

Section 2.2. Materials and Equipment

2.2.1. General

2.2.1.1. 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 or storm water are present shall be suitable for the purpose.

2.2.1.2. Restrictions on Re-Use

- 1) 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*.

2.2.1.3. Identification

- 1) Every length of pipe and every fitting shall
 - a) 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
 - b) be marked in accordance with the relevant standard.
- 2) Markings required in Sentence (1) shall be visible after installation.

2.2.1.4. Pipe or Piping

- 1) Where the term pipe or piping is used, it shall also apply to tube or tubing unless otherwise stated.

2.2.1.5. Withstanding Pressure

- 1) 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.

2.2.1.6. Working Pressure of a Water Service Pipe

- 1) The working pressure rating of a *water service pipe* shall not be less than the maximum water main pressure at their point of connection as established by the *City*.

2.2.2. Fixtures

2.2.2.1. Surface Requirements

- 1) Every *fixture* shall have a smooth, hard, corrosion-resistant surface free of flaws and blemishes that may interfere with cleaning.

2.2.2.2. Conformance to Standards

- 1) Except as provided in Article 2.2.2.3.,
 - a) *fixtures* shall conform to CAN/CSA-B45 Series, "Plumbing Fixtures,"
 - b) vitreous china *fixtures* shall conform to ASME A112.19.2/CSA B45.1, "Ceramic Plumbing Fixtures,"
 - c) enamelled cast-iron *fixtures* shall conform to ASME A112.19.1/CSA B45.2, "Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures,"
 - d) porcelain-enamelled steel *fixtures* shall conform to ASME A112.19.1/CSA B45.2, "Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures,"
 - e) stainless steel *fixtures* shall conform to ASME A112.19.3/CSA B45.4, "Stainless Steel Plumbing Fixtures,"
 - f) plastic *fixtures* shall conform to CSA B45.5/IAPMO Z124, "Plastic Plumbing Fixtures,"

- g) hydromassage bathtubs shall conform to ASME A112.19.7/CSA B45.10, “Hydromassage Bathtub Systems,” and
- h) macerating toilet systems shall conform to CAN/CSA-B45.9, “Macerating Systems and Related Components.”

2.2.2.3. Showers

- 1) Shower receptors 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 Note A-2.2.2.3.(3).)
- 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.

2.2.2.4. Concealed Overflows

- 1) A dishwashing sink and a food preparation sink shall not have concealed overflows. (See Note A-2.2.2.4.(1).)

2.2.2.5. Water Closets in Public Washrooms

- 1) When a water closet is installed in a washroom for *public use*, it shall be of the elongated type and provided with a seat of the open front type.

2.2.3. Traps and Interceptors

2.2.3.1. Traps

- 1) Except as provided for in Sentence (2), *traps* 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 Note A-2.2.3.1.(1) and (3).)
 - 2) The *trap seal depth* on *fixtures* draining to an acid waste system shall be a minimum of 50 mm.
 - 3) Except for a floor-mounted service sink, 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 removed for cleaning purposes.(See Notes A-2.2.3.1.(1) and (3).)
 - 4) A bell *trap* shall not be installed in a *drainage system*. (See Note A-2.2.3.1.(4).)
 - 5) A drum *trap* shall not be used as a *fixture trap* unless required to serve as an *interceptor* and access for servicing is provided.
 - 6) A *bottle trap* may be used on a laboratory sink or other *fixture* equipped with corrosion resistant fittings.

2.2.3.2. Interceptors

- 1) *Interceptors* shall be designed so that it can be readily cleaned.
- 2) Grease *interceptors* shall
 - a) be designed so that it does not become air bound, and
 - b) not have a water jacket.
- 3) Grease *interceptors* shall be selected and installed in conformance with
 - a) CSA B481.0, “Material, Design, and Construction Requirements for Grease Interceptors,” and
 - b) CSA B481.3, “Sizing, Selection, Location, and Installation of Grease Interceptors.”

(See Note A-2.2.3.2.(3).)

2.2.3.3. Tubular Traps

1) Tubular metal or plastic traps conforming to ASME A112.18.2/CSA B125.2, “Plumbing Waste Fittings,” shall be used only in accessible locations.

2.2.4. Pipe Fittings**2.2.4.1. T and Cross Fittings**

(See Note A-2.2.4.1.)

- 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*.

2.2.4.2. Sanitary T Fittings

(See Note A-2.2.4.2.)

- 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.

2.2.4.3. 90° Elbows

- 1) Except as permitted in Sentence (2), 90° elbows of 4 inch *size* or less whose centre-line radius is less than the *size* of the pipe shall not be used to join 2 *soil-or-waste pipes*.
- 2) For *sanitary drainage systems* of 4 inch size or less, 90° elbows described in Sentence (1) shall only be permitted
 - a) to change the direction of piping from horizontal to vertical, in the direction of flow,
 - b) where a *trap arm* enters a wall, or
 - c) to connect *trap arms* as permitted by Sentence 2.5.6.3.(2).

2.2.5. Non-Metallic Pipe and Fittings

(For a summary of pipe applications, see Notes A-2.2.5., 2.2.6. and 2.2.7.)

2.2.5.1. Asbestos-Cement Pipe and Fittings

- 1) Reserved.
- 2) Reserved.
- 3) Asbestos-cement pipe shall not be used in new construction.

2.2.5.2. Concrete Pipe and Fittings

- 1) Concrete pipe shall conform to
 - a) CSA A257.1, “Non-Reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe, and Fittings,” or
 - b) CSA A257.2, “Reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe, and Fittings.”
- 2) Joints with internal elastomeric gaskets shall conform to CSA A257.3, “Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets.”
- 3) Concrete fittings fabricated on the site from lengths of pipe shall not be used. (See Note A-2.2.5.2.(3).)
- 4) Concrete pipe shall not be used above ground inside a *building*.
- 5) Precast reinforced circular concrete manhole sections, catch basins and fittings shall conform to CSA A257.4, “Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings.”

2.2.5.3. 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*.

2.2.5.4. Polyethylene Pipe and Fittings

- 1) Polyethylene water pipe, tubing and fittings shall conform to Series 160 of CAN/CSA-B137.1, “Polyethylene (PE) 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 D 3261, “Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.”

2.2.5.5. Polyethylene Pipe Used Underground

- 1) Polyethylene pipe used underground outside a *building* for the rehabilitation of existing *drainage systems* using trenchless technology shall conform to ASTM F 714, “Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter,” and shall be HDPE 3408 and SDR 11 or heavier. (See Note A-2.2.5.5.(1).)

2.2.5.6. Crosslinked Polyethylene Pipe and Fittings

- 1) Crosslinked polyethylene pipe and its associated fittings used in hot and cold *potable water systems* shall conform to CAN/CSA-B137.5, “Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.” (See Note A-2.2.5.6.(1).)

2.2.5.7. PVC Pipe and Fittings

- 1) PVC water pipe, fittings and solvent cement shall
 - a) conform to CAN/CSA-B137.3, “Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications,” and
 - b) have a pressure rating of not less than 1 100 kPa.
- 2) PVC water pipe fittings shall conform to
 - a) ASTM D 2466, “Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40,” or
 - b) ASTM D 2467, “Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.”
- 3) PVC injection-moulded gasketed fittings shall conform to CAN/CSA-B137.2, “Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications.”
- 4) PVC water pipe and fittings referred to in Sentences (1), (2) and (3) shall not be used in a *hot water system*.

2.2.5.8. CPVC Pipe, Fittings and Solvent Cements

- 1) CPVC hot and cold water pipe, fittings and solvent cements shall conform to CAN/CSA-B137.6, “Chlorinated Polyvinylchloride (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 2.2.5.8.

Table 2.2.5.8.
Maximum Permitted Pressure for CPVC Piping at Various Temperatures
 Forming Part of Sentence 2.2.5.8.(2)

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
82	690

2.2.5.9. Plastic Pipe, Fittings and Solvent Cement Used Underground

(See Notes A-2.2.5.9. to 2.2.5.11.)

- 1) Plastic pipe, fittings and solvent cement used underground outside a *building* or under a *building* in a *drainage system* shall conform to
 - a) ASTM F 628, “Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core,”
 - b) CAN/CSA-B181.1, “Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings,”
 - c) CAN/CSA-B181.2, “Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings,”
 - d) CAN/CSA-B182.1, “Plastic Drain and Sewer Pipe and Pipe Fittings,” with a pipe stiffness not less than 320 kPa,
 - e) CAN/CSA-B182.2, “PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings,” with a pipe stiffness not less than 320 kPa,
 - f) CAN/CSA-B182.4, “Profile Polyvinylchloride (PVC) Sewer Pipe and Fittings,” with a pipe stiffness not less than 320 kPa,
 - g) CAN/CSA-B182.6, “Profile Polyethylene (PE) Sewer Pipe and Fittings For Leak-Proof Sewer Applications,” with a pipe stiffness of not less than 320 kPa, or
 - h) CAN/CSA-B182.8, “Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings,” for Type 1 joints and non-perforated pipes.

2.2.5.10. Transition Solvent Cement

(See Notes A-2.2.5.9. to 2.2.5.11.)

- 1) Solvent cement for transition joints shall conform to
 - a) CAN/CSA-B181.1, “Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings,” or
 - b) CAN/CSA-B181.2, “Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings.”
- 2) Transition solvent cement shall only be used for joining an ABS *drainage system* to a PVC *drainage system*.

2.2.5.11. Plastic Pipe, Fittings and Solvent Cement Used in Buildings

(See Notes A-2.2.5.9. to 2.2.5.11.)

- 1) Plastic pipe, fittings and solvent cement used inside or under a *building* in a *drainage* or *venting* system shall conform to
 - a) ASTM F 628, “Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core,”
 - b) CAN/CSA-B181.1, “Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings,”
or
 - c) CAN/CSA-B181.2, “Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings.”
- 2) Requirements for *combustible* piping in relation to fire safety shall conform to Sentences 3.1.5.19.(1) and 9.10.9.6.(3) to (11), and Articles 3.1.9.5. and 9.10.9.7. of Division B of Book I (General) of this By-law.
- 3) Where *noncombustible* piping pierces a *fire separation* or a fire stop, the requirements of fire stopping of Subsection 3.1.9., Sentence 9.10.9.6.(1) and Article 9.10.16.4. of Division B of Book I (General) of this By-law shall apply.

2.2.5.12. Polyethylene/Aluminum/Polyethylene Composite Pipe and Fittings

- 1) PE/AL/PE composite pipe and fittings shall conform to CAN/CSA-B137.9, “Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-Pipe Systems.” (See Note A-2.2.5.12.(1).)
- 2) Except as provided in Sentences (3) and (4), PE/AL/PE pipe and fittings shall not be used in hot *water systems*.
- 3) PE/AL/PE pipe with a pressure rating of 690 kPa or greater at 82°C shall be permitted for hot *water systems*.
- 4) PE/AL/PE pipe with a pressure rating of 690 kPa or greater at 82°C shall be used with fittings that conform to CAN/CSA-B137.10, “Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe Systems,” in hot *water systems*.

2.2.5.13. Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene Composite Pressure Pipe and Fittings

- 1) PEX/AL/PEX composite pipe and fittings used in hot and cold *potable water systems* shall conform to CAN/CSA-B137.10, “Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe Systems.” (See Note A-2.2.5.13.(1).)

2.2.5.14. Polypropylene Pipe and Fittings

- 1) Polypropylene pipe and fittings used for hot and cold *potable water systems* shall conform to CAN/CSA-B137.11, “Polypropylene (PP-R) Pipe and Fittings for Pressure Applications.” (See Note A-2.2.5.14.(1).)

2.2.6. Ferrous Pipe and Fittings

(For a summary of pipe applications, see Note A-2.2.5., 2.2.6. and 2.2.7.)

2.2.6.1. Cast-Iron Drainage and Vent Pipe and Fittings

- 1) Drainage piping, vent piping and fittings made of cast iron shall conform to CSA B70, “Cast Iron Soil Pipe, Fittings, and Means of Joining.”
- 2) Cast-iron soil pipe and fittings shall not be used in a *water system*.

2.2.6.2. Maintenance Holes and Catch Basins

- 1) Cast-iron frames and covers for maintenance holes and catch basins shall conform to CSA B70.1, “Frames and Covers for Maintenance Holes and Catchbasins.”

2.2.6.3. Reserved

2.2.6.4. Threaded Cast-Iron Drainage Fittings

- 1) Threaded cast-iron drainage fittings shall conform to ASME B16.12, “Cast Iron Threaded Drainage Fittings.”
- 2) Threaded cast-iron drainage fittings shall not be used in a *water system*.

2.2.6.5. Cast-Iron Water Pipes

- 1) Cast-iron water pipes shall conform to ANSI/AWWA C151/A21.51, “Ductile-Iron Pipe, Centrifugally Cast.”
- 2) Cement mortar lining for cast-iron water pipes shall conform to ANSI/AWWA C104/A21.4, “Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.”
- 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.”
- 4) Rubber gasket joints for cast-iron and ductile-iron pressure pipe for water shall conform to ANSI/AWWA C111/A21.11, “Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.”

2.2.6.6. Screwed Cast-Iron Water Fittings

- 1) Screwed cast-iron water fittings shall conform to ASME B16.4, “Gray Iron Threaded Fittings: Classes 125 and 250.”
- 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*.

2.2.6.7. Screwed Malleable Iron Water Fittings

- 1) Screwed malleable iron water fittings shall conform to ASME B16.3, “Malleable-Iron Threaded Fittings: Classes 150 and 300.”
- 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*.

2.2.6.8. 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 is permitted to be used in a *drainage system* or a *venting system* above ground inside a *building*.
 - 3) Galvanized steel pipe and fittings shall not be used in a *water distribution system* except
 - a) in *buildings* of industrial *occupancy* as described in Book I (General) of this By-law, or
 - b) for the repair of existing galvanized steel piping systems.
- (See Note A-2.2.6.8.(3).)
- 4) Galvanized steel pipe and fittings shall conform to ASTM A 53/A 53M, “Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.”

2.2.6.9. Corrugated Steel Pipe and Couplings

- 1) Corrugated steel pipe and couplings shall conform to CSA G401, “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.

2.2.6.10. Sheet Metal Leaders

- 1) A sheet metal *leader* shall not be used except above ground outside a *building*.

2.2.6.11. Stainless Steel Pipe

- 1) Stainless steel pipe shall conform to
 - a) ASME B36.19M, “Stainless Steel Pipe,”
 - b) ASTM A 312/A 312M, “Seamless, Welded, and Heavily Cold Worked Stainless Steel Pipes,” and
 - c) NSF/ANSI 61, “Drinking Water System Components – Health Effects.”
- 2) Only grade 304/304L or 316/316L stainless steel pipe shall be used.

2.2.6.12. Stainless Steel Butt Weld Pipe Fittings

- 1) Stainless steel butt weld pipe fittings shall conform to
 - a) ASME B16.9, “Factory-Made Wrought Butt Welding Fittings,”
 - b) ASTM A 403/A 403M, “Wrought Austenitic Stainless Steel Piping Fittings,” and
 - c) NSF/ANSI 372, “Drinking Water System Components – Lead Content.”
- 2) Stainless steel butt weld pipe fittings shall be made of a material that matches the grade of the pipe material used.

2.2.6.13. Stainless Steel Pipe Flanges

- 1) Stainless steel pipe flanges shall conform to
 - a) ASME B16.5, “Pipe Flanges and Flanged Fittings: NPS ½ Through NPS 24 Metric/Inch Standard,”
 - b) NSF/ANSI 372, “Drinking Water System Components – Lead Content,” and
 - c) ASTM A 182/A 182M, “Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service” or AWWA C228, “Stainless-Steel Pipe Flanges for Water Service – Sizes 2 in. through 72 in. (50 mm through 1,800 mm).”
- 2) Stainless steel pipe flanges shall be made of a material that matches the grade of the pipe material used.

2.2.6.14. Stainless Steel Threaded Fittings

- 1) Stainless steel threaded fittings shall be schedule 40s or greater conforming to NSF/ANSI 372, “Drinking Water System Components – Lead Content,” and
 - a) ASTM A 182/A 182M, “Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service,” or
 - b) ASTM A 351/A 351M, “Castings, Austenitic, for Pressure-Containing Parts.”
- 2) Stainless steel threaded fittings shall be made of a material that matches the grade of the pipe material used.

2.2.6.15. Stainless Steel Tube

- 1) Stainless steel tube shall conform to
 - a) ASME B16.9, “Factory-Made Wrought Butt Welding Fittings,” and
 - b) ASTM A 269, “Seamless and Welded Austenitic Stainless Steel Tubing for General Service.”
- 2) Only grade 304/304L or 316/316L stainless steel tube shall be used.

2.2.6.16. Stainless Steel Pipe and Tube

- 1) The use of stainless steel pipe and tube shall conform to Table 2.2.6.16.

Table 2.2.6.16.
Permitted Uses of Stainless Steel Pipe and Tube
 Forming Part of Sentence 2.2.6.16.(1)

Stainless Steel Pipe or Tube	Plumbing Purposes						
	Water Distribution System		Building Sewer	Drainage System		Venting System	
	Underground	Aboveground		Underground	Aboveground	Underground	Aboveground
Stainless steel pipe	P	P	P	P	P	P	P
Stainless steel tube	P	P	N	N	N	N	N

P = Permitted N = Not Permitted

2.2.7. Non-Ferrous Pipe and Fittings

(For a summary of pipe applications, see Note A-2.2.5., 2.2.6. and 2.2.7.)

2.2.7.1. Copper and Brass Pipe

- 1) Copper pipe shall conform to ASTM B 42, “Seamless Copper Pipe, Standard Sizes.”
- 2) Brass pipe shall conform to ASTM B 43, “Seamless Red Brass Pipe, Standard Sizes.”

2.2.7.2. Brass or Bronze Pipe Flanges and Flanged Fittings

- 1) Brass or bronze pipe flanges and flanged fittings shall conform to ASME B16.24, “Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500.”

2.2.7.3. Brass or Bronze Threaded Water Fittings

- 1) Brass or bronze threaded water fittings shall conform to ASME B16.15, “Cast Copper Alloy Threaded Fittings: Classes 125 and 250.”
- 2) Brass or bronze threaded water fittings shall not be used in a *drainage system*.

2.2.7.4. Copper Tube

- 1) Copper tube shall conform to
 - a) ASTM B 88, “Seamless Copper Water Tube,” or
 - b) ASTM B 306, “Copper Drainage Tube (DWV).”
- 2) Except as provided in Sentence (3), the use of copper tube shall conform to Table 2.2.7.4.
- 3) Copper tube shall not be used for the *fixture drain* or the portion of the *vent pipe* below the *flood level rim* of manually flushing or waterless urinals.

Table 2.2.7.4.
Permitted Use of Copper Tube and Pipe
 Forming Part of Sentence 2.2.7.4.(2)

Type of Copper Tube or Pipe	Plumbing Purposes							
	Water Service Pipe	Water Distribution System		Building Sewer	Drainage System		Venting System	
		Underground	Aboveground		Underground	Aboveground	Underground	Aboveground
K & L hard temper	N	N	P	P	P	P	P	P
K & L soft temper	P	P	P	N	N	N	N	N
M hard temper	N	N	N	N	N	P	N	P
M soft temper	N	N	N	N	N	N	N	N
DWV	N	N	N	N	N	P	N	P

P = Permitted N = Not Permitted

2.2.7.5. Solder-Joint Drainage Fittings

- 1) Solder-joint fittings for *drainage systems* shall conform to
 - a) ASME B16.23, “Cast Copper Alloy Solder Joint Drainage Fittings: DWV,” or
 - b) ASME 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*.

2.2.7.6. Solder-Joint Water Fittings

- 1) Except as provided in Sentence (2), solder-joint fittings for *water systems* shall conform to
 - a) ASME B16.18, “Cast Copper Alloy Solder-Joint Pressure Fittings,” or
 - b) ASME B16.22, “Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.”
- 2) Solder-joint fittings for *water systems* not made by casting or the wrought process shall conform to the applicable requirements of ASME B16.18, “Cast Copper Alloy Solder-Joint Pressure Fittings.”

2.2.7.7. Flared-Joint Fittings for Copper Water Systems

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

2.2.7.8. Lead Waste Pipe and Fittings

- 1) Lead *waste pipe* and fittings shall not be used in a *water system* or as a *building sewer*.
- 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 a manner that prevents the retention of liquid in the bend.

2.2.8. Corrosion-Resistant Materials**2.2.8.1. Pipes and Fittings**

- 1) Pipes and fittings to be used for drainage and venting of acid and corrosive wastes shall conform to
 - a) ASTM A 518/A 518M, “Corrosion-Resistant High-Silicon Iron Castings,”
 - b) ASTM C 1053, “Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications,” or
 - c) CAN/CSA-B181.3, “Polyolefin and Polyvinylidene Fluoride (PVDF) Laboratory Drainage Systems.”

2.2.9. Jointing Materials**2.2.9.1. Cement Mortar**

- 1) Cement mortar shall not be used for jointing.

2.2.9.2. Solders and Fluxes

- 1) Solders for solder joint fittings shall conform to ASTM B 32, “Solder Metal.”
- 2) Solders and fluxes having a lead content in excess of 0.2% shall not be used in a *potable water system*.
- 3) Fluxes for soldered joints shall conform to ASTM B 813, “Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.”
- 4) Brazing alloys shall conform to ANSI/AWS A5.8M/A5.8, “Filler Metals for Brazing and Braze Welding,” BCuP range.

2.2.10. Miscellaneous Materials**2.2.10.1. Brass Floor Flanges**

- 1) Brass floor flanges shall conform to CSA B158.1, “Cast Brass Solder Joint Drainage, Waste and Vent Fittings.”

2.2.10.2. Screws, Bolts, Nuts and Washers

- 1) Every screw, bolt, nut and washer shall be of corrosion-resistant materials when used
 - a) to connect a water closet to a floor flange,
 - b) to anchor the floor flange to the floor, or
 - c) to anchor the water closet to the floor.

2.2.10.3. 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.

2.2.10.4. Mechanical Couplings

- 1) Groove- and shoulder-type mechanical couplings for pressure applications shall conform to CSA B242, “Groove- and Shoulder-Type Mechanical Pipe Couplings.”
- 2) Mechanical couplings for non-pressure applications shall conform to CAN/CSA-B602, “Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe.”

2.2.10.5. Saddle Hubs

- 1) A saddle hub or fitting shall not be installed in *drainage, venting* or *water systems*. (See Note A-2.2.10.5.(1).)

2.2.10.6. Supply and Waste Fittings

- 1) Supply fittings shall conform to
 - a) ASME A112.18.1/CSA B125.1, “Plumbing Supply Fittings,” or
 - b) CSA B125.3, “Plumbing Fittings.”
- 2) Supply fittings and individual shower heads shall have an integral means of limiting the maximum water flow rate to that specified in Table 2.2.10.6. (See Note A-2.2.10.6.(2).)

Table 2.2.10.6.
Water Flow Rates from Supply Fittings
 Forming Part of Sentence 2.2.10.6.(2)

Supply Fittings	Maximum Water Flow Rate, L/min
Kitchen faucet (non-residential)	8.3
Kitchen faucet (residential)	6.8 ⁽¹⁾
Lavatory faucet (for <i>private use</i>)	5.7
Lavatory faucet (for <i>public use</i>)	1.9 ⁽²⁾⁽³⁾
<i>Pre-rinse spray valve</i>	4.8 ⁽⁴⁾
<i>Shower head</i>	7.6 ⁽⁵⁾
Wash fountain, per <i>plumbing fixture</i> fitting	6.8 ⁽⁶⁾

Notes to Table 2.2.10.6.:

- (1) May be temporarily increased to a maximum flow rate of 8.3 L/min but must default to the lower flow rate upon release of the activation mechanism or closure of the faucet valve.
- (2) A *metering fixture* faucet is limited to 1.0 L per cycle.
- (3) A lavatory faucet in a health care facility is permitted a maximum flow rate of 8.3 L/min. The *Chief Building Official* may, for human health reasons, permit exemptions within other facilities, to a maximum flow rate of 8.3 L/min.
- (4) Each *pre-rinse spray valve* shall be equipped with an automatic shut-off.
- (5) Emergency and safety *shower heads* and *shower heads* in health care facilities and detention facilities are exempted from this requirement.
- (6) A maximum flow rate of 6.8 L/min is permitted for each 500 mm of circumference. For a wash fountain with *metering fixture* faucets, a maximum of one *metering fixture* faucet is permitted for each 500 mm of circumference. A *metering fixture* faucet is limited to 1.0 L per cycle.

3) An automatic compensating valve serving an individual shower head addressed in Sentence (1) shall have a water flow rate equal to or less than the shower head it serves. (See Note A-2.2.10.6.(3).)

4) Where multiple shower heads installed in a public showering facility are served by one temperature control, each shower head shall be equipped with a device capable of automatically shutting off the flow of water when the shower head is not in use. (See Note A-2.2.10.6.(4) and (5).)

5) Each lavatory in a public washroom and each wash fountain shall be equipped with a device capable of automatically shutting off the flow of water when the lavatory is not in use. (See Note A-2.2.10.6.(4) and (5).)

6) Waste fittings shall conform to ASME A112.18.2/CSA B125.2, “Plumbing Waste Fittings.”

2.2.10.7. Water Temperature Control

(See Note A-2.2.10.7.)

1) Except as provided in Sentence (2), valves supplying fixed-location shower heads shall be individual pressure-balanced or thermostatic-mixing valves conforming to ASME A112.18.1/CSA B125.1, “Plumbing Supply Fittings.”

2) Individual pressure-balanced or thermostatic-mixing valves shall not be required for shower heads having a single tempered water supply that is controlled by an automatic compensating valve conforming to CSA B125.3, “Plumbing Fittings.”

3) Mixing valves that supply shower heads shall be of the pressure-balanced, thermostatic, or combination pressure-balanced/thermostatic type capable of

- a) maintaining a water outlet temperature that does not exceed 49°C, and
- b) limiting thermal shock.

4) The temperature of water discharging into a bathtub shall not exceed 49°C.

2.2.10.8. Direct Flush Valves

1) Direct flush valves shall

- a) open fully and close positively under service pressure,
- b) complete their cycle of operation automatically,
- c) be provided with a means of regulating the volume of water that they discharge, and
- d) be provided with a *vacuum breaker* unless the *fixture* is designed so that *back-siphonage* cannot occur.

2.2.10.9. Drinking Fountain Bubblers

1) The orifice of drinking fountain bubblers shall

- a) be of the shielded type, and
- b) direct the water upward at an angle of approximately 45°.

2) Drinking fountain bubblers shall include a means of regulating the flow to the orifice.

3) Bubblers shall be installed only on drinking fountains. (See Note A-2.2.10.9.(3).)

2.2.10.10. Back-Siphonage Preventers and Backflow Preventers

1) Except as provided in Sentence (2), *back-siphonage preventers* and *backflow preventers* shall conform to

- a) CSA B64.0, “Definitions, General Requirements, and Test Methods for Vacuum Breakers and Backflow Preventers,”
- b) CSA B64.1.1, “Atmospheric Vacuum Breakers (AVB),”
- c) CSA B64.1.2, “Pressure Vacuum Breakers (PVB),”
- d) CSA B64.1.3, “Spill-Resistant Pressure Vacuum Breakers (SRPVB),”
- e) CSA B64.2, “Hose Connection Vacuum Breakers (HCVB),”
- f) CSA B64.2.1, “Hose Connection Vacuum Breakers (HCVB) with Manual Draining Feature,”
- g) CSA B64.2.2, “Hose Connection Vacuum Breakers (HCVB) with Automatic Draining Feature,”
- h) CSA B64.3, “Dual Check Valve Backflow Preventers with Atmospheric Port (DCAP),”
- i) CSA B64.4, “Reduced Pressure Principle (RP) Backflow Preventers,”

- j) CSA B64.5, “Double Check Valve (DCVA) Backflow Preventers,”
 - k) CSA B64.6, “Dual Check Valve (DuC) Backflow Preventers,”
 - l) CSA B64.7, “Laboratory Faucet Vacuum Breakers (LFVB),” or
 - m) CSA B64.8, “Dual Check Valve Backflow Preventers with Intermediate Vent (DuCV).”
- 2) *Back-siphonage preventers* for tank-type water closets (anti-siphon fill valves) shall conform to CSA B125.3, “Plumbing Fittings.”

2.2.10.11. Relief Valves

- 1) Temperature-relief, pressure-relief, combined temperature- and pressure-relief, and vacuum-relief valves shall conform to ANSI Z21.22/CSA 4.4-M, “Relief Valves for Hot Water Supply Systems.”

2.2.10.12. Reducing Valves

- 1) Direct-acting water-pressure-reducing valves for domestic water supply systems shall conform to CAN/CSA-B356, “Water Pressure Reducing Valves for Domestic Water Supply Systems.”

2.2.10.13. Solar Domestic Hot Water

- 1) Equipment for solar heating of *potable* water shall conform to CAN/CSA-F379 SERIES, “Packaged Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer).”

2.2.10.14. 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) aluminum sheet not less than 0.48 mm thick,
 - c) *alloyed zinc* sheet not less than 0.35 mm thick,
 - d) lead sheet not less than 1.73 mm thick,
 - e) galvanized steel sheet not less than 0.33 mm thick, or
 - f) polychloroprene (neoprene) not less than 2.89 mm thick.
- 2) Prefabricated flashing for *vent pipes* shall conform to CSA B272, “Prefabricated Self-Sealing Roof Vent Flashings.” (See Article 2.5.6.5. for location of *vent pipe* terminals.)

2.2.10.15. Water Hammer Arresters

- 1) Water hammer arresters shall conform to ANSI/ASSE 1010, “Water Hammer Arresters.”

2.2.10.16. Air Admittance Valves

- 1) *Air admittance valves* shall conform to ASSE 1051, “Individual and Branch Type Air Admittance Valves (AAVs) for Sanitary Drainage Systems.” (See Note A-2.2.10.16.(1).)

2.2.10.17. Water Treatment Systems

(See Article 2.6.2.1. and Note A-2.2.10.17.)

- 1) Except as provided in Sentence (3), a water treatment device or apparatus may be connected to the *City* water system at the discretion of the *Chief Building Official* and, if permitted
 - a) an *operating permit* shall be obtained,
 - b) the *operating permit* number assigned to a water treatment device or apparatus shall be posted on a sign or plate that is securely fastened to the water treatment device or apparatus in a location that is conspicuously visible and constructed of a durable, weather resistant material, and
 - c) the *Chief Building Official* shall be notified within 30 days of any changes to the information that was last provided to the *City* with regard to the *operating permit*, in the form prescribed by the *Chief Building Official*.

- 2) Except as provided in Sentence (3), an existing water treatment device or apparatus shall comply with Clauses (1)(a), (b) and (c).
- 3) The requirements in Sentences (1) and (2) do not apply to a *building* used exclusively for *residential occupancy* containing no more than 4 principal *dwelling units*.

2.2.11. Building Appliances and Mechanical Systems

2.2.11.1. Building Appliances

- 1) Appliances listed in Table 2.2.11.1 shall comply with the applicable Energy Star program requirements.

Table 2.2.11.1.
Appliance Energy Star Program Requirements
 Forming Part of Sentence 2.2.11.1.(1)

Appliance	Energy Star Program Requirements
Residential clothes washer ⁽¹⁾	Product Specification for Clothes Washers
Commercial clothes washer ⁽¹⁾	Product Specification for Clothes Washers
Residential dishwasher ⁽²⁾	Product Specification for Residential Dishwashers
Commercial dishwasher ⁽³⁾	Product Specification for Commercial Dishwashers
Commercial ice maker ⁽⁴⁾	Product Specification for Automatic Commercial Ice Makers
Commercial steam cooker ⁽⁵⁾	Product Specification for Commercial Steam Cookers
Combination oven ⁽⁶⁾	Product Specification for Commercial Ovens

Notes to Table 2.2.11.1.:

- (1) “Residential clothes washer” and “commercial clothes washer” are as defined by the Energy Star Program Requirements Product Specification for Clothes Washers.
- (2) “Residential dishwasher” is as per the definition of “dishwasher” by the Energy Star Program Requirements Product Specification for Residential Dishwashers.
- (3) “Commercial dishwasher” is as per the definition of “dishwashing machine” by the Energy Star Program Requirements Product Specification for Commercial Dishwashers. Dishwashers intended for laboratory applications are exempted.
- (4) “Commercial ice maker” is as per the definition of “automatic commercial ice maker” by the Energy Star Program Requirements Product Specification for Automatic Commercial Ice Makers.
- (5) “Commercial steam cooker” is as per the definition of “commercial steam cooker” by the Energy Star Program Requirements Product Specification for Commercial Steam Cookers.
- (6) “Combination oven” is as per the definition of “combination oven” by the Energy Star Program Requirements Product Specification for Commercial Ovens.

- 2) Clothes washers with a top-loading design that are designed for use in applications in which the occupants of more than one household will be using the clothes washer, such as multi-family housing common areas and coin laundries, shall not be installed.

2.2.11.2. Residential Landscape Irrigation Systems

- 1) Residential landscape irrigation systems that apply herbicides, fungicides, insecticides, fertilizers, soil amendments or other chemicals or pesticides by means of irrigation water are prohibited.
- 2) Where the water pressure supplied to a property exceeds 550 kPa, the residential landscape irrigation system shall be equipped with a pressure reducing valve providing a maximum supplied pressure of 415 kPa and located downstream of the backflow preventer.

2.2.11.3. Vehicle Wash Facilities

- 1) The maximum flow rate of a spray wand, foam brush or similar *plumbing fixture* used at a vehicle wash facility shall not exceed 11.4 L/min.

- 2) Where a machine cleans a vehicle at a vehicle wash facility,
 - a) a water recycling system that recycles and reuses at least 60% of the water and rinse water shall be installed, used and maintained, and
 - b) discharge shall be directed to an *interceptor* dedicated exclusively to the vehicle wash facility and designed to trap oil, gasoline, sand, grit and similar materials. (See Article 2.4.4.3.)

2.2.11.4. Non-recirculating Applications

- 1) Except as provided in Sentence (2), the *City* water system shall not be connected to
 - a) *once through cooling equipment*,
 - b) venturi-type flow-through vacuum generators or aspirators in which running water is used solely for the venturi effect,
 - c) *non-recirculating liquid ring pumps*,
 - d) non-recirculating wet-hood scrubbers,
 - e) machinery powered by water,
 - f) non-recirculating ponds, waterways, water features, ornamental fountains, or swimming pools,
 - g) non-recirculating systems or equipment that use water for thermal conditioning of building surfaces or roofs, except that this does not apply to emergency fire protection of buildings, or
 - h) non-recirculating systems or equipment that use water for melting or thawing. (See also Sentence 2.4.4.2.(2).)
- 2) *Emergency once through cooling equipment* or *maintenance once through cooling equipment* may be connected to the *City* water system at the discretion of the *Chief Building Official* or *City Engineer* and, if permitted
 - a) an *operating permit* shall be obtained,
 - b) the *operating permit* number assigned to the *once through cooling equipment* shall be posted on a sign or plate that is securely fastened to the *once through cooling equipment* in a location that is conspicuously visible and constructed of a durable, weather resistant material,
 - c) the *Chief Building Official* shall be notified within 30 days of any changes to the information that was last provided to the *City* with regard to the *operating permit*, in the form prescribed by the *Chief Building Official*,
 - d) a water meter shall be installed on the *potable* water supply to the *once through cooling equipment* and shall be capable of recording the volume of *potable* water being supplied, and
 - e) the *once through cooling equipment* shall be capable of activating an *alert* whenever *potable* water is supplied to the *once through cooling equipment*. (See Note A-2.2.11.4.(2).)

2.2.11.5. Geoexchange Systems

- 1) Make-up water for a closed loop geoexchange (geothermal) ground heat exchanger shall be provided by a feeder tank isolated from the domestic water supply.
- 2) The use of a direct connection to the domestic water supply as a source of make-up water for a closed loop geoexchange (geothermal) ground heat exchanger is prohibited.
- 3) Methanol shall not be used for geoexchange (geothermal) applications.
- 4) An open loop geoexchange (geothermal) system serving a *building* used exclusively for *residential occupancy* containing no more than 4 principal *dwelling units* shall not be installed.
- 5) An open loop geoexchange (geothermal) system shall not discharge into the *sewer*.