

URBANA
PLUMBING ORDINANCE
1959

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PLUMBING ORDINANCE

An ordinance providing for the materials, construction, alteration and inspection of all plumbing in, or in connection with, any building in the City of Urbana, Illinois, and for the regulation and enforcement of all rules, regulations, and laws or ordinances pertaining thereto; and for the issuance of permits for the installation and/or repair and/or alteration of plumbing and the establishing and collection of fees therefor and for the protection of public health.

BE IT ORDAINED by the City Council of the City of Urbana that all plumbing work hereafter done and performed in the City of Urbana, Illinois, shall conform to the provisions of this ordinance and shall be performed only by the persons herein specified and all such plumbing work shall be inspected as herein provided.

BASIC PRINCIPLES

The basic principles of this Code are enunciated as basic goals in environmental sanitation worthy of accomplishment through properly designed, acceptably installed, and adequately maintained plumbing systems. Some of the details of plumbing construction must vary, but the basic sanitary and safety principles are the same. The results desired and necessary to protect the health of the people are the same everywhere. As unforeseen situations arise which are not covered in the body of the Code, these principles shall serve to define the intent.

PRINCIPLE NO. 1 - All premises intended for human habitation, occupancy, or use shall be provided with a supply of pure and wholesome water, neither connected with unsafe water supplies nor subject to the hazards of backflow or backsiphonage.

PRINCIPLE NO. 2 - Plumbing fixtures, devices, and appurtenances shall be supplied with water in sufficient volume and at pressures adequate to enable them to function satisfactorily and without undue noise under all normal conditions of use.

PRINCIPLE NO. 3 - Plumbing shall be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning.

PRINCIPLE NO. 4 - Devices for heating and storing water shall be so designed and installed as to prevent dangers from explosion through overheating.

PRINCIPLE NO. 5 - Every building having plumbing fixtures installed and intended for human habitation, occupancy, or use on premises abutting on a street, alley, or easement in which there is a public sewer shall have a connection with the sewer.

PRINCIPLE NO. 6 - Each family dwelling unit on premises abutting on a sewer or with a private sewage-disposal system shall have, at least, one water closet, one kitchen-type sink, and a bathtub or shower installed to meet the basic requirements of sanitation and personal hygiene.

All other structures for human occupancy or use on premises abutting on a sewer or with a private sewage-disposal system shall have adequate sanitary facilities but in no case less than one water closet and one hand-washing lavatory or other similar fixture for cleansing purposes.

PRINCIPLE NO. 7 - Plumbing fixtures shall be made of smooth nonabsorbent material, shall be free from concealed fouling surfaces, and shall be located in ventilated enclosures.

PRINCIPLE NO. 8 - The drainage system shall be designed, constructed, and maintained so as to guard against fouling, deposit of solids, and clogging, and with adequate cleanouts so arranged that the pipes may be readily cleaned.

PRINCIPLE NO. 9 - The piping of the plumbing system shall be of durable material, free from defective workmanship and so designed and constructed as to give satisfactory service for its reasonable expected life.

PRINCIPLE NO. 10 - Each connection, direct or indirect, to the drainage system shall be equipped with a water-seal trap.

PRINCIPLE NO. 11 - The drainage system shall be designed to provide an adequate circulation of air in all pipes with no danger of siphonage, aspiration, or forcing of trap seals under conditions of ordinary use.

PRINCIPLE NO. 12 - Each vent terminal shall extend to the outer air and be so installed as to minimize the possibilities of clogging and the return of foul air to the building, or adjoining buildings.

PRINCIPLE NO. 13 - The plumbing system shall be subjected to such tests as will effectively disclose all leaks and defects in the work.

PRINCIPLE NO. 14 - No substance which will clog the pipes, produce explosive mixtures, destroy the pipes or their joints, or interfere unduly with the sewage-disposal process shall be allowed to enter the building drainage system.

PRINCIPLE NO. 15 - Proper protection shall be provided to prevent contamination of food, water, sterile goods, and similar materials by backflow of sewage. When necessary, the fixture, device, or appliance shall be connected indirectly with the building drainage system.

PRINCIPLE NO. 16 - No water closet shall be located in a room or compartment which is not properly lighted and ventilated.

PRINCIPLE NO. 17 - If water closets or other plumbing fixtures are installed in buildings where there is no sewer within a reasonable distance, suitable provision shall be made for disposing of the building sewage by some accepted method of sewage treatment and disposal.

PRINCIPLE NO. 18 - Where a plumbing drainage system may be subject to backflow of sewage, suitable provision shall be made to prevent its overflow in the building.

PRINCIPLE NO. 19 - Plumbing systems shall be maintained in a sanitary and serviceable condition. See definition "Plumbing."

PRINCIPLE NO. 20 - All plumbing fixtures shall be so installed with regard to spacing as to be reasonably accessible for their intended use.

PRINCIPLE NO. 21 - Plumbing shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls and other surfaces through fixture usage.

PRINCIPLE NO. 22 - Sewage or other waste, from a plumbing system which may be deleterious to surface or sub-surface waters shall not be discharged into the ground or into any waterway unless it has first been rendered innocuous through subjection to some acceptable form of treatment.

CHAPTER 1

DEFINITIONS

1.1 GENERAL

1.1.1 For the purpose of this code, the following terms shall have the meaning indicated in this chapter.

1.1.2 No attempt is made to define ordinary words which are used in accordance with their established dictionary meaning except where the word has been loosely used and it is necessary to define its meaning as used in this code to avoid misunderstanding.

1.1.3 Because the primary purpose is to define terms rather than words, the definitions are arranged alphabetically according to the first word of the term rather than the noun.

1.2 DEFINITION OF TERMS

Administrative Authority. "Administrative Authority" as used herein is the Plumbing Inspector of the City of Urbana unless otherwise specifically indicated. He is to administer and enforce the provisions of the plumbing code as adopted or amended.

Air Gap. An air gap in a water-supply 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.

Anchors. See Supports.

Anti-Siphon Ball Cock. An anti-siphon ball cock 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 Administrative Authority.

Area Drain. An area drain is a receptacle designed to collect surface or rain water from an open area.

Back Pressure. Back pressure is an exerted 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.

Backflow. Backflow is the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water and sewers from any source or sources other than its intended source. (See back-siphonage.)

Backflow Connection. Backflow connection or condition is any arrangement whereby backflow can occur.

Backflow Preventer. A backflow preventer is a device or means to prevent reverse flow into the potable water system.

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 or sewer due to a negative pressure in such pipe. (See backflow.)

Ball Cock. 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.

Boiler Blow-Off. A boiler blow-off is an outlet on a boiler to permit emptying or discharge of sediment.

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 story height, but in no case less than 8 feet within which the horizontal branches from one floor or story of a building are connected to the 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 component structural parts designed for the housing, work, play, shelter, enclosure, or support of persons, animals, or property of any kind.

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

Building Drain. The building sanitary 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 septic tank.

Building Storm Drain. A building storm drain is a building drain used for conveying rain water, surface water, ground water, subsurface water, condensate, cooling water, or other similar discharge to a building storm sewer or a combined building sewer, extending to an approved point of disposal.

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 building sewer.

Burr. Roughness or extra metal protruding from the walls of a pipe usually as the result of cutting the pipe.

Catch Basin. A receptacle in which liquids are retained for a sufficient period to deposit settleable material.

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.

Cock. See Faucet.

Code. The word "Code" when used alone shall mean these regulations, subsequent amendments thereto, or any emergency rule or regulation which the Administrative Authority having jurisdiction may lawfully adopt.

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 Sewer. A combined building sewer 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 Vent. A common vent is a vent connecting at the junction of two fixture drains and serving as a vent for both fixtures.

Common Waste. A common waste is a drain from a fixture containing multiple compartments connected to a single trap.

Conductor. See Leader.

Continuous Vent. A continuous vent is a continuation of the drain to which it connects.

Cross-Connection. 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. (See Backflow and Back-Siphonage).

Crown. The crown of a trap. This is the part of a trap in which the direction of flow is changed from an upward to downward direction.

Crown Weir. The highest portion of the inside bottom surface at the crown of a trap.

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 feet or more by means of a plug or other closed fitting.

Deep Seal Trap. A trap with a seal of four inches or more.

Developed Length. The developed length of a pipe is its length along the center line of the pipe and fittings.

Diameter. Unless specifically stated, the term "diameter" is the nominal diameter as designated commercially.

Dip of a Trap. The lowest portion of the inside top surface of the channel through a trap.

Double Offset. A double offset is two changes of direction installed in succession or series in continuous pipe.

Downspout. See Leader.

Drain. A drain is any pipe which carries waste water or water-borne wastes 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.

Drum Trap. A trap consisting of a cylinder with its axis vertical. The cylinder is larger in diameter than the inlet or outlet pipe. It is usually four inches in diameter with 1½- or 2-inch inlets and outlets.

Dual Vent. See Common Vent.

Durham System. Durham system is a term used to describe soil or waste systems where all piping is of threaded pipe, using recessed drainage fittings.

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.)

Emergency. A sudden and unexpected condition, the making of remedies for which can not be postponed until a permit has been secured without endangering life or property.

Existing Work. Existing work is a plumbing system or any part thereof which has been installed prior to the effective date of this Code, or under authorization of a previously issued permit in accordance with this Code.

Faucet or Cock. A valve on a water pipe by means of which water can be drawn from or held within the pipe.

Ferrule. A metallic sleeve, caulked or otherwise joined to an opening in a pipe, into which a plug is screwed which can be removed for the purpose of cleaning or examining the interior of the pipe.

Fittings. Parts of a pipe line other than straight pipe or valves, such as couplings, elbows, tees, crosses, unions, increasers, etc.

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 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 by some arbitrarily chosen scale.

Fixture-Unit Flow Rate. Fixture-unit flow rate is the total discharge flow in 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 multiplied of this unit of flow.

Float Valve. A float valve is a positive operating valve, operated by a float, used to control the water level in a vessel, tank, or other container.

Flood Level. See Flooded.

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 overflow rim.

Flush Valves. A flush valve is a device located at the bottom of the tank for the purpose of flushing water closets and other fixtures.

Flushometer Valve. A flushometer valve is a device which discharges a predetermined quantity of water to fixtures for flushing purposes.

Frostproof Closet. A frostproof closet is a hopper that has no water in the bowl and has the trap and the control valve for its water supply installed below the frost line.

Grade. Grade is the slope or fall 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. See Interceptor.

Grease Trap. See Interceptor.

Group 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.

Hangers. See Supports.

Horizontal Branch. A horizontal branch is a drain pipe extending laterally from a soil or waste 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 to the building drain.

Horizontal Pipe. Horizontal pipe means any pipe or fitting which makes an angle of more than 45 deg. with the vertical.

Hose. A hose is any flexible pipe which is readily removed without the use of tools, which may or may not be equipped with fittings.

House Drain. See Building Drain.

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

Industrial Wastes. 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.

Insanitary. Contrary to sanitary principles--injurious to health.

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 lowest portion of the inside of any pipe that is not vertical.

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

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

Load Factor. Load factor is the percentage of the total connected fixture unit flow rate which is likely to occur at any point in the drainage system. It varies with the type of occupancy, the total flow unit above this point being considered, and with the probability factor of simultaneous use.

Loop Vent. A loop vent is an individual vent that terminates in its own drain.

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.

May. The word "may" is a permissive term.

Manhole. An opening constructed to a sewer, or any portion of a plumbing system, of sufficient size to permit a person to gain access thereto.

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 Administrative Authority.

Nuisance. The word "nuisance" embraces public nuisance as known at common law or in equity jurisprudence; and whatever is dangerous to human life or detrimental

to health; whatever building, structure, or premises is not sufficiently ventilated, sewered, drained, cleaned, or lighted, in reference to its intended or actual use; and whatever renders the air or human food or drink or water supply unwholesome, are also severally, in contemplation of this Code, nuisances.

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.

Person. Person is a human being, his heirs, executors, administrators or assigns; and includes a firm, partnership or corporation, its or their successors or assigns. Singular includes plural; male includes female.

Pipe. A Pipe is any conduit used to convey fluids, air, or gases, not otherwise defined in this Code.

Pitch. See Grade.

Plumbing. Plumbing is 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 sewerage, and water-supply systems of any premises to their connection with any point of public disposal or other acceptable terminal. Plumbing does not mean or include, and nothing in this Code shall be held or construed to have any application to the trade of drilling water wells, which constitute the sources of private water supplies, or the trade or business of installing water softening equipment and apparatus and of maintaining and servicing the same, or the business of manufacturing or selling plumbing fixtures, appliances, equipment or hardware; nor does it mean or include minor repairs which do not require changes in the piping to or from plumbing fixtures or involve the removal, replacement, installation or reinstallation of any pipe or plumbing fixtures, where used for personal or domestic use.

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 System. The plumbing system includes the water-supply and distribution pipes; plumbing fixtures and traps; soil, waste, and vent pipes; building drains and building sewers including their respective connections, devices, and appurtenances and water-treating or water-using equipment, and installed for personal or domestic use and purposes.

Pool. A pool is a water receptacle used for swimming or as a plunge or other bath, designed to accommodate more than one bather at a time.

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.

Public or Public Use. In the classification of plumbing fixtures, public applies to fixtures in general toilet rooms of schools, gymnasiums, hotels, railroad stations, public buildings, bars, public comfort stations, and other installations (whether pay or free) where a number of fixtures are installed so that their use is similarly unrestricted.

Public Official. See Administrative Authority.

Public Sewer. A public sewer is a common sewer directly controlled by public authority.

Public Water Supply. A public water supply is any facility for furnishing water for drinking or general domestic use through a system of distribution mains in incorporated municipalities; or unincorporated communities where 10 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.

Return Offset. A return offset is a realignment of pipe and fittings installed so as to return the pipe to its original alignment.

Revent Pipe. A revent pipe (sometimes called an individual vent) is that part of a vent pipe line which connects directly with an individual waste, underneath or back of the fixture, and extends either to the main or branch vent pipe.

Rim. A rim is an unobstructed open edge of a fixture.

Riser. A riser is a water-supply pipe which extends vertically one full story 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, and vent piping, and the necessary fixture supports.

Safe Pan. A pan or other collector placed beneath a pipe or fixture to prevent leakage from escaping on to the floor, ceiling or walls.

Sand Interceptor. See Interceptor.

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

Seal. The vertical distance between the dip and the crown weir of a trap.

Second Hand. Second hand as applied to material or plumbing equipment is that which has been installed, and has been used, removed, and passed to another ownership or possession.

Self-Siphonage. The breaking of the seal effect of a trap as the result of the discharge of a fixture through the trap.

Separator. See Interceptor.

Septic Tank. 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-joints or perforated piping, or disposal pit.

Service Pipe. The pipe from the water main or source of supply to the building served.

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

Sewer. A conduit for carrying off sewage.

Sewerage. (noun) The works comprising a sewer system, pumping stations, treatment works, and all other works necessary to the collection, treatment or disposal of sewage. (adj.) Having to do with the collection, treatment, or disposal of sewage.

Shall. The word "shall" is a mandatory term.

Side Vent. A side vent is a vent connecting to the drain pipe through a fitting at an angle not greater than 45 deg. to the vertical.

Size of Pipe and Tubing. See Diameter.

Slip Joint. A connection in which one pipe slides into another. The joint is made tight with approved gasket, packing or caulking.

Slope. See Grade.

Soil Pipe. A soil pipe is any pipe which conveys the discharge of water closets 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.

Special Waste Pipe. See Chapter 9.

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

Stack Group. Stack group is a term applied to the location of fixtures in relation to the stack so that by means of proper fittings, vents may be reduced to a minimum.

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.

Surface Water. That portion of a rainfall or other precipitation which runs off over the surface of the ground.

Supports. Supports, hangers, and anchors are devices for supporting and securing pipe 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.

Vacuum Breaker. A vacuum breaker is a device designed to prevent back-siphonage by providing an opening through which air may be drawn to relieve negative pressure (vacuum) in the water supply pipe.

Vent Pipe. See Vent System.

Vent Stack. A vent stack is a vertical vent pipe installed primarily for the purpose of providing circulation of air to and from any part of the drainage system.

Vent System. A vent system is a pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

Vertical Pipe. A vertical pipe is any pipe or fitting which is installed in a vertical position or which makes an angle of not more than 45 deg. with the vertical.

Waste. See Liquid Waste and Industrial Wastes.

Waste Pipe. A waste pipe is a pipe which conveys only liquid waste, free of fecal matter.

Waste Stack. A stack used for conveying liquid wastes not containing human excrement.

Water-Distributing Pipe. A water-distributing pipe in a building or premises is a pipe which conveys water from the water-service pipe to the plumbing fixtures and other water outlets.

Water Main. The water (street) main is a water-supply pipe for public or community use.

Water Outlet. A water outlet, as used in connection with the water-distributing system, is the discharge opening for the water (1) to a fixture; (2) to atmospheric pressure (except into an open tank which is part of the water-supply system); (3) to a boiler or heating system; (4) to any water-operated device or equipment requiring water to operate, but not a part of the plumbing system.

Water Riser Pipe. See Riser.

Water-Service Pipe. The water-service pipe is the pipe from the water main or other source of water supply to the building served.

Water-Supply System. The water-supply system of a building or premises consists of the water-service pipe, the water-distributing pipes, and the necessary connecting pipes, fittings, control valves, and all appurtenances in or adjacent to the building or premises.

Wet Vent. A wet vent is a stack which receives the discharge of wastes above an individual vent inlet or combination waste and vent inlet.

Yoke Vent. A yoke vent is a pipe connecting upward from a soil or waste stack to a vent stack for the purpose of preventing pressure changes in the stacks.

CHAPTER 2

GENERAL REGULATIONS

2.1 CONFORMANCE WITH CODE

2.1.1 All plumbing systems hereafter installed shall conform at least with the provisions of this Code. (See Chapter 14 for Administration.)

2.2 GRADE OF HORIZONTAL DRAINAGE PIPING

2.2.1 Horizontal drainage piping shall be run in practical alignment at a uniform grade. (See Chapter 11 for specific slopes.)

2.3 CHANGE IN DIRECTION

2.3.1 Fittings. Changes in direction in drainage piping shall be made by the appropriate use of 45-degree 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.

2.3.2 Short Sweeps. Short Sweeps not less than 3 inches 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.

2.4 FITTINGS AND CONNECTIONS

2.4.1 Fittings Prohibited. No fitting having a hub in the direction opposite to flow, or tee branch shall be used as a drainage fitting. No running threads, bands, or saddles shall be used in the drainage system. No drainage or vent piping shall be drilled or tapped.

2.4.2 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.

2.4.3 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 as of ultimate benefit to the proper and continuing functioning of the plumbing system. The enlargement of a 3-inch closet bend or stub to 4 inches shall not be considered an obstruction. None of the methods described in Pars. 2.27.1, 2.27.2, and 2.27.3 shall be considered as restriction to flow.

2.5 REPAIR AND ALTERATIONS

2.5.1 Existing Buildings. In existing buildings or premises in which plumbing installations are to be altered, repaired, or renovated, necessary deviations from the provision 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.

2.5.2 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.

2.6 SEWER AND WATER PIPES

2.6.1 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, except as provided for in Paragraphs 10.6.1 and 10.6.2.

2.7 TRENCHING, EXCAVATION, AND BACKFILL

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

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

2.7.3 Open Trenches. 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.

2.7.4 Mechanical Excavation. Mechanical means of excavation may be used.

2.7.5 Backfilling. Adequate precaution shall be taken to insure proper compactness of backfill around piping without damage to such piping.

2.8 STRUCTURAL SAFETY

2.8.1 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 in accordance with the Requirements of the Building Code or as approved by the Administrative Authority.

2.9 WORKMANSHIP

2.9.1 Workmanship shall conform to generally accepted good practice.

2.10 PROTECTION OF PIPES

2.10.1 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.

2.10.2 Cutting or Notching. No structural member shall be weakened or impaired by cutting, notching, or otherwise, except to the extent permitted by the proper Administrative Authority.

2.10.3 Pipes Through Footings or Foundation Walls. A soil or waste pipe, or 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 or as may be approved in writing by the Administrative Authority.

2.10.4 Freezing. No water, soil, or waste pipe shall be installed or permitted outside of a building or in an exterior wall unless adequate provision is made to protect such pipe from freezing where necessary.

2.11 DAMAGE TO DRAINAGE SYSTEM OR PUBLIC SEWER

2.11.1 It shall be unlawful for any person to deposit by any means into the building drainage system or into a public or private sewer any ashes; cinders; rags; inflammable, poisonous, or explosive liquids; gases; oils; grease; or any other material which would or could obstruct, damage, or overload such system or sewer, or interfere unduly with the sewage disposal process.

2.12 INDUSTRIAL WASTES

2.12.1 Wastes detrimental to the public sewer system or detrimental to the functioning of the sewage-treatment plant shall be treated and disposed of as directed by the Administrative Authority or other authority having jurisdiction.

2.13 SLEEVES

2.13.1 Annular space between sleeves and pipes shall be filled or tightly caulked with lead, or other material found equally effective and approved as such by the Administrative Authority.

2.14 RATPROOFING

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

2.14.2 Interior Openings. Interior openings through walls, floors, and ceilings shall be ratproofed as found necessary by the Administrative Authority.

2.15 USED OR SECOND-HAND EQUIPMENT

2.15.1 It shall be unlawful to purchase, sell, or install used equipment or material for plumbing installation unless it complies with the minimum standards set forth in this Code.

2.16 CONDEMNED EQUIPMENT

2.16.1 Any plumbing equipment condemned by the Administrative Authority because of wear, damage, defects, or sanitary hazards, shall not be re-used for plumbing purposes.

2.17 DEPTH OF BUILDING SEWER AND WATER SERVICE (OUTSIDE OF BUILDING)

2.17.1 Sewers and water-service piping shall be installed below the recorded frost penetration, but in no case less than 3 feet 0 inches from top of pipe for sewer and 3 feet 6 inches from top of pipe for water piping below grade.

2.18 PIPING IN RELATION TO FOOTINGS

2.18.1 Parallel. No piping shall be laid parallel to footings or outside bearing walls closer than 3 feet, except as may be approved by the Administrative Authority.

2.18.2 Depth. Piping installed deeper than footings or bearing walls shall be 45 deg. therefrom except as may be approved by the Administrative Authority.

2.19 DRAINAGE BELOW SEWER LEVEL

2.19.1 Drainage piping located below the level of the sewer shall be installed as provided for in Chapters 10 and 11.

2.20 CONNECTIONS TO PLUMBING SYSTEM REQUIRED

2.20.1 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.

2.21 SEWER REQUIRED

2.21.1 Every building having plumbing fixtures installed and intended for human habitation, occupancy, or use on premises abutting on a street, alley, or easement in which there is a public sewer, or which is otherwise so located as to have a sewer available, shall have a connection with the sewer.

2.22 INDIVIDUAL OR PRIVATE SEWAGE-DISPOSAL SYSTEM

2.22.1 If plumbing fixtures are installed in buildings located other than as specified in paragraph 2.21.1, suitable provisions shall be made for disposal of the building sewage in accordance with the provisions of Appendix B.

2.23 LOCATION OF FIXTURES

2.23.1 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. (see ASA A53.1-1946.)

2.32.2 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.

2.24 PIPING MEASUREMENTS

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

2.25 VENTING

2.25.1 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 or more than 1 inch of water.

2.26 VENTILATION DUCTS

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

2.27 WATER CLOSET CONNECTIONS

2.27.1 Lead. Three-inch lead bends and stubs may be used on water closets or similar connections, provided the inlet is dressed or swedges to receive a 4-inch floor flange.

2.27.2 Iron. Three-inch bends may be used on water closets or similar connections, provided a 4-inch x 3-inch flange is used to receive the fixture horn.

2.27.3 Reducing. Four-by-three-inch reducing bends are acceptable.

2.28 DEAD ENDS

2.28.1 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 3

MATERIALS - QUALITY AND WEIGHT

3.1 MATERIALS

3.1.1 **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 shall allow the extension, addition, or relocation of existing soil, waste, or vent pipes with materials of like grade or quality, as permitted in paragraph 2.5.1.

3.1.2 **Use of Materials.** Each material listed in Table 3.5 shall conform to at least one of the standards cited opposite it. Its use shall be further governed by the requirement imposed in other chapters of the Code. Materials not included in the table shall be used only as provided for in paragraph 3.1.1. 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.

3.1.3 **Specifications for Materials.** Standard specifications for materials for plumbing installations are listed in Table 3.5. Products conforming at least to any of the specifications listed for a given material shall be considered acceptable.

NOTE 1. Abbreviations used in Table 3.5 refer to standards or specifications identified as follows:

- ASA** American Standards approved by the American Standards Association, 70 East 45th Street, New York 17, N. Y.
- ASTM** Standards and Tentative Standards published by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.
- FS** Federal Specifications published by the Federal Specifications Board and obtained from the General Services Administration, Regional Office 3, Washington 25, D. C.
- AWWA** Standards and Tentative Standards published by the American Water Works Association, 500 Fifth Avenue, New York 18, N. Y.
- CS** Commercial Standards representing recorded voluntary recommendations of the trade, issued by the United States Department of Commerce and obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.
- MSS** Standards published by the Manufacturers Standardization Society of the Valve and Fittings Industry, 420 Lexington Avenue, New York 17, N. Y.
- SPR** Simplified Practice Recommendations representing recorded recommendations of the trade and issued by the U. S. Department of Commerce, Washington 25, D. C.

NSF Seal of Approval Listing published by the National Sanitation Foundation Testing Laboratory, Inc., Ann Arbor, Michigan.

NOTE 2. ASTM Standards are issued under fixed designations; the final number indicates the year of original adoption, or in the case of revision, the year of last revision. "T" indicates Tentative. In the "CS" series of standards, also, the final number indicates the year of issue. For Federal Specifications, the year indicated in Table 3.5 is that of the date of issue or that of the latest revision or amendment.

NOTE 3. All standards and specifications for materials are subject to change. Designations carrying indication of the year of issue may thus become obsolete. Table 3.5 gives the full designations of standards current at the time this Code is printed. As provided in paragraph 3.4.1, the Administrative Authority is required to review this table and have it brought up to date at intervals not exceeding two years.

3.1.4 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 classes of the product, when such marking is required by the approved standard that applies.

3.2.1 Lead. See Table 3.5 Sheet lead shall be not less than the following:

For safe pans -- not less than 4 pounds per square foot.

For flashings of vent terminals -- not less than $2\frac{1}{2}$ pounds per square foot.

Lead bends and lead traps shall not be less than $\frac{1}{8}$ inch wall thickness.

3.2.2 Copper. Sheet copper shall be not less than the following:

Safe pans -- 12 ounces per square foot.

Vent terminal flashings -- 8 ounces per square foot.

3.2.3 Calking Ferrules shall be manufactured from red brass and shall be in accordance with the following table:

Pipe Sizes Inches	Inside Diameter Inches	Length Inches	Minimum Weight Each
2	$2\frac{1}{4}$	$4\frac{1}{2}$	1 lb. 0 oz.
3	$3\frac{1}{4}$	$4\frac{1}{2}$	1 lb. 12 oz.
4	$4\frac{1}{4}$	$4\frac{1}{2}$	2 lb. 8 oz.

3.2.4 Soldering Bushings shall be of red brass in accordance with the following table:

Pipe Sizes Inches	Minimum Weight Each
$1\frac{1}{4}$	6 oz.
$1\frac{1}{2}$	8 oz.
2	14 oz.
$2\frac{1}{2}$	1 lb. 6 oz.
3	2 lb. 0 oz.
4	3 lb. 8 oz.

3.2.5 Floor Flanges. Floor flanges for water closets or similar fixtures shall be not less than 1/8 inch thick for brass - 1/4 inch thick and not less than 2-inch calking depth for cast iron or galvanized malleable iron. If of hard lead, they shall weigh not less than 1 lb. 9 oz. and be composed of lead alloy with not less than 7.75 per cent antimony by weight.

Flanges shall be soldered to lead bends, or shall be calked, soldered or screwed to other metal.

Closet screws and bolts shall be brass.

3.2.6 Cleanouts.

- (a) Cleanout plugs shall be of brass and shall conform to Federal Specification WW-P-401.
- (b) Plugs may have raised square or counter sunk heads.
- (c) Countersunk heads should be used where raised heads may cause a hazard.

3.2.7 Plastic Pipe and Fittings for Potable Water Supplies.

3.2.7.1 Plastic pipe and fittings may be used in a potable water system only for the house or building service connection and in the cold water piping system outside the building walls or foundation. All plastic pipes so used shall be installed below the recorded frost penetration, at or below the minimum depth prescribed by the Administration Authority. All risers to outside fittings or bibbs shall be of metal piping as authorized in paragraph 10.10.1. Plastic pipe or fittings shall not be used in the hot water piping system or in the cold water system within the building.

3.2.7.2 Plastic pipe and fittings, plastic cement, and pipe thread lubricant for rigid plastic pipe shall have received the Seal of Approval of the National Sanitation Foundation and the manufacturer, material, and trade name shall be included in the "Seal of Approval Listing of Plastic Materials, Pipe, and Fittings for Potable Water Supplies" compiled and published by The National Sanitation Foundation Testing Laboratory, Inc., Ann Arbor, Michigan. All such material at the job location must visibly bear the above-cited stamped Seal of Approval.

3.2.7.3 All plastic pipe and fittings for use in potable water systems shall have a maximum continuous working pressure of at least 100 psi at 73.4° F. The use of flexible plastic pipe is further limited to Series 3 Polyethylene pipe in sizes up to and including 2 inches nominal as specified in Commercial Standard CS 197-57.

3.2.7.4 Joints and Fittings. Joints in plastic pipe shall be made in accordance with the manufacturers recommendations, subject to the following limitations:

- (a) Flexible plastic pipe shall be installed only with insert and clamp type or solvent welded type fittings. All clamps shall be of corrosion resistant material and homogeneous throughout.
- (b) Rigid or semi-rigid plastic pipe shall be installed only with solvent welded, flanged, or threaded type fittings and joints. Threaded joints may be used only with Schedule 80 and 120 I. P. S. pipe and fittings, with dimensions as shown in Table 1.

Table 1. Dimensions and tolerance for rigid or semi-rigid plastic pipe.

Nominal size	Outside diameter ¹		Wall thickness ²			
			Schedule 10	Schedule 40	Schedule 80	Schedule 120
Inches	Inches		Inch	Inch	Inch	Inch
1/8	0.405	±0.008	0.049	0.068	0.095	--
1/4 . . . . .	.540	±.008	.065	.088	.119	--
3/8 . . . . .	.675	±.008	.065	.091	.126	--
1/2 . . . . .	.840	±.008	.083	.109	.147	0.170
3/4	1.050	±.010	.083	.113	.154	.170
1	1.315	±.010	.109	.133	.179	.200
1 1/4	1.660	±.012	.109	.140	.191	.215
1 1/2	1.900	±.012	.109	.145	.200	.225
2	2.375	±.012	.109	.154	.218	.250
2 1/2	2.875	±.015	.120	.203	.276	.300
3	3.500	±.015	.120	.216	.300	.350
3 1/2	4.000	±.020	.120	.226	.318	.350
4	4.500	±.020	.120	.237	.337	.438
5	5.563	±.030	.134	.258	.375	.500
6	6.625	±.035	.134	.280	.432	.562

¹ If pipe is out-of-round, no diameter shall be outside the tolerance shown.

² Minimum thickness. A tolerance of plus 15 per cent is allowed on schedule 10 pipe, and plus 10 per cent on schedules 40, 80, and 120 pipe.

(c) All joints shall be tested as required in paragraph 14.12.1.

3.2.7.5 Plastic Cement and Pipe Thread Compound. Plastic cement and pipe thread compound for rigid plastic pipe shall have been tested and found to be satisfactory by the National Sanitation Foundation Testing Laboratory, Inc., and shall be specific for the piping material.

3.2.7.6 Installation.

(a) Plastic pipe shall not be installed in any tunnel or chase that is heated or which contains hot water, hot air or steam piping.

(b) The pipe trench shall have a smooth, compacted bottom of soil or sand. The first 18 inches of backfill shall be free of rock or debris and shall be placed by hand.

3.2.8 Plastic Pipe and Fittings for Drainage and Vent Piping Above Ground Within the Building Walls.

3.2.8.1 Plastic pipe and fittings for drainage and vent piping above ground within the building walls shall be Series 80 or 120 Rigid Polyvinyl Chloride Pipe in conformance with Commercial Standard CS 207-57. Fittings shall be extrusion molded, fully recessed, socket type designed for solvent welded joints. The diameter of the socket, measured just inside the chamfered entrance shall be not more than 0.04 inches larger than the minimum outside diameter of the pipe. Fabricated fittings are specifically

prohibited. Special purpose threaded or flanged adapter fittings may be used between plastic pipe and other piping material only, provided that they are fully recessed and create no restriction to flow greater than that created by conventional reducer fittings of like size.

3.2.8.2 Joints in plastic drainage or vent piping above ground within the building walls shall be solvent welded, except that threaded or flanged joints may be used with adapter fittings as outlined in paragraph 3.2.8.1. The solvent cement shall be specific for polyvinyl chloride pipe. The finished joint shall meet the performance requirements specified in paragraph 11.2.1.

3.2.8.3 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 3-foot intervals.

3.2.9 Plastic Pipe and Fittings for Drainage Piping.

3.2.9.1 Plastic pipe and fittings for drainage piping shall be rigid, and shall have a minimum average crushing strength equal to, or greater than, that required for Standard Drain Tile as specified in Table L, ASTM Specification No. C4-55. The fittings shall be manufactured of the same material as the pipe and shall be extrusion molded, threaded, flanged or socket type designed for solvent welded joints. The diameter of the socket, measured just inside the chamfered entrance shall be not more than 0.04 inches larger than the minimum outside diameter of the pipe. Fittings shall be fully recessed and shall be smooth and non-restrictive to flow. Fabricated fittings are specifically prohibited. Special purpose plastic adapter fittings may be used, if necessary, provided that they create no restriction to flow and meet the performance requirements specified in paragraph 11.2.1.

3.2.9.2 Above ground flexible sewer connections to house trailers or mobile homes employing plastic or other elastomeric pipe and fittings shall be made in accordance with the requirements of the Illinois Trailer Coach Park Control Law.

3.2.9.3 Joints in plastic drainage piping shall be solvent welded, threaded, 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 manufacturers recommendations, and shall meet the performance requirements specified in paragraph 11.2.1.

3.2.9.4 Installation. Plastic drainage piping shall be laid in a trench having a smooth compacted bottom of soil or sand. The first 18 inches of backfill shall be placed and compacted by hand. All plastic pipe so used shall be installed below the maximum recorded frost penetration, at or below the minimum depth prescribed by the Administrative Authority.

3.3 ALTERNATE MATERIALS AND METHODS

3.3.1 Existing Premises. In existing buildings or premises in which plumbing installations are to be altered, repaired, or renovated, the Administrative Authority has 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.

3.3.2 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 authorized, provided such alternate has been approved by the Administrative Authority, in accordance with this section.

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

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

3.3.5 Test Procedure. Tests shall be made in accordance with generally recognized standards; but in the absence of such standards, the Administrative Authority shall specify the test procedure.

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

3.4 APPROVED MATERIALS

3.4.1 Periodic Review. The Administrative Authority shall periodically, at least once every two years, review the approved list of specifications and standards for materials in Table 3.5 and in Chapter 7 "Plumbing Fixtures" to check the designations, numbers, etc., which are used for identification, and if there are later issues shall submit them for their legal adoption.

NOTE: All standards and specifications for materials are subject to change. Designations carrying indication of the year of issue may thus become obsolete. Table 3.5 gives the full designations of standards current at the time this Code is printed.

3.4.2 Specified Usage. Each chapter of this Code indicates specifically the type of material permitted for the various parts of the plumbing system. The specifications for each of those materials are given in Table 3.5.

Table 3.5 MATERIALS FOR PLUMBING INSTALLATIONS

MATERIALS	See Sections 3.1.3 and 3.4.2		Other Standards and Remarks
	ASA	ASTM	
<u>Nonmetallic Piping</u>			
Asbestos Cement Pressure Pipe		C296-55	FS:SS-P-351a (1953)
Asbestos Cement Sewer Pipe			FS:SS-P-351a (See Footnote 1)
Bituminized Fiber Sewer Pipe and Fittings			CS:116-54 FS:SS-P-356 (1955)
Clay Sewer Pipe, Standard Strength	A106.3-1958	C13-57T	
Clay Sewer Pipe, Extra Strength		C200-57T	
Clay Sewer Pipe, Perforated	A106.1-1954	C211-57T	
Clay Sewer Pipe, Standard Strength, Ceramic Glazed	A106.4-1958	C261-54	
Concrete Sewer Pipe		(C76-57T (C14-57	
Drain Tile	A6.1-1956	(C4-55 (C118-56	
Plastic Pipe and Fittings		(CS197-57 (CS207-57	
<u>Ferrous Pipe and Fittings</u>			
Cast Iron Soil Pipe and Fittings	A40.1-1935	A74-42	FS:WW-P-401 (1951) ²
Cast Iron Soil Pipe (Threaded)	A40.5-1943		
Cast Iron Screwed Drainage Fittings	B16.12-1953		

Table 3.5 MATERIALS FOR PLUMBING INSTALLATIONS (Continued)

MATERIALS	See Sections 3.1.3 and 3.4.2		Other Standards and Remarks
	ASA	ASTM	
<u>Ferrous Pipe and Fittings (Cont'd)</u>			
Cast Iron Pressure Pipe (Water)	(A21.2-1953 (A21.6-1953 (A21.8-1953		(AWWA:C102-53 (AWWA:C106-53 (AWWA:C108-53 AWWA:C100-53
Cast Iron Pressure Fittings			
Cast Iron Screwed Fittings (Water)	B16.4-1949		
Cast Iron Pipe Flanges and Flanged Fittings	B16.1-1948		
Mechanical Joint for Cast Iron Pipe	A21.11-1953		AWWA:C111-53
Galvanized Pipe and Fittings	B36.20-1958	A120-57T	
Malleable Iron Fittings	B16.3-1953		
Open Hearth Iron Pipe	B36.23-1956	A253-55T	
Steel Pipe		A53-58AT	AWWA:C202-49
Steel Pipe Flanges and Fittings	B16.5-1957		
Stainless Steel Pipe	B36.19-1957		
Wrought Iron Pipe	B36.2-1956 (B36.10-1950	A72-56T	
<u>Non-Ferrous Pipe and Fittings</u>			
Brass Pipe		B43-58 ⁽⁴⁾	
Brass Tubing		B135-58 ⁽⁴⁾	

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Table 3.5 MATERIALS FOR PLUMBING INSTALLATIONS (Continued)

MATERIALS	See Sections 3.1.3 and 3.4.2		Other Standards and Remarks
	ASA	ASTM	
<u>Non-Ferrous Pipe and Fittings (Cont'd)</u>			
Copper Pipe	H26.1-1958	B42-58 ⁽⁴⁾	FS-WW-P-377b(1955) ASTM B251-58
Seamless Copper Tubing		B75-58 ⁽⁴⁾	WW-T-797(1933) ¹⁰ ASTM B251-58
Copper Water Tube (KLM)	H23.1-1956	B88-58 ⁽⁴⁾	WW-T-799A(1943) ASTM B251-58
Copper Drainage Tube (DWV)		B306-58	
Brass or Bronze Flanges and Flanged Fittings	B16.24-1953		
Cast-Brass Solder-Joint Fittings	B16.18-1950		
Cast-Brass Solder-Joint Drainage Fittings	B16.23-1955		
Brass or Bronze Screwed Fittings, 125#	B16.15-1958		WW-P-460(1945) MSS-SP-10
Wrought Copper and Wrought Bronze Solder-Joint Fittings	B16.22-1951		
Flared Fittings for Copper (Water) Tubes	B16.26-1958		
Lead Pipe and Traps			FS:WW-P-325(1944)
<u>Miscellaneous</u>			
Air Gap Standards	A40.4-1942		
Backflow Preventors	A40.6-1943		

Table 3.5 MATERIALS FOR PLUMBING INSTALLATIONS (Continued)

MATERIALS	See Sections 3.1.3 and 3.4.2		Other Standards and Remarks
	ASA	ASTM	
<u>Miscellaneous (Cont'd)</u>			
Calking Materials (Water)			AWWA:C600-54T
Cement Lining for Cast Iron Pipe	A21.4-1953		AWWA:C104-53
Coal Tar Enamel (Protective Coating)			AWWA:C203-57
Ferrous Plugs, Bushings and Locknuts with Pipe Threads	B16.4-1949		
Galvanized Iron and Steel Sheets		A93-55T	
Fixture Setting Compound			FS:HH-C-536a (1954)
Precast Jointing Material for Clay Pipe			CS:181-52
Sheet Brass		B36-56	
Sheet Copper		(B152-55 (B248-55T	
Sheet Lead Sheet Soft Solder			FS:QQ-L-201a (1953) ³
Valves		B32-58 A181-57T	MSS: SP-37-1949 and SP-52-1957 SPR: 183-46
Hot Water Heaters	C72.1-1949 Z21.10.1-1956 Z21.10.2-1956		Addenda 21.10.1a-1957 Included
Manhole Frames and Covers	A35.1-1947		

Table 3.5 MATERIALS FOR PLUMBING INSTALLATIONS (Continued)

- 1 Asbestos-cement sewer pipe shall meet Federal Specifications SS-P-351a dated October 7, 1953, except for the following substitutions:

Sizes only 4, 5 and 6-inch

Class - nonpressure tests

Lengths: 10 feet - cut of roundness, inside diameter; $\frac{1}{4}$ inch Hydrostatic strength; not applicable

Flexural strength - 9 foot span

4-inch pipe - 560 lbs.

5-inch pipe - 900 lbs.

6-inch pipe - 1290 lbs.

Crushing strength

4-inch pipe - 1740 lbs.

5-inch pipe - 1680 lbs.

6-inch pipe - 1420 lbs.

Tests: one specimen from each 300 lengths of pipe

- 2 Amendment 3 dated July 18, 1951, subject: Pipe and Pipe-Fittings, Soil, Cast-Iron.
- 3 Amendment No. 4, dated September 18, 1953, included
- 4 Refer to ASTM Specification B251-56T for dimensions and dimensional tolerance.

CHAPTER 4

JOINTS AND CONNECTIONS

4.1 TIGHTNESS

4.1.1 Joints and connections in the plumbing system shall be gas-tight and water-tight 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 collecting and conveying ground or seepage water to the underground storm drains.

4.2 TYPES OF JOINTS

4.2.1 Calked Joints. Calked joints for cast-iron bell-and-spigot soil pipe shall be firmly packed with oakum or hemp and filled with molten lead not less than 1 inch deep and not to extend more than 1/8 inch below rim of hub. No paint, varnish, or other coatings shall be permitted on the jointing material until after the joint has been tested and approved.

4.2.1.1 Calked Joints - Water piping system. Yarning material used in the water piping system shall conform to AWWA specification No. 0600-54T. Material shall consist of asbestos fiber rope, paper rope, or rubber rings. Material shall be handled so as to prevent unnecessary contamination before and during use. The use of jute, hemp, or oakum is expressly forbidden.

4.2.2 Threaded Joints - Screwed Joints. Threaded joints shall conform to American National Taper Pipe thread, ASA B2.1-1945. 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. White lead compounds shall not be used for water supply piping.

4.2.3 Wiped Joints. Joints in lead pipe or fittings, or between lead pipe or fittings and brass or copper pipe, ferrules, solder nipples, or traps, shall be full-wiped joints. Wiped joints shall have an exposed surface on each side of a joint not less than 3/4 inch and at least as thick as the material being jointed. Wall or floor flange lead-wiped joints shall be made by using a lead ring or flange placed behind the joints at wall or floor. Joints between lead pipe and cast iron, steel or wrought iron shall be made by means of a calking ferrule, soldering nipple, or bushing.

4.2.4 Soldered, or Sweat Joints. Soldered or sweat joints for tubing shall be made with approved fittings. Surfaces to be soldered or sweated shall be cleaned bright. The joints shall be properly fluxed and made with approved solder. Joints in copper water tubing shall be made by the appropriate use of approved brass or wrought copper water fittings, properly sweated or soldered together.

4.2.5 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.

4.2.6 Hot-Poured Joints. Hot-poured compound for clay or concrete sewer pipe shall not be water absorbent and when poured against a dry surface shall have a bond of not less than 100 psi. All surfaces of the joint shall be cleaned and dried before pouring. If wet surfaces are unavoidable, a suitable primer shall be applied. Compound shall not

soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 160 deg. F. nor be soluble in any of the waste carried by the drainage system. Approximately 25 per cent of the joint space at the base of the socket shall be filled with jute or hemp. A pouring collar, rope or other device shall be used to hold the hot compound during pouring. Each joint shall be poured in one operation until the joint is filled. Joints shall not be tested until one hour after peuring.

4.2.7 Precast Joints. Precast collars shall be formed in both the spigot and bell of the pipe in advance of use. Collar surfaces shall be conical with side slopes of 3 deg. with the axis of the pipe and the length shall be equal to the depth of the socket. Prior to making joint contact, surfaces shall be cleaned and coated with solvents and adhesives as recommended by the manufacturer. When the spigot end is inserted in the collar, it shall bind before contacting the base of the socket. Material shall be inert and resistant to both acids and alkalies.

4.2.8 Brazed Joints. Brazed joints shall be made in accordance with the provisions of Section 6 of the Code for Pressure Piping, ASA B31.1-1951.

4.2.9 Cement Mortar Joints. Cement mortar joints shall not be used in any piping controlled by this Code.

4.2.10 Burned Lead Joints. Burned (welded) lead joints shall be lapped and the *lead shall be fused together to form a uniform weld at least as thick as the lead being joined.*

4.2.11 Asbestos Cement Sewer Pipe Joints. Joints in asbestos cement pipe shall be made with sleeve couplings of the same composition as the pipe, sealed with rubber rings. Joints between asbestos cement pipe and metal pipe shall be made by means of an adapter coupling calked as required in paragraph 4.2.1.

4.2.12 Bituminated Fiber Pipe Joints. Joints in bituminated fiber pipe shall be made with tapered type couplings of the same material as the pipe. Joints between bituminized fiber pipe and metal pipe shall be made by means of an adapter coupling calked as required in paragraph 4.2.1.

4.2.13 Plastic Pipe Joints. See Sections 3.2.7, 3.2.8, and 3.2.9.

4.3 USE OF JOINTS

4.3.1 Clay Sewer Pipe. Joints in vitrified clay pipe or between such pipe and metal pipe shall be made as provided in paragraphs 4.2.6 and 4.2.7.

4.3.2 Concrete Sewer Pipe. Joints in concrete sewer pipe or between such pipe and metal pipe shall be made as in paragraphs 4.2.6 and 4.2.7.

4.3.3 Cast-Iron Pipe. Joints in cast-iron pipe shall be either calked or screwed, as provided in paragraphs 4.2.1 and 4.2.2, or mechanical as per ASA 21.11-1953.

4.3.4 Screw Pipe to Cast-Iron. Joints between wrought-iron, steel, brass, or copper pipe, and cast-iron pipe shall be either calked or threaded joints made as provided in paragraphs 4.2.1 and 4.2.2, or shall be made with approved adapter fittings.

4.3.5 Lead to Cast Iron, Wrought Iron or Steel. Joints between lead and cast-iron, wrought-iron, or steel pipe shall be made by means of wiped joints to a calking ferrule, soldering nipple, or bushing as provided in paragraph 4.2.3.

4.3.6 Copper Water Tube. Joints in copper tubing shall be made either by the appropriate use of approved brass or wrought copper water fittings, properly sweated or soldered together or by means of approved compression fittings as provided in paragraphs 4.2.4 and 4.2.5.

4.4 SPECIAL JOINTS

4.4.1 Copper Tubing to Screwed Pipe Joints. Joints from copper tubing to threaded pipe shall be made by the use of brass converter fittings. The joint between the copper pipe and the fitting shall be properly sweated or soldered, and the connection between the threaded pipe and the fitting shall be made with a standard pipe size screw joint.

4.4.2 Welding or Brazing. Brazing or welding shall be performed in accordance with requirements of recognized published standards of practice and by licensed or otherwise qualified mechanics, except when it is determined by the administrative authority to be equivalent procedure for the purpose of this code.

4.4.3 Slip Joints. In drainage and water piping, slip joints may be used only on the inlet side of the trap or in the trap seal, and on the exposed fixture supply.

4.4.4 Expansion Joints. Expansion joints must be accessible and may be used where necessary to provide for expansion and contraction of the pipes.

4.4.5 Ground Joint Brass Connections. Ground joint brass connections which allow adjustment of tubing but provide a rigid joint when made up shall not be considered as slip joints.

4.4.6 Dresser Type Couplings. Dresser Type couplings may be used in exposed water piping.

4.5 UNIONS (SCREWED)

4.5.1 Drainage System. Unions may be used in the trap seal and on the inlet side of the trap. Unions shall have metal-to-metal seats.

4.5.2 Water-Supply System. Unions in the water-supply system shall be metal-to-metal with ground seats.

4.6 WATER CLOSET, PEDESTAL URINAL, AND TRAP STANDARD SERVICE

4.6.1 Fixture connections between drainage pipes and water closets, floor-outlet service sinks, pedestal urinals, and earthenware trap standards, shall be made by means of brass, hard-lead, or iron flanges, calked, soldered, or screwed to the drainage pipe. The connection shall be bolted, with approved gasket or washer or setting compound between the earthenware and the connection. The floor flange shall be set on an approved firm base. The use of commercial putty or plaster is prohibited.

4.7 PROHIBITED JOINTS AND CONNECTIONS

4.7.1 Drainage System. Any fitting or connection which has an enlargement, chamber, or recess with a ledge, shoulder, or reduction of pipe area, that offers an obstruction to flow through the drain, is prohibited.

4.7.2 No fitting or connection that offers abnormal obstruction to flow, shall be used. The enlargement of a 3-inch closet bend or stub to 4 inches shall not be considered an obstruction.

4.8 WATERPROOFING OF OPENINGS

4.8.1 Joints at the roof, around vent pipes, shall be made watertight by the use of lead, copper or other approved flashings or flashing material. Exterior-wall openings shall be made watertight.

4.9 INCREASERS AND REDUCERS

4.9.1 Where different sizes of pipes, or pipes and fittings are to be connected, the proper size increasers or reducers or reducing fittings shall be used between the two sizes.

5.3.2 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 brass trap screw of ample size protected by this water seal.
- (b) Cleanouts on the seal of a trap shall be made tight with threaded clean-out plug and approved washer.

5.3.3 Trap Level and Protection. Traps shall be set true with respect to their water seals and, where necessary, they shall be protected from freezing.

5.3.4 Traps Underground. Underground traps, except "P" traps into which floor drains with removable strainers discharge, shall be provided with accessible and removable cleanouts.

5.3.5 Building Traps. No trap shall be installed at the foot of a soil or waste stack or in a building drain.

5.3.6 Prohibited Traps

- (a) No trap which depends for its seal upon the action of movable parts shall be used.
- (b) Full "S" traps are prohibited.
- (c) Bell traps are prohibited.
- (d) Crown-vented traps are prohibited except on fixture replacement.

5.3.7 Double Trapping. No fixture shall be double trapped.

5.4 PIPE CLEANOUTS

5.4.1 Location. Cleanouts shall be not more than 50 feet apart in horizontal drainage lines of 4-inch nominal diameter or less and not more than 100 feet apart for larger pipes under 8 inches in diameter.

5.4.2 Change of Direction. Cleanouts shall be installed at each change of direction of the building drain greater than 45 deg.

5.4.3 Large Pipes. For underground piping over 8 inches, manholes shall be provided and located at each 90 deg. or better change in direction and at intervals of not more than 150 feet. Metal covers shall be provided for manholes. Manholes within buildings shall have gas tight cover.

5.4.4 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 may be extended to outside of the building when found necessary.

5.4.5 Concealed Piping. Cleanouts on concealed piping shall be extended through and terminate flush with the finished wall or floor; or pits or chases may be left in the wall or floor, provided they are of sufficient size to permit removal of the cleanout plug and proper cleaning of the system.

5.4.6 Base of Stacks. A cleanout shall be provided at, or no more than 3 feet above the foot of each vertical waste or soil stack.

5.4.7 Building Drain Junction. There shall be a yard cleanout accessibly located within 5'-0" of building wall or foundation on floor slab building.

5.4.8 Direction of Flow. Every cleanout shall be installed so that the cleanout opens in a direction opposite to the flow of the drainage line or at right angle thereto.

5.4.9 Cleanout plugs shall not be used for the installation of new fixtures or floor drains except where approved in writing by the Administrative Authority.

5.5 SIZE OF CLEANOUTS

5.5.1 Small Pipes. Cleanouts shall be of the same nominal size as the pipes up to 4 inches and not less than 4 inches for larger piping.

5.6 CLEANOUT CLEARANCES

5.6.1 Large Pipes. Cleanouts on 3-inch or larger pipes shall be so installed that there is a clearance of not less than 18 inches for the purpose of rodding.

5.6.2 Small Pipes. Cleanouts smaller than 3 inches shall be so installed that there is a 12-inch clearance for rodding.

5.6.3 Concealment. Where it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided which will permit ready access to the plug.

5.7 CLEANOUT EQUIVALENT

5.7.1 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 deg. bend on the line to be rodded.

5.8 ACIDPROOF TRAPS

Where a vitrified-clay or other brittleware, acidproof trap is installed underground, it shall be embedded in concrete to a thickness of 6 inches from the bottom and side of the trap.

CHAPTER 6

INTERCEPTORS - SEPARATORS AND BACKWATER VALVES

6.1 INTERCEPTORS AND SEPARATORS

6.1.1 When Required. Interceptors (including grease, oil, and sand interceptors, etc.) shall be provided when, in the opinion of the Administrative Authority, they are necessary for the proper handling of liquid wastes containing grease, flammable wastes, sand and other ingredients harmful to the building drainage system, the public sewer or sewage-treatment plant or processes.

6.1.2 Approval. The size, type, and location of each interceptor or separator shall be approved by the Administrative Authority and no wastes other than those requiring treatment or separation shall be discharged into any interceptor.

6.1.3 No grease interceptor shall be hereinafter installed which does not comply, in all respects with the type or model of each size thereof approved by the Administrative Authority.

6.1.4 Separation. A mixture of light and heavy solids or liquids and solids having various specific gravities may be treated and then separated in an interceptor as approved by the Administrative Authority, in accordance with paragraph 6.1.2.

6.2 GREASE INTERCEPTORS

6.2.1 Commercial Buildings. A grease interceptor shall be installed in the waste line leading from sinks, drains, or other fixtures in the following establishments when, in the opinion of the Administrative Authority, a hazard exists: restaurants, hotel kitchens or bars, factory cafeterias or restaurants, clubs, or other establishments where grease can be introduced into the drainage system in quantities that can affect line stoppage or hinder sewage disposal.

6.2.2 Residential Units. A grease interceptor is not required for individual dwelling units or any private living quarters.

6.3 OIL SEPARATORS

6.3.1 An oil separator shall be installed in the drainage system or section of the system where, in the opinion of the Administrative Authority, a hazard exists or where oils or other flammables can be introduced or admitted into the drainage system by accident or otherwise.

6.4 SAND INTERCEPTORS

6.4.1 Commercial Installations. Sand and similar interceptors for heavy solids shall be so designed and located as to be readily accessible for cleaning, and shall have a water seal of not less than 6 inches.

6.5 VENTING INTERCEPTORS

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

6.6 ACCESSIBILITY OF INTERCEPTOR

6.6.1 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. The use of ladders or the removal of bulky equipment in order to service interceptors shall constitute a violation of accessibility.

6.7 INTERCEPTOR'S EFFICIENCY

6.7.1 Flow Rate. Interceptors shall be rated and approved for their efficiency as directed by the Administrative Authority and in accordance with generally accepted practice.

6.7.2 Approval. No grease interceptor shall be approved until it has successfully passed the testing and rating procedure set up by the Administrative Authority.

6.7.3 Water Connection. Water connection for cooling or operating a grease interceptor shall be prohibited.

6.8 LAUNDRIES

6.8.1 Interceptors. Commercial laundries shall be equipped with an interceptor having a removable wire basket or similar device that will prevent strings, rags, buttons or other materials detrimental to the public sewerage system from passing into the drainage system.

6.8.2 Intercepting Device. Basket or device shall prevent passage into the drainage system of solids 1/2 inch or larger in size. The basket or device shall be removable for cleaning purposes.

6.9 BOTTLING ESTABLISHMENTS

6.9.1 Bottling Plants. Bottling plants shall discharge their process wastes into an interceptor which will provide for the separation of broken glass or other solids, before discharging liquid wastes into the drainage system.

6.10 SLAUGHTER HOUSES

6.10.1 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.

6.10.2 Interceptors. Slaughtering and dressing room drains shall be provided with interceptors approved by the Administrative Authority, in accordance with paragraph 6.1.2.

6.11 FOOD--WASTE GRINDERS

6.11.1 Food Grinder. Wastes may discharge directly to the building drainage system.

6.11.2 Approval. When so required by the Administrative Authority permission must be obtained for the installation of food-waste grinders.

6.11.3 Commercial. Where food waste grinders are installed in commercial establishments the waste from those units may discharge direct into the building drainage system and not through a grease interceptor, except as directed by the Administrative Authority. The Administrative Authority shall determine where and what type of interceptor is required.

6.11.4 Residential. Where food-waste grinders are installed for residential use the waste from those units shall discharge direct into the building drainage system and not through a grease interceptor.

6.12 MAINTENANCE

6.12.1 Cleaning. Interceptors shall be maintained in efficient operating condition by periodic removal of accumulated grease.

6.13 OIL INTERCEPTORS

6.13.1 Where Required. Oil separators shall be installed when required by the Administrative Authority and shall conform to requirements of paragraph 6.13.2.

6.13.2 Minimum Dimension. Oil separators shall have a depth of not less than 2 feet below the invert of the discharge drain.

6.13.3 Motor Vehicle Storage. Interceptors shall have a capacity of 6 cubic feet where not more than three vehicles are serviced and one cubic foot in net capacity shall be added for each additional vehicle up to ten vehicles. Where more than ten vehicles are serviced and stored, the Administrative Authority shall determine the size of separator required.

6.13.4 Motor Vehicle Servicing. Where storage facilities are not maintained, as in repair shops, the capacity of the separator shall be based on a net capacity of 1 cubic foot for each 100 square feet of surface to be drained into the interceptor with a minimum capacity of 6 cubic feet.

6.13.5 Special Type Separators. Before installing any special type separator a drawing including all pertinent information shall be submitted for approval of the Administrative Authority, as being in accordance with this code.

6.14 BACKWATER VALVES

6.14.1 Installation. Backwater valves shall be installed only on those branches which are below ground level, and only if such branches are subject to backflow or back-pressure and permission must be obtained from the Administrative Authority for and prior to said installation.

6.14.2 Fixture Branches. Backwater valves shall be installed in the branch of the building drain which receives only the discharge from fixtures located within such branch and below grade.

6.14.3 Material. Backwater valves shall have all bearing parts of corrosion-resistant material.

6.14.4 Backwater valves shall be so constructed as to insure a mechanical seal against backflow.

6.14.5 Diameter. Backwater valves, when fully opened, shall have a capacity not less than that of the pipes in which they are installed.

6.14.6 Location. Backwater valves shall be so installed as to provide ready accessibility to their working parts.

6.15 SIZING INTERCEPTORS

6.15.1 Common Sizes. The table indicates various size sinks commonly used in residences, apartment houses, restaurants, hotel or club kitchens, or similar institutions where food is served.

Where size of sinks or fixtures vary from those in Table 6.15.1, use the sizing formula in 6.15.2 to determine the correct size interceptor.

6.15.2 Sizing Formula.

CUBIC CONTENT OF A FIXTURE = LENGTH X WIDTH X DEPTH.

CONTENT IN CUBIC INCHES DIVIDED BY 231 = CAPACITY IN GALLONS.

No fixture is ever filled to capacity. Pots, pans and other items being washed displace a certain amount of water, estimated at 25%. Consequently 75% of CAPACITY = DRAINAGE LOAD.

Recommended DRAINAGE PERIOD IS ONE MINUTE but conditions may exist whereby a longer drainage period would be satisfactory.

The flow rate for any given drainage period can be determined by using the following formula:

$$\frac{\text{Drainage load in gallons}}{\text{Drainage period in minutes}} = \text{Flow rate in GPM}$$

6.15.3 Multiple Fixture Installation. In the event the installation is to consist of more than one fixture, all served by a single interceptor, calculate the total capacity of all fixtures, establish the maximum number of fixtures that may be drained simultaneously and apply this factor to the total capacity to determine maximum simultaneous capacity. To this result apply the factor of 75% to determine the drainage load; and then proceed on the same basis as above.

Table 6.15.1 SIZE OF INTERCEPTOR

TYPE OF FIXTURE	SIZE OF FIXTURE Size of tailpiece or com- bined waste should not exceed size of interceptor inlet.		Drainage Load in Gals. 75% of Cubic Capacity	Drainage period Approx. 1 Min.	
	Single Compt. (inches)	Double Compt. (inches)		Flow Rate G. P. M.	Grease Cap. Lbs.
MISCEL- LANEOUS SINKS	12 x 18 x 6		4.2	4	8
	16 x 14 x 8		5.8	7	14
	20 x 18 x 8		9.4	10	20
		18 x 16 x 8 Ea. Compt.	15.0	15	30
		20 x 18 x 8 Ea. Compt.	18.7	20	40
		20 x 30 x 8	15.5	15	30
Commercial Pot, Pan & Scullery Sinks; Soup Kettles or other Kitchen or Pantry Equipment of these dimensions or other sizes having same capacities. This also applies to Apartment & Residential Sinks of these dimen- sions or capacities.	20 x 24 x 12	18 x 20 x 8 Ea. Compt.	18.7	20	40
		20 x 22 x 8 Ea. Compt.	23.0	25	50
		20 x 22 x 12 Ea. Compt.	34.0	35	70
		24 x 24 x 12 Ea. Compt. or 60 Gal. Kettle	45.0	50	100
		24 x 32 x 12 Ea. Compt.	60.0	75	150
DISHWASHER	Up to 20 Gal. Tank			20	40
	20 to 25 Gal. Tank			35	70
	35 to 50 Gal. Tank			50	100

CHAPTER 7

PLUMBING FIXTURES

7.1 GENERAL REQUIREMENTS - MATERIALS

7.1.1 Quality of Fixtures. Plumbing fixtures shall be constructed from approved materials, have smooth impervious surfaces, be free from defects and concealed fouling surfaces, and except as permitted elsewhere in this Code, shall conform in quality and design to one of the following standards:

Staple Porcelain Plumbing Fixtures, United States Department of Commerce, Commercial Standard CS 4-29.

Vitreous China Plumbing Fixtures, United States Department of Commerce, Commercial Standard CS 20-56.

Plumbing Fixtures (for) Land Use, Federal Specification WW-P-541a-1947.

Formed Metal Porcelain Enameled Sanitary Ware, United States Department of Commerce, Commercial Standards CS 144-47.

7.2 ALTERNATE MATERIALS

7.2.1 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.

7.3 OVERFLOWS

7.3.1 Design. When any fixture is provided with an overflow, the waste shall be so arranged 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 empty.

7.3.2 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 discharge 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.

7.4 INSTALLATION

7.4.1 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.

7.4.2 Joints. Where fixture comes in contact with wall and floors, the joint shall be watertight.

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

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

7.4.5 Setting. Fixtures shall be set level and in proper alignment with reference to adjacent walls. (see par. 4.6.1)

7.5 WATER-SUPPLY PROTECTION

7.5.1 Supply Fittings. The supply lines or fittings for every plumbing fixture shall be so installed as to prevent backflow. (See paragraph 10.4.3)

7.6 PROHIBITED FIXTURES AND CONNECTIONS

7.6.1 Fixtures. Pan, valve, plunger, offset, washout, latrine, frostproof, and other water closets having an invisible seal or an unventilated space or having walls which are not thoroughly washed at each discharge, shall be prohibited. Any water closet which might permit siphonage of the contents of the bowl back into the tank shall be prohibited.

7.6.2 Connections. Fixtures having concealed slip-joint connections shall be provided with an access panel or utility space so arranged as to make the slip connections accessible for inspection and repair.

7.7 WATER CLOSETS

7.7.1 Public Use. Water-closet bowls for public use shall be of the elongated type.

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

7.7.3 Ball Cocks. Ball cocks for flush tanks shall be of the antisiphon type, properly installed, and having a provision for trap refill.

7.7.4 Close-Coupled Tanks. The flush-valve seat in closed-coupled water-closet combinations shall be 1 inch or more above the rim of the bowl, so that the flush-valve will close even if the closet trapway is clogged. Any closets with flush valve seats less than one inch above the rim of the bowl are prohibited.

7.7.5 Automatic Flush Valve. Flushometer 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 as specified in paragraph 7.5 and 10.5.1.

7.7.6 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. Water closets with integral seats shall not be installed for public use, but may be

installed, in certain institutions and prisons with the permission of the Administrative Authority or other Authority having jurisdiction.

7.7.7 Location. No water closet shall be located in a room or compartment which has less than 5 f. c. of illumination at floor level, and/or which is not ventilated to the atmosphere, either forced draft, or direct opening.

7.8 URINALS

7.8.1 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.

7.8.1.1 Float Valves. Float valves or ball cocks 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.

7.8.2 Urinals Equipped with Automatic Flush Valves. Flushometer shall be as prescribed in paragraph 7.7.5 and no valve shall be used to flush more than one urinal. Protection against backflow shall be provided by a satisfactory backflow preventer as specified in paragraphs 7.5 and 10.5.1.

7.8.3 Trough Urinals. They shall be not less than 6 inches deep and shall be furnished with one-piece backs and have strainers with outlets at least $1\frac{1}{2}$ inches 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 $1\frac{1}{2}$ gallons of water for each 2 feet of urinal length. Protection against backflow shall be provided as specified in paragraph 10.5.3.

7.8.4 Equivalent Length. Trough urinals shall be figured on the basis of one (1) urinal for each 18 inches of length, i. e.,

24 in. trough equals 1 urinal
36 in. trough equals 2 urinals
48 in. trough equals 2 urinals
60 in. trough equals 3 urinals
72 in. trough equals 4 urinals

7.8.5 Backflow Protection. All urinals not otherwise specified shall be protected against backflow as specified in paragraph 10.4.3.

7.8.6 Floor-type Urinals. Floor-type trough urinals are prohibited.

7.8.7 Surrounding Materials. Wall and floor space to a point one foot in front of urinal lip and 4 feet above the floor, and at least, one foot to each side of the urinal shall be lined with nonabsorbent material.

7.8.8 Location. No urinal shall be located in a room or compartment which has less than 5 f. c. of illumination at floor level, and/or which is not vented to the atmosphere, either forced draft, or direct opening

7.9 STRAINERS AND FIXTURE OUTLETS

7.9.1 All plumbing fixtures, other than water closets and syphon-action wash-down or blowout urinals, shall be provided with metal strainers having waterway area complying with paragraph 7.1.1.

7.10 LAVATORIES

7.10.1 Waste Outlets. Lavatories shall have waste outlets not less than $1\frac{1}{4}$ inches in diameter. Wastes may have open strainers or may be provided with stoppers.

7.11 SHOWER RECEPTORS AND COMPARTMENTS

7.11.1 Shower. All shower compartments, except those built directly on the floor slab or those having metal enameled receptors or precast receptors, shall have a lead or copper shower pan or the equivalent thereof. The pan shall turn up on all sides at least 2 inches above finished floor level. Traps shall be so constructed that the pan may be securely fastened to the trap at the seepage entrance, making a watertight joint between the pan and trap. Shower receptacle waste outlets shall be not less than 2 inches and have a removable strainer.

7.11.2 On the Ground. Shower receptors built on the ground shall be constructed from dense nonabsorbent and noncorrosive materials and shall have smooth impervious surfaces, or as provided in paragraph 7.11.1.

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

7.11.4 Construction. Floors under shower compartments shall be laid on a smooth and structurally sound base and shall be lined and made watertight with sheet lead, copper or other acceptable materials. Pans shall be pitched to drain and shall not be installed in direct contact with wood floors. Shower compartments located in basements, cellars, or in other rooms in which the floor has been laid directly on the ground surface need not be lined.

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

7.11.6 Walls. Shower compartments shall have walls constructed of smooth, noncorrosive and nonabsorbent waterproof materials to a height of not less than 6 feet above the floor.

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

7.12 SINKS

7.12.1 Waste Outlets. Sinks shall be provided with waste outlets not less than $1\frac{1}{2}$ inches in diameter. Waste outlets may have open strainers or may be provided with stoppers.

7.12.2 Food Grinders. Sinks on which a food grinder is installed shall have a waste opening not less than $3\frac{1}{2}$ inches in diameter.

7.13 FOOD-WASTE-GRINDER UNITS

7.13.1 Separate Connections. Domestic food-waste-disposal units shall be connected and trapped separately from any other fixture or compartment. Units may have either automatic or hand-operated water supply control. (See paragraph 10.4.)

7.13.2 Grease Interceptors. No food-waste grinder shall be connected through a grease interceptor.

7.13.3 Commercial-type Grinders. Commercial-type food-grinders shall be provided with not less than a 2-inch waste line. Each waste shall be trapped and vented as provided in other sections of this Code.

7.14 DRINKING FOUNTAINS

7.14.1 Design and Construction. Drinking fountains shall conform to American Standard Specifications for Drinking Fountains. (ASA Z4.2-1942.)

7.14.2 Protection of Water Supply. Stream projectors shall be so assembled as to provide an orifice elevation as specified by American Standard Air Gaps in Plumbing Systems (ASA A40.4-1942) and American Standard Backflow Preventers in Plumbing Systems (ASA A40.6-1943), 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 $\frac{7}{16}$ (0.440) inch diameter or 0.150 square inch area shall be placed so that the lower edge of the nozzle orifice is at an elevation not less than $\frac{3}{4}$ inch above the flood level rim of the receptacle.

(b) The $\frac{3}{4}$ inch 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 $\frac{7}{16}$ inch in diameter.

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

7.14.4 Installation. The jet of the fountain should issue from a nozzle of non-oxidizing, impervious material set at an angle from the vertical such as to prevent the return of water in the jet to the orifice or orifices 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 or the fountain becomes clogged.

7.14.5. Protection. The end of the nozzle should be protected by nonoxidizing guards to prevent the mouth and nose of the user from coming into 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.

7.14.6 Spattering. The inclined jet of water issuing from the nozzle should not touch the guard, and thereby cause spattering.

7.14.7 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.

7.14.8 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.

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

7.14.10 Flow Regulator. The water-supply pipe should be provided with an adjustable valve fitted with a loose key 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.

7.14.11 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 fountains will permit children of various ages to utilize the fountain.

7.14.12 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.

7.14.13 Location.

(a) Drinking fountains shall not be installed in toilet rooms.

(b) Drinking fountain bubblers shall not be installed as an integral part of any other fixture such as a lavatory or sink.

7.14.14 Special conditions and certain other materials related to drinking fountains shall meet requirements as set forth in American Standard A40.4-1943 and American Standard ASA Z4.2, respectively.

7.15 FLOOR DRAINS

7.15.1 Trap and Strainers. Floor drains shall have metal traps and a minimum water seal of 3 inches and shall be provided with removable strainers. The open area of strainer shall be at least two-thirds of the cross-section area of the drain line to which it connects.

7.16 DISHWASHING MACHINES

7.16.1 Protection. Domestic dishwashing machines shall meet requirements in paragraph 10.4.3.

7.16.2 Separate Trap. Each unit shall be separately trapped or discharge indirectly into a properly trapped and vented fixture.

7.16.3 Air Gap. Commercial dishwashing machines shall be connected through an air gap or as provided in Chapter 9 "Indirect Waste Piping and Special Wastes."

7.16.4 Hot Water. Dishwashing machines or similar dishwashing equipment not in private living quarters or dwelling units shall be provided with water at 180 deg. F. for sterilization.

7.17 MULTIPLE WASH SINKS

7.17.1 Circular Type. Each 18 inches of wash sink circumference (circular type) shall be equivalent to one lavatory.

7.17.2 Straight-Line Type. Multiple wash sinks of the straight-line type shall have hot and cold combination spouts not closer than 18 inches from adjacent similar spouts and each spout shall be considered the equivalent of one lavatory.

7.18 GARBAGE-CAN WASHERS

7.18.1 Discharge. Garbage-can washers shall not discharge through a trap serving any other device or fixture.

7.18.2 Grease Interceptor. The discharge from a garbage-can washer shall be connected through a grease interceptor.

7.18.3 Baskets. The receptacle receiving the wash from garbage cans shall be provided with a basket or similar device to prevent the discharge of large particles into the building drainage system.

7.18.4 Connections. Water Supply connections shall conform to paragraph 10.4.3.

7.19 LAUNDRY TRAYS

7.19.1 Waste Outlets. Each compartment of a laundry tray shall be provided with a waste outlet not less than 1½ inches in diameter and with a stopper.

7.19.2 Overflow. Laundry-tray overflows shall conform to the requirements of paragraph 7.3.1.

7.20 SPECIAL FIXTURES AND SPECIALTIES

7.20.1 Water and Drain Connections. Baptisries, ornamental and lily pools, aquaria, ornamental fountain basins and similar constructions when provided with water supplies shall be protected from back-siphonage as required in paragraph 10.4.3.

7.20.2 Approval. Specialties requiring water and waste connections shall be submitted for approval of the Administrative Authority.

7.21 MINIMUM FACILITIES

7.21.1 Wherever plumbing fixtures are installed, the minimum number of each type of fixture installed shall be in accordance with Table 7.21.2, unless otherwise specifically provided.

Table 7.21.2 MINIMUM FACILITIES¹

Type of Building or Occupancy ²	Water Closets	Urinals	Lavatories	Bathtubs or Showers	Drinking Fountains ³																										
Dwelling or apt. houses ⁴	1 each for each dwelling or apartment unit	1 for each apt. or dwelling unit	1 for each apt. or dwelling unit																										
Schools ⁵	<table border="1"> <thead> <tr> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr> <td>1 per 50</td> <td>1 per 25</td> </tr> </tbody> </table>	Male	Female	1 per 50	1 per 25	1 per 30 male Urinals may be substituted for water closets for females, not to exceed 1/3 of the required total.	1 per 50 persons		1 per 75 persons																						
Male	Female																														
1 per 50	1 per 25																														
Office or Public Buildings	<table border="1"> <thead> <tr> <th>No. of Persons</th> <th>No. of Fixtures</th> </tr> </thead> <tbody> <tr> <td>1-15</td> <td>1</td> </tr> <tr> <td>16-35</td> <td>2</td> </tr> <tr> <td>36-55</td> <td>3</td> </tr> <tr> <td>56-80</td> <td>4</td> </tr> <tr> <td>81-110</td> <td>5</td> </tr> <tr> <td>111-150</td> <td>6</td> </tr> </tbody> </table> <p>1 fixture for each 40 additional persons</p>	No. of Persons	No. of Fixtures	1-15	1	16-35	2	36-55	3	56-80	4	81-110	5	111-150	6	Wherever urinals are provided for men, one water closet less than the number specified may be provided for each urinal installed ² except that the number of water closets in such cases shall not be reduced to less than 2/3 of the minimum specified.	<table border="1"> <thead> <tr> <th>No. of Persons</th> <th>No. of Fixtures</th> </tr> </thead> <tbody> <tr> <td>1-15</td> <td>1</td> </tr> <tr> <td>16-35</td> <td>2</td> </tr> <tr> <td>36-60</td> <td>3</td> </tr> <tr> <td>61-90</td> <td>4</td> </tr> <tr> <td>91-125</td> <td>5</td> </tr> </tbody> </table> <p>1 fixture for each 45 additional persons</p>	No. of Persons	No. of Fixtures	1-15	1	16-35	2	36-60	3	61-90	4	91-125	5		1 for each 75 persons
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Manufacturing,* Warehouses, workshops, loft buildings, foundries and similar establishments ⁵	<table border="1"> <thead> <tr> <th>No. of Persons</th> <th>No. of Fixtures</th> </tr> </thead> <tbody> <tr> <td>1-9</td> <td>1</td> </tr> <tr> <td>10-24</td> <td>2</td> </tr> <tr> <td>25-49</td> <td>3</td> </tr> <tr> <td>50-74</td> <td>4</td> </tr> <tr> <td>75-100</td> <td>5</td> </tr> </tbody> </table> <p>1 fixture for each additional 30 employees</p>	No. of Persons	No. of Fixtures	1-9	1	10-24	2	25-49	3	50-74	4	75-100	5	Same substitution as above	1-100 persons, 1 fixture for each 10 persons. Over 100, 1 for each 15 persons ^{6, 7} .	1 shower for each 15 persons exposed to excessive heat or to skin contamination with poisonous, infectious, or irritating material.	1 for each 75 persons														
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Dormitories ⁸	<p>Male: 1 for each 10 persons Female: 1 for each 8 persons Over 10 persons, add 1 fixture for each 25 additional males and 1 for each 20 additional females</p>	1 for each 25 men Over 150 persons, add 1 fixture for each additional 50 men	1 for each 12 persons (Separate dental lavatories should be provided in community toilet rooms. Ration of dental lavatories for each 50 persons is recommended.) Add 1 lavatory for each 20 males, 1 for each 15 females.	1 for each 8 persons. In the case of women's dormitories, additional bathtubs should be installed at the ratio 1 for each 30 females. Over 150 persons, add 1 fixture for each 20 persons.	1 for each 75 persons																										
Theatres, auditoriums	<table border="1"> <thead> <tr> <th>No. of Persons</th> <th>No. of Fixtures</th> </tr> </thead> <tbody> <tr> <td>1-100</td> <td>1</td> </tr> <tr> <td>101-200</td> <td>2</td> </tr> <tr> <td>201-400</td> <td>3</td> </tr> </tbody> </table> <p>Over 400, add 1 fixture for each additional 500 males and 1 for each 300 females</p>	No. of Persons	No. of Fixtures	1-100	1	101-200	2	201-400	3	<table border="1"> <thead> <tr> <th>No. of Persons</th> <th>No. of Fixtures</th> </tr> </thead> <tbody> <tr> <td>1-200</td> <td>1</td> </tr> <tr> <td>201-400</td> <td>2</td> </tr> <tr> <td>401-600</td> <td>3</td> </tr> </tbody> </table> <p>Over 600 1 for each additional 300 males</p>	No. of Persons	No. of Fixtures	1-200	1	201-400	2	401-600	3	<table border="1"> <thead> <tr> <th>No. of Persons</th> <th>No. of Fixtures</th> </tr> </thead> <tbody> <tr> <td>1-200</td> <td>1</td> </tr> <tr> <td>201-400</td> <td>2</td> </tr> <tr> <td>401-750</td> <td>3</td> </tr> </tbody> </table> <p>Over 750, 1 for each additional 500 persons</p>	No. of Persons	No. of Fixtures	1-200	1	201-400	2	401-750	3		Over 1,000 add 1 fixture for each additional 1,000		
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¹ The figures shown are based upon one fixture being the minimum required for the number of persons indicated or any fraction thereof.

² Building category not shown on this table. Will be considered separately by the Administrative Authority.

³ Drinking fountains shall not be installed in toilet rooms.

⁴ Laundry trays - one single compartment tray for each dwelling unit or 2 compartment trays for each 10 apartments. Kitchen sinks - 1 for each dwelling or apartment unit.

⁵ As required by the American Standard Safety Code for Industrial Sanitation in Manufacturing Establishments (ASA Z4.1-1935).

⁶ Where there is exposure to skin contamination with poisonous, infectious, or irritating materials, provide 1 lavatory for each 5 persons.

⁷ 24 lineal inches of wash sink or 18 inches of a circular basin, when provided with water outlets for such space, shall be considered equivalent to 1 lavatory.

⁸ Laundry trays, 1 for each 50 persons. Slop sinks, 1 for each 100 persons.

General. In applying this schedule of facilities, consideration must be given to the accessibility of the fixtures. Conformity purely on a numerical basis may not result in an installation suited to the need of the individual establishment. For example, schools should be provided with toilet facilities on each floor having classrooms.

Temporary workmen facilities:

1 water closet and 1 urinal for each 30 workmen

24-in. urinal trough = 1 urinal

48-in. urinal trough = 2 urinals

36-in. urinal trough = 2 urinals

60-in. urinal trough = 3 urinals

72-in. urinal trough = 4 urinals

CHAPTER 8

HANGERS AND SUPPORTS

8.1 STRAIN AND STRESSES

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

8.2 VERTICAL PIPING

8.2.1 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.

8.2.2 Cast-Iron Soil Pipe. Cast-iron soil pipe shall be supported at not less than at every story height and at its base.

8.2.3 Screwed Pipe. Screwed pipe (SPS) shall be supported at not less than every other story height.

8.2.4 Copper Tubing. Copper tubing shall be supported at each story for piping $1\frac{1}{2}$ inches and over and at not more than 4-foot intervals for piping $1\frac{1}{4}$ inches and smaller. Supports be of copper material.

8.2.5 Lead Pipe. Lead pipe shall be supported at intervals not exceeding 4 feet. Supports be of lead material.

8.2.6 Plastic drain and Vent Pipe. Plastic Drain and vent pipe shall be supported at not less than at every story height and at its base.

8.3 HORIZONTAL PIPING

8.3.1 Supports. Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.

8.3.2 Cast-Iron Soil Pipe. Cast-iron soil pipe shall be supported at not more than 5-foot intervals.

8.3.3 Screwed Pipe. Screwed pipe (S. P. S.) shall be supported at approximately 12-foot intervals.

8.3.4 Copper Tubing. Copper tubing shall be supported at approximately 6-foot intervals for piping $1\frac{1}{2}$ inches and smaller and 10-foot intervals for piping 2 inches and larger.

8.3.5 Lead Pipe. Lead pipe shall be supported by strips of rigid material or otherwise for its entire length.

8.3.6 Plastic Drain and Vent Pipe. Plastic drain and vent pipe shall be supported at not less than 3-foot intervals.

8.3.7 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 Administrative Authority.

8.4 HANGERS AND ANCHORS

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

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

8.5 STRAINS AND STRESSES

8.5.1 Installation of Pipe. Piping in a plumbing system shall be so installed as to prevent undue strains and stresses.

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

8.5.3 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, and shall be adequately protected.

8.6 BASE OF STACKS

8.6.1 Supports. Bases of cast-iron soil stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction, or by other methods approved by the Administrative Authority.

8.6.2 Piping Material. Other piping material shall be so anchored as to take the load off the stack at the base.

CHAPTER 9

INDIRECT WASTE PIPING AND SPECIAL WASTES

9.1 INDIRECT WASTE PIPING

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

9.1.2 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, cooling or refrigerant coils, steam tables, egg boilers, coffee urns, potato peelers, vegetable sinks or similar equipment discharge indirectly into a water-supplied sink or receptor and the waste outlet shall terminate at least 2 inches above the flood rim of such sink or receptor, and not concealed.

9.1.3 Commercial Dishwashing Machines and Fixtures. Dishwashing machines and sinks, pot-washing sinks, glass-washers and other similar fixtures, except those in private living quarters or dwelling units, shall be indirectly connected, except when located adjacent to a floor drain, whereby the waste may be connected direct on the sewer side of the floor drain trap, and revented if necessary in accordance with Table 12.9.3, provided that the distance from the floor to the bottom of the washer tank or sink is greater than the distance from the floor to the top dip of the floor drain trap.

9.1.4 Interceptor. An interceptor may be placed on the outlet side of the dishwashing machine, or on the discharge side of the indirect waste receptor.

9.1.5 Connection. Indirect waste connections shall be provided for drains, overflows, or relief vents from the water-supply system.

9.1.6 Sterile Materials. Appliances, devices, or apparatus such as stills, sterilizers, 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 the appliance.

9.1.7 Drips. Appliances, devices, or apparatus not regularly classed as plumbing fixtures but which have drips or drainage outlets, may be drained by indirect waste pipes discharging into an open receptacle as provided in paragraph 9.1.2.

9.1.8 Cleaning. Indirect waste piping shall be so installed as to permit ready access for flushing and cleansing.

9.2 MATERIAL AND SIZE

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

9.3 LENGTH AND SLOPE

9.3.1 Maximum Length. The maximum length of the indirect waste to vent shall not exceed 15 feet.

CHAPTER 5

TRAPS AND CLEANOUTS

5.1 TRAPS

5.1.1 **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) Provided, that a combination plumbing fixture may be installed on one trap, if one compartment is not more than 6 inches deeper than the other and the waste outlets are not more than 30 inches apart.
- (b) Provided, that 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 inches apart and the trap is centrally located when three compartments are installed.

5.1.2 **Distance of Trap to Fixture.** The vertical distance from the fixture outlet to the trap wire shall not exceed 24 inches.

5.2 TYPE AND SIZE OF TRAPS AND FIXTURE DRAINS

5.2.1 **Trap Size.** The size (nominal diameter) of trap for a given fixture shall be sufficient to drain the fixture rapidly but in no case less than given in Chapter 11, Table 11.4.2.

5.2.2 Type of Traps

- (a) Fixture traps shall be self-cleaning other than integral traps without partitions or movable parts, except as specifically approved in other sections of this Code.
- (b) Slip joints or couplings may be used on the trap inlet or within the trap seal of the trap if metal-to-metal ground joint is used.
- (c) A trap integral with the fixture shall have a uniform interior and smooth waterway.

5.2.3 Drum Traps

- (a) Drum traps shall be 3 or 4 inches in diameter and shall be provided with a water seal of not less than 2 inches.
- (b) The trap screw shall be one size less than the trap diameter.

5.3 GENERAL REQUIREMENTS

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

9.3.2 Minimum Slope. Indirect waste pipes shall be installed at a uniform slope, but at slopes not less than permitted in paragraphs 11.3.2, 11.3.3, and 11.3.4.

9.4 AIR GAP OR BACKFLOW PREVENTER

9.4.1 Provision of Air Gap. 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 as provided in paragraph 9.4.2 or 9.4.3.

9.4.2 By extending the indirect waste pipe to an open, accessible slop sink, floor drain, or other suitable fixture which is properly trapped or vented. The indirect waste shall terminate a sufficient distance above the flood level rim of the receiving fixture to provide the required air gap, and shall be installed in accordance with other applicable sections of this Code.

9.4.3 By providing a break (air gap) in the drain connection on the inlet side of the trap serving the fixture, device, appliance or apparatus.

9.5 RECEPTORS

9.5.1 Installation. Waste receptors serving indirect pipes shall not be installed in any toilet room, nor in any inaccessible or unventilated space such as a closet or storeroom, nor be concealed.

9.5.2 Cleanout Location. If the indirect waste receptor is set below floor level, it shall be equipped with a running trap adjacent to the sink with cleanout brought level with the floor.

9.5.3 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. in height.

9.5.4 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 of an indirect waste pipe.

9.6 CLEAR WATER WASTES

9.6.1 Water lifts, expansion tanks, cooling jackets, sprinkler systems, drip or overflow pans, or similar devices which waste clear water only shall discharge onto a roof or into the building drainage system through an indirect waste.

9.7 CONDENSORS AND SUMPS

9.7.1 No steam pipe shall connect to any part of a drainage or plumbing system, nor shall any water above 180 F. be discharged into any part of a drainage system. Such pipes may be indirectly connected by discharging through an interceptor into the drainage system.

9.8 DRINKING FOUNTAINS

9.8.1 Drinking fountains may be installed with indirect wastes in existing structures.

9.9 SPECIAL WASTES

9.9.1 Acid Waste. Acid and chemical indirect waste pipes shall be of materials unaffected by contact with the specific wastes to be discharged.

9.9.2 Neutralizing Device. In no case shall corrosive liquids, spent acids, or other harmful chemicals which might destroy or injure a drain, sewer, soil or waste pipe, or which might create noxious or toxic fumes, discharge into the plumbing system without being thoroughly diluted or neutralized by passing through a properly constructed and acceptable dilution or neutralizing device. Such device shall be automatically provided with a sufficient intake of diluting water or neutralizing medium, so as to make its contents noninjurious before being discharged into the soil or sewage system.

9.10 SWIMMING POOLS

9.10.1 Piping carrying waste water from swimming or wading pools including pool drainage, back wash from filters, water from scum gutter drains or floor drains which serve walks around pools, shall be installed as an indirect waste utilizing any existing circulation pump, if necessary, when indirect waste line is below the sewer grade.

CHAPTER 10

WATER SUPPLY AND DISTRIBUTION

10.1 QUALITY OF WATER SUPPLY

10.1.1 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.

10.1.2 All premises intended for human habitation, occupancy, or use shall be provided with a supply of pure and wholesome water, neither connected with unsafe water supplies nor subject to the hazards of backflow or back-siphonage. Where a public supply of potable water is not available, requirement satisfactory to the Administrative Authority shall be observed.

10.1.3 Nonpotable Water. Nonpotable water may be used for the flushing of water closets, urinals, and other fixtures only with the approval of the Administrative Authority, and only when there is an inadequate supply of potable water for this purpose. 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. See Section 10.2.

10.2 COLOR CODE

10.2.1 Identification of Piping. All piping conveying nonpotable water shall be adequately and durably identified by a distinctive yellow-colored paint so that it is readily distinguished from piping carrying potable water. (See ASA Z53.1-1945 Safety Color Code for Marking Physical Hazards and ASA A13.1-1956 Scheme for the Identification of Piping Systems.)

10.3 WATER SUPPLY MANDATORY

10.3.1 Every building in which plumbing fixtures are installed and are for human occupancy or habitation shall be provided with an ample supply of pure and wholesome water.

10.4 PROTECTION OF POTABLE WATER SUPPLY

10.4.1 Cross Connections. Potable water-supply piping, water discharge outlets, backflow prevention devices or similar equipment shall not be so located as to make possible their submergence in any contaminated or polluted liquid or substance.

10.4.2 Approval of Devices. Before any device for the prevention of backflow or back-siphonage is installed, it shall have first been certified as meeting the requirements of ASA A40.6-1943 by a recognized testing laboratory acceptable to the Administrative Authority. 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 Administrative Authority having jurisdiction may inspect such devices and if found to be defective or inoperative, shall require the replacement thereof.

10.4.3 Backflow. The water-distributing system shall be protected against backflow. Every water outlet shall be protected from backflow, preferably by having the outlet and 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" as defined in ASA A40.4-1942. Where it is not possible to provide a minimum air gap, the water outlet shall be equipped with an accessibly located backflow preventer complying with ASA A40.6-1943, installed on the discharge side of the final control valve.

10.4.4 Prohibited Connections.

(a) Chemical, Contaminated Water, or Sewage Lines or Vessels. There shall be no direct connection between potable water lines and lines, equipment or vessels containing raw or contaminated water, contaminating chemicals or sewage. Such connections shall be made only through a minimum air gap as outlined in paragraph 10.5.1, sub-paragraph (d).

(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 pressurized tank or cylinder containing or having contained liquified gaseous petroleum products or other liquified gaseous chemicals to any public water supply. Water for flushing or cooling, or otherwise to be instilled into such a vessel shall be obtained by gravity through a minimum air gap as outlined in paragraph 10.5.1, sub-paragraph (d). 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 as outlined in paragraph 10.5.1, sub-paragraph (d).

(c) Refrigerant Condensers. No refrigerant condenser of the water jacket type employing a common wall between the refrigerant gas and the cooling water shall be directly connected to a public water supply. Cooling water, if from a public water supply shall be obtained by gravity through a minimum air gap, or by use of an auxiliary pump and tank as outlined in paragraph 10.4.4, sub-paragraph (b).

(d) Chemical pressure vessels containing chemicals used in the water treatment process by the authority charged with the operation of the water supply are hereby specifically exempted from the provisions of paragraph 10.4.4.

10.5 VACUUM BREAKERS AND AIR GAPS

10.5.1 Air Gaps. Air gaps should be used whenever possible, in preference to backflow preventers (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. (See Fig. 1 and Fig. 2.)

(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. (See Fig. 1 and Fig. 2.)

(c) The water inlet to certain fixtures, such as water-closet flush tanks and tanks or vats, may be difficult to protect with air gaps and therefore requires special consideration. (See pars. e, f, g, h, and i.)

(d) The minimum required air gap shall be twice the diameter of the effective opening, but in no case less than given in Table 10.5. (See next page 105)

(e) Where it is not practical to provide a minimum required air gap above the flood-level rim of a tank or vat, an arrangement similar to that shown on Fig. 3 may be provided.

(f) The overflow pipe or channel shall be so arranged as to allow overflow water a free discharge to atmosphere under all conditions, overflow piping to be provided with an adequate break in the piping as close to the tank as possible, and the area of the free opening shall be at least equal to that of the overflow pipe. (See Fig. 3.) Tank and overflow piping must be protected against freezing.

(g) When water enters the tank at the maximum rate with all inlets open and all outlets closed, the size and capacity of overflow pipe or channel shall be sufficient to keep the water level from rising to more than half of the minimum required air gap as shown in Table 10.5, said distance to be measured above the top of the overflow.

(h) The minimum air gap, as measured from the lowest point of any supply outlet to the top of the overflow opening, shall be one and one-half times the minimum air gap as required by Table 10.5. (See Fig. 3.)

(i) If a tank or vat cannot be provided with an adequate air gap as required, a backflow (back-siphonage) preventer is required.

10.5.2 Vacuum Breakers or Backflow Preventers.

(a) Required. 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 the water in the fixture or receptacle is exposed at all times to atmospheric pressure. The type of preventer referred to will not protect against flow when water is discharged through it into a space which is higher than atmospheric pressure.

(b) Where. Backflow preventers shall be installed between the control valve and the fixture and in such a manner that it 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 outlet side of 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.

(e) Backflow preventers shall have been tested and approved to meet tests and performances as required for Backflow Preventers by ASA A40.6-1943.

10.5.3 Flushometer. Flushometer shall be equipped with an approved vacuum breaker. The vacuum breaker shall be installed on the discharge side of the flushing valve with the critical level at least 4 inches above the overflow rim of the bowl.

AIR GAPS, BACKFLOW PREVENTERS, AND DRINKING FOUNTAIN STANDARDS

**Table 10.5 MINIMUM AIR GAPS FOR GENERALLY
USED PLUMBING FIXTURES**

Fixture	Minimum Air Gap	
	When not Affected by Near Wall ¹	When Affected by Near Wall ²
Lavatories with effective openings not greater than 1/2-in. diameter.....	1.0	1.50
Sink, laundry trays, and goose neck bath faucets with effective openings not greater than 3/4-in. diameter.....	1.5	2.25
Overrim bath fillers with effective openings not greater than 1-in. diameter.....	2.0	3.00
Effective openings greater than 1-in.	(3)	(4)

¹Side walls, ribs, or similar obstructions do not affect the air gaps when spaced from inside edge of spout opening a distance greater than three times the diameter of the effective opening for a single wall, or a distance greater than four times the diameter of the effective opening for two intersecting walls. (See Fig. 2.)

²Vertical walls, ribs, or similar obstructions extending from the water surface to or above the horizontal plane of the spout opening require a greater air gap when spaced closer to the nearest inside edge of spout opening than specified in note 1 above. The effect of three or more such vertical walls or ribs has not been determined. In such cases, the air gap shall be measured from the top of the wall.

³2 x effective opening.

⁴3 x effective opening.

10.5.4 Flushing Tanks. Flushing tanks shall be equipped with an approved anti-siphon ball-cock. The ball-cock shall be installed with the critical level of the vacuum breaker at least 1 inch above the full opening of the overflow pipe. In cases where the ball-cock has no hush tube, the bottom of the water-supply inlet shall be installed 1 inch above the full opening of the overflow pipe.

10.5.5 Trough Urinals. Trough urinals shall be equipped with an approved vacuum breaker installed on the discharge side of the last valve and not less than 12 inches above the spray pipe.

10.5.6 Lawn Sprinklers. Lawn sprinkler systems shall be equipped with an approved preventer on the discharge side of each of the last valves. The backflow preventer shall be at least 6 inches above the highest head, and in no case less than 6 inches above the surrounding ground. Where combination control valves and backflow preventers are installed, the bottom of the valve shall constitute the bottom of the backflow preventer.

10.5.7 Valve Outlet. Fixtures with hose attachments shall be protected by an approved backflow preventer installed six inches above the highest point of usage and on the discharge side of the valve.

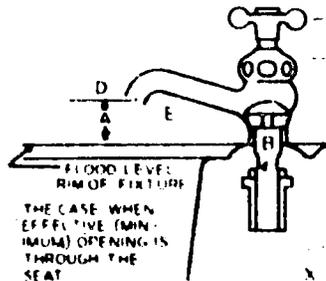


Fig. 1 AIR GAP AND EFFECTIVE OPENING

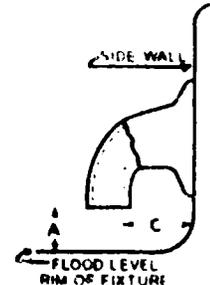


Fig. 2 NEAR WALL INFLUENCE ON AIR GAP

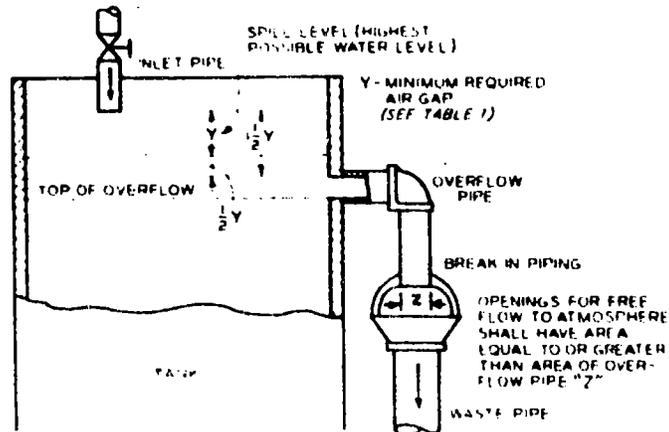


Fig. 3 AIR GAP IN OPEN TANK WITH OVERFLOW

10.5.8 Commercial Laundry Machines. Commercial laundry machines shall be equipped with approved backflow preventers located on the discharge side of the water control valves, a minimum distance of 26 inches above the top of the machine.

10.5.9 Commercial Dishwashers. Commercial dishwashers shall be equipped with approved backflow preventers located in the rinse water supply line of the discharge side of the final control valve, a minimum distance of 6 inches above the uppermost spray outlets. The cold water or make-up water supply line shall be provided with an air gap as outlined in paragraph 10.5.1, or an approved backflow preventer located on the discharge side of the final control valve, a minimum distance of 6 inches above the absolute overflow or flood rim.

10.5.10 Aspirators. Water operated aspirators shall meet the following specifications: (A) The water supply line shall be equipped with a shut-off and a check valve. (B) An approved backflow preventer shall be installed on the discharge side of the control valve and shall be located at least 6 inches above the highest point from which the aspirator may take suction. (C) The aspirator water discharge shall be provided with a 2 inch air gap to the receiving fixture.

10.5.11 Pressure-Type Water Treatment Units. Wash-water and rinse-water drain lines from water softeners and other types of water treatment filters shall discharge to a sump through an air gap equal to at least two times the nominal diameter of the discharge pipe.

10.6 WATER SERVICE PIPE

10.6.1 The underground water-service pipe and the building drain shall be not less than 10 feet apart horizontally and shall be separated by undisturbed or compacted earth.

10.6.2 Exception. The water-service pipe may be placed in the same trench with the building drain only if space is not available to provide the separation required in paragraph 10.6.1, and provided that the following conditions are met:

The bottom of the water-service pipe, at all points, shall be at least 18 inches above the top of the sewer line at its highest point.

The water-service pipe shall be placed on a solid shelf excavated at one side of the common trench.

The number of joints in the service pipe shall be kept to a minimum.

The materials and joints of sewer and water-service pipe shall be installed in such 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. The water-service pipe shall be in accordance with paragraph 10.10.1 and the sewer pipe shall be in accordance with paragraph 11.2.2.

10.6.3 Stop-and-Waste Valve Combination. Combination stop-and-waste valves and cocks shall not be installed in an underground service pipe, except by approval of the Administrative Authority. In no case shall a stop-and-waste valve be located closer than 10 feet to a sewer line. Whenever possible, stop-and-waste valves shall be replaced with shut-off and drip valves as provided in paragraph 10.12.1.

10.6.4 Private Water Supply. No private water supply shall be interconnected with any public water supply without the specific approval of the Illinois Department of Health.

10.7 WATER PUMPING AND STORAGE EQUIPMENT

10.7.1 Pumps and Other Appliances. Water pumps, tanks, filters, and all other appliances and devices shall be protected against contamination.

10.7.2 Water-Supply Tanks. Potable-water-supply tanks 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.

10.7.3 Pressure Tanks, Boilers, and Relief Valves. The drains from pressure tanks, boilers, relief valves and similar equipment shall be connected to the drainage system through an indirect waste.

10.7.4 Cleaning, Painting, Repairing Water Tanks. 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.

10.8 WATER-SUPPLY TANKS AND AUXILIARY PRESSURE SYSTEMS

10.8.1 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 house tank or auxiliary pressure (booster) system. See paragraphs 10.14.5 and 10.14.6 for pump control requirements. Auxiliary pressure systems shall not be utilized as an alternate for adequate sizing of water distribution piping within the building.

10.8.2 Support. All water-supply tanks shall be supported in accordance with the building code or other regulations which apply.

10.8.3 Overflow for Water-Supply Tanks. Overflow pipes for gravity tanks shall discharge above and within 6 inches 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.

10.8.4 Tank Supply. 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 inches above the overflow. (See Appendix A).

10.8.5 Drains. Water-supply tanks shall be provided with valved drain lines located at their lowest point and discharged as an indirect waste or as required for overflow pipes in paragraph 10.4.3. Each drain line shall be equipped with a quick-opening valve of the same diameter as the pipe.

10.8.6 Size of Overflow. Overflow drains for water-supply tanks shall not be less than the following:

Drain pipe (Inches)	Tank Capacity (gallons)	Drain Pipe (Inches)	Tank Capacity (gallons)
1	Up to 750	2½	3,001 to 5,000
1½	751 to 1,500	3	5,001 to 7,500
2	1,501 to 3,000	4	Over 7,500

10.8.7 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 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 (24) mesh per inch.

10.8.8 Pressure Tanks. Pressure tanks used for supplying water to the domestic water distribution system, combined supply to fire standpipes and domestic water system, or to supply standpipes for fire equipment only, shall be equipped with an acceptable vacuum breaking device located on the top of the tank. The air inlet of this device shall be covered with a metallic screen of not less than twenty-four (24) mesh per inch.

10.9 DISINFECTATION OF POTABLE WATER SYSTEM PIPING

10.9.1 Potable water systems or any part thereof installed or repaired shall be disinfected in accordance with one of the following methods before it is placed in operation.

10.9.2 The system, or part thereof, shall be filled with a solution containing 50 parts per million of available chlorine and allowed to stand 6 hours before flushing and returning to service.

10.9.3 The system, or part thereof, shall be filled with a solution containing 100 parts per million of available chlorine and allowed to stand 2 hours before flushing and returning to service.

10.9.4 In the case of a potable-water storage tank where it is not possible to disinfect as provided in paragraphs 10.9.2 and 10.9.3 the entire interior of the tank shall be swabbed with a solution containing 200 parts per million of available chlorine and the solution allowed to stand 2 hours before flushing and returning to service.

10.9.5 In the case of potable-water filters or similar devices, the dosage shall be determined by the Administrative Authority, or other authority having jurisdiction.

10.10 WATER-DISTRIBUTION PIPE, TUBING AND FITTINGS

10.10.1 Materials for water distributing pipes and tubing shall be brass, copper, lead, cast iron, wrought iron, steel, asbestos, cement or plastic (See Sec. 3.2.7) with appropriate approved fittings. All threaded ferrous pipe and fittings shall be galvanized (zinc-coated) or cement lined. When used underground in corrosive soil, all ferrous pipe and fittings shall be coal-tar enamel coated and the threaded joints shall be coated and wrapped after installation. (See Chapter 3 for Standards.)

10.10.2 Cement Joints. Cement joints shall not be used in the water distribution system.

10.11 ALLOWANCE FOR CHARACTER OF WATER

10.11.1 Selection of Materials. When selecting the material and size for 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.

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

10.12 WATER SUPPLY CONTROL

10.12.1 Water Supply Control. A main shut-off valve on the water-service pipe shall be provided near the curb and, also, an accessible shut-off valve with a drip valve shall be provided inside near the entrance of the water-service pipe into the building.

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

10.12.3 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.

10.12.4 Group 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.

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

10.12.6 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.

10.12.7 Shut-Off Valve at Meter. The shut-off valve at the discharge side of the water meter shall be not less in size than the size of the building water service, and shall be of the gate-type with suitable drainage provisions.

10.13 WATER SUPPLY DISTRIBUTION

10.13.1 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 peak demand, and in no case shall be less than 3/4 inch 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.

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

10.14 PROCEDURE IN SIZING THE WATER DISTRIBUTION SYSTEM OF A BUILDING.

10.14.1 The sizing of the water distribution system shall conform to good engineering practice. Methods used to determine pipe sizes shall be acceptable to the Administrative Authority. (See Appendix A for guidance in the design of water-supply systems.)

10.14.3 Minimum Pressure. Minimum, fairly constant, service pressure, at the point of outlet discharge shall be not less than 8 psi for all fixtures except for direct flush-valves, for which it shall be not less than 15 psi, and except where special equipment is used requiring higher pressure. In determining the minimum pressure, allowance shall be made for the pressure drop due to friction loss in the piping system during maximum demand periods as well as head, meter, and other losses in the system.

10.14.4 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.

10.14.5 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 water system. A shut-off valve shall be installed on the suction side of the water system, and within 5 feet from the pump suction inlet, and a pressure gage shall be installed between the shut-off valve and pump.

As an alternate arrangement, a pump suction tank may 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.

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

10.14.7 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.

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

10.15 HOT - WATER SUPPLY AND DISTRIBUTION

10.15.1 Hot-Water Heaters. Hot-Water heaters shall conform to ASA Standards No. C72.1-1949, Z21.10.1-1956 and Z21.10.2-1956.

10.15.2 Hot-Water Distribution Piping. The sizing of the hot-water distribution piping shall conform to good engineering practice (See paragraph 10.14)

10.16 SAFETY DEVICES

10.16.1 Pressure-Relief Valve, a reseating type. Pressure-relief valves shall be installed for all equipment used for heating or storage of hot water. The rate of discharge of such a valve shall limit the pressure rise for any given heat input to 10 percent of the pressure at which the valve is set to open.

10.16.2 A Reseating Type Temperature Relief Valves or Energy Shut-Off Devices. Temperature relief valves or energy shut-off devices shall be installed for equipment used for the heating or storage of hot water. Each temperature relief valve shall be rated as to its BTU capacity. At 210 deg. F., it shall be capable of discharging sufficient hot water to prevent any further rise in temperature. As an alternative to the temperature relief valve, and in lieu thereof, an energy shut-off device may be used, which will cut off the supply of heat energy to the water tank before the temperature of the water in the tank exceeds 210 deg. F.

10.16.3 Approvals. Combination pressure and temperature relief valves, separate pressure and temperature relief valves, or energy shut-off devices, which have been tested and approved by, or meet the specification requirements of, the American Gas Association, the Underwriters' Laboratories, Inc., or other recognized approval authorities, shall be considered acceptable.

10.16.4 Relief-Valve Location. Temperature-relief valves shall be so located in the tank as to be actuated by the water in the top one-eighth of the tank served and in no case more than 3 inches away from such tank. Pressure-relief valves may be located adjacent to the equipment they serve. There shall be no check valve or shut-off valve between a relief valve and the heater or tank for which it is installed.

10.16.5 Relief Outlet Wastes. The outlet of a pressure, temperature, or other relief valve shall not be connected to the drainage system as a direct waste.

10.16.6 Pressure Marking of Storage Tank. Any storage tank hereafter installed for domestic hot water shall have clearly and indelibly stamped in the metal, or so marked upon a plate welded thereto, or otherwise permanently attached, the maximum allowable working pressure. Such markings shall be in an accessible position outside of the tank so as to make inspection or reinspection readily possible. All storage tanks for domestic hot water shall meet the applicable ASA standards.

10.17 MISCELLANEOUS

10.17.1 Drain Cocks. All storage tanks shall be equipped with adequate drain cocks.

10.17.2 Line Valves. Valves in the water-supply distribution system, except those immediately controlling one fixture supply, when fully opened shall have a

cross-sectional area of the smallest orifice or opening through which the water flows at least equal to the cross-sectional area of the nominal size of the pipe in which the valve is installed.

10. 17. 3 Water Used for Processing. Water used for cooling of equipment or similar purposes shall not be returned to the potable-water distributing system. When discharged to the building drainage system, the waste water shall be discharged through an indirect waste pipe or air gap.

10. 18 WATER HEATERS

10. 18. 1 All automatic type gas water heaters, now installed or which shall hereafter be installed in buildings, shall have a sheet metal vent pipe at least two and one-half inches in diameter, connected with or leading into a masonry flu or chimney in the building or leading outside the building in a safe and suitable manner.

10. 18. 2 All other encased gas water heaters shall be provided with vent pipe as described in Section One of this Ordinance, connected or leading as therein required, if located in any bathroom or room used for living or working purposes.

10. 18. 3 Before any gas water heater shall be hereafter installed in any building, a permit shall be obtained from the Plumbing Inspector of the City, who shall inspect the installation. The fee for such inspection shall be fifty cents, which shall be paid by the person who shall apply for the permit.

10. 18. 4 Any person who shall install any water heater, or cause the same to be installed, or permit the same to remain installed, in any building owned, occupied or controlled by him, without complying with any of the provisions of this ordinance in such case provided to be complied with, shall be subject to a penalty of Ten Dollars. Each day during which such installation shall remain in violation of any of the provisions of this ordinance shall be and constitute a distinct and separate offense.

CHAPTER 11

DRAINAGE SYSTEM

11.1 MATERIALS

11.1.1 General. Pipe, tubing, and fittings for drainage systems shall comply with the provisions in Chapter 3.

11.1.2 Above-Ground Piping Within Buildings. Soil and waste piping for a drainage system within a building shall be X. H. cast-iron, lead, brass, or copper pipe, or rigid plastic pipe. (See Sec. 3.2.8.)

11.1.3 Underground Piping Within Buildings. All drains within buildings, when underground, shall be of X. H. cast-iron pipe, lead, Type L or K copper, brass, rigid plastic to undisturbed earth a point no less than 5'-0" beyond the footings or bearing walls, or such other distance as the Administrative Authority may direct.

11.1.4 Fittings. Fittings on the drainage system shall conform to the type of piping used. Fittings on screwed pipe and copper shall be of the recessed drainage type. (See Section 2.4)

11.2 BUILDING DRAIN

11.2.1 Separate Trenches. The building drain shall be installed in a separate trench from the water-service pipe, the pipes being separated horizontally by not less than 10 feet of undisturbed or compacted earth. The building drain from a point 5'-0" beyond building walls or otherwise as specified in 11.1.3, shall be cast-iron drain pipe, copper pipe (DWV or heavier), rigid plastic pipe (see paragraph 3.2.9), vitrified clay sewer pipe, concrete sewer pipe, bituminized-fiber sewer pipe, or asbestos-cement sewer pipe. Joints shall be rootproof and watertight when tested with a 10 foot head of water or equivalent.

11.2.2 Sewer in Filled Ground. A building drain installed in filled or unstable ground shall be of cast-iron pipe, except that nonmetallic drains may be laid upon an approved concrete pad if installed in accordance with paragraph 11.2.1.

11.2.3 Sanitary and Storm Sewers. Where separate systems of sanitary drainage and storm drainage are installed in the same property, the sanitary and storm building sewers or drains may be laid side by side in one trench.

11.2.4 Old House Sewers and Drains. Old house sewers and 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 sewers, and the Administrative Authority shall notify the owner to make the changes necessary to conform to this Code.

11.2.5 Protection of Pipes. Trench bottoms shall be hand-trimmed to grade with provision for bedding of the pipe throughout its 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 rootproof and shall be made in accordance with the requirements contained in Chapter 4. Trenches shall be backfilled and compacted to a distance of at least 18 inches above the top of the pipe with hand tools prior to the use of mechanical equipment for backfilling.

11.3 DRAINAGE PIPING INSTALLATION

11.3.1 Horizontal Drainage Piping. Horizontal drainage piping shall be installed at a uniform slope but at slopes not less than permitted in paragraphs 11.3.2, 11.3.3, and 11.3.4.

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

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

11.3.4 Minimum Velocity. Where conditions do not permit building drains and sewers to be laid with a fall as great as that specified, then a lesser slope may be permitted provided the computed velocity will not be less than 2 feet per second.

11.3.5 Cleanouts. See Chapter 5.

11.4 FIXTURE UNITS

11.4.1 Values for Fixtures. Fixture-unit values as given in Table 11.4.2 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 sizes for soil, waste, and drain pipes for which the permissible load is given in terms of fixture units.

Table 11.4.2 FIXTURE UNITS PER FIXTURE OR GROUP

Fixture Type	Fixture-Unit Value as Load Factors	Minimum Size of Trap ¹ Inches
1 bathroom group consisting of water closet, lavatory and bathtub or shower stall	Tank water closet 6 Flush-valve water closet 8	
Bathtub ¹ (with or without overhead shower)	2	1½
Bathtub ¹	3	2
Bidet	3	Nominal 1½
Combination sink-and-tray	3	1½
Combination sink-and-tray with food-disposal unit	4	Separate traps 1½
Dental unit or cuspidor	1	1¼
Dental lavatory	1	1¼
Drinking fountain	½	1
Dishwasher ² , domestic	2	1½
Floor drains ³	1	2
Kitchen sink, domestic	2	1½
Kitchen sink, domestic, with food waste grinder	3	1½
Lavatory ⁴	1	Small P.O. 1¼
Lavatory ⁴	2	Large P.O. 1½
Lavatory, barber, beauty parlor	2	1½
Lavatory, surgeon's	2	1½
Laundry tray (1 or 2 compartments)	2	1½
Shower stall, domestic	2	2
Showers (group) per head ²	3	
Sinks		
Surgeon's	3	1½
Flushing rim (with valve)	8	3
Service (Trap standard)	3	3
Service (P trap)	2	2
Pot, scullery, etc. ²	4	1½
Urinal, pedestal, syphon jet, blowout	8	Nominal 3
Urinal, wall lip	4	1½
Urinal stall, washout	4	2
Urinal trough ³ (each 2-ft section)	2	1½
Wash sink ² (circular or multiple) each set of faucets	2	Nominal 1½
Water closet, tank-operated	4	Nominal 3
Water closet, valve-operated	8	3

¹A shower head over a bathtub does not increase the fixture value.

²See Para. 11.4.3 and 11.4.4 for method of computing unit value of fixtures not listed in Table 11.4.2 or for rating of devices with intermittent flows.

³Size of floor drain shall be determined by the area of surface water to be drained.

⁴Lavatories with 1¼ or 1½ inch trap have the same load value; larger P.O. plugs have greater flow rate.

11.4.3 Fixtures not listed in Table 11.4.2 shall be estimated in accordance with Table 11.4.3.

Table 11.4.3

Fixture drain or trap size	Fixture-unit value
1½ inches and smaller	1
1½ inches	2
2 inches	3
2½ inches	4
3 inches	5
4 inches	6

11.4.4 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.

11.5 DETERMINATION OF SIZES FOR THE DRAINAGE SYSTEM

11.5.1 Maximum Fixture-Unit Load. The maximum number of fixture units that may be connected to a given size of building sewer, building drain, horizontal branch, or vertical soil or waste stack is given in Tables 11.5.2 and 11.5.3.

11.5.2 Minimum Size of Building Sewer, Building Drain, Horizontal Branch, or Vertical Soil Stack. The minimum allowable size of any building sewer, building drain, horizontal branch, or vertical soil or waste stack serving one or more water closets shall be three (3) inches.

Table 11.5.2 BUILDING DRAINS AND SEWERS

Diameter of Pipe	Maximum Number of Fixture Units That May Be Connected to Any Portion ¹ of the Building Drain or the Building Sewer			
	Fall per Foot			
	1/16-inch	1/8-inch	1/4-inch	1/2-inch
Inches				
2			21	26
2½			24	31
3		20 ²	27 ²	36 ²
4		180	216	250
5		390	480	575
6		700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	3,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

¹ Includes branches of the building drain.

² Not over two water closets.

**Table 11.5.3 HORIZONTAL FIXTURE
BRANCHES AND STACKS**

Diameter of Pipe	Maximum Number of Fixture Units That May Be Connected To:			
	Any Horizontal ¹ Fixture Branch	One Stack of 3 Stories in Height or 3 Intervals	More Than 3 Stories in Height	
			Total for Stack	Total at One Story or Branch Interval
Inches				
1 1/4	1	2	2	1
1 1/2	3	4	8	2
2	6	10	24	6
2 1/2	12	20	42	9
3	20 ²	30 ³	60 ³	16 ³
4	160	240	500	90
5	360	540	1,100	200
6	620	960	1,900	350
8	1,400	2,200	3,600	600
10	2,500	3,800	5,600	1,000
12	3,900	6,000	8,400	1,500
15	7,000	.....	.....	.....

¹Does not include branches of the building drain.

²Not over two water closets.

³Not over six water closets.

11.5.5 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 W. C. connection shall not be considered as a reduction in pipe size.

11.5.6 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 4 inches in diameter or the size of the building drain, whichever is the lesser.

11.5.7 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.

11.5.8 Underground Drainage Piping. No portion of the drainage system installed underground or below a basement or cellar shall be less than 2 inches in diameter.

11.6 OFFSETS ON DRAINAGE PIPING

11.6.1 Offsets of 45 Deg. or Less. An offset in a vertical stack, with a change of direction of 45 deg. or less from the vertical, may be sized as a straight vertical stack. In case a horizontal branch connects to the stack within 2 feet above or below the offset, a relief vent shall be installed in accordance with paragraph 12.18.3.

11.6.2 Waste Stacks Serving Kitchen Sinks. In a one-or two-family dwelling only in which the waste stack or vent receives the discharge of a kitchen-type sink and also serves as a vent for fixtures connected to the horizontal portion of the branch served by the waste stack, the minimum size of the waste stack up to the highest sink branch connection shall be 2 inches in diameter. Above that point the size of the stack shall be governed by the total number of fixture units vented by the stack.

11.6.3 Above Highest Branch. An offset above the highest horizontal branch is an offset in the stack-vent and shall be considered only as it affects the developed length of the vent.

11.6.4 Below Lowest Branch. In the case of an offset in a soil or waste stack below the lowest horizontal branch, no change in diameter of the stack because of the offset shall be required if it is made at an angle of not greater than 45 deg. If such an offset is made at an angle greater than 45 deg., the required diameter of the offset and the stack below it shall be determined as for a building drain (Table 11.5.3).

11.6.5 Offsets of More Than 45 Deg. A stack with an offset of more than 45 deg. from the vertical shall be sized as follows:

The portion of the stack above the offset shall be sized as for a regular stack based on the total number of fixture units above the offset.

The offset shall be sized as for a building drain. (Table 11.5.3, Column 5).

The portion of the stack below the offset shall be sized as for the offset or based on the total number of fixture units on the entire stack, whichever is the larger. (See Table 11.5.4, Column 4.)

A relief vent for the offset shall be installed as provided in Chapter 12 and in no case shall the horizontal branch connect to the stack within 2 feet above or below the offset.

11.7 SUMPS AND EJECTORS

11.7.1 Building Drains Below Sewer. Building drains which cannot be discharged to the sewer 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.

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

11.7.3 Venting. The system of drainage piping below the sewer level shall be installed and vented, in a manner similar to that of the gravity system.

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

11.7.5 Vent Sizes. Building sump vents shall be sized in accordance with Table 12.21.5 but shall in no case be sized less than 1½ inches.

11.7.6 Separate Vents. Vents from pneumatic ejectors or similar equipment shall be carried separately to the open air as a vent terminal.

11.7.7 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 higher temperature exists, proper cooling methods shall be provided.

11.8 FLOOR DRAINS

11.8.1 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.

11.8.2 Provision for Evaporation. Floor-drain trap 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.

11.8.3 Size. Floor-drain traps and drains, installed below a basement floor or underground, shall be not less than 2 inches in diameter.

11.8.4 Bell Traps. Bell traps are prohibited.

11.9 FROST PROTECTION

11.9.1 No soil or waste pipes shall be installed or permitted outside of a building, or concealed in outside walls or in any place where they may be subjected to freezing temperatures, unless adequate provision is made to protect them from frost.

11.10 PROHIBITED LOCATION

11.10.1 Exposed Drainage Piping. Exposed drainage piping shall not be installed above any area which is to be used for food or drink preparation, storage, or serving, where leakage from such piping may result in contamination of food or drink.

11.11 INDEPENDENT SYSTEM

11.11.1 The drainage and plumbing system of each new building and of new work installed in an existing building shall be separate from and independent of that of any other building, except as provided below, and every building shall have an independent connection with a public or private sewer when available. In no case, except as noted below, will the sewer from one building be permitted to run beneath any other building. A sewer is deemed available when a public sewer has been provided for the plot of ground of which it may be a part.

CHAPTER 12

VENTS AND VENTING

12.1 MATERIALS

12.1.1 Vents. Pipe, tubing, and fittings for the vent piping system shall comply with the provisions in Chapter 3.

12.1.2 Specific Type. Standards given in Table 3.5 apply to the specific materials approved for use and as indicated in the various paragraphs in this chapter as they apply to the venting system.

12.1.3 Piping. Vent piping shall be of X. H. ca. t-iron, galvanized wrought iron, galvanized steel, and ferrous alloys, lead, brass, or copper pipe, or copper tube, or rigid plastic pipe. (See Sec. 3.2.8).

12.1.4 Underground. Vent piping placed underground shall be X. H. cast-iron pipe, lead, copper, brass or rigid plastic. Where threaded joints are used underground, they shall be coated and wrapped after installation and test.

12.1.5 Fittings. Fittings shall conform to the type of pipe used in the vent system as required by paragraphs 12.1.2 and 12.1.3.

12.1.6 Acid System. Vent piping on acid-waste systems shall conform to that required for acid-waste pipe, except as may be found adequate by the Administrative Authority.

12.1.7 Other Materials. Nothing in this section shall be deemed to preclude the use of other materials of equal or better quality when approved as such by the Administrative Authority.

12.2 PROTECTION OF TRAP SEALS

12.2.1 Traps Protected. 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, loop vents, circuit or continuous vents, or combinations thereof, installed in accordance with the requirements of this chapter.

12.3 VENT STACKS

12.3.1 Installation. A vent stack or a main vent shall be installed with a soil or waste stack whenever back vents, relief vents, or other branch vents are required in two or more branch intervals.

12.3.2 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 inches above the flood-level rim of the highest fixture.

12.3.3 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 above the roof.

12.4 VENT TERMINALS

12.4.1 Roof Extension. Extensions of vent pipes through a roof shall be terminated at least 6 inches above it.

12.4.2 Roof Garden. When a roof is to be used for any purpose other than weather protection, the vent extensions shall be run at least 5 feet above the roof.

12.4.3 Flashings. Each vent terminal shall be made watertight with the roof by proper flashing.

12.4.4 Flag Poling. Vent terminals shall not be used for flag poling, TV aeri-als, or similar purposes.

12.4.5 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 feet horizontally of such an opening unless it is at least 2 feet above the top of such opening.

12.4.6 Extensions Outside Building. No soil, waste, or vent pipe extension shall be run or placed on the outside of a wall of any building, but shall be carried up inside the building.

12.5 FROST CLOSURE

12.5.1 Vent Terminals. The vent extension through the roof shall in no instance be smaller than the vent which it terminates, and shall be increased to prevent closure by frost when so required by the Administrative Authority. Vent terminals shall not be screened.

12.5.2 Increasers. Change in diameter of vent terminals when required shall be made by use of a long increaser at least 1 foot below the roof.

12.6 VENT GRADES AND CONNECTIONS

12.6.1 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.

12.6.2 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 deg. from the vertical, before it is venting before offsetting horizontally or before connecting to the branch vent.

12.6.3 Height Above Fixtures. A connection between a vent pipe and a vent stack or stack-vent shall be made at least 6 inches above the flood-level rim of the highest fixture served by the vent. Horizontal vent pipes forming branch vents, relief vents, or loop vents shall be at least 6 inches above the flood-level rim of the highest fixture served.

12.6.4 Side-Inlet. Side-inlet closet bends are permitted only in cases where the fixture connecting thereto is vented and in no case shall the inlet be used to vent a bathroom group without being washed by a fixture.

12.7 BARS AND SODA-FOUNTAIN SINKS

12.7.1 Bar and Fountain-Sink Traps. Traps serving sinks which are part of the equipment of bars, soda fountains, and counters need not be vented when the location and construction of such bars, soda fountains, and counters are such as to make it possible so to do. When such conditions exist, such sinks shall discharge into a floor sink or hopper which is properly trapped and vented and screened with 16 mesh screening.

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

12.8 FIXTURES BACK-TO-BACK

12.8.1 Distance. 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. (See paragraph 12.10.2.)

12.9 FIXTURE VENTS

12.9.1 Distance of Trap from Vent. Each fixture trap shall have a protecting vent so located that the slope and the developed length in the fixture drain from the trap wire to the vent fitting are within the requirements set forth in Table 12.9.3.

12.9.2 Trap-Seal Protection. The plumbing system shall be provided with a system of vent piping which will permit the admission or emission of air so that under normal and intended use the seal of any fixture trap shall not be subjected to a pressure differential of more than 1 inch of water.

Table 12.9.3 DISTANCE OF FIXTURE TRAP FROM VENT

Size of fixture drain Inches	Distance trap to Vent
1 $\frac{1}{4}$	2 ft. 6 in.
1 $\frac{1}{2}$	3 ft. 6 in.
2	5 ft. 0 in.
3	6 ft. 0 in.
4	10 ft. 0 in.

12.9.4 Trap Dip. The vent pipe opening from a soil or waste pipe, except for water closets and similar fixtures, shall not be below the top wire of the trap.

12.9.5 Crown Vent. No back vent shall be installed within two pipe diameters of the trap wire.

12.10 COMMON VENT

12.10.1 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.

12.10.2 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 than the lower fixture drain, whichever is the larger and that both drains conform to Table 12.9.3.

12.11 VENTS FOR FIXTURE TRAP BELOW TRAP DIP

12.11.1 Hydraulic Gradient. Fixture drains shall be vented within the hydraulic gradient between the trap outlet and vent connection, but in no case shall the unvented drain exceed the distance provided for in Table 12.9.3.

12.11.2 Different Levels. If any stack has fixtures entering at different levels, the fixtures other than the fixture entering at the highest level shall be vented, except as may be permitted in other sections of this chapter.

12.12 WET VENTING

12.12.1 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 inch diameter wet vent or not more than four fixture units drain into a 2-inch 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.

12.12.2 Double Bath. Bathroom groups back-to-back on top floor consisting of two lavatories and two bathtubs or shower stalls may be installed on 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 inches in diameter, and the length of the fixture drain conforms to Table 12.9.3.

12.12.3 Multistory Bathroom Groups. On the lower floors of a multistory building, the waste pipe from one or 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 is 2 inches in diameter.

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

(c) The vent stack is sized as given in Table 12.12.3c.

Table 12.12.3c 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	4

12.12.4 Exception. In multistory bathroom groups, wet vented in accordance with paragraph 12.12.3, the water closets below the top floor need not be individually vented if the 2-inch waste connected directly into the water-closet bend at a 45 deg. angle to the horizontal portion of the bend in the direction of flow.

12.12.5 No other form of wet venting is permissible.

12.13 STACK VENTING

12.13.1 One-Bathroom Group. Except as indicated in paragraph 12.13.2, 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-story 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 and in accordance with the requirements in Table 12.9.3.

12.13.2 Overtaxed Sewers. When a sink or combination fixture connects to the stack-vented bathroom group, and when the street sewer is sufficiently overloaded to cause frequent submersion of the building sewer, a relief vent or back-vented fixture shall be connected to the stack below the stack-vented water closet or bathtub.

12.14 INDIVIDUAL FIXTURE REVENTING

12.14.1 Horizontal Branches. One sink and one lavatory, or three lavatories within 8 feet developed length of a main-vented line may be installed on a 2-inch horizontal waste branch without reventing, provided the branch is not less than 2 inches 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 1/4 inch per foot.

12.14.2 Where Required. When fixtures other than water closets discharge downstream from a water closet, each fixture connecting downstream shall be individually vented.

12.14.3 Limits of Fixture Units Above Bathtubs and Water Closets. A fixture or combination of fixtures whose total discharge rating is not more than 3 fixture units may discharge into a stack not less than 3 inches in diameter without reventing, provided such fixture connections are made above the connection to the highest water closet, or bathtub tee-wye, the fixture-unit rating of the stack is not otherwise exceeded, and their waste piping is installed as otherwise required in paragraph 12.14.1.

12.15 CIRCUIT AND LOOP VENTING

12.15.1 Battery Venting. A branch soil or waste pipe to which two but not more than eight water closets (except blowout type), pedestal urinals, 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 first fixture connection. When lavatories or similar fixtures discharge above such branches, each vertical branch shall be provided with a continuous vent.

12.15.2 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 as 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.

12.15.3 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 or from the top of the horizontal branch.

12.15.4 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 double connection shall be provided. The common vent shall be installed in a vertical position as a continuation of the double connection.

12.15.5 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.

12.15.6 Loop Vents. Loop vents are specifically prohibited.

12.16 PNEUMATIC EJECTORS

12.16.1 Relief vents from a pneumatic ejector shall not be connected to a fixture-branch vent but shall be carried separately to a vent stack or stack-vent or thru the roof.

12.17 RELIEF VENTS

12.17.1 Stacks of More Than 10 Branch Intervals. Soil and waste stacks in buildings having more than 10 branch intervals shall be provided with a relief vent at each tenth interval installed, beginning with the top floor. The size of the relief vent shall be equal to the size of the vent stack to which it connects. The lower end of each relief vent shall connect to the soil or waste stack through a wye below the horizontal branch serving the floor and the upper end shall connect to the vent stack through a wye not less than 3 feet above the floor level.

12.18 OFFSETS AT AN ANGLE LESS THAN 45 DEG. FROM THE HORIZONTAL IN BUILDINGS OF FIVE OR MORE STORIES

12.18.1 Offset Vents. Offsets less than 45 deg. from the horizontal, in a soil or waste stack, except as permitted in Chapter 11, Section 11.6, shall comply with paragraphs 12.18.2 and 12.18.3.

12.18.2 Separate Venting. Such offsets may be vented as two separate soil or waste stacks, namely, the stack section below the offset and the stack section above the offset.

12.18.3 Offset Reliefs. Such offsets may be vented by installing a relief vent as a vertical continuation of the lower section of the stack or as a side vent connected to the lower section between the offset and the next lower fixture or horizontal branch. The upper section of the offset shall be provided with a yoke vent. The diameter of the vents shall not be less than the diameter of the main vent, or of the soil and waste stack, whichever is the smaller.

12.19 MAIN VENTS TO CONNECT AT BASE

12.19.1 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 re-connected with the main soil or waste vent.

12.20 VENT HEADERS

12.20.1 Connections of Vents. Stack-vents and vent stacks may be connected into a common vent header at the top of the stacks and then extended to the open air at one point. This header shall be sized in accordance with the requirements of Table 12.21.5, the number of units being the sum of all units on all stacks connected thereto and the developed length being the longest vent length from the intersection at the base of the most distant stack to the vent terminal in the open air as a direct extension of one stack.

12.21 SIZE AND LENGTH OF VENTS

12.21.1 Length of Vent Stacks. The length of the vent stack or main vent shall be its developed length from the lowest connection of the vent system with the soil stack, waste stack, or building drain to the vent stack terminal, if it terminates separately in the open air, or to the connection of the vent stack with the stack-vent, plus the developed length of the stack-vent from the connection to the terminal in the open air, if the two vents are connected together with a single extension to the open air.

12.21.2 Size of Individual Vents. The diameter of an individual vent shall be not less than $1\frac{1}{4}$ inches nor less than one-half the diameter of the drain to which it is connected.

12.21.3 Size of Relief Vent. The diameter of a relief vent shall be not less than one-half the diameter of the soil or waste branch to which it is connected.

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

12.21.5 Size of Vent Piping. The nominal size of vent piping shall be determined from its length and the total of fixture units connected thereto, as provided in Table 12.21.5. Twenty per cent of the total length may be installed in a horizontal position.

Table 12.21.5 SIZE AND LENGTH OF VENTS

Size of soil or waste stack	Fixture Units Connected	Diameter of Vent Required (Inches)								
		1¼	1½	2	2½	3	4	5	6	8
		Maximum Length of Vent (Feet)								
Inches										
1¼	2	30								
1½	8	50	150							
1½	10	30	100							
2	12	30	75	200						
2	20	26	50	150						
2½	42	.....	30	100	300					
3	10	.....	30	100	200	600				
3	30	.....	.....	60	200	500				
3	60	.....	.....	50	80	400				
4	100	.....	.....	35	100	260	1000			
4	200	.....	.....	30	90	250	900			
4	500	.....	.....	20	70	180	700			
5	200	.....	.....	.....	35	80	300	1000		
5	500	.....	.....	.....	30	70	300	900		
5	1100	.....	.....	.....	20	50	200	700		
6	350	.....	.....	.....	25	50	200	400	1300	
6	620	.....	.....	.....	15	30	125	300	1100	
6	960	.....	.....	.....	.....	24	100	250	1000	
6	1900	.....	.....	.....	.....	20	70	200	700	
8	600	.....	.....	.....	.....	.....	50	150	500	1300
8	1400	.....	.....	.....	.....	.....	40	100	400	1200
8	2200	.....	.....	.....	.....	.....	30	80	350	1100
8	3600	.....	.....	.....	.....	.....	25	60	250	800
10	1000	.....	.....	.....	.....	.....	.....	75	125	1000
10	2500	.....	.....	.....	.....	.....	.....	50	100	500
10	3800	.....	.....	.....	.....	.....	.....	30	80	350
10	5600	.....	.....	.....	.....	.....	.....	25	60	250

12.22 PROHIBITED LOCATION

12.22.1 Exposed Vent Piping. Exposed vent piping shall not be installed above any area which is to be used for food or drink preparation, storage, or serving, where leakage from such piping may result in contamination of food or drink.

CHAPTER 13
STORM DRAINS

13.1 GENERAL

13.1.1 Drainage Required. Roofs, paved areas, yards, courts, and court-yards, shall be drained into a storm-sewer system or a combined-sewer where such systems are available.

13.1.2 Prohibited Drainage. Storm water shall not be drained into sewers intended for sewage only.

13.1.3 Traps. Leaders and storm drains, when connected to a combined sewer, shall be trapped and provided with cleanout at grade level.

13.1.4 Expansion Joints. Expansion joints or sleeves shall be provided where warranted by temperature variations or physical conditions.

13.1.5 Subsoil Drains. Where subsoil drains are placed under the cellar or basement floor or are used to surround the outer walls of a building, they shall be made of open-jointed or horizontally split or perforated clay tile, or perforated bituminized fiber pipe or asbestos cement pipe, not less than 4 inches in diameter. When the building is subject to back-water, the subsoil drain shall be protected by an accessibly located backwater valve. Subsoil drains may discharge into a properly trapped area drain or sump. Such sumps do not require vents.

13.1.6 Building Subdrains. Building subdrains located below the public sewer level shall discharge into a sump or receiving tank the contents of which shall be automatically lifted and discharged into the drainage system as required for building sumps.

13.2 MATERIALS

13.2.1 Inside Conductors. Conductors placed within a building or run in a vent or pipe shaft shall be of X. H. cast-iron, galvanized wrought iron, galvanized ferrous alloys, brass copper, lead or rigid plastic pipe.

13.2.2 Outside Leaders. When outside leaders are subject to mechanical injury they shall be constructed of standard weight galvanized steel pipe or equivalent.

13.2.3 Underground Storm Drains. Building storm drains buried underground, inside the building, shall be of X. H. cast-iron pipe to a distance beyond foundation to undisturbed earth no less than 5'0".

13.2.4 Building Storm Drains. The building storm drain from 5'0" beyond foundation shall be of cast-iron pipe, vitrified-clay pipe, concrete pipe, bituminized-fiber pipe, or asbestos-cement pipe, or copper pipe.

13.3 TRAPS

13.3.1 Main Trap. Individual storm-water traps shall be installed on the storm-water drain branch serving each conductor, or a single trap shall be installed in the main

storm drain just before its connection with the combined building sewer, main drain, or public sewer.

13.3.2 Material. Storm-water traps, when required, shall be of cast-iron.

13.3.3 No traps shall be required for storm-water drains which are connected to a sewer carrying storm water exclusively.

13.3.4 Traps for individual conductors shall be the same size as the horizontal drain to which they are connected.

13.3.5 Conductor traps shall be so located that an accessible cleanout may be installed on the building side of the trap.

13.4 CONDUCTORS AND CONNECTIONS

13.4.1 Conductor pipes shall not be used as soil, waste, or vent pipes, nor shall soil, waste, or vent pipes be used as conductors.

13.4.2 Rain-water conductors installed along alley ways, driveways, or other locations where they may be exposed to damage shall be protected by metal guards, recessed into the wall, or constructed from standard weight galvanized steel pipe or equivalent.

13.4.3 Combining storm with sanitary drainage. The sanitary and storm-drainage system of a building shall be entirely separate, except that where a combined sewer is available the building storm drain may be connected in the same horizontal plane through a single Y fitting to the combined drain or sewer at least 10 feet downstream from any soil stack.

13.4.4 Double Connections of Storm Drains. Where the sanitary and storm drains are connected on both sides of the combined sewer, single Y's shall be used and the requirements of paragraph 13.4.3 relative to the location of connections shall also apply.

13.4.5 Floor drains connected to a sanitary sewer shall be trapped.

13.5 ROOF DRAINS

13.5.1 Material. Roof drains shall be of cast-iron, copper, lead, or other acceptable corrosion-resisting material.

13.5.2 Strainers. All roof areas, except those draining to hanging gutters, shall be equipped with roof drains having strainers extending not less than 4 inches above the surface of the roof immediately adjacent to the roof drain. Strainers shall have an available inlet area, above roof level, of not less than $1\frac{1}{2}$ times the area of the conductor or leader to which the drain is connected.

13.5.3 Flat Decks. Roof drain strainers for use on sun decks, parking decks, and similar areas, normally serviced and maintained, may be of the flat surface type, level with the deck and shall have an available inlet area not less than 2 times the area of the conductor or leader to which the drain is connected.

13.5.4 Roof Drain Flashings. The connection between roofs and roof drains which pass through the roof and into the interior of the building shall be made watertight by the use of proper flashing material.

13.6 SIZE OF LEADERS AND STORM DRAINS

13.6.1 Vertical leaders shall be sized on the maximum projected roof area, according to Table 13.6.1.

13.6.2 Building Storm Drain. The size of the building storm drain or any of its horizontal branches having a slope of 1/2 inch or less per foot, shall be based upon the maximum projected roof area to be handled according to the following table:

NOTE: Tables 13.6.1 and 13.6.2 are based upon a maximum rate of rainfall of 4 inches per hour. If it is desired to design for a maximum rate of rainfall greater than 4 inches per hour, then the figures for roof area must be adjusted proportionately by multiplying the figure by 4 and dividing by the maximum rate of rainfall in inches per hour.

13.6.3 Roof Gutters. The size of semicircular gutters shall be based on the maximum projected roof area, according to the following table:

13.7 SIZE OF COMBINED DRAINS AND SEWERS

13.7.1 Conversion of Roof Area to Fixture Units. The drainage area may be converted to equivalent fixture unit loads.

Table 13.6.1 SIZE OF VERTICAL LEADERS

Size of leader or conductor ¹ Inches	Maximum projected roof area Square feet
2	720
2½	1300
3	2200
4	4600
5	8650
6	13500
8	29000

¹ The equivalent diameter of square or rectangular leader may be taken as the diameter of that circle which may be inscribed within the cross-sectional area of the leader.

NOTE: See footnote to Table 13.6.2.

Table 13.6.2 SIZE OF HORIZONTAL STORM DRAINS

Diameter of Drain Inches	Maximum Projected Roof Area for Drains of Various Slopes		
	1/8-In. Slope Square Feet	1/4-In. Slope Square Feet	1/2-In. Slope Square Feet
3	822	1160	1644
4	1880	2650	3760
5	3340	4720	6680
6	5350	7550	10700
8	11500	16300	23000
10	20700	29200	41400
12	33300	47000	66600
15	59500	84000	119000

Table 13.6.3 SIZE OF GUTTERS

Diameter of Gutter ¹ Inches	Maximum Projected Roof Area for Gutters of Various Slopes			
	1/16-In. Slope Square Feet	1/8-In. Slope Square Feet	1/4-In. Slope Square Feet	1/2-In. Slope Square Feet
3	170	240	340	480
4	360	510	720	1020
5	625	880	1250	1770
6	960	1360	1920	2770
7	1380	1950	2760	3900
8	1990	2800	3980	5600
10	3600	5100	7200	10000

¹ Gutters other than semicircular may be used provided they have an equivalent cross-sectional area.

13.7.2 When the total fixture unit load on the combined drain is less than 256 fixture units, the equivalent drainage area in horizontal projection shall be taken as 1000 square feet.

13.7.3 When the total fixture-unit load exceeds 256 fixture units, each fixture unit shall be considered the equivalent of 3.9 square feet of drainage area.

13.7.3 If it is desired to design for rainfall greater than 4 inches per hour, the 1000 square foot equivalent in paragraph 13.7.2 and 3.9 in paragraph 13.7.3 shall be adjusted by multiplying by 4 and dividing by the rainfall per hour to be provided for.

13.8 VALUES FOR CONTINUOUS FLOW

13.8.1 Where there is a continuous or semicontinuous discharge into the building storm drain or building storm sewer, as from a pump, ejector, air-conditioning plant, or similar device, each gallon per minute of such discharge shall be computed as being equivalent to 24 square feet of roof area, based upon a 4-inch rainfall per hour.

CHAPTER 14

INSPECTION, TESTS, MAINTENANCE AND ADMINISTRATION

14.1 INSPECTIONS

14.1.1 New Work. All new plumbing work and such portions of existing systems as may be affected by new work or any changes, shall be inspected to insure 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.

14.1.2 Plumbing Inspector. There is hereby created the office of Plumbing Inspector, who shall be appointed by the Mayor. The Plumbing Inspector shall be a Licensed Plumber.

(a) **Appointment and Qualifications.** No person shall be appointed to the office of Plumbing Inspector who is not skilled in the business of plumbing, house drainage and plumbing ventilation. Hereafter he shall hold a plumber's certificate when appointed, and shall be competent to design plumbing work.

(b) **Duties and Powers.** It shall be the duty of the Inspector to see that the construction, maintenance and control of the plumbing, drainage and ventilation of all buildings in the City of Urbana shall conform to and comply with the rules and regulations established by Ordinance. He shall have the right, as far as may be necessary in the performance of his duties, to enter between sunrise and sunset any building or premises in the City of Urbana, he shall also perform such further duties as may be required of him by the Mayor.

He shall pass upon all plans submitted, sign and issue all notices and certificates required, keep a daily record of his work, including all notices and applications received, permits issued and granted, violations of these regulations and all other matters which pertain thereto. He shall inspect the plumbing in all buildings in course of erection or alteration, as often as may be necessary, and shall see that it is performed in accordance with the provisions of the rules and regulations established by the Ordinance and shall collect all fees thereof. He shall arrest and prosecute all persons violating any of the provisions of Plumbing Ordinance or regulations. He shall keep in proper books provided for that purpose a record of all transactions relating to plumbing work, including all plans and specifications examined by him and how disposed of, also a record of the conditions of plumbing sewage or lack of same in all plans or buildings inspected, with notes, etc., appended thereto, as will enable future inspectors or Boards to trace sources of filth or contamination without re-examination of the premises. All plans must be examined and passed on within three days, all books or records of his office shall be open for public inspection at all times.

(c) **Inspections.** He shall hold himself in readiness between the hours of 8:00 A. M. and 5:00 P. M. or as scheduled by the Commissioner of Public Works to inspect any plumbing work in course of construction or any building or premises that there may be reason for presuming to be in a condition such as might menace the public health.

(d) **Bond-Oath.** Within ten days after his appointment, the Plumbing Inspector shall give a bond in the sum of Two Thousand (\$2000.00) Dollars running to the City of Urbana with two or more sureties to be approved by the City Council conditioned upon the faithful performance of his duties, and he shall take and subscribe to the oath prescribed for City Officers, and shall not during his incumbency of said

office be interested directly or indirectly in any sewer or plumbing contract, or materials, or the profits thereof, within the City of Urbana nor shall he act as agent for any person or persons engaged in the plumbing business.

(e) Reports. He shall keep an accurate record of all fees paid to or received by him, giving the name of the person paying same, date, amount of fees, and shall on the third day of each month pay over to the City Clerk all moneys collected, file a duplicate receipt therefor with the City Clerk and shall render a report under oath each month to the City Clerk showing the transactions of his office for the preceding month and of all moneys received, which shall be placed in the City Treasury. He shall at the end of each fiscal year make a report to the Mayor showing receipts and expenditure of his office, and a detailed and comprehensive statement of all matters pertaining to his department. He shall be responsible for the collection of all fees for permits issued.

(f) Compensation. He shall receive monthly as compensation for the performance of the duties herein prescribed, such sums as shall be fixed by the City Council.

(g) Police Power. The Plumbing Inspector shall have police power to enforce compliance with the rules and regulations set forth in this plumbing ordinance.

(h) Inspections. All piping, traps, and fixtures of a plumbing system shall be inspected by the Plumbing Inspector to insure compliance with all the requirements of this ordinance and the installation and construction of the system in accordance with any approved plans and the permit.

14.2 NOTIFICATION

14.2.1 It shall be the duty of the plumber to notify the Plumbing Inspector and the owner or his authorized agent orally, by telephone, or in writing, not less than eight working hours, between the hours of 8:00 A. M. and 4:00 P. M., before the work is to be inspected or tested.

14.2.2 Plumber's Responsibility. It shall be the duty of the plumber to make sure that the work will stand the test prescribed before giving the above notification.

14.2.3 Retesting. If the Plumbing Inspector finds that the work will not stand the test, the plumber shall be required to re-notify as above and to pay the sum of one dollar for each re-notification.

If the Plumbing Inspector fails to appear within 8 working hours of the time set for each inspection or test, the inspection or test shall be deemed to have been made, and the plumber required to file an affidavit with the Plumbing Inspector that the work installed is in accordance with this ordinance or approved plans and permit, and that it was free from defects and that the required tests had been made and the system found free from leaks; also whether the owner or his authorized agent was present when such inspection or test was made, or was duly notified.

14.2.4 Test. Tests shall be conducted in the presence of the Plumbing Inspector or his duly appointed representative.

14.3 CROSS-CONNECTION AND PLUMBING SURVEY

14.3.1 The Plumbing Inspector 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 of 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.

14.4 VIOLATIONS

14.4.1 Notices of violations shall be written and mailed or delivered by the Plumbing Inspector to the person responsible at the time inspection was made.

14.5 REINSPECTION

14.5.1 Reinspections. Reinspections of plumbing installations of any part thereof shall be made when deemed necessary by the Plumbing Inspector.

14.6 COVERING OF WORK

14.6.1 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.

14.6.2 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 Plumbing Inspector.

14.7 MATERIAL AND LABOR FOR TESTS

14.7.1 The equipment, material, power and labor necessary for inspections or tests shall be furnished by the person to whom the permit is issued or by whom inspection is requested.

14.8 TESTS OF DRAINAGE AND VENT SYSTEMS

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

14.9 METHODS OF TESTING DRAINAGE AND VENT SYSTEMS

14.9.1 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 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-foot head of water. In testing successive sections at least the upper 10 feet of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet of the system) shall have been submitted to a test of less than a 10-foot head of water. The water shall be kept in the system, or in the portion under test, for at least 15 minutes before inspection starts; the system shall then be tight at all points.

14.9.2 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 gage pressure of 5 psi or sufficient to balance a column of mercury 10 inches in height. This pressure shall be held without introduction of additional air for a period of at least 15 minutes.

14.9.3 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-inch water column shall be built and maintained for 15 minutes before inspection starts. Where the peppermint test is preferred, 2 ounces of oil of peppermint shall be introduced for each line or stack.

14.10 BUILDING DRAIN

14.10.1 Test Required. Building drain shall be tested.

14.10.2 Method. Test shall consist of plugging end of building drain at point of connection with the public sewer and filling the building sewer with water and testing with not less than a 10-foot head of water, or a flow test as provided by the Plumbing Inspector may be substituted.

14.11 INSPECTION AND TEST NOT REQUIRED

14.11.1 No test or inspection shall be required where a plumbing system, or part thereof, is set up for exhibition purposes and has no connection with a water or drainage system.

14.12 TEST OF WATER-SUPPLY SYSTEM

14.12.1 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.

14.13 TEST OF INTERIOR LEADERS OR DOWNSPOUTS

14.13.1 Leaders or downspouts and branches within a building shall be tested by water or air in accordance with paragraph 14.9.1 or 14.9.2.

14.14 CERTIFICATE OF APPROVAL

14.14.1 Certificate of Approval. If said plumbing is approved by the Plumbing Inspector, he shall issue a certificate of satisfactory inspection, but no certificate shall be issued unless all plumbing conditions, fixtures, apparatus and appliances are in strict conformity with the rules and regulations of this ordinance.

14.15 DEFECTIVE WORK

14.15.1 Defective Work. If inspection or test show defects, such defective work or material shall be replaced within three days, or as the Plumbing Inspector may direct, and inspection and test repeated.

14.16 MAINTENANCE

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

14.17 ADMINISTRATION

14.17.1 Permit. No plumbing work including a connection with the public sewer shall be done except in an emergency without first securing from the Plumbing Inspector a written permit therefor. Before issuing such a permit an application shall be filed by a Licensed Plumber with the Plumbing Inspector.

No connection with the storm drainage system shall be made except in an emergency without first securing from the Plumbing Inspector a permit therefor.

All applications for permits shall be in writing on blanks to be furnished by the Plumbing Inspector.

The owner or agent in charge of any premises upon which such plumbing or storm drainage work is to be done shall not permit the performance of such plumbing or storm drainage work unless a permit therefor shall have been issued as provided herein.

Each application that does not conform to the Ordinance shall be accompanied by a complete and legible set of plans and specifications of the work to be done, or in lieu thereof such written description or information as shall be acceptable to the Plumbing Inspector and shall be kept on file in his office.

14.17.1 (a) Expiration of Permit. If the work is not commenced under any permit, within six months after the issue of said permit, and if the work is not thereafter satisfactorily prosecuted, such permit will be considered as having expired.

14.17.1 (b) 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 bonafide owner of such dwelling and that the same will be occupied by said owner and that said owner shall personally purchase all material and perform all labor in connection therewith, and provided that all workmanship, methods, and materials shall meet the requirements of this Code.

14.17.1 (c) Bond. A pre-requisite to the issuing of a permit as mentioned Article 5, Section 2 of this Ordinance shall be the filing of a bond satisfactory to and be made payable to the City of Urbana, for the faithful performance of work under permits issued by the Plumbing Inspector and as security for the payment of any penalties for the violation of this Ordinance.

Any said bond so delivered shall terminate one year after its execution and delivery to the Plumbing Inspector or when the Plumbing Inspector deems the security inadequate, or when a new Plumbing Inspector assumes the duties of this office and deems a new bond feasible, whereupon the Plumbing Inspector shall require the execution and delivery of a new bond as hereinbefore set forth.

Provided, however, that no plumber shall be required to deliver to the Plumbing Inspector more than one bond executed in the manner hereinbefore set forth, regardless of the number of permits issued, while said bond is in full force and effect.

14.17.1 (d) Schedule of Fees. Fees shall be in accordance with the Official Schedule as prepared by the Plumbing Inspector based upon fees established by the City Council.

14.17.2 REQUIREMENTS FOR PLUMBING PERMITS

14.17.2 (a) Plans and Specifications. No permit shall be issued until plans and specifications showing the proposed work in necessary detail have been submitted to the Plumbing Inspector or authorized 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 payment of 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 original application for permit, shall be obtained to cover the change.*

14.17.2 (b) 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.*

14.17.2 (c) Protection of Water-supply System. The Plumbing Inspector may 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.

14.17.3 ENFORCEMENT

14.17.3 (a) Inspections and Tests. It shall be the duty of the Plumbing Inspector to enforce the provisions of this Code and to make the inspections and tests required thereunder.

14.17.3 (b) Right of Entry. The authorized representative of the Plumbing Inspector 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 reasonable necessary for the enforcement of this Code.

14.17.3 (c) Certificate of Inspection. When the plumbing in any building is found, upon inspection, to be in a sanitary condition or when changes, which are ordered in the Plumbing, Drainage, or Ventilation, have been completed and found correct, a Certificate of Inspection signed by the Inspector, shall be issued and delivered to the owner of the building. Triplicate copies of the Certificate of Inspection shall be made, one to be retained in a permanent book form in the office of the Inspector, one copy shall be given to the person, firm or corporation installing the work, and the original copy to the owner or manager of the building or premises. Upon notice by the Inspector, said certificate shall be revoked for violations of the plumbing ordinances or regulations.

14.17.3 (d) Permits and Fees. He shall issue all permits required by ordinance or regulation, retaining one copy in permanent book form in his office and deliver the original to person applying for same, and shall collect the following fees therefor: For permission to connect to the sanitary sewer or storm water drain and inspection thereof, the sum of One (\$1.00) Dollar shall be charged and collected. A permit and a fee of One (\$1.00) Dollar will be required for making an excavation in any of the public streets or alleys for the purpose of laying or replacing or repairing any drain tile or connecting water pipe, gas pipe, telephone conduits or appurtenances belonging to the equipment of any public service corporation. A permit and a fee of One (\$1.00) Dollar for each fixture shall be required and collected for plumbing installed in new buildings or for the addition to or alteration of existing plumbing. The word fixture being here meant to include all openings left for waste or ventilation pipes, whether the fixtures are set or not.

14.17.3 (e) Condemned Materials. The presence of any material, other than that provided for in this ordinance, about a joint or on any part of a plumbing system or on, or near the site of the work, shall be sufficient excuse for condemning such joint, part of the system, or the entire work.

If test or inspection discloses defective material, or unworkmanlike construction which does not conform to the requirements of this ordinance, or leakage, such defective materials, or unworkmanlike construction shall be condemned.

Condemned materials not yet installed shall be removed forthwith from the site of the work and construction already installed shall be removed within three days following the condemnation thereof or as the Plumbing Inspector may direct.

14.18 APPEAL BOARD

An Appeal Board shall be created consisting of six members to serve without compensation, of whom the Commissioner of Public Works shall be a member and shall act as Secretary. The Board shall elect its own Chairman. The members shall be appointed by the Mayor with the advice and consent of the Council. The members are appointed to

serve as follows: one member to serve one year, one member to serve two years, one member to serve three years, two members to serve four years, or until their successors are appointed. Said members of said board shall include two licensed plumbers, a registered Professional Engineer, a builder or superintendent of construction of not less than ten years' experience as such, and one member of said board shall be appointed as a layman representing the public at large. Such board shall meet upon notice of the Chairman within a reasonable time of a filing of an appeal. The board may establish reasonable rules and regulations as to the time of regular meetings and as to procedure before the board not inconsistent with the terms of this ordinance. Hearings on appeals shall be open to the public. Four members of the Appeal Board shall constitute a quorum. The appellant or his representative, any officer of the municipality and any other person whose interest may be affected by the matter on appeal shall be given an opportunity to be heard but no notice of the appeal shall be required to be given to anyone other than to the appellant and the Plumbing Inspector.

The concurring vote of four members shall be necessary for the reversal of the decision of the Plumbing Inspector, or any other decision or determination favorable to the appellant. The failure of such concurring vote shall be deemed to be a confirmation of the judgment of the Plumbing Inspector. Every action of the Board shall be by resolution, copies of which shall be certified to the Plumbing Inspector and the appellant. No member of the Board shall participate in any cases in which he is personally interested.

An appeal may be prosecuted by the owner of any building or structure of his duly authorized agent from any decision of the Plumbing Inspector and such appeal shall be perfected by filing a written notice of appeal which the Chairman of the Appeal Board, stating briefly the decision complained of and a request for a hearing of the same by the Appeal Board. It shall be one of the duties of the Appeal Board to periodically study and recommend amendments to this Plumbing Code as may be required due to changes in materials and practices.

14.19 ENACTMENT AND PENALTIES

14.19.1 **Conflicting Ordinances Repealed.** All ordinances or part of ordinances in conflict with this ordinance are hereby repealed.

14.19.2 **Ineffective Sections of Ordinance.** Each section of this ordinance and every part of each section is hereby declared to be an independent section and part of section and the holding of any section or part thereof to be void and ineffective for any cause shall not be deemed to affect any other section or part thereof.

14.19.3 **Revocation of Rights and Privileges.** The rights and privileges of a Licensed Plumber to work or perform as such in the City of Urbana shall become void in the City of Urbana when he shall refuse or neglect within a reasonable time after notification thereof to make such necessary corrections to plumbing work as shall have been ordered by the Plumbing Inspector, or if he shall permit the use of his name by a person or persons for the purpose of obtaining a permit to do plumbing work.

14.19.4 **Penalties for Violation.** Any person or persons who violate, neglect or refuse to comply with, or who resist or oppose the enforcement of any of the provisions of this ordinance, where no other penalty is provided, shall be fined not less than Twenty-five (\$25.00) Dollars or more than Two Hundred (\$200.00) Dollars for each offense, and every such person shall be deemed guilty of a separate offense for every day which such violation, neglect, or refusal shall continue, and any plumber who shall construct or install any plumbing work in violation of any of the provisions

of this Ordinance, and any builder, contractor, architect, or designer designing drawing, or issuing plans for or having charge of such plumbing work, or who shall permit it to be constructed or installed shall be liable to the penalties provided and imposed in this section. All fines shall be collected by the Plumbing Inspector and accounted for in the same manner as other fees.

14. 19.5 This ordinance shall take effect and be in force ten days after its publication.

14. 19.6 *Publication.* The City Clerk shall certify to the passage and approval of this Ordinance and cause the same to be published in pamphlet form.

Passed by the City Council of the City of Urbana, Illinois, this 2nd day of March, 1959.

Attested:

Approved:

BESS M. HOLMES
City Clerk

STANLEY B. WEAVER
Mayor

CITY CLERK'S CERTIFICATE

State of Illinois
Champaign County
City of Urbana

I, Bess M. Holmes, City Clerk of the City of Urbana, Illinois, do hereby certify that the above and foregoing ordinance, entitled "*An Ordinance providing for the materials, construction, alteration and inspection of all plumbing, in or in connection with any building in the City of Urbana, Illinois, and for the regulation and enforcement of all rules, regulations, and laws or ordinances pertaining thereto; and for the issuance of permits for the installation and/or repair and/or alteration of plumbing and the establishing and collection of fees therefor and for the protection of public health*" was passed and adopted by the City Council of said City, at a regular meeting thereof, on the 2nd day of March, A. D. 1959, and was duly signed and approved by the Mayor of said city on the 2nd day of March, A. D. 1959.

And I do further certify that the foregoing is a true and correct copy of the original ordinance, which was deposited and is on file in my office as said Clerk, and that the same is published and printed in book or pamphlet form under the direction and by authority of the City Council of said City.

In witness whereof, I have hereunto set my hand and affixed the corporate seal of said city this 3rd day of August, A. D. 1959.

(Corporate Seal)

BESS M. HOLMES, City Clerk

APPENDIX A

SIZING THE WATER SUPPLY SYSTEM

GENERAL

Proper design of the water-distributing system in a building is necessary in order that the various fixtures may function properly. The amount of either hot or cold water used in any building is variable, depending on the type of structure, usage, occupancy, and time of day. It is necessary to provide piping, water heating, and storage facilities of sufficient capacity to meet the peak demand without wasteful excess in either piping or equivalent cost.

For additional information on this subject the reader is referred to "Water Supply Piping for Plumbing Systems" by F. M. Dawson and A. A. Kalinske - "Technical Bulletin No. 3 of the National Association of Master Plumbers; "Water Distributing Systems for Buildings" by Roy B. Hunter; Report BMS 79 of the National Bureau of Standards, and Plumbing Manual - Report BMS 66 also published by the National Bureau of Standards.

This appendix gives a suggested procedure for sizing the water-supply system prepared by F. M. Dawson.

A.1 PRELIMINARY INFORMATION

A.1.1 Available Pressure. Obtain the necessary information regarding the minimum daily service pressure in the area where the building is to be located.

A.1.2 Piping Material. Obtain all available local information regarding the use of different kinds of pipe with respect both to durability and to decrease in capacity with length of service in the particular water supply.

A.2 ESTIMATE OF DEMAND LOAD AND PIPE CAPACITY

A.2.1 Rate of Flow. One of the important items that must be determined before any part of the water-piping system can be sized is the probable rate of flow in any particular reach of piping. The rate of flow in the service, line, risers, and main branches, however, will rarely be equal to the sum of the rates of flow of all connected fixtures. In fact, the probability of every fixture in a large group being used at the same time is so remote that it would be very poor engineering to design the piping large enough to take care of such simultaneous flow.

A.2.2 Simultaneous Use. The demand load in building water-supply systems cannot be determined exactly and is not readily standardized. The two main problems to be considered are: (1) the satisfactory supply of water for a given fixture and (2) the number of fixtures which may be assumed to be in use at the same time.

A.2.3 Daily Demand. The minimum flow that will be satisfactory to the consumer depends greatly on the consumer, his standard of living, his professional needs, size of family, garden requirements, and similar factors. Depending on those factors, per capita water consumption for domestic use usually varies between 20 and 80 gallons per day.

A. 2. 4 Type of Building. Experience indicates that the type of dwelling has considerable influence on the water consumption.

A. 2. 5 Apartment Buildings. In apartment houses the per capita daily water consumption is generally higher than to single family houses. This is due to the central watering system which is not conducive to the saving of water and to long hot-water lines which result in high heat losses, thus in the wasting of the cooled water. In designing water supply systems for apartment houses, a daily per capita water consumption of 50 gallons may be considered a safe design fixture.

A. 2. 6 Dwellings. Although a considerable number of housing projects have been developed across the nation, conclusive water-consumption data have not been gathered as yet. Nevertheless, it seems that the daily per capita water consumption in housing projects falls in between the consumption in apartment houses and single dwellings at the same geographical location. In general, a daily per capita water consumption of 40 gallons can be used as a safe design figure for housing projects.

A. 3 FLOW AND PRESSURE REQUIRED

A. 3. 1 Table A. 3. 2 gives the rate of flow desirable for many common types of fixtures, and the average pressure necessary to give this rate of flow. The pressure necessarily varies with fixture design; with some, a much greater pressure is necessary to give the same rate of flow than with others.

Table A. 3. 2 RATE OF FLOW AND REQUIRED PRESSURE DURING FLOW FOR DIFFERENT FIXTURES

Fixture	Flow Pressure (a) psi	Flow rate gpm
Ordinary basin faucet	8	3.0
Self-closing basin faucet	12	2.5
Sink Faucet - 3/8 in.	10	4.5
Sink Faucet - 1/2 in.	5	4.5
Bathtub faucet	5	6.0
Laundry tub cock - 1/2 in.	5	5.0
Shower	12	5.0
Ball-cock for closet	15	3.0
Flush valve for closet	10-20	15-40 (b)
Flush valve for urinal	15	15.0
Garden hose, 50 ft. and sill cock	30	5.0

(a) Flow pressure is the pressure in the pipe at the entrance to the particular fixture considered.

(b) Wide range due to variation in design and type of flush valve closets.

A. 3. 3 In estimating the load, the rate of flow is frequently computed in fixture units.

A. 3. 4 Table A. 3. 5 gives the demand weight in terms of fixture units for different plumbing fixtures under several conditions of service.

**Table A.3.5 DEMAND WEIGHT OF FIXTURES IN
FIXTURE UNITS (a)**

Fixture or Group (b)	Occupancy	Type of Supply Control	Weight in Fixture Units (c)
Water closet	Public	Flush valve	10
Water closet	Public	Flush tank	5
Pedestal urinal	Public	Flush valve	10
Stall or wall urinal	Public	Flush valve	5
Stall or wall urinal	Public	Flush tank	3
Lavatory	Public	Faucet	2
Bath tub	Public	Faucet	4
Shower head	Public	Mixing valve	4
Service sink	Office, etc.	Faucet	3
Kitchen sink	Hotel or restaurant	Faucet	4
Water closet	Private	Flush valve	6
Water closet	Private	Flush tank	3
Lavatory	Private	Faucet	1
Bath tub	Private	Faucet	2
Shower head	Private	Mixing valve	2
Bathroom group	Private	Flush valve for closet	8
Bathroom group	Private	Flush tank for closet	6
Separate shower	Private	Mixing valve	2
Kitchen sink	Private	Faucet	2
Laundry trays (1-3)	Private	Faucet	3
Combination fixture	Private	Faucet	3

(a) For supply outlets likely to impose continuous demands estimate continuous supply separately and add to total demand for fixtures.

(b) For fixtures not listed, weights may be assumed by comparing the fixture to a listed one using water in similar quantities and at similar rates.

(c) The given weights are for total demand. For fixtures with both hot and cold water supplies, the weights for maximum separate demands may be taken as three-fourths the listed demand for supply.

A.3.6 Chart No. 1 gives the estimated demand in gallons per minute corresponding to any total number of fixture units. Chart No. 2 shows an enlargement of Chart No. 1 for a range up to 250 fixture units.

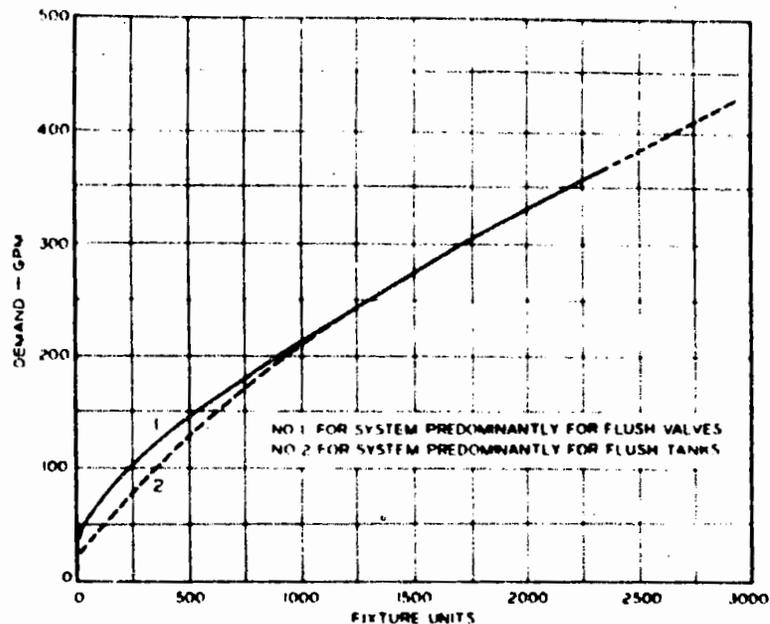


Chart 1. ESTIMATE CURVES FOR DEMAND LOAD

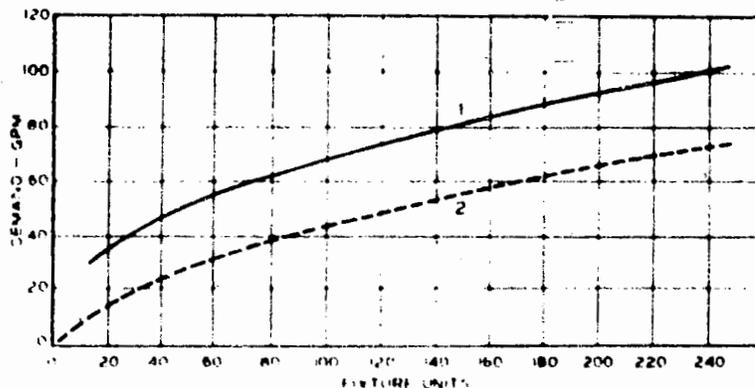


Chart 2. ENLARGED SCALE DEMAND LOAD

A. 3. 7 The estimated demand load for fixtures used intermittently on any supply pipe will be obtained by multiplying the number of each kind of fixture supplied through that pipe by its weight from Table A. 3. 5, adding the products, and then referring to the appropriate curve of Charts Nos. 1 or 2 to find the demand corresponding to the total fixture units. In using this method it should be noted that the demand for fixture or supply outlets other than those listed in the table of fixture units is not yet included in the estimate. The demands for outlets (such as hose connections, air conditioning apparatus, etc.) which are likely to impose continuous demand during times of heavy use of the weighted fixtures, should be estimated separately and added to the demand for fixtures used intermittently, in order to estimate the total demand.

A.4 SIZING COLD-WATER-SUPPLY PIPING

A.4.1 Pressure Loss. As water flows through a pipe, the pressure continuously decreases along the pipe, due to loss of energy from friction. The problem is then one of ascertaining the minimum pressure in the street main, and the minimum pressure required for the operation of the topmost fixture. (A pressure of 15 psi is ample for flush valves, but reference should be made to the manufacturers' requirements. A minimum of 8 psi should be allowed for other fixtures.) The pressure differential thus obtained will be available for overcoming pressure losses in the distributing system and in overcoming the difference in elevation between the water main and the highest fixture.

A.4.2 Pressure Loss by Elevation. The pressure loss, in pounds per square inch, caused by the difference in elevation between the street main and the highest fixture, may be obtained by multiplying the difference in elevation in feet by the conversion factor 0.43.

A.4.3 Water Flow. When water flows through a pipe, friction occurs as the result of the sliding of water particles past one another. If the pipe wall is rough, the roughness projections cause additional friction, owing to the development of increased turbulence in the flowing water. As the water flows along a smooth pipe, the pressure decreases as a result of a dissipation of energy arising from the internal friction set up by viscosity of the water. This loss in energy is shown by the loss of pressure. The pressure is proportioned to the length of straight uniform pipes, and varies greatly with flow velocity, pipe diameter, and roughness of pipe.

A.5 PIPE CLASSIFICATION

A.5.1 On the basis of inside surface conditions, pipes may be classified as smooth, fairly rough, and rough, as follows:

A.5.2 Smooth Pipe. The inside pipe surface shows no perceptible roughness. Pipes made of copper, brass, plastic, or lead may be classified as smooth.

A.5.3 Fairly Rough. All ordinary pipes, such as wrought iron, galvanized iron, steel and cast-iron, after a few years of usage, may be called fairly rough.

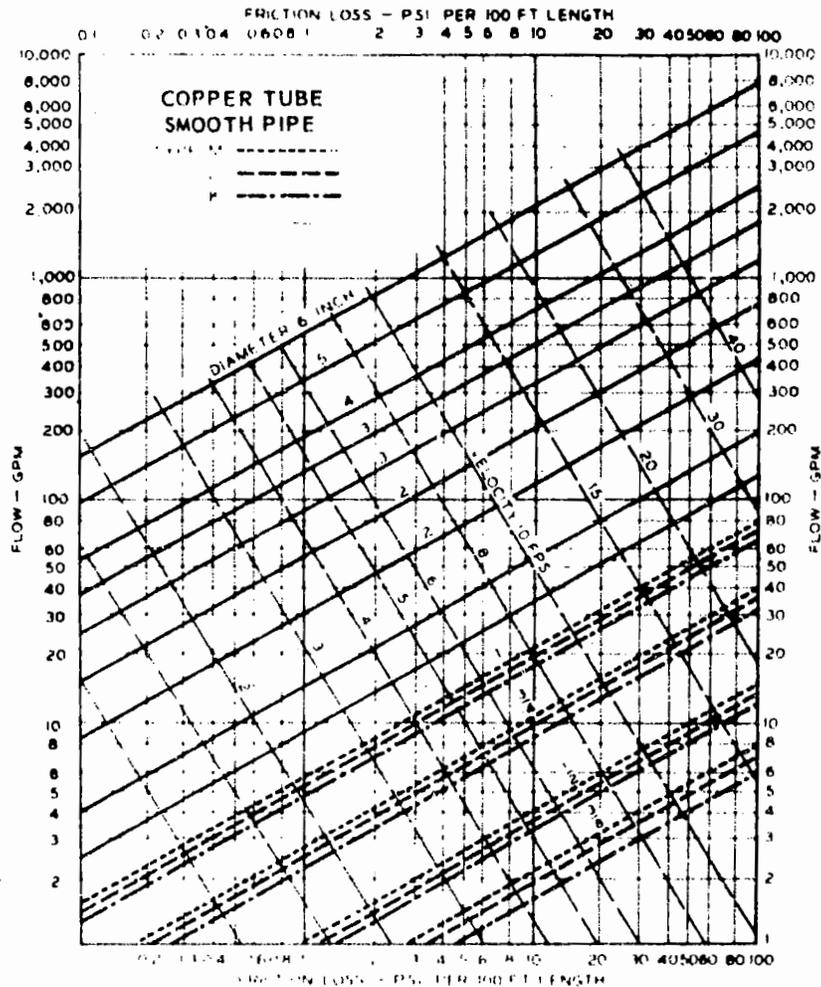
A.5.4 Rough. Pipes that have deteriorated fairly rapidly for some 10 or 15 years after being laid, are classified as rough.

A.6 FLOW CHARTS

A.6.1 Charts 3, 4 and 5 give the pipe-friction losses corresponding to these three types of pipes for various nominal diameters.

Example 1--A 2-inch fairly rough pipe supplies 100 gpm of water. Find the friction loss in head if the pipe length is 200 ft.

Solution--Enter Chart 4 at 100 gpm and move along this line until it intersects the 2-inch diameter line. From this intersection point, move vertically down and read 4.5 psi friction loss per 100 ft. of pipe length. Then the total friction loss will be $2 \times 4.5 = 9$ psi.



A.7 FITTINGS, VALVES, AND METERS

A.7.1 The pressure losses in the distributing system will consist of the pressure losses in the piping itself, plus the pressure losses in the pipe fittings, valves, and the water meter. Estimated pressure losses for disc-type meters for various rates of flow are given in Chart No. 6.

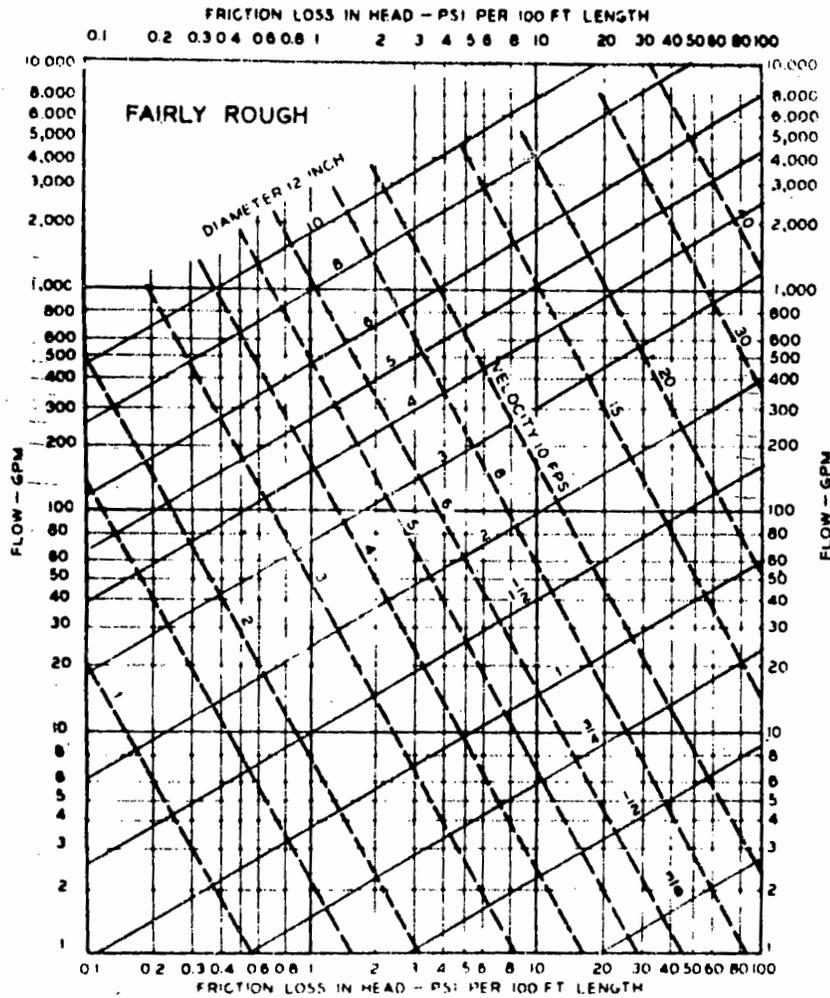


Chart 4

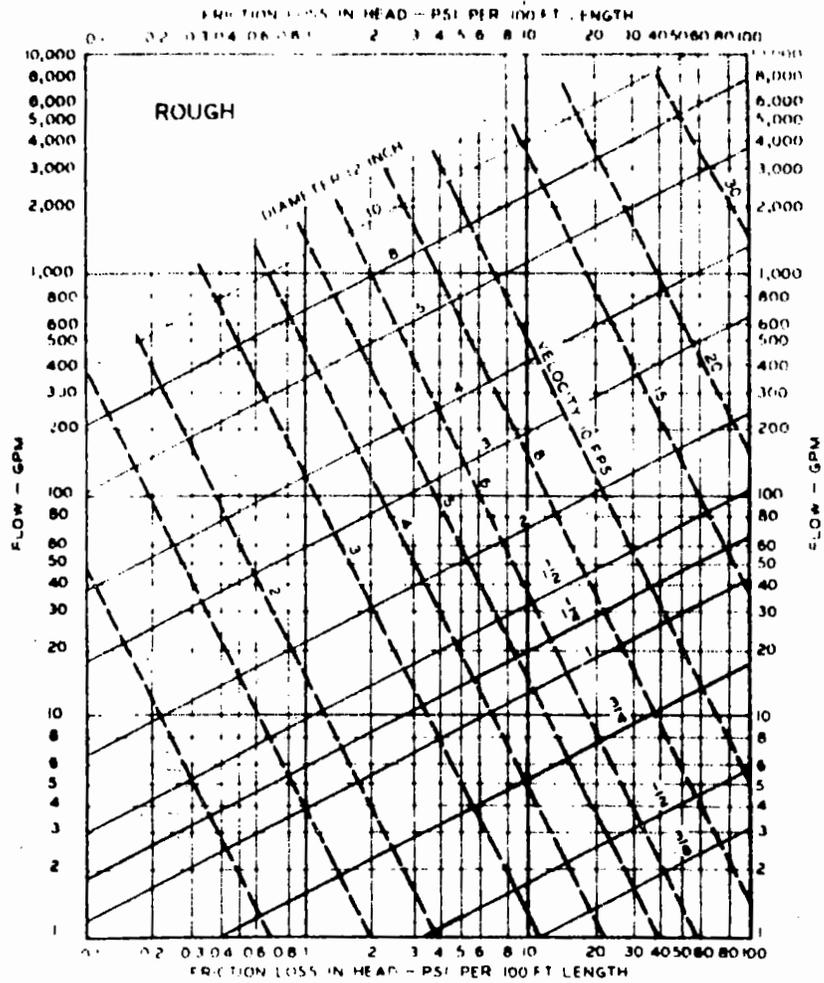


Chart 5

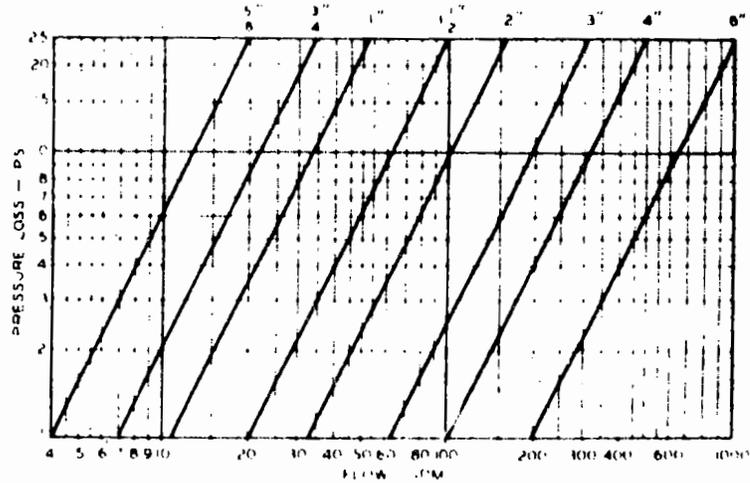


Chart 6. PRESSURE LOSSES IN DISK-TYPE WATER METERS

A.7.2 Flow limits for disc-type meters, which may be regarded as the limits of recommended ranges in capacities, are given in Table A.7.3. For information on other types of meters, the manufacturer should be consulted.

Table A.7.3 PERFORMANCE REQUIREMENTS OF WATER METERS (a)

Pipe Size In.	Normal Test-Flow Limits Gpm	Minimum Test Flow Hours
1/8	1 to 20	1/2
1/4	2 to 34	1/2
1	3 to 53	1/2
1 1/2	5 to 100	1 1/2
2	8 to 160	2
3	16 to 315	4
4	28 to 500	7
6	48 to 1,000	12

(a) American Water Works Association Standards.

A.7.4 Registration. The registration on the meter dial shall indicate the quantity recorded to be not less than 98 per cent nor more than 102 per cent of the water actually passed through the meter while it is being tested at rates of flow within the specified limits (see Table A.7.3) under normal test-flow limits. There shall be not less than 90 per cent of the actual flow recorded when a test is made at the rate of flow set forth under minimum test flow.

A.7.5 Chart 7 shows the variation of pressure loss with rate of flow for various types of faucets and cocks, based on experimental data obtained at the State University of Iowa.

A.7.6 The loss of pressure through any fitting or valve can be expressed in pounds per square inch for any given rate of flow. Experience has shown, however, that the simplest method of expressing losses in fittings and valves is to use the concept of an equivalent length of straight pipe. It has been found, for example, that a 1-inch, 90 degree elbow, introduces a loss which is equivalent to

- A 1/2 in. laundry bib (old style)
- B Laundry compression faucet
- C, 1/2 in. compression sink faucet (manufacturer 1)
- C₂ 1/2 in. compression sink faucet (manufacturer 2)
- D Comb. comp. bathtub faucet (both open)
- E Comb. compression sink faucet
- F Basin faucet
- G Spring self-closing faucet
- H Slow self-closing basin faucet

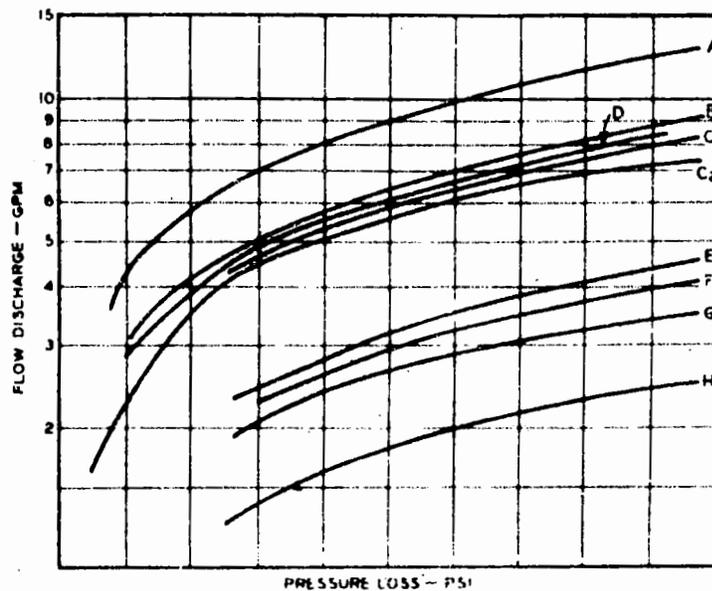


Chart 7

2.2-feet of straight 1-inch pipe. Therefore, for each 1-inch, 90-degree elbow, 2.2-feet of 1-inch pipe are added to the total length of 1-inch pipe.

A. 7. 7 Estimated pressure losses for pipe fittings and valves in terms of equivalent pipe lengths are shown in Table A. 7. 8.

A. 7. 9 Table A. 7. 10 lists the equivalent lengths for various special lengths for various special types of apparatus and fittings. The loss in water meters varies considerably with the design even in meters of the same nominal size. The values given in Table A. 7. 10 are ample for the well known meters now on the market.

Example 2--Assume a minimum street-main pressure of 55 psi, a height of topmost fixture above street main of 50 ft.; a developed pipe length from water main to highest fixture of 100 ft.; a total load on the system of 50 fixture units; and that the water closets are flush-valve operated. Find the required size of supply main.

Solution--From Chart No. 2 the estimated peak demand is found to be 51 gpm. From Table A. 7. 3 it is evident that several sizes of meters would adequately measure this flow. For a trial computation choose the 1½-in. meter. From Chart No. 6 the pressure drop through a 1½-inch disc-type meter for a flow of 51 gpm is found to be 6.5 psi.

Then the pressure drop available for overcoming friction in pipes and fittings is $55 - (15 + 50 \text{ times } 0.43 + 6.5) = 12 \text{ psi.}$

At this point it is necessary to make some estimate of the equivalent pipe length of the fittings on the direct line from the street main to the highest fixture. The exact equivalent length of the various fittings cannot now be determined since the pipe sizes

Table A. 7. 8 ALLOWANCE IN EQUIVALENT LENGTH OF PIPE FOR FRICTION LOSS IN VALVES AND THREADED FITTINGS

Diameter of Fitting	90 Deg Standard Ell	45 Deg Standard Ell	90 Deg Side Tee	Coupling or Straight Run of Tee	Gate Valve	Globe Valve	Angle Valve
Inches	Feet	Feet	Feet	Feet	Feet	Feet	Feet
3/8	1	0.6	1.5	0.3	0.2	8	4
1/2	2	1.2	3	0.6	0.4	15	8
3/4	2.5	1.5	4	0.8	0.5	20	12
1	3	1.8	5	0.9	0.6	25	15
1 1/4	4	2.4	6	1.2	0.8	35	18
1 1/2	5	3	7	1.5	1.0	45	22
2	7	4	10	2	1.3	55	28
2 1/2	8	5	12	2.5	1.6	65	34
3	10	6	15	3	2	80	40
3 1/2	12	7	18	3.6	2.4	100	50
4	14	8	21	4.0	2.7	125	55
5	17	10	25	5	3.3	140	70
6	20	12	30	6	4	165	80

Table A. 7. 10 EQUIVALENT LENGTHS OF IRON PIPE TO GIVE SAME LOSS AS SPECIAL FITTINGS OR APPARATUS

Fitting Apparatus	Nominal Diameter of Pipe			
	½ In.	¾ In.	1 In.	1 ¼ In.
	Feet	Feet	Feet	Feet
30-gal. Vertical hot-water tank, ½-in. pipe	4	17	56	.....
30-gal. Horizontal hot-water tank, ½-in. pipe	1.2	5	16	.....
Water meters (No valves included)				
5/8 in. with ½-in. connections	6.7	28	90	.....
5/8 in. with ¾-in. connections	4.8	20	64	.....
¾ in. with ½-in. connections	3.4	14	45	.....
1 in. with 1-in. connections	....	9	30	115
1 ¼ in. with 1-in. connections	....	4.4	14	54
Water softener	....	50-200		.....

of the building main, riser, and branch leading to the highest fixture are not known as yet, but a first approximation is necessary in order to make a tentative selection of pipe sizes. If the computed pipe sizes differ from those used in determining the equivalent length of pipe fittings, a recalculation will be necessary, using the computed pipe sizes for the fittings. For the purposes of this example assume that the total equivalent length of the pipe fitting is 50 feet. Then the permissible pressure loss per 100 ft. of equivalent pipe is $12 \text{ times}/(100 + 50) = 8 \text{ psi}$.

Assuming that the corrosive and caking properties of the water are such that Chart No. 4 for fairly rough pipe is applicable, a 2-in. building main will be adequate.

The sizing of the branches of the building-main, the risers, and fixture branches follow the principles outlined. For example, assume that one of the branches of the building-main carried the cold water supply for 3 water closets, 2 bathtubs, and 3 lavatories. Using the permissible pressure loss of 8 psi per 100 ft., the size of branch determined from Table A. 3. 5, and Charts 2 and 4 is found to be $1\frac{1}{2}$ in. Items entering the computation of pipe size are given in Table A. 7. 11.

Table A. 7. 11 COMPUTATION OF BRANCH SIZE IN EXAMPLE 2

Number and Kind of Fixtures	Fixture Units (from Table D. 3. 5 & Note C)	Den. and (from Chart 2)	Pipe Size (from Chart 4)
			Inches
3 flush valves	$3 \times 6 = 18$		
2 bathtubs	$\frac{1}{2}(2 \times 2) = 2$		
3 lavatories	$\frac{1}{4}(3 \times 1) = 2.25$		
Total	23.25	38	$1\frac{1}{2}$

Items entering the computation of pipe size are given in Table A. 7. 11.

A. 8 UP-FEED AND DOWN-FEED SYSTEMS

A. 8. 1 The principles involved in sizing either up-feed or down-feed systems are the same. The principal difference in procedure is that in the down-feed system, the difference in elevation between the house tank and the fixtures provides the pressure required to overcome pipe friction.

A. 8. 2 The water demand for hose bibbs or other large-demand fixtures taken off the building main is frequently the cause of inadequate water supply to the upper floor of a building. This condition may be prevented by sizing the distribution system so that the pressure drops from the street-main to all fixtures are the same. It is good practice to maintain the building main of ample size (not less than 1 in. where possible) until all branches to hose bibbs have been connected. Where the street-main pressure is excessive and a pressure reducing valve is used to prevent water hammer or excessive pressure at the fixtures, it is frequently desirable to connect hose bibbs ahead of the reducing valve.

A. 8. 3 The recommended procedure in sizing pipe systems may be outlined as follows:

- 1) Draw a sketch of the main lines, risers, and branches indicating the fixtures served. Indicate the rate of flow of each fixture.
- 2) Using Table A. 3. 5, compute the demand weights of the fixtures in fixture units.

3) Determine the total demand in fixture units and, using Chart 1 or Chart 2, find the expected demand in gallons per minute.

4) Determine the equivalent length of pipe in the main lines, risers, and branches. Since the sizes of the pipes are not known, the exact equivalent length for various fittings, etc., cannot be made. Add up the equivalent lengths starting at the street main and proceeding along the service line, main line in the building, and up the riser to the top fixture of the group served.

5) Determine the average minimum pressure in the street main and the minimum pressure required for the operation of the topmost fixture. This latter pressure should be 8 to 15 psi.

6) Calculate the approximate value of the average pressure drop per 100 feet of pipe in the equivalent length determined in Item 4

Do this according to the following rule:

$$p = (P - 0.43H - 10) \frac{100}{L}$$

where p = pressure in street-main in psi

H = height of highest fixture above street main, in feet

L = equivalent length determined in Item 4.

If the system is of the down-feed supply from a gravity tank, the height of water in the tank converted to pounds per square inch by multiplying 0.43 replaces the street-main pressure and the term 0.43 in the equation in Item 6 is added instead of subtracted in calculating the term p . In this case H will be the vertical distance of the fixture below the bottom of the tank.

7) From the expected rate of flow determined in Item 3 and the value of p calculated in Item 6, choose the sizes of pipe, from Charts 3, 4 or 5.

APPENDIX B

INDIVIDUAL SEWAGE-DISPOSAL SYSTEMS

Introduction

The most satisfactory method of disposing of sewage is by connection to a public sewerage system. Every effort should be made to secure public sewer extensions. When connection to a public sewer is not feasible and when a considerable number of residences are to be served, consideration should be given to the construction of a community sewer system and treatment plant. Specific information on this matter may be obtained from the Sanitary Water Board of Illinois.

B. 1 GENERAL

B. 1.1 Sanitary Water Board Law. Plans and specifications of sewerage works to serve 15 persons or more shall be submitted to the Sanitary Water Board of the State of Illinois for approval prior to commencing construction, in accordance with the Illinois Sanitary Water Board Law.

B. 1.2 Approval Required. Before any individual septic tank system is installed, approval must be obtained from the Administrative Authority. Septic tank systems shall not be approved where a public sewer is available. Such means of disposal shall be discontinued when public sewers are, or become available.

B. 1.3 Design. The design of the individual sewage-disposal system must take into consideration location with respect to wells or other sources of water supply, topography, water table, soil characteristics, area available, maximum occupancy of the building, and any special appliances which may discharge into the system.

B. 1.4 Type of System. The type of system to be installed shall be determined on the basis of location, soil permeability, and ground-water elevation.

B. 1.5 Sanitary Sewage. The system shall be designed to receive all sanitary sewage from the building, including laundry waste, sink drains, and floor or basement drains. Drainage from footings or roofs shall not enter the system.

B. 1.6 Complete Treatment Required. The system shall consist of a septic tank discharging into a subsurface disposal field constructed in accordance with the specifications set forth in Sections B. 4 through B. 9.

B. 1.7 Alternate Design. Where soil conditions are such that the system mentioned in B. 1. 4 cannot be expected to operate satisfactorily, approval of the alternate design outlined in Section B. 10, consisting of a septic tank discharging into a sand filter, shall be secured from the Administrative Authority with concurrence of the proper health authorities having jurisdiction.

B. 2 LOCATION

B. 2.1 Distances. Table B. 2. 2 provides for the minimum distances that shall be observed in locating the various components of the disposal system.

B. 2.2 LOCATION OF COMPONENTS OF SEWAGE DISPOSAL SYSTEM

Type of System	Distance				
	Well or Suction Line	Water Supply Line (Pressure)	Stream	Dwell-ing	Property Line
	Feet	Feet	Feet	Feet	Feet
Building Sewer	50	10	.....	.....	.....
Septic Tank	50	10	.....	.....	.....
Distribution Box	75	10	.....	.....	.....
Disposal Field	75	10	25	10	10
Sand Filter	75	10	25	10	10

NOTE: Distances listed above apply only in clay and loam soils. In gravel and sand formations safe distances will be variable being greater than for clay and loam soils. In areas where shallow or out-cropping creviced limestone is prevalent no safe distance can be established and the Administrative Authority or Health Authority having jurisdiction should be contacted.

B. 3 BUILDING SEWER

B. 3.1 Size. The sewer shall be of a minimum size to serve the connected fixtures as determined from Chapter 11 of the Code.

B. 3.2 Slope. The sewer shall have a minimum slope as determined in Chapter 11, Table 11.5.3, except that the slope of the sewer 10 feet preceding the tank connection shall not exceed 1/4 inch per foot.

B. 4 SEPTIC TANK

B. 4.1 Capacity. The septic tank shall have a minimum capacity in accordance with the provisions of the Table B. 4. 2.

Table B. 4. 2 MINIMUM CAPACITIES FOR SEPTIC TANKS SERVING AN INDIVIDUAL DWELLING

Number of Bedrooms	Maximum Number of Persons Served	Nominal Liquid Capacity of Tank	Recommended Inside Dimensions			
			Length	Width	Liquid Depth*	Total Depth
	Persons	Gallons	Ft. In.	Ft. In.	Ft. In.	Ft. In.
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 6
6	12	1, 100	8 6	3 6	4 6	5 6
7	14	1, 300	10 0	4 0	4 6	5 6
8	16	1, 500	10 0	4 6	4 6	5 6

*NOTE: The minimum allowable liquid depth shall be 4 feet.

B. 4. 3 Multiple Compartments. In tanks of more than one compartment, the inlet compartment shall have a capacity of not less than the required minimum capacity as specified in Table B. 4. 2.

B. 4. 4 Garbage Disposal. Where domestic garbage disposal units are installed or contemplated, the capacity of the septic tank shall be at least 50 per cent greater than the requirements given in Table B. 4. 2.

B. 4. 5 Length. Septic Tanks shall be at least twice as long as they are wide, except that cylindrical tanks are approved.

B. 4. 6 Depth. The minimum allowable liquid depth shall be 4 feet. The total depth shall be such that 12 inches of air space shall be provided between the bottom of the cover and the invert of the outlet pipe.

B. 4. 7 Construction. Septic tanks shall be constructed of corrosion-resistant materials and be of permanent construction. The cover of the tank shall be designed for a dead load of not less than 150 pounds per square foot and, if of concrete, should be reinforced and not less than 3 inches thick.

B. 4. 8 Manholes. The inlet compartment must be provided with at least one manhole. Other compartments may be provided with a manhole. Manholes shall be at least 20 inches square or 24 inches in diameter and provided with close-fitting covers. Where removable slab covers are provided, manholes are not required.

B. 4. 9 Baffles. If inlet and outlet baffles are used, they shall extend the full width of the tank and be located 6 inches from the end walls. Such baffles shall extend at least 10 inches above the flow line, but not closer than 1 inch to the under side of the cover. Inlet baffles shall extend 6-12 inches below the flow line and outlet baffles shall extend 12-18 inches below the flow line.

B. 4. 10 Pipe Inlet and Outlet. In lieu of baffles, submerged pipe inlets and outlets may be installed consisting of concrete, vitrified clay, or cast-iron sanitary tee's with a short section of pipe to the required depth as indicated in paragraph B. 4. 8.

B. 4. 11 Invert. The invert of the inlet pipe shall be located at least 3 inches above the invert of the outlet.

B. 4. 12 Dosing Chambers. Dosing chambers are not required in the case of individual disposal systems.

B. 5 DISTRIBUTION BOX

B. 5. 1 Required. A distribution box shall be provided to receive the effluent from the septic tank and assure equal distribution to each individual line of the disposal field.

B. 5. 2 Connection. The distribution box shall be connected to the septic tank by a tight sewer line and be located at the upper end of the disposal field.

B. 5. 3 Invert Level. The invert of the inlet pipe shall be located 6 inches above the bottom of the box. The invert of the outlets to each distribution line shall be located 4 inches above the bottom of the box and set at the same elevation.

B. 5. 4 Inspection. The sides of the box should extend to within a short distance of the ground surface to permit inspection. The box should be kept to the minimum size necessary to accommodate the inlet and outlets.

B. 6 ABSORPTION AREAS

B. 6. 1 Individual Residences. The absorption areas for individual residences shall be determined from Table B. 6. 2.

Table B. 6. 2 ABSORPTION AREAS FOR INDIVIDUAL RESIDENCES

Time Required for Water to Fall 1 Inch (Minutes)	Effective Absorption Area Required in Bottom of Disposal Trenches (Square Feet per Bedroom)
2 or less	50
3	60
4	70
5	80
10	100
15	130
30	180
60	240
Over 60	(1)

L Special design

Note: A minimum of 200 sq. ft. should be provided for each dwelling unit.

B.7 PROCEDURE TO BE FOLLOWED FOR PERCOLATION TEST

B.7.1 Size of Test Holes. Not less than two holes shall be tested, each to be 1 foot square and as deep as the proposed disposal trenches. The holes may be dug with an 8 inch post hole digger if desired.

B.7.2 Variations in Soil Condition. Fill each hole to a depth at least 6" and allow the water to seep away to saturate the soil. Allowance shall be made for variation in soil conditions at the time of the test from year-round average conditions. Where exceptional conditions are encountered, greater depths of water may be used or the test repeated.

B.7.3 Effective Absorption. Add an additional 6" of water to the hole and observe the time in minutes required for the water to seep away completely. Calculate the average time in minutes for the water to fall 1 inch. Average the results from the holes tested. The effective absorption area required shall then be determined from Table B.6.2.

B.7.4 Special Soils. Tests shall not be made on filled or frozen ground. Where fixture-soil formation is encountered, tests shall be made under the direction of the Administrative Authority or the health department having jurisdiction.

B.8 MINIMUM STANDARDS FOR DISPOSAL FIELD CONSTRUCTION

B.8.1 Disposal Field Construction. The minimum standards for disposal field construction shall be as given in Table B.8.2.

Table B.8.2 MINIMUM STANDARDS FOR DISPOSAL FIELD CONSTRUCTION

Disposal-field construction	Minimum Standard
Lines per field, minimum number.....	2
Individual lines, maximum length	100 ft.
Trench bottom, minimum width.....	18 in.
Trench bottom, maximum width.....	6 in.
Field tile, minimum diameter.....	6 in.
Field tile lines, maximum slope	6 in. in 100 ft.
Field trenches, minimum separation	6 ft.
Effective absorption area, minimum per (1) dwelling unit	200 sq. ft.

¹ See Table B.6.2

B.9 DISPOSAL TRENCHES

B.9.1 Disposal Trenches. Disposal trenches shall be designed and constructed on the basis of the required effective percolation area.

B.9.2 Filter Material. The bedding material shall cover the tile and extend the full width of the trench and shall be not less than 6 inches deep beneath the bottom of the tile. The bedding material may be washed gravel, crushed stone, slag, or clean bank-run gravel ranging in size from 1/2 to 2 1/2 inches. The bedding material shall

be covered by a 2-inch layer of pea gravel or straw to support the backfill as the laying of the tile drain proceeds.

B. 9. 3. Disposal Field. The size and minimum spacing requirements for disposal fields shall conform to those given in Table B. 9. 4.

Table B. 9. 4 SIZE AND SPACING FOR DISPOSAL FIELDS

Width of Trench at bottom	Recommended Depth of Trench	Spacing Tile Lines 1	Effective Ab- sorption Area per Lineal Foot of Trench
Inches	Inches	Feet	Square Feet
18	18 to 30	6.0	1.5
24	18 to 30	6.0	2.0
30	18 to 36	7.6	2.5
36	24 to 36	9.0	3.0

¹ A greater spacing is desirable where available area permits.

B. 9. 5 Absorption Lines. Absorption lines shall be constructed of farm tile laid with open joints. The tile sections shall be spaced not more than 1/4 inch, and the upper half of the joint shall be protected by asphalt-treated paper while the tile is being covered. Perforated clay tile or perforated bituminized-fiber pipe or asbestos cement pipe may be used, provided that sufficient openings are available for distribution of the effluent into the trench area.

B. 10 ALTERNATE DESIGN

NOTE: The following alternate design can be expected to function properly only if it is installed in exact accordance with the design criteria. The effective size and uniformity coefficient of the sand are of the utmost importance. Mortar sand and most natural (pit-run) sands are not satisfactory and their use will result in an early failure of the filter. If natural sand having the correct specifications is not available, graded sand should be used. No sand should be used in the absence of a sieve analysis report on the lot.

B. 10. 1 Sand Filters. In areas having dense soil with a percolation test time greater than 60 minutes which precludes the use of subsurface absorption lines, sand filters may be used. The filters shall be designed in accordance with figures 1, 2, and 3, and sub-paragraphs B. 10. 1 through B. 10. 8. The effluent shall not be discharged to street or highway ditches, but may be piped to any available natural drainage system.

B. 10. 1 Size. The size shall be such to provide 100 square feet of filter area per person served, or 200 square feet of filter area per bedroom. In systems serving a garbage grinder the size shall be increased to provide 250 square feet of filter area per bedroom. It is recommended that the size be based on a filter 20 feet square for a 2 bedroom home, with an additional 10 feet of length added for each additional bedroom.

B. 10. 2 Minimum Filtering Depth. The minimum filtering (sand) depth shall be 24 inches.

B. 10.3 Cover Material and Depth. The filter may be covered with a maximum depth of 12 inches of porous soil or medium to coarse gravel.

B. 10.4 Filter Media. The filter media (sand) shall have an effective size of 0.6 to 0.8 millimeters and a uniformity coefficient of less than 3.0. It shall be washed and free from clay or silt.

B. 10.5 Distribution and Collection Lines. The distribution and collection lines shall conform to the requirements for absorption lines as given in paragraph B. 9. 5. The distribution lines shall have a slope of 2 inches per 100 feet and shall be spaced 2 feet apart, center-to center. The collection lines shall have a slope of 6 inches per 100 feet and one collection line shall be provided for each 10 feet of width, or fraction thereof. The lower end of the distribution lines shall be vented as required in paragraph B. 10. 1. 7, and the upper end of the collection lines shall be completely plugged.

B. 10. 1. 6 Bedding Material. The bedding material for the distribution and collection lines shall be placed as shown in figures 2 and e, and shall consist of washed gravel, washed crushed stone, or slag. The coarse gravel may range in size from 1/4 to 1 1/2 inches in diameter. The collection lines shall be laid directly on the cut, without placing gravel beneath the line.

B. 10. 1. 7 Venting. Vents shall be placed on the downstream end of each of the distribution lines as shown in figures 1, 2 and three. The vents shall extend to, or slightly above the ground surface and the outlet shall be screened with 1/4 inch mesh screen.

B. 10. 1. 8 Drainage. Adequate drainage must be provided to prevent ponding of surface water above the filter, and adequate drainage must also be available to insure free drainage of the effluent from the filter.

B. 11 PROHIBITED TREATMENT METHODS

B. 11. 1 Seepage Pits. Seepage pits can function properly only under conditions favorable to the installation of absorption lines, or when certain geological conditions prevail. Owing to the superiority of design and operation of absorption lines under normal conditions and to the possible health hazard created by improperly designed seepage pits, the use of seepage pits for the disposal of septic tank effluent is prohibited.

B. 11. 1. 1 Exception. Seepage pits may be used in areas where such special conditions exist that their use is specifically approved by the Illinois State Department of Health.

B. 11. 2 Cesspools. The use of cesspools is prohibited.