

CHAPTER 222**WATER INDUSTRY (PLUMBING) CODE****ARRANGEMENT OF CODE**

1. Short title.
2. Application.
3. Penalty.

SCHEDULE

CHAPTER 222

WATER INDUSTRY (PLUMBING) CODE

(Sections 155)

29 of 1982.

Ch. 185.

[20th March, 1982.]

1. These By-laws may be cited as the

Short title.

WATER INDUSTRY (PLUMBING) CODE.

2. The By-laws contained in the Schedule hereto shall apply to the whole of Belize.

Application.

3. Any person who contravenes any of the provisions of any By-law shall be guilty of an offence and be liable on summary conviction to a fine not exceeding one hundred dollars or to imprisonment for a period not exceeding three months, and in the case of a continuing offence to an additional fine not exceeding fifty dollars for each day on which the offence continues after the conviction.

Penalty.

SCHEDULE**CHAPTER I****GENERAL REGULATIONS****1.1 CONFORMANCE WITH CODE**

1.1.1 All plumbing systems hereafter installed shall conform with the provisions of this Code.

1.2 GRADE OF HORIZONTAL DRAINAGE PIPING

1.2.1 Horizontal drainage piping shall be run in practical alignment at a uniform grade.

1.3 CHANGES IN DIRECTION

1.3.1 *Fittings.* Change in direction in drainage piping shall be made by the appropriate use of 45° wyes, long or short sweep quarter bends, sixth, eighth, or sixteenth bends, or by a combination of these or equivalent fittings. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from the horizontal to the vertical.

1.3.2 *Short Sweeps.* Short sweeps not less than 3" in diameter may be used in soil and waste lines where the change in direction of flow is from either the horizontal to the vertical or from the vertical to the horizontal, and may be used for making necessary offsets between the ceiling and the next floor above.

1.4 FITTINGS AND CONNECTIONS

1.4.1 *Fittings Prohibited.* No fitting having a hub in the direction opposite to flow or to the branch shall be used as a drainage fitting. No running

threads or saddles shall be used in the drainage system. No drainage or vent piping shall be drilled or tapped.

1.4.2 *Heel or Side-Inlet Bend.* A heel or side-inlet quarter bend shall not be used as a vent when the inlet is placed in a horizontal position.

1.4.3 *Obstruction to Flow.* No fitting, connection, device, or method of installation which obstructs or retards the flow of water, wastes, sewage, or air in the drainage or venting systems in an amount greater than the normal frictional resistance to flow, shall be used unless it is indicated as acceptable in this Code or is approved by the Administrative Authority as having a desirable and acceptable function and is of ultimate benefit to the proper and continuing functioning of the plumbing system. The enlargement of a 3" closet bend or stub to 4" shall not be considered an obstruction.

1.5 REPAIR AND ALTERATIONS

1.5.1 *Existing Buildings.* In existing buildings or premises in which plumbing installations are to be altered, repaired, or renovated, necessary deviations from the provisions of this Code may be permitted provided such deviations conform to the intent of the Code and are approved in writing by the Administrative Authority.

1.5.2 *Health or safety.* Wherever compliance with all the provisions of this Code fails to eliminate or alleviate a nuisance which may involve health or safety hazards, the owner or his agent shall install such additional plumbing or drainage equipment as may be necessary to abate such nuisance.

1.6 SEWER AND WATER PIPES

1.6.1 Water service pipes, or any underground water pipes, shall not be run or laid in the same trench as the building sewer or drainage piping unless approved by the Administrative Authority.

1.7 TRENCHING, EXCAVATION, AND BACKFILL

1.7.1 *Support of Piping.* Buried piping shall be supported throughout its entire length.

1.7.2 *Tunnelling and Driving.* Tunnelling may be done in yards, courts, or driveways or any building site. When pipes are driven the drive pipe shall be at least one size larger than the pipe to be laid.

1.7.3 *Open Trenches and Soak Aways.* All excavations required to be made for the installation of a building drainage system or any part thereof within the walls of a building, shall be open trench work and shall be kept open until the piping has been inspected, tested, and accepted.

1.7.4 *Backfilling.* Adequate precaution shall be taken to ensure proper compactness of backfill around piping without damage to such piping. Trenches shall be backfilled and compacted in thin layers to 12" above the top of the piping with clean earth which shall not contain stones, boulders, cinder fill, or other materials which would damage or break the piping or cause corrosive action. Mechanical devices such as bulldozers, graders, etc. may then be used to complete the backfill to grade. Fill shall be properly compacted.

1.8 STRUCTURAL SAFETY

1.8.1 In the process of installing or repairing any part of a plumbing and drainage installation, the finished floors, walls, ceilings, tile work, or any other part of the building or premises which must be changed or replaced shall be left in a safe structural condition.

1.9 WORKMANSHIP

1.9.1 Workmanship shall be of such character as to secure the results sought in all of the sections in the building provisions of this Code.

1.10 PROTECTION OF PIPES

1.10.1 *Breakage and Corrosion.* Pipes passing under or through walls shall be protected from breakage. Pipes passing through or under cinder or concrete or other corrosive material shall be protected against external corrosion by protective coating, wrapping, or other means which will prevent such corrosion.

1.10.2 *Cutting or Notching.* No structural member shall be weakened or impaired by cutting or notching, or in any other way.

1.10.3 *Piping through Footings or Foundation Walls.* A soil or waste pipe or a building drain passing under a footing or through a foundation wall shall be provided with a relieving arch; or there shall be built into the masonry wall an iron pipe sleeve, two pipe sizes greater than the pipe passing through.

1.11 SLEEVES

1.11.1 Annular space between sleeves and pipe shall be filled or tightly calked with coal tar or asphalt compound, lead, or other material found equally effective and approved as such by the Administrative Authority.

1.12 INDUSTRIAL WASTE

1.12.1 Wastes detrimental to the public sewer system or to the functioning of the sewage treatment plant shall be treated and disposed of as directed by the Administrative Authority.

1.13 RATPROOFING

1.13.1 *Exterior Openings.* All exterior openings provided for the passage of piping shall be properly sealed with snugly fitting collars of metal or other approved ratproof material securely fastened into place.

1.13.2 *Interior Openings.* Interior openings through walls, floors and ceilings shall be ratproofed.

1.14 USED OR SECOND-HAND EQUIPMENT

1.14.1 It shall be unlawful to install used equipment or material for plumbing installation unless it complies with the minimum standard set forth in this Code.

1.15 CONDEMNED EQUIPMENT

1.15.1 Any plumbing equipment condemned by the Administrative Authority because of wear, damage, defects, or sanitary hazards, shall not be reused for plumbing purposes.

1.16 PIPING IN RELATION TO FOOTINGS

1.16.1 No piping shall be laid parallel to building footings closer than 3', except with the approval of the Administrative Authority when space is not available. When parallel piping is laid deeper than the building footings the horizontal distance from the footing shall be equal to or greater than the vertical distance below the footing, but in no case shall the horizontal distance be less than 3', except with the approval of the Administrative Authority when space is not available.

1.17 CONNECTIONS TO PLUMBING SYSTEM REQUIRED

1.17.1 All plumbing fixtures, drains, appurtenances, and appliances used to receive or discharge liquid wastes or sewage shall be connected properly to the drainage system of the building or premises in accordance with the requirements of this Code.

1.18 LOCATION OF FIXTURES

1.18.1 *Light and Ventilation.* Plumbing fixtures, except drinking

fountains and single lavatories, shall be located in compartments or rooms provided with ventilation and illumination conforming to standards of good practice.

1.18.2 *Improper Location.* Piping, fixtures, or equipment shall not be located in such a manner as to interfere with the normal operation of windows, doors, or other exit openings.

1.19 PIPING MEASUREMENTS

1.19.1 Except where otherwise specified in this Code all measurements between pipes and walls, etc., shall be made to the center lines of the pipes.

1.20 VENTING

1.20.1 The drainage system shall be provided with a system of vent piping which will permit the admission or emission of air so that under no circumstance of normal or intended use shall the seal of any fixture trap be subjected to a pressure differential of more than 1" of water. See 12.9.3.

1.21 VENTILATION DUCTS

1.21.1 Ventilation ducts from washrooms and toilet rooms shall exhaust to the outer air or form an independent system.

1.22 WATER CLOSET CONNECTIONS

1.22.1 *Bends.* 3" bends may be used on water closets or similar connections provided a 4" x 3" flange is used to receive the fixture horn.

1.22.2 *Reducing.* Soil or waste lines may not decrease in pipe size on the downward side of fixtures.

1.23 DEAD ENDS

1.23.1 In the installation or removal of any part of a drainage system, dead ends shall be avoided except where necessary to extend a cleanout so as to be accessible.

CHAPTER 2**MATERIALS-STANDARDS, WEIGHTS, AND
MEASUREMENT****2.1 MATERIALS**

2.1.1 *Minimum Standards.* The materials listed in this chapter shall conform at least to the standards cited when used in the construction, installation, alteration, or repair of any part of a plumbing and drainage system, except that the Administrative Authority may allow the extension, addition, or relocation of existing soil, waste, or vent pipes with materials of like grade or quality.

2.1.2 *Use of Materials.* The use of each material shall be governed by the requirements imposed in this Code. Materials shall be free of manufacturing defects or damage, however occasioned, which would, or would tend to, render such materials defective, unsanitary, or otherwise improper to accomplish the purpose of this Code.

NOTE: All standards and specifications for materials are subject to change. The Administrative Authority shall review this information and have it brought up to date at intervals not exceeding two years.

2.1.3 *Identification of Materials.* Each length of pipe and each pipe fitting, trap, fixture, and device used in a plumbing system shall have cast, stamped, or indelibly marked on it, the maker's mark or name, the weight, type, and class of the product.

**2.2 PLASTIC PIPE, TUBING, AND FITTINGS FOR POTABLE
WATER PIPING**

2.2.1 *Potable Water Piping.* Plastic pipe, tubing, and fittings may be used in the potable water piping system. Plastic pipe shall not be used in the

hot water system. Plastic pipe used in the cold water system inside the building shall be of Schedule 40 through 4" nominal size, and shall have a minimum pressure of 200 psi at 73.47. Plastic pipe used in the cold water system outside the building shall have a minimum pressure rating of 160 psi at 73.47. Minimum pressure ratings for the specific materials, grades, and schedules in the sizes to be used shall be based upon the manufacturer's standards.

2.2.2 *Approval.* Plastic pipe, tubing, fittings, and solvent cement for rigid plastic pipe shall have received the Seal of Approval of an independent testing laboratory such as the *National Sanitation Foundation* and the Manufacturer, materials and trade name shall be included in the current "Listing of Plastic Materials, Pipe, Fittings, and Appurtenances of Potable Water and Waste Water" compiled and published by such Organisations as the National Sanitation Foundation

Testing Laboratory, Inc., Ann Arbor, Michigan, U.S.A. All such material at the job location must visibly bear the above cited stamped Seal of Approval, or must be approved by the Administrative Authority.

2.2.3 *Identification.* All plastic pipe for use in potable water systems shall be marked for identification purposes. In addition to the approval required in the preceding paragraph, the pipe shall be marked to include material, grade, pressure rating schedule, and size.

2.2.4 *Joints and Fittings.* Joints and fittings in plastic pipe for potable water piping shall be in accordance with the manufacturer's recommendations, subject to the following limitations:

- (a) Polyethylene (PE) pipe shall be installed only with insert and clamp type fittings or thermal welded joints and fittings. All insert fittings shall be approved by the Administrative Authority. All clamps shall be of corrosion resistant material.

- (b) Polyvinyl chloride (PVC) pipe shall be installed with solvent welded or flanged joints only. The pipe shall not be threaded. Transition to metallic or other piping shall be made with the use of threaded or flanged adapter fittings. The fittings shall be molded from the same material as the pipe. Fittings shall be approved by the Administrative Authority. The solvent cement used for solvent welded joints shall meet the requirements of the manufacturer and shall also be approved by the Authority.
- (c) Polybutylene (PB) pipe shall be installed only with inset and clamp type, flanged type, or thermal welded joints and fittings. All plastic insert fittings shall be approved by the Authority, all clamps shall be of corrosion resistant material.

2.2.5 Installation.

- (a) Plastic pipe shall not be installed in any tunnel or chase which contains uninsulated hot water, hot air, or steam piping.
- (b) The pipe trench shall have a smooth, compacted bottom of soil or sand. The first 6" of backfill shall be free of rock or debris and shall be placed by hand.

2.3 PLASTIC PIPE AND FITTINGS FOR DRAINAGE AND VENT PIPING WITHIN THE BUILDING

2.3.1 *Pipe and Fittings.* Plastic pipe and fittings for drainage and vent piping within the building shall be Schedule 40 PVC-DWV or ABS-DWV. 3" or 4" Thin Wall PVC-DWV is approved for above ground use (not for acid

waste) in single family residences not exceeding two stories in height above ground level. All pipe and fittings shall be approved by the Authority and shall bear markings as required by the aforementioned standards. Fittings shall be molded, fully recessed, socket type designed for solvent welded joints. Special purpose threaded or flanged adaptor fittings, couplings, unions, etc., may be used provided that they are fully recessed and create no restriction to flow greater than that created by conventional fittings junctions or couplings in plastic drainage and vent piping made by welding adjacent sections as a substitute for the use of standard drainage fittings are prohibited.

2.3.2 *Joints.* Joints in plastic drainage or vent piping within the building shall be solvent welded, except that threaded or flanged joints may be used with adaptor fittings as outlined in paragraph 2.3.1. The solvent cement shall be specific for the piping material and shall meet the requirements of currently applicable revisions thereof. O-ring type joints may be used where they meet special needs as determined by the Authority.

2.3.3 *Hangers and Supports.* Vertical piping shall be supported at not less than every story height and at its base. Horizontal piping shall be supported at not less than 4' intervals.

2.4 PLASTIC PIPE AND FITTINGS FOR DRAINAGE PIPING OUTSIDE THE BUILDING

2.4.1 *Pipe and Fittings.* Plastic pipe and fittings for drainage piping shall be Schedule 40 or heavier PVC or ABS. Any additional piping materials shall be submitted for, and shall have specific written approval, either by developed standards or by the manufacturer's certification of the product, and shall be approved by the Authority. For approval, the pipe shall have a minimum average crushing strength of 1000 pounds per lineal foot, at which loading the maximum reduction of the original inside diameter shall not exceed 15%. Perforated (drain) pipe shall have a minimum average crushing strength of 600 pounds per lineal foot. The crushing strength at 15% deflection shall be determined in accordance with Authority. The fittings shall be manufactured of

the same basic material as the pipe and shall be molded flange or socket type designed for solvent welded joints. Fittings shall be fully recessed and shall be smooth and non-restrictive to flow. Special purpose plastic adaptor fittings may be used if necessary, provided that they create no restriction to flow and meet the performance requirements specified. Junctions or couplings in plastic drainage piping made by welding adjacent sections as a substitute for the use of standard drainage fittings are prohibited. Mechanical joints may be considered but shall be submitted for, and receive individual approval by type or manufacture before installation.

2.4.2 *Joints.* Joints in plastic drainage piping shall be solvent welded or flanged. The solvent cement shall be specific for the type of plastic material used in the manufacture of the pipe and fittings. In all other respects the joints shall be made in accordance with the manufacturer's recommendations and shall meet the necessary performance requirements.

2.4.3 *Installation.* Plastic drainage piping shall be laid in a trench having a smooth compacted bottom of soil or sand. The first 6" of backfill shall be placed and compacted by hand. All plastic pipe so used shall be installed at or below the minimum depth prescribed by the Authority.

2.5 ALTERNATE MATERIALS AND METHODS

2.5.1 *Existing Premises.* In existing buildings or premises in which plumbing installations are to be altered, repaired, or renovated, the Authority shall have discretionary powers to permit deviation from the provisions of this Code provided that such a proposal to deviate is first submitted for proper determination in order that health and safety requirements, as they pertain to plumbing, shall be observed.

2.5.2 *Approval.* Provisions of this Code are not intended to prevent the use of any material, device, method of assemblage or installation, fixture, or appurtenance not specifically authorised, provided such alternate has been approved by the Authority in accordance with this by-law.

2.5.3 *Evidence of Compliance.* The Authority shall require sufficient evidence to enable it to judge whether the proposed alternates meet the requirements of this Code for safety and health.

2.5.4 *Tests.* When there is insufficient evidence to substantiate claims for alternates the Authority may require as proof, tests of compliance to be made by an approved agency at the expense of the applicant.

2.5.5 *Test Procedure.* Tests shall be made in accordance with generally recognised standards, but in the absence of such standards, the Authority shall specify the test procedure.

2.5.6 *Repeated Tests.* The Authority may require tests to be repeated if at any time there is reason to believe that an alternate no longer conforms to the requirements on which its approval was based.

2.6 APPROVED MATERIALS

2.6.1 *Steel Pipe.* All steel pipe shall conform to the standard specifications for black and galvanised welded and seamless pipe, and shall be of standard weight or heavier.

2.6.2 *Periodic Review.* The Authority shall periodically review the approved list of specifications and standards for materials to check the designations, numbers and other particulars which are used for identification, and if there are later issues, shall submit them for their legal adoption.

NOTE: All standards and specifications are subject to change.
Materials introduced subsequent to the date on which this
Code comes into effect may be approved by the Authority.

2.6.3 *Specific Usage.* Each chapter of this Code indicates specifically the types of material permitted for the various applications to plumbing.

2.7 PIPE SPECIFICATIONS

2.7.1 *Schedules.* There are seven classifications, or Schedules, of pipes used in plumbing. These classifications refer to the wall thickness of the pipe, and are the same for pipes of any material, such as plastic, cast iron, steel, etc. The classifications are: Schedule 10, Schedule 20, Schedule 30, Schedule 40, Schedule 60, Schedule 80, and Schedule 100. Schedule 10 pipe has very thin walls; Schedule 100 pipe has very thick walls. Schedule 40 is Standard Weight pipe; Schedule 80 is Extra Strong pipe.

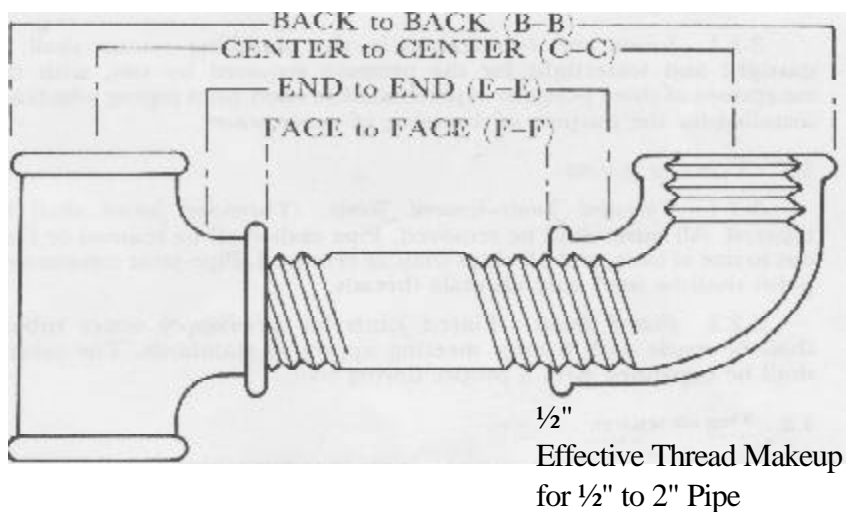
Nominal Pipe Size	Nominal Wall Thickness or Schedule Numbers	
	Schedule 40 (Standard) (inches)	Schedule 80 (X.S) (inches)
3/8	.091	.126
1/2	.109	.147
3/4	.113	.154
1	.133	.179
1 1/4	.140	.191
1 1/2	.145	.200
2	.154	.218
2 1/2	.203	.276
3	.216	.300
3 1/2	.226	.318
4	.237	.337

2.7.2. *Standard Pipe Data.*

Nominal Pipe Diameter in Inches	Actual I.D. in Inches	Actual O.D. in Inches	Inside Area in Sq. In.	Length in feet Containing One Cubic Ft.	U.S. Gallons in One Lineal Foot
$\frac{3}{8}$	.493	.675	.191	754.360	.0099
$\frac{1}{2}$	.622	.840	.304	473.910	.0158
$\frac{3}{4}$	.824	1.050	.533	270.030	.0277
1	1.049	1.315	.864	166.620	.0449
$1\frac{1}{4}$	1.308	1.660	1.495	96.275	.0777
2	1.610	1.900	2.036	70.733	.1058
$2\frac{1}{2}$	2.067	2.375	3.356	49.913	.1743
3	2.469	2.875	4.788	30.077	.2487
$3\frac{1}{2}$	3.068	3.500	7.393	19.479	.3840
4	3.548	4.000	9.887	14.565	.5136
6	4.026	4.500	12.730	11.312	.6613
	6.065	6.625	28.990	4.984	1.5008

2.8 HOW TO MEASURE PIPE

TYPES OF MEASUREMENTS



45° OFFSET - Always measure center to center (C-C)

To determine TRAVEL

$$\text{TRAVEL} = \text{OFFSET} \times 1.41$$

$$\text{TRAVEL} = \text{ADVANCE} \times 1.41$$

Example: OFFSET = 6"

$$\text{TRAVEL} = \text{OFFSET} \times 1.41$$

$$\text{TRAVEL} = 6" \times 1.41$$

$$\text{TRAVEL} = 8.64" \text{ or } 8\frac{1}{2}"$$

(C-C)

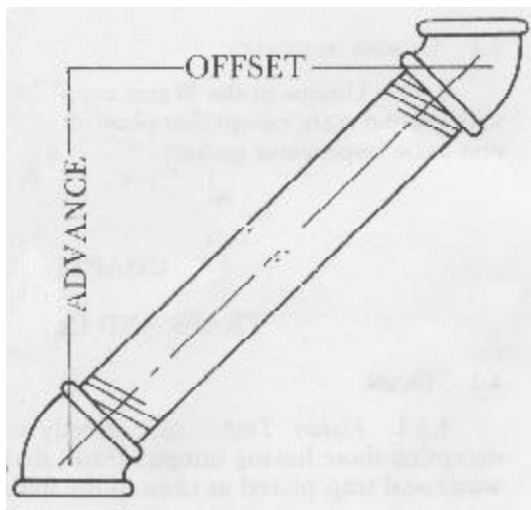
Example: ADVANCE = 12"

$$\text{TRAVEL} = \text{ADVANCE} \times 1.41$$

$$\text{TRAVEL} = 12" \times 1.41$$

$$\text{TRAVEL} = 16.92"$$

$$\text{or } 17" \text{ (C-C)}$$



CHAPTER 3**JOINTS AND CONNECTIONS****3.1 TIGHTNESS**

3.1.1 Joints and connections in the plumbing system shall be gastight and watertight for the pressure required by test, with the exceptions of those portions of perforated or open-joint piping which are installed for the purpose of disposing of waste water.

3.2 TYPES OF JOINTS

3.2.1 *Threaded Joints-Screwed Joints.* Threaded joints shall be tapered. All burrs shall be removed. Pipe ends shall be reamed or filed out to size of bore, and all chips shall be removed. Pipe-joint cement and paint shall be used only on male threads.

3.2.2 *Flared Joints.* Flared joints for soft-copper water tubing shall be made with fittings meeting approved standards. The tubing shall be expanded with a proper flaring tool.

3.3 USE OF JOINTS

3.3.1 *Copper Water Tubes.* Joints in copper tubing shall be made either by the appropriate use of approved cast bronze or wrought copper pressure fittings properly soldered, or by means of approved compression fittings.

3.3.2 *Plastic Pipe.* Joints between plastic pipe and non-plastic material shall be made only by the utilisation of an appropriate type of adaptor.

3.4 UNIONS (SCREWED)

3.4.1 Unions in the Water supply system shall be metal to metal with ground seats, except that plastic to metal unions may utilise durable non-toxic impervious gaskets.

CHAPTER 4

TRAPS AND CLEANOUTS

4.1 TRAPS

4.1.1 *Fixture Traps.* All directly connected plumbing fixtures, excepting those having integral traps, shall be separately trapped by a water-seal trap placed as close to the fixture outlet as possible.

- (a) A combination plumbing fixture may be installed on one trap if one compartment is not more than 6" deeper than the other and the waste outlets are not more than 30" apart.
- (b) One trap may be installed for a set of not more than three single-compartment sinks or laundry trays or three lavatories immediately adjacent to each other in the same room if the waste outlets are not more than 30" apart and the trap is centrally located when three compartments are installed.

4.1.2 *Distance of Trap to Fixture.* The vertical distance from the fixture to the trap Weir shall not exceed 24" except in the use of an interceptor for a trap.

4.1.3 Low water use toilets with mechanical traps are recommended

for private dwelling where sewage disposal is by septic tank and subsurface drainage but are not allowed where sewage discharges into collector sewers such as at Belize City & Belmopan.

4.2 TYPE AND SIZE OF TRAPS, FIXTURE SUPPLY PIPES, AND FIXTURE DRAINS

4.2.1 *Trap Size.* The size (nominal diameter) of trap for a given fixture shall be sufficient to drain the fixture rapidly. See Table in 9.13.8.

4.2.2 *Relation to Fixture Drains.* No “P” trap shall be larger than the fixture drain to which it is connected.

4.2.3 *Types of Traps.*

- (a) Fixture traps shall have a uniform interior and a smooth waterway; they shall be without partitions or moveable parts, except cleanout plugs.
- (b) Slip joints may be used only on the inlet side of the trap and in the trap seal in exposed locations.
- (c) Visible ground joint connections may be used on the inlet side of the trap, in the trap seal, and on the Outlet side of the trap in exposed locations.
- (d) A trap integral with the fixture shall have a uniform interior and smooth waterway.

4.3 GENERAL REQUIREMENTS

4.3.1 *Trap Seal.* Each fixture trap shall have a water seal of not less than 2" and not more than 4", except where a deeper seal is required by the Administrative Authority for special conditions.

4.3.2 *Trap Cleanouts.*

- (a) Each fixture trap, except those cast integral or in combination with fixtures in which the trap seal is readily accessible or except when a portion of the trap is readily removable for cleaning purposes, shall have an accessible trap screw of ample size protected by this water seal. The screw shall be of brass or other non-corrodeable material.
- (b) Cleanouts on the seal of a trap shall be made tight with threaded cleanout plug and approved washer.

4.3.3 *Trap Level and Protection.* Traps shall be set true with respect to their water seals.

4.3.4 *Traps Underground.* Underground traps shall be provided with accessible and removable cleanouts, except for separate “P” traps into which floor drains, urinals, and like fixtures with removable drain strainers discharge.

4.3.5 *Building (House) Traps.* No trap shall be installed at the foot of a soil or waste stack or in a building drain.

4.4 PIPE CLEANOUTS-CLEANING EYES

4.4.1 *Location.*

- (a) Inside: Cleanouts shall be more than 50' apart in horizontal drainage lines of 4" nominal diameter or less.

A cleanout or manhole shall be installed at each change of direction of the building drain greater

than 60°. Metal gastight covers shall be provided for manholes within buildings.

A cleanout shall be provided at or near the base of each vertical waste or soil stack, when it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided.

- (b) Outside: A full size cleanout shall be located not more than 5' from the building foundation in direct line with the building drain and sewer.

4.4.2 *Change of Direction.* Cleanouts shall be installed at each change of direction of the building drain greater than 60°.

4.4.3 *Underground Drainage.* Cleanouts, when installed on an underground drain, shall be extended to or above the finished grade level directly above the place where the cleanout is installed; or they may be extended to outside of the building when necessary.

4.5 SIZE OF CLEANOUTS: CLEARANCES

4.5.1 Cleanouts shall be of the same nominal size as the pipes up to 4" and not less than 4" for larger piping.

- (a) Large Pipes. Cleanouts on 3" or larger pipes shall be so installed that there is clearance of not less than 18" for the purpose of rodding.
- (b) Small Pipes. Cleanouts smaller than 3" shall be so installed that there is a 12" clearance for rodding.

4.6 CLEANOUT EQUIPMENT

4.6.1 A fixture trap or a fixture with integral trap readily removable without disturbing concealed roughing work may be accepted as a cleanout equivalent if there is no more than one 90° bend on the line to be rodded.

4.7 WASTE AND VENTILATION PIPING

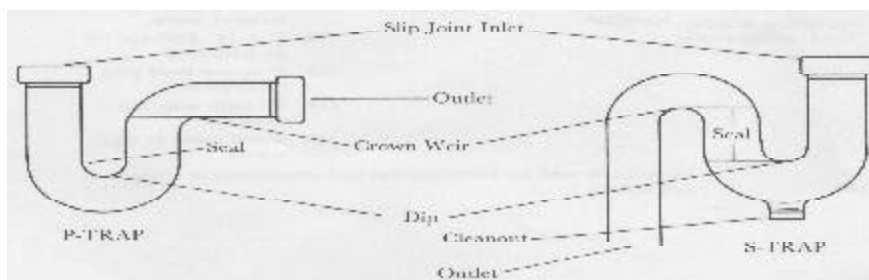
4.7.1 See diagram “Waste and Ventilation Piping for Toilet, Lavatory, and Bath”.

4.8 P-TRAPS AND S-TRAPS

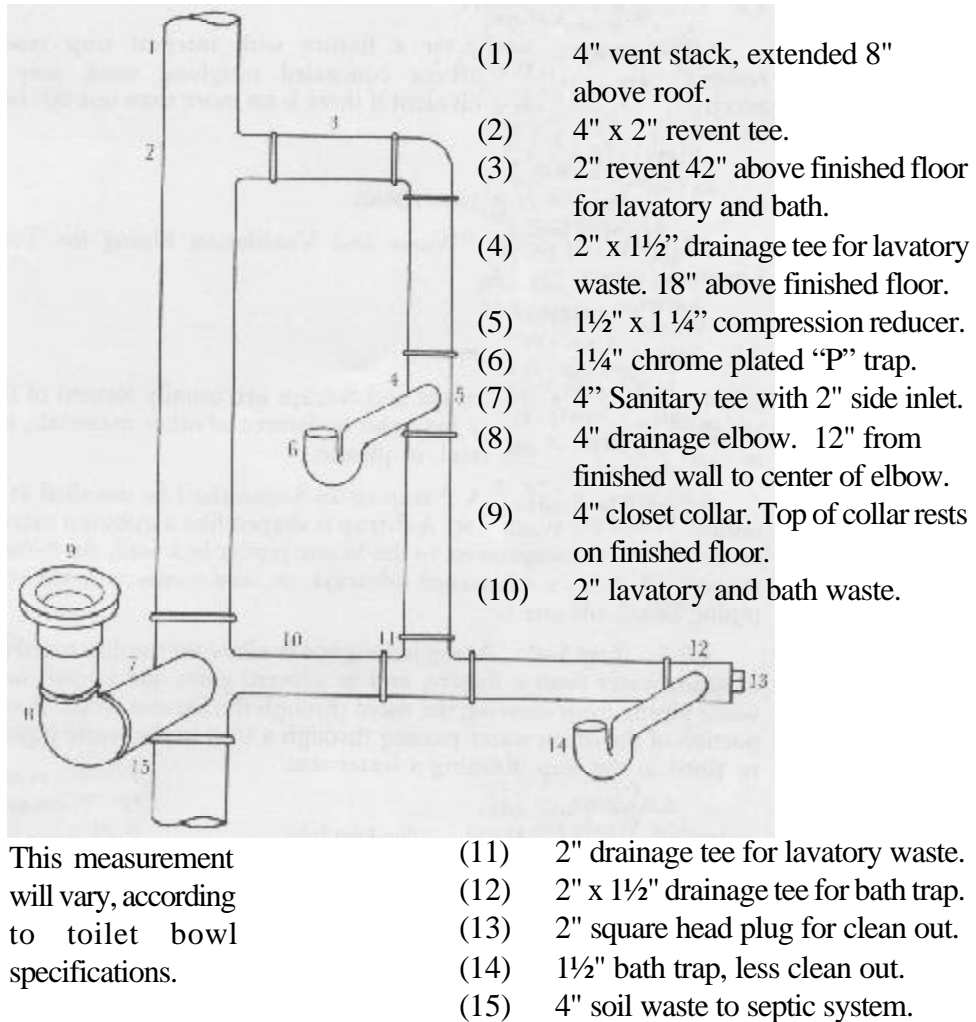
4.8.1 *Materials.* P-traps and S-traps are usually formed of light weight brass tubing. They may also be formed of other materials, such as cast iron, galvanized steel, or plastic.

4.8.2 *Installation.* A P-trap or an S-trap shall be installed at the outlet of a plumbing fixture. A P-trap is shaped like a question mark, ?, or the letter P, and connects to the Waste piping in a wall. An S-trap is shaped like the letter S turned sideways, ∞, and connects to the waste piping below the floor.

4.8.3 *Trap Seal.* A trap is designed to allow the unobstructed flow of drain water from a fixture, and to prevent gases and odours in the waste piping from entering the room through the fixtures drain. A small portion of the drain water passing through a trap to the waste piping is retained in the trap, forming a water seal.



WASTE AND VENTILATION PIPING FOR TOILET, LAVATORY, AND BATH



This measurement will vary, according to toilet bowl specifications.

Chart to be used for Identification and measurements of pipe and fittings.

CHAPTER 5**GREASE INTERCEPTORS, CATCH BASINS****5.1 GREASE INTERCEPTORS-CATCH BASINS**

5.1.1 *Commercial Buildings.* A grease interceptor or catch basin, shall be installed in the waste line leading from sinks, drains, or other fixtures in the following establishments: restaurants, hotel kitchens or bars, clubs, or other establishments where grease can be introduced into the drainage system in quantities that can affect line stoppage or hinder sewage disposal.

5.1.2 See diagram “Commercial Kitchen Grease Interceptor”.

5.1.3 *Residential Units.* All residential waste may discharge into the septic tank. No discharge shall enter directly into a soak away, filter trench system, or public way.

5.2 VENTING INTERCEPTORS

5.2.1 Interceptors shall be so designed that they will not become air bound if closed covers are used.

5.3 ACCESSIBILITY OF INTERCEPTOR

5.3.1 Each interceptor shall be so installed as to provide ready accessibility to the cover and means for servicing and maintaining the interceptor in working and operating condition.

5.4 MAINTENANCE

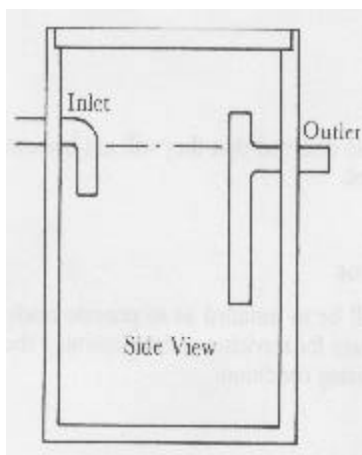
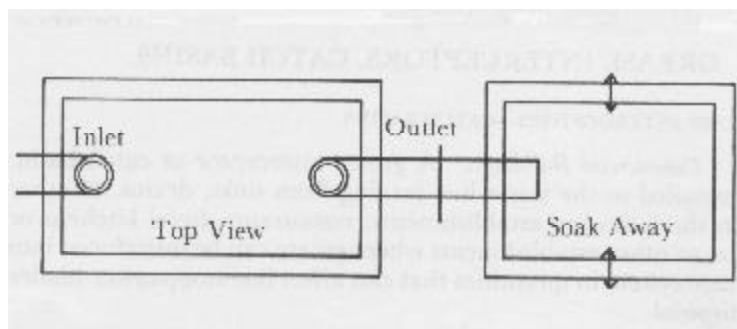
5.4.1 Interceptors, catch basins, and septic tanks shall be maintained in efficient operating condition by periodic removal of accumulated grease and solids.

5.5 SLAUGHTER HOUSES

5.5.1 *Separators.* Slaughtering-room drains shall be equipped with separators which shall prevent the discharge into the drainage system of feathers, entrails, and other materials likely to clog the drainage system.

5.5.2 *Interceptors.* Slaughtering and dressing room drains shall be provided with interceptors approved by the Authority.

COMMERCIAL KITCHEN GREASE INTERCEPTOR

*Specifications*

Inside dimensions	16" x 32" x 32" deep.
Capacity	9.5 cubic feet, 70 gallons.
Soak Away	Size depends on field conditions.
Bottom of inlet	12" below top of tank.
Top of outlet	Same elevation as bottom of inlet pipe.
Inlet elbow	Faces down 6".
Outlet tee	Extends to 12" from bottom of tank.
Top of outlet tee	Plugged, to be used for cleanout.
Grease interceptor	To be of waterproof construction, with removable cover.

CHAPTER 6**PLUMBING FIXTURES****6.1 GENERAL REQUIREMENTS**

6.1.1 *Quality of Fixtures.* Plumbing fixtures shall be constructed from approved materials, have smooth impervious surfaces, be free from defects and concealed fouling surfaces.

6.1.2 *Materials.* Sinks and special fixtures may be made of soapstone, chemical stoneware, or may be lined with lead, copper-base alloy, nickel-copper alloy, corrosion resisting steel, or other materials especially suited to the use for which the fixture is intended.

6.1.3 *Design.* In any one structure only plumbing fixtures similar to one another in quality and design shall be used.

6.2 OVERFLOWS

6.2.1 *Design.* When any fixture is provided with an overflow the waste piping shall be so designed that the standing water in the fixture cannot rise in the overflow when the stopper is closed or remain in the overflow when the fixture is emptied.

6.2.2 *Connection.* The overflow pipe from a fixture shall be connected on the house or inlet side of the fixture trap, except that overflows of flush tanks may be discharged into the water closets or urinals served by them, but it shall be unlawful to connect such overflows with any other part of the drainage system.

6.3 INSTALLATION

6.3.1 *Cleaning.* Plumbing fixtures shall be installed in a manner to

afford easy access for cleaning. Where practical, all pipes from fixtures shall be run to the nearest wall.

6.3.2 *Joints.* Where a fixture comes in contact with wall and floors, the joints shall be water tight.

6.3.3 *Securing Fixtures.* Floor outlet fixtures shall be rigidly secured to floor by screws or bolts.

6.3.4 *Wall Hung Bowls.* Wall hung water closet bowls shall be rigidly supported by a concealed metal member so that no strain is transmitted to the closet connection.

6.3.5 *Setting.* Fixtures shall be set level and in proper alignment with reference to adjacent walls.

6.4 WATER SUPPLY PROTECTION

6.4.1 The supply lines or fittings for every plumbing fixture shall be so installed as to prevent backflow.

6.5 STRAINERS AND WASTE OUTLETS

6.5.1 All plumbing fixtures, other than water closets and siphonaction washdown or blowout urinals, shall be provided with metal strainers.

6.6 WATER CLOSETS

6.6.1 *Flushing Device.* Water closet tanks shall have a flushing capacity sufficient to properly flush the water closet bowls with which they are connected.

6.6.2 *Ballcocks.* Ballcocks for flush tanks shall be of the antisiphon type, properly installed, and having a provision for trap refill.

6.6.3 *Close-Coupled Tanks.* The flush valve seat in a close-coupled water closet combination shall be 1" or more above the rim of the bowl, so that the flush valve will close even if the closet trapway is clogged. A water closet with a flush valve set less than 1" above the rim of the bowl is prohibited.

6.6.4 *Automatic Flush Valve.* Flush valves shall be so installed that they will be readily accessible for repairing. When the valve is operated it shall complete the cycle of operation automatically, opening fully and closing positively under the service pressure. At each operation the valve shall deliver water in sufficient volume and at a rate that will thoroughly flush the fixture and refill the fixture trap. Means shall be provided for regulating flush valve flow. Not more than one fixture shall be served by a single flush valve. Protection against backflow shall be provided by a satisfactory backflow preventer.

6.6.5 *Seats.* Water closets shall be equipped with seats of smooth non-absorbent material. All seats of water closets provided for public use shall be of the open front type.

6.6.6 *Surrounding Materials.* Where water closets are installed for public use the flooring under the fixture base extending to at least 18" from the front and both sides of the closet and extending to the wall from the back of the water closet shall be of non-absorbent material.

6.6.7 *Location.* No water closet shall be located in a room or compartment which does not have sufficient illumination at floor level, and/or which is not ventilated to the atmosphere, either forced draft or direct opening.

6.6.8 Nothing in the foregoing shall prevent the use of an approved low water use toilet where sewage disposal is by septic tank and subsurface disposal.

6.7 URINALS

6.7.1 *Automatic Flushing Tank.* Tanks flushing more than one urinal shall be automatic in operation and of sufficient capacity to provide the necessary volume to flush and properly cleanse all urinals simultaneously not less than four times per hour.

6.7.2 *Float Valves.* Float valves or ballcocks for flush tanks shall be of the anti-siphon type, properly installed, and having a provision for trap refill if serving a urinal incorporating a reverse trap.

6.7.3 *Trough Urinals.* Trough urinals shall be not less than 6" deep and shall be furnished with one-piece backs and have strainers with outlets at least 1½" in diameter. The washdown pipe shall be perforated so as to flush with an even curtain of water against the back of the urinal. This pipe shall be securely clamped as high as practicable to the back of the urinal. Trough urinals shall have tanks with a flushing capacity of not less than 1½ gallons of water for each 2' of urinal length. Protection against backflow shall be provided.

6.7.4 *Equivalent Length.* Trough urinals shall be figured on the basis of one urinal for each 18" of length, i.e.

24" trough equals one urinal
36" trough equals two urinals
48" trough equals three urinals
60" trough equals four urinals
72" trough equals five urinals

6.7.5 *Backflow Prevention.* All urinals not otherwise specified shall be protected against backflow.

6.7.6 *Surrounding Materials.* When for public use, the wall and floor space to a point 18" in front of the urinals lip, 4' above the floor, and at least 18" to each side of the urinal shall be of non-absorbent material.

6.7.7 *Location.* No urinal shall be located in a room or compartment which has inadequate lighting at floor level and/or which is not vented to the atmosphere, either forced draft or direct opening.

6.8 BATHTUBS

6.8.1 Bathtubs shall have waste outlets not less than 1½" in diameter. Outlet openings may have open strainers or stoppers.

6.9 LAVATORIES

6.9.1 Lavatories shall have waste outlets not less than 1¼" in diameter. Waste may have open strainers or may be provided with stoppers.

6.10 SHOWER RECEPTORS AND COMPARTMENTS

6.10.1 *On the Ground.* Shower receptors built on the ground shall be constructed from dense non-absorbent and non-corrosive materials and shall have smooth impervious surfaces.

6.10.2 *Dimensions.* Shower compartments shall have not less than 1,024 square inches in floor area and, if rectangular, square, or triangular in plan, shall not be less than 30" in shortest dimension.

6.10.3 *Construction.* Floors under shower compartments shall be laid on a smooth and structurally sound base, and shall be lined and made water tight with sheet lead, copper, or other acceptable materials. Shower compartments located in rooms in which the floor has been laid directly on the ground need not be lined.

6.10.4 *Public or Institution Showers.* Floors of public shower rooms shall be drained in such a manner that no waste water from any shower will pass over areas occupied by other bathers.

6.10.5 *Walls.* Shower compartments shall have walls constructed of smooth, non-corrosive and non-absorbent waterproof materials to a height of not less than 6' above the floor.

6.10.6 *Joints.* Built-in-tubs with overhead showers shall have waterproof joints between the tub and the waterproof wall.

6.11 SINKS

6.11.1 Sinks shall be provided with waste outlets not less than 1½" in diameter. Waste outlets may have open strainers or may be provided with stoppers.

6.12 DRINKING FOUNTAINS

6.12.1 *Design.* Drinking fountains shall conform to the standards of good hygienic practice.

6.12.2 *Protection of Water Supply.* Stream projectors shall be so assembled as to provide an orifice elevation as follows:

- (a) Minimum Elevation. All drinking fountain nozzles including those which may at times extend through a water surface with orifice not greater than 7/16" in diameter or 0.150 square inches in area shall be placed so that the lower edge of the nozzle orifice is at an elevation not less than ¾" above the flood level rim of the receptacle.
- (b) The ¾" elevation shall also apply to nozzles with more than one orifice, provided that the sum of the area of all orifices shall not exceed the area of a circle 7/16" in diameter.

6.12.3 *Material.* The fountain should be constructed of impervious material such as vitreous china, porcelain, enameled cast iron, other metals, or stoneware.

6.12.4 *Installation.* The jet of the fountain should issue from a nozzle of non-oxidising non-toxic impervious material set at an angle from the vertical such as to prevent the return of water in the jet to the orifice from whence the jet issues. The nozzle and every other opening in the water pipe or conductor leading to the nozzle should be above the edge of the bowl, so that such nozzle or opening cannot be flooded in case a drain from the bowl of the fountain becomes clogged.

6.12.5 *Protection.* The end of the nozzle should be protected by non-oxidising impervious guards to prevent the mouth and nose of the user from contact with the nozzle. Guards should be so designed that the possibility of transmission of infection by touching the guards is reduced to a minimum.

6.12.6 *Splattering.* The inclined jet of water from the nozzle should not touch the guard, and thereby cause Splattering.

6.12.7 *Cleansing.* The bowl of the fountain should be so designed and proportioned as to be free from corners which would be difficult to clean or which would collect dirt.

6.12.8 *Splashing.* The bowl of the fountain should be so proportioned as to prevent unnecessary splashing at a point where the jet falls into the bowl.

6.12.9 *Traps.* The drain from the fountain should not have a direct physical connection with a waste pipe, unless the drain is trapped.

6.12.10 *FlowRegulator.* The water supply pipe should be provided with an adjustable valve fitted with a loose key stop or an automatic valve permitting the regulation of the rate of flow of water to the fountain so that the

valve manipulated by the users of the fountain will merely turn the water on or off.

6.12.11 *Height.* The height of the fountain at the drinking level should be such as to be most convenient to persons using the fountain. The provision of several step-like elevations to the floor at the fountain will permit children of various ages to utilise the fountain.

6.12.12 *Flow.* The waste opening and pipe should be of sufficient size to carry off the water promptly. The opening should be provided with a strainer.

6.13 MULTIPLE WASH SINKS

6.13.1 *Circular Type.* Each 18" of wash sink circumference shall be equivalent to one lavatory.

6.13.2 *Straight-Line Type.* Multiple wash sinks of the straightline type shall have spouts not closer than 18" apart and each spout shall be considered the equivalent of one lavatory.

6.14 LAUNDRY TRAYS

6.14.1 Each compartment of a laundry tray shall be provided with a waste outlet not less than 11" in diameter and with a stopper.

6.15 SPECIAL FIXTURES AND SPECIALTIES

6.15.1 *Water and Drain Connections.* Baptistries, ornamental and lily pools, aquaria, ornamental fountain basins, and similar constructions when provided with water supplies shall be protected from back siphonage.

6.15.2 *Approval.* Specialties requiring water and waste connections shall be submitted for approval when so required by the Authority.

6.15.3 *Fixtures for Children.* Fixtures for children are smaller than regular fixtures. Pre-schools, kindergartens, and children's wards (hospitals) should install plumbing fixtures for children.

6.16 MINIMUM PLUMBING FACILITIES

6.16.1 See the Table "Minimum Plumbing Fixtures".

RECOMMENDED MINIMUM PLUMBING FACILITIES

Type of Building or Occupancy	Number of Water Closets	Number of Urinals	Number of Lavatories	Number of Bathtubs or Showers	Number of Drinking Fountains
Single Family Residence	1		1	1	
Multiple Dwelling -per unit	1		1	1	
Apartments - per unit	1		1	1	
Church Number of Females Number of Males	1 for every 1 to 150 1 to 300	1 for every 300	1 for every 1 to 150 1 to 300		1 for every 300 persons
School Number of Females Number of Males	1 for every 1 to 18 1 to 30	1 for every 25	1 for every 1 to 18 1 to 30	1/5 of gym class pupils	1 for every 40 persons
Hospital Number of patients	1 for every 1 to 8		1 for every 1 to 10	1 for every 1 to 20	1 for every 100
Office Building Public Building Number of Females Number of Males	1 for every 1 to 15 1 to 15	1 for every 25	1 for every 1 to 15 1 to 15		1 for every 75 persons
Theater Auditorium Outdoor Arena Number of Females Number of Males	1 for every 1 to 100 1 to 100	1 for every 25	1 for every 1 to 230 1 to 200		1 for every 500 persons
Industrial Number of Females Number of Males	1 for every 1 to 10 1 to 10	1 for every 25	1 for every 1 to 10 1 to 15	1 for every 1 to 15 1 to 15	1 for every 75 persons

CHAPTER 7

HANGERS AND SUPPORTS

7.1 STRAIN AND STRESSES

7.1.1 Piping in a plumbing system shall be installed without undue strains and stresses and provision shall be made for expansion, contraction, and structural settlement.

7.2 VERTICAL PIPING

7.2.1 *Attachment.* Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents.

7.2.2 *Cast Iron Soil Pipe.* Cast iron soil pipe shall be supported at not less than every storey height and at its base. Supports shall be of ferrous material.

7.2.3 *Screwed Pipe.* Screwed pipe (SPS) shall be supported at not less than every other storey height and at its base. Supports shall be of ferrous material.

7.2.4 *Copper Tubing.* Copper tubing shall be supported at each storey for piping 1½" and over and at not more than 4' intervals for piping ¼" and smaller. Supports shall be of copper material.

7.2.5 *Plastic Pipe.* Plastic pipe shall be supported at not less than every storey height and at its base.

7.3 HORIZONTAL PIPING

7.3.1 *Supports.* Horizontal piping shall be supported at sufficiently

close intervals to keep it in alignment and prevent sagging.

7.3.2 *Cast Iron Soil Pipe.* Cast iron soil pipe shall be supported at not more than 5' intervals. Supports shall be of ferrous material or other appropriate material not subject to deterioration.

7.3.3 *Screwed Pipe.* Screwed pipe (SPS) shall be supported at approximately 12' intervals. Supports shall be of ferrous material or other appropriate material not subject to deterioration.

7.3.4 *Copper Tubing.* Copper tubing shall be supported at approximately 6' intervals for piping 1½" and smaller and 10' intervals for piping 2" and larger. Supports shall be of copper material.

7.3.5 *Plastic Pipe.* Plastic pipe shall be supported at intervals of not less than 4'. Plastic pressure pipe shall be supported in accordance with the manufacturer's recommendations.

7.3.6 *In Ground.* Piping in the ground shall be laid on a firm bed for its entire length, except where support is otherwise provided which is adequate in the judgment of the Authority.

7.4 HANGERS AND ANCHORS

7.4.1 *Material.* Hangers and anchors shall be of metal of sufficient strength to maintain their proportional share of the metal pipe alignments and prevent rattling.

7.4.2 *Attachment.* Hangers and anchors shall be securely attached to the building construction.

7.5 STRAINS AND STRESSES

7.5.1 *Installation of Pipe.* Piping in a plumbing system shall be so

installed as to prevent undue strains and stresses.

7.5.2 Expansion and Contraction. Provision shall be made for expansion and contraction of piping and for structural settlement that may affect the piping.

7.5.3 Piping in Concrete. Piping in concrete or masonry walls or footings shall be placed or installed in chases or recesses which will permit access to the piping for repair or replacement.

7.6 BASE OF STACKS

7.6.2 Pipe Materials. Other piping material shall be so anchored as to take the load off the stack at the base or the horizontal parts thereof.

CHAPTER 8

INDIRECT WASTE PIPING AND SPECIAL WASTES

8.1 INDIRECT WASTE (AIR GAP) PIPING

8.1.1 General. Wastes from the following shall discharge to the building drainage system through an air gap serving the individual fixtures, devices, appliances, or apparatus.

8.1.2 Food Handling. Establishments engaged in the storage, preparation, selling, serving, processing, or otherwise handling of food shall have the waste piping from all refrigerators, ice boxes, coffee makers, potato peelers, cooling or refrigerant coils, steam tables, egg boilers, vegetable sinks, or similar equipment discharge to the drainage piping system through an approved air gap, or discharge indirectly into a water supplied sink or receptor.

8.1.3 *Sterile Materials.* Appliances, devices, or apparatus such as stills, sterilisers, and similar equipment requiring water and waste connections and used for sterile material shall be indirectly connected or provided with an air gap between the trap and appliance.

8.1.4 *Cleaning.* Indirect waste piping shall be so installed as to permit ready access for flushing and cleaning.

8.2 MATERIAL AND SIZE

8.2.1 The material and size of indirect waste pipes shall be in accordance with the provisions of this Code applicable to sanitary drainage piping.

8.3 LENGTH AND SLOPE

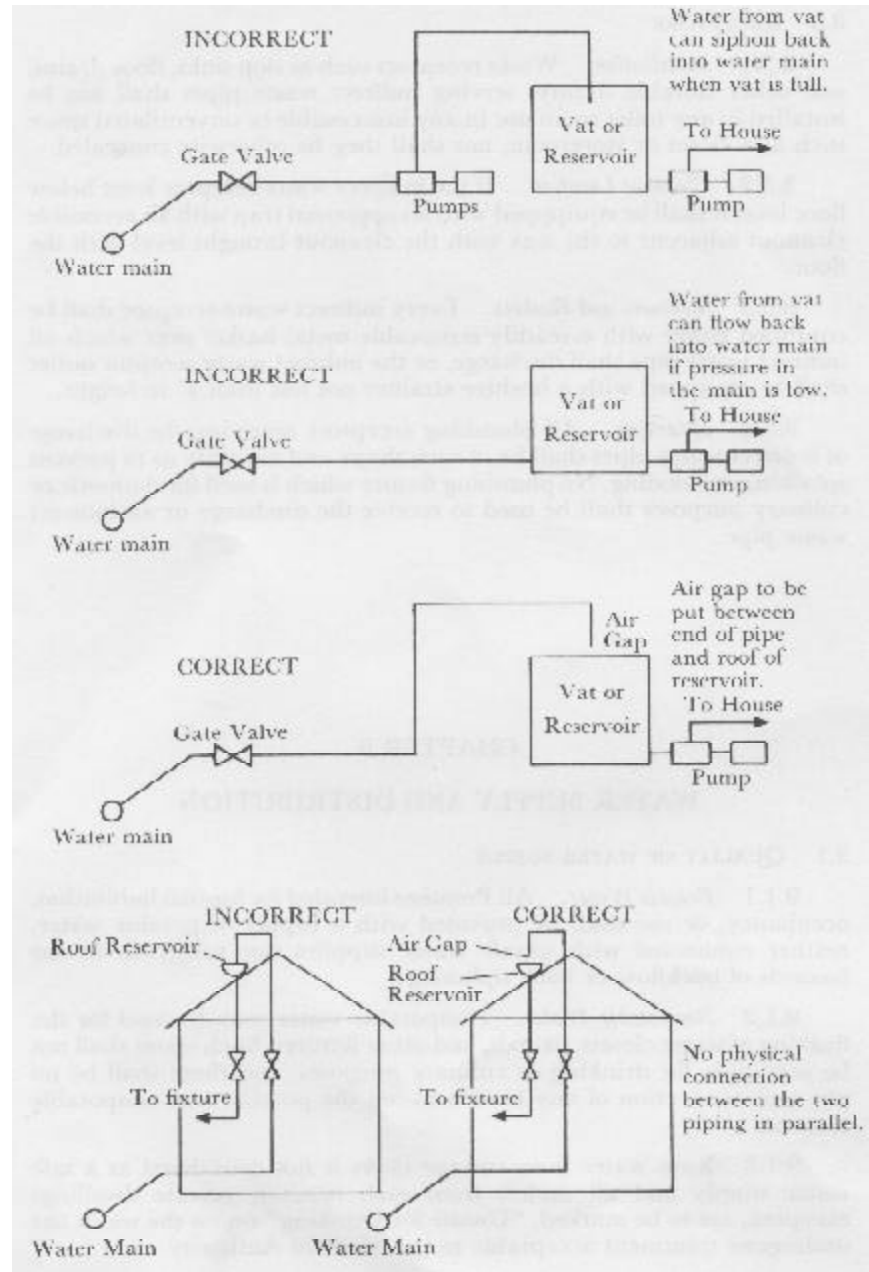
8.3.1 *Maximum Length.* The maximum length of the indirect waste to vent shall not exceed 15'.

8.3.2 *Minimum Slope.* Indirect waste pipes shall be installed at a uniform slope, but not less than 1/8" per foot.

8.4 AIR GAP OR BACKFLOW PREVENTER

8.4.1 The air gap between the indirect waste and the building drainage system shall be at least twice the effective diameter of the drain served and shall be provided by extending the indirect waste pipe to an open accessible slop sink, floor drain, or other suitable fixture which is properly trapped and vented. The indirect waste shall terminate a sufficient distance above the floor level rim of the receiving fixture to provide the required air gap, and shall be installed in accordance with the provisions of this Code. The break (airgap) in the drain connection shall be on the inlet side of the trap serving the fixture, device, appliance, or apparatus.

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- (a) It shall be unlawful for any water that has left the Belize water mains to return (re-enter) into the Belize water system.
- (b) No suction pumps are to be connected directly to the Belize water mains except pumps and equipment operated with the approval of the Administrative Authority.



8.5 RECEPTORS

8.5.1 *Installation.* Waste receptors such as slop sinks, floor drains, and other suitable fixtures serving indirect waste pipes shall not be installed in any toilet room nor in any inaccessible or unventilated space such as a closet or storeroom, nor shall they be otherwise concealed.

8.5.2 *Cleanout Location.* If the indirect waste receptor is set below floor level it shall be equipped with an approved trap with an accessible cleanout adjacent to the sink with the cleanout brought level with the floor.

8.5.3 *Strainers and Baskets.* Every indirect waste receptor shall be equipped either with a readily removable metal basket over which all indirect waste pipe shall discharge, or the indirect waste receptor outlet shall be equipped with a beehive strainer not less than 4" in height.

8.5.4 *Splashing.* All plumbing receptors receiving the discharge of indirect waste pipes shall be of such shape and capacity as to prevent splashing or flooding. No plumbing fixture which is used for domestic or culinary purposes shall be used to receive the discharge or an indirect waste pipe.

CHAPTER 9

WATER SUPPLY AND DISTRIBUTION

9.1 QUALITY OF WATER SUPPLY

9.1.1 *Potable Water.* All Premises intended for human habitation, occupancy, or use shall be provided with a supply of potable water, neither connected with unsafe water supplies nor subjected to the hazards of backflow or back siphonage.

9.1.2 *Nonpotable Water.* Nonpotable water may be used for the flushing of water closets, urinals, and other fixtures. Such water shall not be accessible for drinking or culinary purposes, and there shall be no physical connection of any kind between the potable and nonpotable systems.

9.1.3 Rain water from storage tanks is not considered as a safe water supply and all outlets from such systems, private dwellings excepted, are to be marked, "Unsafe for Drinking" unless the water has undergone treatment acceptable to the Medical Authority.

9.2 WATER SUPPLY MANDATORY

9.2.1 Every building in which plumbing fixtures are installed for human use shall be provided with an adequate water supply.

9.3 PROTECTION OF POTABLE WATER SUPPLY

9.3.1 *Cross Connection.* Potable water supply piping, water discharge outlets, backflow prevention devices, or similar equipment shall not be so located as to make possible a cross connection. A cross connection is any physical connection or arrangement of piping which provides a connection between a safe water supply system and a separate system or source which is unsafe or of questionable safety, and which under certain conditions permits a flow of fluids between safe, unsafe, or questionable systems or sources.

9.3.2 *Approval of Devices and Maintenance.* Devices installed in a potable water supply for protection against backflow shall be maintained in good working condition by the person or persons having control of such devices. The Authority having jurisdiction may inspect such devices and, if they are found to be defective or inoperative, shall require the replacement thereof.

9.3.3 *Backflow.* The water distribution system shall be protected against backflow. Every water outlet shall be protected from backflow,

preferably by having the outlet end from which the water flows spaced, a distance above the flood level rim of the receptacle into which the water flows, sufficient to provide a minimum required air gap. Where it is not possible to provide a minimum air gap, the water outlet shall be equipped with an accessibly located vacuum breaker installed on the discharge side of the final control valve.

9.3.4 *Prohibited Connections.*

- (a) **Chonical, Contaminated Water, or Sewerage Lines or Vessels.** There shall be no direct connection between potable water lines and lirros, equipment, or vessels containing raw or contaminated water, contaminating chemicals, or sewage. Such connections shall be made only through a minimum air gap.
- (b) **Chemical or Petroleum Pressure Vessels.** No person, corporation, or firm shall connect any pressure vessel, i.e. storage tank, tank car, tank truck or trailer, or other miscellaneous pressurised tank or cylinder containing or having contained liquified gaseous petroleum products or other liquified gaseous chemicals to any potable water supply. Water for flushing or cooling, or otherwise to be installed into such a vessel, shall be obtained by gravity through a minimum air gap. If water under pressure is required it may be supplied only by means of an auxiliary pump taking suction from a suction tank provided with an over-rim supply having the required minimum air gap.
- (c) **Refrigerant Condensers.** No refrigerant condenser of the water jacket type with a common wall between the refrigerant gas and the cooling water

shall be directly connected to a potable water supply. Cooling water, if from a potable water supply, shall be obtained by gravity through a minimum air gap or by use of an auxiliary pump and tank.

- (d) Exception. Chemical pressure vessels containing chemicals used in the water treatment process by the authority charged with the operation of the water supply are hereby exempted from the provisions of paragraph 9.3.4, subparagraphs (a) and (b).

9.4 VACUUM BREAKERS AND AIR GAPS

9.4.1 *Air Gaps.* Air gaps should be used whenever possible, in preference to backflow (vacuum breakers), and should be used on such installations as cooling towers, air-conditioning plenum chambers, open tanks, etc., in accordance with the following requirements.

- (a) The air gap in a water supply system is the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank or plumbing fixture and the flood level rim of the receptacle.
- (b) The minimum required air gap shall be measured vertically from the end of the faucet spout or supply pipe to the flood level rim of the fixture or vessel.
- (c) The minimum required air gap shall be twice the diameter of the effective opening.

- (d) Where it is not practical to provide the minimum required air gap above the flood level rim of a tank or vat, a backflow preventer shall be installed, but only with the specific approval of the Authority.

9.4.2 *Vacuum Breakers or Backflow Preventers*

- (a) Backflow preventers shall be installed with any supply fixture, the outlet end of which may at times be submerged, such as hose and spray, direct flushing valves, aspirators, and underrim water supply connections to a plumbing fixture or receptacle in which the surface of water in the fixture or receptacle is exposed at all times to atmospheric pressure. The type of preventer referred to will not protect against backflow when water is discharged through it into a space which contains pressure higher than atmospheric.
- (b) Backflow preventers; shall be installed between the control valve and the fixture and in such a manner that they will not be subjected to water pressure, except the back pressure incidental to water flowing to the fixture.
- (c) Backflow preventers shall be installed on the outlet side of the control valve.
- (d) Backflow preventers shall be made of corrosion resistant material and shall be so designed and proportioned as to prevent deterioration or deformation under reasonable service conditions.

9.5 WATER SERVICE PIPE

9.5.1 *Placement.* The underground water service pipe and the building drain shall be separated by undisturbed or compacted earth and shall never be in the same trench.

9.5.2 *Exception.* The water service pipe may be placed in the same trench with the building drain provided that the following conditions are met and provided the plans of such installations have the prior approval of the Authority.

- (a) The bottom of the water service pipe, at the point shall be at least 18" above the top of the drain line at its highest point.
- (b) The water service pipe shall be placed on a solid shelf excavated at one side of the common trench.
- (c) The number of joints in the service pipe shall be kept to a minimum.
- (d) The materials and joints of drain and water service pipe shall be installed in such a manner and shall possess the necessary strength and durability to prevent the escape of solids, liquids, and gases therefrom under all known adverse conditions such as corrosion, strains due to temperature changes, settlement, vibrations, and superimposed loads.

9.5.3 *Stop-and-Waste Valve Combination.* Combination stop-and waste valves and cocks shall not be installed in an underground service pipe. In no case shall a stop-and-waste valve be located closer than 10' to a sewer or drain line. Stop-and waste valves shall be replaced with shut-off and drip valves.

9.5.4 *Private Water Supply Interconnection.* Whenever a system of water supply piping is installed either inside or outside of any building or structure, or in any public way or other public or private property which receives its supply from any rain vat, well, cistern, river, pond, lake, or any other source except the Belize Waterworks systems, such system shall be kept entirely separated from and no connections of any kind, either direct or indirect, shall be made with any pipe or system of piping which receives its supply from the Belize Waterworks systems.

9.5.5 *Rain Vats, Reservoirs, Receiver Tanks.* Rain vats, reservoirs, or receiver tanks shall not be interconnected with any public water supply without an approved air gap in the piping system.

9.6 WATER PUMPING AND STORAGE EQUIPMENT

9.6.1 *Pumps, Rain Vats, and Other Appliances.* Water pumps, tanks, rain vats, filters, and all other appliances and devices shall be protected against contamination.

9.6.2 *Water Supply Tanks and Rain Vats.* Potable water supply tanks and rain vats shall be properly covered to prevent the entrance of foreign material or insects into the water supply. Soil or waste lines shall not pass directly over such tanks.

9.6.3 *Cleaning, Painting, Repairing Water Tanks and Rain Vats.* A potable water supply tank used for domestic purposes shall not be lined, painted, or repaired with any material which will affect either the taste or the potability of the water supply when the tank is returned to service. Tanks shall be disconnected from the system during such operations to prevent any foreign fluid or substance from entering the distribution piping.

9.7 WATER SUPPLY TANKS AND AUXILIARY PRESSURE SYSTEMS

9.7.1 *When Required.* When the water pressure from the public water supply main is insufficient during periods of peak flow or due to the building height to supply all fixtures adequately and continuously, the rate of supply shall be supplemented by gravity or auxiliary pressure (booster) systems. Auxiliary pressure systems shall not be utilised as an alternate for adequate sizing of water distribution piping within the buildings. Pumps are not to be connected to the supply mains without the written approval of the Authority.

9.7.2 *Support.* All water supply tanks shall be supported in accordance with the building code or other applicable regulations.

9.7.3 *Tank Supply Inlet.* The water supply inlet within the tank shall be at an elevation not less than is required for an air gap in an open tank with overflow, but in no case shall the elevation be less than 4" above the overflow.

9.7.4 *Overflow for Water Supply Tanks.* Overflow pipes for gravity tanks shall discharge above and within 6" of a roof or catch basin, or they shall discharge over an open water supplied sink. Adequate overflow pipes properly screened against the entrance of insects and vermin shall be provided.

9.7.5 *Drains.* Water supply tanks shall be provided with valved drain lines located at their lowest point and discharged as an indirect waste.

9.7.6 *Gravity and Suction Tanks.* Tanks used for domestic water supply, combined supply to fire standpipes and domestic water system, or to supply standpipes for fire fighting equipment only, shall be equipped with tight overlapping covers which are vermin and rodent proof. Such tanks shall be vented with a return bend vent pipe having an area not less than one-half the area of the down feed riser and the vent opening shall be covered with a

metallic screen of not less than twenty four mesh per inch.

9.8 DISINFECTION OF POTABLE WATER SYSTEM PIPING

9.8.1 Potable water systems or any part thereof installed or repaired shall be disinfected in accordance with one of the following methods before being placed in operation:

- (a) The system, or part thereof, shall be filled with a solution containing fifty parts per million of available chlorine and allowed to stand six hours before flushing and returning to service.
- (b) The system, or part thereof, shall be filled with a solution containing one hundred parts per million of available chlorine and allowed to stand two hours before flushing and returning to service.
- (c) In the case of a potable water storage tank where it is not possible to disinfect as provided in (a) or (b) the entire interior of the tank shall be swabbed with a solution containing twenty parts per million of available chlorine and the solution allowed to stand two hours before flushing and returning to service.

9.9 WATER DISTRIBUTION PIPE, TUBING, AND FITTINGS.

9.9.1 Materials for water distribution pipes and tubing shall be plastic, brass, copper (type K.L. or M when used in accessible locations), cast iron, galvanised wrought iron, galvanised steel, stainless steel, and asbestos cement, with appropriate fittings. All threaded ferrous pipe and fittings shall be galvanised (zinc coated) or cement lined. When used underground in corrosive soil all ferrous pipe and fittings shall be coal tar enamel coated and threaded joints

shall be coated and wrapped after installation. Other materials may be approved by the Authority provided the materials are of proper grade and quality.

9.10 ALLOWANCE FOR CHARACTER OF WATER

9.10.1 *Selection of Materials.* When selecting the material and size of water supply pipe, tubing, or fittings, due consideration shall be given to the action of the water on the interior and of the soil, fill, or other material on the exterior of the pipe. No material that would produce toxic conditions in a potable water supply system shall be used for piping, tubing, or fittings.

9.10.2 *Used Piping.* No piping material that has been used for other than a potable water supply system shall be re-used in the potable water supply system.

9.11 WATER SUPPLY CONTROL VALVES

9.11.1 *Water Supply Control.* A main shut-off valve on the water service pipe shall be provided near the curb or property line. In addition, an accessible shut-off valve with a drip valve shall be provided inside near the entrance of the water service pipe into the building.

9.11.2 *Shut-Of Valve at Meter.* The curb shut-off valve at the intake side of the water meter shall be not less in size than the size of the building water service, and shall be of gate type.

9.11.3 *Tank Controls.* Supply lines taken from pressure or gravity tanks shall be valved at or near their source.

9.11.4 *Separate Controls for Each Family Unit.* In two-family or multiple dwellings each family unit shall be controlled by an arrangement of shut-off valves which permit each group of fixtures or the individual fixtures to be shut off without interference with the water supply to any other family unit or portion of the building.

9.11.5 *Group of Fixtures.* A group of fixtures means two or more fixtures adjacent or near each other. In a one-family house one or two bathrooms adjacent or one over the other may be considered a group.

9.11.6 *Building Other Than Dwellings.* In all buildings other than dwellings shut-off valves shall be installed which permit the water supply of all equipment in each separate room to be shut off without interference with the water supply to any other room or portion of building.

9.11.7 *Water Heating Equipment.* A shut-off valve shall be provided in the cold water branch line to each water storage tank or each water heater.

9.12 WATER SUPPLY DISTRIBUTION

9.12.1 *Water Service Pipe.* The water service pipe from the street main to the water distribution system for the building shall be of sufficient size to furnish an adequate flow of water to meet the requirements of the building at the peak demand, and in no case shall be less than $\frac{3}{4}$ " nominal diameter.

If flushometers or other devices requiring a high rate of water flow are used the water service pipe shall be designed to supply this flow.

9.12.2 *Demand Load.* The demand load in the building water supply system shall be based on the number and kind of fixtures installed and the probable simultaneous use of these fixtures.

9.13 PROCEDURE IN SIZING THE WATER DISTRIBUTION SYSTEM OF A BUILDING

9.13.1 *General.* The sizing of the water distribution system shall conform to good engineering practice.

9.13.2 *Minimum Flow Pressure.* Minimum, fairly constant, service pressure at the point of outlet discharge shall be not less than 8 psi (pounds per

square inch) for all fixtures except for direct flush valves, for which it shall not be less than 15 psi.

9.13.3 *Auxiliary Pressure. Supplementary Tank.* If the residual pressure in the system is below the minimum allowable at the highest water outlet when the flow in the system is at peak demand, an automatically controlled pressure tank or gravity tank shall be installed, of sufficient capacity to supply sections of the building installation which are too high to be supplied directly from the public water main.

9.13.4 *Low Pressure Cut-Off.* When a booster pump is used on an auxiliary pressure system there shall be installed a low pressure cut-off switch on the booster pump to prevent the creation of pressures less than 5 psi on the suction side of the pump. A shut-off valve shall be installed on the suction side of the water system and within 5' from the pump suction inlet, and a pressure gauge shall be installed between the shut-off valve and pump.

A pump suction tank shall be provided for the auxiliary pressure system. Water shall be supplied to the suction tank through a float controlled over rim supply having a minimum air gap equal to two diameters of the supply opening.

9.13.5 *Approval of Auxiliary Pressure System.* Whenever in any building, structure or premises receiving its water supply directly from the public water system, a pump or any other device of increasing the water pressure is to be installed, plans of such installations shall first be submitted to the Authority for approval.

9.13.6 *Variable Street Pressures.* When the street main has a wide fluctuation in pressure during the day, the water distribution system shall be designed for minimum pressure available.

9.13.7 *Hazard and Noise.* Where water pressures are excessive, air chambers or other approved mechanical devices shall be provided to reduce water hammer or line noise to such an extent that no pressure hazard to the piping will exist.

9.13.8 *Size of Fixture Supply.* The minimum size of a fixing supply pipe shall be as stipulated in the following table.

Type of Fixture	Fixture Unit Value as Load Factor	Minimum Size of Trap (inches)	Minimum Size of Fixture Drain (inches)	Minimum Size of Fixture Supply Pipe (inches)
Automatic Clothes Washer	3	1½	1½	½
Bathtub, with or without Shower	3	1½	2	½
Bidet	1	1¼	1½	3/8
Combination Sink and Food Waste Grinder	4	1½	1½	½
Dental Unit or Aspirator	1	1½	1½	3/8
Dishwasher, Dwelling	2	1½	1½	3/8
Dishwasher, Restaurant	3	2	2	¾
Drinking Fountain	½	1¼	1½	3/8
Floor Drain, above Ground	2	2	2	
Floor Drain, Underground	3	3	3	
Laundry Tray, One or Two compartments	2	1½	1½	½
Lavatory	1	1½	1½	3/8
Shower Stall	2	1½	1½	½
Shower, Group, per head	3			Each head ½
Sink, Dwelling	2	1½	1½	½
Sink, Restaurant	4	1½	2	½
Urinal, P-Trap Exposed	4	1½	2	Flush tank ½
Urinal, Stall Type	4	2	2	Flush valve ¾
Water Closet, Flush Tank	4	3	4	3/8
Water Closet, Flush Valve	8	3	4	1

For fixtures not listed, the minimum supply branch shall be the same as for a comparable fixture.

9.13.9 *Air Chambers.* An air chamber is a predetermined length of pipe, capped on one end, inserted in the run of the tee which serves the plumbing fixture.

- (a) Air chambers shall be installed at the upper terminals of all up feed riser pipes, and directly above the connection of such pipes to the plumbing fixture or other water supplied appliance. Such air chambers shall be installed in a direct line with the flow of water through such pipes and shall be of sufficient capacity to provide an air cushion which will absorb shock, stress, or strain and eliminate all excess noises which may be caused by the operation of any valves, faucets, bibbs, or cocks in the water supply system.
- (b) No air chamber which is constructed of pipe shall be of a size less than the pipe which it serves and to which it is connected; and it shall be not less than 2' in length.
- (c) The air chamber on each water supply branch to a plumbing fixture shall be not less than 12" long.

CHAPTER 10

DRAINAGE SYSTEM

10.1 MATERIALS

10.1.1 *General.* Pipe Tubing, and fittings for drainage systems shall comply with good engineering principles.

10.1.2 *Above Ground Piping Within Buildings.* Soil and waste

piping for a drainage system within a building shall be of cast iron, galvanised wrought iron, galvanised steel, lead, brass, copper (DWV or heavier), or DWV plastic.

10.1.3 *Underground Piping Within Buildings.* Drains within buildings, when underground, shall be of cast iron, copper (type K or L), or DWV plastic pipe.

10.1.4 *Exception.* In certain cases where extra-corrosive waste is to be carried or where soil conditions make it necessary, piping of other special materials may be used within limits defined in other provisions of this Code.

10.1.5 *Fittings.* Fittings on the drainage system shall conform to the type of piping used. Fittings on screwed pipe shall be of the recessed drainage type with flow in the direction of sweep of the fitting.

10.2 BUILDING DRAIN

10.2.1 *Separate Trenches.* The building drain shall be installed in a separate trench from the water service pipe, the pipes separated horizontally by not less than 10' of undisturbed or compacted earth. The building drain shall be of cast iron pipe, copper pipe (K or L), DWV plastic pipe, vitrified clay sewer pipe, asbestos cement sewer pipe, or bituminised fiber pipe. Joints shall be rotproof and water tight when tested.

10.2.2 *Drain in Filled Ground.* A building drain installed in filled or unstable ground shall be of cast iron pipe, except that nonmetallic drain may be laid upon an approved concrete pad if installed in accordance with good engineering principles.

10.2.3 *Sanitary and Storm Drains.* Where separate systems of sanitary and storm drainage are installed in the same property, the sanitary and storm building drains may be laid side by side in one trench.

10.2.4 *Old House Drains.* Old house drains may be used in connection with new building or new plumbing and drainage work only when they are found, on examination and test, to conform in all respects to the requirements governing new house drains, and the Authority shall notify the owner to make the changes necessary to conform to this Code.

10.2.5 *Protection of Pipes.* Trench bottoms shall be hand-trimmed to grade with the provision for bedding of the pipe throughout the entire length. Adequate excavations shall be made to accommodate the bells or couplings to prevent unnecessary stress in the pipe. Joints shall be made waterproof and rotproof.

10.3 DRAINAGE PIPING INSTALLATION

10.3.1 *Horizontal Drainage Piping.* Horizontal drainage piping shall be installed at a uniform slope but at slopes not less than 1/8" per foot.

10.3.2 *Small Piping.* Horizontal drainage piping of 3" diameter and less shall be installed with a fall of not less than 1/4" per foot.

10.3.3 *Large Piping.* Horizontal drainage piping larger than 3" diameter shall be installed with a fall of not less than 1/8" per foot.

10.3.4 *Cleanouts.* See Chapter 4.

10.4 FIXTURE UNITS

10.4.1 *Fixture Unit Values.* Fixture unit values as given in the Table in 9.13.8 designate the relative load weight of different kinds of fixtures which shall be employed in estimating the total load carried by a soil waste pipe and shall be used in connection with the tables of size for soil, waste, and drain pipes for which the permissible load is given in terms of fixture units.

10.4.2 *Fixture Unit Flow Rate.* Fixture unit flow rate is the total

discharge flow in gallons per minute (gpm) of a single fixture divided by 7.5 which provides the flow rate of that particular plumbing fixture as a unit of flow. Fixtures are rated as multiples of this unit of flow.

10.4.3 *Values for Continuous Flow.* For a continuous or semicontinuous flow into a drainage system such as from a pump, pump ejector, air conditioning equipment, or similar device, two fixture units shall be allowed for each gallon per minute of flow.

10.5 DETERMINATION OF SIZES FOR THE DRAINAGE SYSTEM

10.5.1 *Minimum Size of Fixture Drain.* See Table in 9.13.8.

10.5.2 *Maximum Fixture Unit Load.* The maximum number of fixture units that may be connected to a given size of building drain, horizontal branch, or vertical soil or waste stack is given in the Table in 10.5.4.

10.5.3 *Minimum Size of Building Drain, Horizontal Branch, or Vertical Soil Stack.* The minimum allowable size of any building drain, horizontal branch, or vertical soil or waste stack serving one or more water closets shall be 3". The building sewer and main building drain should be not less than 4" in diameter. Branches of sewer and drain should be sized according to the Table in 10.5.4.

10.5.4 *Building Drains.*

Diameter of Pipe (inches)	Maximum Number of Fixture Units That May Connected To...				
	Any Portion of Building Drain			Any Horizontal Branch	One Stack Up to 3 storeys
	Fall per foot				
	1/8 inch	¼ inch	½ inch		
1 ¼				1	2
1 ½				3	4
2		21	26	6	10
2 ½		24	31	12	20
3	20 *	27 *	36 *	20 *	30 **
4	180	216	250	160	240
5	390	480	575	360	540
6	700	840	1000	620	960

*Not more than two water closets.

**Not more than six water closets.

10.5.5 *Minimum Size of Soil and Waste Stacks.* No soil or waste stack shall be smaller than the largest horizontal branch connected thereto, except that a 4 x 3 water closet connection shall not be considered as a reduction in pipe size.

10.5.6. *Minimum Size of Stack Vent or Vent Stack.* Any structure on which a building drain is installed shall have at least one stack vent or vent stack carried full size through the roof not less than 2" in diameter or the size of the building drain, whichever is the greater.

10.5.7 *Future Fixtures.* When provision is made for the future installation of fixtures, those provided for shall be considered in determining the required sizes of drain pipes. Construction to provide for such future installation shall be terminated with a plugged fitting or fittings at the stack so as to form no dead end.

10.5.8 *Underground Drainage Piping.* No portion of the drainage

system installed underground shall be less than 2" in diameter.

10.6 SUMPS AND EJECTORS

10.6.1 *Building Drains Below Sewer.* Building drains which cannot be discharged by gravity flow shall be discharged into a gas-tight covered and vented sump from which the liquid shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment.

10.6.2 *Design.* Sump and pumping equipment shall be so designed as to discharge all contents accumulated in the sump during the cycle of emptying operation.

10.6.3 *Venting.* The system of drainage piping below the building drain level shall be installed and vented in a manner similar to that of the gravity system.

10.6.4 *Duplex Equipment.* Sumps receiving the discharge of more than six water closets shall be provided with duplex pumping equipment.

10.6.5 *Connections.* No direct connection of a steam exhaust blowoff, or drip pipe shall be made with the building drainage system. Waste water when discharged into the building drainage system shall be at a temperature not higher than 180°F. When a higher temperature exists proper cooling methods shall be provided.

10.7 FLOOR DRAINS

10.7.1 *Accessibility.* Floor drains shall connect into a trap so constructed that it can be readily cleaned and of a size to serve efficiently the purpose for which it is intended. The drain inlet shall be so located that it is at all times in full view.

10.7.2 *Provision for Evaporation.* Floor drain seals subject to

evaporation shall be of the deep-seal type or shall be fed from an approved plumbing fixture or by means of an approved automatic priming device designed and approved for that purpose.

10.7.3 *Size.* Floor drain traps and drains installed underground shall be not less than 2" in diameter.

10.7.4 *Floor Drain Connection.* All floor drains shall be connected and discharge to the building drain.

10.7.5 *Bell Traps.* Bell Traps are prohibited.

CHAPTER II

VENTS AND VENTING

11.1 PLUMBING VENTS

11.1.1 *Purpose.* Plumbing vents provide free circulation of air through the drainage and vent piping, maintain equal internal and external pressures; prevent plus or minus pressures; prevent selfsiphonage of traps; prevent indirect siphonage of traps; remove objectionable, odorous, or corrosive gases and vapors; and provide free flow of fixture wastes.

11.1.2 *Vent Systems.* See diagram "Vent Systems".

- (a) Dry Vent. A dry vent conducts air and vapors only.
- (b) Wet Vent. A wet vent conducts air and vapors, and also wastes. If the vent pipe from the bath were removed, the waste line from the lavatory would become a wet vent for the bath. (See

diagram).

- (c) Back Venting. Back Venting, individual venting, or continuous venting are all the same. Back venting is the vent system in which fixture vents are connected back to the main vent.
- (d) Back-to-Back Venting. Back-to-back venting is a single waste and vent piping arrangement for two fixtures with a partition or wall separating them. Back-to-back venting may also be used to vent fixtures located side by side on the same partition or wall.
- (e) Battery or Circuit Venting. Battery or circuit venting is used to vent a battery of not more than eight floor outlet water closets. The circuit vent connection is made between the last and next to last fixtures so the flush of the last fixture will keep the vent opening clear. The circuit vent continues undiminished in size and either terminates above the roof or ties into the soil stack above the top waste opening.
- (f) Loop Venting. Loop venting is a pipe continuation, in a vertical line, of the waste piping which receives the fixture discharge. It continues vertically to 6" above the fixture, makes a 180° turn (return bend) to loop back and reconnect into the same waste piping that received the fixture discharge.
- (g) Return Bend. Return bends (180°) are not recommended for the top of roof vents. Natural air flow through the vent system may be impeded

by the return bend in tropical climates where high humidity prevails, as in Belize.

11.2 MATERIALS

11.2.1 *Vents.* Pipe, tubing, and fittings for the vent piping system shall comply with good engineering principles.

11.2.2 *Piping.* Vent piping shall be of cast iron, galvanised wrought iron, galvanised steel, and ferrous alloys, lead, brass, copper (DWV or heavier), or DWV plastic.

11.2.3 *Other Materials.* Nothing in this by-law shall be deemed to preclude the use of other materials of equal or better quality when approved as such by the Authority.

11.3 PROTECTION OF TRAP SEALS

11.3.1 The protection of trap seals from siphonage or back pressure shall be accomplished by the appropriate use of soil or waste stacks, vents, revents, back vents, circuit or continuous vents, or combinations thereof, installed in accordance with the requirements of this chapter.

11.4 VENT STACKS

11.4.1 *Terminal.* The vent stack shall terminate independently above the roof of the building or shall be connected with the extension of the soil or waste stack (stack vent) at least 6" above the flood level rim of the highest fixture.

11.4.2 *Main Stack.* Every building in which plumbing is installed shall have at least one main stack which shall run undiminished in size and as directly as possible from the building drain through to the open air 6" above the roof.

11.5 VENT TERMINALS

11.5.1 *Roof Extension.* Extensions of vent pipes through a roof shall be terminated at least 6" above it.

11.5.2 *Flashings.* Each vent terminal that passes through the roof shall be made watertight with the roof by proper flashing.

11.5.3 *Flag Poling.* Vent terminals shall not be used for the purpose of flag poling, television aerials, or similar purposes.

11.5.4 *Location of Vent Terminal.* No vent terminal from a drainage system shall be directly beneath any door, window, or other ventilating opening of the building or of an adjacent building nor shall any such vent terminal be within 10' horizontally of such an opening unless it is at least 2' above the top of such opening.

11.6 VENT GRADES AND CONNECTIONS

11.6.1 *Grade.* All vent and branch vent pipes shall be so graded and connected as to drip back to the soil or waste pipe by gravity.

11.6.2 *Vertical Rise.* Where vent pipes connect to a horizontal soil or waste pipe the vent shall be taken off above the center line of the soil pipe, and the vent pipe shall rise vertically or at an angle not more than 45° from the vertical from the fixture it is venting before offsetting horizontally or before connecting to the branch vent.

11.6.3 *Height Above Fixtures.* A connection between a vent pipe and a vent stack or stack vent shall be made at least 6" above the flood level rim of the highest fixture served by the vent. Horizontal vent pipes forming branch vents or relief vents shall be at least 6" above the flood level rim of the highest fixture served, i.e., usually 42" above the floor.

11.7 Sumps

11.7.1 Sinks or sumps receiving indirect waste shall be located in a properly lighted and ventilated space.

11.8 FIXTURES BACK-TO-BACK

11.8.1 Two fixtures set back-to-back within the distance allowed between a trap and its vent may be served with one continuous soil or waste vent pipe provided that each fixture wastes separately into an approved double fitting having inlet openings at the same level.

11.9 FIXTURE VENTS

11.9.1 *Trap Seal Protection.* The plumbing system shall be provided with a system of vent piping which will permit the admission or emission of air throughout the entire system.

11.9.2 *Distance of Fixture Trap From Vent.*

Size of Fixture Drain (inches)	Distance Trap to Vent
1¼	2' 6"
1½	3' 6"
2	5'
3	6'
4	10'

11.10 COMMON VENT

11.10.1 *Individual Vent.* An individual vent, installed vertically, may be used as a common vent for two fixture traps when both fixture drains connect with a vertical drain at the same level.

11.10.2 *Common Vent.* A common vent may be used for two fixtures set on the same floor level but connecting at different levels in the stack provided the vertical drain is one pipe diameter larger than the upper fixture drain but in no case smaller than the lower fixture drain whichever is the larger.

11.11 WET VENT

11.11.1 *Single Bathroom Groups.* A single bathroom group of fixtures may be installed with the drain from a back vented lavatory, kitchen sink, or combination fixture serving as a wet vent for a bathtub or shower stall and for the water closet provided that:

- (a) Not more than one fixture unit is drained into a 1½" diameter wet vent or not more than four fixture units drain into a 2" diameter wet vent.
- (b) The horizontal branch connects to the stack at the same level as the water closet drain or below the water closet drain when installed on the top floor. It may also connect to the water closet bend.

11.11.2 *Double Bath.* Bathroom groups back-to-back on a top floor, consisting of two lavatories and two bathtubs or shower stalls, may be installed in the same horizontal branch with a common vent for the lavatories and with no back vent for the bathtubs or shower stalls and for the water closets provided the wet vent is 2" in diameter.

11.11.3 *Multistory Bathroom Groups.* On the lower floors of a multistorey building, the waste pipe from one of two lavatories may be used as a wet vent for one or two bathtubs or showers, provided that:

- (a) The wet vent and its extension to the vent stack are 2" in diameter.

- (b) Each water closet below the top floor is individually back vented.

11.11.4 Size of Vent Stacks.

Number of Wet Vented Fixtures	Diameter of Vent Stacks (inches)
1 or 2 bathtubs or showers	2
3 to 5 bathtubs or showers	2½
6 to 9 bathtubs or showers	3
10 to 16 bathtubs or showers	3½

11.11.5 Prohibited. No other form of wet vent is permissible.

11.12 STACKVENTING

11.12.1 A group of fixtures consisting of one bathroom group and a kitchen sink or combination fixture may be installed without individual fixture vents in a one storey building or on the top floor of a building provided each fixture drain connects independently to the stack and the water closet and bathtub or shower stall drain enters the stack at the same level.

11.13 INDIVIDUAL FIXTURE REVENTING

11.13.1 *Horizontal Branches.* One sink and one lavatory, or three lavatories within 8' developed length of a main vented line, may be installed on a 2" horizontal water branch without reventing provided the branch is not less than 2" in diameter throughout its length, and provided the wastes are connected into the side of the branch and the branch leads to its stack connection with a pitch of not more than ¼" per foot.

11.13.2 *Where Required.* When fixtures other than water closets

discharge downstream from a water closet each fixture connecting downstream shall be individually vented.

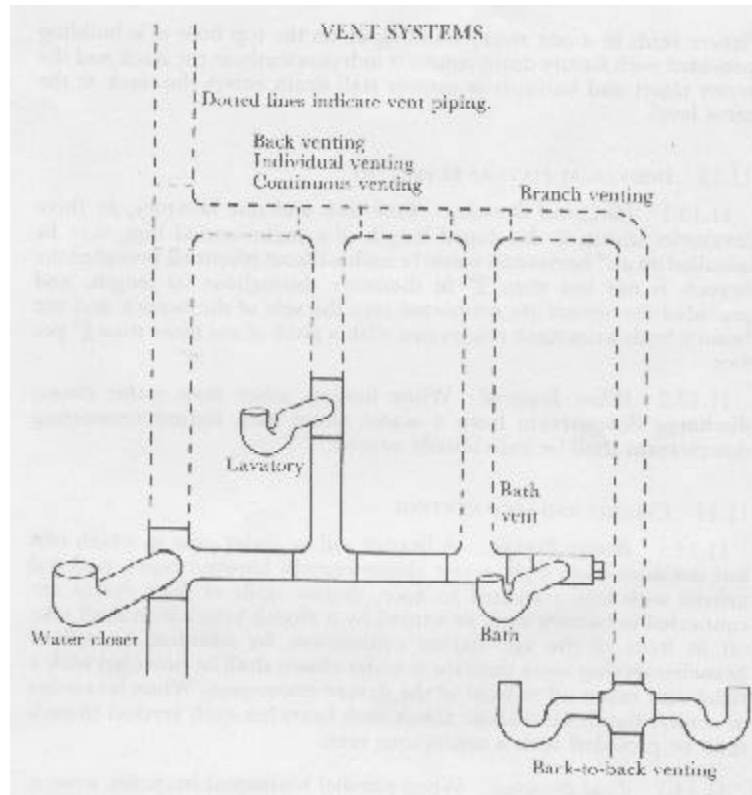
11.14 CIRCUIT AND LOOP VENTING

11.14.1 *Battely Venting.* A branch soil or water pipe to which two but not more than eight water closets (except blowout type), pedestal urinals with trap standard to floor, shower stalls or floor drains are connected in battery shall be vented by a circuit vent which shall take off in front of the last fixture connection. In addition, lower floor branches serving more than three water closets shall be provided with a relief vent taken off in front of the fixture connection. When lavatories or similar fixtures discharge above such branches each vertical branch shall be provided with a continuous vent.

11.14.2 *Dual Branches.* When parallel horizontal branches serve a total of eight water closets (four on each branch) each branch shall be provided with a relief vent at a point between the two most distant water closets. When other fixtures (than water closets) discharge above the horizontal branch each such fixture shall be provided with a continuous vent.

11.14.3 *Vent Connections.* When the circuit or relief vent connections are taken off the horizontal branch, the vent branch connection shall be taken off at a vertical angle from the top of the horizontal branch.

11.14.4 *Fixtures Back-to-Back in Battery.* When fixtures are connected to one horizontal branch through a double wye or a sanitary tee in a vertical position a common vent for each two fixtures back-to-back or a double connection shall be provided. The common vent shall be installed in a vertical position as a continuation of the double connection.



11.14.5 *Fixture Connections.* Branch wastes and fittings for circuit vented fixtures shall be set so that the fixture drain shall enter the side of the branch drain.

11.14.6 *Loop Vents.* Loop vents are prohibited.

11.15 MAIN VENTS TO CONNECT AT BASE

11.15.1 All main vents or vent stacks shall connect full size at their base to the building drain or to the main soil or waste pipe at or below the lowest fixture branch. All vent pipes shall extend undiminished in size above

the roof or shall be reconnected with the main soil or waste vent.

11.16 SIZE AND LENGTH OF VENTS

11.16.1 *Size of Individual Vents.* The diameter of an individual vent shall be not less than 1½" nor less than one-half the diameter of the drain to which it is connected.

11.16.2 *Size of Circuit Vent.* The diameter of a circuit vent shall be not less than one-half the diameter of the horizontal soil or waste branch or the diameter of the vent stack, whichever is smaller, but not less than 1¼".

CHAPTER 12

INSPECTION, TESTS, MAINTENANCE, AND ADMINISTRATION

12.1 INSPECTIONS

12.1.1 *New Work.* All new work and such portions of existing systems as may be affected by new work, or any changes, may be inspected by the Authority to ensure compliance with all the requirements of this Code and to assure that the installation and construction of the plumbing system is in accordance with approved plans.

12.1.2 *Workmanship.* Workmanship shall conform to generally accepted good practice.

12.2 NOTIFICATION

12.2.1 *Advance Notice.* It shall be the duty of the holder of a permit to give a notice to the Authority when plumbing work is ready for test or inspection.

12.2.2 *Plumber's Responsibility.* It shall be the duty of the holder of a permit to make sure that the work will stand the test prescribed before giving the notification.

12.2.3 *Retesting.* If the Authority finds that the work will not pass the test the holder of a permit shall be required to make necessary corrections and the work shall then be resubmitted for test or inspection.

12.2.4 *Test.* Tests shall be conducted in the presence of the Authority or its duly appointed representative.

12.3 CROSS CONNECTION AND PLUMBING SURVEY

12.3.1 The Authority may conduct an inspection survey of any or all plumbing installations existing at the time of adoption of this Code to determine the existence of public health or safety hazards including cross connections or back siphonage hazards which may result in contamination of the water supply. The responsible persons shall be required to correct any defects or they shall be considered to be in violation of this Code and subject to the penalties prescribed therefor.

12.4 VIOLATIONS

12.4.1 Notice of violations shall be written and mailed or delivered by the Authority to the person responsible at the time inspection was made.

12.5 REINSPECTION

12.5.1 Reinspection of plumbing installations or any part thereof shall be made when deemed necessary by the Authority.

12.6 COVERING OF WORK

12.6.1 *Requirements.* No drainage or plumbing system or part thereof shall be covered until it has been inspected, tested, and accepted as prescribed in this Code.

12.6.2 *Uncovering.* If any building drainage or plumbing system or part thereof which is installed, altered, or repaired is covered before being inspected, tested, and approved as prescribed in this Code it shall be uncovered for inspection after notice to uncover the work has been issued to the responsible person by the Authority.

12.7 MATERIAL AND LABOUR FOR TESTS

12.7.1 The equipment, material, and labour necessary for inspection or tests shall be furnished by the person to whom the permit is issued or by whom inspection is requested.

12.8 TESTS AND DRAINAGE AND VENT SYSTEMS

12.8.1 The piping of the plumbing, drainage, and venting systems may be tested by the Authority with water or air prior to setting the fixtures. After the plumbing fixtures have been set and their traps filled with water the entire drainage system may be submitted to a final test. The Authority may require the removal of any cleanouts to ascertain if the pressure has reached all parts of the system.

12.9 METHODS OF TESTING DRAINAGE AND VENT SYSTEMS

12.9.1 *Water Test.* The water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system all openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to the point of overflow. If the system is tested in sections each opening shall be tightly plugged except the highest opening of the section under test, and each section shall be filled with water, but no section

shall be tested with less than a 10' head of water. In testing successive sections at least the upper 10' of the next preceding section shall be tested so that no joint or pipe in the building (except the uppermost 10' of the system) shall have been submitted to a test of less than a 10' head of water. The water shall be kept in the system or in the portion under test for at least fifteen minutes before inspection starts; the system shall then be tight at all points.

12.9.2 *Air Test.* The air test shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets and outlets to the system forcing air into the system until there is a uniform gauge pressure of 5 psi or sufficient to balance a column of mercury 10" in height. (1 cu. in. of mercury weighs 0.49 lb., or ½ lb.) This pressure shall be held without introduction of additional air for a period of at least fifteen minutes.

12.9.3 *Final Test.* The final test of the completed drainage and vent system may be either a smoke test or a peppermint test. Where the smoke test is preferred it shall be made by filling all traps with water and then introducing into the entire system a pungent thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof they shall be closed and a pressure equivalent to a 1" water column (1 cu. in. of water weighs 0.036 lb. or ½ oz.) shall be built and maintained for fifteen minutes before inspection starts. Where the peppermint test is preferred 2 oz. of oil of peppermint shall be introduced for each line or stack before closing the stack and applying pressure as in the smoke test.

Generally a 1" pressure on a final smoke test is sufficient to discover any leak on a fixture connection or trap seal. A plumbing system is not designed for more than a 1" pressure at the fixture trap. Greater pressure may disturb the trap seals.

12.10 TEST OF WATER SUPPLY SYSTEM

12.10.1 Upon completion of a section or of the entire water supply system it shall be tested and proved tight under a water pressure not less than

50% greater than the working pressure under which it is to be used. The water used for tests shall be obtained from a potable source of supply.

12.11 CERTIFICATE OF APPROVAL

12.11.1 Upon the satisfactory completion and final test of the plumbing system a certificate of approval shall be issued by the Authority to the plumber to be delivered to the owner, or a self-adhesive non-removable certificate of approval shall be affixed to a portion of the pipe that will remain exposed.

12.12 DEFECTIVE PLUMBING

12.12.1 Whenever there is reason to believe that the plumbing system of any building has become defective that plumbing system shall be subjected to test or inspection, and any defects found shall be corrected as required in writing by the Authority.

12.13 MAINTENANCE

12.13.1 The plumbing and drainage system of any premises under the jurisdiction of the Authority shall be maintained in a sanitary and safe operating condition by the owner or his agent.

12.14 PERMIT FOR PLUMBING WORK

12.14.1 *Issuance of Permit.* No plumbing work, unless excepted in this by-law, shall be undertaken prior to the issuance of a permit by the Authority. The permit shall be issued to a licensed plumber.

12.14.2 *Exception.* Any permit required by this Code may be issued to any person to do any work regulated by this Code in a single-family dwelling used exclusively for living purposes, including the usual accessory buildings and quarters in connection with such buildings, provided the person is the *bona fide* owner of such dwelling and that the same will be occupied by the said

owner who shall personally purchase all material and perform all labour in connection therewith, and provided that all workmanship, methods, and materials shall meet the requirements of this Code.

12.14.3 *Application for Permit.* Application for permits shall be made on suitable forms provided by the Authority. The application shall be accompanied by fees in accordance with the schedule of fees.

12.4.4 *Schedule of Fees.* Fees shall be in accordance with the Official Schedule as prepared by the Authority.

12.15 REQUIREMENTS FOR PLUMBING PERMIT

12.15.1 *Plans and Specifications.* No permit shall be issued until plans and specifications showing the proposed work in necessary detail have been submitted to the Authority, or authorised representative, and it has been determined from examination of such plans and specifications that they give assurance that the work will conform to the provisions of this Code. If a permit is denied the applicant may submit revised plans and specifications without the payment of an additional fee. If in the course of the work it is found necessary to make any change from the plans and specifications on which a permit has been issued, amended plans and specifications shall be submitted, and a supplementary permit subject to the same conditions applicable to the original application for a permit shall be obtained to cover the change.

12.15.2 *Repairs.* Repairs involving only the working parts of a faucet or valve, the clearance of stoppages, repairing of leaks, or replacement of defective faucets or valves may be made without a permit provided no changes are made in the piping to the fixtures.

12.15.3 *Protection of Water Supply System.* The Authority may also make rules and regulations in furtherance of the purposes of this Code and not inconsistent with the specific provisions of this Code for the installation, repair, or alteration of air conditioning systems, water treatment equipment, and water

operated devices as may be deemed necessary to properly protect the water supply system.

12.16 ENFORCEMENT

12.16.1 *Inspection and Tests.* It shall be the duty of the Authority to enforce the provisions of this Code and to make the inspections and tests required thereunder.

12.16.2 *Right of Entry.* The authorised representative of the Authority shall after proper identification have the right to enter any premises for the purpose of inspecting any plumbing system at such times as may be reasonably necessary for the enforcement of this Code.

CHAPTER 13

ENFORCEMENT

13.1 CODE MANDATORY

13.1.1 The Code is mandatory and shall be followed as a minimum standard for all plumbing work done in Belize.

13.2 INSPECTIONS

13.2.1 The Authority may make routine plumbing inspections to ascertain compliance with the code, and shall investigate all *bona fide* complaints regarding failure of a contractor to comply with the requirements of the Code.

13.3 VIOLATIONS

13.3.1 *Notices of Violations.* Plumbing contractors will be informed of observed violations at the time of the inspection. This will be followed by a

formal notice of violation in writing, including a deadline date for correction of the violation.

13.3.2 *Reinspection.* Upon receipt of information indicating correction of violations or upon expiration of the established deadline a reinspection may be made and the indicated action taken in accordance with this Code.

13.3.3 *Failure to Comply.* Failure to comply with the provisions of this Plumbing Code may result in the water service pipe being removed and/or legal action taken to correct the violations.

CHAPTER 14

PRIVATE WATER SUPPLIES-WELLS

14.1 GENERAL

14.1.1 Lot sizing-Many residential areas not served by public water supply or sewerage systems have been developed in which the lot sizes are inadequate to permit the proper location of individual water and sewerage systems without the sewerage systems contaminating the water supplies. Under such circumstances, the construction of a municipal water supply system will ensure safe water. However, the resultant increased water consumption is likely to cause the individual sewerage systems to be increasingly inadequate and contamination of ditches and water courses result. Where municipal water supplies are not available for developing areas, lots with areas of less than one half acre should not be considered.

14.1.2 *Rainwater Storage Tanks.* Water from these storage tanks is not considered safe for human consumption unless it is treated since debris from roofs is collected in the Tanks. Tanks should be cleaned and disinfected at least once a year and the water should be chlorinated to eliminate bacteria.

Boiling and filtration of the water used for human consumption is the minimum acceptable precaution.

14.1.3 Wells—Wells may be classified into four groups on the basis of the method of construction, as follows: Dug, bored, driven, and drilled. Wells are susceptible to contamination from many sources and particularly from sewage disposal facilities and the dumping of waste oil. Dug wells are generally the most susceptible to contamination because they are shallow and do not have a water-tight casing. Wells with short water-tight casings are the next most susceptible and wells with long water-tight casings grouted in rock are the least susceptible to contamination. The minimum distance between wells and sources of contamination shall be not less than that given in the following table:

Distances in feet of wells from Sources of Contamination

	<i>Dug Wells Wells with less than 10' casing</i>	<i>Other Wells</i>
Sewer	50	50
Septic Tanks	50	50
Leaching Bed	150	100
Privies	45	50
Leaching Pits	150	100

Note: These distances constitute minimum separation and should be increased in areas of creviced rock or limestone, or where the direction of movement of the ground-water is from sources of contamination toward the well.

14.2 CONSTRUCTION

14.2.1 *Elevation.* The well site should have good surface drainage and should be at a higher elevation than possible sources of contamination. The top of the well should be at least 2' above the highest known water mark and at

least 50' from surface bodies of water.

14.2.2 *Depth.* The well should not be developed from a waterbearing stratum located less than 10' below grade and preferably, the stratum should be at least 20' from the natural ground surface.

14.2.3 *Outside Casing.* The well shall be provided with an outside water-tight casing extending at least 10' below and 6" above the ground surface. In the case of drilled or driven wells, the casing should be of steel or wrought iron. For dug or bored wells the casing should be of concrete 6" thick, except that in the case of the buried-slab type of dug or bored well, the upper 10' section of casing should be of steel or wrought iron as provided for drilled wells. The annular space between the casing and the earth formation shall be grouted to a depth of at least 10'. The casing shall be large enough to permit the installation of an independent drop pipe. The casing should preferably be sealed in an impermeable stratum or extended several feet into the water-bearing stratum.

14.2.4 *Cover.* Every well shall be provided with a watertight cover overlapping the top of the casing or pipe sleeve. The annular opening between the casing or pipe sleeve and drop pipe shall be sealed either by extending the casing or pipe sleeve into the base of the pump or by some suitable type of "well seal".

14.2.5 *Drainage.* The well platform or pump room floor shall be sloped to drain away from the well. The platform or floor shall be constructed of concrete at least 4" thick, or other material approved by the Authority.

14.2.6 *Dug or Bored Well.* In the case of a dug or bored well, the cover shall overlap and extend downward at least 2" outside the wall or curbing of the well.

14.2.7 *Pipe Sleeve-*A pipe sleeve of sufficient diameter to permit removal of the drop pipe and cylinder or jet body shall be provided in the

cover. The pipe sleeve should extend at least 1" above the cover.

14.2.8 *Pumping Equipment.* Pumping equipment should be installed to prevent the entrance of any contaminating substances into the well and equipment should be disinfected before use.

14.2.9 *Testing.* After construction of the well and before installation of equipment, water samples should be sent to a laboratory for chemical and bacteriological testing. This same sampling and testing should continue at least annually.

CHAPTER 15

PRIVATE SEWAGE DISPOSAL

15.1 GENERAL

15.1.1 *Systems.* Although private sewage disposal systems may range from complicated large sewage treatment plants, to packaged mechanical systems, to lagoons, to single family systems, only single family or small systems are discussed in the following articles and these will be confined to disposal of sewage by subsurface methods.

15.1.2 *Treatment Principles.* The degree of treatment of sewage depends on the time the sewage is in contact with oxygen. This is called aerobic treatment and all subsurface disposal is based on the principle of aerobic treatment. Since there is little oxygen in the groundwater, treatment of sewage in the groundwater table takes much longer than in the soil above the groundwater table and hence the groundwater contaminated with sewage will disperse the contamination over a wide area before treatment is complete. The soil above the groundwater table has much more oxygen especially if the soil is permeable, e.g. sand, and under normal conditions a large percentage of the sewage bacteria die off while percolating through as little as 3' of fine sand as long as the sand is

not flooded with percolating sewage.

15.1.3 *Rate of Application.* As one would expect, the lower the rate of application of sewage effluent per square foot of treatment bed, the greater is the treatment since with a low rate of application the effluent will percolate more slowly through the aerated treatment bed. For a given size of treatment bed and a given quantity of effluent per hour, it therefore becomes important to distribute the effluent as evenly as possible over the entire bed to keep the rate of application per square foot of bed to a minimum and avoid flooding parts of the treatment bed.

15.1.4 *Types of Systems.* Only two types of systems are considered in this Code. The first type is used where water pressure is not available in the dwelling and it consists of a privy for human excreta plus a leaching pit into which wash wastes are disposed. The second type is used where water pressure is available in the dwelling and it consists of a septic tank for settlement and digestion of solids plus leaching pits or leaching beds for the disposal of septic tank effluent.

15.1.5 *Location.* Privies, leaching pits, septic tanks and leaching beds are all sources of contamination of wells, ditches and surface waters and should not be located closer to such items than is shown in the following table:

Location of Components of Sewage-Disposal System

<i>Type of Item</i>	<i>Well or Suction Line</i>	<i>Water Supply Line (Pressure)</i>	<i>Surface Water</i>	<i>Dwelling</i>	<i>Property Line</i>
Building Sewer	50	10	-	-	-
Septic Tank	50	10	50	-	10
Leaching Bed	100*	25	50	10	10
Leaching Pit	100*	25	50	10	10
Privy	100*	25	50	10	10

**Note:* Distances are to be increased by 50' for dug wells and wells with casings extending into the ground less than 10'.

15.1.6 *High Ground Water Table.* To keep the leaching beds, leaching pits, and privies from contaminating the ground water significantly and thus spreading the contamination over a wide area, a minimum of 3' of permeable soil (fine sand, loam, etc). is required between the bottom of pit, privy or leaching bed trench and the high ground water table. The high ground water table can only be determined during the wettest time of the year and is the highest level to which the groundwater rises in a hole dug in the ground in the location of the proposed facility.

15.2 PRIVY PLUS LEACHING PIT

15.2.1 *Privy.* A properly located and built privy is the lowest contaminator of all private sewage disposal facilities since the water content of the human excreta is low and thus the spread of bacteria from the privy pit is minor. The chief health hazard from this type of system is caused by lack of cleanliness of the privy and transport of viruses by flies and rodents. It is therefore necessary to ensure that the privy is properly screened and the pit is maintained in a rodent proof condition. The pit should also be ventilated. Figure I shows a typical well built privy.

15.2.2 *Leaching Pit.* Where privies are built to handle excreta, leaching pits are required to handle other household wastes, wash water, etc. Although these wastes are thrown on the surface of the ground, such a practice attracts flies that can cause the spread of diseases. A leaching pit with a removable cover provides a sanitary method of disposal of such wastes. Figure 2 shows a typical leaching pit.

15.3 SEPTIC TANK PLUS EFFLUENT DISPOSAL

15.3.1 *General.* Where water pressure is available in a dwelling and the plumbing fixtures cannot be connected through the building sewer to a sewage collection system, a septic tank and effluent disposal system must be used.

15.3.2 *Septic Tank.* The septic tank is to be built of durable materials and is to be water tight. Minimum capacities for septic tanks serving individual dwellings are as shown in the following Table which includes recommended dimensions of tanks. A two compartment tank with the inlet compartment twice the size of the outlet compartment is recommended. Figure 3 shows the construction of a typical septic tank.

Minimum Capacities for Septic Tanks Serving an Individual Dwelling

<i>Number of Bedrooms</i>	<i>Maximum Number of Persons Served</i>	<i>Nominal Liquid Capacity of Tank</i>	<i>Recommended Inside Dimensions</i>			
			<i>Length</i>	<i>Width</i>	<i>Liquid Depth</i>	<i>Total Dept</i>
	<i>Persons</i>	<i>Gallons</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>
2 or less	4	500	6 0	3 0	4 0	5 0
3	6	600	7 0	3 0	4 0	5 0
4	8	750	7 6	3 6	4 0	5 0
5	10	900	8 6	3 6	4 6	5 0
6	12	1,100	8 6	4 0	4 6	5 0
7	14	1,300	10 0	4 0	4 6	5 0
8	16	1,500	10 0	4 6	4 6	5 0

Note: Liquid capacity is based on number of bedrooms in dwelling. Total volume in cubic feet includes air space above liquid level.

15.3.3 *Leaching Bed.* Figure 4 shows the construction of a typical leaching bed. All details as shown in the figure and its notes are important to the satisfactory operation of the leaching bed. The length of weeping pipes required in the bed depends on the trench bottom width and the permeability of the soil in which the trenches are dug. The width of the trench (minimum 1½') times the length of the trench is known as the absorption area. The following table shows absorption areas required in various soils for individual dwellings of various sizes.

**Absorption Areas Requirements (Absorption Trenches)
for Individual Premises**

<i>Absorption Area</i>	<i>Size of Dwelling</i>				
<i>Soil Structure</i>	<i>2 bedroom or 4 persons or less</i>	<i>3 bedroom or 6 persons</i>	<i>4 bedroom or 8 persons</i>	<i>5 bedroom or 10 persons</i>	<i>6 bedroom or 12 persons</i>
Course Sand & Gravel	150	175	200	250	300
Fine Sand	160	240	320	400	480
Sandy Loam or Sand with some clay	200	300	400	500	600
Clay with Considerable Sand	360	540	720	900	1,080
Clay with a small amount of Sand	480	720	960	1,200	1,440
Heavy Clay	Requires permeable fill with system installed in the fill				

Note: To get the length of absorption trench, divide figures shown by width of trench bottom in feet.

15.3.4 *Leaching Pit.* Figure 5 shows the construction of a typical leaching pit that can be used to supplement the absorption trenches or as a replacement for absorption trenches. The effective absorption area of the leaching pit is the bottom area excavation in which it is built plus the area of the walls of the excavation below the inlet pipe since the back fill around the structure is coarse gravel and rock. The absorption areas required in various soils for individual dwellings of various sizes are shown in the following table.

**Absorption Areas Requirements (Leaching pit)
for Individual Premises**

<i>Absorption Area</i>	<i>Size of Dwelling</i>				
<i>Soil Structure</i>	<i>2 bedroom or 4 persons or less</i>	<i>3 bedroom or 6 persons</i>	<i>4 bedroom or 8 persons</i>	<i>5 bedroom or 10 persons</i>	<i>6 bedroom or 12 persons</i>
Course Sand & Gravel	60	70	80	100	120
Fine Sand	70	100	120	150	180
Sandy Loam or Sand with some clay	120	150	200	250	300
Clay with Considerable Sand	180	240	320	400	480
Clay with little Sand	400	480	640	800	960

Note: Leaching pits are more subject to plugging than absorption trenches particularly in clay type soils.

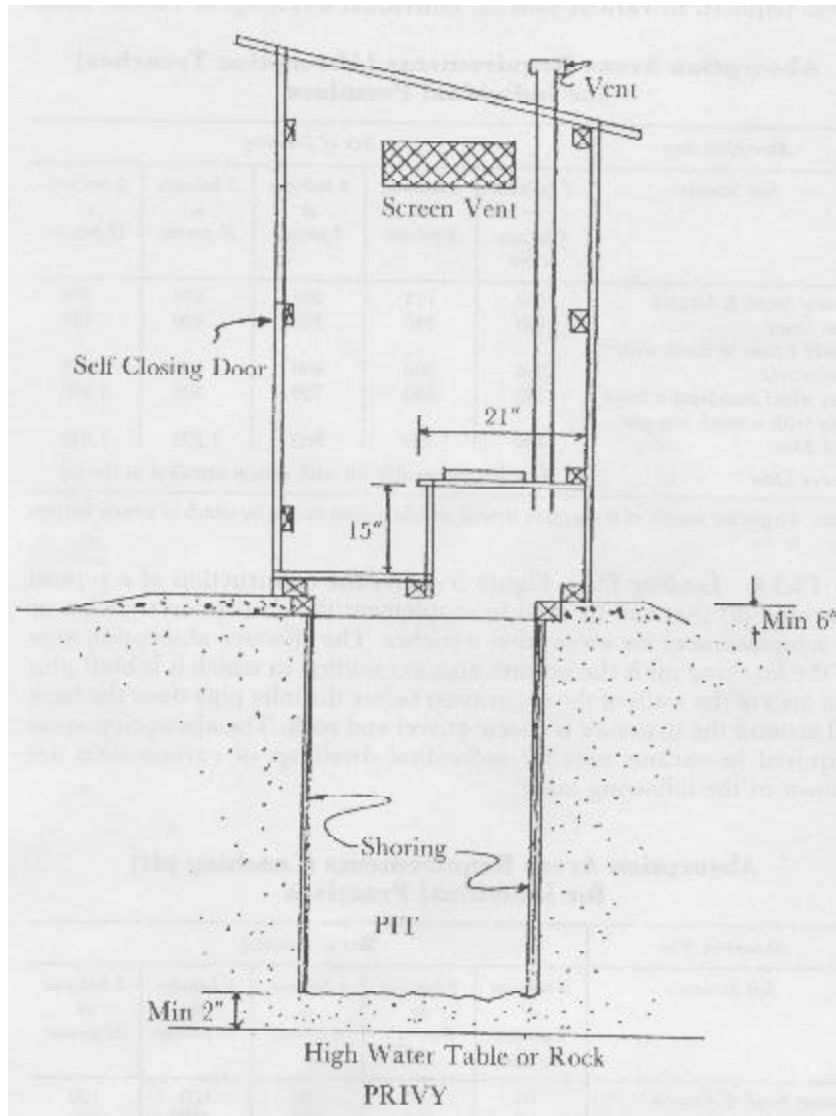


Figure 1

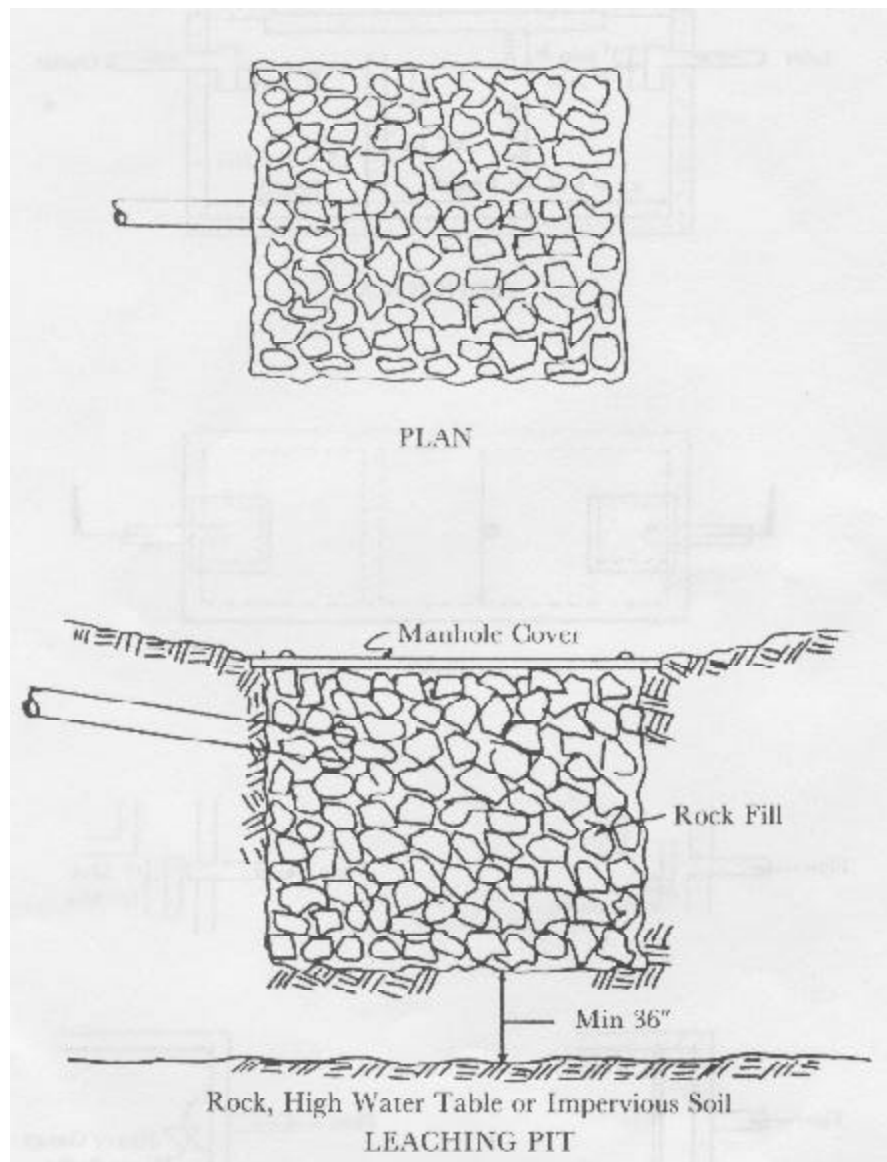


Figure 2

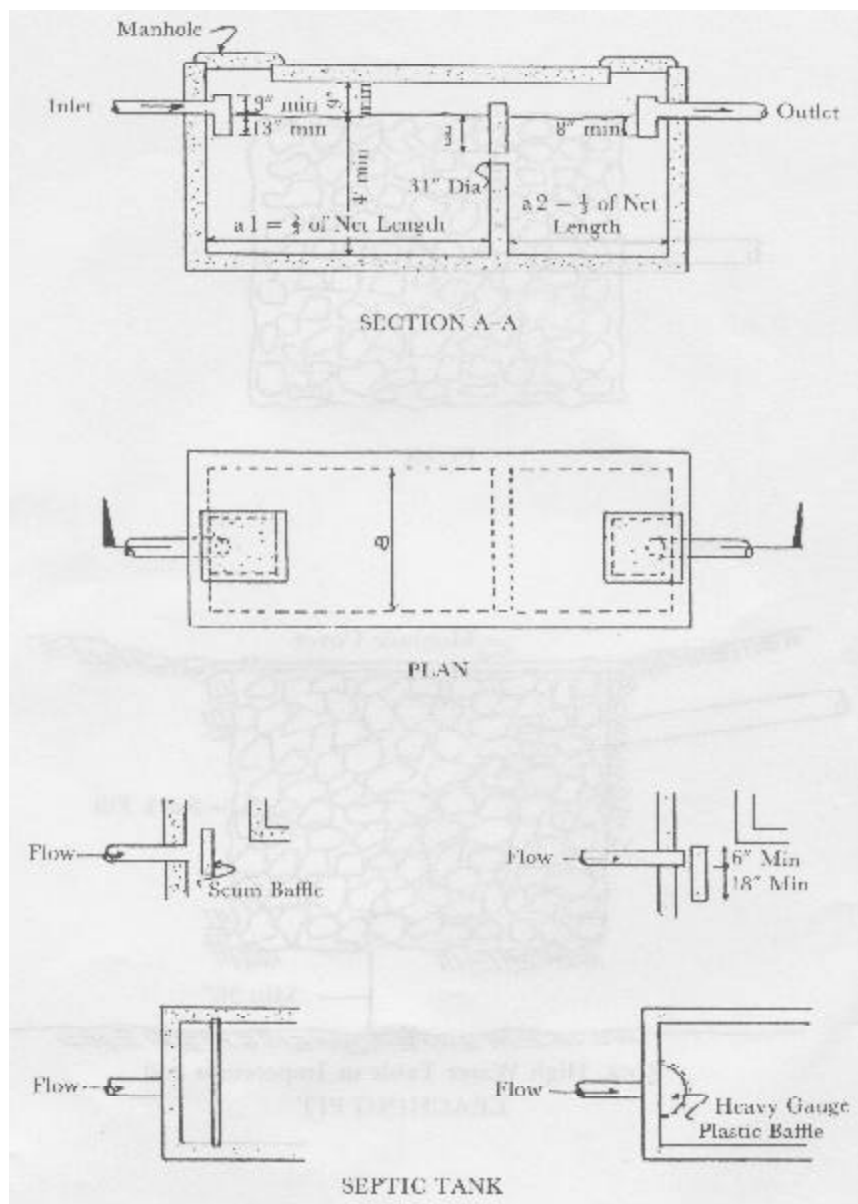


Figure 3

Max. Length Absorption Trench 60' Gravity Feed - 100' Dosed Bed

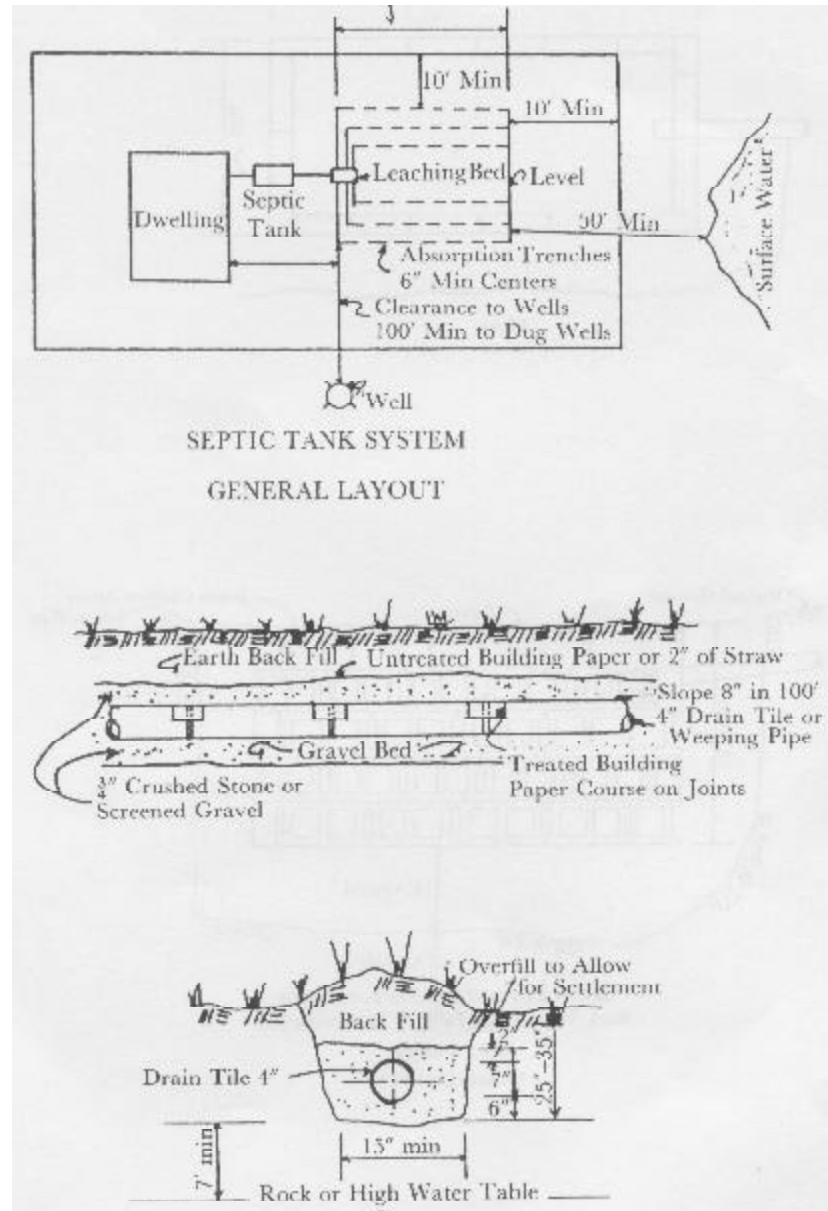


Figure 4

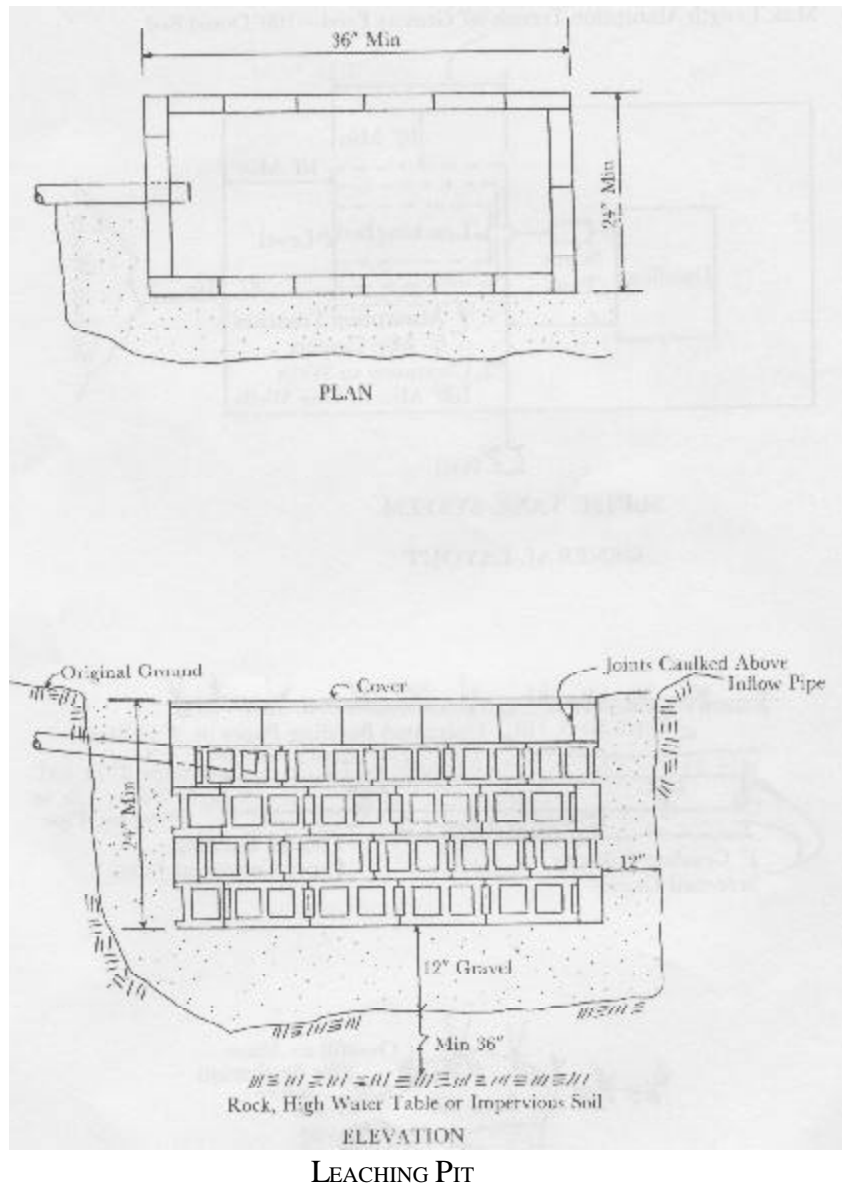


Figure 5

CHAPTER 16**DEFINITIONS**

ABSORPTION TRENCH - An absorption trench receives the discharge from a septic tank through a network of trenches containing perforated pipe encased in 1" stone and disposes of the liquid through a process of percolation and evaporation.

CAP. 222. **"ADMINISTRATIVE AUTHORITY OR AUTHORITY"** means the Successor Company to the Water and Sewerage Authority as provided under Section 85 and 86 of the Water Industry Act.

AIR CHAMBER - An air chamber is a predetermined length of pipe, capped on one end, inserted in the run of the tee which serves the plumbing fixture. (See 9.13.9).

AIR GAP - An air gap in a water supply system is the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe, faucet, or appurtenance supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle. An air gap in the drainage system is the unobstructed vertical distance through the free atmosphere between the lowest opening in a fixture or appliance drain and the flood level rim of the receiving receptacle, floor drain, or other sewer inlet.

ANTI-SIPHON BALL COCK - An anti-siphon ballcock is a device consisting essentially of a float valve equipped with a flow splitter to provide for tank and trap refill, which has an integral vacuum breaker, and which is used in conjunction with flush tanks.

APPROVED - Approved means accepted or acceptable under an applicable specification stated or cited in this Code, or accepted as suitable for the proposed use under procedures and powers of the Authority.

BACKFLOW - Backflow is the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than its intended source.

BACKFLOW CONNECTION - A backflow connection or condition is any arrangement whereby backflow can occur.

BACKFLOW PREVENTER - A backflow preventer is a device or means to prevent backflow into the system.

BACK PRESSURE - Back pressure is an opposing pressure which causes or tends to cause liquid or air to flow in the direction opposite to the normal direction of flow in a closed conduit.

BACK SIPHONAGE - Back siphonage is the flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a negative pressure in such pipe.

BALLCOCK - A ballcock is a device consisting essentially of a float valve equipped with a flow splitter to provide for tank and trap refill, used in conjunction with flush tanks.

BATTERY OF FIXTURES - A battery of fixtures is any group of two or more similar adjacent fixtures which discharge into a common horizontal waste or soil branch.

BENCH MARK-See Datum.

BRANCH - A branch is any part of the piping system other than a main, riser or stack.

BRANCH FIXTURE - See Fixture Branch.

BRANCH, HORIZONTAL - See Horizontal Branch.

BRANCH INTERVAL - A branch interval is a length of soil or waste stack corresponding in general to a storey height, but in no case less than 8' within which the horizontal branches from one floor or storey of a building are connected to a stack.

BRANCH VENT - A branch vent is a vent connecting one or more individual vents with a vent stack or stack vent.

BUILDING - A building is a structure built, erected, and framed of a component structural parts designed for the housing, work, recreation, shelter, enclosure, or support of persons, animals, or property of any kind.

BUILDING CLASSIFICATION - Building classification is the arrangement adopted by the Authority for the designation of buildings in classes based upon their use or occupancy.

BUILDING DRAIN - The building drain is that part of the lowest piping of a drainage system which receives the discharge from soil, waste and other drainage pipes inside the walls of the building and conveys it to the public sewer or other approved point of discharge.

BUILDING SEWER - The building sewer is that part of the horizontal piping of a drainage system which extends from the end of the building drain and which receives the discharge of the building drain and conveys it to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.

BUILDING STORM DRAIN - A building storm drain is a drain used for conveying rain water, surface water, ground water, subsurface water, condensate, cooling water, or other similar discharge to a storm sewer, a combined sewer, or other approved point of discharge.

BUILDING SUBDRAIN - A building subdrain is that portion of a drainage system which cannot drain by gravity into the building sewer.

BUILDING TRAP - A building trap is a device, fitting, or assembly of fittings installed in the building drain to prevent circulation of air between the drainage system of the building and the sewer. Its use is prohibited.

BUSHING - A bushing is a pipe fitting for connecting a pipe with a female fitting of larger size. It is a hollow plug with internal and external threads.

BYPASS - A bypass in a pipe line is a supplementary line leaving the main run and rejoining it at some point beyond a valve or other apparatus so that service is not interrupted when the valve or apparatus is not usable.

CATCH BASIN - A catch basin is a receptacle which separates and retains greases, oil, dirt, gravel, and all other substances lighter or heavier than the liquid waste which bears them, in order to prevent their entrance into the house sewer. A catch basin may perform the functions of a gravel or grease basin, or both, except that the liquid waste which is received shall not contain fecal matter.

CESS POOL - A cesspool is a receptacle in the ground which receives crude sewage and is so constructed that the organic portion of such sewage is retained while the liquid portion seeps through its walls or bottom.

CHECK VALVE - A check valve is a valve designed to allow a fluid to pass through in one direction only.

CIRCUIT VENT - A circuit vent is a branch vent that serves two or more traps and extends from in front of the last fixture connection of a horizontal branch to the vent stack or stack vent.

CODE - The word “CODE” when used alone shall mean these bylaws and subsequent amendments thereto, which the Authority may lawfully make.

COMBINATION FIXTURE - A combination fixture is a fixture combining one sink and tray or a two or three compartment sink or tray in one unit.

COMBINED BUILDING DRAIN - A combined building drain receives storm water and sewage.

COMBINATION WASTE AND VENT SYSTEM - A combination waste and vent system is a specially designed system of waste piping embodying the horizontal wet venting of one or more sinks or floor drains by means of a common waste and vent pipe adequately sized to provide free movement of air above the flow line of the drain.

COMMON TRAP - A common trap is a trap having a water seal of not less than 2" or not more than 4".

COMMON VENT - A common vent is a vent connecting at the junction of two fixture drains and serving as a vent for both fixtures.

COMPRESSION JOINT - A compression joint is a multi-piece joint with cup shaped threaded nuts which, when tightened, compress tapered sleeves so that they form a tight joint on the periphery of the tubing they connect.

CONTINUOUS VENT - A continuous vent is a vertical vent that is a continuation of the drain to which it connects.

CONTINUOUS WASTE - A continuous waste is a drain from two or three fixtures connected to a single trap.

CROSS CONNECTION - A cross connection is a physical arrangement whereby one system of piping is connected to another system of piping in such a way that the contents of the two systems may become mixed. As far as the water supply system is concerned, a cross connection is any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other water of unknown or questionable safety; whereby water may flow from one system to the other, the direction of flow depending on the pressure differential between the two systems.

CROSS-OVER - A cross-over is a small fitting with a double offset, or shaped like the letter U with the ends turned out. It is generally made in small sizes and is used to pass the flow of one pipe past another when the pipes are in same plane. Cross-overs are more frequently encountered on vent pipes than on water or waste pipes.

DATUM - A datum is an arbitrary established point from which vertical measurements are taken, either plus or minus. Interchangeably used with Bench Mark.

DEAD END - A dead end is a branch leading from a soil, waste, or vent pipe building drain, or building sewer, which is terminated at a developed distance of 2' or more by means of a plug or other closed fitting. (See 1.23.1).

DEEP SEAL - Deep seal is a term applied to a trap having a water seal of more than 4".

DEVELOPED LENGTH - The developed length of a pipe is its length along the center line of the pipe and fittings.

DIAMETER - Unless specifically stated otherwise, diameter is the nominal diameter as designated commercially.

DOUGLAS VALVE - See Flush Valve.

DOWNSPOUT - See Leader.

DRAIN - A drain is any pipe which carries waste water or wasteborne waste in a building drainage system.

DRAINAGE SYSTEM - A drainage system (drainage piping) includes all the piping within public or private premises, which conveys sewage, rain water, or other liquid wastes to a legal point of disposal, but does not include the mains of a public sewer system or private or public sewage treatment or disposal plant.

DUAL VENT - See Common Vent.

EFFECTIVE OPENING - The effective opening is the minimum cross-sectional area at the point of water supply discharge, measured or expressed in terms of (1) diameter of a circle, (2) if the opening is not circular, the diameter of a circle of equivalent cross-sectional area. (This is applicable to air gap.)

EXISTING WORK - Existing work is a plumbing system or any part thereof which has been installed prior to the date on which this Code came into force, or under authorisation of a previously issued permit in accordance with this Code.

FALL - See Grade.

FIXTURE BRANCH - A fixture branch is a water supply pipe serving more than one fixture.

FIXTURE DRAIN - A fixture drain is the outlet pipe from the trap of a fixture to the junction of that drain with any other drain pipe.

FIXTURE SUPPLY - A fixture supply is a water supply pipe connecting the fixture with the fixture branch.

FIXTURE UNIT - A fixture unit is a quantity in terms of which the load-producing effects on the plumbing system of different kinds of plumbing fixtures are expressed on some arbitrarily chosen scale.

FIXTURE UNIT FLOW RATE - The fixture unit flow rate is the total discharge flow in gallons per minute (gpm) of a single fixture divided by 7.5 which provides the flow rate of the particular plumbing fixture as a unit of flow. Fixtures are rated as multiples of this unit of flow.

FLOAT VALVE - Float valve is a positive operating valve, operated by a float, and used to control the water level in a vessel, tank, or other container.

FLOOD LEVEL - The flood level is that elevation at which impounded fluid will overflow.

FLOOD LEVEL RIM - The flood level rim is the top edge of the receptacle from which water overflows.

FLOODED - A fixture is flooded when the liquid therein rises to the flood level rim.

FLOOR DRAIN - A floor drain is a receptacle fitted with a strainer or grate and a trap or seal and connected to the plumbing or drainage system.

FLUSHOMETER VALVE - A flushometer valve is a device which discharges a predetermined quantity of water to fixtures for flushing purposes.

FLUSH VALVE - A flush valve is a gravity flow device which discharges at the bottom of the closet tank for the purpose of flushing water closets and similar fixtures. It is also referred to as a Douglas Valve.

GRADE - Grade is the slope or fall of a line of pipe in reference to a horizontal plane. In drainage it is usually expressed as the fall in a fraction of an inch per foot length of pipe.

GREASE INTERCEPTOR - A grease interceptor is a receptacle designed to cause separation and retention of oil or grease from liquid wastes.

GREASE TRAP - See Grease Interceptor.

GROUP OF FIXTURES - A group of fixtures means two or more fixtures adjacent to or near each other.

HANGERS - See Supports.

HORIZONTAL BRANCH - A horizontal branch is a drain pipe extending

laterally from a soil waste or stack or building drain, with or without vertical sections or branches, which receives the discharge from one or more fixture drains and conducts it to the soil or waste stack or the building drain.

HORIZONTAL PIPE - Horizontal pipe means any pipe or fitting which makes an angle of less than 45' with the horizontal.

HOSE - A hose is any flexible pipe which is readily removable without the use of tools and which may or may not be equipped with fittings.

HOUSE DRAIN - See Building Drain.

HOUSE SEWER - See Building Sewer.

HOUSE TRAP - See Building Trap.

INDIRECT WASTE - An indirect waste is a pipe that does not connect directly with the drainage system but conveys liquid wastes by discharging through an air gap into a plumbing fixture or receptacle which is directly connected to the drainage system.

INDIVIDUAL VENT - See Revent Pipe.

INDUSTRIAL WASTE - Industrial waste is any liquid, gaseous, solid, or other waste substance or a combination thereof resulting from any process of industry, manufacturing trade or business, or from the development, processing, or recovery of any natural resources. Industrial waste does not contain faecal matter.

INTERCEPTOR - An interceptor is a device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter from normal wastes and permit normal sewage or liquid wastes to discharge into the disposal terminal by gravity.

INVERT - The invert is the floor, bottom, or lowest part of the internal cross-section of a pipe or conduit.

LEADER - A leader (downspout) is the water conductor from the roof to the building storm drain, combined building drain, or other means of disposal.

LENGTH OF PIPE - See Developed Length.

LIQUID WASTE - Liquid waste is the discharge from any fixture, appliance, or appurtenance in connection with a plumbing system which does not receive faecal matter.

MAIN - The main of any system of continuous piping is the principal artery of the system, to which branches may be connected.

MAIN SEWER - See Public Sewer.

MAIN VENT - The main vent is the principal artery of the vent system to which vent branches may be connected.

NEW WORK - Any plumbing system, part thereof, or addition to or alteration of an existing system being installed or recently completed within the area of jurisdiction of the Authority.

OFFSET - An offset in a line of piping is a combination of elbows or bends which brings one section of the pipe out of line but into a line parallel with the other section.

OPEN PLUMBING - A plumbing system in which no plumbing fixtures, except a built in bathtub, is so enclosed as to form a space in which air does not circulate.

PERSON - Person is a natural person, his heirs, executors, administrators or assigns; and includes a firm, partnership, or corporation, and its or their

successors or assigns. Singular includes plural; male includes female.

PIPE - A pipe is any closed conduit used to convey fluids, air, or gases, not otherwise defined in this Code.

PITCH - See Grade.

PLUMBER - The plumber is the person engaged in the installation of items relating to plumbing, and in the maintenance thereof, relative to this Code. It shall be the duty of the plumber to notify the Authority having jurisdiction over plumbing and the owner, or his authorised agent, not less than one working day before the work is to be inspected or tested. The plumber shall make sure that the work will stand the test prescribed before giving the above notification.

PLUMBING - Plumbing means the practice, materials, and fixtures used in the installation, maintenance, extension, and alteration of all piping, fixtures, appliances, and appurtenances in connection with any of the following: Sanitary drainage or storm drainage facilities, the venting system and the public or private water supply systems, within or adjacent to any building, structure, or conveyance; also the practice and materials used in the installation, maintenance, extension, or alteration of storm water, liquid waste, or sewage, and water supply systems of any premises to their connection with any point of public disposal or other acceptable terminal.

PLUMBING FIXTURES - Plumbing fixtures are installed receptacles, devices, or appliances which are supplied with water or which receive or discharge liquids or liquid-borne wastes, with or without discharge into the drainage system with which they may be directly or indirectly connected, and installed for personal or domestic use and purposes.

PLUMBING INSPECTOR - means any person authorised by the Authority for the purpose of any function under this Code.

PLUMBING SYSTEM-The plumbing system is the water supply and

distribution pipes; plumbing fixtures and traps; soil, waste, and vent pipes; building drains and building sewers; including their respective connection, devices, and appurtenances within the property lines of the premises, and water treating or water using equipment, and installed for personal or domestic use and purposes.

POTABLE WATER-Potable water is water which is satisfactory for drinking, culinary, and domestic purposes, and meets the requirements of the health authority having jurisdiction.

PRIVATE OR PRIVATE USE-In the classification of plumbing fixtures, private applies to fixtures in residences and apartments and to fixtures in private bathrooms of hotels and similar installations where the fixtures are intended for the use of a family or an individual.

PRIVATE SEWER-A private sewer is a sewer privately owned and not directly controlled by public authority.

PRIVATE WATER SUPPLY-A private water supply is any facility furnishing water for general domestic purposes which serves less than ten separate lots of premises.

PUBLIC OR PUBLIC USE-In the classification of plumbing fixtures, public applies to fixtures in general toilet rooms of schools, sports arenas, hotels, public buildings, bars, public comfort stations, and other installations where a number of fixtures are installed so that their use is similarly unrestricted. No fee is to be charged for the use of public plumbing facilities.

“PUBLIC OFFICER”-means any person authorised by the Authority for the purpose of any function under this Code.

PUBLIC SEWER-A public sewer (main sewer) is a sewer directly controlled by public authority.

PARTS PER MILLION-Eight parts per million (ppm) one ounce in one thousand

gallons.

PUBLIC WATER SUPPLY - A public water supply is any facility furnishing water for general domestic use through a system of distribution mains where ten or more separate lots or properties are served.

RELIEF VENT - A relief vent is a pipe having the primary function of providing for circulation of air between drainage and vent systems.

RETURNED BEND - A return bend is a device or a combination of pipe and fittings arranged like a U, making a 180° bend (See 11.12g).

RETURN OFFSET - A return offset is a double offset installed so as to return the pipe to its original alignment.

REVENT PIPE - A revent pipe, sometimes called an individual vent, is a pipe installed to vent a fixture trap and which connects with the vent system above the fixture served, or terminates in the open air. Horizontal revents; must be at least 42" above the finished floor.

RIM - A rim is an unobstructed open edge of a fixture.

RISER - A riser is a water supply pipe which extends vertically one full storey or more to convey water to branches or fixtures.

ROOF DRAIN - A roof drain is a receptacle installed to receive water collecting on the surface of a roof and to discharge it into the leader (downspout).

ROUGHING-IN-Roughing-in is the installation of all parts of the plumbing system which can be completed prior to the installation of fixtures. This includes drainage, water supply, vent piping, and the necessary fixture supports.

SANITARY SEWER - A sanitary sewer is a pipe which carries sewage and excludes storm, surface, and ground water.

SEEPAGE BED - See Soak Away.

SEEPAGE PIT - See Cesspool.

SEPARATOR - A septic tank is a watertight receptacle which receives the discharge of a drainage system or part thereof, and is designed and constructed so as to separate solids from the liquid, digest organic matter through a period of detention, and allow the liquids to discharge into the soil outside of the tank through a system of open joint or perforated piping, or a soak away.

SEWAGE - Sewage is any liquid waste containing animal, vegetable, or faecal matter in suspension or solution, and may include liquids containing chemicals in solution.

SEWERAGE SYSTEM - A sewerage system comprises all piping, appurtenances, and treatment facilities used for the collection and disposal of sewage, except plumbing inside and in connection with buildings served and the building drain.

SIDE VENT - A side vent is a vent connecting to the drain pipe through a fitting at an angle not greater than 45° to the vertical.

SIZE OF PIPE AND TUBING - A slipjoint is a connection in which one pipe slides into another. The joint is made tight with an approved gasket and threaded retainer.

SLOPE - See Grade.

SOAK AWAY - A soak away is a bed which receives the discharge from a septic tank and disposes of the liquid through a process of percolation and evaporation.

SOIL PIPE - A soil pipe is any pipe which conveys the discharge of water closets, urinals, or fixtures having similar functions, with or without the discharge

from other fixtures, to the building drain or building sewer.

SOIL VENT - See Stack Vent.

STACK - A stack is the vertical main of a system of soil, waste, or vent piping.

STACK VENT - A stack vent, sometimes called a waste vent or soil vent, is the extension of a soil or waste stack above the highest horizontal drain connected to the stack.

STACK VENTING - Stack venting is a method of venting a fixture or fixtures through the soil or waste stack.

STORM DRAIN - See Building Storm Drain.

SUBSOIL DRAIN - A subsoil drain is a drain which receives only subsurface or seepage water and conveys it to a place of disposal.

SUMP - A sump is a tank or pit which receives sewage or liquid waste, located below the normal grade of the gravity system and which must be emptied by mechanical means.

SUPPORTS - Supports, hangers, and anchors are devices for supporting and securing pipes and fixtures to walls, ceilings, floors, or structural members.

TRAP - A trap is a fitting or device so designed and constructed as to provide, when properly vented, a liquid seal which will prevent the back passage of air without materially affecting the flow of sewage or waste water through it.

TRAP SEAL - The Trap seal is the maximum vertical depth of liquid that a trap will retain, measured between the crown weir and the top of the dip of the trap. The crown weir is the inside bottom of the outlet part of a trap.