NATIONAL RESEARCH COUNCIL OF CANADA

CODES AND SPECIFICATIONS SECTION

A STANDARD PLUMBING BY-LAW

OTTAWA

JUNE, 1940

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CANADA

NATIONAL BUILDING CODE

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FOREWORD

The project for the preparation of a model building code for use by Canadian municipalities was undertaken some two years ago by a group of committees organized under the joint sponsorship of the National Research Council and the Department of Finance of Canada.

Early in the course of their work the committees recognized the need for certain ancillary documents bearing upon the housing field but not usually considered to be within the scope of a building code. On this basis a model zoning by-law, prepared by the Committee on Health and Sanitation, was published some months ago. The present document is a further contribution from the same committee.

Since the outbreak of war the activities of the committees have been carried on under somewhat difficult conditions. To assure that the work that has been done will not be lost it has been deemed advisable to publish separately the various documents as they become available, for such use as municipalities might wish to make of them.

In preparing this plumbing by-law the Committee has taken cognizance of by-laws now in force in various communities and, with the co-operation of the Advisory Committee and numerous municipal officials, has endeavoured to bring the various clauses into harmony with modern conditions in the plumbing field. The document as it stands represents the work of a technical committee but legal considerations have not been dealt with except insofar as they bear on technical matters. In some instances where common practice in this country has been deemed to run counter to modern conceptions of public health, the Committee has set down what, in its opinion, is in the best public interest, realizing fully that some municipalities may wish to modify slightly certain regulations to more satisfactorily meet local conditions.

The work of the National Building Code Committees is directed by an Administrative Committee, the members of which are the following:

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T.J. Lafrenière, Bureau of Health, Quebec
F.S. Parney, Department of Pensions and National Health
A.H. Perry, Department of Pensions and National Health.

C.J. Mackenzie,
Acting Chairman,
National Building Code Project.

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NATIONAL BUILDING CODE

A STANDARD PLUMBING BY-LAW

PART 1 - GENERAL REQUIREMENTS

1.1 SCOPE OF THIS BY-LAW.- All new buildings, and all existing buildings not already provided with a plumbing system or in which alterations or additions are made to any plumbing system, shall be subject to the requirements of this By-law.

When any requirement of this By-law is at variance with any other By-law of this municipality or with any provincial enactment applying to this municipality, the more restrictive regulation shall be fulfilled.

Whenever dated editions of codes, specifications, or other publications are cited herein, subsequent editions may be used, subject to permission from the authority having jurisdiction.

1.2 DEFINITIONS

1.2.1 For the purposes of this By-law, the definitions given in Articles 1.2.2. to 1.2.33, inclusive, shall govern.

1.2.2 Approved, when applied to materials, design, or workmanship, shall mean approved by the authority having jurisdiction.

1.2.3 Authority having jurisdiction shall mean the Plumbing Inspector, the Health Officer, or other official authorized by municipal enactment to administer any regulation contained in this By-law.

1.2.4 Assembly building shall mean a building in which persons congregate for civic, political, educational, religious, social, or recreational purposes; including among others, court houses, schools, colleges, libraries, museums, exhibition buildings, lecture halls, churches, assembly halls, lodge rooms, dance halls, theatres, bath houses, armouries, arenas, gymnasiums, recreation piers, passenger stations.

1.2.5 Business building shall mean a building occupied for the transaction of business; for the rendering of professional services;for the display, sale,or storage of goods, wares or merchandise; for the supplying of food, drink, or other bodily needs or comforts;or for the performance of work or labour; including among others, office buildings, stores, markets, restaurants, factories, workshops, laboratories.

1.2.6 Institutional building shall mean a building into which persons are admitted to receive care or treatment, or in which persons are held under restraint; including among others, hospitals, asylums, sanatoria, police stations, jails.

1.2.7 Residence building shall mean any building except an institutional building in which sleeping accommodation is provided; including among others one-family dwellings,two-family dwellings, multiple dwellings, hotels, lodging houses, dormitories,convents, studios, club houses, fire stations.

1.2.8 Dead end shall mean any portion of a pipe that is more than two feet in developed length and does not terminate in a fitting designed to admit air or liquids to the pipe.

1.2.9 House drain shall mean that part of the lowest horizontal piping of a drainage system which receives the discharge from soil, waste, or other drainage pipes and conveys it to a point not less than three feet beyond the wall of the building there discharging it to a house sewer.

1.2.10 Sub-house drain shall mean that portion of any drainage system which cannot drain by gravity into the house sewer.

1.2.11 Drainage system, with reference to any building, shall mean all piping that conveys sewage, rain-water, or other liquid waste to a house sewer, together with all joints, fittings, vents, and vent pipes appurtenant to such piping.

1.2.12 Dwelling unit shall mean a room, or suite of two or more rooms, in which facilities are provided for cooking or for the installation of cooking equipment.

1.2.13 Horizontal, with reference to any pipe or fitting, shall mean that it is installed with its longitudinal axis at an angle of more than 60 degrees with the vertical.

1.2.14 Leader shall mean any pipe, located in or outside of a building, which conveys storm or rainwater from any roof or area to any sewer or storage container.

1.2.15 Developed length, with reference to any pipe, shall mean its length along the centre line of pipe and fittings.

1.2.16 Main, with reference to any drainage system, shall mean that part of such system which receives waste, vents, or back-vents, from fixture outlets or traps, directly or through branch pipes.

1.2.17 Plumber

Master plumber shall mean a person, firm or corporation licensed by this municipality to engage in plumbing, either himself or through his employees.

Journeyman plumber shall mean a person who is licensed by this municipality to engage in plumbing as an employee of a master plumber.

Apprentice shall mean a person who is duly registered with the authority having jurisdiction as one undergoing training with a view to becoming a journeyman plumber.

1.2.18 Plumbing shall mean the installation, alteration, or repair, in or appurtenant to any building, of a plumbing system or part thereof.

1.2.19 Plumbing fixture shall mean a receptacle intended to receive water and to discharge water or other liquid or water-borne waste into a drainage system.

1.2.20 Plumbing system shall mean, severally and individually, the water distribution system; all fixtures and fixture traps; the drainage system; the house sewer; any private sewage disposal system; all leaders; together with all their devices, appurtenances, and connections.

1.2.21 Septic tank shall mean a settling tank constructed to receive sewage from one or more house

sewers and to retain the sludge in such sewage for such a time and in such a way as to secure adequate decomposition of organic solids by anaerobic bacterial action.

1.2.22 Sewers

(a) House sewer shall mean any piping system that conveys sewage, rain-water, or other liquid waste from the house drain to a street sewer or to a sewage disposal system.

(b) Sanitary sewer shall mean a street or common sewer intended to receive effluent from a sanitary house sewer only.

(c) Sanitary house sewer shall mean a house sewer intended to receive discharge from plumbing fixtures only.

(d) Storm sewer shall mean a street or common sewer intended to receive surface or sub-surface water only.

(e) Storm house sewer shall mean a house sewer intended to receive storm-water or sub-surface water only.

(f) Combined sewer shall mean a sewer intended to carry both liquid or water-borne wastes,and surface or sub-surface water.

1.2.23 Size, with reference to any pipe or fitting, shall mean the nominal diameter in accordance with accepted commercial usage.

1.2.24 Soil pipe shall mean any pipe that conveys the discharge of any water-closet, with or without that of other fixtures, to a house drain.

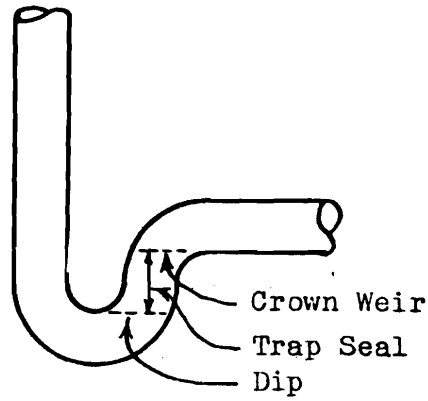
1.2.25 Stack shall mean a vertical line of soil, waste, or vent piping as indicated in the context.

1.2.26 Trap shall mean a fitting or device so constructed as to prevent the passage of air or gas through a pipe or fixture, without materially affecting the flow of liquids.

The crown weir of any trap shall mean the highest portion of the inside lower surface.

The dip of any trap shall mean the lowest portion of the inside upper surface.

The trap seal shall mean the vertical distance between the crown weir and the dip of a trap.



1.2.27 Crown vent shall mean a vent pipe connected to the crown of a trap.

1.2.28 Vent pipe shall mean any pipe provided to ventilate a drainage system and to prevent trap siphonage and back pressure.

1.2.29 Ventilating pipe shall mean a pipe through which foul air is removed from a room or fixture.

1.2.30 Vertical, with reference to any pipe or fitting, shall mean that it is installed with its longitudinal axis at an angle of not more than 60 degrees with the vertical.

1.2.31 Waste pipe shall mean any pipe that conveys the discharge of one or more fixtures, other than water-closets, to a soil pipe or house drain.

1.2.32 Water distribution system shall mean the piping, together with its fittings and connections, that conveys water from the service pipe to plumbing fixtures or other apparatus or devices.

1.2.33 Water service pipe shall mean a pipe from a water-main, or private pumping system, to the building served.

PART 2 - ADMINISTRATION

2.1 LICENSING OF PLUMBERS

2.1.1 Required licenses.- No person, firm, or corporation shall engage in plumbing work unless duly licensed by this municipality as a Master Plumber or Journeyman Plumber or registered as an apprentice; provided that tile drains shall be laid by a competent tile-drain layer.

2.1.2 Qualifications of Master Plumbers.- Every Master Plumber shall be a licensed Journeyman Plumber or shall have in his employ a sufficient number of licensed Journeyman Plumbers and apprentices to do all plumbing work which he may undertake.

2.1.3 Application for Master Plumber's License.- Every application for a Master Plumber's license shall be made in writing and shall give the name and business address of the applicant. If the applicant is a partnership, the application shall contain the names and addresses of the various partners of the firm; if the applicant is a corporation, the names and addresses of the President, Secretary and Treasurer shall be shown.

2.1.4 Qualifications of Journeyman Plumbers.- Licenses as Journeyman Plumbers shall be granted only to persons who have furnished sufficient evidence that they are capable of properly performing plumbing work, and have passed such tests as the authority having jurisdiction may require.

2.1.5 Application for Journeyman Plumber's License.- Every application for a Journeyman Plumber's license shall be made in writing. Such application shall contain the applicant's name, address, age, and a statement of his experience and qualifications.

2.1.6 Transfer of Licenses.- Licenses shall be personal and not transferable and must be renewed each year during the month of January. Licenses not renewed before the first day of February shall be renewable as new licenses only.

2.1.7 Posting of Licenses.- Master Plumber's licenses shall be posted in a conspicuous place in the place of business of the licensee.

2.1.8 Responsibility of Master Plumbers.- Every Master Plumber shall be responsible for the workmanship of his employees. He shall not allow anyone except Journeyman Plumbers, and apprentices under their supervision, to do any plumbing work.

2.1.9 Revocation of Licenses.- Violation of any of the requirements of this By-law shall be cause for revocation of any Master Plumber's license.

2.2 PERMITS

2.2.1 Required Permits.- No person shall proceed to construct, alter, or add to any plumbing system until a permit for the performance of such work has been obtained from the authority having jurisdiction, provided that no permit shall be required for the clearing of stoppages or the repairing of leaks in pipes, valves, or fixtures, when such repairs do not involve or require alteration or rearrangement of pipes or fixtures.

2.2.2 Applications for Permits.- Every application for a plumbing permit shall be made on the form provided and shall be signed by the owner or an agent bearing his written authorization. Such application shall give the name of the master plumber by whom the work is to be done. It shall be accompanied by: (a) information that will serve to give the exact location of the building concerned, including the street number and block plan number; (b) a description of the proposed work, giving the number, size, kind, and weight of all pipes, traps, and fittings, together with a description of all fixtures; (c) when required by the authority having jurisdiction, a plan legibly drawn to scale, showing the proposed plumbing system and the location of the building with reference to the street sewer or sewage disposal system.

2.2.3 Changes to Plans and Descriptions.- After a plumbing permit has been issued, no departure shall be made from the plan or description submitted with the application for such permit, without the written approval of the authority having jurisdiction.

2.2.4 Permit Limitations

2.2.4.1 Term of Permits.- A plumbing permit shall be granted or refused within five days from the time of filing the application; if issued, it shall be valid for six months only and must be renewed if the work authorized is not begun within that period.

2.2.4.2 Responsibility after Issuance of Permit.- Neither the granting of a permit, nor the approval of plans and descriptions, nor inspections made by the authority having jurisdiction, shall in any way relieve the Master Plumber from full responsibility for carrying out the work in strict accordance with this By-law.

2.2.5 Allowable Responsibility of Journeyman Plumbers.- Provided that the regulations of this Section are otherwise fulfilled, a licensed Journeyman Plumber may obtain a permit and do plumbing work in a commercial or industrial establishment in which he is steadily employed for such purpose. In such instance the observance of the requirements of Item 2.2.4.2 shall be the responsibility of such Journeyman Plumber.

2.2.6 Fees.- No plumbing permit shall be issued until the following minimum fees have been paid:

(a) A fee of $2.00 for a permit authorizing any plumbing work which consists of installing, altering, extending, or renewing, not more than one soil or other stack, and not more than four fixtures.

(b) An additional fee of 25 cents for each additional stack and for each additional fixture to be installed, altered, extended, or renewed.

PART 3 - REQUIRED PLUMBING FACILITIES

3.1 GENERAL.- Whenever a municipal water supply is available within 100 feet of the building, every residence building, institutional building, business building, or assembly building, whether new or existing, shall be provided with a plumbing system including an adequate supply of potable water, and suitable sanitary facilities with drainage to a public sanitary sewer, private sewage disposal system, or other approved means of sewage disposal.

When such municipal water supply is not available a plumbing system shall not be mandatory but any plumbing system that is installed in any building, and any to which alterations or additions are made, shall comply with the requirements of this part of this By-law. When no plumbing system is installed there shall be provided sanitary privies, chemical closets, or other means for the disposal of human excreta, approved by the authority having jurisdiction.

3.2 FIXTURES REQUIRED

3.2.1 General Requirements.- As a minimum requirement, every residence building, institutional building, business building, or assembly building shall be provided with at least one water-closet and one lavatory or sink. Every residence building

or institutional building shall also be provided with at least one bath-tub or one shower-bath.

Additional fixtures shall be provided, when necessary to meet the requirements hereinafter prescribed; provided that:

(a) Whenever more than one water-closet, one lavatory or sink, or one bath-tub or shower-bath is installed in a single room other than a private dwelling unit, the use of such room shall be restricted to one sex only;

(b) Whenever separate water-closet rooms or bathrooms are provided for each sex separately, they shall be closed by a full-sized door and shall be clearly and properly marked;

(c) Whenever water-closet rooms are provided for the exclusive use of males, urinals may be substituted for one-half of the required number of water-closets.

3.2.2 Residence Buildings and Institutional Buildings

(a) Every dwelling unit in a one-family, two-family, or multiple dwelling, shall be provided with at least one private water-closet, one private bath-tub or shower-bath, and one private lavatory or sink.

(b) Every residence building or institutional building shall be provided with not less than one water-closet, one lavatory or sink, and one bath-tub or shower-bath for every ten bedrooms. When any bedroom is provided with a private water-closet, lavatory or sink, and bath-tub or shower-bath, such room and such fixtures shall not be considered in the computation of the required number of fixtures.

Whenever bedroom accommodation is to be provided for both sexes and more than one water-closet, one lavatory or sink, and one bath-tub or shower-bath is required, such facilities shall be provided in separate rooms for each sex.

Whenever sleeping accommodation is to be provided for more than two persons in one room - as in a dormitory - one water-closet, one lavatory or sink, and one bath-tub or shower-bath, for every 15 persons, shall be installed on the basis of the total

number of persons for whose accommodation such building is designed, intended, or used.

(c) Whenever sleeping accommodation is to be provided in detached rooms having private entrances - as, for example, in a tourist camp - water-closet, bath, and lavatory accommodation may be provided in a detached building on the same premises, if such building and facilities otherwise comply with the requirements of this By-law.

3.2.3 Business Buildings.- Every business building shall be provided with water-closets and lavatories or sinks depending upon the number of employees for whose accommodation such building is designed, intended, or used, in accordance with the requirements of Table 1, provided that any separate business occupancy, - for example, a retail store - within a building, shall have separate facilities, in accordance with the table, if the total number of employees for whose accommodation such occupancy is designed, intended, or used, is in excess of nine.

TABLE 1.

Required Water-closets and Sinks

Number of Persons	Minimum Number of Water-closets	Minimum Number of Lavatories or Sinks
1 to 9	1	1
10 to 24	2	2
25 to 49	3	3
50 to 100	5	5
Over 100	one water-closet and one lavatory or sink for each additional 30 persons	

Whenever any business building or occupancy is designed, intended, or used for the accommodation of both sexes, separate facilities shall be provided for each sex independently, in accordance with Table 1, if the total number of employees is in excess of nine.

3.2.4 Assembly Buildings

(a) In every school or college building there shall be provided for each sex, not less than one water-

closet for every twenty, and not less than one lavatory or sink for every forty persons of such sex for whose accommodation such building is designed, intended, or used.

(b) In every other assembly building there shall be provided for each sex, not less than one water-closet for every one hundred and fifty persons, and not less than one lavatory or sink for every three hundred persons, of such sex for whose accommodation such building is designed, intended, or used.

3.2.5 Temporary Facilities.- Suitable toilet facilities shall be provided for the use of workmen during the construction of any building. These toilet facilities shall be maintained in a sanitary condition.

3.3 DRINKING WATER.- Facilities to provide an adequate supply of potable water for drinking purposes shall be installed in readily accessible places in every business, institutional, or assembly building. All such water shall be from an approved source.

PART 4 - QUALITY AND DESIGN OF FIXTURES, PIPING, FITTINGS, AND ACCESSORIES

4.1 FIXTURES

4.1.1 Materials and Design

4.1.1.1 General.- All plumbing fixtures shall be of non-absorbent materials, impermeable to water, and shall be finished with a smooth surface free from flaws or blemishes that would serve to prevent ready cleaning. No sink, tub, water-closet bowl, or other fixture shall be encased in wood or other absorbent material.

All water-closets and urinals shall be of vitrified earthenware, glazed porcelain, or vitreous china; other fixtures shall be of these materials or of porcelain-enamelled cast iron, or stainless alloys, provided that for special industrial purposes other materials may be used if approved by the authority having jurisdiction.

Equipment already installed in or removed from any building may be used only if it complies in all respects with the requirements of this Section.

4.1.1.2 Water-closets.- Water-closet bowls and traps shall be made in one piece and of such form as to hold a sufficient quantity of water, when filled to the trap overflow, to prevent fouling of surfaces, and shall be provided with integral flushing rims so constructed as to flush the entire interior of the bowl.

Every water-closet and every urinal shall be flushed by means of an approved tank or flush valve, adjusted to prevent waste of water. Each water-closet shall receive not less than four gallons of water and each urinal not less than two gallons at each flushing. The flush pipe for any water-closet shall not be less than 1½ inches in diameter and the water from the flushing system shall not be used for any other purpose.

Any seat on a water-closet to which the public has access shall be of the open-front type.

4.1.1.3 Drinking Fountains.- Every drinking fountain shall be designed as a separate fixture and shall be of such form that it may be cleaned readily. The water orifice shall be of the shielded type and shall be above the extreme overflow level of the bowl. The orifice shall direct the water stream at an angle of approximately 45 degrees with the horizontal. Means for regulating the flow of water shall be provided.

4.1.1.4 Fixture Strainers.- All fixtures other than water-closets shall be provided with substantial metal strainers having outlet areas not less than that of the interior of the trap and waste pipe. For the purpose of this regulation, floor and shower-bath drains shall be considered as fixtures.

4.1.2 Prohibited Fixtures

4.1.2.1 Prevention of Back Siphonage.- No plumbing fixture, device, or construction shall be installed that will provide any cross connection be-

tween a water distribution system and any part of a drainage system so as to make possible the back-flow or siphonage of any liquid into the water distribution system.

All water supply inlets to fixtures, including those provided with automatic valves, such as "flushometers", shall be located a sufficient height above the maximum possible water-level in the fixture that there will be no possibility of back-siphonage of any of the contents of the fixture under any degree of vacuum in the supply lines, provided that the authority having jurisdiction may permit the installation of fixtures having a water inlet at or below the overflow level if such fixtures are provided with an approved vacuum-breaker on the supply lines.

Pan and valve plunger, offset washout, and other water-closets having invisible seals, unventilated space, or walls not thoroughly washed at each flush, shall not be installed.

4.1.2.2 Frost Proof Closets.- Frost proof closets shall be installed only when specifically permitted by the authority having jurisdiction. The soil pipe between the hopper and the trap shall not be more than six feet long, shall be of at least three inches in internal diameter, and shall be of lead or of cast iron enamelled on the inside.

4.2 PIPE

4.2.1 General.- All piping used in any plumbing system shall be free from defects and shall comply with the requirements of Article 4.2.2.

4.2.2 Quality and Weight.- All pipe shall conform to the specifications indicated in Table 2 hereof.

TABLE 2

Specifications Governing Quality of Pipe

Kind of Pipe	A.S.T.M.* Specn.No.	C.E.S.A.* Specn.No.
Clay sewer pipe.....	C13-35	A60-1940
Concrete sewer pipe.....	C14-35	-
Reinforced concrete sewer pipe	C75-35	-
Cast-iron pipe(1).....	A74-39T	-
Wrought-iron pipe(2).....	A72-39	B62-1940
Steel pipe(3).....	A120-36	-
Lead pipe(4).....	-	B67-1940
Brass pipe.....	B43-39T	B64-1940
Copper pipe.....	B42-39T	B64-1940
Copper tubing.....	B88-39	B66-1940

*When both A.S.T.M. and C.E.S.A. specifications are cited, they are alternatives; materials complying with either are acceptable.

(1) This specification shall cover all cast-iron pipe for use in drainage systems. The weight in pounds shall be marked on each unit. Dimensions and weights shall be in accordance with the publication entitled American Standard Cast-Iron Soil Pipe and Fittings, as approved by the American Standards Association in October 1935 (A.S.A. No. A40.1-1935) such weights being known commercially as 'extra heavy'; provided that, in buildings less than 5 storeys in height, it shall be permissible to use 1½, 2, 3, and 4 inch pipe, having minimum weights respectively of 17, 20, 30, and 45 pounds per single-hub length of five feet, such weights being known commercially as 'medium'. All cast-iron pipe in contact with the ground shall be 'extra heavy' and coated.

(2) Wrought-iron pipe shall be galvanized.

(3) Steel pipe shall be galvanized.

(4) Lead pipe used above ground shall be 'strong' or heavier; that used below ground shall be 'extra strong' or heavier.

4.3 FITTINGS

4.3.1 General.- Fittings shall comply with the specifications herein cited for the corresponding pipe when specifically covered by such specification; otherwise they shall be of quality equivalent to that of the pipe and of corresponding weight in accordance with approved commercial practice.

4.3.2 Prohibited Fittings.- No double hub or double tee shall be used on any soil or waste line. The drilling and tapping of house drains, soil, waste, or vent pipes, and the use of saddle hubs and bands are prohibited. (See also Article 5.2.12.)

4.3.3 Threaded Fittings.- Plain screwed fittings shall be of cast iron, malleable iron, brass, or copper.

Drainage fittings shall be of cast iron, malleable iron, brass, or copper, of recessed pattern, with smooth interior waterways, and with threads tapped out of solid metal.

All malleable iron fittings and all cast-iron fittings made for water distribution, shall be galvanized.

4.3.4 Caulking Ferrules.- Caulking ferrules shall be of the best quality annealed cast brass, or of annealed cold-drawn seamless brass tubing, with weights and dimensions in accordance with Table 3.

TABLE 3

Minimum Weights and Dimensions of Caulking Ferrules

Pipe Size	Actual Inside Diameter	Length	Weight
2 in.	2¼ in.	4½ in.	1 lb. 0 oz.
3 "	3¼ "	4½ "	1 " 12 "
4 "	4¼ "	4½ "	2 " 8 "

4.3.5 Soldering Nipples and Bushings.- Soldering nipples shall be of brass pipe (iron pipe size), or of heavy cast brass of not less than the weights shown in Table 4.

TABLE 4

Weights of Soldering Nipples

Diameter	Weight
1¼ in.	6 oz.
1½ "	8 "
2 "	14 "
2½ "	1 lb. 6 "
3 "	2 " 0 "
4 "	3 " 8 "

Soldering bushings shall be of brass pipe (iron pipe size), or of heavy cast brass.

4.3.6 Floor Flanges for Water-closets.- Floor flanges for water-closets shall be of brass, and shall be not less than 3/16 inch in thickness.

4.3.7 Pipe Clean-outs.- The bodies of clean-out ferrules shall be made of standard pipe sizes, shall conform in thickness to that required for pipe of the same metal, and shall extend not less than one-quarter inch above the hub. The clean-out cap or plug shall be of heavy brass not less than one-eighth inch thick in any part and shall be provided with a raised nut, recessed socket, or other suitable means of removal.

4.3.8 Traps.- All fixture traps shall be of vitrified earthenware, glazed porcelain, vitreous china, lead, brass, copper, cast iron, galvanized malleable iron, stainless alloys, or porcelain enamelled inside. They shall have smooth interior waterways of full-sized bore. (See also Item 5.5.6.2.)

All traps shall have a water seal of not less than two inches or more than four inches; provided that traps for floor drains shall have a seal of not less than four inches. Every trap that is not so combined with a fixture that the seal is plainly visible and accessible shall be provided with a screw clean-out of ample size, protected by the water seal.

Traps which depend for their seal upon moveable parts or concealed interior partitions shall not be used, provided that grease traps may have integrally cast partitions of corrosion-resistant material.

4.3.9 Back-water Valves.- Back-water valves shall have all bearing parts of corrosion-resisting metal and shall be so designed and constructed as to assure a positive seal against back-pressure but permit the free flow of waste.

4.4 SHEET METAL

4.4.1 Sheet lead shall not weigh less than 5.0 lb. per square foot.

4.4.2 Sheet brass and copper shall not be thinner than 0.040 inch (or B. and S. Gauge No.18) provided that for local and interior ventilating pipes and flush tanks having moveable tops the minimum thickness shall be 0.0126 inch (or B. and S. Gauge No.28).

4.4.3 Galvanized sheet iron or steel for pipe shall not be thinner than the sizes shown in Table 5.

TABLE 5

Minimum Thickness of Sheet Iron and Steel for Pipe

Pipe Size in Inches	Thickness in Inches	Brown and Sharpe Gauge
2 to 12	0.015	26
13 to 20	0.020	24
21 to 26	0.025	22

4.5 USE OF MATERIALS OTHER THAN THOSE SPECIFIED.- Materials other than those hereinbefore specified may be used in a plumbing system provided specific approval of them has been given in writing by the authority having jurisdiction. Such authority may require that tests be conducted by a publicly owned or other recognized laboratory.

PART 5 - INSTALLATION

5.1 GENERAL REGULATIONS

5.1.1 Grades of Horizontal Piping.- All horizontal piping shall be run in true alignment and at a uniform grade of not less than one-quarter inch per foot; provided that water distribution pipe may be run at not less than one-eighth inch per foot; and provided that, when necessary in the opinion of the authority having jurisdiction, house drains and sewers may be run at not less than one-eighth inch per foot. All pipe shall be so supported or anchored as to maintain the required grade.

5.1.2 Support of Piping

(a) All stacks and pipes shall be rigidly secured and adequate provision shall be made for expansion, contraction, and structural settlement.

Vertical piping shall be supported at the base and at every alternate floor, provided that supports shall not be more than 25 feet apart. All stacks shall rest on a solid base and all horizontal runs of drainage piping shall be supported on masonry piers or hung from overhead joists by substantial hangers.

Pipe in the ground shall be laid on a firm bed throughout their length. Horizontal lead pipes shall have continuous support throughout their length.

All other horizontal pipe shall be supported at intervals of not less than ten feet.

(b) Strap hangers may be used for all pipe of diameter up to two inches; ring hangers shall be used for all pipe of greater size. Hangers shall be metal of heavy pattern and shall be securely attached to the building construction.

5.1.3 Expansion Bolts.- Connection of wall hangers, pipe supports, or fixture settings with masonry, stone, or concrete backing, shall be made with expansion bolts without the use of wooden plugs.

5.1.4 Changes in Direction.- All changes in direction of drainage pipes shall be made by the appropriate use of 45 degree wyes, half wyes, long sweep quarter bends, sixth, eighth, or sixteenth bends, except that single sanitary tees may be used on stacks, and short quarter bends may be used in soil and waste pipes when the change in direction is from the horizontal to the vertical. Tees and crosses may be used in vent pipes.

Soil and waste stacks shall be plumb whenever possible and shall be free from sharp bends and turns.

5.1.5 Dead Ends.- Dead ends shall be avoided in the installation of drainage systems.

5.1.6 Protection of Piping.- All pipes passing under or through walls or floors shall be protected from breakage and from external corrosion.

No water-supply or drainage pipe shall be installed outside a building or in any outside wall, unless adequate provision is made to protect it from frost.

5.1.7 Restrictions on Location of Soil and Waste Pipes.- No soil or waste pipe shall pass directly over a water tank or over any place where drinking water, ice, or food is prepared, stored, or handled.

5.1.8 Workmanship.- Workmanship shall be such as to assure the results required by all sections of this By-law, and shall be executed in a thorough and approved manner.

5.2 JOINTS AND CONNECTIONS

5.2.1 Tightness of Joints and Connections.- All joints and connections shall be made gas and water tight as required by Part 6 hereof.

5.2.2 Joints in Concrete and Vitrified Pipe.- Joints of cement mortar or bituminous material may be used only in concrete and vitrified clay sewer pipe. In making such joints the bell of the pipe shall be firmly packed with oakum or hemp and shall be secured with cement mortar or asphaltic compound at least one inch deep all around the pipe.

5.2.3 Caulked Joints.- All caulked joints shall be made with the spigot end in the direction of flow. They shall be firmly packed with oakum or hemp and shall be secured with pure lead not less than one inch deep, run in one pouring, and caulked tight. No paint, varnish, or putty shall be permitted until the joints have been tested.

5.2.4 Screw Joints.- All screw joints shall be of approved standard pattern with threads sharp and true, and all burrs due to cutting shall be reamed out.

5.2.5 Joints in Lead Pipes.- Joints in lead pipes, or between lead pipes and brass or copper pipes, shall be full-wiped joints, except that solder-brazed or sweated joints may be used on reamed, con-

cave bushings of brass connecting to exposed brass or lead traps. Wiped joints shall have an exposed surface of solder of not less than three-quarter inch on each side of the joint and a minimum thickness of three-eighths inch at the thickest part of the joint.

5.2.6 Joints of Lead to Cast Iron, Steel, or Wrought Iron.- Joints of lead to cast iron, steel, or wrought iron shall be made by means of a caulking ferrule, soldering nipple, or bushing.

5.2.7 Joints in Copper and Brass Pipe and Tubing.- Except as otherwise permitted in Article 5.2.11, screwed joints shall be used in copper or brass pipe; alternatively, joints shall be soldered by the use of a suitable flux, a thin film of solder being provided between pipe and fittings. A torch shall be used to heat the assembly to soldering temperature. Subject to the approval of the authority having jurisdiction, flux and solder shall be as recommended by the manufacturer of the pipe and fittings and his instructions for making joints shall be followed. Joints in tubing shall be soldered in accordance with the foregoing.

5.2.8 Slip Joints and Unions.- Slip joints shall be permitted only in trap seals, or on the inlet side of a trap. Unions on the sewer side of a trap shall be ground faced and shall not be concealed or enclosed.

5.2.9 Closet, Urinal, and Trap Slop Sink Connections.- The connection between soil or waste pipes and water-closets, floor outlet slop sinks, urinals, and earthenware trap standards shall be made by means of brass flanges, caulked or screwed to the drainage pipes. They may be wiped or soldered to lead pipes. The connections shall be bolted, with heavy brass bolts and heavy brass washers, to the earthenware with a gasket or washer between the earthenware and the connection.

5.2.10 Increasers and Reducers.- Any increaser or reducer, connecting different pipe sizes, shall be of the required size and shall have a pitch of not more than 45 degrees with its central axis.

5.2.11 Welding of Plumbing Joints and Connections.- The welding of any cast-iron pipe, and of drain, soil, vent, or waste pipe of any material is

forbidden. The welding of any galvanized pipe using ferrous filler metal is forbidden. Joints and connections in water-supply pipes made of brass or copper, or combinations of these materials, may be made by bronze-welding. Joints and connections in galvanized water-supply pipes may be made by bronze-welding, provided that such joints and connections are prepared and welded in a manner which will preserve the galvanizing material on the inside of the pipe or fitting, and provided further that the exterior of the finished weld and the adjacent area on which the galvanizing material may have been destroyed shall be adequately protected against corrosion. The welding of any joints or connections is forbidden unless specifically permitted herein.

All welding shall be performed in accordance with accepted good commercial practice. The welding requirements of the American Standards Association as set forth in Chapter 3 of Section 5 of the publication entitled American Tentative Standard Code for Pressure Piping, numbered B 31.1 - 1935, shall be accepted as good commercial practice and all welders shall be qualified in accordance with the qualification tests set forth therein.

5.2.12 Prohibited Joints and Connections.- Any fitting or connection which has an enlargement, chamber, or recess, with a ledge, shoulder, or reduction of the pipe area in the direction of flow, on the outlet or drain side of any trap, is prohibited. (See also Article 4.3.2.)

5.2.13 Joints not Specified.- Types of joints other than those herein specified may be used when specifically approved in writing by the authority having jurisdiction.

5.3 WATER DISTRIBUTION SYSTEMS

5.3.1 Distribution.- All water distribution systems shall be entirely independent of any other piping system and no connection shall be made or condition permitted whereby any foreign matter might enter such distribution system whether by gravity, syphonage, leakage, or back pressure.

5.3.2 Adequacy of Water Supply.- The water service pipe to any building shall be of sufficient size to permit a continuous flow of water from all outlets at one time provided that in no case shall

its internal diameter be less than five-eights inch. All plumbing fixtures shall be provided with a water supply sufficient to keep them in a clean and sanitary condition.

5.3.3 Sizes of Pipe.- The minimum internal diameters of water distributing pipes to fixtures shall be one-half inch for sill cocks, hot water boilers, laundry trays, sinks, bath-tubs, and urinals, and three-eighths inch for lavatories and water-closet tanks.

5.3.4 Restrictions on Materials.- All water-distribution pipe shall be of lead, or of galvanized wrought iron or steel, brass, copper, or cast iron, with brass or galvanized iron fittings, or of copper tubing with soldered-on bronze fittings. No pipe or fittings that have been used for any other purpose shall be used for distributing water.

5.3.5 Protection.- All concealed or exposed water pipes, storage tanks and flushing cisterns shall be adequately protected against frost.

5.3.6 Control Valves.- Control valves shall be provided on water piping as follows: a stop or curb valve at or near the curb; a stop and waste valve inside the foundation wall; control valves for each flat or apartment; an interior stop valve for each exterior outlet and for each hot water tank.

5.3.7 Relief Valves.- Whenever a check valve, water meter, or pressure regulating valve is installed on the water supply pipe between the street main and a hot water tank, a suitable relief valve shall be installed on the hot water distribution system.

5.3.8 Protection Against Results of Water-stoppage.- Protection shall be provided in the installation of any device connected with a water distribution system to ensure the safety of the occupants of any building in the event of an interruption of the water supply.

5.4 PLUMBING FIXTURES

5.4.1 Support.- All wall-hung fixtures shall be rigidly supported by approved metal hangers or bolts and all floor-outlet fixtures shall be rigidly secured to the floor by approved screws or bolts.

Water-tight joints shall be made at the junction of fixtures with walls or floors.

5.4.2 Access to Fixtures and Connections.- All fixtures shall be installed free from any enclosing work that would prevent access for cleaning. Where practicable, all pipes from fixtures shall run directly to a wall and any pipe or trap of a type liable to damage, such as lead or ceramic material, shall be adequately protected if it extends to within 12 inches of the floor.

5.4.3 Fixture Overflow.- The overflow pipe from a fixture shall be connected on the house or inlet side of the trap and be so arranged that it may be readily and effectively cleaned.

5.4.4 Shower Drains.- Any ceiling below a shower-bath which does not discharge into a tub or other fixture shall be protected from leakage by an apron or tray of lead or other equally corrosion-resistant metal draining into the shower drain.

5.4.5 Location of Fixtures.- No bath room or water-closet room shall be used for any other purpose except as a lavatory. Any such room shall have a full-sized door completely closing the entrance to it, shall either have a window opening directly to the exterior of the building or shall be provided with adequate mechanical ventilation, and shall comply in construction and design with the Building By-law.

5.4.6 Location of Sanitary Privies and Frost Proof Closets.- No sanitary privy, chemical closet, or frost proof closet shall be installed within any building used for human occupancy nor within 10 feet of any dwelling, nor in any location where it could contaminate any domestic water supply.

5.5 DRAINAGE SYSTEMS AND HOUSE SEWERS

5.5.1 General.- Every plumbing fixture in any building shall be connected to a drainage system, which shall convey all liquid or water-borne wastes to a house sewer. Except as hereinafter provided, the drainage from every fixture shall discharge into a soil or waste stack extending full size through the roof.

5.5.2 Restrictions on Materials.- Any drainage system, other than one restricted to storm water, shall be of cast iron, galvanized steel or wrought iron, lead, brass, or copper; provided that galvanized steel or wrought iron pipe shall not be used underground.

Any house sewer shall be of cast iron, vitrified clay, or concrete pipe.

5.5.3 Fixture Units.- Table 6 shall be used to determine the number of fixture units equivalent to the fixtures indicated.

TABLE 6

Equivalent Fixture Units

Fixture	Number of Fixture Units
One drinking fountain	1
One household ice-chest	1
One lavatory or wash basin	2
One kitchen sink	2
One bath-tub	2
One laundry tray	3
One dishwashing unit	3
One combination fixture	3
One urinal	3
One shower-bath	3
One floor drain	3
One slop sink	3
One water-closet	6
One bathroom group containing one water-closet, one lavatory, and one bath-tub	8
180 square feet of roof or other drained area	1

5.5.4 Soil and Waste Pipes

5.5.4.1 Minimum Sizes.- Table 7 shall be used to determine the minimum size of fixture traps and soil or waste pipes draining single fixtures.

TABLE 7

Minimum Sizes of Fixture Traps and Soil or Waste Pipes from Single Fixtures

Number of Fixture Units in a Single Fixture as Established by Article 5.5.3	Minimum Size of Fixture Trap, Soil or Waste Pipe
1	1¼ inches
2	1½ "
3	2 "
6	3 inches or more

Table 10 shall be used to determine the minimum size of other horizontal soil or waste pipes.

Table 8 shall be used to determine the minimum size of any soil or waste stack, on the basis of the distribution and total number of fixture units connected to the stack, provided that no water-closet shall discharge into a stack of less than three inches in diameter.

TABLE 8

Required Relation of Fixture Units to the Length and Diameter of Soil or Waste Stacks

Diameter of Stack	With "Sanitary T" Inlets		With all 45°Y or Combination Y and 1/8 Bend Inlets		Maximum Length Including Extension as Vent
	Fixture Units on One Branch Interval*	Fixture Units on Any One Stack	Fixture Units on One Branch Interval*	Fixture Units on Any One Stack	
1¼ inches	1	1	1	1	50 feet
1½ inches	2	8	4	12	65 feet
2 inches	9	16	15	36	85 feet
3 inches	24	48	45	72	212 feet
4 inches	144	256	240	384	300 feet
5 inches	324	680	540	1020	390 feet
6 inches	672	1380	1122	2070	510 feet
8 inches	2088	3600	3480	5400	750 feet

*The term "branch interval" shall be interpreted to mean a vertical length of stack, not less than eight feet long, within which a branch or branches are connected.

5.5.4.2 Fixture Connections.- All soil and waste stacks and branches shall be provided with correctly faced inlets for fixture connections.

No fixture connection shall be made to a lead branch from a water-closet, or similar fixture. No soil or waste vent, circuit or loop vent, above the highest installed fixture on a branch or main shall subsequently be used as a soil or waste pipe.

5.5.4.3 Indirect Wastes

(a) Indirect wastes shall be discharged into a water-supplied, trapped, and vented sink; a floor drain; a funnel; or other approved receptacle. Indirect waste pipes receiving the discharge from fixtures on more than three floors, or exceeding 100 feet in length, shall extend full size through the roof. Fixtures connected to indirect waste pipes shall be trapped but need not be vented.

(b) Soda and drinking fountains may be installed with indirect wastes.

(c) Drip pipes from refrigerators, ice boxes, or any receptacle where food is stored, shall be installed as indirect wastes. Such pipes shall be not less than $1\frac{1}{4}$ inches for one opening, $1\frac{1}{2}$ inches for three openings, and two inches for four to ten openings. They shall have a trap at each opening and clean-outs at all angles, and shall be so arranged as to permit flushing and cleaning. Such waste pipes shall be continued full size through the roof, except where such fixtures are located in the basement or first floor.

5.5.4.4 Overflow Pipes.- Pipes from any water supply tank, or exhaust from a water lift, shall not be connected directly with any house drain, soil pipe, or waste pipe.

5.5.4.5 Flammable Wastes.- Flammable liquids shall not be discharged into any drain discharging directly or indirectly into a street sewer.

Floor drains or catch basins from garages, gasoline service stations, or other establishments handling petroleum or other flammable liquids shall be equipped with oil intercepting traps of approved design.

Grease or oil changing pits shall not be connected with a street sewer.

5.5.4.6 Steam Exhaust, etc.- No steam exhaust, blow-off, or drip pipe shall discharge directly into any plumbing system. Such pipes shall be connected to a condenser or cooling tank. Water or vapour at a higher temperature than 150° Fahrenheit or any substance liable to be injurious to any part of such plumbing system or to the sewage system shall not be discharged into any plumbing system.

5.5.4.7 Acid Wastes.- Pipes conveying acid wastes shall be of lead, glazed earthenware, high-silicon iron, or other material of equal corrosion resistance, provided that other pipes may be used if they are not enclosed in walls or partitions and are so arranged as to be replaceable without damage to the structure or finish of the building.

All acid waste pipes shall have attached to them automatic flush tanks, shall discharge into a diluting tank of adequate dimensions, and thence directly to a drain or over a catch basin.

5.5.4.8 Hazardous Wastes and Solid Wastes.- No materials which may give off explosive gas, or which form or may tend to form explosive substances shall be discharged into a street sewer either directly or indirectly. No materials which may settle or form deposits in a sewer or which may in any way tend to diminish the capacity of a sewer, shall be discharged into a street sewer either directly or indirectly.

5.5.5 House Drains

5.5.5.1 Minimum Sizes.- Table 10 shall be used to determine the maximum number of fixture units that may be drained by any sanitary house drain or part thereof, provided that no water-closet shall discharge into a house drain less than four inches in diameter.

5.5.5.2 Excavation.- All excavations for the installation of a drainage system within the walls of a building shall be open-cut and shall be kept open until the piping has been inspected and approved. (See Article 6.2.2.)

5.5.5.3 Depth and Location.- All house drains shall be laid at sufficient depth to protect them

from frost and, where possible, shall be brought into the building below the lowest floor. No joints shall be made in or under any foundation wall.

5.5.5.4 Back-water Valves.- Any back-water valve shall be installed in such a way as to be readily accessible for cleaning.

5.5.6 Traps and Clean-outs

5.5.6.1 General.- Each fixture shall be separately trapped, except that a battery of two or three laundry trays, one sink and two laundry trays, or a two-compartment sink, the outlets of which are two inches or less, may connect with a single trap, provided the trap is centrally placed. Traps shall be as near to the fixture as possible, and in all cases, within two feet of developed length from the outlet of the fixture. The waste from a bath-tub or other fixture shall not discharge into a water-closet trap or bend. No fixture shall be double trapped.

5.5.6.2 Size of Traps.- The nominal inside diameter of any trap, except grease traps, shall be equal to that of the soil or waste pipe with which it is connected. (See Item 5.5.4.1.)

5.5.6.3 Setting and Protection of Traps.- All traps shall be so located as to be accessible, shall be rigidly supported, set true with respect to their water seals, and protected from frost and evaporation.

5.5.6.4 Grease Traps.- Water-jacketed grease traps shall be installed in all waste pipes from kitchen sinks in hotels, restaurants, and institutional buildings.

Grease traps shall be placed as near as possible to the fixture from which they receive the discharge and shall have twice the capacity of such fixture.

5.5.6.5 Sand Traps and Catch Basins.- Sand traps or catch basins when installed shall be designed and placed so as to be readily accessible for cleaning. When installed within or in close proximity to any building, adequate means shall be provided to protect their seal against evaporation.

5.5.6.6. Basement Floor Drains.- Any cellar or basement floor drain shall be connected to a trap which is provided with a water-seal and so constructed that it can be readily cleaned. When subject to back-flow or back-pressure, any such drain shall be equipped with an adequate back-water valve.

5.5.6.7 Clean-outs.- Easily accessible clean-outs shall be provided at the foot of each vertical waste or soil stack, at each change of direction in horizontal runs, inside the wall near the connection between the house drain and the sewer, and in such locations as shall make every part of the drainage system readily accessible. The distance between clean-outs in horizontal soil lines shall not exceed 50 feet. Clean-outs shall be of the full size of the pipe up to four inches in diameter and not less than four inches for larger pipe.

5.5.6.8 Manholes.- All underground traps and clean-outs in any building, except where clean-outs are flush with the floor, and all exterior underground traps shall be made accessible by manholes. Wherever possible, clean-outs in a building shall be brought to the surface of the floor.

5.5.6.9 Clean-out Equivalent.- Any floor or wall connection of a fixture trap when bolted or screwed to the floor or wall shall be regarded as a clean-out.

5.5.7 Storm-water Drains

5.5.7.1 General.- The runoff from roofs and paved areas may be drained into storm, or combined sewers, but shall not be drained into sanitary sewers. When such drains are connected with combined sewers they shall be effectively trapped, except that roof leaders and conductors, for which the roof or gutter opening is located 12 feet or more from a door, window, or air shaft, need not be trapped. One trap may serve for all such connections, but must be set below the frost line, or on the inside of the building.

5.5.7.2 Size of Gutters and Leaders.- No gutter or inside vertical leader shall be of a size less than that indicated in Table 9.

TABLE 9

Sizes of Gutters and Leaders*

Drained Area (square feet)	Gutter (inches)	Leader (inches)
Up to 90	3	1½
91 " 270	4	2
271 " 810	4	3
811 " 1800	5	3
1801 " 3600	6	4
3601 " 5500	8	5
5501 " 9600	10	6

*Leader sizes as given in Table 9 indicate the diameter of circular sections, and gutter sizes indicate the diameter of semicircular sheet-metal sections. Other shapes of leaders and gutters shall have equivalent areas.

5.5.7.3 Size of Horizontal Storm-water Drains.- The required sizes of horizontal storm-water drains shall be determined in accordance with Table 11 hereof.

The size of combined storm and sanitary drains shall conform to the requirements for sewers as set forth in Item 5.5.8.8.

5.5.7.4 Inside Leaders.- When placed within the walls of any building, or in an inner court or air well, all conductors or roof leaders shall be constructed of cast iron, or galvanized wrought iron or steel pipe.

5.5.7.5 Outside Leaders.- When outside leaders or down spouts of sheet metal are connected with the house drain, they shall be so connected by not less than one length of cast iron pipe extending vertically at least one foot above the grade line.

5.5.7.6 Connections with Leaders Prohibited.- Rain water leaders shall not be used as soil, waste, or vent pipes, nor shall any soil, waste, or vent pipes be used as rain water leaders, provided that a roof having an area of less than 1000 square feet may be drained into a soil or waste stack below any portion of such stack serving as a vent. The size

of any such stack shall be adequate for its combined purposes.

5.5.8 House Sewers

5.5.8.1 General.- Where practicable, the plumbing system of any new building or dwelling, or a new plumbing system in any existing building, shall be entirely separate from and independent of that of any other building and every building or dwelling shall have an independent connection with a public or private sewer, when available.

When one building stands in the rear of another building on the same lot, and no private sewer is available or can be constructed to the rear building, the house drain from the front building may be extended to the rear building and the whole considered as one house sewer.

5.5.8.2 Old House Sewers.- Old house sewers may be used in connection with new buildings or new plumbing only when they are found, on examination and test, to conform in all respects to the requirements governing new sewers as prescribed in this By-law.

5.5.8.3 House Sewer Discharges.- Every house sewer shall be connected to a street sewer; provided that when a street sewer is not available such house sewer shall be connected to a septic tank or other approved private sewage disposal system.

5.5.8.4 Excavation.- Excavations for house sewers shall be open-cut trenches, except that tunelling may be permitted in yards and courts for distances not exceeding six feet.

5.5.8.5 Depth and Location.- All house sewers shall be laid at sufficient depth to protect them from frost. No sewer shall be laid within three feet of any bearing wall.

5.5.8.6 Size of Sanitary House Sewers

(a) All sanitary house sewers from a point three feet outside of the outer wall of the building, shall have an inside diameter of not less than six inches; provided that when cast iron pipe is used it shall be of not less than four inches in diameter. No sewer shall be of smaller diameter than any drain pipe served by it.

(b) Table 10 shall be used to determine the maximum number of fixture units that may be drained by any sanitary house sewer or part thereof.

TABLE 10

House Drains, House Sewers, and Horizontal Soil or Waste Pipes

Diameter of Pipe in Inches	Maximum Number of Fixture Units		
	1/8 inch fall per foot	1/4 inch fall per foot	1/2 inch fall per foot
1¼	1	1	1
1½	2	2	3
2	5	6	8
3	15	18	21
4	84	96	114
5	180	234	280
6	330	440	580
8	870	1,150	1,680
10	1,740	2,500	3,600
12	3,000	4,200	6,500

5.5.8.7 Sizes of Storm-water House Drains and Sewers.- The required sizes of storm-water house drains and sewers shall be determined on the basis of the total drained area in horizontal projection in accordance with Table 11 hereof.

TABLE 11

Storm-water Drains and Sewers

Diameter of Pipe in Inches	Maximum Drained Area in Square Feet		
	1/8 inch fall per foot	1/4 inch fall per foot	1/2 inch fall per foot
3	865	1,250	1,750
4	1,860	2,650	3,800
5	3,300	4,700	6,650
6	5,250	7,500	10,700
8	11,000	16,000	22,200
10	19,500	27,500	40,000
12	32,500	45,500	65,500
15	58,000	81,000	115,000

Note: Table 11 is based on gravity flow in a full pipe, and a maximum rate of rainfall of four inches per hour. Subject to the approval of the authority having jurisdiction, the table may be modified, when necessary, to meet local conditions of rainfall, by multiplying each given roof area by 4/x, where x is the rate of rainfall to be provided for in inches per hour.

5.5.8.8 Sizes of Combined House Drains and Sewers.- The required sizes of all house drains and sewers carrying storm and sanitary flow shall be determined by adding to the total drained area an allowance in square feet for each fixture unit on the sanitary system and using the total area so obtained with Table 11. This allowance shall be determined in accordance with Table 12 hereof.

TABLE 12

Drained-area Equivalent of Fixture Units

30	square	feet	for	each	of	the	first	6 units
20	"	"	"	"	"	"	next	4 units
14	"	"	"	"	"	"	"	10 units
9	"	"	"	"	"	"	"	10 units
6	"	"	"	"	"	"	"	1,470 units
5	"	"	"	"	"	"	"	1,500 units
.4	"	"	"	"	"	"	"	2,000 units
3	square	feet	for	each	fixture	unit	thereafter.	

5.5.8.9 House Sewers in Made Ground.- When house sewers are laid in made or filled-in ground, they shall be of vitrified clay or concrete pipe laid in a concrete cradle or on an approved grillage, or of cast iron pipe.

5.5.8.10 Drainage Below Sewer Level.- In all buildings in which the whole, or part, of the house drainage and plumbing system lies below the level of the crown of the street sewer, sewage or house wastes shall be lifted by approved means and discharged into the house sewer.

5.5.8.11 Sumps and Receiving Tanks.- All sub-house drains shall discharge into an air-tight sump or receiving tank, so located as to receive the sewage by gravity, from which sump or receiving tank the sewage shall be lifted and discharged into the house sewer by pumps, ejectors, or other equally efficient method, operated automatically. When sub-

house drains do not receive the discharge from plumbing fixtures other than cellar floor drains, the sump or receiving tank need not be air-tight or vented.

5.5.8.12 Motors, Compressors, etc.- All motors, air compressors, and air tanks shall be located where they are open for repair and inspection at all times.

5.5.8.13 Sub-soil Drains.- Sub-soil drains below the sewer and cellar floor drains shall be discharged into an independent sump or receiving tank and the contents automatically discharged into the sewer. The discharge of automatic systems shall be protected against back-pressure.

5.5.9 Vents

5.5.9.1 General.- Every fixture trap shall be protected against siphonage and back-pressure, and air circulation shall be assured throughout the drainage system by means of a soil or waste stack vent, a continuous soil or waste vent, or a loop or circuit vent. No crown vent shall be installed.

Branch vents shall be so installed as to eliminate any possibility of their functioning as soil or waste pipes.

5.5.9.2 Required Size of Vents

(a) Branch and Individual Vents.- No vent shall be less than 1¼ inches in diameter. No branch or main vent shall have a diameter less than one-half that of the soil or waste pipe served, and in no case shall the length of a branch vent of given diameter exceed the maximum length permitted for a main vent serving the same size soil or waste stack.

(b) Vent Stacks or Main Vents.- The required size of main vents or vent stacks shall be determined from the size of the soil or waste stack vented, the total number of fixture units drained into it, and the developed length of the vent, in accordance with Table 13 hereof, interpolating when necessary between permissible lengths of vent.

TABLE 13

Maximum Permissible Lengths of Main Vents or Vent Stacks (in feet)

Diameter of soil or waste stack (inches)	Number of Fixture Units	Diameter of vent (in inches)									
		1¼	1½	2	2½	3	4	5	6	8	10
1¼	1	45									
1½	8	35	60								
2	18	30	50	90							
2½	36	25	45	75	105						
3	12		34	120	180	212					
3	18		18	70	180	212					
3	24		12	50	130	212					
3	36		8	35	93	212					
3	48		7	32	80	212					
3	72		6	25	65	212					
4	24			25	110	200	300	340			
4	48			16	65	115	300	340			
4	96			12	45	84	300	340			
4	144			9	30	72	300	340			
4	192			8	30	64	282	340			
4	264			7	20	56	245	340			
4	384			5	18	47	206	340			
5	72				40	65	250	390	440		
5	144				30	47	180	390	440		
5	288				20	32	124	390	440		
5	432				16	24	94	320	440		
5	720				10	16	70	225	440		
5	1,020				8	13	58	180	440		
6	144					27	108	340	510		
6	288					15	70	220	510	630	
6	576					10	43	150	425	630	
6	864					7	33	125	320	630	
6	1,296					6	25	92	240	630	
6	2,070					4	21	75	186	630	
8	320						42	144	400	750	900
8	640						30	86	260	750	900
8	960						22	60	190	750	900
8	1,600						16	40	120	525	900
8	2,500						12	28	90	370	900
8	4,160						7	22	62	252	840
8	5,400						5	17	52	212	705

5.5.9.3 Distance of Vent from Trap Seal.- The maximum distance from any trap to its vent shall not be more than five feet of horizontal developed length. The vent opening from the soil or waste pipe, except for water-closets and similar fixtures, shall be above the dip of the trap.

5.5.9.4 Vent Connections.- All main vents or vent stacks shall connect in full size, at their base, to the main soil or waste pipe at or below the lowest fixture branch, and shall extend undiminished in size, above the roof, or shall be reconnected with the main soil or waste stack, at least three feet above the highest fixture branch.

Where a vent pipe connects to a horizontal soil or waste pipe, the vent pipe shall be taken off above the centre line of the soil or waste pipe, and shall rise vertically, or at an angle of not more than 45 degrees with the vertical, to a point six inches above the fixture it is venting before offsetting horizontally or connecting to a branch or main vent or to a waste or soil vent.

5.5.9.5 Vent Pipe Grades.- All vent and branch vent pipes shall be free from drops or sags, and shall be so graded and connected as to drip back to the soil or waste pipe by gravity.

5.5.9.6 Roof Extensions.- Roof extensions of soil, waste, or vent stacks shall extend full size at least two inches above the roof. When climatic conditions are such that there is danger of condensation and freezing in such extensions, any extension exceeding three inches shall be adequately protected.

Any soil, waste, or vent stack extending above a roof used for purposes other than protection against the weather shall extend not less than six feet above such roof. Any such pipe or vent terminating within 12 feet of any door, window, or air shaft shall extend at least three feet above the top of such opening.

Soil, waste, or vent stacks extended through the roof shall be at least four inches in diameter. Stacks smaller than four inches shall be provided with a long increaser at least one foot below the roof.

5.5.9.7 Circuit and Loop Vents.- A circuit or loop vent shall be permitted as follows: A branch soil or waste pipe to which two and not more than eight water-closets, urinals, trap-standard slop sinks, or shower stalls are connected in a series or battery formation may be vented by a circuit or loop vent, which shall be taken off in front of the last fixture connection. When fixtures discharge above such branch, each branch shall be provided with a relief vent one-half the diameter of the soil or waste stack, taken off in front of the first fixture connection. Not more than eight fixtures shall be connected to a battery type branch soil or waste pipe, unless a two-inch relief vent is provided between each additional eight fixtures or fraction thereof.

5.5.9.8 Venting of Ejector Systems.- The soil or waste pipe leading to an ejector or other appliance for raising sewage or other waste matter to the street sewer shall be provided with a vent pipe. The vent for any such soil pipe shall be not less than four inches in diameter, and the vent for any such waste pipe shall be of the same diameter as the waste pipe.

5.5.9.9 Vents Not Required.- No vent shall be required on a down spout or rain leader trap, a backwater trap, a sub-soil catch basin trap, or on a cellar floor drain, provided the cellar floor drain branches into the house drain on the sewer side at a distance of five feet or more from the base of the stack.

5.5.9.10 Common Vents for Adjacent Fixtures.- Two fixtures of the same kind set back to back, side by side, or on opposite sides of a wall or partition, may be served by a common vent; provided that each fixture drains separately into a double fitting having inlet openings at the same level.

PART 6 - INSPECTION AND TESTING

6.1 REQUIRED INSPECTIONS.- Every part of any plumbing system shall be subject to inspection by the authority having jurisdiction who shall have the right of entry to any building within this municipality for the purpose of making inspection, reinspections, or otherwise performing such duties as may be necessary to approval in accordance with this By-law.

6.2 REGULATIONS PERTAINING TO INSPECTIONS

6.2.1 Notification.- It shall be the duty of the plumber to notify the authority having jurisdiction, in writing, when the work is ready for inspection or testing.

6.2.2 Covering of Work.- No plumbing system, or part thereof, shall be covered until it has been inspected, tested, and approved.

6.2.3 Material and Labour for Tests.- All equipment, materials, and labour necessary for inspection and testing shall be furnished by the plumber.

6.2.4 Defective Materials or Workmanship.- If inspection or testing shows defective materials or workmanship, such defective work or materials shall be replaced and the inspection and test repeated, until satisfactory.

6.2.5 Maintenance.- Any part of a plumbing system that becomes defective or unsanitary shall be repaired, replaced, or removed within 30 days after receipt of written notice from the authority having jurisdiction; the quality and design of materials and the workmanship employed in such work shall in all respects comply with the requirements of this By-law.

6.3 CERTIFICATE OF APPROVAL.- Upon the satisfactory completion and final testing of any plumbing system, a certificate of approval shall be issued to the plumber by the authority having jurisdiction, and no owner or occupier of any building shall use any plumbing or fixture until such certificate has been granted.

6.4 TESTS

6.4.1 Water Distribution Systems.- Upon the completion of any water distribution system it shall be tested and proven tight under water pressure not less than the maximum working pressure under which it is to be used.

6.4.2 Fixtures, Drainage Systems, and House Sewers

(a) Every part of any drainage system shall be tested by means of a water test before being concealed or built in. After all plumbing fixtures have been set the system shall be subjected to a final smoke test.

(b) Water and Air Tests.- When specifically permitted by the authority having jurisdiction, the air test may be used in place of the water test; otherwise the latter shall be applied to all drainage systems and house sewers. Both tests, when used, shall be applied to the whole system, either in one operation or by sections.

The water test shall be conducted by closing all openings and filling the system completely with water under a pressure equal to that exerted by a

column of water at least ten feet high in all parts. The air test shall be conducted in a similar manner, a minimum air pressure of five pounds per square inch being employed.

In neither test shall there be any discernible leakage of water or air, nor shall there be any loss of pressure when the system is brought to the test pressure and held for 15 minutes without further addition of water or air.

(c) Smoke Test.- This test shall be applied to the entire drainage system and house sewer with all traps filled with water. A dense smoke, produced by one or more approved smoke machines, shall be introduced into the entire system. As soon as smoke issues in substantial quantities from the stack openings on the roof, such openings shall be tightly closed and a pressure equal to that exerted by a column of water at least one inch high shall be applied to the system. There shall be no evidence of smoke leakage at any joint or in any fixture.

PART 7 - PRIVATE SEWAGE DISPOSAL SYSTEMS

7.1 GENERAL.- Whenever a street or common sewer is not available any sanitary house sewer shall be connected to a private sewage disposal system. Such system shall consist of a septic tank with a tile disposal field or other approved means of disposal.

7.2 LOCATION.- Any septic or other sewage disposal tank shall be located outside, and be separated from any wall, of a dwelling house. Any disposal field or area shall be located as far as practicable from any dwelling and in no case shall disposal tiles be nearer at any point than ten feet to any dwelling.

No sewage disposal system shall be so located that it is liable to contaminate any existing domestic water supply nor shall it be located under any roadway or traffic way.

7.3 MATERIALS.- The walls and floors of any septic tank or other sewage disposal tank shall be of substantial water-tight construction.

7.4 CAPACITY.- No septic tank or other sewage disposal tank for dwellings shall have a capacity, below the invert of the outlet pipe, of less than 150 gallons, and this capacity shall be increased by not less than 60 gallons for each bedroom, in excess of two, in the dwelling served.

For schools and similar establishments whose daily requirements are of limited duration the capacity below the invert of the outlet pipe shall be not less than 300 gallons and shall be in proportion to the total number of persons for whose accommodation such establishment is designed, intended, or used, at a minimum rate of 15 gallons per person.

Adequate provision shall be made for any condition that may result in a flow of sewage greater than 150 gallons per day in any dwelling or 15 gallons per person per day in any school or similar establishment. When computations or assumptions are made as to the expected flow of sewage, the septic tank shall be sufficiently large to allow a detention period of 24 hours and shall contain in addition a reasonable space for sludge storage.

7.5 DESIGN.- The digestion or treatment and dosing chambers of any septic tank or other sewage disposal tank shall be securely covered with concrete, metal, or wood and shall be provided with adequate means of access and ventilation.

The depth of the digestion chamber shall not be less than 42 inches below the level of the liquid outflow. A space of at least 12 inches shall be provided above the level of liquid outflow, for scum formation and gas escape.

The inlet and outlet pipes shall be of a size not less than that of the sewer served and shall be so provided with baffle plates or with inverted sanitary tee fittings as to prevent any excess turbulence or disturbance of the scum. The outlet baffle or tee fitting shall extend not less than six inches above and 15 inches below the water line. The inlet tee fitting or baffle shall extend several inches above and 10 to 15 inches below the water level in the tank. The level of the outlet shall be two to four inches below that of the inlet.

The length of rectangular digestion chambers shall be at least one and one-half times their width and the direction of flow of sewage shall be parallel to the longest dimension of the tank.

7.6 DOSING CHAMBERS.- Any septic tank or other sewage disposal tank discharging into a sub-surface tile disposal field or sand filter shall be provided with a dosing chamber of liquid capacity at least one-quarter that of the treatment or digestion chamber.

7.7 DOSING SIPHONS.- Dosing chambers shall be provided with siphons or other discharging devices and shall be automatic unless other means are provided for their proper operation. Such siphons or other discharging devices shall be made of corrosion-resistant material.

7.8 STORM WATER.- Surface or storm water shall not be drained into any private sanitary sewage disposal system.

7.9 VENT PIPES.- No vent pipe or fresh air inlet of any sewage disposal system shall terminate within 20 feet of any window, door, or other air intake of any building used for human habitation; provided that if such vent pipe opening or inlet is at least three feet above any window, door, or other air intake, it may terminate not less than ten feet from it.

7.10 EFFLUENT PIPE FROM SEWAGE TANK.- The effluent pipe from any septic tank or other sewage tank to the disposal field or area shall comply with the requirements for house sewers as set forth in this By-law. Every effluent pipe shall be placed at a depth such that it is wholly below the level of the floor of any dosing chamber serving it.

7.11 CAPACITY OF TILE DISPOSAL FIELD.- The capacity of any private sub-surface irrigation field for sewage shall depend on the character of the soil and the capacity of the dosing chamber.

The length of open-joint tiling shall be not less than 130 lineal feet per dwelling in porous soils and shall be increased in proportion to the number of bedrooms in excess of two at the minimum rate of 50 lineal feet per bedroom.

For schools and similar establishments whose daily requirements are of limited duration, the length of open-joint tiling shall be not less than 260 lineal feet and shall be increased in proportion to the accommodation provided in such establishment at the minimum rate of 12 feet per person.

The volume of the disposal tile and feeder pipes shall in no case be less than 120 per cent. of the discharge volume of the dosing chamber.

7.12 TILE DISPOSAL FIELD IN IMPERVIOUS SOIL.- No sub-surface sewage irrigation field shall be constructed in clay or other heavy or impervious soil unless porous filtration media and adequate drainage are provided by removing such impervious soil and replacing it with porous filtering material such as coarse sand, gravel, cinders, or broken stone, to a depth below the bottom of the disposal tile of not less than 18 inches and preferably not less than 24 inches.

7.13 SIZE OF OPEN-JOINT TILE AND METHOD OF LAYING.- Ordinary field drainage tile of a size not less than four inches shall be used. They shall be laid on a firm base of broken stone, gravel, or on tile supports, and shall have a depth of cover not less than 12 inches nor greater than 24 inches. Open joints of 1/8 to 3/8 inch shall be left between tiles, and the upper half of such joints shall be covered by tarred paper, broken tile, or other approved protection. The tile trench shall be backfilled with coarse sand, gravel, cinders or broken stone of particle size not greater than one-half inch in any dimension, to a depth of six inches over the top and around the sides of the tile wherever the soil is less porous than coarse sand or gravel. Tiling shall not be laid under any roadway or traffic way.

7.14 GRADE OF TILING.- The open-joint tiling shall be laid at a small uniform down grade not exceeding two inches per 100 feet.

7.15 LATERAL BRANCHES OF TILING.- Lateral branches of open-joint tiling shall be not less than three feet apart and shall be connected to the liquid effluent pipe or to a header by sewer pipe branch fittings. Header pipes shall be of a quality equal to that required for house sewer pipes.

PART 8 - PENALTIES

Any person convicted of a breach of any of the provisions of this By-law shall be liable to a fine, with or without costs, and in default of immediate payment of the said fine, with or without costs, to an imprisonment; the amount of said fine and the term of said imprisonment to be fixed by the convicting magistrate at his discretion. The fine shall not exceed $50.00 and the term of imprisonment shall not be for a longer period than sixty days.

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