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Canadian Plumbing Code 1990

1st printing

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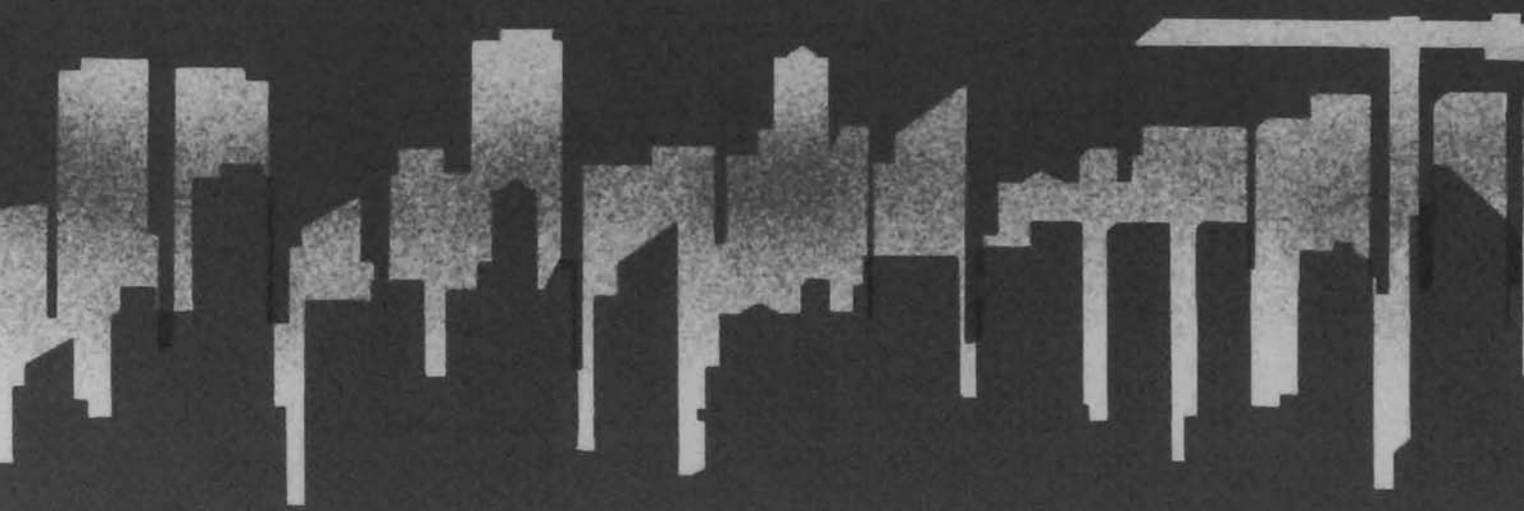

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Canadian Plumbing Code 1990

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Table of Contents

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Preface

The Canadian Plumbing Code contains the requirements for the design and installation of plumbing systems.

Where technical changes or additions to the previous (1985) edition of this document have been made, the paragraphs affected are indicated by vertical lines in the margins. No indication is provided where requirements have been renumbered or deleted. Care should be taken therefore in relating requirements in previous codes with the 1990 edition.

The requirements contained in this Code are supported by explanatory material and diagrams contained in Appendix A, thus leaving the body of the Code consisting of regulatory material only. The first line of each item in the Appendix contains in bold-face type a reference to the definition or requirement to which the explanatory material is applicable. These references have been placed in alphabetical or numerical order to ensure that they are easily found when they are referred to in the text.

The Code is drafted in such a way that it may be adopted or enacted for legal use by any jurisdictional authority in Canada. It is divided into seven Sections, each Section being self-sufficient with a minimum of cross references. A decimal numbering system has been used throughout the Code. The first number indicates the Section of the Code, the second the Subsection in the Section, the third the Article and the fourth the Sentence in the Article. A Sentence (indicated by numbers in brackets) may be further divided into Clauses and Subclauses. They are illustrated as follows:

4.	Section
4.6	Subsection
4.6.5.	Article
4.6.5.(1)	Sentence
4.6.5.(1)(c)	Clause
4.6.5.(1)(c)(i)	Subclause

This edition has been converted to SI units where this is feasible, except for pipe sizes which continue to be expressed in inches. These are nominal dimensions by which pipe is known in the trade and the exact dimension may vary with different pipe materials. Until there is general acceptance of a uniform nominal size for such piping, the pipe size is expressed in inches to avoid confusion.

The Canadian Plumbing Code is published by the National Research Council of Canada and is prepared under the auspices of the Associate Committee on the National Building Code. It is published separately from but referenced in the National Building Code of Canada. It can thus be adopted for legal use by a municipality or provincial body jointly with or separately from the National Building Code.

Comments and inquiries on the use of this Code and suggestions for its improvement are welcomed and should be submitted to: The Secretary, Associate Committee on the National Building Code, National Research Council of Canada, Ottawa, Ontario K1A 0R6. As Code revisions are developed by the committees, they will be made available for public review and comment prior to the next edition of the Code being published.

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Section 1
General Requirements and Administration

1.1 Application

1.1.1. This Code applies to the design, construction, extension, alteration, renewal or repair of *plumbing systems*.

1.1.2. The appropriate requirements in the Administrative Requirements for Use with the National Building Code 1990 shall apply to this Code.

1.2 Scope

1.2.1. Scope

(1) This Code specifies the minimum requirements for

(a) *drainage systems* for water-borne wastes and *storm water* for *buildings* to the point of connection with public services,
(b) *venting systems*,
(c) *water service pipes*, and
(d) *water distribution systems*.

1.3 Definitions and Abbreviations

1.3.1. Definitions Not Listed. Definitions of words and phrases used in this Code that are not included in the list of definitions in this Section shall have the meanings which are commonly assigned to them in the context in which they are used in this Code, taking into account the specialized use of terms by the various trades and professions to which the terminology applies.

1.3.2. Definitions in Italics. The words and terms in italics in this Code shall have the following meanings: (See Appendix A.)

Air break means the unobstructed vertical distance between the lowest point of an indirect *drainage system* and the *flood level rim* of the *fixture* into which it discharges. (See A-3.3.12.(2) in Appendix A.)

Air gap means the unobstructed vertical distance through air between the lowest point of a water supply outlet and the *flood level rim* of the *fixture* or device into which the outlet discharges. (See A-6.2.2. in Appendix A.)

Alloyed zinc means an alloy of zinc having the corrosion resistance and physical properties of an alloy containing 0.15 per cent titanium, 0.74 per cent copper and 99.11 per cent zinc, and so tempered as to be capable of being formed into the shape required for a watertight joint.

Backflow means a flowing back or reversal of the normal direction of the flow.

Backflow preventer means a device or a method that prevents *backflow*. (See Appendix A.)

Back pressure means pressure higher than the supply pressure.

Back-siphonage means *backflow* caused by atmospheric pressure. (See Appendix A.)

Back-siphonage preventer (or vacuum breaker) means a device or a method that prevents *back-siphonage*. (See Appendix A.)

Backwater valve means a *check valve* designed for use in a gravity *drainage system*.

Branch means a *soil-or-waste pipe* connected at its upstream end to the junction of 2 or more *soil-or-waste pipes* or to a *soil-or-waste stack*, and connected

at its downstream end to another *branch*, a sump, a *soil-or-waste stack* or a *building drain*. (See A-1.3.2. Drainage System in Appendix A.)

Branch vent means a *vent pipe* that is connected at its lower end to the junction of 2 or more *vent pipes* and is connected at its upper end either to a *stack vent*, *vent stack* or *header*, or is terminated in open air. (See Appendix A.)

*Building** means any structure used or intended for supporting or sheltering any use or *occupancy*.

Building drain means the horizontal piping, including any vertical *offset* that conducts *sewage*, *clear-water waste* or *storm water* to a *building sewer*. (See A-1.3.2. Drainage System in Appendix A.)

Building sewer means a pipe that is connected to a *building drain* 1 m outside a wall of a *building* and that leads to a public sewer or *private sewage disposal system*.

Building trap means a *trap* that is installed in a *building drain* or *building sewer* to prevent circulation of air between a *drainage system* and a public sewer. (See-A-4.5.4.(1) in Appendix A.)

Check valve means a valve that permits flow in one direction but prevents a return flow.

Cleanout means an access provided in *drainage* and *venting systems* to provide for cleaning and inspection services.

Clear-water waste means waste water with impurity levels that will not be harmful to health and may include cooling water and condensate drainage from refrigeration and air conditioning equipment and cooled condensate from steam heating systems, but does not include *storm water*. (See Appendix A.)

Combined building drain means a *building drain* that is intended to conduct *sewage* and *storm water*.

Combined building sewer means a *building sewer* that is intended to conduct *sewage* and *storm water*.

Combined sewer means a sewer that is intended to conduct *sewage* and *storm water*.

*Combustible** means that a material fails to meet the acceptance criteria of CAN4-S114-M, "Standard Method of Test for Determination of Noncombustibility in Building Materials."

Continuous vent means a *vent pipe* that serves 2 or more *fixtures* and is an extension of a *wet vent*. (See Appendix A.)

Critical level means the level of submergence at which the *back-siphonage preventer* ceases to prevent *back-siphonage*.

Dead end means a pipe that terminates with a closed fitting.

Developed length means the length along the centre line of the pipe and fittings. (See A-5.6.3.(1) in Appendix A.)

Directly connected means physically connected in such a way that water or gas cannot escape from the connection.

Drainage system means an assembly of pipes, fittings, *fixtures*, *traps* and appurtenances that is used to convey *sewage*, *clear-water waste* or *storm water* to a public sewer or a *private sewage disposal system*, but does not include *subsoil drainage pipes*. (See Appendix A.)

Dual vent means a *vent pipe* that serves 2 *fixtures* and connects at the junction of the *trap arms*. (See A-1.3.2. Drainage System in Appendix A.)

*Dwelling unit** means a *suite* operated as a housekeeping unit used or intended to be used as a domicile by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.

*Fire Separation** means a construction assembly that acts as a barrier against the spread of fire.

Fixture means a receptacle, appliance, apparatus or other device that discharges *sewage* or *clear-water waste*, and includes a floor drain.

Fixture drain means the pipe that connects a *trap* serving a *fixture* to another part of a *drainage system*.

Fixture outlet pipe means a pipe that connects the waste opening of a *fixture* to the *trap* serving the *fixture*. (See Appendix A.)

Fixture unit (as applying to *drainage systems*) means the unit of measure based on the rate of discharge, time of operation and frequency of use of a *fixture* that expresses the hydraulic load that is imposed by that *fixture* on the *drainage system*.

Fixture unit (as applying to *water distribution systems*) means the unit of measure based on the rate of supply, time of operation and frequency of use of a *fixture* or outlet that expresses the hydraulic load that is imposed by that *fixture* or outlet on the supply system.

Flood level rim means the top edge at which water can overflow from a *fixture* or device. (See A-1.3.2. Back Siphonage in Appendix A.)

Flow control roof drain means a *roof drain* that restricts the flow of *storm water* into the *storm drainage system.*

Fresh air inlet means a *vent pipe* that is installed in conjunction with a *building trap* and terminates outdoors. (See A-4.5.4.(1) in Appendix A.)

Header means a *vent pipe* that connects 2 or more *vent stacks* or *stack vents* to outdoors. (See Appendix A.)

*Indirect service water heater** (see *Service water heater, indirect*).

Indirectly connected means not *directly connected.* (See A-3.3.12.(2) in Appendix A.)

Individual vent means a *vent pipe* that serves one *fixture.*

Interceptor means a receptacle that is installed to prevent oil, grease, sand or other materials from passing into a *drainage system.*

Leader means a pipe that is installed to carry *storm water* from a roof to a *storm building drain* or *sewer* or other place of disposal.

Nominally horizontal means at an angle of less than 45° with the horizontal. (See Appendix A.)

Nominally vertical means at an angle of not more than 45° with the vertical. (See Appendix A.)

*Noncombustible** means that a material meets the acceptance criteria of CAN4-S114-M, "Standard Method of Test for Determination of Non-Combustibility in Building Materials."

*Occupancy** means the use or intended use of a *building* or part thereof for the shelter or support of persons, animals or property.

Offset means the piping that connects the ends of 2 pipes that are parallel. (See Appendix A.)

*Owner** means any person, firm or corporation controlling the property under consideration.

Plumbing contractor means a person, corporation or firm that undertakes to construct, extend, alter, renew or repair any part of a *plumbing system.*

*Plumbing system** means a *drainage system,* a *venting system* and a *water system* or parts thereof. (See Appendix A.)

Potable means safe for human consumption.

*Private sewage disposal system** means a privately owned plant for the treatment and disposal of *sewage* (such as a septic tank with an absorption field).

Private water supply system means an assembly of pipes, fittings, valves, equipment and appurtenances that supplies water from a private source to a *water distribution system.*

Relief vent means an auxiliary vent which provides additional circulation of air between *drainage systems* and *venting systems.*

Riser means a water distribution pipe that extends through at least one full *storey.*

Roof drain means a fitting or device that is installed in the roof to permit *storm water* to discharge into a *leader.*

Roof gutter means an exterior channel installed at the base of a sloped roof to convey *storm water.*

Sanitary building drain means a *building drain* that conducts *sewage.*

Sanitary building sewer means a *building sewer* that conducts *sewage.*

*Sanitary drainage system** means a *drainage system* that conducts *sewage.*

Sanitary sewer means a sewer that conducts *sewage.*

*Service water heater** means a device for heating water for plumbing services.

*Service water heater, indirect** means a *service water heater* that derives its heat from a heating medium such as warm air, steam or hot water.

*Service water heater, storage type** means a *service water heater* with an integral hot water storage tank.

Sewage means any liquid waste other than *clear-water waste* or *storm water.*

Size means the nominal diameter by which a pipe, fitting, *trap* or other similar item is commercially designated.

Soil-or-waste pipe means a pipe in a *sanitary drainage system.*

Soil-or-waste stack means a vertical *soil-or-waste pipe* that passes through one or more *storeys,* and includes any *offset* that is part of the stack.

Stack vent means a *vent pipe* that connects the top of a *soil-or-waste stack* to a *header* or open air. (See A-1.3.2. Drainage System in Appendix A.)

*Storage-type service water heater** (see *service water heater, storage type*).

Storey (as applying to plumbing) means the interval between 2 successive floor levels including mezzanine floors that contain plumbing fixtures or between a floor level and roof.

Storm building drain means a *building drain* that conveys *storm water.*

Storm building sewer means a *building sewer* that conveys *storm water.*

Storm drainage system means a *drainage system* that conveys *storm water.*

Storm sewer means a sewer that conveys *storm water.*

Storm water means water that is discharged from a surface as a result of rainfall or snowfall.

Subdrainage system means a *drainage system* that does not drain by gravity to the *building sewer.*

Subsoil drainage pipe means a pipe that is installed underground to intercept and convey subsurface water.

*Suite** means a single room or series of rooms of complementary use, operated under a single tenancy and includes *dwelling units,* individual guest rooms in motels, hotels, boarding houses, rooming houses and dormitories as well as individual stores and individual or complementary rooms for business and personal services occupancies.

Trap means a fitting or device that is designed to hold a liquid seal that will prevent the passage of gas but will not materially affect the flow of a liquid.

Trap arm means that portion of a *fixture drain* between the *trap weir* and the *vent pipe* fitting. (See A-5.6.3.(1) in Appendix A.)

Trap dip means the lowest part of the upper interior surface of a *trap.*

Trap seal depth means the vertical distance between the *trap dip* and the *trap weir.* (See A-2.3.1.(1) in Appendix A.)

Trap standard means the *trap* for a *fixture* that is integral with the support for the *fixture.*

Trap weir means the highest part of the lower interior surface of a *trap.* (See A-2.3.1.(1) and (2) in Appendix A.)

Vacuum breaker (see *back-siphonage preventer*).

Vent pipe means a pipe that is part of a *venting system.*

Vent stack means a *vent pipe* that is connected at its upper end to a *header* or is terminated in open air and that is used to limit pressure differential in a *soil-or-waste stack.* (See A-1.3.2. Drainage System in Appendix A.)

Venting system means an assembly of pipes and fittings that connects a *drainage system* with outside air for circulation of air and the protection of *trap seals* in the *drainage system.* (See A-1.3.2. Drainage System in Appendix A.)

Waste pipe (see *soil-or-waste pipe*).

Water distribution system means an assembly of pipes, fittings, valves and appurtenances that conveys water from the *water service pipe* or *private water supply system* to water supply outlets, *fixtures,* appliances and devices.

Water service pipe means a pipe that conveys water from a public water main or private water source to the inside of the *building.*

Water system means a *private water supply system,* a *water service pipe,* a *water distribution system* or parts thereof.

Wet vent means a *soil-or-waste pipe* that also serves as a *vent pipe.* (See A-5.8.1. in Appendix A.)

1.3.3. Abbreviations of Proper Names.

Abbreviations of proper names in this Code have the following meanings:

ACNBC ..... Associate Committee on the National Building Code
(National Research Council of Canada Ottawa, Ontario KlA 0R6)

ANSI ..... American National Standards Institute
(1430 Broadway, New York, New York 10018 U.S.A.)

ASHRAE ..... American Society of Heating, Refrigerating and Air-Conditioning Engineers
(1791 Tullie Circle, N.E., Atlanta, Georgia 30329 U.S.A.)

ASPE ..... American Society of Plumbing Engineers
(15233 Ventura Blvd., Suite 811, Sherman Oakes, California 91403 U.S.A.)

ASTM ..... American Society for Testing and Materials (1916 Race Street, Philadelphia, Pennsylvania 19103 U.S.A.)

CAN ..... National Standard of Canada designation (The number or name following the CAN designation represents the agency under whose auspices the standard is issued. CAN 1 designates CGA, CAN 2 designates CGSB, CAN 3 designates CSA, and CAN 4 designates ULC.)

CGA ..... Canadian Gas Association (55 Scarsdale Road, Don Mills, Ontario M3B 2R3)

CGSB ..... Canadian General Standards Board (Jeanne-Mance Building, Tunney's Pasture, Ottawa, Ontario K1A 1G6)

CSA ..... Canadian Standards Association (178 Rexdale Blvd., Rexdale, Ontario M9W 1R3)

NBC ..... National Building Code of Canada (National Research Council of Canada Ottawa, Ontario KlA 0R6)

NFPA ..... National Fire Protection Association (Batterymarch Park, Quincy, Massachusets 02269 U.S.A.)

ULC ..... Underwriters' Laboratories of Canada (7 Crouse Road, Scarborough, Ontario M1R 3A9)

1.3.4. Symbols and Other Abbreviations. Symbols and other abbreviations in this Code have the following meanings:

ABS ..... acrylonitrile-butadiene-styrene
cm^2 ..... square centimetre(s)
CPVC ..... chlorinated poly (vinyl chloride)
° ..... degree(s)
°C ..... degree(s) Celsius
diam ..... diameter
DWV ..... drain, waste and vent
h ..... hour(s)
in. ..... inch(es)
kg/m^2 ..... kilograms per square metre
kPa ..... kilopascal(s)
L ..... litre(s)
L/s ..... litres per second
m ..... metre(s)
m^2 ..... square metre(s)
max. ..... maximum
min. ..... minimum
min ..... minute(s)
mm ..... millimetre(s)
NA ..... not applicable
No. ..... number(s)
PVC ..... poly (vinyl chloride)
temp. ..... temperature

1.4 Equivalents

1.4.1. The provisions of this Code are not intended to limit the appropriate use of materials, appliances, systems, equipment, methods of design or construction procedures not specifically authorized herein.

1.4.2. Any person desirous of providing an equivalent to satisfy one or more of the requirements of this Code shall submit sufficient evidence to demonstrate that the proposed equivalent will provide the level of performance required by this Code.

1.4.3. Materials, appliances, systems, equipment, methods of design and construction procedures not specifically described herein, or which vary from the specific requirements in this Code, may be used if it can be shown that these alternatives are suitable on the basis of past performances, tests or evaluations.

1.5 Plumbing Facilities

1.5.1. Plumbing facilities shall be provided in accordance with Subsection 3.6.4. of Part 3 and Section 9.31 of Part 9 of the National Building Code of Canada 1990.

1.6 Service Connections

1.6.1. Sanitary Drainage Systems

(1) Every *sanitary drainage system* shall be connected to a public *sanitary sewer*, a public *combined sewer* or a *private sewage disposal system.*

(2) A *combined building drain* shall not be installed. (See Appendix A.)

1.6.2. Storm Drainage Systems. Every *storm drainage system* shall be connected to a public *storm sewer*, a public *combined sewer* or a designated *storm water* disposal location.

1.6.3. Water Distribution Systems. Every *water distribution system* shall be connected to a public water main or a *private potable water supply system.*

1.6.4. Separate Services. Piping in any *building* connected to the public services shall be connected separately from piping of any other *building*, except that an ancillary *building* on the same property may be served by the same service. (See Appendix A.)

1.7 Location of Fixtures

1.7.1. Lighting and Ventilation Requirements

(1) Plumbing *fixtures* shall not be installed in a room that is not lighted and ventilated in accordance with the appropriate requirements in Parts 3 and 9 of the National Building Code of Canada 1990.

(2) When a water closet is installed in a public washroom it shall be provided with a seat of the open front type.

1.7.2. Accessibility. Every *fixture*, appliance, *interceptor*, *cleanout*, valve, device or piece of equipment shall be so located that it is readily accessible for use, cleaning and maintenance.

1.8 Plumbing Drawings and Related Documents

1.8.1. Contents

(1) Plumbing drawings and related documents submitted with the application for a plumbing permit shall show

(a) the location and *size* of every *building drain* and of every *trap* and *cleanout* fitting that is on a *building drain*,

(b) the *size* and location of every *soil-or-waste pipe*, *trap* and *vent pipe*, and

(c) a layout of the *potable water distribution system*, including pipe *sizes* and valves.

1.9 Referenced Documents

1.9.1. Conflict between Code and Referenced Documents. In case of conflict between the provisions of this Code and those of a referenced document, the provisions of this Code shall govern.

1.9.2. Amendments, Revisions and Supplements. Unless otherwise specified herein, the documents referenced in this Code shall include all amendments, revisions and supplements effective to 30 June 1989.

1.9.3. Designated Editions. Where standards are referenced in this Code, they shall be the editions designated in Table 1.9.A.

Table 1.9.A.
Forming Part of Article 1.9.3.

Documents Referenced in the Canadian Plumbing Code 1990			
Issuing Agency	**Document Number**	**Title of Document**	**Code Reference**
ANSI	B16.3-1985	Malleable-Iron Threaded Fittings, 150 to 300 lb.	2.6.6.(1)
ANSI	B16.4-1985	Cast-Iron Threaded Fittings, 125 and 250 lb	2.6.5.(1)
ANSI	B16.12-1983	Cast-Iron Threaded Drainage Fittings	2.6.3.(1)
ANSI	B16.15-1985	Cast Bronze Threaded Fittings, Class 125 and 250	2.7.3.(1)
ANSI	B16.18-1984	Cast Copper Alloy Solder-Joint Pressure Fittings	2.7.6.(1) 2.7.6.(2)
ANSI	B16.22-1989	Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings	2.7.6.(1)
ANSI	B16.24-1979	Bronze Pipe Flanges and Flanged Fittings, 150 and 300 lb	2.7.2.
ANSI	B16.26-1983	Cast Copper Alloy Fittings for Flared Copper Tubes	2.7.7.(1) 2.7.7.(2)
ANSI	B16.29-1986	Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings-DWV	2.7.5.(1)
ANSI/AWWA	C104/A21.4-1985	Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water	2.6.4.(2)
ANSI/AWWA	C110/A21.10-87	Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in., for Water and Other Liquids	2.6.4.(3)
ANSI/AWWA	C111/A21.11-1985	Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings	2.6.4.(4)
ANSI/AWWA	C151/A21.51-86	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids	2.6.4.(1)
ASTM	A53-89	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless	2.6.7.(4)
ASTM	B32-89	Solder Metal	2.8.2.(2)
ASTM	B42-88	Seamless Copper Pipe, Standard Sizes	2.7.1.(1)
ASTM	B43-88	Seamless Red Brass Pipe, Standard Sizes	2.7.1.(2)
ASTM	B88-88	Seamless Copper Water Tube	2.7.4.(1)
ASTM	B306-88	Copper Drainage Tube (DWV)	2.7.4.(1)
ASTM	D2466-89	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	2.5.6.(2)
ASTM	D2467-89	Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80	2.5.6.(2)
ASTM	D2564-88	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings	2.5.6.(3)
Column 1	2	3	4

Table 1.9.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
ASTM	D3261-88	Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	2.5.5.(3)
CGSB	CAN/CGSB-34.1-M87	Pipe, Asbestos Cement, Pressure	2.5.2.(1)
CGSB	CAN/CGSB-34.9-M-87	Pipe, Asbestos Cement, Sewer	2.5.1.(2)
CGSB	CAN/CGSB-34.22-M-87	Pipe, Asbestos Cement, Drain	2.5.1.(1)
CGSB	CAN/CGSB-34.23-M87	Pipe, Asbestos Cement, Sewer, House Connection	2.5.1.(2)
CGA	CAN1-4.4-M80	Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves	2.9.10.
CSA	A60.1-M1976	Vitrified Clay Pipe	2.5.4.(1)
CSA	A60.3-M1976	Vitrified Clay Pipe Joints	2.5.4.(2)
CSA	A257.1-M1982	Concrete Culvert, Storm Drain and Sewer Pipe	2.5.3.(1)
CSA	A257.2-M1982	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	2.5.3.(1)
CSA	A257.3-M1982	Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets	2.5.3.(2)
CSA	CAN/CSA-B45.0-M88	General Requirements for Plumbing Fixtures	2.2.2.(1)
CSA	CAN/CSA-B45.1-M88	Vitreous China Plumbing Fixtures	2.2.2.(2)
CSA	CAN/CSA-B45.2-M88	Enamelled Cast Iron Plumbing Fixtures	2.2.2.(3)
CSA	CAN/CSA-B45.3-M88	Porcelain Enamelled Steel Plumbing Fixtures	2.2.2.(4)
CSA	CAN/CSA-B45.4-M88	Stainless Steel Plumbing Fixtures	2.2.2.(5)
CSA	CAN/CSA-B45.5-M88	Plastic Plumbing Fixtures	2.2.2.(6)
CSA	CAN/CSA-B45S1-88	Supplement No. 1, Hydromassage Bathtubs, to CAN/CSA-B45 Series-88, CSA Standards on Plumbing Fixtures	2.2.2.(7)
CSA	CAN/CSA-B64.0-1976	Definitions, General Requirements, and Test Methods for Vacuum Breakers and Backflow Preventers	2.9.9.(1)
Column 1	2	3	4

Table 1.9.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
CSA	CAN/CSA-B64.1.1-M88	Vacuum Breakers – Atmospheric Type (AVB)	2.9.9.(1)
CSA	CAN/CSA-B64.1.2.-M88	Vacuum Breakers – Pressure Type (PVB)	2.9.9.(1)
CSA	CAN/CSA-B64.2-M88	Vacuum Breakers – Hose Connection Type (HCVB)	2.9.9.(1)
CSA	CAN/CSA B64.2.1.-M88	Vacuum Breakers – Hose Connection Type (HCVB) with Manual Draining Feature	2.9.9.(1)
CSA	CAN/CSA B64.2.2-M88.	Vacuum Breakers – Hose Connection Type (HCVB) with Automatic Draining Feature	2.9.9.(1)
CSA	CAN/CSA-B64.3-M88	Backflow Preventers, Dual Check Valve Type with Atmospheric Port (DCAP)	2.9.9.(1)
CSA	CAN/CSA-B64.4-M88	Backflow Preventers – Reduced-Pressure-Principle Type (RP)	2.9.9.(1)
CSA	CAN/CSA-B64.5-M88	Backflow Preventers – Double-Check-Valve Type (DCVA)	2.9.9.(1)
CSA	CAN/CSA-B64.6-M88	Backflow Preventers – Dual Check Valve Type (DuC)	2.9.9.(1)
CSA	CAN/CSA-B64.7-M88	Vacuum Breakers – Laboratory Faucet Type (LFVB)	2.9.9.(1)
CSA	B67-1972	Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories	2.7.8.(1) 2.8.2.(1)
CSA	CAN3-B70-M86	Cast Iron Soil Pipe, Fittings and Methods of Joining	2.6.1.(1) 2.6.2.
CSA	CAN/CSA-B125-M89	Plumbing Fittings	2.33. 2.9.6. 2.9.9.(2)
CSA	B127.1-M1977	Components for Use in Asbestos Cement Drain, Waste and Vent Systems	2.5.1.(1)
CSA	B127.2-M1977	Components for Use in Asbestos Cement Building Sewer Systems	2.5.1.(2)
CSA	CAN/CSA B137.1-M89	Polyethylene Pipe, Tubing and Fittings for Cold Water Pressure Services	2.5.5.(1)
CSA	CAN/CSA B137.3-M90	Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications	2.5.6.(1)
CSA	B137.6-M1983	CPVC Pipe, Tubing and Fittings for Hot and Cold Water Distribution Systems	2.5.7.(1)
CSA	CAN3-B137.8-M86	Polybutylene (PB) Piping for Pressure Applications	2.5.8.(1)
Column 1	2	3	4

Table 1.9.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
CSA	B158.1-1976	Cast Brass Solder Joint Drainage, Waste and Vent Fittings	2.7.5.(1) 2.9.1.
CSA	CAN/CSA B181.1-M90	ABS Drain, Waste and Vent Pipe and Pipe Fittings	2.5.9.(1) 2.5.10.(1)
CSA	CAN/CSA-B181.2-M90	PVC Drain, Waste, and Vent Pipe and Pipe Fittings	2.5.9.(1) 2.5.10.(1)
CSA	CAN/CSA-B181.3-M86	Polyolefin – Laboratory Drainage Systems	2.5.10.(1)
CSA	CAN/CSA-B182.1-M87	Plastic Drain and Sewer Pipe and Pipe Fittings	2.5.9.(1)
CSA	CAN/CSA-B182.2-M87	Large-Diameter, Type PSM PVC Sewer Pipe and Fittings	2.5.9.(1)
CSA	B242-M1980	Groove and Shoulder Type Mechanical Pipe Couplings	2.9.4.
CSA	B272-M1978	Prefabricated Self-Sealing Vent Flashings	2.9.11.(2)
CSA	CAN/CSA B281-M90	Aluminum Drain, Waste and Vent Pipe, and Components	2.7.9.(1)
CSA	CAN3-G401-M81	Corrugated Steel Pipe Products	2.6.8.(1)
NFPA	13-1989	Installation of Sprinkler Systems	6.2.4.(1)
ULC	CAN4-S114-M80	Standard Method of Test for Determination of Non-Combustibility in Building Materials	1.3.2.
Column 1	2	3	4

Section 2
Materials and Equipment

2.1 General

2.1.1. Defects in Products and Materials. All materials, systems and equipment installed to meet the requirements of this Code shall be free from defects and possess the necessary characteristics to perform their intended functions when installed.

2.1.2. Exposure of Materials

(1) Where unusual conditions exist such as excessively corrosive soil or water, only materials suited for use in such locations shall be used.

(2) Materials and equipment used in a drainage system where excessively corrosive wastes are present shall be suitable for the purpose.

2.1.3. Restrictions on Re-Use

(1) Used materials and equipment, including fixtures, shall not be reused unless they meet the requirements of this Code for new materials and equipment and are otherwise satisfactory for their intended use.

(2) Materials and equipment that have been used for a purpose other than the distribution of *potable* water shall not be subsequently used in a *potable water system.*

2.1.4. Identification. Every length of pipe and every fitting shall have cast, stamped or indelibly marked on it the maker's name or mark and the weight or class or quality of the product, or it shall be marked in accordance with the relevant standard, and such markings shall be visible after installation.

2.1.5. Pipe or Piping. Where the term pipe or piping is used, it shall also apply to tube or tubing unless otherwise stated.

2.1.6. Withstanding Pressure. Piping, fittings and joints used in pressure sewer, forcemain or sump pump discharge applications shall be capable of withstanding at least one and one-half times the maximum potential pressure.

2.2 Fixtures

2.2.1. Surface Requirements. Every *fixture* shall have a smooth, hard, corrosion-resistant surface free from flaws and blemishes that may interfere with cleaning.

2.2.2. Conformance to Standards

(1) Every *fixture* shall conform to CAN/CSA-B45.0-M, "General Requirements for Plumbing Fixtures" as applicable.

(2) Every vitreous china *fixture* shall conform to CAN/CSA-B45.1-M, "Vitreous China Plumbing Fixtures."

(3) Every enamelled cast iron *fixture* shall conform to CAN/CSA-B45.2-M, "Enamelled Cast Iron Plumbing Fixtures."

(4) Every porcelain enamelled steel *fixture* shall conform to CAN/CSA-B45.3-M, "Porcelain Enamelled Steel Plumbing Fixtures."

(5) Every stainless steel *fixture* shall conform to CAN/CSA-B45.4-M, "Stainless Steel Plumbing Fixtures."

(6) Every plastic *fixture* shall conform to CAN/CSA-B45.5-M, "Plastic Plumbing Fixtures."

(7) Every hydromassage bathtub shall conform to "Supplement No. 1, Hydromassage Bathtubs," to CAN/CSA-B45-M Series, "CSA Standards on Plumbing Fixtures."

2.2.3. Showers

(1) Every shower receptor shall be constructed and arranged so that water cannot leak through the walls or floor.

(2) Not more than 6 shower heads shall be served by a single shower drain.

(3) Where 2 or more shower heads are served by a shower drain, the floor shall be sloped and the drain located so that water from one head cannot flow over the area that serves another head. (See Appendix A.)

(4) Except for column showers, when a battery of shower heads is installed, the horizontal distance between 2 adjacent shower heads shall be not less than 750 mm.

2.2.4. Concealed Overflows. A dishwashing sink and a food preparation sink shall not have concealed overflows. (See Appendix A.)

2.3 Traps and Interceptors

2.3.1. Traps

(1) Every *trap* shall
- (a) have a *trap seal depth* of not less than 38 mm,
- (b) be so designed that failure of the seal walls will cause exterior leakage, and
- (c) have a water seal that does not depend on the action of moving parts. (See Appendix A.)

(2) Every *trap* that serves a lavatory, a sink or a laundry tray shall
- (a) be provided with a *cleanout* plug located at the lowest point of the *trap* and of the same material as the *trap*, except that a cast-iron *trap* shall be provided with a brass *cleanout* plug, or
- (b) be designed so that part of the *trap* can be completely removed by screwed connections for cleaning purposes.

(See Appendix A.)

(3) A bell *trap* shall not be installed in a *drainage system*. (See Appendix A.)

(4) A drum *trap* shall not be used as a *fixture trap* unless required to serve as an *interceptor* and access for servicing is provided.

2.3.2. Interceptors

(1) Every *interceptor* shall be designed so that it can be readily cleaned.

(2) Every grease *interceptor* shall be designed so that it does not become air bound and it shall not have a water jacket.

2.3.3. Tubular Traps. Tubular metal or plastic traps conforming to CAN/CSA B125-M, "Plumbing Fittings," shall be used only in accessible locations.

2.4 Pipe Fittings

2.4.1. T and Cross Fittings

(1) A T fitting shall not be used in a *drainage system* except to connect a *vent pipe*.

(2) A cross fitting shall not be used in a *drainage system*.

(See Appendix A.)

2.4.2. Sanitary T Fittings

(1) A single or double sanitary T fitting shall not be used in a *nominally horizontal soil-or-waste pipe*, except that a single sanitary T fitting may be used to connect a *vent pipe*.

(2) A double sanitary T fitting shall not be used to connect the *trap arms* of
- (a) back outlet water closets installed back-to-back, or
- (b) 2 urinals where no *cleanout* fitting is provided above the connection.

(See Appendix A.)

2.4.3. One-Quarter Bends. A one-quarter bend of 4 in. *size* or less that has a centre-line radius that is less than the *size* of the pipe shall not be used to join 2 *soil-or-waste pipes*.

2.4.4. Sisson Fittings. A sisson fitting shall not be installed in a *nominally horizontal soil-or-waste pipe*.

2.5 Non-Metallic Pipe and Fittings

(For a summary of pipe applications see Appendix A.)

2.5.1. Asbestos-Cement Drainage Pipe and Fittings

(1) Except as provided in Sentence (2), asbestos-cement pipe and its fittings for use in a drain, waste or vent system shall conform to

(a) CAN/CGSB-34.22-M, "Pipe, Asbestos Cement, Drain," or

(b) CSA B127.1-M, "Components for Use in Asbestos Cement Drain, Waste and Vent Systems."

(2) Asbestos-cement pipe and fittings used underground either outside a *building* or under a *building* shall conform to Sentence (1) or to

(a) CAN/CGSB-34.9-M, "Pipe, Asbestos Cement, Sewer,"

(b) CAN/CGSB-34.23-M, "Pipe, Asbestos Cement, Sewer, House Connection," or

(c) CSA B127.2, "Components for Use in Asbestos Cement Building Sewer Systems."

2.5.2. Asbestos-Cement Water Pipe and Fittings

(1) Asbestos-cement water pipe, couplings and bends shall conform to CAN/CGSB-34.1-M, "Pipe, Asbestos Cement, Pressure."

(2) Asbestos-cement water pipe shall not be used above ground.

2.5.3. Concrete Pipe and Fittings

(1) Concrete pipe shall conform to CSA A257.1-M, "Concrete Culvert, Storm Drain and Sewer Pipe" or CSA A257.2-M, "Reinforced Concrete Culvert, Storm Drain and Sewer Pipe" of CSA Series A257, "Standards for Concrete Pipe."

(2) Joints with internal elastomeric gaskets shall conform to CSA A257.3-M, "Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets" of CSA Series A257, "Standards for Concrete Pipe."

(3) Joints with external elastomeric gaskets shall be made with corrosion resistant external band type flexible mechanical couplings.

(4) Concrete fittings fabricated on the site from lengths of pipe shall not be used. (See Appendix A.)

(5) Concrete pipe shall not be used above ground inside a *building*.

2.5.4. Vitrified Clay Pipe and Fittings

(1) Vitrified clay pipe and fittings shall conform to CSA A60.1-M, "Vitrified Clay Pipe."

(2) Couplings and joints for vitrified clay pipe shall conform to CSA A60.3-M, "Vitrified Clay Pipe Joints."

(3) Vitrified clay pipe and fittings shall not be used except for an underground part of a *drainage system*.

2.5.5. Polyethylene Pipe and Fittings

(1) Polyethylene water pipe, tubing and fittings shall conform to Series 160 of CAN/CSA-B137.1-M, "Polyethylene Pipe, Tubing and Fittings for Cold Water Pressure Services."

(2) Polyethylene water pipe shall not be used except for a *water service pipe*.

(3) Butt fusion fittings for polyethylene pipe shall conform to ASTM D3261, "Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing."

2.5.6. PVC Pipe and Fittings

(1) PVC water pipe and fittings shall conform to CAN/CSA-B137.3-M, "Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications," and have a pressure rating of not less than 1 100 kPa.

(2) PVC water pipe fittings shall conform to ASTM D2466, "Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40": or ASTM D2467, "Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80."

(3) PVC solvent cements shall conform to ASTM D2564, "Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings."

(4) PVC water pipe and fittings referred to in Sentences (1) and (2) shall not be used in a hot *water system*.

2.5.7. CPVC Pipe, Fittings and Solvent Cements

(1) CPVC hot and cold water pipe, fittings and solvent cements shall conform to CSA B137.6-M, "CPVC Pipe, Tubing and Fittings for Hot and Cold Water Distribution Systems."

(2) The design temperature and design pressure of a CPVC piping system shall conform to Table 2.5.A.

Table 2.5.A.
Forming Part of Sentence 2.5.7.(2)

Maximum Permitted Pressure for CPVC Piping at Various Temperatures	
Maximum Temperature of Water, °C	Maximum Permitted Pressures, kPa
10	3 150
20	2 900
30	2 500
40	2 100
50	1 700
60	1 300
70	1 000
80	700
90	500
100	400
Column 1	2

2.5.8. Polybutylene Pipe and Fittings

(1) Polybutylene pipe and its associated fittings shall conform to CAN3-B137.8-M, "Polybutylene (PB) Piping for Pressure Applications."

(2) Joints in polybutylene tubing shall not be embedded in or installed under a concrete grade slab.

2.5.9. Plastic Pipe, Fittings and Solvent Cement Used Underground

(1) Plastic pipe, fittings and solvent cement used underground outside a *building* or under a *building* in a *drainage system* shall conform to

(a) CAN/CSA-B181.1-M, "ABS Drain, Waste and Vent Pipe and Pipe Fittings,"

(b) CAN/CSA-B181.2-M, "PVC Drain, Waste and Vent Pipe and Pipe Fittings,"

(c) CAN/CSA-B182.1-M, "Plastic Drain and Sewer Pipe and Pipe Fittings," or

(d) CAN/CSA-B182.2, "Large-Diameter, Type PSM PVC Sewer Pipe and Fittings," SDR rating of no greater than 35.

2.5.10. Plastic Pipe, Fittings and Solvent Cement Used Above Ground

(1) Plastic pipe, fittings and solvent cement used inside or under a *building* in a *drainage* or *venting system* shall conform to

(a) CAN/CSA-B181.-M, "ABS Drain, Waste and Vent Pipe and Pipe Fittings,"

(b) CAN/CSA-B181.2-M, "PVC Drain, Waste and Vent Pipe and Pipe Fittings," or

(c) CAN/CSA-B181.3-M, "Polyolefin Laboratory Drainage Systems."

(2) Requirements for *combustible* piping in relation to fire safety shall conform to Sentence 3.1.5.15.(1) and Article 3.1.9.4. of Part 3 and Sentences 9.10.9.6.(2) to (8) and Article 9.10.9.7. of Part 9 of the National Building Code of Canada 1990.

(3) Where *noncombustible* piping pierces a *fire separation* or a *fire stop*, the requirements of fire stopping of Subsection 3.1.11. of Part 3 and Sentence 9.10.9.6.(1) and Article 9.10.15.4. of Part 9 of the National Building Code of Canada 1990 shall apply.

2.6 Ferrous Pipe and Fittings

(For a summary of pipe applications see Appendix A.)

2.6.1. Cast Iron Drainage and Vent Pipe and Fittings

(1) Drainage piping, vent piping and fittings made of cast iron shall conform to CAN3-B70-M, "Cast Iron Soil Pipe, Fittings and Methods of Joining."

(2) Cast iron soil pipe and fittings shall not be used in a *water system*.

2.6.2. Cast Iron Fittings for Asbestos-Cement Drainage Pipe. Cast iron fittings designed for use with asbestos-cement pipe for drain-

age purposes shall conform to the applicable requirements of CAN3-B70-M, "Cast Iron Soil Pipe, Fittings and Methods of Joining."

2.6.3. Threaded Cast Iron Drainage Fittings

(1) Threaded cast iron drainage fittings shall conform to ANSI B16.12, "Cast-Iron Threaded Drainage Fittings."

(2) Threaded cast iron drainage fittings shall not be used in a *water system*.

2.6.4. Cast Iron Water Pipes

(1) Cast iron water pipes shall conform to ANSI/AWWA C151/A21.51, "Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids."

(2) Cement mortar lining for cast iron water pipes shall conform to ANSI/AWWA C104/A21.4, "Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water."

(3) Cast iron fittings for cast iron or ductile-iron water pipes shall conform to ANSI/AWWA C110/A21.10, "Ductile-Iron and Gray-Iron Fittings, 3-in. Through 48-in. for Water and Other Liquids."

(4) Rubber gasket joints for cast-iron and ductile-iron pressure pipe for water piping shall conform to ANSI/AWWA C111/A21.11, "Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings."

2.6.5. Screwed Cast Iron Water Fittings

(1) Screwed cast iron water fittings shall conform to ANSI B16.4, "Cast Iron Threaded Fittings, 125 and 250 lb."

(2) Screwed cast iron water fittings used in a *water system* shall be cement-mortar lined or galvanized.

(3) Screwed cast iron water fittings shall not be used in a *drainage system*.

2.6.6. Screwed Malleable Iron Water Fittings

(1) Screwed malleable iron water fittings shall conform to ANSI B16.3, "Malleable-Iron Threaded Fittings 150 and 300 lb."

(2) Screwed malleable iron water fittings used in a *water system* shall be cement-mortar lined or galvanized.

(3) Screwed malleable iron water fittings shall not be used in a *drainage system*.

2.6.7. Steel Pipe

(1) Except as provided in Sentences (2) and (3), welded and seamless steel pipe shall not be used in a *plumbing system*.

(2) Galvanized steel pipe may be used in a *drainage system* or a *venting system* above ground inside a *building*.

(3) Galvanized steel pipe shall not be used in a *water distribution system* except

(a) in *buildings* of industrial occupancy as described in the National Building Code of Canada 1990, or
(b) for the repair of existing galvanized steel piping systems.

(See Appendix A.)

(4) Galvanized steel pipe shall conform to ASTM A53, "Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless."

2.6.8. Corrugated Steel Pipe and Couplings

(1) Corrugated steel pipe and couplings shall conform to CAN3-G401-M, "Corrugated Steel Pipe Products."

(2) Corrugated steel pipe shall only be used underground outside a *building* in a *storm drainage system*.

(3) Couplings for corrugated steel pipe shall be constructed so that when installed they shall

(a) maintain the pipe alignment,
(b) resist the separation of adjoining lengths of pipe,
(c) prevent root penetration, and
(d) prevent the infiltration of surrounding material.

2.6.9. Sheet Metal Leaders. A sheet metal *leader* shall not be used except above ground outside a *building*.

2.7 Non-Ferrous Pipe and Fittings

(For a summary of pipe applications see Appendix A.)

2.7.1. Copper and Brass Pipe

(1) Copper pipe shall conform to ASTM B42, "Seamless Copper Pipe, Standard Sizes."

(2) Brass pipe shall conform to ASTM B43, "Seamless Red Brass Pipe, Standard Sizes."

2.7.2. Brass or Bronze Pipe Flanges and Flanged Fittings.

Brass or bronze pipe flanges and flanged fittings shall conform to ANSI B16.24, "Bronze Pipe Flanges and Flanged Fittings, 150 and 300 lb."

2.7.3. Brass or Bronze Threaded Water Fittings

(1) Brass or bronze threaded water fittings shall conform to ANSI B16.15, "Cast Bronze Threaded Fittings, Class 125 and 250."

(2) Brass or bronze threaded water fittings shall not be used in a *drainage system.*

2.7.4. Copper Tube

(1) Copper tube shall conform to

(a) ASTM B88, "Seamless Copper Water Tube," or

(b) ASTM B306, "Copper Drainage Tube (DWV)."

(2) Except as provided in Sentence (3), the use of copper tube shall conform to Table 2.7.A.

(3) Copper tube shall not be used for the *fixture drain* or the portion of the *vent* below the flood level rim of a flush valve-operated urinal.

2.7.5. Solder-Joint Drainage Fittings

(1) Solder-joint fittings for *drainage systems* shall conform to

(a) CSA B158.1, "Cast Brass Solder Joint Drainage, Waste and Vent Fittings," or

(b) ANSI B16.29, "Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings–DWV."

(2) Solder-joint fittings for *drainage systems* shall not be used in a *water system.*

2.7.6. Solder-Joint Water Fittings

(1) Except as provided in Sentence (2), solder-joint fittings for *water systems* shall conform to

(a) ANSI B16.18, "Cast Copper Alloy Solder-Joint Pressure Fittings," or

(b) ANSI B16.22, "Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings."

Table 2.7.A.
Forming Part of Article 2.7.4.

Type of Copper Tube or Pipe	Permitted Use of Copper Tube and Pipe							
	Plumbing Purposes							
	Water Service Pipe	*Water Distribution System*		*Building Sewer*	*Drainage System*		*Venting System*	
		Underground	Above ground		Underground	Above ground	Underground	Above ground
K & L hard	N	N	P	P	P	P	P	P
K & L soft	P	P	P	N	N	N	N	N
M hard	N	N	P	N	N	P	N	P
M soft	N	N	N	N	N	N	N	N
DWV	N	N	N	N	N	P	N	P
Column 1	2	3	4	5	6	7	8	9

P–Permitted N–Not Permitted

(2) Solder-joint fittings for *water systems* not made by casting or the wrought process shall conform to the applicable requirements of ANSI B16.18, "Cast Copper Alloy Solder-Joint Pressure Fittings."

2.7.7. Flared-Joint Fittings for Copper Water Systems

(1) Flared-joint fittings for copper tube *water systems* shall conform to ANSI B16.26, "Cast Copper Alloy Fittings for Flared Copper Tubes."

(2) Flared-joint fittings for copper tube *water systems* not made by casting shall conform to the applicable requirements of ANSI B16.26, "Cast Copper Alloy Fittings for Flared Copper Tubes."

2.7.8. Lead Waste Pipe and Fittings

(1) Lead *waste pipe* and fittings shall conform to CSA B67, "Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories."

(2) When there is a change in *size* of a lead closet bend, the change shall be in the vertical section of the bend or made in such a manner that there shall be no retention of liquid in the bend.

(3) Lead *waste pipe* and fittings shall not be used in a *water system* or for a *building sewer.*

2.7.9. Aluminum DWV Pipe and Components

(1) Aluminum DWV pipe and components shall conform to CAN/CSA–B281-M, "Aluminum Drain, Waste and Vent Pipe, and Components."

(2) Aluminum DWV pipe shall only be used above ground in a drainage system or a venting system.

2.8 Jointing Materials

2.8.1. Cement Mortar. Cement mortar shall not be used for jointing.

2.8.2. Wiping Solder and Caulking Lead

(1) Wiping solder and caulking lead shall conform to CSA B67, "Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories."

(2) Solders for solder joint fittings shall conform to ASTM B32, "Solder Metal" in accordance with the recommended use.

(3) Solders and fluxes having a lead content in excess of 0.2 per cent shall not be used in a *potable water system.*

2.9 Miscellaneous Materials

2.9.1. Brass Floor Flanges. Brass floor flanges shall conform to CSA B158.1, "Cast Brass Solder Joint Drainage, Waste and Vent Fittings."

2.9.2. Brass Screws, Bolts, Nuts and Washers

(1) Every screw, bolt, nut and washer shall be of brass when used

(a) to connect a water closet to a water closet flange,

(b) to anchor the water closet flange to the floor, or

(c) to anchor the water closet to the floor.

2.9.3. Cleanout Fittings

(1) Every plug, cap, nut or bolt that is intended to be removable from a ferrous fitting shall be of a non-ferrous material.

(2) A *cleanout* fitting that as a result of normal maintenance operations cannot withstand the physical stresses of removal and reinstallation or cannot ensure a gas-tight seal shall not be installed.

2.9.4. Groove and Shoulder Type Mechanical Pipe Couplings. Groove and shoulder type mechanical pipe couplings shall conform to CSA B242-M, "Groove and Shoulder Type Mechanical Pipe Couplings."

2.9.5. Saddle Hubs. A saddle hub or fitting shall not be installed in *drainage, venting* or *water systems.* (See Apppendix A.)

2.9.6. Supply and Waste Fittings. Supply and waste fittings shall conform to CAN/CSA-B125-M, "Plumbing Fittings."

2.9.7. Direct Flush Valves

(1) Every direct flush valve shall

(a) open fully and close positively under service pressure,

(b) complete its cycle of operation automatically,
(c) be provided with a means of regulating the volume of water that it discharges, and
(d) be provided with a *vacuum breaker* unless the *fixture* is designed so that back-siphonage cannot occur.

2.9.8. Drinking Fountain Bubblers

(1) The orifice of every drinking fountain bubbler shall
(a) be of the shielded type, and
(b) direct the water upward at an angle of approximately 45°.

(2) Every drinking fountain bubbler shall include a means of regulating the flow to the orifice.

(3) Bubblers shall be installed only on drinking fountains. (See Appendix A.)

2.9.9. Back-Siphonage Preventers and Backflow Preventers

(1) Except as provided in Sentence (2), *back-siphonage preventers* and *backflow preventers* shall conform to
(a) CAN/CSA B64.0-M, "Definitions, General Requirements, and Test Methods for Vacuum Breakers and Backflow Preventers,"
(b) CAN/CSA B64.1.1-M, "Vacuum Breakers – Atmospheric Type (AVB),"
(c) CAN/CSA B64.1.2-M, "Vacuum Breakers – Pressure Type (PVB),"
(d) CAN/CSA B64.2, "Vacuum Breakers – Hose Connection Type (HCVB),"
(e) CAN/CSA B64.2.1-M, "Vacuum Breakers – Hose Connection Type (HCVB) with Manual Draining Feature,"
(f) CAN/CSA B64.2.2-M, "Vacuum Breakers – Hose Connection Type (HCVB) with Automatic Draining Feature,"
(g) CAN/CSA B64.3-M, "Backflow Preventers, Dual Check Valve Type with Atmospheric Port (DCAP),"
(h) CAN/CSA B64.4-M, "Backflow Preventers – Reduced – Pressure – Principle Type (RP),"
(i) CAN/CSA B64.5, "Backflow Preventers – Double-Check-Valve Type (DCVA),"
(j) CAN/CSA-B64.6-M, "Backflow Preventers – Dual Check Valve Type (DuC)," or
(k) CAN/CSA-B64.7-M "Vacuum Breakers – Laboratory Faucet Type (LFVB)."

(See Appendix A.)

(2) *Back-siphonage preventers* for tank type water closets (anti-siphon ballcocks) shall conform to CAN/CSA-B125-M, "Plumbing Fittings."

2.9.10. Relief Valves. Temperature relief, pressure relief, combined temperature and pressure relief and vacuum relief valves shall conform to CAN1-4.4-M, "Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves."

2.9.11. Vent Pipe Flashing

(1) Flashing fabricated on-site for *vent pipes* shall be fabricated from
(a) copper sheet not less than 0.33 mm thick,
(b) aluminium sheet not less than 0.61 mm thick,
(c) *alloyed zinc* sheet not less than 0.35 mm thick,
(d) lead sheet not less than 2.16 mm thick,
(e) galvanized steel sheet not less than 0.41 mm thick, or
(f) polychloroprene (neoprene) not less than 2.89 mm thick.

(2) Prefabricated flashing for *vent pipes* shall conform to CSA B272-M, "Prefabricated Self-Sealing Vent Flashings."

(See Article 5.6.5. for location of vent pipe terminals.)

Section 3
Piping

3.1 Application

3.1.1. This Section applies to the construction and use of joints and connections, and the arrangement, protection, support and testing of piping.

3.2 Construction and Use of Joints

3.2.1. Caulked Lead Drainage Joints

(1) Every caulked lead drainage joint shall be firmly packed with oakum and tightly caulked with lead to a depth of not less than 25 mm.

(2) No paint, varnish or other coating shall be applied on the lead until after the joint has been tested.

(3) Caulked lead drainage joints shall not be used except for cast-iron pipe in a *drainage system* or *venting system*, or between such pipe and

(a) other ferrous pipe,
(b) brass and copper pipe,
(c) a caulking ferrule,
(d) a *trap standard*, or
(e) aluminum DWV pipe.

(4) A length of hub and spigot pipe and pipe fittings in a *drainage system* shall be installed with the hub at the upstream end.

3.2.2. Wiped Joints

(1) Wiped joints shall not be used except for sheet lead or lead pipe, or between such pipe and copper pipe or a ferrule.

(2) Every wiped joint in straight pipe shall

(a) be made of solder,
(b) have an exposed surface on each side of the joint at least 19 mm wide, and
(c) be not less than 10 mm thick at the thickest part.

(3) Every wiped flanged joint shall be reinforced with a lead flange that is not less than 19 mm wide.

3.2.3. Screwed Joints

(1) In making a screwed joint the ends of the pipe shall be reamed or filed out to the size of the bore and all chips and cuttings shall be removed.

(2) No pipe-joint cement or paint shall be applied to the internal threads.

3.2.4. Soldered Joints. In making a soldered joint the surface to be soldered shall be cleaned bright and the joint shall be properly fluxed, made with solder and thoroughly cleaned of all residue.

3.2.5. Flared Joints

(1) In making a flared joint the pipe shall be expanded with a proper flaring tool.

(2) Flared joints shall not be used for hard (drawn) copper tube.

3.2.6. Burned Lead Joints

(1) In making a burned lead joint the lead shall be lapped and fused to form a weld that is at least one and one-half times as thick as the wall of the pipe.

(2) In lead pipe the width of the weld shall be at least

(a) 13 mm where the *size* of the pipe is less than 3 in.,
(b) 16 mm where the *size* of the pipe is 3 in., or

(c) 19 mm where the *size* of the pipe is 4 in.

(3) In sheet lead the width of the weld shall be as specified in Table 3.2.A.

Table 3.2.A.
Forming Part of Sentence 3.2.8.(3)

Minimum Permitted Width of Weld for Sheet Lead	
Weight of Sheet Lead kg/m²	Minimum Width of Weld, mm
12.2 to 14.6	6
19.5 to 24.4	10
29.3 to 39.1	20
48.8 to 58.6	25
58.6 to 146.5	32
Column 1	2

3.2.7. Mechanical Joints. Mechanical joints shall be made with compounded elastomeric couplings or rings held by stainless steel or cast-iron clamps or contained within a compression connection or groove and shoulder type mechanical coupling.

3.2.8. Cold-Caulked Joints

(1) Cold-caulked joints shall not be used except for bell and spigot pipe in a *water system* or a *drainage system*. The caulking compound shall be applied according to the manufacturer's directions.

(2) Every cold-caulked joint in a *drainage system* shall be firmly packed with oakum and tightly caulked with cold caulking compound to a depth of not less than 25 mm.

(3) Every cold-caulked joint in a *water system* shall be made by tightly caulking the entire depth of the socket with caulking compound.

3.3 Joints and Connections

3.3.1. Drilled and Tapped Joints. Drilled and tapped joints shall not be made in a *soil-or-waste pipe* and *vent pipe* and fittings unless suitable provision has been made for drilling and tapping.

3.3.2. Extracted Tees

(1) Tees may be extracted from the wall thickness of Types K and L copper tube used in a *water distribution system* provided that

(a) a tool specifically designed for the purpose is used,
(b) the branch is at least one *size* smaller than the tube in which the tee is formed,
(c) the end of the branch incorporates a means to prevent it from penetrating into the run and thereby obstructing flow, and
(d) the joint at the tee is brazed with a filler metal having a melting point not below 540°C.

3.3.3. Prohibition of Welding of Pipes and Fittings

(1) Cast-iron soil pipe and fittings shall not be welded.

(2) Galvanized steel pipe and fittings shall not be welded.

(3) Aluminum DWV pipe shall not be welded.

3.3.4. Unions and Slip Joints

(1) Running thread and packing nut connections and unions with a gasket seal shall not be used downstream of a *trap weir* in a *drainage system* or in a *venting system*.

(2) A slip joint shall not be used
(a) in a *venting system*, or
(b) in a *drainage system*, except to connect a *fixture trap* to a *fixture drain* in an accessible location.

(See A-2.3.1.(1) and (2) in Appendix A.)

3.3.5. Increaser or Reducer. Every connection between 2 pipes of different *size* shall be made with an increaser or a reducer fitting installed so that it will permit the system to be completely drained.

3.3.6. Burned Lead Joints. Every joint in hard lead shall be made with a burned lead joint.

3.3.7. Dissimilar Connections. Adaptors, connectors or mechanical joints used to join dissimilar materials shall be designed to accommodate the required transition.

3.3.8. Connection of Roof Drain to Leader. Every *roof drain* shall be securely connected to a *leader* and provision shall be made for expansion.

3.3.9. Connection of Floor Outlet Fixtures

(1) Every pedestal urinal, floor-mounted water closet or *S-trap standard* shall be connected to a *fixture drain* by a floor flange, except that a cast-iron *trap standard* may be caulked to a cast-iron pipe.

(2) Except as provided in Sentences (3) and (4), every floor flange shall be brass.

(3) Where cast iron or plastic pipe is used, a floor flange of the same material may be used.

(4) Where aluminum DWV pipe is used, a floor flange of cast iron shall be used.

(5) Every floor flange shall be securely set on a firm base and bolted to the *trap* flange of the *fixture*, and every joint shall be sealed with a natural rubber, synthetic rubber or asbestos graphite gasket, or with a closet setting compound.

(6) Where a lead water closet stub is used, the length of the stub below the floor flange shall be not less than 75 mm.

3.3.10. Expansion and Contraction. The design and installation of every piping system shall, where necessary, include means to accommodate expansion and contraction of the piping system caused by temperature change or movement of the soil. (See Appendix A.)

3.3.11. Copper Tube. Types M and DMV copper tube shall not be bent.

3.3.12. Indirect Connections

(1) Where a *fixture* or device is *indirectly connected*, the connections shall be made by terminating the *fixture drain* above the *flood level rim* of a *directly connected fixture* to form an *air break*.

(2) The size of the *air break* shall at least equal the *size* of the *fixture drain*, *branch* or pipe that terminates above the *directly connected fixture*, and it shall be not less than 25 mm. (See Appendix A.)

3.4 Support of Piping

3.4.1. Capability of Support

(1) Piping shall be provided with support that is capable of keeping the pipe in alignment and bearing the weight of the pipe and its contents.

(2) Every floor- or wall-mounted water-closet bowl shall be securely attached to the floor or wall by means of a flange and shall be stable.

(3) Every wall-mounted *fixture* shall be supported so that no strain is transmitted to the piping.

3.4.2. Independence of Support. Piping, *fixtures*, tanks or devices shall be supported independently of each other.

3.4.3. Insulation of Support

(1) Where a hanger or support for copper tube or brass or copper pipe is of a material other than brass or copper, it shall be suitably separated and electrically insulated from the pipe.

(2) Where a hanger or support for aluminum DWV pipe is of a metal other than aluminum, it shall be suitably separated and electrically insulated from the pipe.

3.4.4. Support for Vertical Piping

(1) Except as provided in Sentence (2), vertical piping shall be supported at its base and at the floor level of alternate *storeys* by metal rests, each of which can bear the weight of pipe that is between it and the metal rest above it.

(2) The maximum spacing of supports shall be 7.5 m.

3.4.5. Support for Horizontal Piping

(1) *Nominally horizontal* piping that is inside a *building* shall be braced to prevent swaying and buckling and to control the effects of thrust.

(2) *Nominally horizontal* piping shall be supported so that

(a) galvanized iron or steel pipe is supported at intervals not exceeding

(i) 3.75 m if the pipe *size* is 6 in. or more, and

(ii) 2.5 m if the pipe *size* is less than 6 in.,

(b) lead pipe is supported throughout its length,
(c) cast-iron pipe is supported
  (i) at or adjacent to each hub or joint,
  (ii) at intervals not exceeding 3 m, and
  (iii) at intervals not exceeding 1 m if the pipe has mechanical joints and the length of pipe between adjacent fittings is 300 mm or less,
(d) asbestos-cement pipe is supported
  (i) at intervals not exceeding 2 m or 2 supports for every 4 m length of pipe, and
  (ii) at intervals not exceeding 1 m where the length of pipe between adjacent fittings is 300 mm or less,
(e) ABS or PVC plastic pipe is supported
  (i) at intervals not exceeding 1.2 m,
  (ii) at the ends of *branches*,
  (iii) at changes of direction or elevation, and
  (iv) if the pipe is a *fixture drain* that is more than 1 m in length, as close as possible to the *trap*,
(f) CPVC or polybutylene plastic pipe is supported at intervals not exceeding 1 m,
(g) copper tube and copper and brass pipe is supported at intervals not exceeding
  (i) 3 m if the tube or pipe is hard temper and larger than 1 in. in *size*,
  (ii) 2.5 m if the tube or pipe is hard temper and 1 in. in *size* or less, and
  (iii) 2.5 m if the tube is soft temper, and
(h) aluminum DWV pipe is supported
  (i) at or adjacent to each joint,
  (ii) at intervals not exceeding 3 m,
  (iii) at the ends of branches,
  (iv) at changes of direction or elevation, and
  (v) if the pipe is a *fixture drain* that is more than 1 m long, as close as possible to the trap.

(3) Where PVC, CPVC or ABS plastic pipe is installed
(a) the pipe shall be aligned without added strain on the piping,
(b) the pipe shall not be bent or pulled into position after being welded, and
(c) hangers shall not compress, cut or abrade the pipe.

(4) Where hangers are used to support *nominally horizontal* piping they shall be
(a) metal rods of not less than 9.5 mm diam for pipe over 4 in. in *size*, and
(b) solid or perforated metal strap hangers for pipe 4 in. or less in *size*.

(5) Where a hanger is attached to concrete or masonry, it shall be fastened by metal or expansion-type plugs that are inserted or built into the concrete or masonry.

3.4.6. Support for Underground Horizontal Piping

(1) Except as provided in Sentence (2), *nominally horizontal* piping that is underground shall be supported on a base that is firm and continuous under the whole of the pipe. (See Appendix A.)

(2) *Nominally horizontal* piping installed underground that is not suppported as described in Sentence (1) may be installed using hangers fixed to a foundation or structural slab provided that the hangers are capable of keeping the pipe in alignment and supporting the weight of the pipe, its contents and the fill over the pipe.

3.4.7. Support for Vent Pipe above a Roof. Where a *vent pipe* terminates above the surface of a roof it shall be supported or braced to prevent misalignment. (See Article 5.6.5. for location of vent pipe terminals.)

3.5 Protection of Piping

3.5.1. Backfilling of Pipe Trench. Where piping is installed underground, the backfill shall be carefully placed and tamped to a height of 300 mm over the top of the pipe and shall be free of stones, boulders, cinders and frozen earth. (See Appendix A.)

3.5.2. Protection of Non-Metallic Pipe. Where asbestos-cement drainage pipe or vitrified clay is located less than 600 mm below a basement floor and the floor is constructed of other than 75 mm

or more of concrete, the pipe shall be protected by a 75-mm layer of concrete installed above the pipe. (See Appendix A.)

3.5.3. Isolation from Loads. Where piping passes through or under a wall it shall be installed so that the wall does not bear on the pipe.

3.5.4. Protection from Frost. Where piping may be exposed to freezing conditions it shall be protected from frost.

3.5.5. Protection from Mechanical Damage. Plumbing, piping and equipment exposed to mechanical damage shall be protected.

3.6 Testing of Drainage and Venting Systems

3.6.1. Tests and Inspection of Drainage or Venting Systems

(1) Except in the case of an external *leader*, after a section of a *drainage system* or a *venting system* has been roughed in, and before any *fixture* is installed or piping is covered, a water or an air test shall be conducted.

(2) After every *fixture* is installed and before any part of the *drainage system* or *venting system* is placed in operation, a final test shall be carried out when requested.

(3) Where a prefabricated system is assembled off the *building* site in such a manner that it cannot be inspected and tested on site, off-site inspections and tests shall be conducted.

(4) Where a prefabricated system is installed as part of a *drainage* and *venting system*, all other plumbing work shall be tested and inspected and a final test shall be carried out on the complete system when requested.

(5) When requested, a ball test shall be made to any pipe in a *drainage system*.

3.6.2. Tests of Pipes in Drainage Systems

(1) Every pipe in a *drainage system*, except an external *leader* or *fixture outlet pipe*, shall be capable of withstanding without leakage a water test, air test and final test.

(2) Every pipe in a *drainage system* shall be capable of meeting a ball test.

3.6.3. Tests of Venting Systems. Every *venting system* shall be capable of withstanding without leakage a water test, air test and final test.

3.6.4. Water Tests

(1) Where a water test is made it shall be applied to

(a) the system as a whole, or

(b) sections of the system, each of which is not less than 3 m high and includes not less than 1.5 m of the section below.

(2) In making a water test

(a) every opening except the highest shall be tightly closed with a testing plug or a screw cap, and

(b) the system or the section shall be kept filled with water for 15 min.

3.6.5. Air Tests

(1) Where an air test is made

(a) every opening in the system shall be closed,

(b) air shall be forced into the system until a pressure of 35 kPa is created, and

(c) this pressure shall be maintained for 15 min without the addition of more air.

3.6.6. Final Tests

(1) Where a final test is made

(a) every *trap* shall be filled with water,

(b) the bottom of the system being tested shall terminate at a *building trap*, test plug or cap,

(c) except as provided in Sentence (2), smoke from smoke-generating machines shall be forced into the system,

(d) when the smoke appears from all roof terminals they shall be closed, and

(e) a pressure equivalent to a 25 mm water column shall be maintained for 15 min without the addition of more smoke.

(2) The smoke referred to in Clauses 3.6.6.(1)(c) and (d) may be omitted provided the roof terminals are closed and the system is subjected to an

air pressure equivalent to a 25 mm water column maintained for 15 min without the addition of more air.

3.6.7. Ball Tests

(1) Where a ball test is made, a hard ball dense enough not to float shall be rolled through the pipe.

(2) The diameter of the ball shall be not less than

(a) 50 mm where the *size* of the pipe is 3 in. or more, or

(b) 25 mm where the *size* of the pipe is less than 3 in.

3.7 Testing of Potable Water Systems

3.7.1. Application of Tests

(1) After a section of a *potable water system* has been completed, and before it is placed in operation, a water test shall be conducted, except that an air test may be used in freezing conditions.

(2) A test may be applied to each section of the system or to the system as a whole.

(3) Where a prefabricated system is assembled off the *building* site in such a manner that it cannot be inspected and tested on site, off-site inspections and tests shall be conducted.

(4) Where a prefabricated system is installed as part of a *water system*, all other plumbing work shall be tested and inspected, and the complete system shall be pressure tested when requested.

3.7.2. Tests of Potable Water Systems

(1) Every *potable water system* shall be able to

(a) withstand without leakage a water pressure that is at least equal to the maximum pressure to which it may be subject in service, or

(b) withstand for at least 2 h without a drop in pressure an air pressure that is not less than 700 kPa.

3.7.3. Water Tests

(1) Where a water test is made all air shall be expelled from the system before *fixture* control valves or faucets are closed.

(2) *Potable* water shall be used to test a *potable water system*.

Section 4
Drainage Systems

4.1 Application

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

4.2 Connections to Drainage Systems

4.2.1. Connections to Sanitary Drainage Systems

(1) Every *fixture* shall be *directly connected* to a *sanitary drainage system*, except that

(a) drinking fountains may 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 *check valve* is installed in the fountain waste pipe, (see Appendix A)

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

(c) a floor drain may 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* may be connected to a *storm drainage system* or be drained onto a roof,

(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 Appendix A).

(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 respectively 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 Appendix A.)

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

4.2.2. Connection of Overflows from Rainwater Tanks.

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

4.2.3. Direct Connections

(1) Two or more *fixture outlet pipes* that serve outlets from a single *fixture* that is listed in Clause 4.2.1.(1)(e) may be *directly connected* to a *branch* that

(a) has a *size* of not less than 1.25 in., and

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

(2) *Fixture drains* from *fixtures* that are listed in Subclauses (i) and (ii) of Clause 4.2.1.(1)(e) may 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,* and

(b) is extended through the roof when *fixtures* on 3 or more *storeys* are connected to it. (See A-4.2.1.(1)(a) and (e) in Appendix A.)

(3) *Fixture drains* from *fixtures* that are listed in Subclauses (iii) to (vi) of Clause 4.2.1.(1)(e) may 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,* and

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

4.3 Location of Fixtures

4.3.1. Urinals. Urinals shall not be installed adjacent to wall and floor surfaces that are pervious to water.

4.3.2. Restricted Locations of Indirect Connections and Traps. Indirect connections or any *trap* that may overflow shall not be located in a crawl space or any other unfrequented area.

4.3.3. Equipment Restrictions Upstream of Interceptors. Garbage grinders, potato peelers and other similar types of equipment shall not be located upstream of an *interceptor.*

4.3.4. Fixtures Located in Chemical Storage Locations. 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.*

4.4 Treatment of Sewage and Wastes

4.4.1. Sewage Treatment. 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.*

4.4.2. Cooling of Hot Water or Sewage. Where a *fixture* discharges sewage or *clear-water waste* that is at a temperature above 75°C, provision shall be made for cooling of the waste to 75°C or less before it is discharged to the *drainage system.*

4.4.3. Interceptors

(1) Where a *fixture* discharging sewage that includes grease is located in a public kitchen or restaurant or in an institution, a grease *interceptor* shall be installed when required. (See Appendix A.)

(2) Where the discharge from a *fixture* may contain oil or gasoline, an oil *interceptor* shall be installed.

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

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

(See Article 5.5.2. for venting requirements for oil interceptors.)

4.5 Traps

4.5.1. Traps for Sanitary Drainage Systems

(1) Except as provided in Sentences (2), (3), (4) and (5) and in Article 4.5.2., every *fixture* shall be protected by a separate *trap.*

(2) One *trap* may protect
(a) all the trays or compartments of a 2- or 3-compartment sink,
(b) a 2-compartment laundry tray, or
(c) 2 similar type single compartment *fixtures* located in the same room.

(See Appendix A.)

(3) One *trap* may 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 Appendix A.)

(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 4.2.1.(1)(e) for indirect connections.)

(5) An *interceptor* with an effective water seal of not less than 38 mm may serve as a *trap.* (See Appendix A.)

4.5.2. Traps for Storm Drainage Systems

(1) Where a *storm drainage system* is connected to a *combined building sewer* or a public *combined sewer,* a *trap* shall be installed between any opening in the system and the drain or sewer, except that no *trap* 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, and
(b) not less than 900 mm above or not less than 3.5 mm in any other direction from any air inlet, openable window or door, and not less than 1.8 m from a property line.

(See Appendix A.)

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

4.5.3. Connection of Subsoil Drainage Pipe to a Sanitary Drainage System.

Where a *subsoil drainage pipe* is connected to a *sanitary drainage system,* the connection shall be made on the upstream side of a *trap* with a *cleanout* or a trapped sump. (See Appendix A.)

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,*
(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 manhole.

(See Appendix A.)

4.5.5. Trap Seals.

Provision shall be made for maintaining the *trap* seal of a floor drain by the use of *trap* seal primer, by using the drain as a receptacle for an *indirectly connected* drinking fountain or by equally effective means. (See Appendix A.)

4.6 Arrangement of Drainage Piping

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 Appendix A.)

(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.

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) manholes in pressure *potable* water storage tanks, or
(c) food-handling or processing equipment.

4.6.3. Sumps or Tanks

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

(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 *size* of the sump shall be sufficient to hold at least a 24 h accumulation of liquid.

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

(6) The discharge pipe from every *sewage* sump shall be equipped with a union, a *check 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.

(See Appendix A.)

4.6.4. Protection from Backflow

(1) A *backwater valve* or a gate valve shall not be installed in a *building drain* or in a *building sewer.* (See Appendix A.)

(2) Except as provided in Sentences (3), (4) and (5), where a *building drain* or a *branch* may be subject to *backflow*, a gate valve or 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.

(3) Where the *fixture* is a floor drain, a removable screw cap may be installed on the upstream side of the *trap.*

(4) Where more than one fixture is located on a *storey* and all are connected to the same *branch*, the gate valve or *backwater valve* may be installed on the *branch.*

(5) A *subsoil drainage pipe* that drains into a *sanitary drainage system* that is subject to surchage shall be connected in such a manner that *sewage* cannot back up into the *subsoil drainage pipe.* (See Appendix A.)

4.6.5. Mobile Home Sewer Service

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

(a) not less than 4 in. 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.

4.7 Cleanouts

4.7.1. Cleanouts for Drainage Systems

(1) Every *sanitary drainage system* and *storm drainage system* shall be provided with *cleanouts* that will permit cleaning of the entire system. (See Appendix A.)

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

(3) Every interior *leader* 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.*

(4) Where a *cleanout* is required on a *building sewer* 8 in. or larger in *size*, it shall be a manhole.

(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 in. 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) Every *building drain* shall be provided with a *cleanout* fitting that is located as close as practical to the place where the *building drain* leaves the *building.*

(7) Every *soil-or-waste stack* 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. (See Appendix A.)

4.7.2. Size and Spacing of Cleanouts

(1) Except as provided in Sentences (2) and (3), the *size* and spacing of *cleanouts* in *nominally horizontal* pipes of a *drainage system* shall conform to Table 4.7.A.

Table 4.7.A.
Forming Part of Sentence 4.7.2.(1)

Permitted Size and Spacing for Cleanouts			
Size of Drainage Pipe, in.	Minimum *Size* of Cleanout, in.	Maximum Spacing, m	
		One Way Rodding	Two Way Rodding
2½ or less	Same *size* as drainage pipe	7.5	15
3 and 4	3	15	30
over 4	4	26	52
Column 1	2	3	4

(2) The spacing between manholes serving a *building sewer*
(a) 24 in. or less in *size* shall not exceed 90 m, and
(b) over 24 in. in *size* shall not exceed 150 m.

(3) The *developed length* of a *building sewer* between the *building* and the first manhole to which the *building sewer* connects shall not exceed 75 m.

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

(5) *Cleanouts* capable of rodding in one direction only shall be installed to rod in the direction of flow.

4.7.3. Manholes

(1) A manhole including the cover shall be designed to support all loads imposed upon it.

(2) A manhole shall be provided with
(a) a cover which shall provide an airtight seal if located within a *building*,
(b) a rigid ladder of a corrosion-resistant material where the depth exceeds 1 m, and
(c) a vent to the exterior if the manhole is located within a *building*.

(3) A manhole 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 manhole in a *sanitary drainage system* shall be channeled to direct the flow of effluent.

4.7.4. Location of Cleanouts

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

(2) A *cleanout* shall not be located in a floor assembly in a manner that may constitute a hazard and shall not be 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 piping or vent piping that it serves shall not change direction by more than 45°.

4.8 Minimum Slope and Length of Drainage Pipes

4.8.1. Minimum Slope. Except as provided in Articles 4.10.8. and 4.10.9., every drainage pipe that has a *size* of 3 in. or less, and every *fixture drain* shall have a downward slope in the direction of flow of at least 1 in 50. (See Appendix A.)

4.8.2. Length of Fixture Outlet Pipes. Except for *fixture outlet pipes* installed in conformance with Sentence 4.5.1.(3), the *developed length* of every *fixture outlet pipe* shall not exceed 900 mm. (See A-4.5.1.(2) in Appendix A.)

4.9 Size of Drainage Pipes

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.

4.9.2. Serving Water Closets

(1) The *size* of every drainage pipe that serves a water closet shall be not less than 3 in.

(2) The *size* of every *branch* or *building drain* downstream of the third water closet *fixture drain* connection shall be not less than 4 in.

(3) The *size* of every *soil-or-waste stack* that serves more than 6 water closets shall be not less than 4 in.

4.9.3. Size of Fixture Outlet Pipes

(1) Except as provided in Sentence (2), the *size* of every *fixture outlet pipe* shall conform to Table 4.9.A.

(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 Appendix A.)

4.10 Hydraulic Loads

(See Appendix A for determination of hydraulic loads and drainage pipe sizes.)

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.

4.10.2. Hydraulic Loads for Fixtures

(1) The hydraulic load from a *fixture* that is listed in Table 4.9.A. 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 4.9.A. is the number of *fixture units* set forth in Table 4.10.A. for the *trap* of the *size* that serves the *fixture*.

Table 4.9.A.
Forming Part of Sentences 4.9.3.(1) and 4.10.2.(1)

Minimum Permitted Size of Fixture Outlet Pipe and Hydraulic Loads for Fixtures		
Fixture	Minimum *Size* of *Fixture Outlet Pipe*, in.	Hydraulic Load, *fixture units*
Autopsy table	1 1/2	2
Bathroom group		
(a) with flush tank		6
(b) with direct flush valve		8
Bathtub (with or without shower)	1 1/2	1 1/2
Bath: foot, sitz or slab	1 1/2	1 1/2
Beer cabinet	1 1/2	1 1/2
Bidet	1 1/4	1
Clothes washer		
(a) domestic (See Appendix A.)	NA	1 1/2 with 1 1/2-in. *trap*
(b) commercial	NA	2 with 1 1/2-in. *trap*
Dental unit or cuspidor	1 1/4	1
Column 1	2	3

Table 4.9.A. (Continued)
Forming Part of Sentences 4.9.3.(1) and 4.10.2.(1)

Fixture	Minimum *Size* of *Fixture Outlet Pipe*, in.	Hydraulic Load, *fixture units*
Dishwasher		
(a) domestic type	1 1/2	1 1/2 { no load when connected to garbage grinder or domestic sink
(b) commercial type	2	3
Drinking fountain	1 1/4	1/2
Floor drain	2	2 with 2-in. *trap* 3 with 3-in. *trap*
Garbage grinder, commercial type	2	3
Icebox	1 1/4	1
Laundry tray		
(a) single or double units or 2 single unts with common *trap*	1 1/2	1 1/2
(b) 3 compartments	1 1/2	2
Lavatory		
(a) barber or beauty parlor	1 1/2	1 1/2
(b) dental	1 1/4	1
(c) domestic type, single or 2 single with common *trap*	1 1/4	1 with 1 1/4-in. *trap* 1 1/2 with 1 1/2-in. *trap*
(d) multiple or industrial type	1 1/2	according to Table 4.10.A.
Potato peeler	2	3
Shower drain		
(a) from 1 head	1 1/2	1 1/2
(b) from 2 or 3 heads	2	3
(c) from 4 to 6 heads	3	6
Sink		
(a) domestic and other small types with or without garbage grinders, single, double or 2 single with a common *trap*	1 1/2	1 1/2
(b) Other sinks	1 1/2	1 1/2 with 1 1/2-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	1 1/2	1 1/2
(ii) other types	2	3
Water closet		
(a) with flush tank	3	4
(b) with direct flush valve	3	6
Column 1	2	3

Table 4.10.A.
Forming Part of Sentence 4.10.2.(2)

Permitted Hydraulic Load from a Fixture Based on Size of Trap	
Size of *Trap*, in.	Hydraulic Load *fixture units*
1 1/4	1
1 1/2	2
2	3
2 1/2	4
3	5
4	6
Column 1	2

4.10.3. Hydraulic Loads from Fixtures with Continuous Flows

(1) Except as provided in Sentence (2), the hydraulic load from a *fixture* that produces a continuous or semi-continuous flow, such as a pump or an air-conditioning *fixture*, is 26.4 *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.

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 2.2.1. of Part 2 of the National Building Code of Canada 1990, 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 Appendix A.)

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

(a) the maximum drain down time does not exceed 24 h,
(b) the roof structure has been designed to carry the load of the stored water,
(c) one or more scuppers are installed so that the maximum depth of water on the roof cannot exceed 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.

4.10.5. Conversion of Fixture Units to Litres

(1) Except as provided in Sentence 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*.

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 4.10.B.

(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 4.10.C. or Table 4.10.D., whichever is the less restrictive.

Table 4.10.C.
Forming Part of Sentence 4.10.6.(2) and Article 4.10.7.

Maximum Permitted Hydraulic Load Drained to a Branch	
Size of *Branch*, in.	Maximum Hydraulic Load *fixture units*
1 1/4	2
1 1/2	3
2	6
2 1/2	12
3	27
4	180
5	390
6	700
8	1 600
10	2 500
12	3 900
Column 1	2

Table 4.10.B.
Forming Part of Sentence 4.10.6.(1)

Maximum Permitted Hydraulic Load Drained to Soil-or-Waste Stack			
Size of Stack, in.	Maximum Hydraulic Load, *fixture units*		
	Maximum Load on Stack that Passes through 3 *Storeys* or Less	Maximum Load on Stack that Passes through more than 3 *Storeys*	Maximum Load to be Drained to Stack of more than 3 *Storeys* from any 1 *Storey*
1 1/4	2	2	2
1 1/2	5	8	2
2	10	24	6
2 1/2	20	42	9
3	60	60	16
4	240	500	90
5	540	1 100	200
6	960	1 900	350
8	2 200	3 600	600
10	3 800	5 600	1 000
12	6 000	8 400	1 500
Column 1	2	3	4

Table 4.10.D.
Forming Part of Sentence 4.10.6.(2) and Article 4.10.8.

Maximum Permitted Hydraulic Load Drained to a Sanitary Building Drain or Sewer						
Size of Drain or Sewer, in.	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
Column 1	2	3	4	5	6	7

4.10.7. Hydraulic Loads on Branches. The hydraulic load that is drained to a *branch* shall conform to Table 4.10.C.

4.10.8. Hydraulic Loads on Sanitary Building Drains or Sewers. The hydraulic load that is drained to a *sanitary building drain* or a *sanitary building sewer* shall conform to Table 4.10.D.

4.10.9. Hydraulic Loads on Storm or Combined Building Drains or Sewers. The hydraulic load that is drained to a *storm building drain*, a *storm building sewer* or a *combined building sewer* shall conform to Table 4.10.E.

4.10.10. Hydraulic Loads to Roof Gutters. The hydraulic load that is drained to a *roof gutter* shall conform to Table 4.10.F.

Table 4.10.E.
Forming Part of Article 4.10.9.

Maximum Permitted Hydraulic Load Drained to a Storm Building Drain or Sewer or a Combined Building Sewer							
Size of Drain or Sewer, in.	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	—	—	—	—	2 390	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
Column 1	2	3	4	5	6	7	8

Table 4.10.F.
Forming Part of Article 4.10.10.

Maximum Permitted Hydraulic Load Drained to a Roof Gutter					
Size of Gutter, in.	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
Column 1	2	3	4	5	6

4.10.11. Hydraulic Loads on Leaders. The hydraulic load that is drained to a *leader* shall conform to Table 4.10.G.

Table 4.10.G.
Forming Part of Article 4.10.11.

Maximum Permitted Hydraulic Load Drained to a Leader			
Circular *Leader*		Non-Circular *Leader*	
Size of *Leader*, in.	Maximum Hydraulic Load L	Area of *Leader* cm^2	Maximum Hydraulic Load L
2	1 700	20.3	1 520
2 1/2	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
Column 1	2	3	4

Section 5
Venting Systems

5.1 Vent Pipes for Traps

5.1.1. Venting for Traps

(1) Except as provided in Sentences (3) and (4), every *trap* shall be protected by

(a) an *individual vent*,
(b) a *dual vent*,
(c) a single *storey wet vent* extended as
  (i) a *continuous vent*,
  (ii) a *stack vent*, or
  (d) a multi-*storey wet vent*.

(2) In addition to the protection required in Sentence (1), *plumbing drainage systems* may require additional protection as provided in Subsections 5.4 and 5.5 by the installation of

(a) *branch vents*,
(b) *vent stacks*,
(c) *stack vents*,
(d) *headers*,
(e) fresh air inlets, or
(f) *relief vents*.

(3) A *trap* that serves a floor drain need not be protected where

(a) the *size* of the *trap* is not less than 3 in.,
(b) the length of the *fixture drain* is not less than 450 mm and
(c) the fall on the *fixture drain* does not exceed its *size*.

(See Appendix A.)

(4) A *trap* need not be protected by a *vent pipe* where it serves

(a) a *subsoil drainage pipe*,
(b) a *storm drainage system*, or
(c) where it forms part of an indirect *drainage system*.

(See Appendix A.)

5.2 Single Storey Wet Venting

5.2.1. Single Storey Wet Venting

(1) A section of *soil-or-waste pipe* may serve as a single *storey wet vent* provided that

(a) it is extended as a *stack vent* or as a *continuous vent*,
(b) all of the *fixtures* are in the same *storey*,
(c) no *soil-or-waste stack* is connected to it upstream of a wet vented *fixture*,
(d) except as provided in Sentence (2), *trap arms* are connected separately and directly to the *soil-or-waste pipe*, and
(e) where a water closet *trap arm* is connected to a vertical pipe, it is connected downstream of all other *fixtures*.

(2) A *branch* or a *fixture drain* not exceeding 2 in. in *size* may discharge into the *wet vent* downstream of the *continuous vent* provided its load is included when sizing the *wet vent* portion.

(See Appendix A.)

5.2.2. Relief Vents

(1) When more than 4 fixtures are wet vented, a *relief vent* shall be connected to the horizontal *soil-or-waste pipe* that forms part of a wet vented system

(a) downstream of the connection for the wet vented *fixture* that is farthest downstream, when the *soil-or-waste pipe* to which the

wet vented system is connected receives a hydraulic load of more than 6 *fixture units* upstream of that connection,

(b) so that the cumulative horizontal change in direction in the *branch* or *building drain* between *vent pipes* does not exceed 45°, and

(c) so that not more than 8 wet vented *fixtures* are connected to the *branch* or *building drain* between *vent pipe connections*.

(See Appendix A.)

(2) A *soil-or-waste pipe* that is extended as an individual, dual or *continuous vent* may serve as a *relief vent* provided the *soil-or-waste pipe* is sized as a *wet vent* in conformance with Articles 5.7.3. and 5.8.1. and the *vent pipe* is sized in accordance with Sentence 5.7.3.(1). (See Appendix A.)

(3) A *relief vent* may serve as a combined *relief vent* for two or more wet vented branches providing that not more than 8 wet vented fixtures are connected between the combined *relief vent* and the *continuous vents* or *soil-or-waste stack*. (See Appendix A.)

5.3 Multi-Storey Wet Venting

5.3.1. Provisions

(1) A *soil-or-waste stack* may serve as a multi-*storey wet vent* provided that

(a) *trap arms* connected to the stack do not exceed 2 in. in *size* except as provided in Sentence (2),

(b) *trap arms* are separately and directly connected to the *soil-or-waste stack*,

(c) When the *soil-or-waste stack* extends through more than 2 *storeys* the total discharge from any 1 *storey* above the second *storey* does not exceed 4 *fixture units*,

(d) there is not more than one *nominally horizontal offset* in the *soil-or-waste stack* and the *offset*

(i) does not exceed 1.2 m for pipe *sizes* 2 in. or less,

(ii) does not exceed 2.5 m for pipe *sizes* larger than 2 in., and

(iii) is not less than 150 mm above the *flood level rim* of any *fixture* that drains to the *soil-or-waste stack* below the *offset*,

(e) no *soil-or-waste pipe* connects to an *offset*, and

(f) the wet vented portion of the *soil-or-waste stack* is the same *size* from its base to the highest *fixture* connection.

(2) Water closets shall be connected below all other *fixtures*.

(3) Where 2 water closets are installed they shall be connected by a double fitting.

5.4 Vent Pipes for Soil-or-Waste Stacks

5.4.1. Stack Vents

(1) The upper end of every *soil-or-waste stack* shall terminate in a *stack vent*.

(2) A *stack vent* may serve as the *vent pipe* for one or 2 *fixtures* connecting at the same level. (See Appendix A.)

5.4.2. Vent Stacks

(1) A *vent stack* shall be installed to protect the base of every *soil-or-waste stack*, other than a *soil-or-waste stack* that serves as a multi-*storey wet vent*, that has *fixtures* draining to it on more than 4 *storeys*.

(2) The *vent stack* shall be connected to the *soil-or-waste stack* at or below the lowest *soil-or-waste pipe* connection, or at the junction of the *soil-or-waste stack* with a *branch* or *building drain*. (See Appendix A.)

(3) Fixtures may be connected to a *vent stack* provided

(a) the total hydraulic load of the connected *fixtures* does not exceed 8 *fixture units*,

(b) at least one *fixture* is connected to a vertical portion of the *vent stack* and upstream of any other *fixtures*,

(c) no other *fixture* is connected downstream of a water closet,

(d) all *fixtures* are located in the lowest *storey* served by the *vent stack*, and

(e) the section of the *vent pipe* that becomes a *wet vent* conforms to the requirements for *wet vents*.

(See Appendix A.)

5.4.3. Relief Vents

(1) Except as provided in Sentence (4), where a *soil-or-waste stack* receives the discharge from *fixtures* located on more than 11 *storeys*, a *relief vent* shall be installed

(a) for each section of 5 *storeys* or part thereof on which *fixtures* are located other than the top and bottom 5 *storeys*, and

(b) at or immediately above each *offset* or double *offset*.

(2) The *relief vent* shall be connected to the *soil-or-waste stack* by means of a drainage fitting at or immediately below the lowest *soil-or-waste pipe* from the lowest *storey* of the section described in Sentence (1).

(3) The *relief vent* shall be connected to the *vent stack* not less than 1 m above the floor level of the lowest *storey* of the section described in Sentence (1).

(4) A required *relief vent* need not be installed provided the *soil-or-waste stack* is interconnected to the *vent stack* in each *storey* of the section in which *fixtures* are located by means of a vent equal in *size* to the *branch* or *fixture* drain or 2 in., whichever is smaller.

(5) Fixtures that have a hydraulic load of not more than one and one-half *fixture units* may be connected to the vertical section of a *relief vent* provided

(a) not more than 2 *fixtures* are connected to the *vent pipe*,

(b) where 2 *fixtures* are connected to the *vent pipe*, the connection is by means of a double sanitary T fitting, and

(c) the section of the *vent pipe* that becomes a *wet vent* conforms to the requirements for *wet vents*.

(See Appendix A.)

5.4.4. Relief Vents for Offsets

(1) A *soil-or-waste stack* that has a *nominally horizontal offset* more than 1.5 m long and above which the upper vertical portion of the stack passes through more than 2 *storeys* and receives a hydraulic load of more than 100 *fixture units* shall be vented by a *relief vent* either

(a) connected to the vertical section immediately above the *offset*,

(b) connected to the lower vertical section at or above the highest *soil-or-waste pipe* connection, or

(c) extended as a vertical continuation of the lower section.

(See Appendix A.)

5.5 Miscellaneous Vent Pipes

5.5.1. Venting of Sewage Sumps. Every sump that receives *sewage* shall be provided with a *vent pipe* that is connected to the top of the sump.

5.5.2. Venting of Oil Interceptors

(1) Every oil *interceptor* shall be provided with 2 *vent pipes* that

(a) connect to the *interceptor* at opposite ends,

(b) extend independently to open air, and

(c) terminate at elevations differing by not less than 300 mm.

(2) Adjacent compartments within every oil *interceptor* shall be connected to each other by a vent opening.

5.5.3. Fresh Air Inlets. Where a *building trap* is installed, a *fresh air inlet* not less than 4 in. in *size* shall be connected upstream and within 1.2 m of the *building trap* and downstream of any other connection. (See A-4.5.4.(1) in Appendix A.)

5.5.4. Provision for Future Installations. Where provision is made for a *fixture* to be installed in the future, the *drainage system* and *venting system* shall be sized accordingly and provision made for the necessary future connections.

5.6 Arrangement of Vent Pipes

5.6.1. Drainage of Vent Pipes. Every *vent pipe* shall be installed without depressions in which moisture can collect.

5.6.2. Vent Pipe Connections

(1) Every *vent pipe* shall be extended to open air by a *venting system* that terminates through a roof and where it is practical to do so, the pipe shall be installed in a *nominally vertical* position.

(2) Except for *wet vents*, where a *vent pipe* is connected to a *nominally horizontal soil-or-waste pipe*, the connection shall be above the horizontal centre line of the *soil-or-waste pipe*. (See Appendix A.)

5.6.3. Location of Vent Pipes

(1) Except as provided in Sentences (2) and (3), a *vent pipe* that protects a *fixture trap* shall be located so that

(a) the *developed length* of the *trap arm* is
  (i) not less than twice the *size* of the *fixture drain*, and
  (ii) not more than 1.5 m,
(b) the total fall of the *trap arm* is not greater than the *size* of the *fixture drain*, and
(c) the *trap arm* does not have a cumulative change of direction of more than 135°.

(See Appendix A.)

(2) The *trap arm* of water closets, *S-trap standards* or *fixtures* that depend on siphonic action for the proper functioning of the *fixture* that discharges vertically shall not have a cumulative change of direction of more than 225°. (See Appendix A.)

(3) A *vent pipe* that protects a water closet or a *fixture* that depends on siphonic action for its proper functioning shall be so located that the distance between connections of the *fixture drain* to the *fixture* and the *vent pipe* shall not exceed

(a) 1 m in the vertical plane, and
(b) 3 m in the horizontal plane.

(See Appendix A.)

5.6.4. Connection of Vents above Fixtures Served

(1) An *individual vent, dual vent, continuous vent* or *relief vent* shall extend above the *flood level rim* of every *fixture* that it serves before being connected to another *vent pipe*.

(2) No *vent pipe* shall be connected to a *branch vent* or a *vent stack* in such a manner that a blockage in a *soil-or-waste pipe* would cause waste to drain through the *vent pipe* to the *drainage system*.

5.6.5. Terminals

(1) The upper end of every *vent pipe* that is not terminated in open air shall be connected to a *venting system* that is terminated in open air.

(2) The upper end of every *vent pipe* that is terminated in open air, other than a *vent pipe* that serves an oil *interceptor* or a *fresh air inlet*, shall be extended through a roof.

(3) Except for a *fresh air inlet*, where a *vent pipe* is terminated in open air the terminal shall be located

(a) not less than 1 m above or not less than 3.5 m in any other direction from every air inlet, openable window or door,
(b) not less than 2 m above or not less than 3.5 m in any other direction from a roof that supports an *occupancy*,
(c) not less than 2 m above ground, and
(d) not less than 1.8 m from every property line.

(See Appendix A.)

(4) Where a *vent pipe* passes through a roof it shall

(a) terminate high enough to prevent the entry of roof drainage but not less than 25 mm above the roof, and
(b) be flashed to prevent the entry of water between the *vent pipe* and the roof. (See Article 2.9.11. for *vent pipe* flashings.)

(5) Where a *vent pipe* passes through a roof and may be subject to frost closure it shall be protected from frost closure

(a) by keeping its height to a minimum,
(b) by being increased at least one *size* immediately before penetrating the roof,
(c) by being insulated, or
(d) by being protected in some other manner.

5.7 Minimum Size of Vent Pipes

5.7.1. General. The *size* of every *vent pipe* shall conform to Table 5.7.A.

5.7.2. Size Restriction. A *branch vent, stack vent, vent stack* or *header* shall be of a *size* not less than the *size* of a *vent pipe* that is connected to it.

Table 5.7.A.
Forming Part of Article 5.7.1.

Minimum Permitted Size of Vent Pipe Based on Size of Trap Served	
Size of *Trap* Served, in.	Minimum *Size* of *Vent Pipe*, in.
1 1/4	1 1/4
1 1/2	1 1/4
2	1 1/2
2 1/2	1 1/2
3	1 1/2
4	1 1/2
5	2
6	2
Column 1	2

5.7.3. Relief Vents

(1) Except as provided in Article 5.7.1., the minimum *size* of a *relief vent* installed in conjunction with a single storey *wet vent* shall be one *size* smaller than the required *size* of the *continuous vent*.

(2) Except as provided in Article 5.7.1., the minimum *size* of a *relief vent* installed in conjunction with an *offset* in a *soil-or-waste stack* shall be one *size* smaller than the *stack vent*.

5.7.4. Relief Vents for Fixtures Located on More Than 11 Storeys.

Relief vents required by Sentence 5.4.3.(1) serving *fixtures* located on more than 11 *storeys* shall be one size smaller than the smaller pipe to which they are connected.

5.7.5. Vent Pipes for Manholes.

The minimum *size* of a *vent pipe* that serves a manhole within a *building* shall be 2 in.

5.7.6. Vents for Sewage Sumps

(1) Except as provided in Sentence (2), the minimum *size* of the *vent pipe* for a *sewage* sump shall be one *size* smaller than the *size* of the largest inlet pipe to the sump.

(2) The minimum *size* of every *vent pipe* for a *sewage* sump shall be 2 in., but the *vent pipe* need not be larger than 4 in.

5.7.7. Vents for Oil Interceptors.

The minimum *size* of every *vent pipe* that serves an oil *interceptor* shall be 2 in.

5.8 Sizing of Vent Pipes

(See Appendix A for an explanation of sizing of vent pipes.)

5.8.1. Hydraulic Loads Draining to Wet Vents

(1) The hydraulic load that drains to a single *storey wet vent* shall conform to Table 5.8.A. (See Appendix A.)

Table 5.8.A.
Forming Part of Sentence 5.8.1.(1)

Maximum Permitted Hydraulic Load Connected to a Single Storey Wet Vent	
Size of *Wet Vent*, in.	Maximum Hydraulic Load *fixture units*
1 1/4	1
1 1/2	2
2	5
2 1/2	8
3	27
4	120
Column 1	2

(2) The hydraulic load that drains to a multi-*storey wet vent* shall conform to Table 5.8.B.

(See Appendix A.)

5.8.2. Individual Vents and Dual Vents.

The *size* of *individual vents* and *dual vents* shall be determined from Table 5.7.A. according to the largest trap served.

5.8.3. Branch Vents, Headers and Continuous Vents

(1) A *branch vent*, a *header* and a *continuous vent* shall be sized in conformance with Table 5.8.C.

(2) The length of a *continuous vent* for the purpose of Table 5.8.C. shall be its *developed length*

Table 5.8.B.
Forming Part of Sentence 5.8.1.(2)

Maximum Permitted Hydraulic Load Drained to a Multi Storey Wet Vent			
Size of *Wet Vent* Portion of *Soil-or-Waste Stack*, in.	Maximum Hydraulic Load, *fixture units*		
	Not Serving Water Closets	Serving Water Closets	
		Fixtures Other Than Water Closets	Water Closets
1 1/2	2	—	—
2	4	3	8
2 1/2	6	4	8
3	12	6	8
4	36	14	8
5	NA	18	8
6	NA	23	8
Column 1	2	3	4

Table 5.8.C.
Forming Part of Sentences 5.8.3.(1) and 5.8.4.(1)

Sizing of Branch Vents, Headers, Continuous Vents, Vent Stacks and Stack Vents									
Total Hydraulic Load Served by Vent *fixture units*	*Size* of *Vent Pipe*, in.								
	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8
	Maximum Length of *Vent Pipe*, m								
2	9.0								
8	9.0	30.0	61.0						
20	7.5	15.0	46.0		Not Limited				
24	4.5	9.0	30.0						
42		9.0	30.0	91.0					
60		4.5	15.0	24.0	120.0				
100			11.0	30.0	79.0	305.0			
200			9.0	27.0	76.0	275.0			
500			6.0	21.0	55.0	215.0			
1 100				6.0	15.0	61.0	215.0		
1 900					6.0	21.0	61.0	215.0	
2 200						9.0	27.0	105.0	335.0
3 600						7.5	13.0	76.0	245.0
5 600							7.5	18.0	76.0
Column 1	2	3	4	5	6	7	8	9	10

from the *wet vent* to a *vent stack, stack vent, header* or open air.

(3) The length of a *branch vent* for the purpose of Table 5.8.C. shall be the *developed length* of vent piping from the most distant *soil-or-waste pipe* connection to a *vent stack, stack vent, header* or open air

(4) The length of a *header* for the purpose of Table 5.8.C. shall be the *developed length* of vent piping from the most distant *soil-or-waste pipe* connection to open air.

(See Appendix A.)

5.8.4. Vent Stacks, Stack Vents or Headers

(1) A *vent stack, stack vent* or *header* shall be sized in accordance with Table 5.8.C. according to

(a) the length of the *vent stack, stack vent*, or *header*, and

(b) the hydraulic load that is drained to the lowest section of *soil-or-waste stack* or stacks served by the vent, plus any additional vent loads connected to the vent. (See Appendix A.)

(2) The length of a *stack vent* or *vent stack* for the purpose of Table 5.8.C. shall be its *developed length* from its lower end to open air. (See Appendix A.)

(3) The minimum *size* of a *vent stack* or *stack vent* shall not be less than one-half the *size* of the *soil-or-waste stack* at its base.

Section 6
Potable Water Systems

6.1 Arrangement of Piping

6.1.1. Design, Fabrication and Installation

(1) *Potable water systems* shall be designed, fabricated and installed in accordance with good engineering practice, such as described in the ASHRAE Guide and Data Books, the ASHRAE Handbooks and ASPE Data Books. (See Appendix A.)

(2) Every *fixture* supplied with separate hot and cold water controls shall have the hot water control on the left and the cold on the right.

6.1.2. Drainage. A *water distribution system* shall be installed so that the system can be drained or blown out with air.

6.1.3. Shut-off Valves

(1) Every *water service pipe* shall be provided with a shut-off valve where the pipe enters the *building*.

(2) Every pipe that is supplied with water from a gravity water tank or a tank of a *private water supply system* shall be provided with a shut-off valve located close to the tank.

(3) Except for a single-family house, every *riser* shall be provided with a shut-off valve at the source of supply.

(4) Every water closet shall be provided with a shut-off valve on its water supply pipe.

(5) Except for a single-family house, shut-off valves shall be installed in every *suite* in a *building* of a residential occupancy as defined in the National Building Code of Canada 1990 as may be necessary to ensure that when the supply to one *suite* is shut off the supply to the remainder of the *building* is not interrupted.

(6) In *buildings* other than those described in Sentence (5), shut-off valves shall be provided on the water supply to

(a) every *fixture* or device, or
(b) group of *fixtures* or devices in the same room except as provided in Sentence (4).

(7) Every pipe that supplies a hot water tank shall be provided with a shut-off valve located close to the tank.

6.1.4. Protection for Exterior Water Supply. Every pipe that passes through an exterior wall to supply water to the exterior of the *building* shall be provided with a frost-proof hydrant or a stop-and-waste cock located inside the *building* and close to the wall.

6.1.5. Check Valves. A *check valve* shall be installed at the *building* end of a *water service pipe* where the pipe is made of plastic that is suitable for cold water use only.

6.1.6. Flushing Devices

(1) Every flushing device that serves a water closet or one or more urinals shall have sufficient capacity and be adjusted to deliver at each operation a volume of water that will thoroughly flush the *fixture* or *fixtures* that it serves.

(2) Where a manually operated flushing device is installed it shall serve only one *fixture*.

6.1.7. Relief Valves

(1) In addition to the requirements in Sentence (2), every hot water tank of a *storage-type service water heater* shall be equipped with a pressure relief valve designed to open when the water pressure in the tank reaches the rated working pressure of the tank, and so located that the pressure in the tank shall not exceed the pressure at the relief valve by more than 35 kPa under any condition of flow within the distribution system.

(2) Every hot water tank of a *storage-type service water heater* shall be equipped with

(a) a temperature relief valve with a temperature sensing element located within the top 150 mm of the tank and designed to open and discharge sufficient water from the tank to keep the temperature of the water in the tank from exceeding 99°C under all operating conditions, or

(b) a device that

(i) is designed to shut off the supply of electricity or fuel to the heater,

(ii) is not connected to and operates independently of the thermostatic control that determines the temperature of the water in the tank, and

(iii) is located and maintained on or within the top 150 mm of the tank so that the maximum temperature of the water in the tank shall not exceed 99°C under all operating conditions.

(3) Every tank equipped as specified in Clause 6.1.7.(2)(b) shall bear the information in a clearly visible location that it is so equipped.

(4) A pressure relief valve and temperature relief valve may be combined where Sentences (1) and (2) are complied with.

(5) Every *indirect service water heater* shall be equipped with

(a) a pressure relief valve, and

(b) a temperature relief valve on every storage tank that forms part of the system.

(6) Every pipe that conveys water from a temperature relief, pressure relief or a combined temperature and pressure relief valve which is installed on a hot water tank shall

(a) have a *size* at least equal to the *size* of the outlet of the valve, and

(b) terminate above a floor drain, sump, *fixture* or other safe location.

(7) The temperature relief valve required in Clause 6.1.7.(5)(b) shall have a temperature sensing element located within the top 150 mm of the tank and be designed to open and discharge sufficient water to keep the temperature of the water in the tank from exceeding 99°C under all operating conditons.

(8) No shut-off valve shall be installed on the pipe between any tank and the relief valves or on the discharge lines from such relief valves.

(9) A vacuum relief valve shall be installed when any tank may be subject to *back-siphonage*.

6.1.8. Water Hammer. Provision shall be made to protect the *water distribution system* from the adverse effects of water hammer. (See Appendix A.)

6.1.9. Mobile Home Water Service

(1) A *water service pipe* intended to serve a mobile home shall

(a) be not less than 0.75 in. in *size*,

(b) be terminated above ground, and

(c) be provided with

(i) a tamperproof terminal connection that is capable of being repeatedly connected, disconnected and sealed,

(ii) a protective concrete pad,

(iii) a means to protect it from frost heave, and

(iv) a curb stop and a means of draining that part of the pipe located above the frost line when not in use.

6.2 Protection from Contamination

6.2.1. Connection of Systems

(1) Except as provided in Sentence (2), connections to *potable water systems* shall be designed and installed so that non-potable water or substances that may render the water non-potable cannot enter the system.

(2) A water treatment device or apparatus shall not be installed unless it can be demonstrated that the device or apparatus will not introduce substances into the system that may endanger health.

6.2.2. Back-Siphonage

(1) *Potable* water connections to *fixtures*, tanks, vats or other devices not subject to pressure above atmospheric and containing other than *potable* water shall be installed so as to prevent *back-siphonage* in conformance with Sentences (2) and (3).

(2) *Back-siphonage* shall be prevented by the installation of

(a) an air gap,
(b) an atmospheric *vacuum breaker*,
(c) a pressure *vacuum breaker*,
(d) a hose connection *vacuum breaker*,
(e) a dual *check valve backflow preventer* with atmospheric port,
(f) a double *check valve* assembly,
(g) a reduced pressure principle *backflow preventer*,
(h) a dual *check valve backflow preventer*, or
(i) a laboratory faucet type *vacuum breaker*.

(3) *Back-siphonage* from a *fixture* or device that operates more than 12 h continuously shall be prevented by the installation of

(a) an air gap,
(b) a pressure *vacuum breaker*,
(c) a dual *check valve backflow preventer* with atmospheric port,
(d) a double *check valve* assembly,
(e) a reduced pressure principle *backflow preventer*, or
(f) a dual *check valve backflow preventer*.

(See Appendix A.)

6.2.3. Backflow Caused by Back Pressure

(1) *Potable* water connections to *fixtures*, tanks, vats, boilers or other devices containing other than *potable* water and subject to pressure above atmospheric shall be arranged to prevent *backflow* caused by *back pressure* in conformance with Sentences (2) and (3).

(2) Except as provided in Article 6.2.4., *backflow* caused by *back pressure* of non-toxic substances into a *potable water system* shall be prevented by the installation of

(a) an *air gap*,
(b) a dual *check valve backflow preventer* with atmospheric port,
(c) a double *check valve* assembly, or
(d) a reduced pressure principle *backflow preventer*.

(3) *Backflow* caused by *back pressure* of toxic substances into a *potable water system* shall be prevented by the installation of

(a) an *air gap*, or
(b) a reduced pressure principle *backflow preventer*.

6.2.4. Backflow from Fire Protection Systems

(1) *Backflow* caused by *back-siphonage* or *back pressure* from fire sprinkler systems where water treatment is not added may be prevented by an alarm *check valve* installed in conformance with NFPA 13 "Standard for the Installation of Sprinkler Systems."

(2) *Backflow* caused by *back-siphonage* or *back pressure* from standpipe systems where water treatment is not added may be prevented by the installation of a detector *check valve* with a resilient-seated *check valve* on the metered bypass.

6.2.5. Separation of Water Supply Systems. No *private water supply system* shall be interconnected with a public water supply system.

6.2.6. Premise or Zone Isolation. In addition to a *backflow preventer* required by this Article for *buildings* or facilities where potentially severe health hazard may be caused by *backflow*, the *potable water system* shall be provided with premise or zone isolation by the installation of a reduced pressure principle *backflow preventer*. (See Appendix A.)

6.2.7. Hose Bibb. Where a hose bibb is installed outside a *building* or inside a garage, the *potable water system* shall be protected against *backflow* through the hose bibb.

6.2.8. Cleaning of Systems. A newly installed part of a *potable water system* shall be cleaned before the system is put into operation.

6.2.9. Air Gap

(1) Every *air gap* shall be not less than 25 mm high, and

(a) at least twice the diameter of the opening of the water supply outlet in height, or

(b) of a design that will preclude the return of water to the *potable water system* when the water level in the *fixture* or device is at its maximum height and a negative pressure of 50 kPa exists in the water supply pipe.

6.2.10. Vacuum Breakers

(1) Where the *critical level* is not marked on an atmospheric *vacuum breaker* or pressure *vacuum breaker*, the critical level shall be taken as the lowest point on the device.

(2) Where an atmospheric *vacuum breaker* is installed, it shall be located on the downstream side of the *fixture* control valve or faucet so that it will be subject to water supply pressure only when the valve or faucet is open. (See Appendix A.)

(3) An atmospheric *vacuum breaker* shall be installed so that the critical level is at least the distance specified by the manufacturer at which the device will operate safely but not less than 25 mm above the *flood level rim* of a *fixture* or maximum water level in a tank.

(4) A pressure *vacuum breaker* shall be installed so that the critical level is not less than 300 mm above the *flood level rim* of a *fixture* or maximum water level in a tank.

6.2.11. Tank Type Water Closets. Tank type water closets shall be provided with a *backsiphonage preventer* in conformance with Sentence 2.9.9.(2).

6.2.12. Backflow Preventers

(1) No bypass piping or other device capable of reducing the effectiveness of a *backflow preventer* shall be installed in a water supply system.

(2) *Backflow preventers* shall be maintained in good working condition.

(3) *Backflow preventers* shall be selected and installed in accordance with good engineering practice. (See Appendix A.)

6.3 Size and Capacity of Pipes

(See Appendix A.)

6.3.1. Design. Every *water distribution system* shall be designed to provide peak demand flow when the flow pressures at the supply openings conform to Table 6.3.A.

6.3.2. Hydraulic Load

(1) Except as provided in Sentence (3), the hydraulic load of a *fixture* or device that is listed in Table 6.3.A. shall be the number of *fixture units* given in the table.

(2) Except as provided in Sentences (1) and (3), the hydraulic load of a *fixture* that is not listed in Table 6.3.A. is the number of *fixture units* listed in Table 6.3.B.

(3) Where *fixtures* are supplied with both hot and cold water, the hydraulic loads for maximum separate demands shall be 75 per cent of the hydraulic load of the *fixture units* given in Tables 6.3.A. and 6.3.B.

6.3.3. Static Pressure. Where the static pressure may exceed 550 kPa, a pressure reducing valve shall be installed to limit the maximum static pressure to not more than 550 kPa in areas that may be occupied.

6.3.4. Size

(1) Every *water service pipe* shall be sized according to the peak demand flow but shall be not less than 0.75 in.

(2) Except as provided in Sentence (3), the *size* of a pipe that supplies a *fixture* or device shall conform to Column 2 of Table 6.3.A.

(3) A tail piece or connector not more than 750 mm long and not less than 0.25 in. inside diameter may be used to supply water to a *fixture* or device.

Table 6.3.A.
Forming Part of Subsection 6.3

Sizing of Water Distribution Systems				
Fixture or Device	Minimum *Size* of Supply Pipe in.	Minimum Flow Pressure [1] kPa (gauge)	Hydraulic Load *fixture units*	
			Private	Public
Bathroom group				
(a) with flush tank	NA	NA	6	—
(b) with direct flush valve	NA	NA	8	—
Bathtub (with or without shower)	1/2	50	2	4
Clothes washer	1/2	100	3	—
Dishwasher, domestic	1/2	100	3	—
Drinking fountain	3/8	100	1/2	1
Hose bib	1/2	100	[2]	[2]
Lavatory	3/8	50	1	2
Sink				
(a) kitchen, domestic	1/2	50	2	—
(b) kitchen, commercial	3/4	50	—	4
(c) service	1/2	50	—	3
(d) service with direct flush valve	3/4	100	—	5
Shower head	1/2	50	2	4
Urinal				
(a) with flush tank	1/2	50	—	3
(b) with direct flush valve	3/4	100	—	5
(c) with self-closing metering valve	1/2	—	—	—
Water Closet				
(a) with flush tank	3/8	50	3	5
(b) with direct flush valve	1	100	6	10
Column 1	2	3	4	5

Notes to Table 6.3.A.:

[1] Measured immediately upstream of faucet or supply valve.

[2] A continuous load of 0.38 L/s.

Table 6.3.B.
Forming Part of Sentence 6.3.2.(2)

Hydraulic Loads of Fixtures Not Listed in Table 6.3.A.		
Size of Supply Pipe in.	Hydraulic Load, *fixture units*	
	Private	Public
3/8	1	2
1/2	2	4
3/4	3	6
1	6	10
Column 1	2	3

Section 7
Non-Potable Water Systems

7.1 Connection

7.1.1. A non-*potable water system* shall not be connected to a *potable water system*.

7.2 Identification

7.2.1. Non-*potable* water piping shall be identified by markings that are permanent, distinct and easily recognized.

7.3 Location

7.3.1. Pipes

(1) Non-*potable* water piping shall not be located

(a) where food is prepared in a food processing plant,
(b) above food-handling equipment,
(c) above a non-pressurized *potable* water tank, or
(d) above a cover of a pressurized *potable* water tank.

7.3.2. Outlets

(1) An outlet from a non-*potable water system* shall not be located where it can discharge into

(a) a sink or lavatory,
(b) a *fixture* into which an outlet from a *potable water system* is discharged, or
(c) a *fixture* that is used for a purpose related to the preparation, handling or dispensing of food, drink or products that are intended for human consumption.

(See Appendix A.)

Symbols and Abbreviations

The following symbols and abbreviations have been used in the diagrams:

Water and drainage pipe _____
Vent pipe _ _ _ _ _ _ _ _

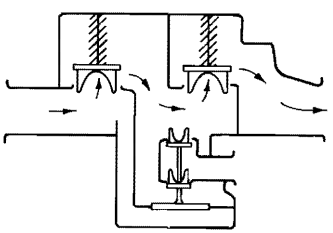
Subsoil drains _ _ _ _

BG	Bathroom group	KS	Kitchen sink
BT	Bathtub	LAV	Lavatory
CO	Cleanout	LT	Laundry tray
DF	Drinking fountain	RD	Roof drain
FD	Floor drain	UR	Urinals
FS	Floor sink	WC	Water closet

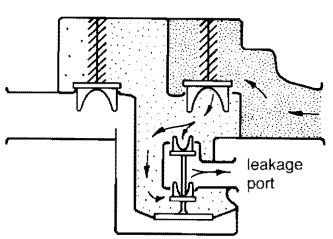
Appendix A
Explanatory Material for the Canadian Plumbing Code 1990

A-1.3.2. National Building Code Definitions. An asterisk (*) following a defined word or term means that the definition for that word or term is taken from the National Building Code of Canada 1990.

A-1.3.2. Backflow Preventer

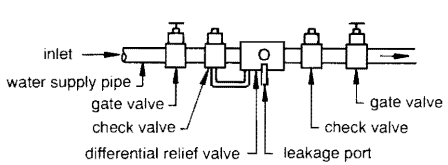


Normal flow conditions



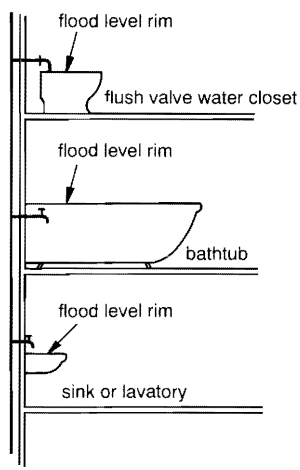
Backflow conditions

(a) Reduced pressure backflow preventer



(b) Assembly of differential valves and check valves used as a backflow preventer

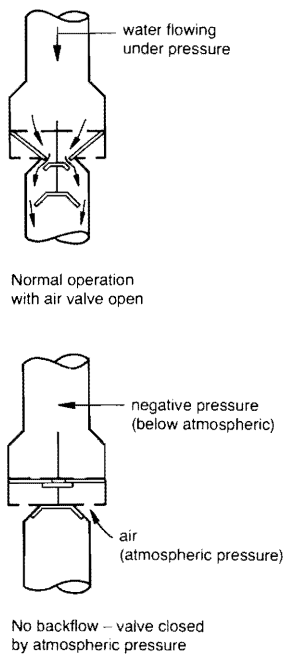
A-1.3.2. Back-Siphonage



This diagram shows a situation that is fairly common in old buildings. If the bathtub is filled to a level above the faucet outlet, or if the flush valve of the water closet is faulty, and if the faucet at the sink or lavatory on the lower floor is opened, water can be drawn (siphoned) from the bathtub or the water closet into the water system when the pressure in the water system is low or the water supply has been shut off.

The Appendix to this document is included for explanatory purposes only and does not form part of the requirements. The bold-face reference numbers that introduce each item apply to the requirements in the Code.

A-1.3.2. Back-Siphonage Preventer

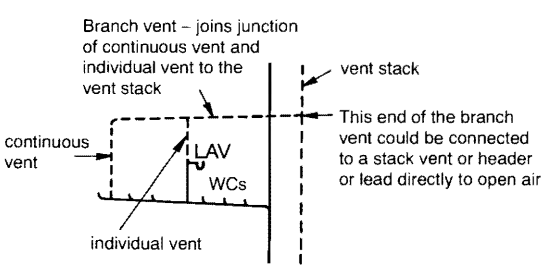


(a) Normal operation with air valve open

(b) No backflow – valve closed by atmospheric pressure

Back-siphonage can be prevented in the above situations by providing an air gap or a back-siphonage preventer (see Subsection 6.2 of this Code).

A-1.3.2. Branch Vent

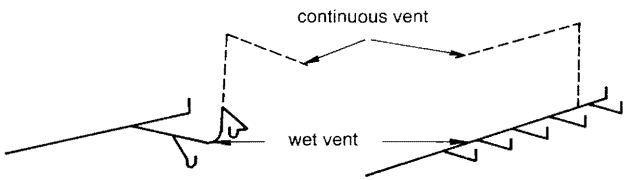


(See also explanation for definitions for header and drainage system.)

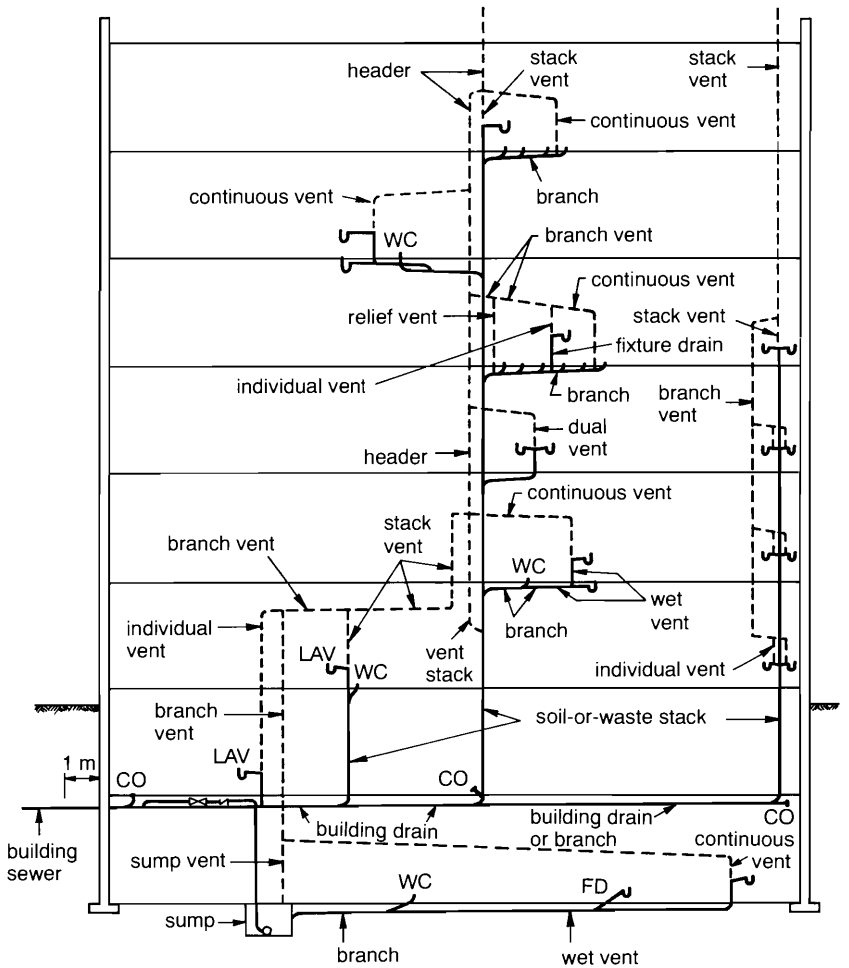
A-1.3.2. Clear-Water Waste

Examples of clear-water waste are the waste waters discharged from a drinking fountain, cooling jacket, air conditioner or relief valve outlet.

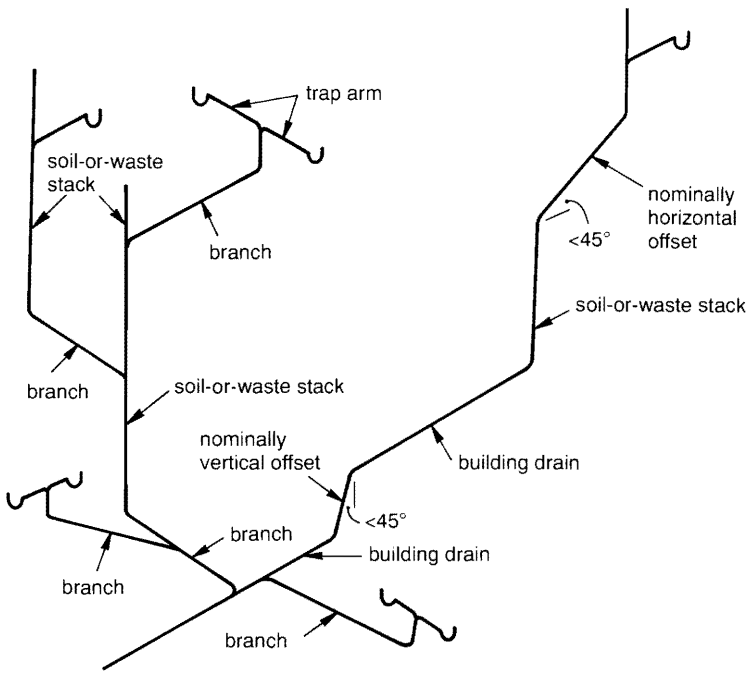
A-1.3.2. Continuous Vent



A-1.3.2. Drainage System (Drainage and venting systems)

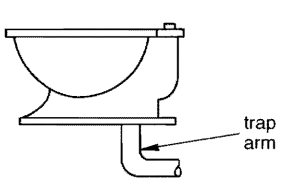


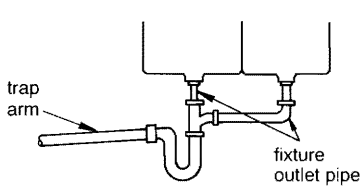
A-1.3.2. Drainage System (Cont'd)(Partial drainage system. Isometric view ignoring vents)



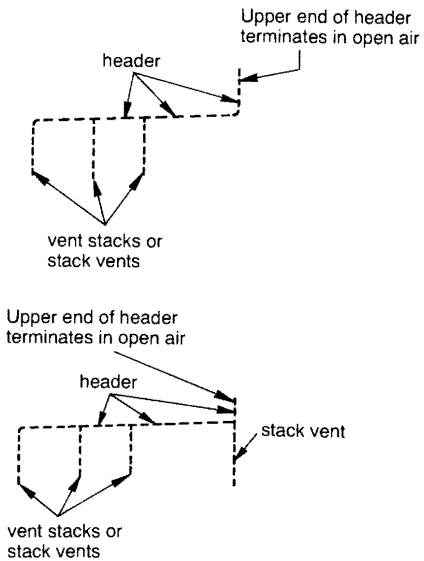
Partial drainage system
(isometric view)

A-1.3.2. Fixture Outlet Pipe and Trap Arm



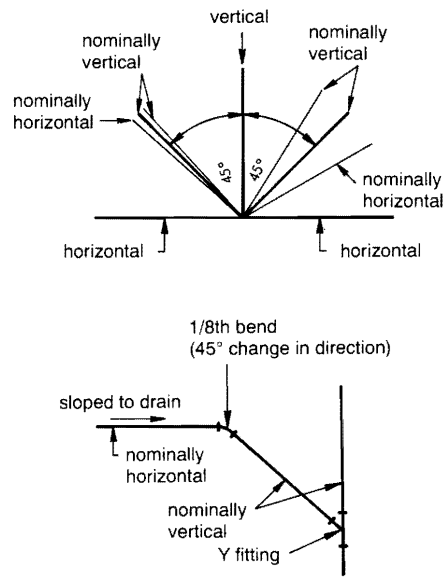


A-1.3.2. Header

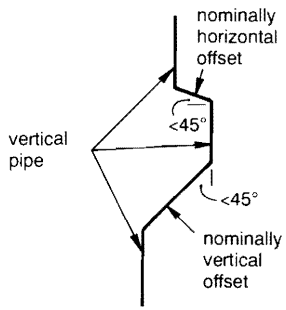


Although a header is similar to a branch vent, it serves the special purpose of connecting the tops of stack vents or vent stacks. To make certain that it is adequate for that purpose it is made larger than a branch vent. The developed length used to determine its size is the total length from the most distant soil-or-waste pipe to open air, rather than the shorter length used to size a branch vent.

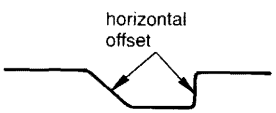
A-1.3.2. Nominally Horizontal and Nominally Vertical



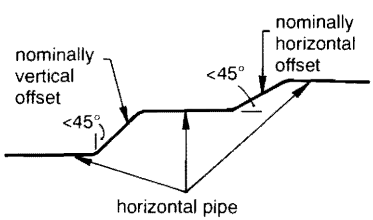
A-1.3.2. Offset



(a) Elevation view of vertical pipe

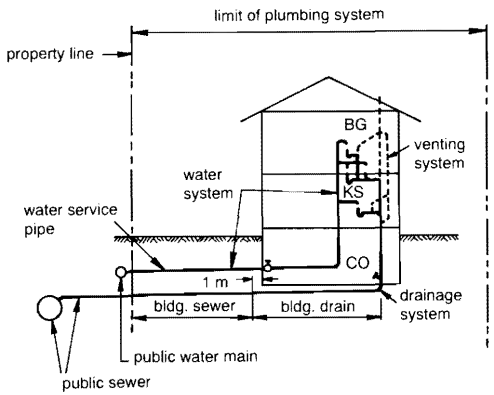


(b) Plan view of horizontal pipe



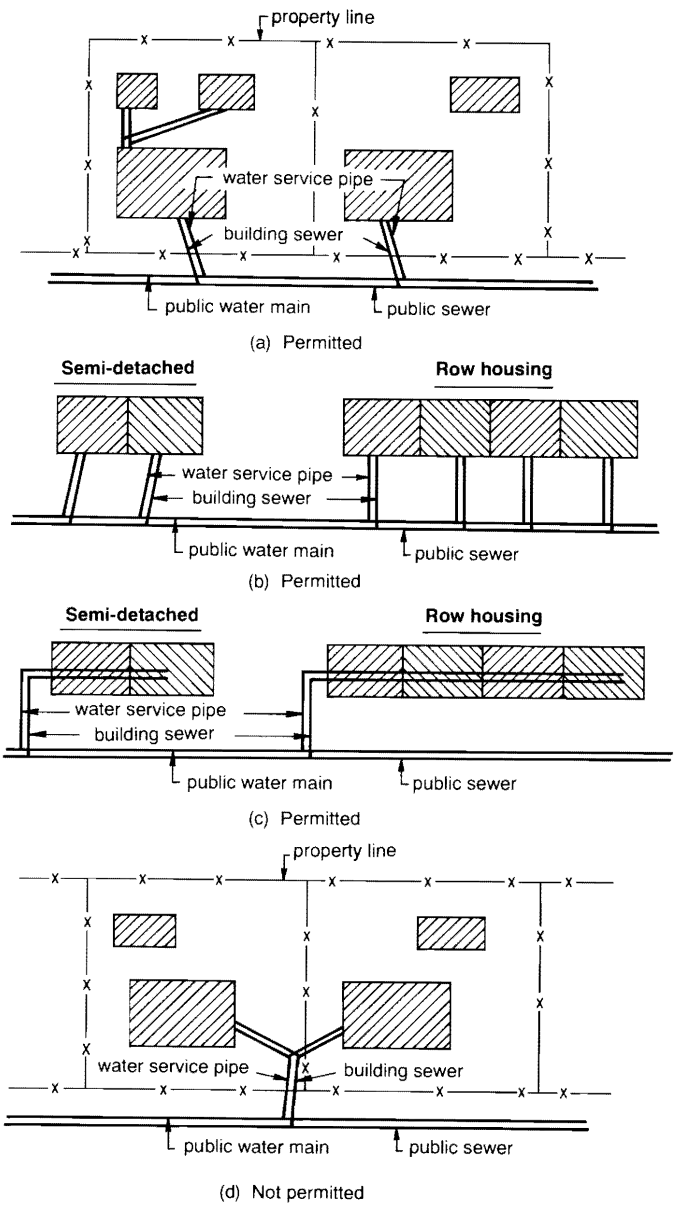
(c) Elevation view of horizontal pipe

A-1.3.2. Plumbing System



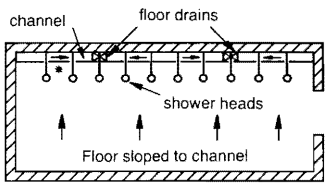
A-1.6.1.(2) Combined Building Drains. Combined building drains may have proved to be acceptable on the basis of past performance in some localities and their acceptance under Article 1.4.3. of this Code may be warranted.

A-1.6.4. Service Piping



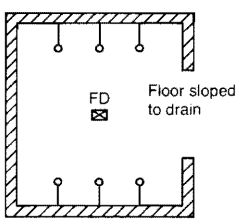
The layout as shown in diagram (c) above may require special legal arrangements in some jurisdictions to ensure that access can be provided to all parts of the service pipes.

A-2.2.3.(3) Shower Drainage, Plan View



(a) Permitted

*Minimum distance between shower heads – 750 mm

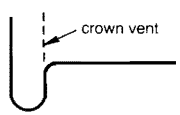


(b) Not permitted

A-2.3.1.(3) Prohibited Traps

(a) Bell trap

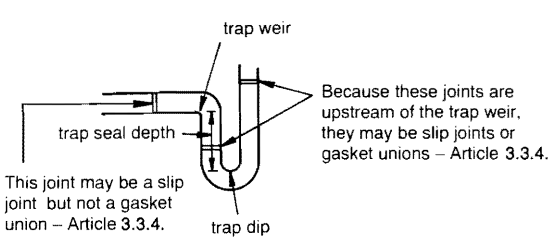
(b) S trap



(c) Crown vented trap

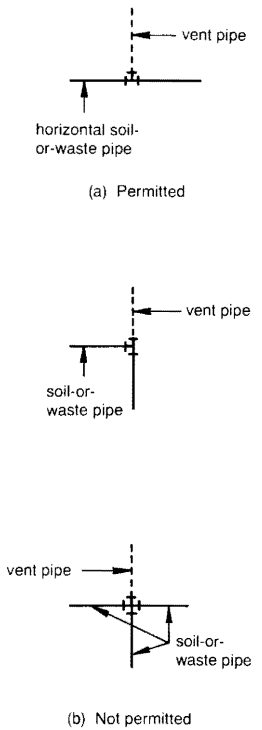
A-2.2.4. This does not preclude the use of a standing waste.

A-2.3.1.(1) and (2) Trap Seal Depth and Trap Connections



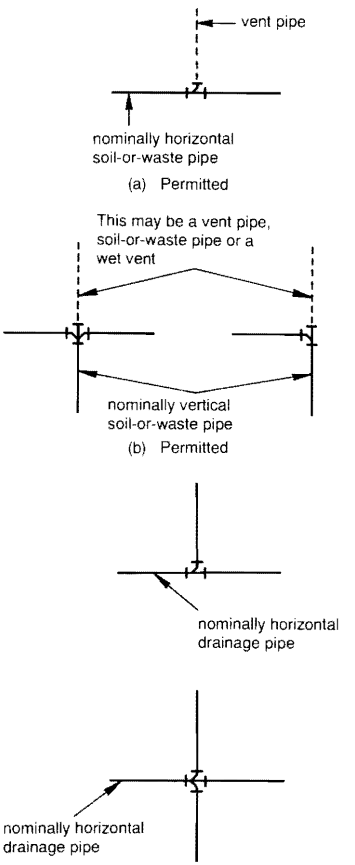
Except for an S-trap standard, the S trap shown in diagram (b) above is prohibited by Clause 5.6.3.(1)(b), which limits the fall on fixture drains. Crown vented traps shown in diagram (c) are prohibited by Clause 5.6.3.(1)(a), which requires that the distance from the trap weir to the vent be not less than twice the size of the fixture drain.

A-2.4.1. T Fittings in Drainage Systems



This prohibits the use of a cross fitting in a drainage system, but such fitting may be used in a venting system to connect 4 vent pipes. In a drainage system a T fitting can only be used as shown in diagram (a), and cannot be used as shown in diagram (b) because the T or cross fitting would change the direction of flow in the drainage system.

A-2.4.2. Sanitary T Fittings in Drainage Systems



A sanitary T fitting may be used to change the direction of flow in a drainage system from horizontal to vertical, but may not be used to change the direction of flow in a nominally horizontal drainage system. A combination Y and 1/8th bend fitting may also be used as shown in Figure (b).

Summary of Pipe and Fittings Applications

Type of Piping	Standard References	Code References	Use of Piping [1]								
			Drainage System			Venting System		Potable Water System			
								Above ground		Underground	
			Above ground inside building	Underground under building	Building sewer	Above ground	Underground	Cold	Hot	Under building	Outside building
Aluminum	CAN3-B281-M	2.7.9.	P	N	N	P	N	N	N	N	N
Asbestos-cement DWV pipe											
Type I Class 3 000, sizes 8-in. to 24-in.	CAN/CGSB-34.22-M, or CSA B127.1-M	2.5.1.(1)	P	P	P	P	P	N	N	N	N
Type II Class 4 000, sizes 3-in. to 24-in.		2.5.1.(1)	P	P	P	P	P	N	N	N	N
Asbestos-cement sewer pipe (non-pressure)											
Classes 1 500, 2 400, 3 000, sizes 4-in., 5-in., 6-in.	CAN/CGSB-34.23-M, or CSA B127.2	2.5.1.(2)	N	P	P	N	P	N	N	N	N
Classes 1 500, 2 400, 3 300, 4 000, 5 000, 6 000, 7 000, sizes 8-in. to 42.2-in.	CAN/CGSB-34.9-M	2.5.1.(2)	N	P	P	N	P	N	N	N	N
Asbestos-cement water pipe											
Class 100 psi Class 150 psi Class 200 psi	CAN/CGSB-34.1-M	2.5.2.	N	N	N	N	N	N	N	P [2]	P [2]
Column 1	2	3	4	5	6	7	8	9	10	11	12

Summary of Pipe and Fittings Applications

Type of Piping	Standard References	Code References	Use of Piping [1]								
			Drainage System			Venting System		Potable Water System			
								Above ground		Underground	
			Above ground inside building	Underground under building	Building sewer	Above ground	Underground	Cold	Hot	Under building	Outside building
Concrete sewer pipe	CSA Series, A257										
Sewer, storm drain and culvert	CSA A257.1-M	2.5.3.	N	P [12]	P	N	N	N	N	N	N
Reinforced culvert, storm drain and sewer	CSA A257.2-M	2.5.3.	N	P [12]	P	N	N	N	N	N	N
Vitrified clay pipe	CSA A60.1-M	2.5.4.	N	P	P	N	P	N	N	N	N
Polyethylene water pipe and tubing											
Series 160 sizes with compression fittings	CAN3-B137.1-M	2.5.5.	N	N	N	N	N	N	N	P [3]	P [3]
Series 50, 75, 100 and 125		2.5.5.	N	N	N	N	N	N	N	N	N
Poly (vinyl chloride) (PVC) water pipe											
Series 80, 100, 125, 160 and 200	CAN3-B137.3-M	2.5.6.	N	N	N	N	N	P	N	P [4]	P [4]
Chlorinated poly (vinyl chloride) (CPVC) water pipe	CSA B137.6-M	2.5.7.	N	N	N	N	N	P [5, 6, 7]	P [5, 6, 7]	P [7]	P [7]
Polybutylene water pipe	CAN3-B137.8-M	2.5.8.	N	N	N	N	N	P [5, 6]	P [5, 6]	P	P
Column 1	2	3	4	5	6	7	8	9	10	11	12

A-2.5, A-2.6 and A-2.7 (Cont'd)

Summary of Pipe and Fittings Applications

Type of Piping	Standard References	Code References	Use of Piping [1]								
			Drainage System			Venting System		Potable Water System			
								Above ground		Underground	
			Above ground inside building	Underground under building	Building sewer	Above ground	Underground	Cold	Hot	Under building	Outside building
Plastic sewer pipe	CAN/CSA-B182.1-M	2.5.9.(1)	N	P	P	N	N	N	N	N	N
Acrylonitrile-butadiene-styrene (ABS) DWV pipe	CAN3-B181.1-M	2.5.9. 2.5.10.	P [5, 6]	P	P	P [5, 6]	P	N	N	N	N
Poly (vinyl chloride) (PVC) DWV pipe	CAN/CSA-B181.2-M	2.5.9. 2.5.10	P [5, 6]	P	P	P [5, 6]	P	N	N	N	N
Type PSM PVC sewer pipe ≯ 35-SDR	CAN/CSA-B182.2	2.5.9.	N	P	P	N	P	N	N	N	N
Polyolefin laboratory drainage systems	CAN/CSA-B181.3	2.5.10.	P [5, 6]	P	P	P [5, 6]	P	N	N	N	N
Cast iron soil pipe	CAN3-B70-M	2.6.1.	P	P	P	P	P	N	N	N	N
Cast iron water pipe	ANSI/AWWA C151/A21.51 (Ductile Iron)	2.6.4.	P	P	P	P	P	P	P	P	P
Cast iron screwed fittings	ANSI B16.4 (Cast iron)	2.6.5.	N	N	N	N	N	P	P	P	P
	ANSI B16.3 (Malleable Iron)	2.6.6.	N	N	N	N	N	P	P	P	P
Welded and seamless steel galvanized pipe	ASTM A53	2.6.7.	P	N	N	P	N	P [8]	P [8]	P [8]	P [8]
Corrugated steel galvanized pipe	CAN3-G401	2.6.8.	N	N	P [9]	N	N	N	N	N	N
Sheet metal pipe [10]	—	2.6.9.	N	N	N	N	N	N	N	N	N
Copper and brass pipe	ASTM B42 (copper)	2.7.1.	P	P	P	P	P	P	P	P	P
Column 1	2	3	4	5	6	7	8	9	10	11	12

Summary of Pipe and Fittings Applications

Type of Piping	Standard References	Code References	Use of Piping [1]								
			Drainage System			Venting System		Potable Water System			
								Above ground		Underground	
			Above ground inside building	Underground under building	Building sewer	Above ground	Underground	Cold	Hot	Under building	Outside building
	ASTM B43 (red brass)	2.7.1.	P	P	P	P	P	P	P	P	P
Brass or bronze threaded water fittings	ANSI B16.15	2.7.3.	N	N	N	N	N	P	P	P	P
Copper tube Types K and L hard	ASTM B88	2.7.4.	P	P	P	P	P	P	P	N	N
Types K and L soft	ASTM B88	2.7.4.	N	N	N	N	N	P	P	P	P
Type M hard	ASTM B88	2.7.4.	P	N	N	P	N	P	P	N	N
Type M soft	ASTM B88	2.7.4.	N	N	N	N	N	N	N	N	N
Type DWV	ASTM B306	2.7.4.	P [11]	N	N	P [11]	N	N	N	N	N
Solder-joint drainage fittings	CSA B158.1 ANSI B16.29	2.7.5.	P	P	P	P	P	N	N	N	N
Solder-joint water fittings	ANSI B16.18 ANSI B16.22	2.7.6.	N	N	N	P	P	P	P	P	P
Lead waste pipe	CSA B67	2.7.8.	P [5, 6]	P	N	P [5, 6]	P	N	N	N	N
Column 1	2	3	4	5	6	7	8	9	10	11	12

Notes to Table:

N – Not permitted. P – Permitted.

(1) Where fire stops are pierced by pipes, the integrity of the fire stop must be maintained.

(2) Cold water only.

(3) Permitted only for water service pipe.

(4) Not permitted in hot water systems.

(5) Combustible piping in noncombustible construction is subject to the requirements of Article 3.1.5.15.(1) of the National Building Code 1990.

(6) Combustible piping that penetrates a fire separation is subject to the requirements in Articles 3.1.9.1., 9.10.9.6. and 9.10.9.7. of the National Building Code 1990.

(7) Not to exceed design temperature and design pressure in Sentence 2.5.7.(2).

(8) Permitted only in buildings of industrial occupancy as described in the National Building Code 1990, or the repair of existing galvanized steel piping systems.

(9) Permitted underground only in a storm drainage system.

(10) Permitted only for a external leader.

(11) Not permitted for the fixture drain or vent below the flood level rim of a flush valve operated urinal.

(12) Gasketted joints required.

A-2.5.3.(4) Concrete Fittings. Concrete fittings fabricated on the site from lengths of pipe may have proved to have been acceptable on the basis of past performances in some localities, and their acceptance under Article 1.4.3. of the Code may be warranted.

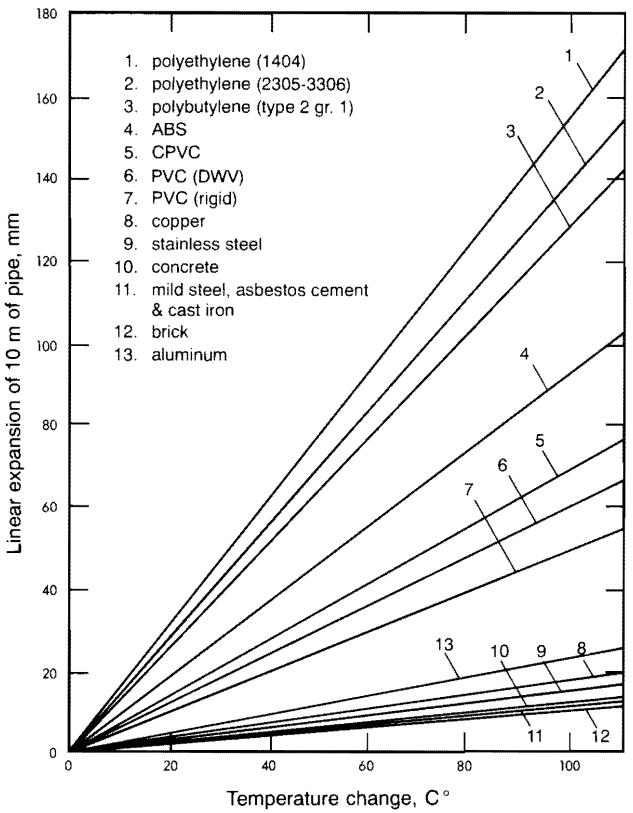
A-2.6.7.(3) Galvanized Steel Pipe. The use of galvanized steel pipe in a water distribution system may have proved to have been acceptable on the basis of past performances in some localities, and its acceptance under Article 1.4.3. of this Code may be warranted.

A-2.9.5. Saddle Hubs or Fittings. Saddle hubs or fittings may have proved to have been acceptable on the basis of past performance in some localities, and their acceptance under Article 1.4.3. of this Code may be warranted.

A-2.9.8.(3) Bubblers. Bubblers installed on other than drinking fountains may have proved to have been acceptable on the basis of past performance in some localities, and their acceptance under Article 1.4.3. of this Code may be warranted.

A-2.9.9.(1) Backflow Preventers. Information on the selection, installation, maintenance and field testing of back-siphonage and backflow preventers can be found in CSA B64.10, "Backflow Prevention Devices – Selection, Installation, Maintenance and Field Testing."

A-3.3.10. Linear Expansion



Example: To determine the expansion of 20 m of ABS pipe for a temperature change from 10°C to 60°C.

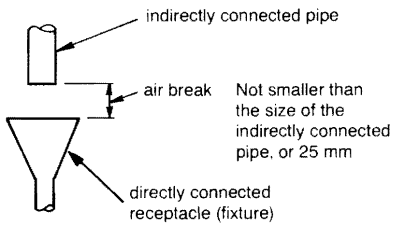
Temperature change = 60 – 10 = 50 °C,

Enter the chart at 50 °C, read up to ABS line, and then across to the mm scale = 47 mm/10 m of pipe,

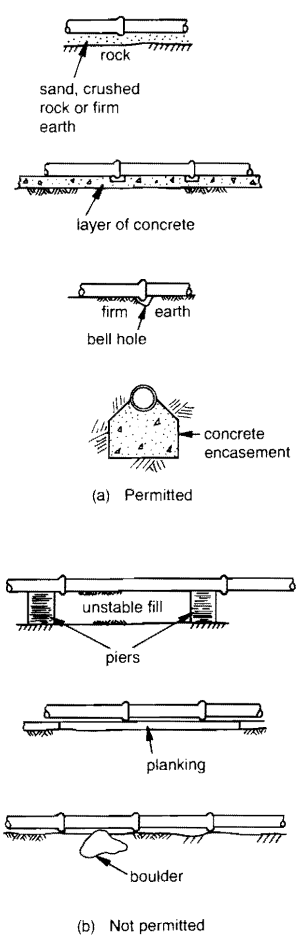
∴ change in length of 20 m of pipe =

$$\frac{20}{10} \times 47 = 94 \text{ mm}.$$

A-3.3.12.(2) Air Break

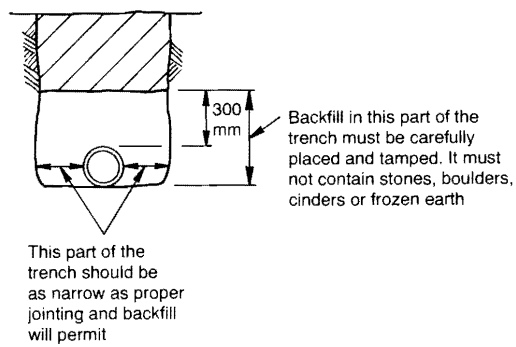


A.3.4.6.(1) Support for Underground Piping



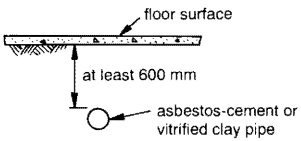
See explanation for Subsection 3.5 for additional protection required for underground pipes. Permitted installations are shown in diagram (a). The methods of support shown in diagram (b) are not permitted because the base does not provide firm and continuous support for the pipe.

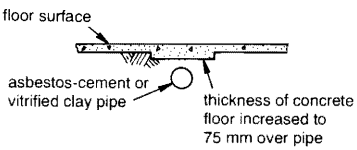
A.3.5.1. Backfilling of Pipe Trench



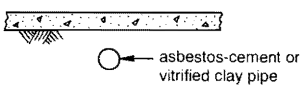
Stronger pipes may be required in deep fill or under driveways, parking lots, etc., and compaction for the full depth of the trench may be necessary.

A.3.5.2. Protection of Underground Non-Metallic Pipes



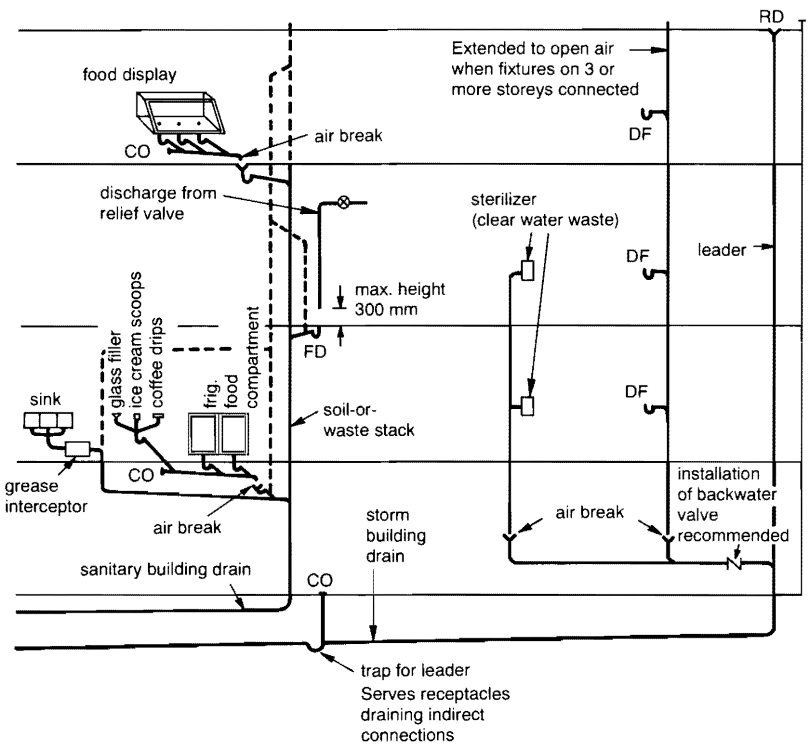


(a) Concrete floors less than 75 mm thick



(b) Concrete floor 75 mm or more thick
(no protection required)

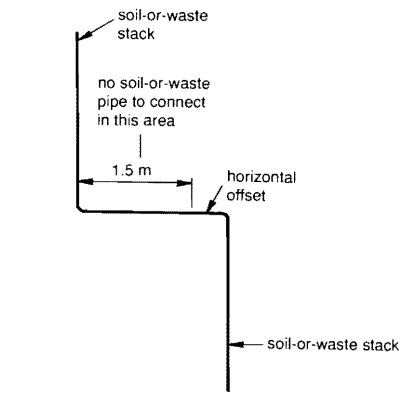
A-4.2.1.(1)(a) and (e) Indirect Connections



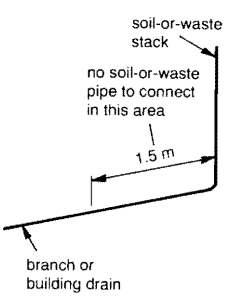
See Sentence 4.5.1.(4) for trapping requirements for indirectly connected fixtures.

See Sentence 4.7.1.(9) for cleanouts on drip pipes for food receptacles or display cases.

A-4.2.1.(2) Soil-or-Waste Pipe Connections



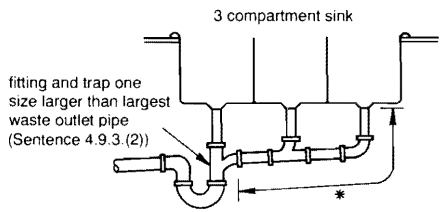
(a) Connection to nominally horizontal offset



(b) Connection to nominally horizontal soil-or-waste pipe

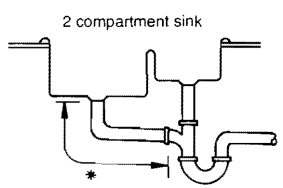
A-4.4.3.(1) Grease Interceptors. Grease interceptors may be required when it is considered that the discharge of excessive grease may impair the drainage system. Information on the design, sizing and replacement of grease interceptors can be found in ASPE 1977-78, Data Book, Volume 2, "Special Plumbing Systems Design."

A-4.5.1.(2) Trapping of Sinks and Laundry Trays

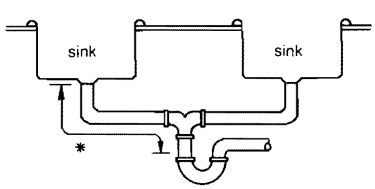


(a)

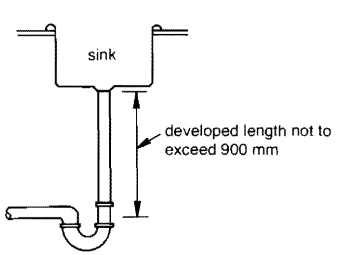
*developed length not to exceed 900 mm (Article 4.8.2.)



*developed length not to exceed 900 mm (Article 4.8.2.)

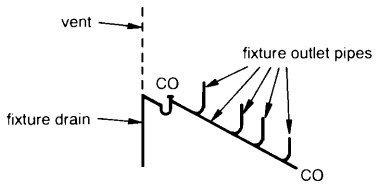


(b)

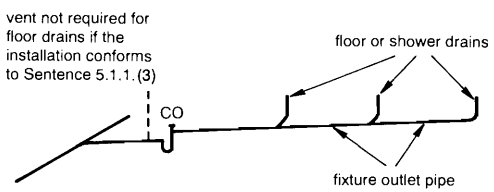


(c)

A-4.5.1.(3) Single Traps for Fixture Groups

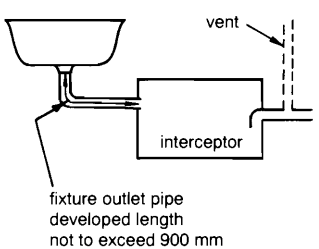


(a) Laboratory sinks or washing machines



(b) Floor drains and shower drains

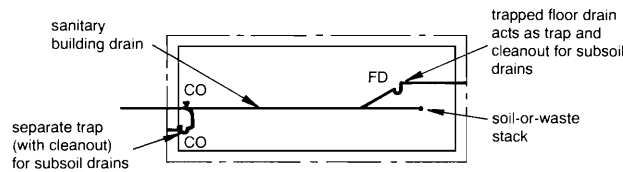
A-4.5.1.(5) Location of Trap or Interceptor



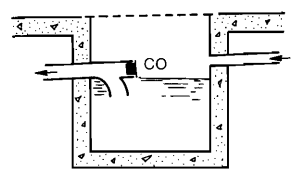
An interceptor that replaces a trap must be vented in the same way as the trap it replaces. (See A-4.2.1.(1)(a) and (e).) Where an interceptor other than an oil interceptor serves a group of fixtures requiring more than one trap, each fixture must be properly trapped and vented. (See Article 5.5.2. for venting of oil interceptors.)

A-4.5.2.(1) When an untrapped leader drains to a combined building sewer, clearance requirements are the same as for vent terminals. (See A-5.6.5.(3).)

A-4.5.3. Subsoil Drainage Connections



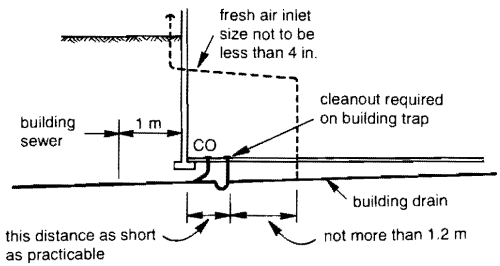
(a) Connections to sanitary drainage system (plan view)



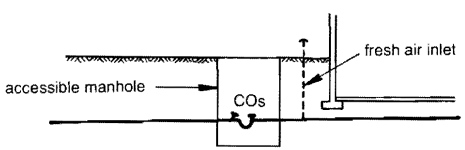
(b) Trapped sump

This Code does not regulate the installation of subsoil drainage pipes, but does regulate the connection of such pipes to the plumbing system. The intent of this Article is to place a trap between the subsoil drainage pipe and the sanitary drainage system. The cleanout must be installed in accordance with Sentence 4.7.1.(2). A trap or sump may be provided specifically for the subsoil drains, or advantage may be taken of the trap of a floor drain or storm water sump as shown above.

A-4.5.4.(1) Location of Building Traps

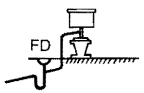


(a) Building trap inside building

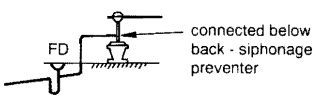


(b) Building trap outside building

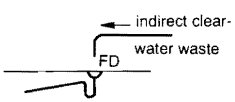
A-4.5.5. Maintaining Trap Seals



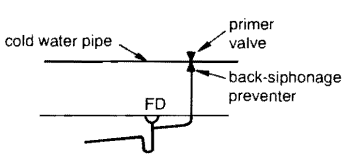
(a) Flush tank



(b) Flush valve



(c) Indirect waste

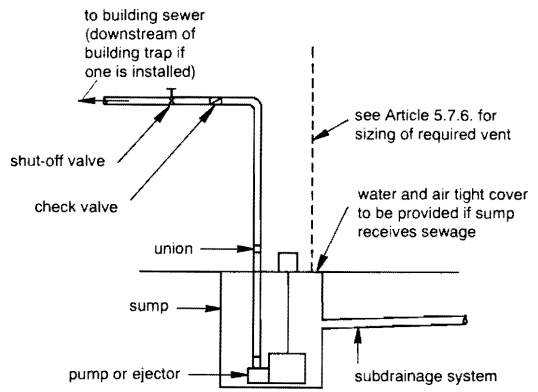


(d) Trap seal primer

Periodic manual replenishment of the water in a trap is considered to be an equally effective means of maintaining the trap seal in floor drains in residences. Under pressure differential conditions special measures are necessary to maintain trap seals.

A-4.6.1.(2) Combined Building Drains. Combined building drains may have proved to have been acceptable on the basis of past performance in some localities, and their acceptance under Article 1.4.3. of this Code may be warranted.

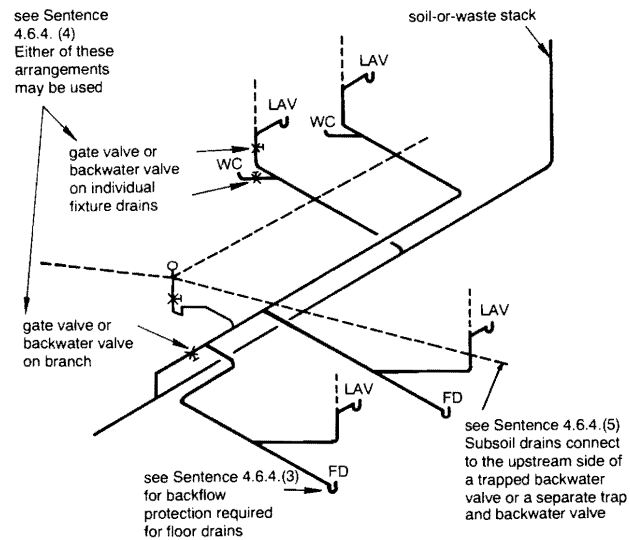
A-4.6.3. Arrangement of Piping at Sump



In most installations controls will be installed in conjunction with a float to automatically empty the sump. If such controls are not provided, the capacity of the sump should equal the maximum inflow to the sump that is expected to occur during any 24 h period.

A-4.6.4.(1) Backwater Valve or Gate Valve. The installation of a backwater valve or a gate valve in a building drain or in a building sewer may have proved to have been acceptable on the basis of past performance in some localities, and their acceptance under Article 1.4.3. of this Code may be warranted.

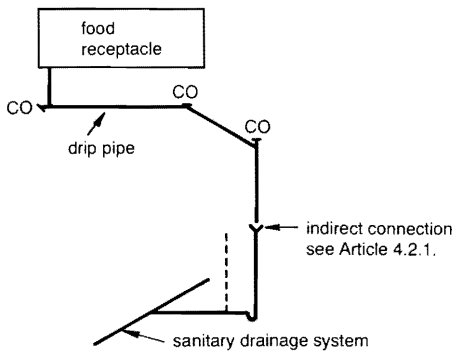
A-4.6.4.(5) Protection from Backflow Caused by Surcharge



These requirements are intended to apply when in the opinion of the authority having jurisdiction there is danger of backup from a public sewer.

A-4.7.1.(1) A trap cleanout plug is not acceptable as a cleanout for the fixture drain, hence either a separate cleanout or a trap with a removable trap dip must be installed.

A-4.7.1.(9) Cleanouts for Food Receptacle Drip Pipes



A-4.8.1. Although slopes below 1 in 100 are permitted for pipes over 4 in., they should be used only where necessary. Steeper slopes and higher velocities will help to keep pipes clean by moving heavier solids that might tend to clog the pipes.

A-Table 4.9.A. When determining the hydraulic load on a pipe, no allowance need be made for a load from a domestic clothes washer when discharged to a laundry tray since the hydraulic load from the laundry tray is sufficient. Also no hydraulic load is required from a floor drain in a washroom since it is for emergency use only.

A-4.9.3.(2) Fixture outlet pipes that are common to 2 or 3 compartments or fixtures are sometimes referred to as continuous wastes and are not considered to be branches. (See also explanation for Sentence 4.5.1.(2).)

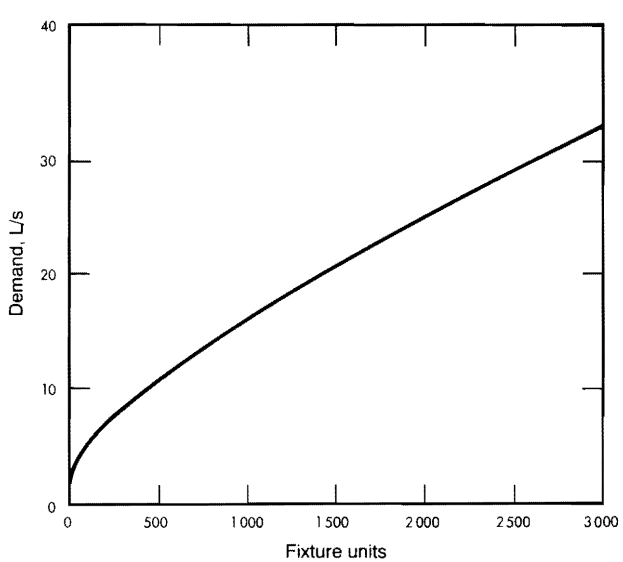
A-4.10 Determination of Hydraulic Loads and Drainage Pipe Sizes

Hydraulic Loads

The hydraulic load that is imposed by a fixture is represented by a factor called a fixture unit. Fixture units are dimensionless and take into account the rate of discharge, time of discharge and frequency of discharge of the fixture.

Confusion often arises when attempts are made to convert fixture units to litres per second because there is no straightforward relationship between the two. The proportion of the total number of fixtures that can be expected to discharge simultaneously in a large system is smaller than in a small system. For example, doubling the number of fixtures in a system will not double the peak flow that the system must carry, although of course the flow will be increased somewhat. The following curve shows the relationship that was used in constructing the tables of capacities of stacks, branches, sanitary building drains and sanitary building sewers (Tables 4.10.B. to 4.10.D.).

Although the curve below was used to prepare the Code tables, it was not included in the Canadian



Plumbing Code. Instead, a single approximate conversion factor is given in the Code so that a continuous flow from a fixture may be converted from litres per second to fixture units in order to determine the total hydraulic load on the sanitary drainage system. The conversion factor which is given in Sentence 4.10.3.(1) is 26.4 fixture units per litres per second. The discharge from a continuous flow fixture in litres per second when multiplied by 26.4 gives the hydraulic load in fixture units, and that load is added to the fixture unit load from other fixtures to give the total load that the sanitary drainage pipe must carry.

The hydraulic load that is produced by storm water runoff depends both on the size of the area that is drained and local rainfall intensity. The capacities of storm drainage pipes and combined sewers in Tables 4.10.E. to 4.10.G. have been expressed in terms of the number of litres that they can carry when the local rainfall intensity is 1 mm in 15 min. The hydraulic load for a particular location is obtained by simply multiplying the rainfall intensity figure given in Chapter 1 of the "Supplement to the NBC 1990" by the actual area drained as specified in Sentence 4.10.4.(1).

When plumbing fixtures are connected to a combined sewer, the hydraulic load from the fixtures must be converted from fixture units to litres or, in the case of continuous flow, from litres per second to litres so that these loads can be added to the hydraulic loads from roofs and paved surfaces. As already pointed out, the relationship between fixture units and litres per second and, consequently, the relationship between fixture units and litres is not straightforward, and an approximate conversion factor has been adopted. The conversion factor which is given in Sentence 4.10.5.(1) is 9.1 L/fixture unit, except where the load is less than 260 fixture units when a round figure of 2 360 L is to be used. In the case of continuous flow fixtures that are connected to combined sewers or storm sewers, the conversion factor given in Sentence 4.10.3.(2) is 900 L per L/s. This conversion factor is not an approximation but is an exact calculation.

The conversion factors given in Sentences 4.10.3.(1) and 4.10.5.(1) are designed to convert in one direction only, and must not be used to convert from fixture units to litres per second in the one instance nor from litres to fixture units in the other instance.

In summary it should be noted that

(a) in sanitary drainage systems all hydraulic loads are converted to fixture units, and
(b) in storm drainage systems or combined drainage systems all hydraulic loads are converted to litres.

Procedure for Selecting Pipe Sizes

The following is an outline, with examples, of the procedures to be followed in determining the size of each section of drainage piping.

1. Sanitary drainage pipes, for example, branches, stacks, building drains or building sewers
   (a) Determine the load in fixture units from all fixtures except continuous flow fixtures,
   (b) Determine the load in litres per second from all continuous flow fixtures and multiply the number of litres per second by 26.4 to obtain the number of fixture units,
   (c) Add loads (a) and (b) to obtain the total hydraulic load on pipe in fixture units, and
   (d) Consult the appropriate table from Tables 4.10.B., 4.10.C. or 4.10.D. and select the pipe size.
   (Note that no pipe size can be smaller than that permitted in Subsection 4.9.)
2. Storm drainage pipes, for example, gutters, leaders, horizontal pipes, building drains or building sewers
   (a) Determine the area in square metres of roofs and paved surfaces according to Sentence 4.10.4.(1),
   (b) Determine the local rainfall intensity (15 min rainfall) from Chapter 1 of the "Supplement to the NBC 1990,"
   (c) Multiply (a) by (b) to obtain the hydraulic load in litres,
   (d) If a fixture discharges a continuous flow to the storm system, multiply its load in litres per second by 900 to obtain the hydraulic load in litres,

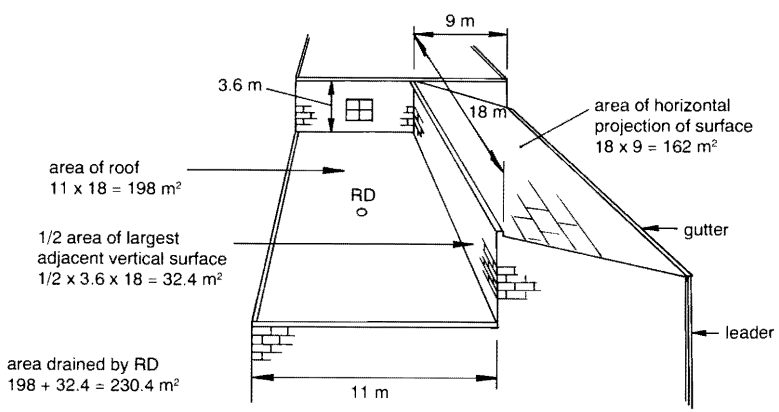
(e) Add loads (c) and (d) to obtain the total hydraulic load on the pipe in litres, and
(f) Consult the appropriate table from Tables 4.10.E., 4.10.F. or 4.10.G. and select pipe or gutter size.
(Note that no pipe size can be smaller than that permitted in Subsection 4.9.)

3. Combined drainage pipes, for example, building sewers
(a) Determine the total load in fixture units from all fixtures except continuous flow fixtures,
(b) If the fixture unit load exceeds 260, multiply it by 9.1 to determine the equivalent hydraulic load in litres. If the fixture unit load is 260 or fewer fixture units, the hydraulic load is 2 360 L,
(c) Obtain the hydraulic load from roofs and paved surfaces in the same manner as for storm drains (see 2(a), (b) and (c)),
(d) Obtain the hydraulic load in litres from any continuous flow source that is connected to the sanitary or storm drainage system in the same manner as for storm drainage pipes (see 2(d)),
(e) Add hydraulic loads (b), (c) and (d) to obtain the total hydraulic load on pipe in litres, and
(f) Consult Table 4.10.E. and select the pipe size.
(Note that no pipe can be smaller than that permitted in Subsection 4.9.)

Examples

Example 1: Determination of the size of storm drainage components for building shown in the following 2 diagrams

Storm Drainage Areas (Example 1)



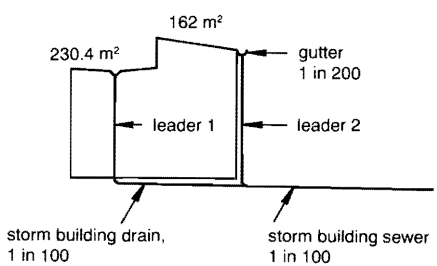
Step No. 1 Determine the hydraulic load from the roofs.
Area drained by gutter 162 m²
Area drained by roof drain 230.4 m²
If the local rainfall intensity is 25 mm
the load on the gutter (leader No. 2)
is (25 × 162) .....4 050 L
the load on the roof drain (leader No. 1)
is (25 × 230.4) .....5 760 L

If the local rainfall intensity is 15 mm
the load on the gutter (leader No. 2)
is (15 × 162) .....2 430 L
the load on the roof drain (leader No. 1)
is (15 × 230.4) .....3 456 L

Step No. 2 Determine the size of storm drainage components.

Using the appropriate hydraulic loads, the size of storm drainage components can be determined from Tables 4.10.E., 4.10.F. and 4.10.G. These values are tabulated in the Table below for rainfall intensities of 25 mm and 15 mm in 15 min.

Storm Drainage Components (Example 1)
(Elevation View)



Example 2: Determination of Size of Drainage Pipes for Buildings

The following diagram represents an office building with washrooms for men and women, a drinking fountain and cleaner's closet on each typical floor. The equipment room with facilities is located in the basement. The building is 18 m by 30 m and is to be built in Kitchener, Ontario.

A. Hydraulic Load per Typical Floor

5 WC @ 6	=	30	fixture units
2 UR @ 1 1/2	=	3	fixture units
4 LAV @ 1 1/2	=	6	fixture units
2 FD @ 3	=	6	fixture units
1 FS @ 3	=	3	fixture units
1 DF @ 1	=	1	fixture unit
		49	fixture units

The reader is left to calculate the size of the branches, one of which must be 4 in. and another 3 in. (see Subsection 4.9). Therefore the smallest part of the stack must be 4 in.

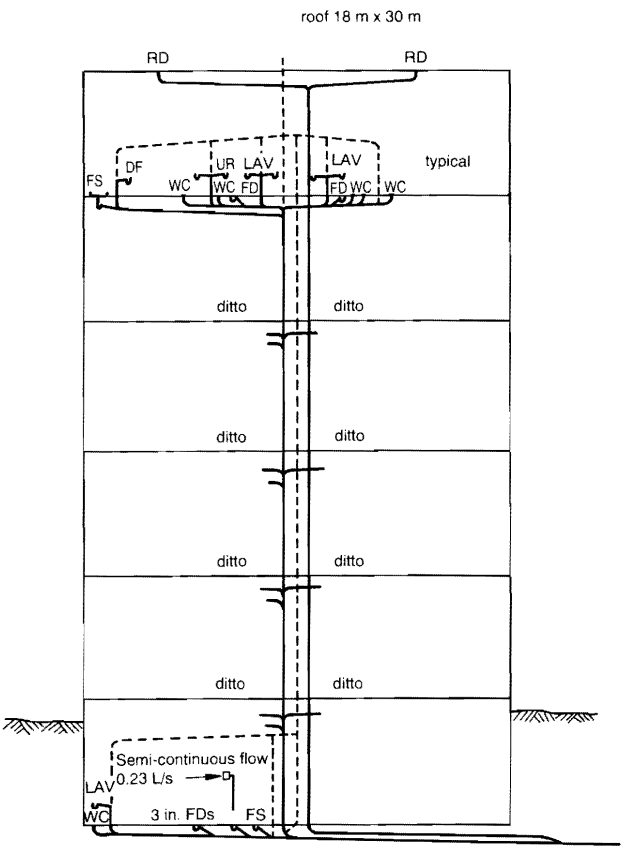
B. Hydraulic Load on Stack
5 storeys @ 49 fixture units
= 245 fixture units

Table 4.10.B. Column 3 permits 4-in. pipe. Use 4-in. pipe

Storm Drainage Pipe Sizes (Example 1)

	Area Drained, m²	15 min Rainfall Intensity, mm				Reference Table No.
		25		15		
		Hydraulic Load, L	Size, in.	Hydraulic Load, L	Size, in.	
Roof drain leader	230.4	5 760	4	3 456	3	4.10.G.
Gutter	162	4 050	8	2 430	7	4.10.F.
Gutter leader	162	4 050	3	2 430	2 1/2	4.10.G.
Storm building drain	230.4	5 760	5	3 456	4	4.10.E.
Storm building sewer	395.8	9 895	6	5 936	5	4.10.E.
Column 1	2	3	4	5	6	7

Building Drainage System (Example 2)



Building drainage system (Example II)

C. Hydraulic Load on Basement Branch

1 WC @ 6	=	6	fixture units
1 LAV @ 1	=	1	fixture unit
2 FD @ 3	=	6	fixture units
1 FS @ 3	=	3	fixture units
Semi-Continuous Flow			
0.23 L/s × 26.4	=	6	fixture units
		22	fixture units

Table 4.10.C. Column 2 permits 3-in. pipe. Use 3-in. pipe.

D. Hydraulic Load on Building Drain

From soil-or-waste stack	245	fixture units
From basement branch	22	fixture units
	267	fixture units

Table 4.10.D. Column 6 @ 1 in 50, a 4-in. pipe will carry 240 fixture units

Table 4.10.D. Column 7 @ 1 in 25, a 4-in. pipe will carry 300 fixture units

For practical reasons use a 4-in. pipe at a slope of not less than 1 in 32.

E. Storm Load

Area of roof 18 × 30 = 540 m^2

Rainfall intensity for Kitchener from Chapter 1 of the "Supplement to the NBC 1990" is 28 mm in 15 min.

Total hydraulic storm load = 28 × 540 = 15 120 L
Storm load on each roof drain 15 120/2 = 7 560 L

F. Size of Horizontal Leaders

Table 4.10.E. Column 8 @ 1 in 25, a 4-in. pipe will carry a load of 8 430 L

Table 4.10.E. Column 5 @ 1 in 100, a 5-in. pipe will carry a load of 7 650L

Table 4.10.E. Column 4 @ 1 in 133, a 6-in. pipe will carry a load of 10 700 L

Therefore use a 5-in. pipe at a slope of 1 in 100.

G. Size of Vertical Leader

Table 4.10.G. Column 2 would permit a 5-in. pipe (19 500 L) but they are not readily available. For practical reasons use a 6-in. pipe.

H. Size of Storm Building Drains

Since a drainage pipe cannot be smaller than any upstream pipes, the storm building drain must be at least 6 in. Referring again to Table 4.10.E., we see that a 6-in. pipe will carry a hydraulic load of 17 600 L at a slope of 1 in 50. Therefore use a 6-in. pipe at a slightly higher slope.

I. Size of Combined Building Sewer

(a) Total sanitary load excluding semi-continuous flow 261 fixture units converted to litres
(Clause 4.10.5.(1)(b)) × 9.1 = 2 375 L

(b) Semi-continuous flow 0.23 L/s converted to litres
(Sentence 4.10.3.(2)) × 900 = 207 L

(c) Storm load 15 120 L

Total hydraulic load 17 702 L

Referring to Table 4.10.E. @ 1 in 50, a 6-in. pipe will carry 17 600 L

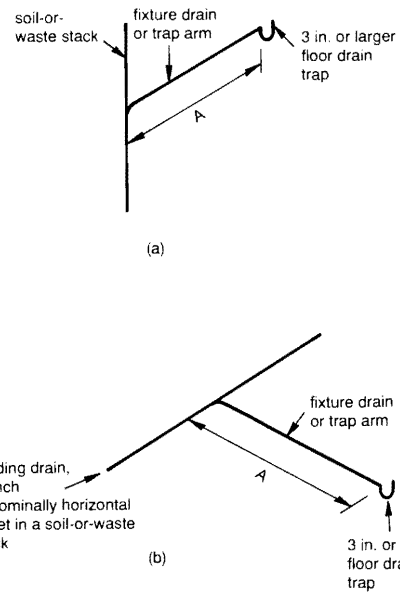
Referring to Table 4.10.E. @ 1 in 25, a 6-in. pipe will carry 24 900 L

Therefore use a 6-in. pipe at a slope of not less than 1 in 32.

A-4.10.4.(1) Climate information on rainfall intensities for various cities can be found in Chapter 1 of the "Supplement to the NBC 1990."

When calculating the hydraulic load from a roof or paved surface, it should be noted that 1 mm depth of water on 1 m^2 of surface is equivalent to 1 L.

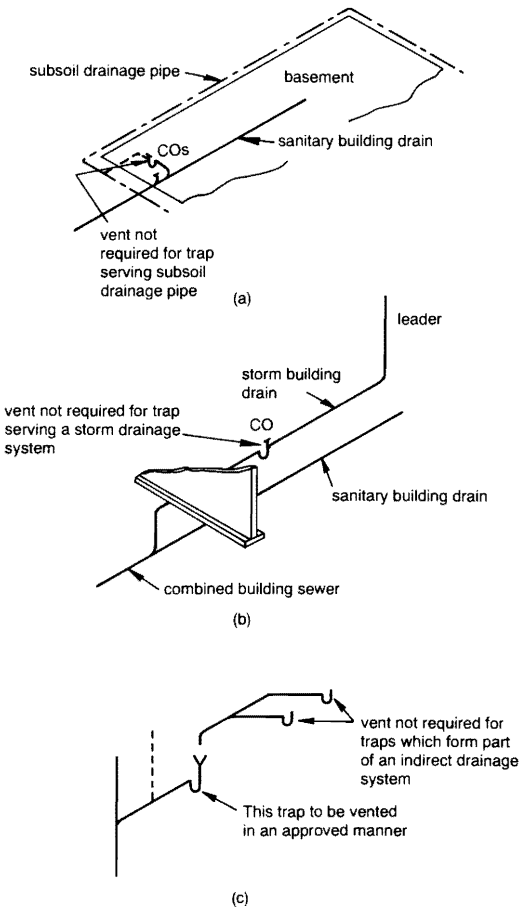
A-5.1.1.(3) Trapping of Floor Drains



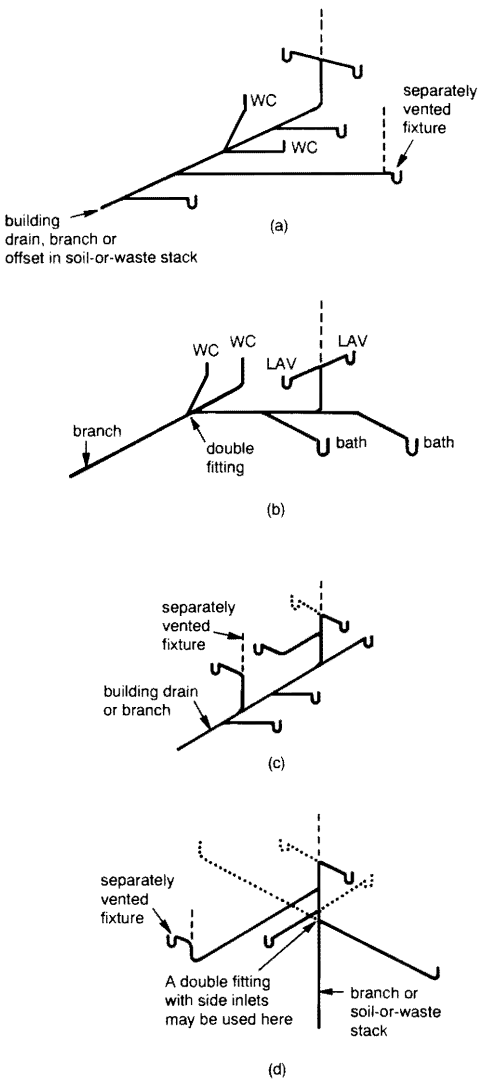
Length of "A" must be at least 450 mm and its fall shall not exceed the size of the pipe

See also explanation of Sentence 5.6.3.(1) for fall on fixture drain

A-5.1.1.(4) Venting not Required



A-5.2.1. Single Storey Wet Venting

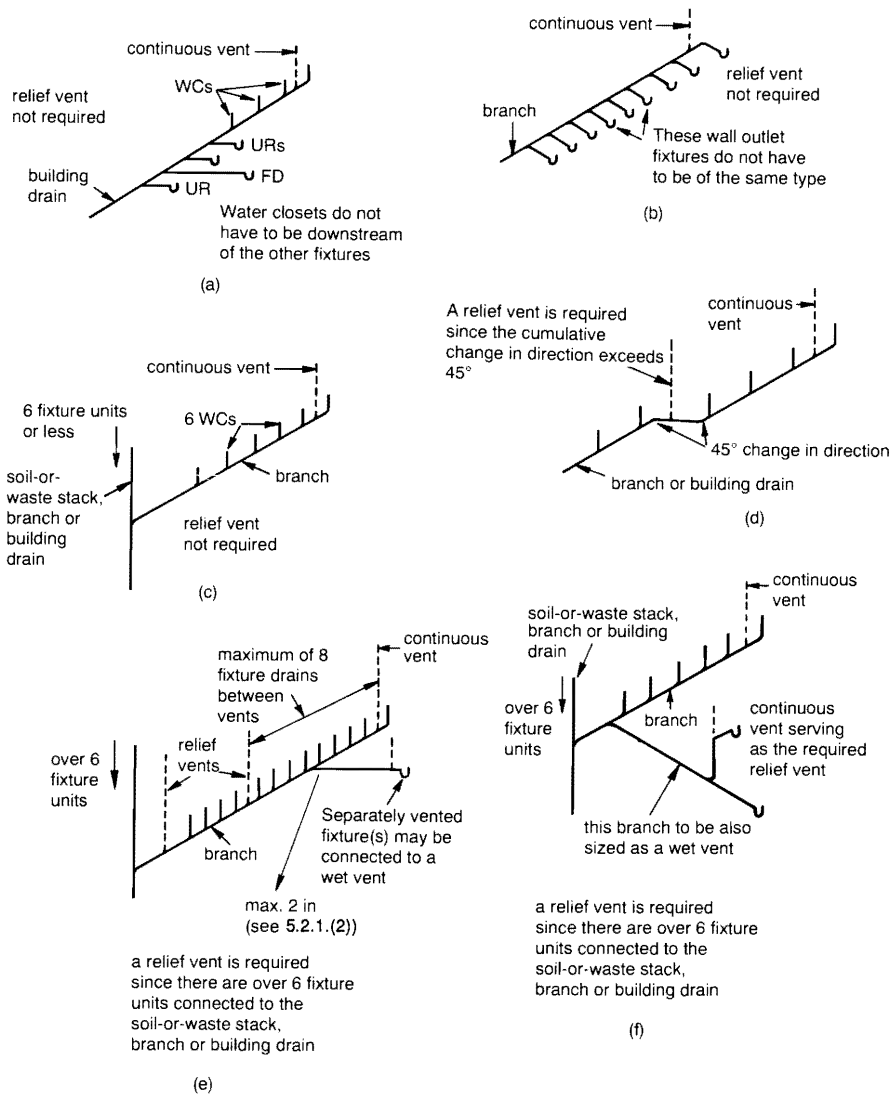


Each section of a single storey wet vent is sized according to the total load it serves (see Article 5.8.1.). Separately vented fixtures may connect to a wet vent.

Fixture drains are connected separately and directly into the branch or soil-or-waste stack in conformance with Article 5.6.3.

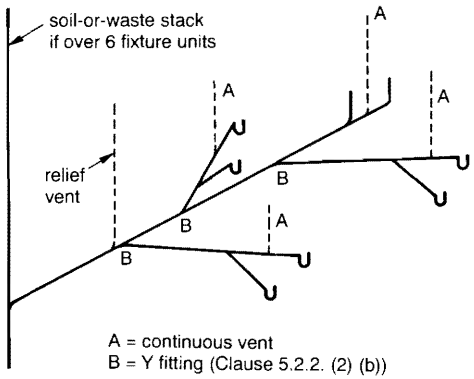
Figure (d) shows that water closets are connected downstream of all other fixtures when connected to a vertical pipe.

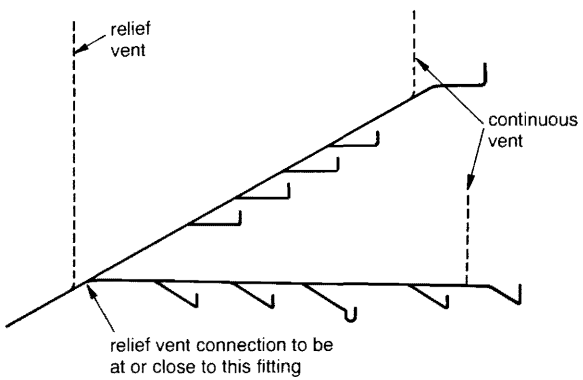
A-5.2.2.(1) and (2) Single Storey Wet Venting with Relief Vents



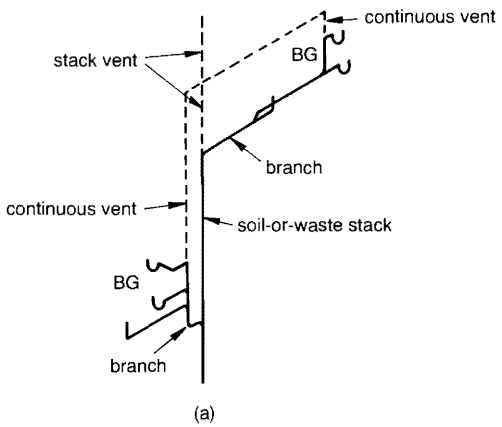
A relief vent is required since more than 6 fixture units are connected to the soil-or-waste stack, branch or building drain.

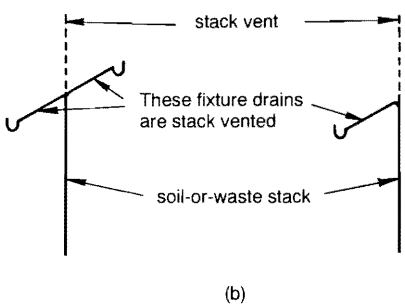
A-5.2.2.(3) Single Storey Wet Venting with Combined Relief Vents



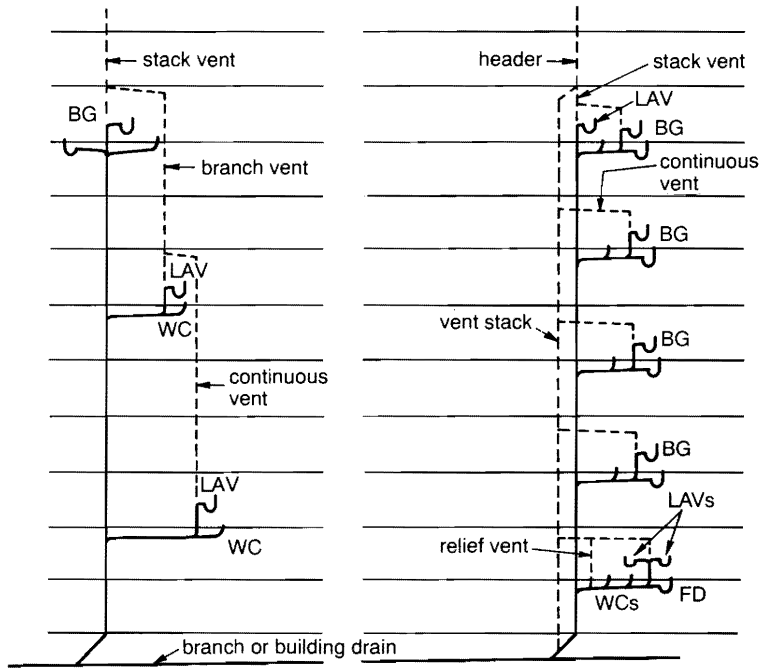


A-5.4.1. Stack Vents





A-5.4.2.(1) and (2) Vent Stacks

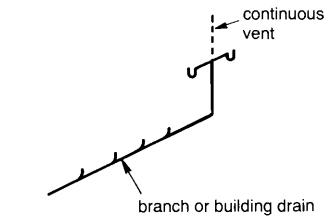


No vent stack required.
(Fixtures draining to the soil-or-waste stack from 3 storeys only)

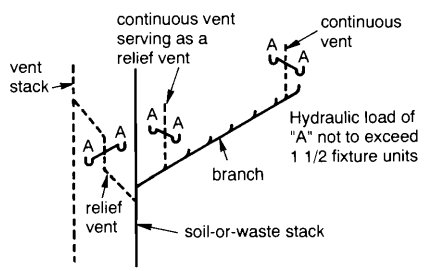
Vent stack required.
(Fixtures draining to the soil-or-waste stack from more than 4 storeys)

Vent stack may terminate at the lowest soil-or-waste connection or immediately below it or it may terminate at the junction of soil-or-waste stack and branch or building drain. The vent stack may also be connected at its lower end to the soil-or-waste stack below the lowest soil-or-waste pipe connection.

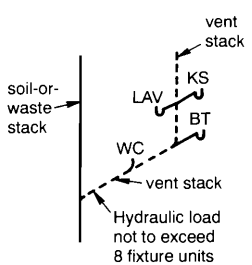
A-5.4.2.(3) and 5.4.3.(5) Fixture Connections to Vent Pipes



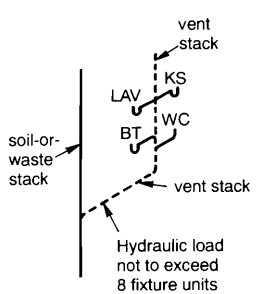
(a)



(b)



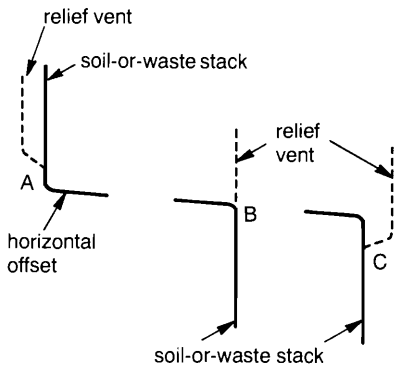
(c)



(d)

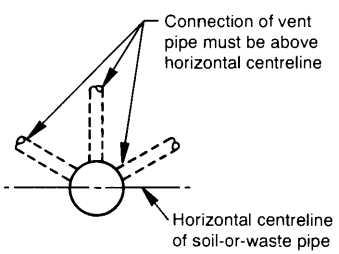
When one or more fixture drains are connected to a vent pipe, the vent pipe becomes a wet vent. It must then conform to all the requirements that can apply to it as a drainage pipe and a vent pipe.

A-5.4.4. Relief Vents for Offsets



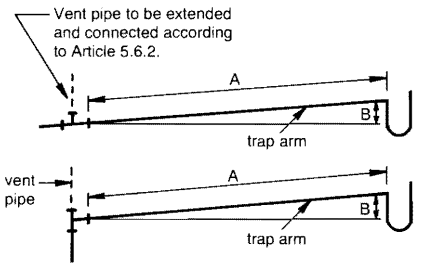
When an offset is greater than 1.5 m, it must be sized as a branch or building drain (see Sentence 4.10.6.(2)). A relief vent is required at A, B or C.

A-5.6.2.(2) Vent Pipe Connections



Fittings used to connect vent pipes to nominally horizontal soil-or-waste pipes are specified in Subsection 2.4.

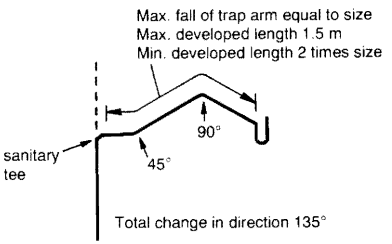
A-5.6.3.(1) Vent Connections



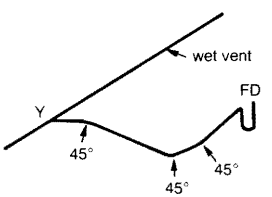
Developed length "A" must be at least twice the size of the fixture drain, but not more than 1.5 m

Fall "B" must not be greater than the size of the fixture drain

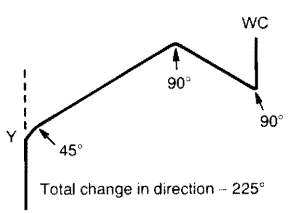
A-5.6.3.(1)(c) and A-5.6.3.(2) Location of Vent Pipes



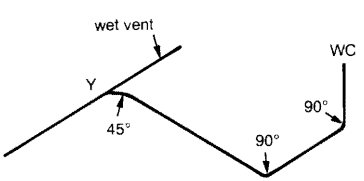
(a)



(b)

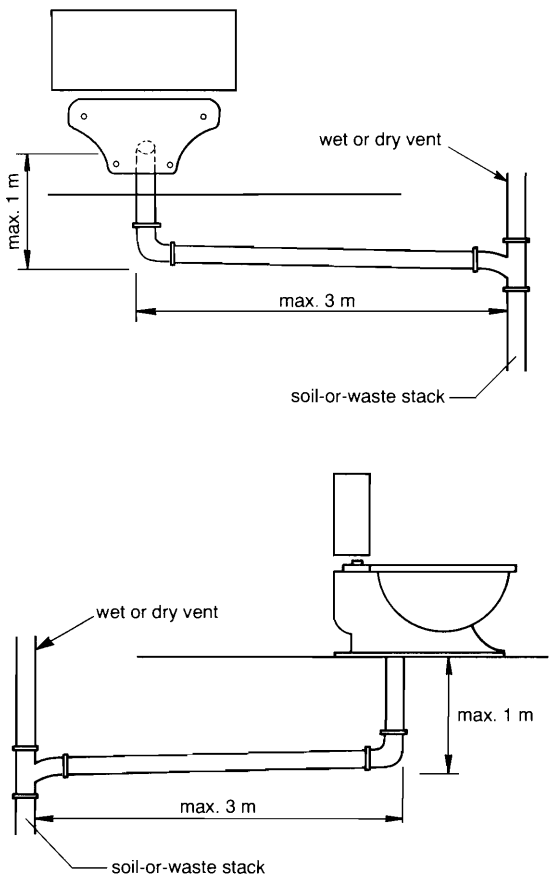


(c)



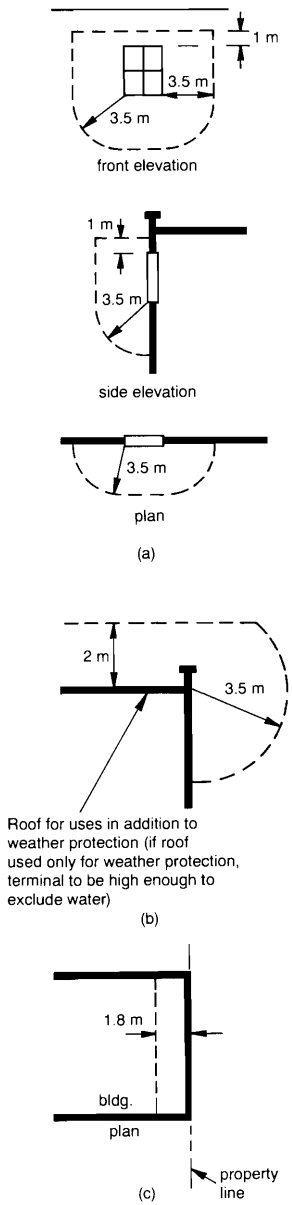
(d)

A-5.6.3.(3) Length of WC Fixture Drain



Note: Fall and length of WC fixture drain applies to floor mounted and wall hung WC's.

A-5.6.5.(3) Vent Terminals



No vent pipe other than a fresh air inlet may terminate within the limits indicated.

A-5.8 Determination of Size of Vent Pipes for Plumbing Systems

Vent pipes are connected to a drainage system and terminate outside the building. Vents provide for circulation of air and protection of trap seals in the drainage system.

Except as permitted in Subsection 5.1, a trap shall be protected by a vent pipe.

Since Article 5.7.1. states every vent pipe must conform to Table 5.7.A., this Table (5.7.A.) takes precedence over all other venting tables.

The material that follows is a concise guide to assist the designer in identifying the factors contained within the Code that are used for the selection of vent pipe sizes for plumbing systems.

Relief Vent

Length is not directly used when sizing a relief vent. When sizing a relief vent connected to a wet vented branch, the size is determined by the size of the stack vent or continuous vent as per Sentence 5.7.3.(1).

A relief vent connected to an offset stack is sized by Sentence 5.7.3.(2), which requires it to be smaller than the stack vent by at least one size.

No load is used to size a relief vent aside from the load on the continuous or stack vent, from which the relief vent size is established.

Relief vents are not sized by a table, but by Article 5.7.3.

A continuous vent can serve as a relief vent (Sentence 5.2.2.(3)) provided it is sized to satisfy Article 5.7.3. (relief vents) and Article 5.8.1. (wet vents) for that part of the system below the fixtures.

After two relief vents connect, they form a branch vent, and are sized as such, by Table 5.8.C.

The load used is the total load from the fixtures served by the branch vent.

Vent Length

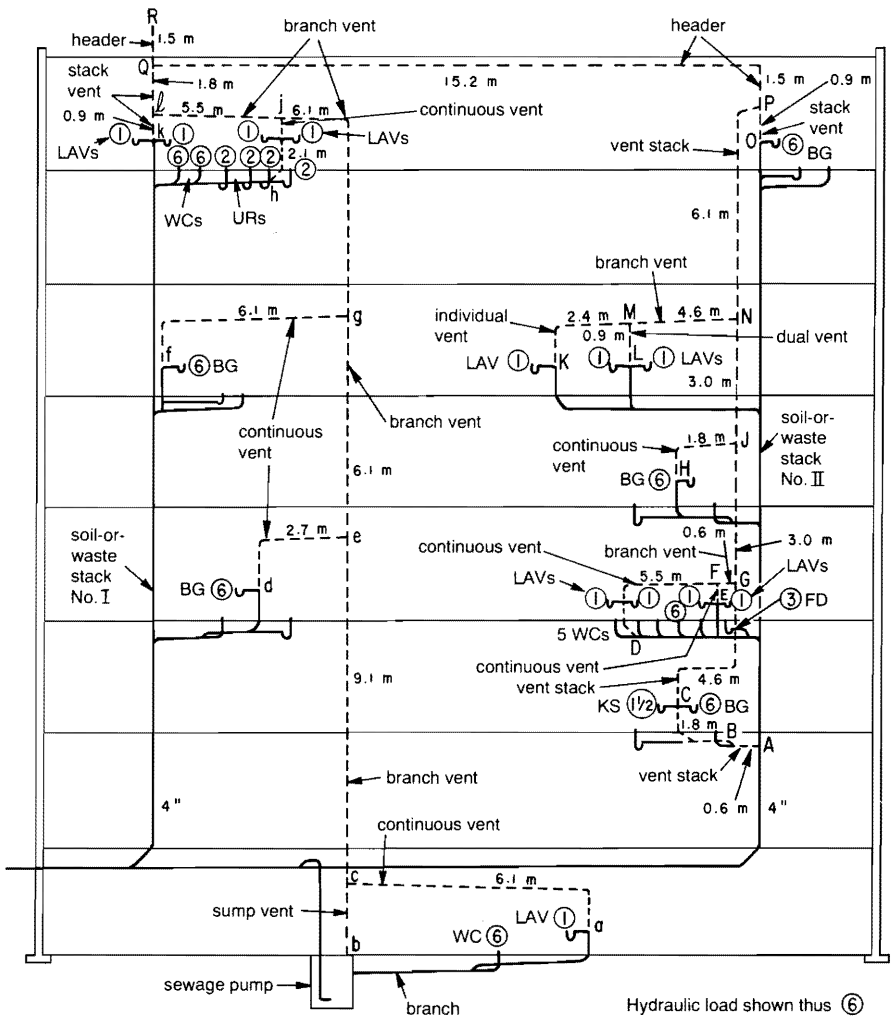
The length of a continuous vent or a branch vent is the developed length from the most distant soil-or-waste pipe connection to the vent's "upper end." (The exception to this rule is a continuous vent which is also a dual or individual vent. Such vents are sized in Table 5.7.A., where length is not a factor.) The "upper end" of any of the above vents is a stack vent, vent stack, header or open air. The length to be used in Table 5.8.C. must include the developed length of any wet vented branch to which the vent is connected (Sentence 5.8.3.(3)).

The length of a stack vent or vent stack for the purpose of Table 5.8.C. is its developed length from where it is connected to the stack to open air, and includes the length of any header to which it is connected (Sentences 5.8.4.(1) and (2)).

The length of a header for the purpose of Table 5.8.C. is its developed length of vent piping from the most distant soil-or-waste pipe connection to open air and includes the length of any vent to which it is connected (Sentence 5.8.3.(4)).

Type of Vent	Code Reference	Items to Consider When Sizing Vent Pipes
Branch vent	5.8.3.(1) Table 5.8.C. 5.8.3.(4) Table 5.7.A.	Number of fixture units vented by the section of the branch vent Length
Continuous vent	 Table 5.8.C.	Size of trap served Number of fixture units vented Length
Dual vent	5.8.2. Table 5.7.A.	Size of largest trap vented only Length is not considered
Fresh air inlet	5.5.3.	Minimum size 4 in.
Header	5.8.3.(1) Table 5.8.C. 5.8.3.(4) Table 5.7.A.	Number of fixture units vented by the section of header Length
Individual vent	5.8.2. Table 5.7.A.	Size of largest trap vented only Length is not considered
Manhole vent	5.7.5.	Minimum 2 in. inside a building
Oil interceptor vent	5.7.7. 5.5.2.(1) and (2)	Minimum size 2 in.
Relief vent	5.7.3.(1)	One size less than the continuous vent or stack vent
Sewage sump vents	5.5.1. 5.7.6.(1) and (2)	One size less than largest inlet to sump Minimum 2 in. maximum 4 in. vent
Stack vent	5.8.4.(1) Table 5.8.C. 5.4.1.(1) and (2)	Number of fixture units draining to base of stack Length of stack vent Table 5.7.A.
Vent stack	5.8.4.(1) Table 5.8.C. 5.8.4.(2) Table 5.7.A. 5.4.2.(1) and (2)	Number of fixture units draining to base of stack Length of vent stack Number of storeys draining to stack
Wet vent	5.8.1.(1) Table 5.8.A. 5.2. 5.3.	Whether water closets are served by the wet vent Number of fixture units other than water closets which drain to the wet vent Trap size other than water closets and emergency floor drains not to exceed 2 in. If wet vent exceeds 2 storeys in height no more than 4 fixture units permitted per storey above the second storey Length of any offset in wet vent

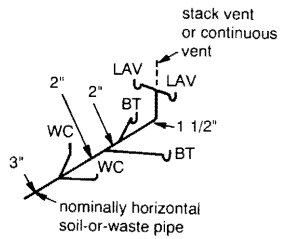
Example: Sizing of a Venting System



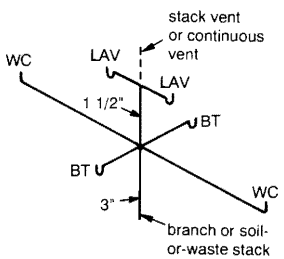
Note: Letters in Columns 1 and 2 of the following table of Vent Pipe Sizes refer to corresponding letters on this diagram.

Vent Pipe Sizes					
Vent Pipe	Developed Length Used to Determine Size, m	Hydraulic Load Used to Determine Size, fixture units	Code Reference to be Considered		Minimum Size, in.
Continuous vent (ac)	32.9 (acegjl)	7	5.7.1. 5.8.3.(1)	5.8.3.(2)	2
Sump vent (bc)	N/A	7	5.7.6.		2 1/2
Branch vent (ce)	32.9 (acegjl)	7	5.7.1. 5.7.2.	5.8.3.(1) 5.8.3.(3)	2 1/2
Continuous vent (de)	20.4 (degjl)	6	5.7.1. 5.8.3.(1)	5.8.3.(2)	1 1/2
Branch vent (eg)	32.9 (acegjl)	13	5.7.1. 5.7.2.	5.8.3.(1) 5.8.3.(3)	2 1/2
Continuous vent (fg)	17.1 (fgjl)	6	5.7.1. 5.8.3.(1)	5.8.3.(2)	1 1/2
Branch vent (gj)	32.9 (acegjl)	19	5.7.1. 5.7.2.	5.8.3.(1) 5.8.3.(3)	2 1/2
Continuous vent (hj)	7.6 (hjl)	22	5.7.1. 5.8.1.	5.8.3.(1)	1 1/2
Branch vent (jl)	32.9 (acegjl)	41	5.7.1. 5.8.3.(1)	5.8.3.(3)	3
Stack vent (kl)	4.2 (klQR)	36	5.7.1. 5.8.4.(1)	5.8.4.(2)	2
Stack vent (lQ)	4.2 (klQR)	43	5.7.1. 5.7.2.	5.8.4.(1) 5.8.4.(2)	3
Vent Stack Section (ABCGJNP)	37.3 (ABCGJNPQR)	59 1/2	4.9.1. 5.4.2.(3) 5.7.1.	5.8.1.(1) 5.8.4.(1) 5.8.4.(2)	3
Continuous vent (DF)	6.1 (DFG)	32	5.7.1. 5.8.1.(1)	5.8.3.(1)	1 1/2
Continuous vent (EF)	N/A	34	4.2.1.(1)(d) 5.2.2.(2)	5.7.1. 5.7.3.	1 1/2
Branch vent (FG)	6.1 (DFG)	34	5.7.1. 5.8.3.(1)	5.8.3.(3)	1 1/2
Continuous vent (HJ)	1.8 (HJ)	6	5.7.1. 5.8.3.(1)	5.8.3.(2)	1 1/2
Individual vent (KM)	N/A	1	5.7.1.		1 1/4
Dual vent (LM)	N/A	2	5.7.1.		1 1/4
Branch vent (MN)	7.0 (KMN)	3	5.7.1. 5.8.3.(1)	5.8.2.(3)	1 1/4
Stack vent (OP)	19.1 (OPQR)	59 1/2	5.7.1. 5.8.4.(1)	5.8.4.(2)	2 1/2
Header (PQ)	37.3 (ABCGJNPQR)	59 1/2	5.7.1. 5.8.3.(1)	5.8.3.(4)	3
Header (QR)	37.3 (ABCGJNPQR)	102 1/2	5.7.1. 5.8.3.(1)	5.8.3.(4)	4
Column 1	2	3	4	5	6

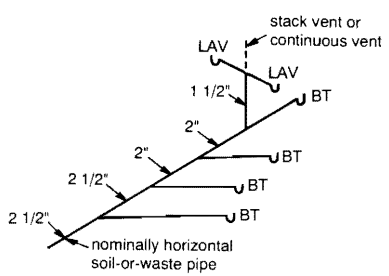
A-5.8.1.(1) Sizing of Single Storey Wet Vent Systems



(a)



(b)



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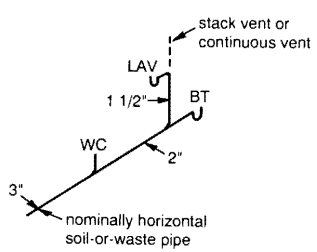
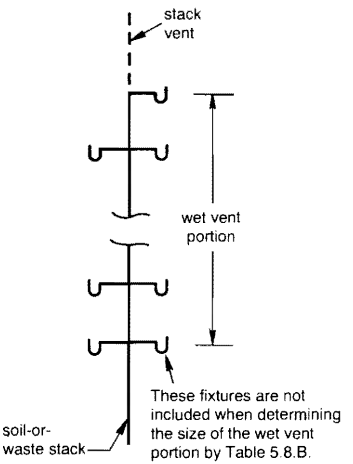
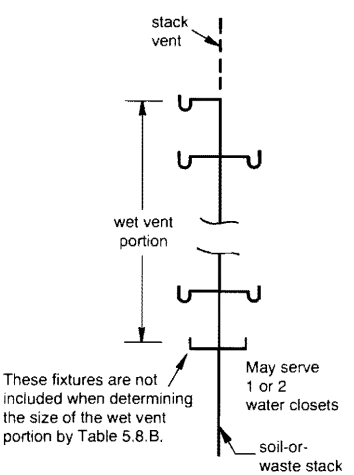


(d)

A-5.8.1.(2) Sizing of Multi-Storey Wet Vent Systems

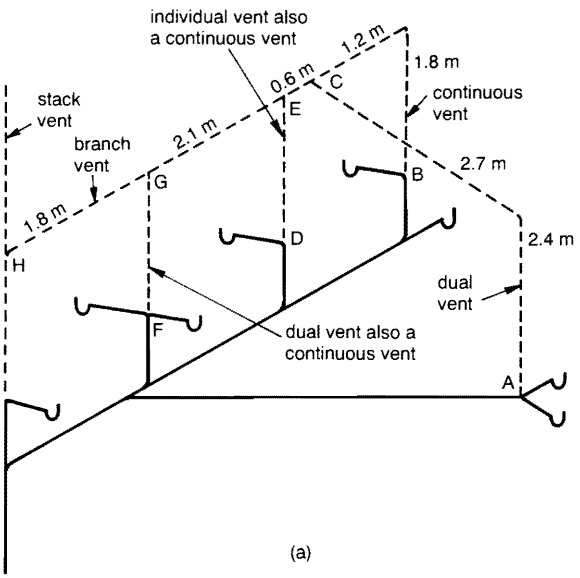


(a)
Not serving water closets



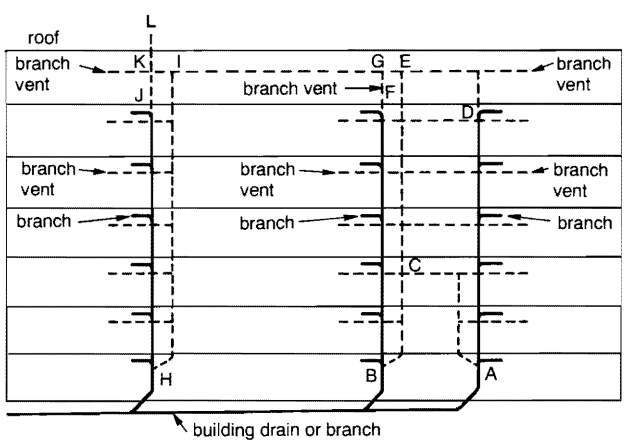
(b)
Serving water closets

A-5.8.3. and 5.8.4. Lengths to be Considered When Sizing Vent Pipes



(a)

Vent	Length to be considered	Reference
Dual vent AC	n/a	5.8.2.
Continuous vent BC	BCEGH 1.8 + 1.2 + 0.6 + 2.1 + 1.8 = (7.5)	5.8.3.
Individual vent DE	n/a	5.8.2.
Dual vent FG	n/a	5.8.2.
Branch vent CEGH	ACEGH 2.4 + 2.7 + 0.6 + 2.1 + 1.8 = (9.6)	5.8.3.



(b)

Vent pipe	Length to be considered	Reference
Vent stack (AC)	ACEGIKL	5.8.4. (2)
Vent stack (BC)	BCEGIKL	5.8.4. (2)
Vent stack (HI)	HIKL	5.8.4. (2)
Stack vent (DE)	DEGIKL	5.8.4. (2)
Stack vent (FG)	FGIKL	5.8.4. (2)
Stack vent (JK)	JKL	5.8.4. (2)
Header (CEGIKL) (or any section of it)	ACEGIKL	5.8.3. (4)

A-6.1.1.(1) Potable Water Systems. The design procedures contained in Chapter 35 of the ASHRAE Guide and Data Book 1970, in Chapter 37 of the ASHRAE Handbook, 1976 Systems, in ASPE 1975-76, Data Book, Volume 1, Basic Plumbing Design and in ASPE 1977-78, Data Book, Volume II, Special Plumbing Systems Design are considered good engineering practice in the field of potable water systems.

As an alternative, the following procedures may be used in determining the size of each section of the water system using Table A-6.1, which incorporates the requirements of Sentence 6.3.2.(3).

1. Determining Conditions. On a proposed water piping installation sized pursuant to Table A-6.1 the following conditions need to be determined:
   (a) total number of fixture units as determined from Tables 6.3.A. and 6.3.B. for the fixtures to be installed;
   (b) developed length of the pipe from property line to most remote outlet, or if the pressure at the property line or meter is unknown, the developed length from the public water main to most remote outlet;
   (c) difference in elevation between the water piping at the property line or other source of supply and the highest fixture or outlet;
   (d) pressure in the public water main or other source of supply at the locality where the installation is to be made; (This pressure may need to be reduced so that the pressure in the water distribution system does not exceed 550 kPa.)
   (e) in localities where there is a wide fluctuation of pressure in the main throughout the day, the minimum pressure available, which is used as a basis for design.

2. Water Service Pipe. Beginning with the available pressure at the property line, public water main or other source of supply, and subtracting 10 kPa for each metre of difference in elevation between such source of supply and the highest water outlet in the building or on the premises, use the "Pressure Range" group in Table A-6.1 within which this adjusted pressure falls. Select the "length column" which is equal to or longer than the required length of service pipe. Follow down the column to a fixture unit equal to or greater than the total number of fixture units required by the installation. Having located the proper fixture unit value for the required length, locate the size of the water service in the left hand column.

3. Cold Water Piping. Starting at the most remote outlet on the cold water piping and working back toward the water service or meter, using the total developed length of pipe, compute the pipe sizing for the system, using the total fixture unit values given in Tables 6.3.A. and 6.3.B. and adding in the fixture unit demand of the hot water supply inlet at the point where it occurs. The final size of the cold water service need not be larger than the size required by Table A-6.1 for the water service.

4. Hot Water Piping. Starting at the most remote outlet on the hot water piping and working back toward the service water heater, compute the pipe sizing for the system from the length column selected in Table A-6.1 using the fixture unit values given in Tables 6.3.A. and 6.3.B.

Example: Sizing the Water Pipe in a Four-Unit Apartment Building

Figures 1 and 2 illustrate the cold and hot water supply piping for a four-unit apartment building. Each apartment has a kitchen sink, a flush tank water closet, a lavatory and a bathtub. The water heater and a laundry room with one service sink and two automatic clothes washers are located in the basement of the apartment building.

For the purpose of this example, the following conditions are assumed:
   (a) water pressure at the meter is 413 kPa,
   (b) developed length of the cold water piping from the property line to the most remote cold water outlet is 18 m,
   (c) the elevation (head) difference between the property line and the highest water supply outlet is 3.65 m.

Step 1A. The cold water supply fixture unit (cwsfu) demand for the entire building is calculated as follows from the "Private Use" column of Table 6.3.A. (The numbers in squares at each fixture or section of pipe indicate the water supply fixture unit demand at that location.)

Table A-6.1

Pipe Sizes for Water Systems Based on Number of Fixture Units Served [1]

Water Service, in.	Water Distribution System, in.	Maximum allowable length, m														
		12	18	24	30	46	61	76	91	122	152	183	213	244	274	305
Pressure range 200 to 310 kPa		Number of Fixture Units Served														
3/4	1/2	6	5	4	3	2	1	1	1	0	0	0	0	0	0	0
3/4	3/4	18	16	14	12	9	6	5	5	4	4	3	2	2	2	1
3/4	1	29	25	23	21	17	15	13	12	10	9	7	6	6	6	6
1	1	36	31	27	25	20	17	15	13	12	10	8	6	6	6	6
1	1 1/4	54	47	42	38	32	28	25	23	19	17	14	12	12	11	11
1 1/2	1 1/4	90	68	57	48	38	32	28	25	21	18	15	12	12	11	11
1 1/2	1 1/2	151	124	105	91	70	57	49	45	36	31	26	23	21	20	20
2	1 1/2	210	162	132	110	80	64	53	46	38	32	27	23	21	20	20
1 1/2	2	220	205	190	176	155	138	127	120	104	85	70	61	57	54	51
2	2	372	329	292	265	217	185	164	147	124	96	70	61	57	54	51
2	2 1/2	445	418	390	370	330	300	280	265	240	220	198	175	158	143	133
311 to 413 kPa																
3/4	1/2	9	7	6	5	4	3	2	2	1	1	1	0	0	0	0
3/4	3/4	27	23	19	17	14	11	9	8	6	5	4	4	3	3	3
3/4	1	44	40	36	33	28	23	21	19	17	14	12	10	9	8	8
1	1	60	47	41	36	30	25	23	20	18	15	12	10	9	8	8
1	1 1/4	102	87	76	67	52	44	39	36	30	27	22	20	19	17	16
1 1/2	1 1/4	156	130	106	89	66	52	44	39	33	29	24	20	19	17	16
1 1/2	1 1/2	270	225	193	167	128	105	90	78	62	52	42	38	35	32	30
2	1 1/2	286	286	242	204	150	117	98	84	67	55	42	38	35	32	30
1 1/2	2	360	360	340	318	272	240	220	198	170	150	135	123	110	102	94
2	2	570	510	470	430	368	318	280	250	205	165	142	123	110	102	94
2	2 1/2	680	640	610	580	535	500	470	440	400	365	335	315	285	267	250
Over 413 kPa																
3/4	1/2	11	9	7	6	5	4	3	3	2	1	1	1	1	1	0
3/4	3/4	31	28	24	22	17	13	11	10	8	7	6	6	5	4	4
3/4	1	63	53	47	42	35	30	27	24	21	17	14	13	12	12	11
1	1	72	66	55	48	38	32	29	26	22	18	14	13	12	12	11
1	1 1/4	140	126	108	96	74	62	53	47	39	31	26	25	23	22	21
1 1/2	1 1/4	156	156	150	127	93	74	62	54	43	34	26	25	23	22	21
1 1/2	1 1/2	286	286	273	240	186	154	130	113	88	73	51	51	46	43	40
2	1 1/2	286	286	286	275	220	170	142	122	98	82	64	51	46	43	40
1 1/2	2	360	360	360	360	360	335	305	282	244	212	187	172	153	141	129
2	2	611	611	610	560	478	420	375	340	288	245	204	172	153	141	129
2	2 1/2	690	690	690	690	690	650	610	570	510	460	430	404	380	356	329
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Note to Table A-6.1:

[1] Branch pipes up to 7 m developed length (from main to outlet or fixture) may supply maximum of 4 fixture units for half-inch size and maximum 16 fixture units for three-quarter inch nominal size.

Figure 1 Cold Water Supply Pipe Sizing for a Four-Unit Apartment Building

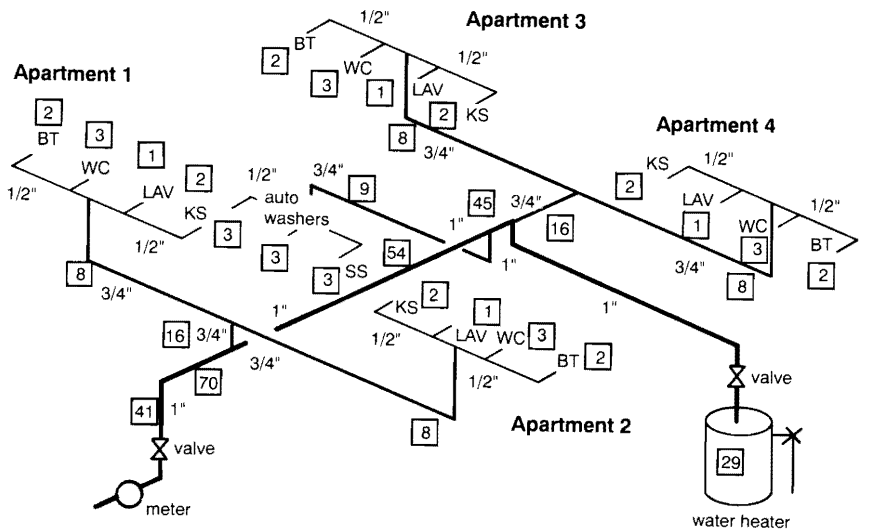
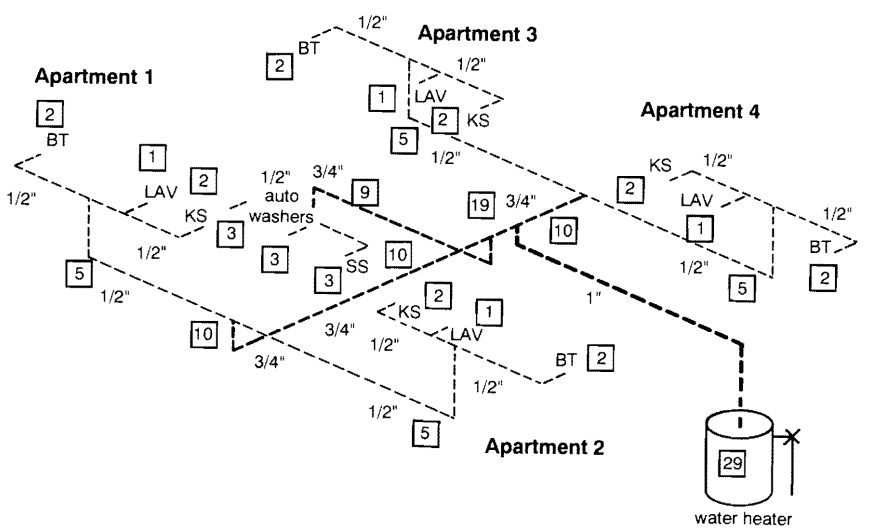


Figure 2 Hot Water Supply Pipe Sizing for a Four-Unit Apartment Building



Each apartment has:		
1 kitchen sink	2	cwsfu
1 water closet	3	cwsfu
1 lavatory	1	cwsfu
1 bathtub	2	cwsfu
Total cwsfu each apartment	8	cwsfu
	× 4	apts.
	32	cwsfu
1 service sink	3	cwsfu
2 automatic clothes washers at 3 cwsfu each	6	cwsfu
Total cwsfu demand of building	41	cwsfu

Step 1B. The hot water supply fixture unit (hwsfu) demand for the entire building is calculated as follows from the "Private Use" column of Table 6.3.A.

Each apartment has		
1 kitchen sink	2	hwsfu
1 lavatory	1	hwsfu
1 bathtub	2	hwsfu
Total each apartment	5	hwsfu
	× 4	apts
	20	hwsfu
1 service sink	3	hwsfu
2 automatic clothes washers at 3 hwsfu each	6	hwsfu
Total hwsfu demand of building	29	hwsfu

This demand of 29 hwsfu is assigned to the water heater in Figures 1 and 2.

Step 2. The developed length is given as 18 m.

Step 3. The elevation (head difference is given as 3.65 m).

$$10 \text{ kPa} \times 3.65 = 36.5 \text{ kPa}$$

Step 4. The available pressure is given as 413 kPa.

$$413 - 36.5 = 376 \text{ kPa}$$

Step 5. A building with 376 kPa static water pressure is sized from the second portion of Table A.6.1 – the 311 to 413 kPa pressure range.

Step 6. The water piping for this entire building will be sized from the 18 m column of the 311 to 413 kPa pressure range portion of Table A.6.1.

Step 7. The size of the water service is determined to be 1-in. pipe because the cold water supply fixture unit value calculated in Step 1A (41 cwsfu) falls between the 40 and 47 fixture unit values on the chart, and the higher 47 fixture unit value must be used.

Step 8. The size of the building supply pipe is also determined to be 1 in. from this same line of the Table.

Step 9. Since the fixtures in apartment 3 are most remote from the water service pipe, the sizing will begin in apartment 3 and proceed back toward the water service pipe.

With a demand of 8 cwsfu on the pipe supplying the cold water to apartment 3, it is sized as three-quarter inch pipe. However, the individual fixtures in apartment 3 are all supplied with half-inch fixture branch piping. (The sizing of the cold water piping of the other 3 individual apartments is identical to that of apartment 3.)

At the point where the apartment 3 cold water supply joins the apartment 4 supply, the pipe serves a demand of 16 cwsfu. However, it does not increase in size, since a three-quarter inch pipe will supply 23 cwsfu. (This sizing also applies to the point where the cold water supplies for apartments 1 and 2 join.)

A three-quarter inch pipe will adequately serve the 9 cwsfu demand of the service sink and two automatic clothes washers located in the basement laundry room.

Step 10. The hot water supply fixture unit demand of the water heater is 29 hwsfu (as calculated in Step 1), which requires a 1-in. cold water supply pipe.

Step 11. At the point where the cold water supply to the water heater is taken from the cold water main, the cold water supply fixture unit demand increases to 45 cwsfu. (The table indicates that the cold water main should increase to one and one-quarter inch pipe at this point.) However, this pipe does not need to increase in size above the originally selected 1-in. building supply pipe. This fact explains why the rest of the cold water main piping back to the water service pipe is all 1-in. size.

Step 12. Referring to Figure 2 (which illustrates the sizing of the hot water piping in the 4-unit apartment building of this example), the sizing begins in apart-

ment 1, which is the apartment most remote from the water heater. A half-inch size branch pipe will adequately serve the 3 fixtures in this apartment that require a hot water supply. (A half-inch pipe serves the other 3 apartments' hot water needs as well.)

At the point where the hot water supply to apartments 1 and 2 joins the hot water main, the piping is increased to three-quarter inch. This same three-quarter inch pipe is also large enough to supply the combined 19 hwsfu demand of apartments 1 and 2 plus the basement laundry room.

The 9 hwsfu demand of the laundry room fixtures requires only a three-quarter inch size branch pipe.

The sizing of the hot water supply piping to apartments 3 and 4 is identical to that for apartments 1 and 2.

At the point where the hot water supply pipe for apartments 1 and 2 and the laundry room joins the supply to apartments 3 and 4, the pipe is increased to 1-in. size. The 1-in. size pipe is continued back to the hot water outlet of the heater.

A-6.1.8. Water Hammer Prevention. Water hammer is a buildup of pressure in a length of horizontal or vertical pipe which occurs when a valve or faucet is closed suddenly. The longer the pipe and the greater the water velocity the greater is the pressure exerted on the pipe, which can be many times the normal static water pressure and be sufficient to burst the pipe. Ordinary kitchen and bathroom faucets can be closed quickly enough to cause water hammer even with relatively low water pressure in the pipe.

Means of preventing water hammer should be installed wherever there are valves or faucets, particularly where they are at the end of long lengths of pipes. This may be done by installing either water hammer arresters which are manufactured for the purpose or air chambers installed vertically that are fabricated from pieces of piping with a closed upper end and connected to the end of the horizontal or vertical run of pipe.

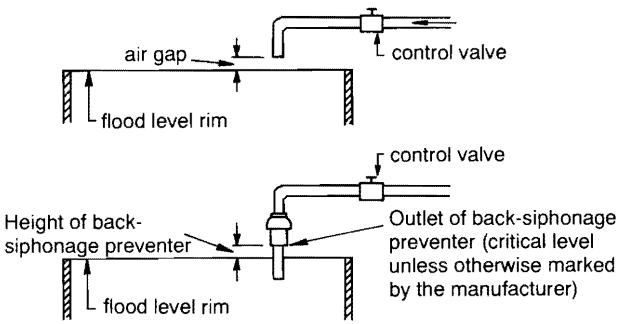
The air chamber should be 300 to 450 mm long if made from the same size pipe as the water pipe it serves. If the chamber is made from a pipe with larger diameter than the water pipe, its length can be reduced accordingly.

Air chambers should be accessible if they are the manufactured type with top air valve and a stop-and-waste valve or are of the diaphragm type. If made from piping, air chambers may become ineffective because of waterlogging, in which case provision should be made to drain that portion of the system. During the drainage operation fresh air is introduced into the chamber through the open faucet. After such draining, the valve or faucet should be closed before refilling the system with water, to ensure that the air chamber contains the maximum amount of air under pressure.

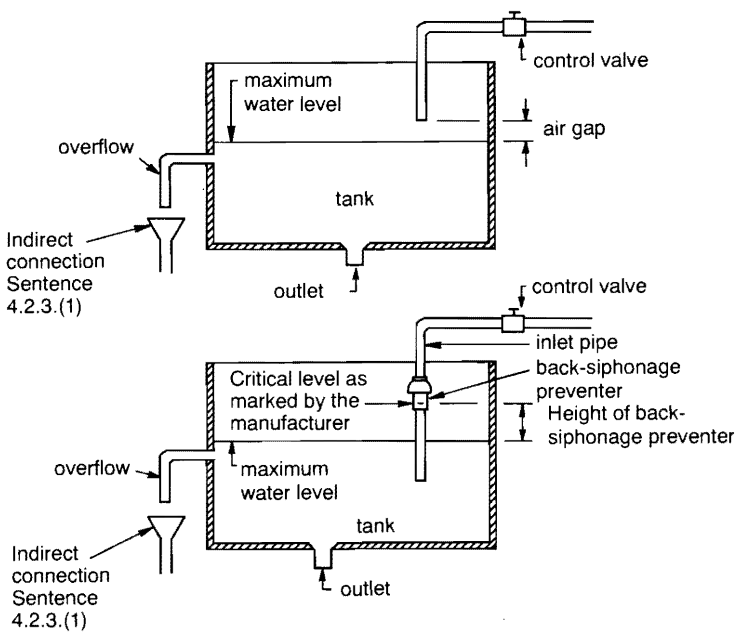
A-6.2.6. The following list is a guide to locations where premise or zone isolation may be required. An assessment of the hazard must be carried out to determine the need, if any, for a device.

Hospital buildings with operating, mortuary or laboratory facilities
Radioactive material processing plants
Petroleum processing facilities
Premises where inspection is restricted
Sewage treatment plants
Commercial laundries (excluding laundromats)
Plating or chemical plants
Docks and dockside facilities
Food and beverage processing plants
Pleasure boat marinas (DCVA)

A-6.2.10.(2) Installation of Air Gaps and Back-Siphonage Preventers



(a) Above flood level rim



(b) In tank

A-6.2.12.(3) The following documents are considered to be good engineering practice when selecting and installing backflow preventers:

CSA B64.10-M88, Backflow Prevention Devices – Selection, Installation, Maintenance and Field Testing

Cross Connection Control Manual, American Water Works Association, Western Canada Section

Cross Connection Control Manual, American Water Works Association, British Columbia Section

A-6.3. This Subsection contains performance requirements for water systems. Two widely used references for the design of water systems are:

Water-Distributing Systems for Buildings by R.B. Hunter, Building Materials and Structures Report BMS 79, United States Department of Commerce, National Bureau of Standards, Washington, D.C., 1941, and

National Plumbing Code Handbook edited by V.T. Manas, McGraw-Hill Book Company, New York, U.S.A 1957.

A-7.3.2. Outlets from Non-Potable Water Systems. The location of outlets from non-potable water systems where they can be discharged into a sink or lavatory, a fixture into which an outlet from a potable water system is discharged, or a fixture that is used for a purpose related to the preparation, handling or dispensing of food, drink or products that are intended for human consumption, may have proved to have been acceptable on the basis of past performance in some localities, and its acceptance under Article 1.4.3. of this Code may be warranted.

Index[1]

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B

[1] Items contained in the Index are referenced to the numbering system used in this Code instead of page numbers. For more information on the numbering system, refer to the Preface at the front of the document.

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Conversion Factors		
To Convert	**To**	**Multiply by**
°C	°F	1.8 and add 32
kPa	lbf/in^2 (psi)	0.1450
kPa	lbf/ft^2	20.88
L	gal (imp.)	0.2200
L/s	gal/min (gpm)	13.20
m	ft	3.281
m^2	ft^2	10.76
mm	in.	0.03937