than one clothes washer, and in which pressure zones are created by detergent suds, no other *soil-or-waste pipe* shall be connected to it within a length less than

a) 40 times the *size* of the *soil-or-waste pipe* or 2.44 m maximum vertical, whichever is less, before changing direction, and

b) 10 times the *size* of the *nominally horizontal soil-or-waste pipe* after changing direction.

(See Note A-2.4.2.1.(4).)

5) Where a *vent pipe* is connected into the suds pressure zone referred to in Sentence (4), no other *vent pipe* shall be connected to that *vent pipe* within the height of the suds pressure zone. (See Note A-2.4.2.1.(4).)

2.4.2.2. Connection of Overflows from Rainwater Tanks

1) An overflow from a rainwater tank shall not be *directly connected* to a *drainage system*.

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2.4.2.3. Direct Connections

1) Two or more *fixture outlet pipes* that serve outlets from a single *fixture* that is listed in Clause 2.4.2.1.(1)(e) are permitted to be *directly connected* to a *branch* that

a) has a *size* of not less than 1.25 inches,

b) is terminated above the *flood level rim* of a *directly connected fixture* to form an *air break*, and Rev. 12717

c) is located within a single room or *suite*.

2) *Fixture drains* from *fixtures* that are listed in Subclauses 2.4.2.1.(1)(e)(i) and (ii) are permitted to be *directly connected* to a pipe that

a) is terminated to form an *air break* above the *flood level rim* of a *fixture* that is *directly connected* to a *sanitary drainage system*,

b) is extended through the roof when *fixtures* on 3 or more *storeys* are connected to it (see Note A-2.4.2.1.(1)(a)(ii) and (e)(vi)), and Rev. 12717

c) is located within a single room or *suite*.

3) *Fixture drains* from *fixtures* that are listed in Subclauses 2.4.2.1.(1)(e)(iii) to (vi) are permitted to be *directly connected* to a pipe that

a) is terminated to form an *air break* above the *flood level rim* of a *fixture* that is *directly connected* to a *storm drainage system*,

b) is extended through the roof when *fixtures* on 3 or more *storeys* are connected to it, and Rev. 12717

c) is located within a single room or *suite*.

2.4.2.4. Connections to Storm Drainage Systems

1) Except as provided in Sentence (2), *building* and site drainage shall connect to a *storm drainage system*. Rev. 13623 13760

2) *Building* and site drainage need not connect to a *storm drainage system* if

a) on-site *rainwater* management practices are employed and overflow is connected to a *storm drainage system*, and

b) *rainwater* does not create a hazardous condition or discharge upon or impact other lands or sites. (See Note A-2.4.2.4.(2).)

2.4.2.5. Rainwater Management Rev. 13760 14078

1) This Article shall apply to all *buildings*, except

a) *float homes*,

b) *marinas*,

c) retaining structures,

d) those to which Part 9 applies, as described in Sentence 1.3.3.3.(1) of Division A of Book I (General) of this By-law, and

e) those *buildings* used exclusively for *residential occupancy* containing no more than 8 principal *dwelling units*.

2) Except as provided by Sentences (6) and (7), the first 24 mm of *rainwater* in a 24 hour period from the site area shall be detained, and the detention volume requirement

a) shall be calculated as the volume of water that would be present if water 24 mm deep covered the entire site, and

b) may be reduced by any combination of the retention or other practices listed in Table 2.4.2.5., by the amounts in Column C of Table 2.4.2.5.

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Table 2.4.2.5.
Permitted Reductions to the Detention Volume Requirement
Forming Part of Sentence 2.4.2.5.(2)

Retention or Other Practice	Reduction to the Detention Volume Requirement		
	Maximum Permitted Reduction Column A	**Limit to Permitted Reduction** Column B	**Permitted Reduction** Column C
Landscape feature[1]	Area of, and area routed to, the landscape feature multiplied by 24 mm	*Rainwater* capture potential, calculated as *rainwater* storage potential in the growing medium (%) multiplied by the growing medium volume, plus as applicable the storage volume within a subsurface reservoir layer and the volume infiltrated into the subgrade during a 24 hour period.[3]	The lesser of Columns A and B
Vegetated roof assembly[2]	Area of, and area routed to, the *vegetated roof assembly* multiplied by 24 mm		The lesser of Columns A and B[4]
Alternate water source system	Area routed to the *alternate water source system* multiplied by 24 mm	Storage volume of the *alternate water source system*	The lesser of Columns A and B

Notes to Table 2.4.2.5.:
(1) Or other *acceptable* ground-level or subsurface based practice, such as permeable pavement or an infiltration tank.
(2) Or other *acceptable* roof-top based practice. For *vegetated roof assemblies*, see Article 3.1.14.4. and Article 5.6.1.2. of Division B of Book I (General) of this By-law.
(3) "*Rainwater* storage potential in the growing medium", "volume infiltrated into the subgrade during a 24 hour period" and "storage volume within a subsurface reservoir layer" shall be demonstrated by *acceptable* data or references.
(4) For a *vegetated roof assembly* from which the runoff is directed to an *alternate water source system*, the permitted reduction in the volume requirement shall equal Column A.

3) Except as provided by Sentences (6) and (7), the peak flow rate discharged to the *combined sewer* or *storm sewer* under post-development conditions shall not be greater than the peak flow rate discharged to the *combined sewer* or *storm sewer* under pre-development conditions, and shall be calculated using

a) the Rational Method,

b) the IDF curves in the City of Vancouver Engineering Design Manual, applying

i) for pre-development, the IDF curve prepared for pre-development estimates with a 5 year return period,

ii) for post-development, the 2100 IDF curve with a 10 year return period, and

iii) the inlet time specified in the City of Vancouver Engineering Design Manual, and

c) a composite runoff based on the percentages of different surfaces of the site area, applying the runoff coefficients from the City of Vancouver Engineering Design Manual. (See Note A-2.4.2.5.(3).)

4) An operating manual conforming to Article 2.2.1.9. is required for each of the *rainwater* management practices employed to satisfy the requirements of Sentences (2) and (3).

5) The *Chief Building Official* shall be provided with a document summarising the *rainwater* management practices employed to satisfy the requirements of Sentences (2) and (3), in the form prescribed by the *Chief Building Official*.

6) When there is an *existing building* on the same property, the site area used in Clauses (2)(a) and (3)(c) may be reduced to be proportional to the ratio of the *buildings'* greatest horizontal area within the outside surface of exterior walls.

7) The *Chief Building Official* may, in consultation with the *City Engineer*, relax the requirements of Sentences (2) or (3) in accordance with Sentence 1.5.2.10.(2) of Division C if

a) the *owner* demonstrates to the satisfaction of the *Chief Building Official* by a *subsurface investigation* that excavation is precluded or limited by soil contamination or other factors, and

b) it is impractical, in the opinion of the *Chief Building Official*, to meet the rainwater management requirements of Sentences (2) or (3).

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2.4.3. Location of Fixtures

2.4.3.1. Urinals

1) Urinals shall not be installed adjacent to wall and floor surfaces that are pervious to water. (See Article 3.7.2.6. of Division B of Book I (General) of this By-law.)

2.4.3.2. Restricted Locations of Indirect Connections and Traps

1) Indirect connections or any *trap* that may overflow shall not be located in a crawl space or any other unfrequented area.

2.4.3.3. Equipment Restrictions Upstream of Grease Interceptors

1) Except as provided in Sentence (2), equipment discharging waste with organic solids shall not be located upstream of a grease *interceptor*. (See Note A-2.4.3.3.(1).)

2) An organic solids *interceptor* is permitted to be installed upstream of a grease *interceptor*.

2.4.3.4. Fixtures Located in Chemical Storage Locations

1) A floor drain or other *fixture* located in an oil transformer vault, a high voltage room or any room where flammable, dangerous or toxic chemicals are stored or handled shall not be connected to a *drainage system*.

2.4.3.5. Macerating Toilet Systems

1) A macerating toilet system shall only be installed where no connection to a gravity *sanitary drainage system* is available.

2.4.3.6. Drains Serving Elevator Pits

1) Where a drain is provided in an elevator pit,

a) it shall be connected directly to a sump located outside the elevator pit, and

b) the drain pipe that connects the sump to the *drainage system* shall have a *backwater valve*.

2.4.4. Treatment of Sewage and Waste

2.4.4.1. Sewage Treatment

1) Where a *fixture* or equipment discharges *sewage* or waste that may damage or impair the *sanitary drainage system* or the functioning of a public or *private sewage disposal system*, provision shall be made for treatment of the *sewage* or waste before it is discharged to the *sanitary drainage system*.

2.4.4.2. Sewer Discharge

1) Sanitary and storm discharge shall conform to the Sewer and Watercourse By-law.

2) Except within health care facilities or for medical sterilization devices, no systems or equipment shall be installed that allow for the use of *potable* water to temper or dilute condensate discharged to the *sewer*. Rev. 13736

2.4.4.3. Interceptors

1) Where a *fixture* discharges *sewage* that includes fats, oils or grease and is located in a public kitchen, in a restaurant or in a *care or detention occupancy*, it shall discharge through a grease *interceptor*. (See Note A-2.4.4.3.(1).)

2) Where the discharge from a *fixture* may contain oil or gasoline, an oil *interceptor* shall be installed. (See Article 2.5.5.2. for venting requirements for oil *interceptors*.)

3) Where a *fixture* discharges sand, grit or similar materials, an *interceptor* designed for the purpose of trapping such discharges shall be installed.

4) *Interceptors* shall have sufficient capacity to perform the service for which it is provided.

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2.4.4.4. Neutralizing and Dilution Tanks

1) Where a *fixture* or equipment discharges corrosive or acid waste, it shall discharge into a neutralizing or dilution tank that is connected to the *sanitary drainage system* through

a) a *trap*, or

b) an indirect connection.

(See Note A-2.4.4.4.(1).)

2) Neutralizing and dilution tanks shall have a method for neutralizing the liquid.

2.4.5. Traps

2.4.5.1. Traps for Sanitary Drainage Systems

1) Except as provided in Sentences (2) to (5) and in Article 2.4.5.2., *fixtures* shall be protected by a separate *trap*.

2) One *trap* is permitted to protect

a) all the trays or compartments of a 2- or 3-compartment sink,

b) a 2-compartment laundry tray, or

c) 2 similar single compartment *fixtures* located in the same room.

(See Note A-2.4.5.1.(2).)

3) One *trap* is permitted to serve a group of floor drains or shower drains, a group of washing machines or a group of laboratory sinks if the *fixtures*

a) are in the same room, and

b) are not located where they can receive food or other organic matter.

(See Note A-2.4.5.1.(3).)

4) An *indirectly connected fixture* that can discharge only *clear-water waste* other than a drinking fountain need not be protected by a *trap*. (See Clause 2.4.2.1.(1)(e) for indirect connections.)

5) An *interceptor* with an effective water seal of not less than 38 mm is permitted to serve as a *trap*.
(See Note A-2.4.5.1.(5).)

6) Where a domestic dishwashing machine equipped with a drainage pump discharges through a direct connection into the *fixture outlet pipe* of an adjacent kitchen sink or disposal unit, the pump discharge line shall rise as high as possible to just under the counter and connect

a) on the inlet side of the sink *trap* by means of a Y fitting, or

b) to the disposal unit.

2.4.5.2. Sumps and Traps for Storm Drainage Systems

1) Where a *storm drainage system* is connected to a public *sewer*, a sump shall be installed between any opening in the system and the *sewer*, except that no *sump* is required if the opening is the upper end of a *leader* that terminates

a) at a roof that is used only for weather protection,

b) not less than 1 m above or not less than 3.5 m in any other direction from any air inlet, openable window or door, and

c) not less than 1.8 m from a property line.

(See Note A-2.4.5.2.(1).)

2) A floor drain that drains to a *storm drainage system* shall be protected by a *trap* that

a) is located between the floor drain and a *leader*, *storm building drain* or *storm building sewer*,

b) may serve all floor drains located in the same room, and

c) need not be protected by a *vent pipe*.

3) Where freezing conditions could cause *storm drainage systems* to freeze due to air circulation within the piping, a *trap* with a *cleanout* shall be installed in a heated location.

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2.4.5.3. Connection of Subsoil Drainage Pipe to a Storm Drainage System

1) A *subsoil drainage pipe* shall be connected to a *sump*. (See Note A-2.4.5.3.(1).)

2) The *sump* referred to in Sentence (1) shall be connected to a *storm sewer* or to a *combined sewer*.

3) The *sump* referred to in Sentence (1) shall not be connected to a *sanitary sewer*.

2.4.5.4. Location and Cleanout for Building Traps

1) Where a *building trap* is installed, it shall

a) be provided with a *cleanout* fitting on the upstream side of and directly over the *trap*,

b) be located upstream of the *building cleanout*, and

c) be located

i) inside the *building* as close as practical to the place where the *building drain* leaves the *building*, or

ii) outside the *building* in a maintenance hole. Rev. 12997

(See Note A-2.4.5.4.(1).)

2.4.5.5. Trap Seals

1) Provision shall be made for maintaining the *trap* seal of a floor drain by

a) the use of a *trap* seal primer,

b) using the drain as a receptacle for an *indirectly connected* drinking fountain, or

c) other equally effective means.

(See Note A-2.4.5.5.(1).)

2.4.6. Arrangement of Drainage Piping

2.4.6.1. Separate Systems

1) No vertical *soil-or-waste pipe* shall conduct both *sewage* and *storm water*.

2) A *combined building drain* shall not be installed. (See Note A-2.1.2.1.(2).)

3) There shall be no unused open ends in a *drainage system* and *dead ends* shall be so graded that water will not collect in them.

2.4.6.2. Location of Soil-or-Waste Pipes

1) A *soil-or-waste pipe* shall not be located directly above

a) non-pressure *potable* water storage tanks,

b) maintenance holes in pressure *potable* water storage tanks, or Rev. 12997

c) food-handling or food-processing equipment.

2.4.6.3. Sumps or Tanks

(See Note A-2.4.6.3.)

1) Piping that is too low to drain into a *building sewer* by gravity shall be drained to a sump or receiving tank provided that Rev. 13259

a) *fixtures* located above the *public sewer connection* shall drain by gravity, and

b) any overflow piping shall drain to the *public sewer connection* by gravity except overflow piping from an *alternate water source system*.

2) Where the sump or tank receives *sewage*, it shall be water- and air-tight and shall be vented.

3) Equipment such as a pump or ejector that can lift the contents of the sump or tank and discharge it into the *building drain* or *building sewer* shall be installed.

4) Where the equipment does not operate automatically, the capacity of the sump shall be sufficient to hold at least a 24 h accumulation of liquid.

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5) Where there is a *building trap*, the discharge pipe from the equipment shall be connected to the *building drain* downstream of the *trap* and *backwater valve*.

6) The discharge pipe from every pumped sump shall be equipped with a union, a *backwater valve* and a shut-off valve installed in that sequence in the direction of discharge.

7) The discharge piping from a pump or ejector shall be sized for optimum flow velocities at pump design conditions.

2.4.6.4. Protection from Backflow

1) Except as permitted in Sentence (2), a *backwater valve* or a gate valve that would prevent the free circulation of air shall not be installed in a *building drain* or in a *building sewer*.

2) A *backwater valve* is permitted to be installed in a *building drain* provided that

a) it is a "normally open" design conforming to
   i) CSA B70, "Cast Iron Soil Pipe, Fittings, and Means of Joining,"
   ii) CAN/CSA-B181.1, "Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings,"
   iii) CAN/CSA-B181.2, "Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings," or
   iv) CAN/CSA-B182.1, "Plastic Drain and Sewer Pipe and Pipe Fittings," and
b) it does not serve more than one *dwelling unit*.

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3) Except as provided in Sentence (5), where a *building drain* or a *branch* may be subject to *backflow*, a *backwater valve* shall be installed on every *fixture drain* connected to them when the *fixture* is located below the level of the adjoining street.

4) Deleted.

5) Where more than one *fixture* is located on a *storey* and all are connected to the same *branch*, the *backwater valve* is permitted to be installed on the *branch*.

6) Except as provided in Sentence (7), where a storm *sump* is provided there shall be a *backwater valve* attached to the outlet pipe.

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7) Notwithstanding Sentence (6), a *backwater valve* is not required if the storm *sump* and the storm *sump* piping are both located above the level of the next upstream maintenance hole of the public storm *sewer*.

2.4.6.5. Mobile Home Sewer Service

1) A *building sewer* intended to serve a mobile home shall be

a) not less than 4 inches in *size*,
b) terminated above ground,
c) provided with
   i) a tamperproof terminal connection that is capable of being repeatedly connected, disconnected and sealed,
   ii) a protective concrete pad, and
   iii) a means to protect it from frost heave, and
d) designed and constructed in accordance with good engineering practice.

2.4.7. Cleanouts

2.4.7.1. Cleanouts for Drainage Systems

1) *Sanitary drainage systems* and *storm drainage systems* shall be provided with *cleanouts* that will permit cleaning of the entire system.

2) A *cleanout* fitting shall be provided on the upstream side and directly over every running *trap*.

3) Interior *leaders* shall be provided with a *cleanout* fitting at the bottom of the *leader* or not more than 3 m upstream from the bottom of the *leader*.

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4) Where a *cleanout* is required on a *building sewer* 8 inches or larger in *size*, it shall be a maintenance hole. Rev. 12997

5) A *building sewer* shall not change direction or slope between the *building* and public sewer or between *cleanouts*, except that pipes not more than 6 inches in *size* may change direction

a) by not more than 5° every 3 m, or

b) by the use of fittings with a cumulative change in direction of not more than 45°.

6) *Building drains* shall be provided with a *cleanout* fitting conforming to Sentence 2.4.7.2.(2) that is located as close as practical to the place where the *building drain* leaves the *building*. (See Note A-2.4.7.1.(6).)

7) *Soil-or-waste stacks* shall be provided with a *cleanout* fitting

a) at the bottom of the stack,

b) not more than 3 m upstream of the bottom of the stack, or

c) on a Y fitting connecting the stack to the *building drain* or *branch*.

8) A *cleanout* shall be provided to permit the cleaning of the piping downstream of an *interceptor*.

9) *Cleanouts* shall be installed so that the cumulative change in direction is not more than 90° between *cleanouts* in a drip pipe from a food receptacle or in a *fixture drain* serving a kitchen sink in a non-residential *occupancy*. (See Note A-2.4.7.1.(9).)

10) A *fixture outlet pipe*, a *trap* with a removable *trap dip*, or a separate *cleanout* shall be used as a *cleanout* for a *fixture drain*. (See Note A-2.4.7.1.(10).)

11) *Building drains* shall be provided with an additional *cleanout* for each cumulative horizontal change in direction exceeding 135°.

2.4.7.2. Size and Spacing of Cleanouts

1) Except as provided in Sentences (2) to (4), the *size* and spacing of *cleanouts* in *nominally horizontal* pipes of a *drainage system* shall conform to Table 2.4.7.2.

Table 2.4.7.2.
Permitted Size and Spacing of Cleanouts
Forming Part of Sentence 2.4.7.2.(1)

Size of Drainage Pipe, inches	Minimum *Size* of *Cleanout*, inches	Maximum Spacing, m	
		One-Way Rodding	Two-Way Rodding
less than 3	Same *size* as drainage pipe	7.5	15
3 and 4	3	15	30
over 4	4	26	52

2) *Cleanout* fittings for *building drains* shall be at least 4 inches in *size*.

3) The spacing between maintenance holes serving a *building sewer* Rev. 12997

a) 24 inches or less in *size* shall not exceed 90 m, and

b) over 24 inches in *size* shall not exceed 150 m.

4) The *developed length* of a *building sewer* between the *building* and the first maintenance hole to which the *building sewer* connects shall not exceed 75 m. Rev. 12997

5) Where a *building sewer* connects to another *building sewer* other than by a maintenance hole, the *developed length* between the *building* and the *building sewer* to which it connects shall not exceed 30 m.

6) *Cleanouts* that allow rodding in one direction only shall be installed to permit rodding in the direction of flow.

2.4.7.3. Maintenance Holes Rev. 12997

1) A maintenance hole, including the cover, shall be designed to support all loads imposed upon it.

2) A maintenance hole shall be provided with

a) a cover that provides an airtight seal if located within a *building*,

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b) a rigid ladder of a corrosion-resistant material where the depth exceeds 1 m, and

c) a vent to the exterior if the maintenance hole is located within a *building*.

3) A maintenance hole shall have a minimum horizontal dimension of 1 m, except that the top 1.5 m may be tapered from 1 m down to a minimum of 600 mm at the top.

4) A maintenance hole in a *sanitary drainage system* shall be channeled to direct the flow of effluent.

2.4.7.4. Location of Cleanouts

1) *Cleanouts* and access covers shall be located so that their openings are readily accessible for drain cleaning purposes.

2) A *cleanout* shall not be

a) located in a floor assembly in a manner that may constitute a hazard, or

b) used as a floor drain.

3) There shall be no change of direction between a *cleanout* fitting and the *trap* that it serves.

4) The piping between a *cleanout* fitting and the *drainage system* it serves shall not change direction by more than 45°.

5) *Cleanouts* serving *fixtures* in health care facilities, mortuaries, laboratories and similar *occupancies*, where contamination by body fluids is likely, shall be located a minimum of 150 mm above the *flood level rim* of the *fixture*.

2.4.8. Minimum Slope and Length of Drainage Pipes

2.4.8.1. Minimum Slope

1) Except as provided in Articles 2.4.10.8. and 2.4.10.9., drainage pipes that are 3 inches or less in *size* shall have a downward slope in the direction of flow of at least 1 in 50. (See Note A-2.4.8.1.(1).)

2.4.8.2. Length of Fixture Outlet Pipes

1) Except for *fixture outlet pipes* installed in conformance with Sentence 2.4.5.1.(3), the *developed length* of *fixture outlet pipes* shall not exceed 1 200 mm. (See Note A-2.4.8.2.(1).) (See also Note A-2.4.5.1.(2).)

2.4.9. Size of Drainage Pipes

2.4.9.1. No Reduction in Size

1) A *soil-or-waste pipe* shall be of a *size* not less than the *size* of

a) a *vent pipe* that is connected to it, or

b) the largest *soil-or-waste pipe* that drains into it.

2.4.9.2. Serving Water Closets

1) Drainage pipes that serve a water closet shall be not less than 3 inches in *size*.

2) Discharge pipes serving a macerating toilet system shall be not less than ¾ inch in *size*. Rev. 13736

2.4.9.3. Size of Fixture Outlet Pipes

1) Except as provided in Sentence (2), the *size* of *fixture outlet pipes* shall conform to Table 2.4.9.3.

2) The part of the *fixture outlet pipe* that is common to 3 compartments of a sink shall be one *size* larger than the largest *fixture outlet pipe* of the compartments that it serves. (See Note A-2.4.9.3.(2).)

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Table 2.4.9.3.
Minimum Permitted Size of Fixture Outlet Pipe and Hydraulic Loads for Fixtures[1]
Forming Part of Sentences 2.4.9.3.(1) and 2.4.10.2.(1)

Fixture	Minimum *Size* of *Fixture Outlet Pipe*, inches	Hydraulic Load, *fixture units*
Autopsy table	1½	2
Bathroom group		
(a) with flush tank	n/a	6
(b) with direct flush valve	n/a	8
Bathtub (with or without shower)	1½	1½
Bath: foot, sitz or slab	1½	1½
Beer cabinet	1½	1½
Bidet	1¼	1
Clothes washer		
(a) domestic[1]	n/a	2 with 2-in. *trap*
(b) commercial	n/a	2 with 2-in. *trap*
Dental unit or cuspidor	1¼	1
Dishwasher		
(a) domestic type	1½	1½ no load when connected to garbage grinder or domestic sink
(b) commercial type	2	3
Drinking fountain	1¼	½
Floor drain[2]	2	2 with 2-in. *trap* 3 with 3-in. *trap*
Garbage grinder, commercial type	2	3
Icebox	1¼	1
Laundry tray		
(a) single or double units or 2 single units with common *trap*	1½	1½
(b) 3 compartments	1½	2
Lavatory		
(a) barber or beauty parlor	1½	1½
(b) dental	1¼	1
(c) domestic type, single or 2 single with common *trap*	1¼	1 with 1¼-in. *trap* 1½ with 1½-in. *trap*
(d) multiple or industrial type	1½	according to Table 2.4.10.2.
Macerating toilet system	¾	4
Potato peeler	2	3
Shower drain Total volume of discharge from all *shower heads*:		
(a) < 9.5 LPM	1½	1½
(b) 9.5 LPM to 20 LPM	2	3
(c) > 20 LPM	3	6

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Table 2.4.9.3. *(continued)*
Minimum Permitted Size of Fixture Outlet Pipe and Hydraulic Loads for Fixtures(1)
Forming Part of Sentences 2.4.9.3.(1) and 2.4.10.2.(1)

Fixture	Minimum *Size* of *Fixture Outlet Pipe*, inches	Hydraulic Load, *fixture units*
Sink		
(a) domestic and other small types with or without garbage grinders, single, double or 2 single with a common *trap*	1½	1½
(b) Other sinks	1½	1½ with 1½-in. *trap* 2 with 2-in. *trap* 3 with 3-in. *trap*
Urinal		
(a) pedestal, siphon-jet or blowout type	2	4
(b) stall, washout type	2	2
(c) wall		
(i) washout type	1½	1½
(ii) other types	2	3
Water closet		
(a) with flush tank	3	4
(b) with direct flush valve	3	6

Notes to Table 2.4.9.3.:

(1) See Note A-Table 2.4.9.3.

(2) No hydraulic load for *emergency floor drains*.

3) Where clothes washers do not drain to a laundry tray, the *trap* inlet shall be fitted with a vertical standpipe that is not less than 600 mm long measured from the *trap weir* and terminates above the *flood level rim* of the clothes washer. (See Note A-2.4.9.3.(3).)

2.4.9.4. Size of Building Drain and Building Sewer

1) *Building drains* and *building sewers* connected to the public sewer system downstream of the main *cleanout* (See Sentence 2.4.7.1.(6)) shall be not less than 4 inches in *size*.

2.4.9.5. Offset in Leaders

1) No change in the *size* of a *leader* with a *nominally horizontal offset* is required if the *offset*

a) is located immediately under the roof,

b) is not more than 6 m long, and

c) has a slope of not less than 1 in 50.

2) If the horizontal *offset* is more than 6 m long, the *leader* shall conform to Table 2.4.10.9.

2.4.10. Hydraulic Loads

(See Note A-2.4.10. for determination of hydraulic loads and drainage pipe sizes.)

2.4.10.1. Total Load on a Pipe

1) The hydraulic load on a pipe is the total load from

a) every *fixture* that is connected to the system upstream of the pipe,

b) every *fixture* for which provision is made for future connection upstream of the pipe, and

c) all roofs and paved surfaces that drain into the system upstream of the pipe.

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2.4.10.2. Hydraulic Loads for Fixtures

1) The hydraulic load from a *fixture* that is listed in Table 2.4.9.3. is the number of *fixture units* set forth in the Table.

2) Except as provided in Sentence (1), the hydraulic load from a *fixture* that is not listed in Table 2.4.9.3. is the number of *fixture units* set forth in Table 2.4.10.2. for the *trap* of the *size* that serves the *fixture*.

Table 2.4.10.2.
Permitted Hydraulic Load from a Fixture Based on Size of Trap
Forming Part of Sentence 2.4.10.2.(2)

Size of *trap*, inches	Hydraulic Load, *fixture units*
1¼	1
1½	2
2	3
2½	4
3	5
4	6

2.4.10.3. Hydraulic Loads from Fixtures with a Continuous Flow

1) Except as provided in Sentence (2), the hydraulic load from a *fixture* that produces a continuous flow, such as a pump or an air-conditioning *fixture*, is 31.7 *fixture units* for each litre per second of flow.

2) Where a *fixture* or equipment that produces a continuous or semi-continuous flow drains to a *combined sewer* or to a *storm sewer*, the hydraulic load from the *fixture* is 900 L for each litre per second of flow.

2.4.10.4. Hydraulic Loads from Roofs or Paved Surfaces

1) Except as provided in Sentence (2), the hydraulic load in litres from a roof or paved surface is the maximum 15 min rainfall determined in conformance with Subsection 1.1.3. of Division B of Book I (General) of this By-law, multiplied by the sum of

a) the area in square metres of the horizontal projection of the surface drained, and

b) one-half the area in square metres of the largest adjoining vertical surface.

(See Note A-2.4.10.4.(1).)

2) *Flow control roof drains* may be installed, provided

a) the maximum drain down time does not exceed 24 h,

b) the roof structure is designed to carry the load of the stored water,

c) one or more scuppers are installed not more than 30 m apart along the perimeter of the *building* so that

i) up to 200% of the 15-minute rainfall intensity can be handled, and

ii) the maximum depth of controlled water is limited to 150 mm,

d) they are located not more than 15 m from the edge of the roof and not more than 30 m from adjacent drains, and

e) there is at least one drain for each 900 m^2.

3) Hydraulic loads, in litres per second, for *flow control roof drains* and restricted paved area drains shall be

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determined according to rain intensity-duration frequency curves as compiled by Environment Canada using 25-year frequencies.

4) Where the height of the parapet is more than 150 mm or exceeds the height of the adjacent wall flashing,

a) emergency roof overflows or scuppers described in Clause (2)(c) shall be provided, and

b) there shall be a minimum of 2 *roof drains*.

2.4.10.5. Conversion of Fixture Units to Litres

1) Except as provided in Sentence 2.4.10.3.(2), where the hydraulic load is to be expressed in litres, *fixture units* shall be converted as follows:

a) when the number of *fixture units* is 260 or fewer, the load is 2 360 L, and

b) when the number of *fixture units* exceeds 260, the load is 9.1 L for each *fixture unit*.

2.4.10.6. Hydraulic Loads to Soil-or-Waste Pipes

1) Except as provided in Sentence (2), the hydraulic load that is drained to every *soil-or-waste stack* shall conform to Table 2.4.10.6.-A.

2) Where the *nominally horizontal offset* in a *soil-or-waste stack* is 1.5 m or more, the hydraulic load that is served by it shall conform to Table 2.4.10.6.-B or Table 2.4.10.6.-C, whichever is the less restrictive.

Table 2.4.10.6.-A
Maximum Permitted Hydraulic Load Drained to a Soil-or-Waste Stack
Forming Part of Sentence 2.4.10.6.(1)

***Size* of Stack, inches**	**Maximum Hydraulic Load, *fixture units***	**Maximum *Fixture Units* Drained from any 1 *Storey***
1¼	2	2
1½	8	2
2	24	6
3	102	18
4	540	100
5	1 400	250
6	2 900	500
8	7 600	830
10	15 000	2 700
12	26 000	4 680
15	50 000	9 000

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Table 2.4.10.6.-B
Maximum Permitted Hydraulic Load Drained to a Branch
Forming Part of Sentence 2.4.10.6.(2) and Article 2.4.10.7.

***Size* of *Branch*, inches**	**Maximum Hydraulic Load, *fixture units***
1¼	2
1½	3
2	6
2½	12
3	27
4	180
5	390
6	700
8	1 600
10	2 500
12	3 900

Table 2.4.10.6.-C
Maximum Permitted Hydraulic Load Drained to a Sanitary Building Drain or Sewer
Forming Part of Sentence 2.4.10.6.(2) and Article 2.4.10.8.

***Size* of Drain or Sewer, inches**	**Maximum Hydraulic Load, *fixture units***					
	Slope					
	1 in 400	**1 in 200**	**1 in 133**	**1 in 100**	**1 in 50**	**1 in 25**
3	—	—	—	—	27	36
4	—	—	—	180	240	300
5	—	—	380	390	480	670
6	—	—	600	700	840	1 300
8	—	1 400	1 500	1 600	2 250	3 370
10	—	2 500	2 700	3 000	4 500	6 500
12	2 240	3 900	4 500	5 400	8 300	13 000
15	4 800	7 000	9 300	10 400	16 300	22 500

2.4.10.7. Hydraulic Loads on Branches

1) The hydraulic load that is drained to a *branch* shall conform to Table 2.4.10.6.-B.

2.4.10.8. Hydraulic Loads on Sanitary Building Drains or Sewers

1) The hydraulic load that is drained to a *sanitary building drain* or a *sanitary building sewer* shall conform to Table 2.4.10.6.-C.

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2.4.10.9. Hydraulic Loads on Storm or Combined Building Drains or Sewers

1) The hydraulic load that is drained to a *storm building drain*, a *storm building sewer* or a *combined building sewer* shall conform to Table 2.4.10.9.

Table 2.4.10.9.
Maximum Permitted Hydraulic Load Drained to a Storm Building Drain or Sewer or a Combined Building Sewer
Forming Part of Article 2.4.10.9.

Size of Drain or Sewer, inches	Maximum Hydraulic Load, L						
	Slope						
	1 in 400	1 in 200	1 in 133	1 in 100	1 in 68	1 in 50	1 in 25
3	—	—	—	—	—	2 770	3 910
4	—	—	—	4 220	5 160	5 970	8 430
5	—	—	6 760	7 650	9 350	10 800	15 300
6	—	—	10 700	12 400	15 200	17 600	24 900
8	—	18 900	23 200	26 700	32 800	37 800	53 600
10	—	34 300	41 900	48 500	59 400	68 600	97 000
12	37 400	55 900	68 300	78 700	96 500	112 000	158 000
15	71 400	101 000	124 000	143 000	175 000	202 000	287 000

2.4.10.10. Hydraulic Loads to Roof Gutters

1) The hydraulic load that is drained to a *roof gutter* shall conform to Table 2.4.10.10.

Table 2.4.10.10.
Maximum Permitted Hydraulic Load Drained to a Roof Gutter
Forming Part of Article 2.4.10.10.

Size of Gutter, inches	Area of Gutter, cm^2	Maximum Hydraulic Load, L			
		Slope			
		1 in 200	1 in 100	1 in 50	1 in 25
3	22.8	406	559	812	1 140
4	40.5	838	1 190	1 700	2 410
5	63.3	1 470	2 080	2 950	4 170
6	91.2	2 260	3 200	4 520	6 530
7	124.1	3 250	4 600	6 500	9 190
8	162.1	4 700	6 600	9 400	13 200
10	253.4	8 480	12 000	17 000	23 600

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2.4.10.11. Hydraulic Loads on Leaders

1) The hydraulic load that is drained to a *leader* shall conform to Table 2.4.10.11.

Table 2.4.10.11.
Maximum Permitted Hydraulic Load Drained to a Leader
Forming Part of Article 2.4.10.11.

Circular *Leader*		Non-Circular *Leader*	
***Size* of *Leader*, inches**	**Maximum Hydraulic Load, L**	**Area of *Leader*, cm²**	**Maximum Hydraulic Load, L**
2	1 700	20.3	1 520
2½	3 070	31.6	2 770
3	5 000	45.6	4 500
4	10 800	81.1	9 700
5	19 500	126.6	17 600
6	31 800	182.4	28 700
8	68 300	324.3	61 500

2.4.10.12. Hydraulic Loads from Fixtures with a Semi-continuous Flow

1) The hydraulic load from a *fixture* or equipment that produces a semi-continuous flow shall conform to Table 2.4.10.12.

Table 2.4.10.12.
Maximum Permitted Hydraulic Load from Fixtures with a Semi-continuous Flow
Forming Part of Sentence 2.4.10.12.(1).

***Trap Size*, inches**	**Flow, L/s**	**Hydraulic Load, *fixture units***
1½	0.00 - 0.090	3
2	0.091 - 0.190	6
3	0.191 - 0.850	27
4	0.851 - 5.700	180

2.4.10.13. Design of Storm Sewers

1) Except as provided in Sentences 2.4.10.4.(1) and (2), and Article 2.4.10.9., *storm sewers* may be designed in accordance with good engineering practice.

2.4.10.14. Design of Siphonic Roof Drainage Systems

1) Siphonic roof drainage systems are to be designed in accordance with ASPE/ANSI 45 “Siphonic Roof Drainage,” and ASME A112.6.9, “Siphonic Roof Drains.”

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