

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

248 CMR 10.00: UNIFORM STATE PLUMBING CODE

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10.01: Scope and Jurisdiction

- (1) Scope. 248 CMR 10.00 governs the requirements for the installation, alteration, removal, replacement, repair, or construction of all plumbing.
- (2) Jurisdiction.
 - (a) Nothing in 248 CMR 10.00 shall be construed as applying to:
 - 1. refrigeration;
 - 2. heating;
 - 3. cooling;
 - 4. ventilation or fire sprinkler systems beyond the point where a direct connection is made with the potable water distribution system.
 - (b) Sanitary drains, storm water drains, hazardous waste drainage systems, dedicated systems, potable and non-potable water supply lines and other connections shall be subject to 248 CMR 10.00.

10.02: Basic Principles

Founding of Principles. 248 CMR 10.00 is founded upon basic principles which hold that public health, environmental sanitation, and safety can only be achieved through properly designed, acceptably installed, and adequately maintained plumbing systems.

- (1) Principle 1: All Occupied Premises Must Have Potable Water. All occupied premises must be provided with a supply of potable water. Such a water supply shall not be connected to unsafe or questionable water sources, nor shall it be subject to the hazards of backflow, backpressure, or back-siphonage.
- (2) Principle 2: Adequate Water Required. Plumbing fixtures, devices, and appurtenances must be supplied with water in enough volume and at pressures adequate to enable them to function properly under normal conditions of use.
- (3) Principle 3: Hot Water Required. Hot water must be supplied in all occupied premises for plumbing fixtures which utilize hot water for sanitary or hygienic purposes.

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(4) Principle 4: Water Conservation. Plumbing must be designed and installed to meet the water conservation requirements of 248 CMR 10.00 while using the minimum quantity of water necessary to function properly under normal conditions of use.

(5) Principle 5: Dangers of Explosion or Overheating. Devices and appliances for heating and storing water must be so designed and installed as to guard against dangers from explosion or overheating.

(6) Principle 6: Required Plumbing Fixtures.

(a) To meet the basic prerequisites of sanitation and personal hygiene each dwelling shall include the following:

1. At least one toilet;
2. At least one lavatory;
3. At least one kitchen style sink;
4. At least one bathtub or shower compartment or shower unit;
5. Laundry Facility Requirements. A washing machine connection that consists of a piping arrangement that includes a cold water supply, hot water supply, and a sufficient drain connection shall be provided in conformance with the following:
 - a. One and Two Family Dwelling. At least one washing machine connection in a common area accessible to all units.
 - b. Multiple Dwellings.
 - i. Non-elderly Housing. One washing machine connection for every ten dwelling units or fraction thereof that do not have a washing machine in the unit. For laundry requirements in dormitories, *see* 248 CMR 10.10(8)(a)2.c.
 - ii. Elderly Housing. In housing that is restricted to the elderly, at least one washing machine connection for every 20 dwelling units or fraction thereof that do not have a washing machine in the unit.
 - iii. The washing machine connection shall be located so that each occupant in a dwelling has access to a washing machine that may be affixed to the washing machine connection.
 - iv. The washing machine connection shall be located so that each occupant in a dwelling has access to a washing machine that may be affixed to the washing machine connection.

(b) All buildings and structures other than residential dwellings that are intended for occupancy shall be equipped with sufficient sanitary facilities as outlined in 248 CMR 10.00.

(c) Plumbing fixtures must be constructed of durable, smooth, nonabsorbent, and corrosion resistant material and must be free of concealed fouling surfaces.

(7) Principle 7: Protection of Drainage Systems. The plumbing drainage system must be installed, designed, arranged, constructed, and maintained to protect against fouling, deposit of solids, and stoppages. Additionally, adequate cleanouts must be incorporated to ensure the system may be readily cleaned.

(8) Principle 8: Durable Materials and Good Workmanship. The piping and other components of the plumbing system must be manufactured of durable material, free from defective workmanship, and designed and constructed to provide satisfactory service for its reasonable expected life.

(9) Principle 9: Need for Traps in the Plumbing Drainage System. Every fixture directly connected to the drainage system must be equipped with a liquid-seal trap. The drainage and associated vent system must be designed to provide adequate circulation of air in and throughout all piping. Trap seals shall be protected from the dangers of siphonage, leakage, aspiration, momentum, oscillation, back pressure, evaporation, and capillary action under conditions of normal ordinary use.

(10) Principle 10: Special Precautions for Oily and/or Flammable Liquid Wastes. Oily and/or flammable liquid wastes pose a public health and safety danger if not properly disposed of. Accordingly, all commercial buildings and garages which are used to store, or repair motor vehicles must have separators installed to ensure that all oil, grease, and other flammable wastes are discharged before emptying into the building drainage system or other point of disposal.

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- (11) Principle 11: Need for Venting in the Plumbing System. Vent terminals shall extend to the outer air above the roof line and be installed to prohibit the possibility of vent obstruction and the return of sewage gases into the building.
- (12) Principle 12: Plumbing Systems Must be Tested. The plumbing system must be subjected to such tests as mandated by 248 CMR 10.00 to effectively disclose all leaks and defects in the work or the materials.
- (13) Principle 13: Harmful Substances Must be Excluded from the Plumbing System. No substance that will cause or exacerbate clogs or stoppages in pipes, produce explosive mixtures, destroy the pipes or their joints or interfere unduly with the sewage disposal process shall enter the sanitary drainage system. Special wastewater discharges containing such hazards must be collected and disposed of or treated prior to entering the sanitary drainage system.
- (14) Principle 14: Need for Indirect Waste Piping in the Plumbing Drainage System. Indirect waste piping shall be provided to prevent backflow of sewage or the contamination of food, water, ice, sterile goods, and other similar products. When the potential of a backflow of sewage event is possible, the fixture, device, or appliance shall be connected indirectly with the building sanitary or storm drainage system.
- (15) Principle 15: Light and Ventilation. No toilets, urinals, bathtubs, or shower facilities shall be installed into a new or renovated room, space, or compartment that does not incorporate proper illumination and mechanical exhaust to the exterior of the building. This principle does not apply to the removal and replacement of existing fixtures.
- (16) Principle 16: Need for Disposal of Sewage. All occupied premises must be provided with a means of disposing of sewage. If toilets or other plumbing fixtures are to be installed in buildings where there is no sewer within a reasonable distance, suitable provisions shall be made for disposing of the sewage in compliance with 248 CMR and 310 CMR 15.00: *The State Environmental Code, Title 5: Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage.*
- (17) Principle 17: Prevent Sewer Flooding. Where a plumbing drainage system is subject to backflow of sewage from the public sewer system suitable provision shall be incorporated to prevent the potential of overflow into the building.
- (18) Principle 18: Proper Maintenance. Plumbing systems shall be maintained in a safe and serviceable condition from the standpoint of both mechanics and health.
- (19) Principle 19: Fixtures Shall Be Accessible. All plumbing fixtures shall be installed in a manner with respect to clearances for spacing and accessibility for their intended use, cleaning, maintenance, and replacement.
- (20) Principle 20: Structural Integrity. The performance of plumbing work shall not impact the structural integrity of building components. *See 780 CMR: The Massachusetts State Building Code* for licensing and other requirements governing such issues.
- (21) Principle 21: Protect Ground and Surface Water. All discharges to ground or surface water must meet all local, state, and federal water quality discharge standards.
- (22) Principle 22: Piping and Treatment of Hazardous Wastes. All waste discharge materials that may become detrimental to the health and welfare of the public, that enter the sanitary drainage system of any building shall be carried within hazardous waste piping systems. The hazardous waste shall be collected and disposed of or treated prior to entering the sanitary drainage system in accordance with the requirements of 248 CMR 10.00.
- (23) Principle 23: Need for Privacy. In a room that accommodates more than one toilet, or that incorporates a urinal and a toilet, each toilet shall be enclosed, and each urinal shall be side shielded for privacy.

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(24) Principle 24: Drinking Water Station. Drinking Water Stations shall be installed in safe, clean, and hazard-free areas. The installation of a drinking water station in a restroom that incorporates toilets or urinals is prohibited.

(25) Principle 25: Structures or Trailers for Temporary Use. Any trailer or other structure used for human shelter which is designed to be transportable, and which is not located on the same premises for more than 30 days in a calendar year are exempt from the material provisions of 248 CMR 10.06. Exception: Trailers for construction projects may remain on the premises for the duration of the project.

(26) Principle 26: Materials and Design. The materials, products, devices, methods, systems, design, and installation of all aspects of a plumbing system shall be in conformance with 248 CMR 3.00 through 10.00, including that all products used in any plumbing or gas fitting systems shall be Product Accepted by the Board.

(27) Principle 27: Emergency/Temporary Use. Failure to have sufficient plumbing fixtures, systems, and other appurtenances whose installation complies with 248 CMR 10.00 represents a significant danger to public health. Where a temporary use of a building or structure not complying with 248 CMR 10.00 is necessary due to an emergency or other hardship, said use shall only be considered safe and legal if approved by the Board and/or the Inspector acting pursuant to 248 CMR 10.05(19).

10.03: Definitions

For purposes of 248 CMR 10.00, the terms defined in 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth* have the meanings as defined in 248 CMR 10.03.

In addition, for the purposes of 248 CMR 10.00, the following terms shall have the meanings. No attempt is made to define ordinary words which are used in accordance with their established dictionary meaning except where it is necessary to define their meaning as used in 248 CMR 10.00 to avoid misunderstanding.

ABS. Acrylonitrile-Butadiene-Styrene.

Accessible. Having access thereto that may require the removal of an access panel, door, or similar obstruction.

Accessible (Readily). Direct access without the necessity of removing or moving any panel, door, lock or similar obstruction.

Air-break (Drainage System). A piping arrangement wherein a drain from a fixture, appliance, or device discharge indirectly into a fixture, receptacle, or interceptor at a point below the flood level rim of the receptacle.

Air Gap (Drainage System). The unobstructed vertical distance through the free atmosphere between the outlet of a waste pipe and the flood level rim of the receptacle into which the waste discharges. An air gap shall be at least twice the effective diameter of the drain served.

Air Gap (Water Distribution System). The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the related receptacle. An air gap shall be at least twice the effective opening of the potable water outlet.

Alkalinity. The measure of its capacity to neutralize acids. The quality or state of being alkaline. Containing more alkali than normal. Having a pH factor of more than seven. The opposite of acidity.

Anti-siphon Vacuum Breaker - Non-pressure Type (Back-siphonage Preventer). A device or means to prevent back-siphonage. Not to be used under continuous pressure.

Anti-siphon Vacuum Breaker - Pressure Type (Back-siphonage Preventer). A device or means to prevent back-siphonage. Designed to be used under continuous pressure.

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Anti-siphon Valve. A diaphragm type spring loaded device that prevents unwanted siphoning or over pumping of a chemical into a potable supply of water. Such device is constructed to sit tight on increasing vacuum, and its positive pressure opening point shall not be less than five PSIG.

Area Drain. A receptacle designed to collect surface or storm water from an open area.

Backflow. The flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than its intended source. Back-siphonage and back pressure are examples of backflows.

Backflow Connection. Any arrangement whereby backflow can occur.

Backflow Preventor. A device or means to prevent backflow.

Backflow Preventor (Reduced Pressure Zone Type). An assembly of differential valves and check valves including an automatically opened spillage port to the atmosphere.

Back-pressure. Pressure created by mechanical means or other means, causing water, liquids or other substances to flow, or move, in a reverse or opposite direction than intended.

Back-pressure Valve. A spring loaded one way check valve to prevent over pumping or unwanted siphoning of a chemical into a potable supply of water.

Back-siphonage. The flowing back of used, contaminated, or polluted water from a plumbing fixture, vessel or other sources into a water supply pipe due to a negative pressure in such pipe.

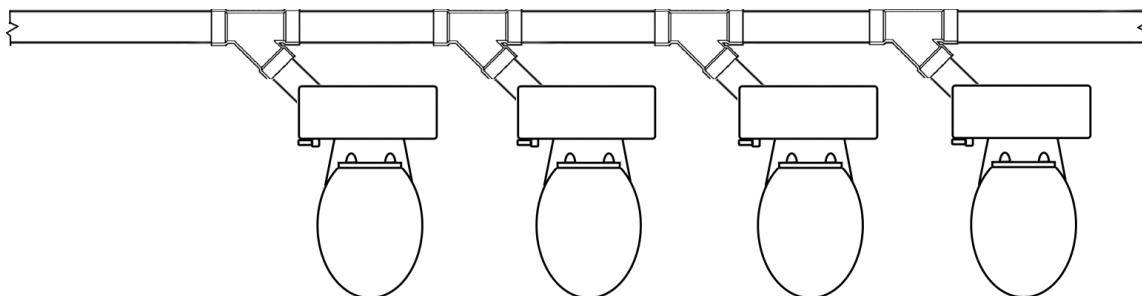
Barometric Loop. A vertical loop of pipe, rising to a height sufficient to prevent back-siphonage from occurring in the potable water supply pipe. (Approximately 35 feet, depending on the weight of the atmosphere.)

Bathroom (Residential). A room equipped with a bathtub or shower stall, toilet and a lavatory basin or any combination thereof.

Bathroom (Half-bath). A room equipped with a toilet and a lavatory basin.

Battery of Fixtures. Any group of two or more similar fixtures, that are adjacent, which discharge into a common horizontal waste or soil branch. *See 10.03: Example 1.*

10.03: Example 1 - Battery of Fixtures



Battery Waste & Vent System. *See Combination Waste & Vent System.*

Black Water. Wastewater containing fecal matter and other human waste that is flushed or discharged from toilets or urinals.

Boiler Blow-off. An outlet on a boiler to permit emptying or discharge of sediment.

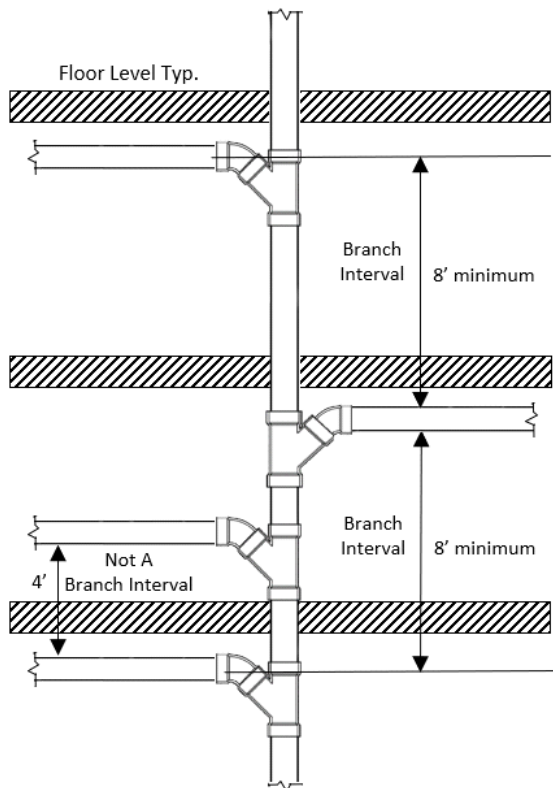
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Boiler Blow-off Tank. A vessel designed to receive the discharge from a boiler blow-off outlet, to cool the discharge to a temperature of 150° F or less and permits the discharge to flow safely to the drainage system.

Branch. Any part of a piping system other than a main, riser, or stack.

Branch Interval. A distance along a soil or waste stack corresponding in general to a story height, but not less than eight feet in vertical height, and wherein the horizontal branches from one floor or story of a building would be connected to the stack. See 10.03: Example 2.

10.03: Example 2 - Branch Intervals

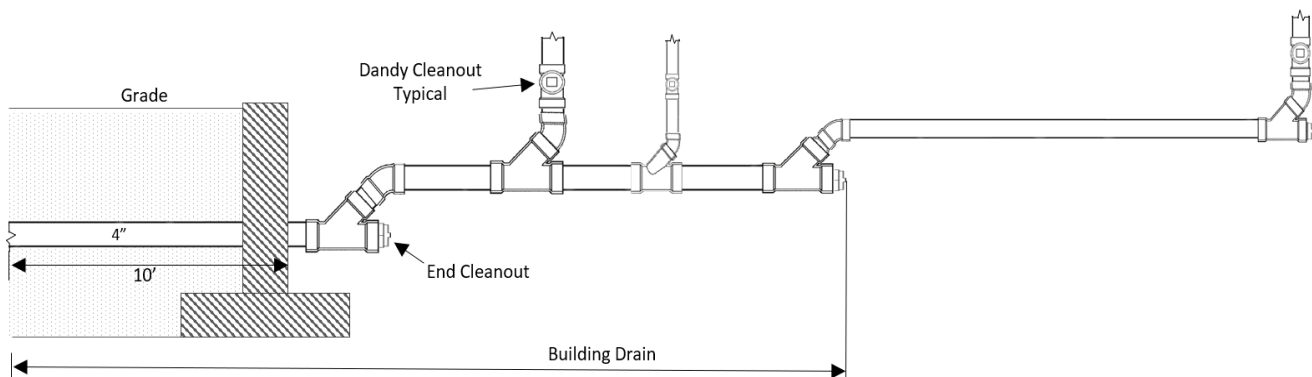


Branch Vent. A vent connecting one or more individual vents with a vent stack or stack vent.

Building. A structure used for the housing, shelter, enclosure, or support of persons, animals or property.

Building Drain. The lowest piping in a drainage system receiving discharge in fixture units from soil, waste and other drainage piping conveying that waste to a building sewer measured ten feet in developed length from the inside face of the foundation wall. The ten-foot section defined as the Building Drain shall be minimum four inch and sized in accordance with 248 CMR 10.15(6)(b). See 10.03: Example 3.

10.03: Example 3 - Building Drain



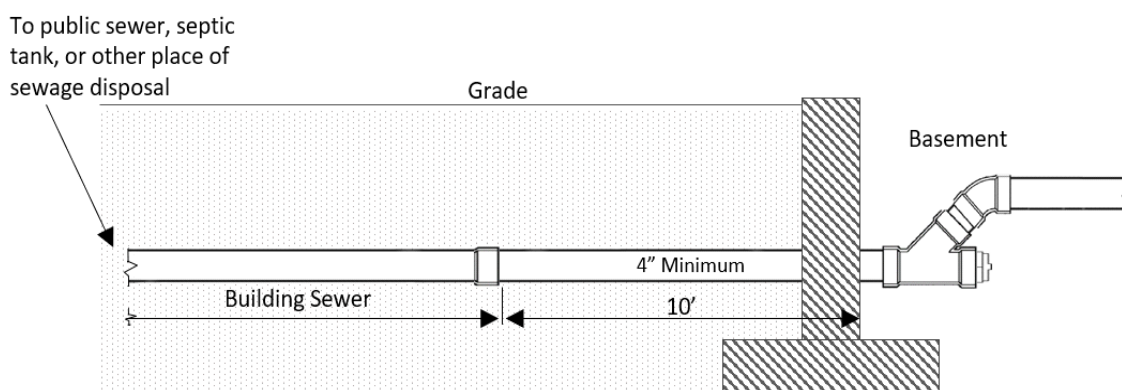
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Building Drain - Sanitary. A building drain which conveys the discharge of plumbing fixtures.

Building Drain - Storm. A building drain which conveys storm water waste or other clear water drainage.

Building Sewer. The pipe that begins at the end of the building drain and extends to a public sewer, septic tank, or other place of sewage disposal. *See 10.03: Example 4.*

10.03: Example 4 - Building Sewer



Building Sewer - Combined. A building sewer that conveys both sewage and storm water or other drainage.

Building Sewer - Sanitary. A building sewer that conveys the discharge of plumbing fixtures.

Building Sewer - Storm. A building sewer that conveys storm water waste or other clear water drainage except that it does not convey sewage.

Building Subdrain. The portion of a drainage system that cannot drain its discharge into a building sewer via the force of gravity.

Building Subdrain - Sanitary. The portion of a drainage system that cannot drain its sewage discharge into a building sewer *via* the force of gravity.

Building Subdrain - Storm. The portion of a drainage system that cannot drain its storm water waste, clear water discharge or other subsurface clear water discharge excluding sewage, into a building storm sewer *via* the force of gravity.

Circuit Vent. A branch vent that serves two or more floor-outlet fixtures that are battery wasted. Said vent extends from the top of the horizontal soil and/or waste branch in front of the last fixture waste and connects to a vent stack adjacent to the upstream end of the horizontal branch. A circuit vent begins where a drain from the fixture connects to the battery waste horizontally and extends to a point where it runs vertically to the venting system providing free movement of air above the flow line of the horizontal drain.

Clear Water Waste. Wastewater discharge from air conditioning and refrigeration equipment, condensate from steam equipment, steam and water boiler blowdowns, sprinkler system discharge and other similar types of waste containing only clear water.

Combination Fixture. A fixture that combines multiple compartments into one unit.

Combination Waste and Vent System. A specially designed system of waste piping embodying the horizontal wet venting of one or more plumbing fixtures or floor drains by means of a common waste and vent pipe. In such a system, the piping is adequately sized to provide free movement of air above the flow line of the drain. The complete system shall be compliant with 248 CMR 10.16(1)(a).

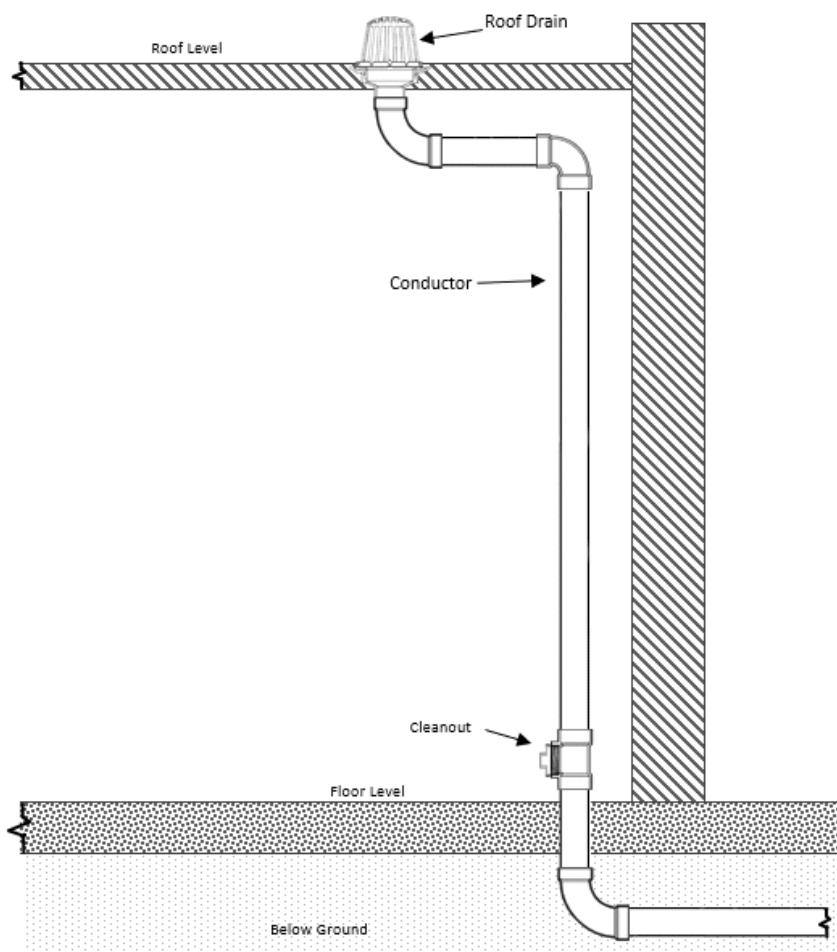
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Common Vent. A vertical vent that serves two fixtures and connects in compliance with 248 CMR 10.16: *Table 1*.

Conductor. A pipe that is inside a building and conveys storm water from the roof to a storm drain or combined building sewer/storm sewer. *See 10.03: Example 5.*

10.03: Example 5 - Roof Drain Conductor



C o r e

A rest room consisting of at least one toilet and one lavatory which may be utilized by more than one business, classification, or category within that building or structure.

Facilities.

CPVC. Chlorinated Polyvinyl-Chloride.

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

Critical Level. In the potable water supply piping, the minimum elevation that a backflow prevention device or anti-siphon vacuum breaker is installed, above the flood level rim of the fixture or receptacle it is to serve.

Cross Connection. Any actual or potential physical connection or arrangement between a pipe containing potable water from a public water system and any non-potable water supply, piping arrangement, or equipment, including, but not limited to waste pipe, soil pipe, sewer drain or other unapproved sources. (*See Back-flow and Back-siphonage.*)

Dead End. A branch on a potable water system which does not contain an accessible isolation valve located within five feet of the main capped for possible future use.

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Decontamination. The reduction or removal of microbial or hazardous chemical contamination from surfaces, liquids or spaces.

Dedicated Systems. Specialized plumbing systems which are located within a property line, but not necessarily within a Building, that are utilized for storing, treating, removing, or recycling water and waste products. Examples of dedicated systems include, but are not limited to:

- (a) Dedicated Acid Waste - Special Wastewater Discharge Systems;
- (b) Dedicated Gasoline, Oil and Sand Systems;
- (c) Dedicated Grease Systems;
- (d) Dedicated Water Recycling Systems;
- (e) Dedicated Class V Well Systems.

Developed Length. The length of a pipeline as measured along the center line of the pipe or fittings.

Double Offset. Two changes of direction that are or have been installed in succession or series in a continuous pipe.

Domestic Sewage. The waterborne wastes derived from ordinary living processes.

Drain. A horizontal pipe that carries wastewater or waterborne waste in a drainage system.

Drainage System. Includes all the piping contained within a public or private premise that conveys sewage, rainwater, or other liquid wastes to an appropriate point of disposal. It does not include the mains of a public sewer system or private or public sewage treatment or disposal plant.

Drainage System - Building Gravity. A drainage system that drains *via* the force of gravity into a building sewer.

Drinking Fountain. For the purposes of 248 CMR 10.00, Drinking Fountain shall be either Drinking Water Station - With Drain or Drinking Water Station - Without Drain.

Drinking Water Station - With Drain. A device equipped with a nozzle that when activated provides a stream of drinking water for either direct consumption or to allow filling of bottles. Said device is connected to the water distribution system, may chill, and/or filter the water, and is connected to the sanitary drainage system.

Drinking Water Station - Without Drain. A device equipped with a nozzle that when activated provides a stream of drinking water for either direct consumption or to allow filling of bottles. Said device is connected to the water distribution system, may chill, and/or filter the water, and is not connected to the sanitary drainage system, though rough plumbing has been added to facilitate a future connection.

Durham System. Soil or waste systems where all piping is threaded pipe that uses recessed drainage fittings to correspond to the types of piping.

Dwelling - Single. A room or group of rooms, forming a single unit that is an independent building enclosed within its own exterior walls, roof, and foundation, with facilities which are used, or intended to be used, for sleeping, living, cooking, and eating; and where both the sewer connection and water supply are within the building's own premise and is separate from and completely independent of any other dwelling.

Dwelling - Multiple. Three or more single dwellings that are not independent buildings, sharing exterior walls, roof, and foundation and where a common sewer connection and water supply are within the premise.

Dwelling - Two Family. Two single dwellings that are not independent buildings, that share a common exterior wall, a roof, and a foundation and a where a common water supply and sewer connection are contained within its own premises.

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DWV. Drain, Waste and Vent.

Effective Opening. The minimum cross-sectional area at the point of water supply discharge, measured or expressed in terms of:

- (a) if the opening is circular as the diameter of a circle; or
- (b) if the opening is not circular, as the diameter of a circle having the equivalent cross-sectional area of the opening.

Fixture (Plumbing Fixture). Installed receptacles, devices or appliances that are either supplied with water and/or receive and/or discharge liquids, or liquid-borne wastes, or both, with or without discharge into the drainage system with which they may be directly or indirectly connect.

Fixture Branch. A pipe connecting several fixtures.

Fixture Drain. A drain connected to the trap of one fixture.

Fixture Connector. The flexible connector made of copper, copper alloy or stainless steel used to connect the fixture shut-off valve to the individual fixture or appliance.

Fixture Unit. One cubic foot of water drained in a 1¼ inch pipe over a period of one minute. One cubic foot of water is equal to 7.5 gallons.

Flood Level Rim. The edge of a receptacle from which water overflows.

Flooded. When the liquid in a fixture or receptacle rises to the flood level rim.

Flow Pressure (Residual Pressure). The pressure in a water supply pipe as measured at the faucet or water outlet when the faucet or water outlet is wide open and flowing.

Flushometer Valve. A device used for flushing purposes that discharges a predetermined quantity of water into fixtures and where the device is closed by direct water pressure.

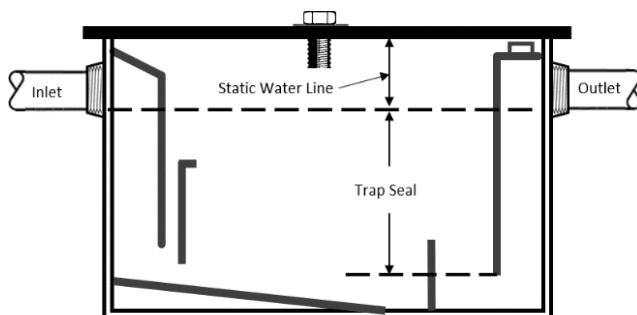
Grade. The fall (slope) of a line of pipe with reference to a horizontal plane. In drainage it is usually expressed as the fall in a fraction of an inch per foot length of pipe.

Graywater. Used water out-flowing from a clothes-washer, shower, bathtub, or bathroom sink and reused on the same site.

GPM. Gallons Per Minute.

Grease Interceptor (Gravity). A large interceptor, (usually installed outside underground) because it requires an extended time for grease separation (30 minutes or more). The separation is simply due to the specific gravity difference between FOG (fats, oils, and grease) and water. See 10.03: Example 6.

10.03: Example 6 - Gravity Type Grease Interceptor



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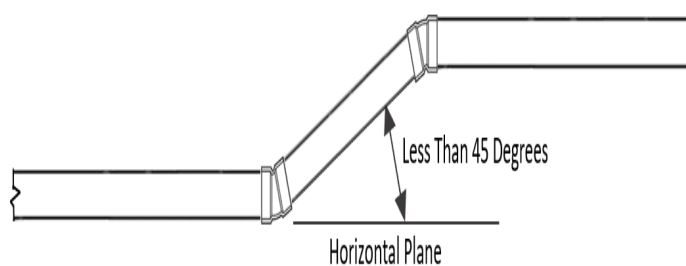
Grease Interceptor (Hydro-mechanical). A smaller interceptor, (normally installed inside a building) which is compact in size because grease separation occurs continuously due to several simultaneous actions; a hydraulic flow action, air entrainment and the difference in specific gravity between water and FOG (fats, oils and grease).

Hangers. (See Supports).

Horizontal Branch Drain. A drain branch pipe that extends laterally from a soil or waste stack or a building drain, that may or may not have vertical sections or branches, that receives the discharge from one or more fixture drains and that conducts the discharge to the soil or waste stack or to the building drain.

Horizontal Pipe. Any pipe or fitting that makes an angle of less than 45° in reference to a horizontal plane. See 10.03: Example 7.

10.03: Example 7 - Horizontal Pipe



Hot Water. Water at a temperature of at least 120°F.

Individual Sewage Disposal System. A system for disposal or treatment of domestic sewage by means of a septic tank or sewage treatment plant wherein the system is designed for use apart from a public sewer and serves a single establishment or building where a public sewer is not available.

Indirect Waste Pipe. A waste pipe that does not connect directly with a drainage system, but discharges into a drainage system through an air break or air gap into a properly wasted and vented trap, fixture, receptacle or interceptor.

Individual Vent. A pipe installed to vent a fixture drain. It connects with the vent system above the fixture served or terminates at a point above the roof level.

Individual Water Supply. A water supply, other than a public water supply, that serves one or more buildings, dwellings or structures.

Industrial Waste Water. Water that has been contaminated with by-products of industrial manufacturing processes.

Industrial Wastes. Liquid wastes that result from the processes employed in industrial and commercial establishments.

Insanitary. Contrary to sanitary principles; injurious to health.

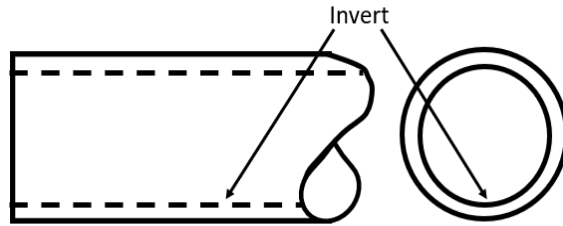
Interceptor. A device designed and installed to separate and retain for removal, by automatic or manual (passive) means deleterious, hazardous, or undesirable matter from normal wastes and permits normal sewage or liquid wastes to discharge into the drainage system by gravity.

Installed. An altered, changed, or new installation.

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Invert. The lowest point inside a pipe upon which water can flow. *See 10.03: Example 8.*

10.03: Example 8 - Invert of a Pipe

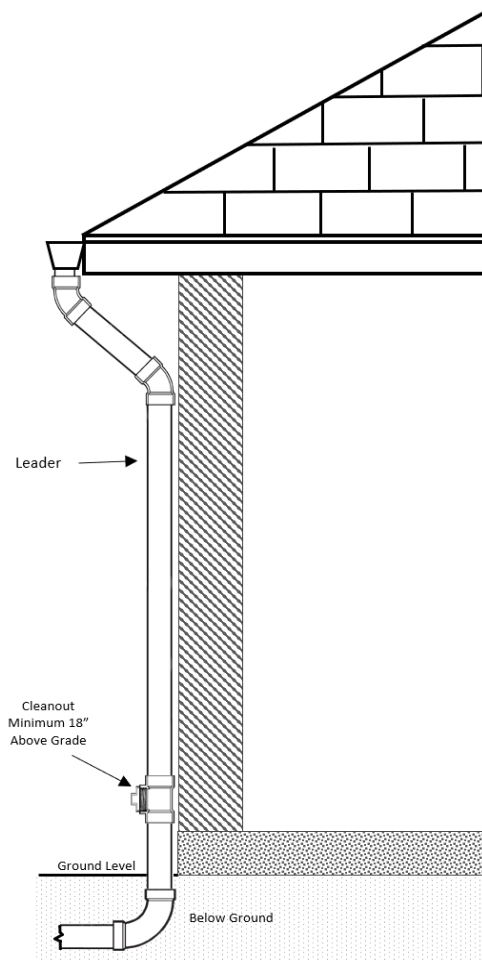


Irrigation System. A system of water distribution piping used to wet or moisten the landscape.

Leaching Well or Pit. A pit or receptacle having porous walls that permits the contents to seep into the ground.

Leader. An exterior drainage pipe for conveying storm water from roof or gutter drains and discharges to a storm water waste system. *See 248 CMR 10.03: Example 9. See 248 CMR 10.03: Plumbing for Jurisdiction.*

10.03: Example 9 - Storm Water Leader



Liquid Waste. Discharge from any fixture, appliance, area or appurtenance that does not contain human or animal waste matter suspended in a solution.

Licensee. The holder of a current journeyman or master plumbing license issued by the Board.

Load Factor. The percentage of the total connected fixture unit flow 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.

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Loop Vent. A branch vent that serves two or more floor-outlet fixtures that are battery wasted. The loop vent extends from the top of the horizontal soil and/or waste branch in front of the last fixture waste and connects to a vent stack or stack vent that is adjacent to the down-stream end of the horizontal branch as required in 248 CMR 10.16. A loop vent begins where a drain from the fixture connects to the battery waste horizontally and extends to a point where it runs vertically to the venting system providing free movement of air above the flow line of the horizontal drain.

Main. The principal pipe artery to which branches may be connected.

Massachusetts Professional Engineer. A person who is licensed or otherwise authorized to practice in the engineering profession as defined by the statutory and regulatory requirements of the Commonwealth.

Materials. All piping, tubing and fittings, drains and receptacles, interceptors and protectors, hangers and supports, covers and coverings, appliances and other devices and appurtenances used, or referred to, in the definitions of Plumbing, Plumbing Fixtures and Plumbing Systems.

Mezzanine. An intermediate floor (or floors) in a building which is open to the floor below projecting in the form of a balcony and is less than 33% of the area of the floor over which it is located. For the purposes of 248 CMR 10.00, a mezzanine shall not be considered a floor level where fixtures are required.

Non-potable Water. Water that does not meet the standards of potable water. Its bacteriological and chemical quality does not conform to the pertinent requirements of 310 CMR 22.00: *Drinking Water*.

Nuisance. Public nuisance as known in common law or in equity jurisprudence; what is dangerous to human life or detrimental to health; what building, structure or premise is not sufficiently ventilated, sewerred, drained, cleaned, or lighted, with reference to its intended or actual use; or what renders the air or human food or drink or water supply unwholesome.

Offset. A combination of elbows or bends which brings a pipe out of line with one section of piping but into a line parallel with another section of piping.

pH. The negative logarithm of the hydrogen-ion concentration used in expressing both acidity and alkalinity on a scale whose values run from zero to 14, with a lower value of less than seven indicating increasing acidity and values greater than seven indicating increasing alkalinity. A value of seven would indicate a neutral pH condition.

Person. A natural person, his heirs, executors, administrators or assigns; a firm, partnership, corporation, institution, association or group, or their successors or assigns, or a city, town, county, or other governmental unit, owning or renting, leasing, or controlling property, or carrying on an activity regulated by M.G.L. c. 142 or 248 CMR.

PEX. Cross-linked Polyethylene.

Plumbing. Plumbing includes the work and/or practice, materials and fixtures used in the installation, removal, maintenance, extension and alteration of a plumbing system; of all piping, fixtures, fixed appliances and appurtenances in connection with any of the following: sanitary drainage or storm drainage facilities, hazardous wastes, the venting system and the public or private water-supply systems, within or adjacent to any building, structure, or conveyance; to their connection with any point of public disposal or other acceptable terminal within the property line. Plumbing shall not include the following:

- (a) The installation of potable water pipes entering the property from outside the property line or a potable water source inside the property to either a metering device or control valve closest to the inside face of the outermost foundation wall of a building or structure. This exemption shall not apply to any potable water pipes on the outlet side of a metering device or control valve serving a plumbing fixture located outside of a building or structure.

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(b) The installation of exterior waste piping beginning after the first ten feet of developed length of Piping falling outside of a building's foundation wall/interior to the building structure which is used to carry building drainage to a public sewer, septic tank, or other place of wastewater disposal. The connection of such pipes to any fixtures (such as an exterior grease interceptor) or other drainage systems are not included in this exemption. Storm drainage leader piping originating from an outside scupper which at no time enters a building or structure.

(c) The installation of perimeter or sub-soil drains which do not discharge, communicate, or convey discharge to a storm or sanitary drainage system.

(d) These exemptions shall be narrowly construed and shall not be considered to apply to Dedicated Systems or any other piping systems not explicitly referenced in 248 CMR 10.03: Plumbing(a) through (c). Additionally, these exemptions apply to pipes only, and should not be construed as creating exemptions for other fixtures, appliances, and appurtenances connected to said pipes.

Plumbing System. The water supply and distribution pipes; plumbing fixtures and traps; soil, waste, and vent pipes; building sanitary and storm drains including the respective connections, devices, and appurtenances of the drains that are connected a point of public disposal or other appropriate terminal within the property line.

Potable Water. Water that does not contain impurities in amounts sufficient to cause disease or harmful physiological effects. Its bacteriological and chemical quality shall conform to the pertinent requirements of 310 CMR 22.00: *Drinking Water*.

Private or Private Use. In the classification of plumbing fixtures, private shall apply to fixtures in residences, apartments, condominiums, dormitories, private office bathrooms and to private guest rooms in hotels and motels.

Private Sewer. A sewer, serving two or more buildings, privately owned, and not directly controlled by a public authority.

PSIG. Pounds Per Square Inch Gauge.

Public or Public Use. In the classification of plumbing fixtures, public shall apply to every fixture not defined under Private or Private Use.

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

Public Water Main. A water supply pipe for public use controlled by public authority.

Public Water System. A system for the provision to the public of water for human consumption, through pipes or other constructed conveyances if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days of the year. Public Water System includes any collection, treatment, storage, and distribution facilities under control of the operator of such a system and used primarily in connection with such system, and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

Purification Waste. A by-product of waste material generated by or from the fermentation process to produce a pure substance.

Purified Water. Water produced by distillation, deionization, reverse osmosis, or other methods so that it meets the requirements of purified water in the most recent edition of the United States Pharmacopoeia.

PVC. Polyvinyl-Chloride.

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Receptor. A properly trapped and vented fixture or device that receives the discharge from indirect waste pipes.

Recombinant Deoxyribonucleic Acid DNA Molecules. Viable organisms containing molecules made outside living cells by joining natural or synthetic DNA segments to DNA molecules that can replicate in a living cell, or DNA molecules that can result from the replication of those described above. Such use shall be in accordance with the NIH Guidelines for Research Involving Recombinant DNA Molecules, Federal Register Vol. 49, No. 227, November 23, 1984, P.462266.

Relief Vent. A vent that is designed to permit additional circulation of air between drainage and vent systems.

Return Offset. A double offset installed so that it returns the pipe to its original alignment.

Reverse Osmosis. A water treatment process that removes undesirable materials from water by using pressure to force the water molecules through a semi-permeable membrane. This process is referred to as “reverse” osmosis. Pressure forces the water to flow in the reverse direction (from the concentrated solution to the dilute solution) to the flow direction (from the dilute to the concentrated) in the process of natural osmosis. Reverse osmosis removes ionized salts, colloids, and organic molecules down to a molecular weight of 100. This process is sometimes referred to as *hyperfiltration*.

Reverse Osmosis - (Water Treatment Unit). A device installed within a potable drinking water system that uses reverse osmosis as the primary technology for processing potable tap water into high quality drinking water. The reverse osmosis drinking water device is designed to separate water from undesirable dissolved and undissolved substances such as particulate matter, salts, metals, organic matter, and microorganisms.

Rim. An unobstructed open edge of a fixture.

Riser. A water supply pipe which extends vertically one full story or more to convey water to branches or to a group of fixtures.

Roof Drain. A drain receptor installed to receive water that collects on the surface of a roof and conveys the discharge water into a leader or a conductor.

Roughing-in. The installation of all parts of the plumbing system that can be completed prior to the installation of fixtures. This includes drainage piping, water supply piping, vent piping, the necessary fixture supports, and any fixtures that are built into the building.

Sand Trap. *See* Interceptor.

Sanitary Sewer. A pipe that carries sewage but does not carry storm, surface, clear water or ground water.

Seepage Well or Pit. A covered pit with open jointed lining. The septic tank effluent the pit receives may seep or leach into the surrounding porous soil through the open jointed lining.

Separator. *See* Interceptor.

Septic Tank. A watertight receptacle to receive sewage from a building sewer or building drain which is designed and constructed to permit sufficient retention of wastewater to allow for the separation of scum and sludge and the partial digestion of organic matter before discharge of the liquid portion to a soil absorption system.

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

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Sewage Ejectors. A device for moving sewage by entraining it on a high velocity steam, air or water jet.

Sewage Pump. A permanently installed mechanical device, except an ejector, for removing sewage or liquid waste from a sump.

Siphon Breaker. A siphon breaker is a valve device, or appurtenance, constructed and installed to prevent back flow in the plumbing system or any portion thereof. (*See Back-flow and Back-siphonage*).

Slope. (*See Grade*).

Soil Pipe. Any pipe that conveys the discharge of toilets, urinals or fixtures having similar functions to the building drain or building sewer. The discharge may be conveyed with or without the discharge from other fixtures.

Special Waste. A waste, or combination of wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health, safety, or welfare or to the environment when improperly treated, stored, transported, used, or disposed of, or otherwise managed. *See 310 CMR 30.00: Hazardous Waste* for possible exemptions and for "Mixed waste."

Special Wastes, Piping or Treatment. Wastes which require special treatment before entry into a normal plumbing system.

Special Waste Pipe. Pipes which convey hazardous wastes.

Stack. A general term for any vertical line of soil, waste, vent or inside conductor piping which extends beyond at least one branch interval in height.

Stack Group. A term that is 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. The portion of a soil or waste stack that is six inches above the highest flood level rim of the highest fixture connected to the stack. The stack vent terminates in compliance with 248 CMR 10.16.

Stack Venting. A method of venting a fixture or fixtures through a soil or waste stack.

Sterilization. The act or process that is physical or chemical that results in the complete destruction of microorganisms.

Storm Drainage System. A system that is used for conveying rainwater, surface water, condensate, cooling water, sprinkler discharge or similar clear liquid wastes to the storm sewer or other place of disposal. The clear liquid waste conveyed excludes sewage or industrial waste.

Storm Sewer. A sewer used for conveying rainwater, surface water, condensate, cooling water, or similar clear liquid wastes.

Subsoil Drain. A drain that collects subsurface, ground or seepage water and conveys it to a place of disposal.

Sump. A tank or pit that receives sewage or liquid waste, that is located below the normal grade of the gravity drainage system, and that must be emptied by mechanical means.

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Sump Pump. A mechanical device, except for an ejector, that removes clear liquid waste from a sump.

Supports - Hangers - Anchors. Devices for supporting and securing pipe, fixtures, and equipment, to walls, ceilings, floors or structural members.

Swimming Pool. Any structure, basin, chamber, or tank containing an artificial body of water for swimming, diving, or recreational bathing and having a depth of two feet or more at any point.

Trap. A fitting or device that provides a liquid seal that prevents the emission of sewer gases without materially effecting the flow of sewage or wastewater through it.

Trap Arm. That portion of a fixture drain or waste drain between the trap and its vent.

Trap Primer. A trap primer is a device or system of piping to maintain a water seal in a trap.

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

Treated Water. Potable water that has passed through a system for the purpose of purification, aeration, filtration, disinfection, softening, conditioning, fluoridation, stabilization, or corrosion correction and/or has had chemicals added which may alter its physical, chemical or radiological quality.

Troughs. An open conduit, drain, channel, trench or gutter.

Unisex/Gender-neutral Toilet Room. A room containing one toilet and one lavatory and a lockable door available for use by anyone.

Vacuum. Any pressure less than that exerted by the atmosphere.

Vacuum Breaker, Non-pressure Type (Atmospheric). *See* Anti-Siphon Vacuum Breaker - Non-pressure Type.

Vacuum Breaker, Pressure Type. *See* Anti-Siphon Vacuum Breaker - Pressure Type.

Vacuum Relief Valve. A device to prevent an excessive vacuum in a water storage tank or heater.

Vent - Automatic. A mechanical device that opens because of negative pressure in the drainage system to prevent trap siphonage, and closes gas and watertight when the pressure in the drainage system is equal to or greater than ambient pressure to prevent the entry of sewer gas into the building.

Vent Pipe. Part of a vent system.

Vent Stack. A vertical vent pipe installed to provide circulation of air to and from the drainage system.

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

Vertical Pipe. Any pipe or fitting which makes an angle of 45° or less with the vertical plane.

Wall Hung Toilet. A wall mounted toilet installed in such a way that no part of the toilet touches the floor.

Waste. *See* Liquid Waste.

Waste Pipe. A pipe which conveys only waste.

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Water Distribution Pipe. A pipe within the building or on the premises that conveys water from the water service pipe to the point of usage.

Water Filter. A device installed on a potable water system through which water flows for the reduction of turbidity, microorganisms, particulate matter, taste, color, odor or other contaminants.

Water Main. A pipe used to convey the public water supply.

Water of Questionable Safety. Water in a plumbing system that passes through an isolated portion of the water piping distribution system. The system is defined as beginning at the outlet of a backflow preventing device and ends at a point of final or actual connection with heating/cooling equipment or other fixtures, apparatus and appliances that require water for operation and process.

Water Outlet. As used in connection with a water-distribution system, a discharge opening for water:

- (a) to a fixture;
- (b) to atmospheric pressure (except into an open tank which is part of the water supply system);
- (c) to a boiler or heating system; or
- (d) to any water operated device or equipment requiring water in a plumbing system.

Water Service Pipe. The pipe from the municipal water main or private other source of water supply to the water distribution system of the building served.

Water Softener. A device installed on a potable water system through which water flows for the reduction of hardness and other metals using the cation exchange process.

Water Supply System. The water service pipe, the water distribution pipes, and the necessary connection pipes, fittings, control valves, and all appurtenances in or adjacent to a building or premises.

Water Treatment Device. A device which means any instrument or product sold, rented or leased, or offered for sale, rental or lease designed or claimed either to benefit potable water systems or to treat water intended for human consumption or use; including but not limited to, instruments or products using filtration, distillation, absorption, adsorption/ion exchange, reverse osmosis or other treatment processes or technologies such as magnetic or electro-magnetic field and catalytic conversion which is claimed to alter the radiological, chemical or physical properties of water.

Wet Vent. A waste pipe that also serves as a vent, on the same floor level.

Workmanship. Work of such character that will fully secure the desired or needed results.

Yoke Vent. A pipe connecting at a 45° angle upward from a soil or waste stack to a vent stack and designed for the purpose of preventing pressure changes in the stack.

10.04: Testing and Safety

(1) Survey. Prior to the commencement of work, all portions of existing systems that will be directly affected by proposed plumbing work shall be surveyed by the licensed plumber to insure the existing systems are adequate to support the proposed work.

(2) Testing and Inspections of the Plumbing System. All testing shall adhere to the manufacturer's testing requirements of the materials being tested.

- (a) Testing and Inspection of Rough Plumbing. Prior to requesting an inspection of rough plumbing, the licensee shall choose one of the testing methods listed in 248 CMR 10.04 to ensure the safe and proper functionality of the installed plumbing system. All testing shall be performed in accordance with product manufacturer instructions. Exception: The testing

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of plumbing systems in manufactured and modular buildings shall be accomplished by performing a non-destructive test and without removal of walls or other pre-fabricated building components. The Inspector may require the permit holder or other licensee employed by the permit holder to be on site, with 248 CMR 10.00.

1. Methods of Testing the Drainage and Vent System.

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

b. Air Test. An air test shall be performed by attaching an air compressor testing apparatus to any suitable opening, and, after closing all other inlets and outlets to the system, forcing air into the system, until there is a uniform gauge pressure of five PSIG or enough pressure to balance a column of mercury ten inches in height. This pressure shall be held without introduction of additional air for a period of at least fifteen minutes. The gauge used for this test shall be calibrated in increments no greater than $\frac{1}{10}$ of a pound.

d. Peppermint Test. A peppermint test shall only be used and performed on the concealed piping within existing buildings or structures. The test shall be applied by creating a liquid mixture with the appropriate amount of oil of peppermint and hot water. The mixture shall be poured down a main stack. The stack opening shall then be sealed. The individual who has handled the oil of peppermint or the peppermint mixture shall not enter the building until the test has been completed. The presence of the aroma of the oil of peppermint may potentially be present on the individual who created the mixture and will compromise the building environment under test and observation.

e. Smoke Test. A smoke test shall be performed by obtaining smoke injector equipment designed for the purpose of producing and introducing a heavy volume of smoke. Smoke injector testing equipment utilizes several methods for producing adequate smoke conditions for testing; manufacturers' recommendations shall be observed. The discharge hose from the smoke injector equipment shall be extended to and through a smoke test cap or plug and all voids encompassing the hose shall be sealed with putty or another similar compound. When the entire system or portion thereof is charged with smoke, air pressure equal to $\frac{1}{2}$ water column shall be applied. Defects, failures, and leaks in the piping system will be revealed by plumes of smoke that will discharge through them.

2. Methods of Testing the Water Distribution and Supply System. Upon completion of a section or of the entire water supply system when roughed, it shall be tested and proved tight under a pressure not less than 125 pounds per square inch. Water used for tests shall be obtained from a potable supply source. Air or other inert gases may be used for testing.

(b) Testing and Inspection of Finish Plumbing. When work is ready for inspection, notice shall be given to the Inspector as required by 248 CMR 3.05(3)(d)1. within five days after the plumbing work is complete.

(c) Within two working days after receipt of such notice, the Inspector shall proceed with the inspection and examine the work with the water turned on to the fixtures. The Inspector may require the permit holder or other licensee employed by the permit holder to be on site, with 248 CMR 10.00.

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- (d) If the installation is found in compliance with 248 CMR an Inspection approval tag shall be issued by the Inspector.
 - (e) Grease Interceptors. Interceptors must be isolated from the drainage system prior to rough or final inspection. The interceptor must not be subjected to air, water, or any other type of pressure test.
- (3) Defects.
- (a) Should inspection of the permitted plumbing work disclose any defects or violations of 248 CMR the permit holder shall be required to remedy the violations and defects, without delay, and notify the inspector for a repeat inspection of the installation.
 - (b) If the licensee holding a permit for work in a building turns the water on and fails to properly notify the Inspector as required, or neglects to remedy any defects or violations disclosed by the Inspector shall not be granted any further permits until the defects have been rectified and/or the final inspection has been performed.
- (4) Repairs and Alterations.
- (a) Deviations from the provisions of 248 CMR may be permitted in existing buildings or where plumbing installations are to be altered, repaired, or renovated. The deviations shall be determined and agreed upon by the permit holder and the inspector prior to the installation. The deviations may be allowed provided they are found to be necessary and conform to the scope and intent of 248 CMR 10.00.
 - (b) Whenever compliance with the provisions of 248 CMR 10.00 fails to eliminate or alleviate a nuisance that may involve health or safety hazards, the Inspector shall notify the owner or the owner's agent in writing regarding the violations and the proper procedures necessary to become compliant. 248 CMR 10.04 shall not be deemed as an allowance to permit waivers from the material provisions of 248 CMR 10.06 or the fixture requirements of 248 CMR 10.10(15).
- (5) Defective Plumbing.
- (a) Whenever there is reason to believe that the plumbing system of any building has become defective, it shall be subjected to test and/or inspection. The Inspector shall notify the owner or the owner's agent in writing regarding the defective plumbing and the proper procedures necessary to become compliant.
 - (b) Whenever the work subject to a permit complies with the provisions of 248 CMR 3.00 through 10.00, but the Inspector notes other existing plumbing or gas fitting that may cause a health or safety hazard, the Inspector shall notify the owner or the owner's agent in writing regarding the violations and the proper procedures necessary to become compliant.
- (6) Demolition and Removal.
- (a) When a fixture that is connected to the plumbing system is to be permanently removed, a permit for the work shall be secured. All plumbing connections to that fixture shall be made water and gas tight.
 - (b) Insofar as they are pertinent, the provisions of 248 CMR 10.04(6)(a) shall also apply when a building, structure, dwelling or tenant space is to be demolished.

10.05: General Regulations

- (1) Conforming with 248 CMR 10.00. Except as otherwise allowed by a variance granted by the Board under 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*, all installed plumbing shall conform to the following general requirements as outlined in 248 CMR 10.00.

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(2) Pitch of Horizontal Drainage Piping.

- (a) Horizontal drainage piping shall be run in straight practical alignment and at a consistent uniform pitch.
- (b) Horizontal drainage piping which is three inches in diameter or smaller shall be installed with a minimum uniform pitch of $\frac{1}{4}$ of an inch per foot.
- (c) Horizontal drainage piping which is larger than three inches in diameter shall be installed with a minimum uniform pitch $\frac{1}{8}$ of an inch per foot.
- (d) Storm or sanitary drain piping may deviate from the above pitch requirements, provided the pitch produces a computed discharge velocity of not less than two feet per second. Such piping systems must be designed by a Massachusetts professional engineer.
- (e) Refer to 10.15: *Table 2* regarding pitch requirements for a building drain.

(3) Changes in Direction of Drainage Piping.

(a) Allowable Fittings.

1. Changes in the direction of drainage piping shall be made with the use of wyes, long sweep quarter bends, fifth, sixth, eighth or sixteenth bends, or their equivalent.
2. Quarter bends, or their equivalent may be used in soil and waste lines when the change in the direction of the flow is from the horizontal to the vertical.
3. Tees and crosses for vent fittings may be used for changes in the direction of vent piping only.
4. Short sweep fittings may be used in a branch waste line when the waste line serves only one outlet and cleanouts are provided in accordance with 248 CMR 10.08.

(4) Fittings and Connections Prohibited.

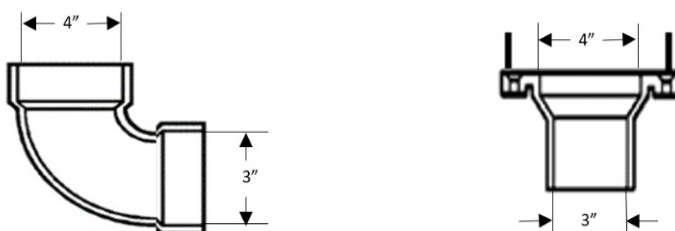
(a) Prohibited Fittings.

1. No fitting that incorporates a straight T branch shall be used as a drainage fitting.
2. No fitting or connection that has an enlargement chamber or that has a recess with a ledge or shoulder, or that incorporates a reduction in pipe area shall be used.
3. No running threads, bands or saddles shall be used in a drainage system.
4. No drainage pipe or vent piping shall be drilled, tapped, burned, or welded.
5. Fittings commonly referred to as "Sisson Joints" are prohibited.

(b) Obstruction to Flow.

1. No fitting, connection, device, or method of installation that obstructs or retards the flow of water, wastes, sewage, or air in drainage or venting systems where the obstruction results in flow resistance that is greater than the normal frictional resistance to flow shall be used unless otherwise specifically indicated elsewhere in 248 CMR 10.00.
2. The enlargement of a three-inch closet bend or stub to four inches shall not be considered an obstruction under 248 CMR 10.05(4)(b) provided that the horizontal flow line or insert is continuous without forming a ledge. *See 10.05: Example 1.*

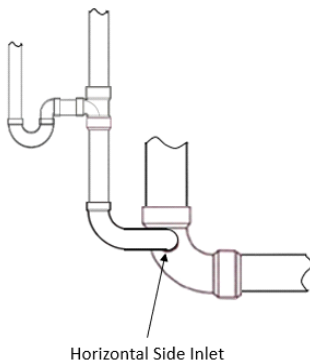
10.05: Example 1 - Enlargement of a three-inch Closet Bend or Flange



- (c) Heel or Side-inlet Bends. A heel or side-inlet quarter bend shall not be used as a dry vent when the inlet is placed in a horizontal position, or any similar arrangement of pipe and fittings producing a similar effect, except when the entire fitting is part of a dry vent arrangement. *See 10.05: Example 2.*

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10.05: Example 2 - Side-Inlet Bend



(5) Trenching, Tunneling and Backfilling for Storm and Sanitary Systems.

(a) Trenching and Bedding.

1. Trenches shall be of enough width to permit proper installation of the pipe.
2. Where shoring is required, ample allowance shall be made in the trench's width to facilitate proper working conditions.
3. Where trenches are excavated to a grade such that the bottom of the trench forms the bed for the pipe:
 - a. care must be exercised to provide solid bearing between joints; and
 - b. bell holes shall be provided at points where the pipe is joined.
4. Where trenches are excavated below grade such that the bottom of the trench does not form the bed for the pipe, the trench shall be back-filled to grade with sand tamped in place so as to provide a uniform bearing surface for the pipe between joints.
5. Where rock is encountered in trenching:
 - a. The rock shall be removed to a point at least three inches below the grade line of the trench and the trench shall be backfilled to grade with sand tamped in place to provide a uniform bearing for the pipe between joints; and
 - b. care shall be exercised to ensure that no portion of the pipe, including its joints, rests on any portion of a rock.
6. If soft materials of poor bearing qualities are found at the bottom of the trench:
 - a. a concrete foundation shall be provided to ensure a firm foundation for the pipe; and
 - b. the concrete foundation shall be bedded with sand tamped in place to provide a uniform bearing for the pipe between joints.
 - c. In trenches where a firm foundation cannot be established, piping shall be properly suspended from the concrete above.
7. Where PVC or ABS is installed underground:
 - a. Prepare a smooth, uniformly compacted trench bottom using granular fill. Place the pipe in uniform alignment and grade with a continuous bearing on the bottom quadrant of the pipe along its entire length.
 - b. Using granular fill, compact and backfill around the pipe to a point at least six inches over the crown of the pipe.
 - c. Do not allow large stones or pieces of earth to be dropped into the trench when completing the backfilling process.
 - d. The requirements of 248 CMR 10.05(5)(a)7.a. through c. shall be the responsibility of the on-site licensed plumber.

(b) Tunneling.

1. Where necessary, pipe may be installed by tunneling or jacking, or a combination of both. In such cases special care shall be exercised to protect the pipe from damage either during installation or from subsequent uneven loading.
2. Where earth tunnels are used, adequate supporting structures shall be provided to prevent future settling or caving.
3. Pipe may be installed in a larger conduit that has been jacked through unexcavated portions of the trench.

(c) Backfilling.

1. Until the crown of the pipe is covered by at least two feet of tamped earth considerable care shall be exercised in backfilling trenches.

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2. Loose earth, free of rocks, broken concrete, frozen chunks and other rubble, shall be carefully placed in the trench in six-inch layers and tamped in place.
 3. Care shall be taken to thoroughly compact the backfill under and beside the pipe to be sure that the pipe is properly supported.
 4. Backfill shall be brought up evenly on both sides of the pipe so that it retains proper alignment.
- (6) Structural Safety.
- (a) A structural member of any building shall not be weakened or impaired by cutting, drilling or notching.
 - (b) Any cutting, drilling, or notching shall be completed in compliance with the local Inspector of buildings or as specified in 780 CMR: *The Massachusetts State Building Code*.
- (7) Protection of Piping.
- (a) Corrosion. Any pipe that is in contact with or that passes through or under a masonry product, concrete product or any other similar and potentially corrosive material shall be protected against external damage by application of a protective sleeve, coating, wrapping, or other means that will prevent corrosion.
 - (b) Freezing Prevention.
 1. For water supply or drainage piping that is installed outside, under a building, exposed to the elements, in an unheated area, in an exterior wall, unconditioned space or similar areas that may be directly influenced by freezing temperatures, adequate provision shall be made to protect all pipes from freezing.
 2. The protection and covering of water and waste pipes shall be the responsibility of the installing plumber.
 - (c) Rodent Proofing.
 1. All strainer plates on drain inlets shall be designed and installed so that the diameter of the opening is no greater than or equal to ½ inch.
 2. Meter boxes shall be constructed in such a manner that rodents cannot enter a building by following the water service pipe from the box into the building.
 - (d) Physical Damage.
 1. Exposed Piping. All exposed drainage piping, vent piping, or water piping in parking garages, in residential garages, warehouses or similar type buildings must be protected against physical damage from all types of vehicles such as automobiles, carts, pallet jacks or forklifts.
 2. Concealed Piping. All water, waste, and vent piping other than cast/ductile iron, or any steel located within one inch of exposed framing shall be protected by steel shielding plates of not less than 18 gauge in thickness. Plates shall extend a minimum of two inches beyond the piping.
 - (e) Protection against Thermal Expansion. Protection of piping shall be provided as warranted by temperature variations or physical conditions. Protection of PVC against thermal expansion shall be provided using expansion joints or loops when temperature variations exceed the piping material's coefficient of linear expansion, the length of pipe between directional changes, and the temperature differential.
 - (f) Non-Metallic Piping Through Firewalls or Rated Fire Separation Walls.
 1. When piping passes through a rated fire separation wall or enclosure to another dwelling unit or space, the pipe shall be encased or shielded by a metal sleeve extended twenty inches on each side of the wall, floor, or ceiling. The metal sleeve shall be 18 gauge (.040 in.) or heavier.
 2. The annular space between the metal sleeve and the piping shall be sealed with non-combustible fire-retardant material, alternate procedures may be used. To the extent applicable, see 780 CMR: *The Massachusetts State Building Code* for licensing and other requirements governing such issues.
 3. The piping connections that penetrate firewalls and ceilings in one- and two-family passenger car garages located beneath dwelling units are exempt and are not required to be encased. The pipe penetrations should be sufficiently sealed by means of caulking or other approved materials to prevent the passage of smoke from space to space.

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10.05: continued

(8) Damage to the Public or Private Sewer Systems. No person shall discharge by any mean into a building drain or sewer the following matter:

- (a) ashes;
- (b) masonry products;
- (c) textiles;
- (d) paints;
- (e) solvents;
- (f) flammables;
- (g) corrosive or explosive liquid(s);
- (h) gas;
- (i) oil;
- (j) grease; or
- (k) any product that would or could obstruct or damage a drain or sewer system.

(9) Detrimental Wastes. Waste that is detrimental to the public sewer system or to the functioning of the sewage treatment plant shall be treated and disposed of according to the requirements of the State, local or Federal authorities having jurisdiction.

(10) Sleeves. The annular space between the sleeve and a pipe that passes through an exterior wall shall be made watertight or weather tight.

- (a) PVC or ABS piping which penetrate concrete floors, slabs or walls shall be provided with sleeves. Maintain an annular space of one inch between the pipe and sleeve.
- (b) PVC or ABS Pipes which penetrate concrete slabs placed on grade shall also provide a sleeve. Maintain an annular space of one inch between the pipe and sleeve.

(11) Second Hand or Previously Installed Plumbing Material. If installation of second hand or previously installed plumbing fixtures or materials complies with 248 CMR 10.00, before installation that fixture or material shall be thoroughly cleansed and disinfected.

(12) Piping in Relation to Footings.

- (a) Outside of Footings. Piping which is installed outside of and below a footing shall not destroy the bearing value of the soil.
- (b) Through or Under Footings, Foundations or Walls. No pipe shall be installed through or under a footing, foundation, or wall, except when a provision is made in the footing to carry the building or structural loads without transmitting such loads to the pipe.

(13) Drainage Below Sewer Level. Drainage piping which is located below the sewer shall be installed as provided in 248 CMR 10.15(9)

(14) Connections to Plumbing System Required. All plumbing fixtures, drains and appurtenances which are used to receive, or discharge liquid waste or sewage waste shall be properly connected to the sanitary or storm drainage system of the building or premises in accordance with the requirements of 248 CMR 10.00.

(15) Sewage Disposal Connections (Buildings).

Each building shall have an independent connection to a public sanitary sewer or sewage disposal system that complies with 310 CMR 15.00. *The State Environmental Code, Title 5: Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage.*

(16) Location of Fixtures.

- (a) Light and Ventilation: Plumbing fixtures shall be located in compartments, rooms, spaces or areas that are provided with mechanical ventilation and illumination that conform to 105 CMR 410.000: *Minimum Standards of Fitness for Human Habitation (State Sanitary Code, Chapter II)* and 780 CMR: *The Massachusetts State Building Code.*
- (b) Improper Location: Piping, fixtures, or plumbing devices and equipment shall not be installed in a manner that will interfere with the normal operation of windows, doors, or other openings.

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(17) Workmanship. Workmanship shall conform to generally accepted good practice. Particular attention shall be applied to all piping installations with regards to the alignment of piping (straight, level, and plumb).

(18) Manufacturer Instructions: The licensee shall conform to the equipment manufacturers' specific requirements in completing an installation unless those requirements conflict with or are less stringent than 248 CMR 10.00.

(19) Temporary and Emergency Uses.

(a) General. Where a new or existing building or structure is desired for use on a temporary or emergency basis but whose plumbing does not comply with 248 CMR 10.00, the Inspector may approve said use on a temporary basis so long as the following provisions are adhered to:

1. No relief shall be granted unless a plumbing permit application has been filed. In cases of emergency requiring an immediate use of a building or structure to protect public health, safety, and general welfare and where the prospective permit applicant is unable to contact the Inspector, the use shall be allowed so long as the requirements of 248 CMR 3.05(1)(a)4. are adhered to.
2. With the permit application, the applicant must submit in writing a description of the temporary or emergency use as well as the reason why compliance with 248 CMR 10.00 cannot be achieved prior to that use.
3. The uniform application for a permit to perform plumbing work must be filled out to show all areas of plumbing work which would be required for full compliance with 248 CMR 10.00, regardless of whether the applicant intends to complete that work prior to the end of the temporary use.
4. The Inspector shall not grant temporary or emergency approvals for the following:
 - a. A building which has no toilets or lavatories;
 - b. A building which is prohibited from being utilized due to an order by a building or fire official or a court of competent jurisdiction;
 - c. Allowing a use which has previously been denied by the Inspector and/or the Board; and
 - d. Any other uses which, in the opinion of the Inspector, would jeopardize public health, safety, or general welfare.
5. The Inspector shall authorize temporary, or emergency uses by issuing said authorization in writing in such format as deemed appropriate by the Inspector and shall accompany a permit to perform plumbing work to allow the applicant to achieve code compliance. Said authorization shall not be permitted for more than 60 days. Further extensions must be granted by the Board by way of the variance process.

(b) Failure to Obtain Inspector or Board Approval of a Temporary or Emergency Use.

As described in 248 CMR 10.02(27), the use of a building or structure that is not in compliance with 248 CMR 10.00 represents a significant danger to public health. Accordingly, any such building or structure whose use has not been approved by the Board or by the Inspector pursuant to 248 CMR 10.05(19) shall be deemed unsafe for occupants regardless of the nature of deficient/missing plumbing. This applies even if the violation is minor or created by a change of use not accompanied by any plumbing work. Until such issues are corrected:

1. Permits for any and all additional work shall be denied per 248 CMR 3.05(1)(b)10.g.; and
2. Inspectors shall not sign off on requests by other officials (such as building officials) regarding the safety of the building or structure for occupancy or other purposes.

(c) Additional Relief. Notwithstanding the requirements of 248 CMR 10.05, where there is a hardship or unusual circumstance not addressed in 248 CMR 10.05, the Board retains the right to issue variances as it deems appropriate pursuant to 248 CMR 3.04(2).

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10.06: Materials

(1) General Rules.

(a) All products, systems, and equipment used in the construction, installation, alteration, repair, replacement, or removal of any plumbing or drainage system or part thereof, shall conform to the material requirements in 248 CMR 10.06. For purposes of 248 CMR 10.06, all products, systems, and equipment must meet the requirements for acceptance under 248 CMR 3.04: *Product, Design, and Testing Standards*, including, but not limited to, meeting the requirements of generally accepted standards acceptable to the Board.

(b) Notwithstanding 248 CMR 10.06(1), the Inspector may allow the extension, addition to, or relocation of existing water, soil, waste and/or vent pipes with materials of like grade or quality in renovations or in renovations or alterations where the original installation met all code requirements then in effect.

(c) The Board may accept products pursuant to 248 CMR 3.04(1) which do not adhere to the requirements of 248 CMR 10.06(1) when the Board has explicitly found that the material used in the product(s) are substantially equivalent to materials normally acceptable by 248 CMR 10.06 and otherwise, would not be detrimental to public health, safety, or welfare.

(d) Alternate Materials, Methods, and Systems. The provisions of 248 CMR 10.06 are not intended to prevent the use of materials, methods or systems that are not specifically authorized or prescribed by 248 CMR 10.06, provided such alternate materials, methods and systems meet the standards, use and intent of 248 CMR 10.06 and the Board has granted Product-Acceptance, a Variance, or a Test-site status pursuant to 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth.*

(e) All pipe, valves and fittings used in a potable water system anticipated to be used for human consumption shall comply with the Federal Safe Water Drinking Act (SWDA) 42 USC Section 300 f.

(f) Notwithstanding the provisions of 248 CMR 10.00, all applicable products must meet the energy efficiency standards outlined in M.G.L. c. 25B, §§ 5 through 10 and 225 CMR 9.00: *Appliance Energy-efficiency Standards, Testing and Certification Program.* To the extent these requirements are mandated by law, no variance or other relief can be granted by the Board to allow use of a non-compliant product.

(2) Allowable Materials.

(a) Sheet Copper. Sheet copper shall not be less than 12 ounces per square foot when used in the following applications:

1. safe pan;
2. shower pan;
3. flush tank linings;
4. vent terminal flashing; or
5. general use.

(b) Floor Flanges: A floor flange used for a toilet or other similar fixture shall be product accepted and made of copper, brass, cast iron, hubless cast iron or plastic.

(c) Storm & Sanitary Above & Below Ground. Materials listed in 248 CMR 10.06: *Table 1.*

(d) Vent Pipe & Fittings Above & Below Ground. Materials listed in 248 CMR 10.06: *Table 1.*

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10.06: continued

10.06: Table 1
Storm and Sanitary Waste and Vent Piping

VENT PIPE AND FITTINGS ABOVE GROUND					
VENT PIPE AND FITTINGS BELOW GROUND					
SANITARY AND STORM DRAINAGE ABOVE GROUND					
SANITARY AND STORM DRAINAGE BELOW GROUND					
1	ABS Plastic Pipe and Drainage Pattern Fittings. See 10.06 (2) (g)	A	A	A	A
2	ABS Cellular Core Plastic Pipe	A	A	A	A
3	Aluminum DWV Pipe with Drainage Pattern Fittings		A	X	A
4	Cast Iron Soil Pipe and Fittings (Extra-Heavy)	A	A	A	A
5	Cast Iron Soil Pipe and Fittings (Service Weight)	A	A	A	A
6	Cast Iron Soil Pipe and Fittings (No-Hub)	A	A	A	A
7	Copper Tubing Hard Drawn & Copper Alloy (DWV) Color Coded Yellow		A	X	A
8	Copper Tubing Hard Drawn & Copper Alloy (Type M) Color Coded Red		A	X	A
9	Copper Tubing Hard Drawn & Copper Alloy (Type L) Color Coded Blue	A	A	A	A
10	Copper Tubing Hard Drawn & Copper Alloy (Type K) Color Coded Green	A	A	A	A
11	Copper DWV Fittings (Wrot)		A	X	A
12	Copper DWV Fittings (Cast Brass)	A	A	A	A
13	Copper Pipe (IPS)	A	A	A	A
14	Ductile Iron Pipe and Drainage Pattern Fittings	A	A	A	A
15	Galvanized Schedule 40 Steel Pipe with Drainage Pattern Fittings		A	X	A
16	Polypropylene Pipe with Drainage Pattern Fittings	A	A	A	A
17	Polyethylene Pipe with Drainage Pattern Fittings	A	A	A	A
18	PVC Plastic Pipe and Drainage Pattern Fittings. See 10.06 (2) (g) & 10.12 (1) (a) 5. b.	A	A	A	A
18	PVC Cellular Core Plastic Pipe. See 10.06 (2) (g) & 10.12 (1) (a) 5. b.	A	A	A	A
19	Type 304 Stainless Steel Tubing with Drainage Pattern Fittings		A	X	A
19	Type 316 Stainless Steel Tubing with Drainage Pattern Fittings	A	A	A	A
20	Epoxy Reinforced Fiberglass Pipe & Fittings*	A	A	X	X

Note: Always follow manufacturers installation instructions wherever more stringent than 248 CMR.

A = Allowed: X = Not Allowed

* May be used only for storm water drainage

For a list of allowable materials for Special Waste, see 248 CMR 10.13(2)(a) and (b).

(e) Water Distribution Piping Above and Below Ground. Materials listed in 248 CMR 10.06: Table 2.

10.06 Table 2
Water Distribution Piping

WATER DISTRIBUTION PIPE AND FITTINGS ABOVE GROUND		
WATER DISTRIBUTION PIPE AND FITTINGS BELOW GROUND		
1	Polypropylene Multilayer Pipe Fiberglass Layer and Compatible Fittings	A
2	Copper Tubing Hard Drawn & Copper Alloy (Type L) Color Coded Blue	A
3	Copper Tubing Hard Drawn & Copper Alloy (Type K) Color Coded Green	A
4	Cast Bronze Threaded Fittings	A
5	Copper Cast Solder Joint Fittings	A
6	Copper Pipe (IPS)	A
7	Ductile Iron Pipe with Compatible Fittings	A
8	PEX (Cross Linked Polyethylene) See 10.06 (2) (f)	A
9	CPVC Pipe and Fittings. See 10.06 (2) (f)	A
10	Wrought Copper Solder Joint Fittings	A
11	Type 304 Stainless Steel Tubing with Compatible Fittings	A
12	Type 316 Stainless Steel Tubing with Compatible Fittings	A
13	Other Plastics. See 10.06 (2) (h)	A

Note: Follow manufacturers installation instructions wherever more stringent than 248 CMR.

A = Allowed: X = Not Allowed

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10.06: continued

(f) CPVC Pipe and PEX Tubing and Fittings. CPVC and PEX may be used for hot and cold-water piping which is:

1. located in residential dwellings, hotels, motels, inns, condominiums, and similar buildings not exceeding six stories; or
2. located in a predominantly residential building where there is a single, non-residential use on single floor and meeting the following requirements:
 - a. the non-residential use would be categorized exclusively as employee (non-residential) per 248 CMR 10.10 (15): *Table 1* with no additional uses and,
 - b. the non-residential use shall be limited to a maximum of four plumbing fixtures; and
 - c. the types of plumbing fixtures shall be limited to toilets, sinks (lavatory, residential, and service sinks) and drinking water stations.
3. used exclusively for dedicated cold-water piping beginning at the outlet of the water meter or main control valve inside any building directly to drinking water stations.
4. PEX tubing, and fittings may be used in commercial buildings for the purpose of conveying reverse osmosis or other similar processes that produce Purified Water from the point of treatment to one or more points of use for drinking water.

Exception:

- a. CPVC pipe and/or PEX domestic water tubing and fittings shall not be installed within 24 inches of the final connection to any domestic water heater.
- b. CPVC pipe and/or PEX tubing, and fittings shall not be used for steam flushing of water purification systems. Only type 316 stainless steel tube and fittings shall be used for this purpose.

(g) PVC and ABS DWV Pipe and Fittings.

1. PVC and ABS schedule 40 pipe and fittings may be used for drains, waste, or vents in residential dwellings, hotels, motels, inns, condominiums and in residential areas of assisted living facilities not exceeding ten stories; or
2. located in a predominantly residential building where there is a single, non-residential use on a single floor and meeting the following requirements:
 - a. the non-residential use would be categorized exclusively as employee (non-residential) per 248 CMR 10.10(15): *Table 1* with no additional uses and
 - b. the non-residential use shall be limited to a maximum of four plumbing fixtures and.
 - c. the types of plumbing fixtures limited to toilets, sinks (lavatory, residential, and service sinks) and drinking water stations.
3. PVC and ABS schedule 40 pipe and fittings shall not be used for drains, waste, or vents in commercial kitchens, laundry rooms, public toilet facilities or other commercial areas located in assisted living facilities, hotels, motels, inns, or similar establishments. *See 10.06: Example 1.*
4. For the purposes of 248 CMR 10.06, ten stories shall be determined by the building permit. If no building permit is required, ten stories shall be determined by the authority having jurisdiction.

Exception:

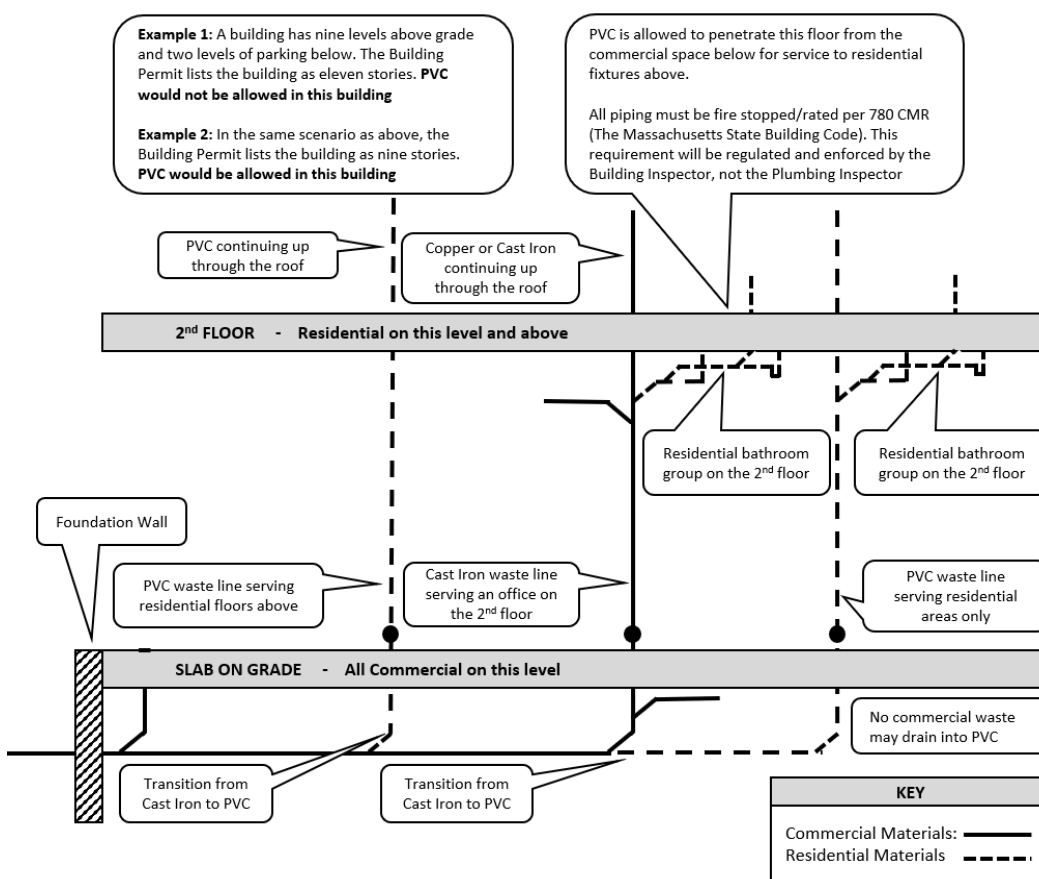
- a. PVC and ABS schedule 40 pipe and fittings may be used for the drains, waste, and vent piping serving fixtures in commercial establishments which are specifically used only for that type of business in:
 - i. sinks used for washing of hair and/or coloring in barber shops and beauty salons;
 - ii. fixtures used in salons for manicures and pedicures;
 - iii. equipment used for processing in photo-labs; or
 - iv. plumbing fixtures which incorporate alcohol, soda, or other similar carbonated type beverages in commercial buildings. These fixtures may discharge indirectly into the sanitary drainage system. Transition to commercially accepted materials shall be made immediately after the point of dilution. Refer to 248 CMR 10.12(1)(a)2.

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10.06: continued

- Note:** All piping for the above-mentioned fixtures shall be connected to the main or branch drain serving other fixtures to provide a point of waste dilution. Vent piping from the fixture discharging the waste shall extend to a point six inches above the flood rim of the fixture and then shall re-transition to cast iron or copper piping material as used throughout the rest of the commercial building.
- v. Type 1 PVC pipe and fittings may be used as indirect waste piping for dialysis equipment in medical buildings.
 - vi. PVC Schedule 40 perforated pipe may be used for subsoil drainage in commercial buildings.
 - vii. For thermal expansion of PVC DWV please *see* 248 CMR 10.05(7)(e).

10.06: Example 1
PVC Limited Allowances in Mixed-Use Building Ten Stories and Under



(h) Other Plastics.

1. Pipe and fittings from purified water systems installed from the point of purification to the final point of use as defined in 248 CMR 10.03 shall be of a size and material specified by the equipment manufacturer.
2. Product-accepted multilayer polypropylene pipe with intermediate fiberglass layer and related fittings. Single wall Polypropylene pipe and fittings for cold water installations only.

(i) Urinal Wastes.

- Urinal waste branches and urinal fixture wastes shall be installed using the following:
1. Extra heavy or service weight cast iron soil pipe and fittings with caulked joints
 2. Extra heavy, service weight or no-hub cast iron soil pipe and fittings with resilient gaskets or no hub clamps with elastomeric sealing sleeves.
 3. Threaded cast iron pipe with cast iron drainage fittings.
 4. Iron size copper or brass pipe with cast brass drainage fittings.
 5. PVC and ABS schedule 40 plastic pipe and fittings may be used only in residential type buildings.
 6. Schedule 80 PVC and CPVC threaded nipples may be used as a final point of connection for toilets and urinals to carriers and fittings.

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10.06: continued

- (j) Sumps and Tanks for Sewage. All sumps and tanks for receiving sewage removed by mechanical or ejector methods shall be watertight and designed and constructed as follows:
1. Concrete. Three-inch minimum wall.
 2. Cast Iron. Minimum ¼-inch thickness.
 3. Metal.
 - a. Minimum ⅛ inch thickness for above ground and treated to resist corrosion.
 - b. For below ground installation sumps and tanks shall be designed and accepted for that type of installation and treated inside and outside to resist corrosion,
 4. Fiberglass. Reinforced polyester resin glass fibers that comply with ANSI listed standards.
- (k) Single Stack Sanitary Drainage System - (So-vent).
1. A Massachusetts professional engineer shall be responsible for the design of the so-vent plumbing system.
 2. As part of the design process, the Massachusetts professional engineer shall be responsible for assuring that the piping installation, including pipe sizing, dimension, and other aspects meet the requirements for proper functioning as designed.
 3. The Local or State plumbing Inspector shall be responsible for all other aspects of the installation, as required by 248 CMR but is under no obligation to approve or otherwise involve themselves in the design process or ensuring the system meets the design specifications. An affidavit shall be provided by the designing engineer to the local plumbing inspector prior to final inspection.
- (l) Vacuum Drainage System. An engineered vacuum system that employs specifically designed fixtures, piping arrangements and vacuum pumps that are designed and installed in compliance with the manufacturer's recommendations may be used in a building or structure provided that in addition to being in conformance with 248 CMR 3.00 through 10.00 the following requirements are satisfied:
1. Each system shall be designed or engineered by a Massachusetts professional engineer.
 2. Piping material shall be type K, L, M or DWV hard drawn copper or cast iron.
 3. All fittings shall be made of cast brass or hard drawn wrought or cast iron and must be of DWV design.
 4. The plumbing Inspector shall be responsible for all other aspects of the installation, as required by 248 CMR but is under no obligation to approve or otherwise involve themselves in the design process or ensuring the System meets the design specifications. An affidavit shall be provided by the designing engineer to the local plumbing inspector prior to final inspection.
 5. Any change or redesign in the vacuum drainage system shall be subject to the requirements of 248 CMR 10.06(2)(m) and 248 CMR 10.23.
- (m) Relief Valve Discharge. The use of any non-ferrous pipe and fittings rated at a maximum service temperature of 200°F on the outlet of a relief valve with a discharge not exceeding 105,000 BTU per hour shall be allowed.

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10.07: Joints and Connections

- (1) Copper Tubing (Potable Water Supply).
 - (a) Joining methods shall be in accordance with the manufacturer's installation instructions and the following:
 1. Soldered.
 - a. Every soldered joint for tubing shall be made with fittings.
 - b. Surfaces to be soldered shall be thoroughly cleaned, reamed, and returned to full-bore.
 - c. The joints shall be fluxed properly and fastened using lead free solder.
 - d. Joints shall be made by appropriate use of brass or wrought copper water fittings and be properly soldered together.
 - e. Solder filler metals used in the fabrication of solder joints in potable water applications shall be lead free.
 2. Flared Copper Tubing. Every flared joint for soft-copper water tubing shall be expanded with a flaring tool.
 3. Threaded.
 - a. All burrs shall be removed
 - b. Pipe ends shall be reamed and returned to size of full bore and all chips shall be removed.
 - c. Pipe joint compounds and tapes shall be used on male threads only.
 - d. Threaded joints used in the piping systems of the potable water supply system of a building shall be made with lead free polytetrafluoroethylene sealant
 - e. Every joint transitioning from copper tubing to threaded pipe shall be made by the use of brass or wrought copper adapter fittings.
 4. Brazed. Brazing filler metal and brazing fluxes utilized for the fabrication of brazed joints in domestic water supply and potable water distribution system piping shall be lead free.
 5. Mechanical Joints. All joining methods must follow material manufacturers' installation instructions.
 - a. Press-connect;
 - b. Push-fit in accordance with the proper standard;
 - c. Compression;
 - d. Grooved;
 - e. Flanged;
 - f. Tee Forming;
 - g. Ductile Iron;
 - h. Other Board Approved joining methods.

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(2) Cast Iron Soil Pipe.

- (a) Caulked Joints firmly packed with oakum or hemp shall be:
1. filled with molten lead that is not less than one inch-deep and does not extend more than $\frac{1}{8}$ inch below the rim of the hub; and
 2. Have lead run in one continuous pour and shall have the lead caulked tight.
- (b) Resilient Gaskets.
- (c) Hub-less Cast-iron Soil Pipe. Joints for hub-less cast-iron soil pipe and fittings shall be made with,
1. elastomeric sealing sleeve, stainless steel clamp, clamping screw and housing.
 2. Hub-less stainless-steel clamps for installation underground shall be listed for that type of installation by the clamp manufacturer.

(3) Aluminum DWV Pipe. Joints for connecting aluminum DWV pipe or aluminum DWV pipe to hub-less cast iron fittings shall be made with:

- (a) an end capped adaptor; and
- (b) an elastomeric sealing sleeve and stainless-steel clamp, clamping screw and housing.

(4) Plastic.

- (a) ABS, PVC and CPVC shall be installed in accordance with the manufacturers' installation

instructions and joined using the following methods:

1. Solvent weld following the primer and solvent manufacturer's installation instructions. Where primers are required, they shall be purple in color. Exception: Clear primer shall be allowed which is detectable by ultra-violet light. The licensee shall make a UV light detection device available at the time of inspection.
 2. Mechanical joints;
 3. Threaded joints;
 4. Shielded stainless-steel clamps.
- (b) Cross-linked Polyethylene (PEX).
1. All pipe, fittings and accessories used in the installation of Cross-linked Polyethylene (PEX) piping systems shall be approved by the product manufacturer for use with their system.
 2. All joints shall be made with pipe and fittings joined in the following manner:
 - a. Flared joints with tools specifically designed for use in this type of system and in accordance with the product manufacturers installation instructions
 - b. Mechanical joints installed in accordance with the product manufacturers installation instructions.
 - c. Push-fit joints installed in accordance with the product manufacturers installation instructions.
 - d. Compression joints installed in accordance with the product manufacturers installation instructions.
- (c) Polypropylene (PP).
1. All pipe, fittings and accessories used in the installation of Polypropylene (PP) piping system shall be approved by the product manufacturer for use with their system.

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2. All joints shall be made with fittings joined in the following manner:
 - a. Heat-fusion.
 - i. socket type;
 - ii. butt fusion;
 - iii. electro fusion.
 - b. Mechanical and Compression.
 - c. Threaded.

(5) Stainless Steel.

(a) Mechanical Joints.

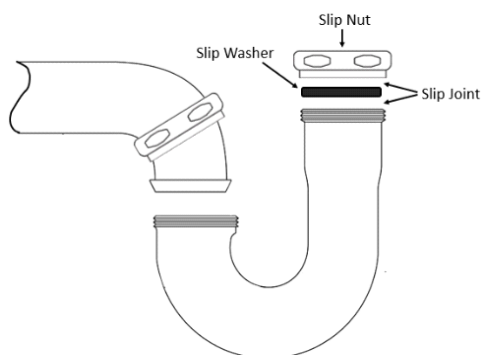
1. All joining methods must follow the material manufacturers installation instructions.
 - a. Compression;
 - b. Grooved;
 - c. Flanged;
 - d. Threaded;
 - e. Press-connect.

(b) Welded Joints.

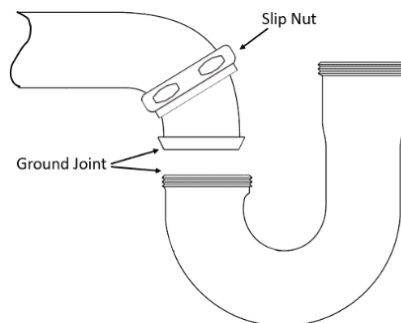
(6) Slip and Ground Joints.

- (a) Every slip joint shall be made using proper packing or gasket material. Slip joints may only be used on the inlet fixture side of a trap. *See 10.07: Example 1.*
- (b) Ground joint connections that allow the adjustment of piping while providing a rigid joint when made up shall be allowed within the trap seal. *See 10.07: Example 2.*
- (c) Devices including strainers, PO (pull out) plugs, tail pieces, waste arms, bathtub wastes and overflows, and any other similar fixture to trap connections made of ABS, PVC, copper alloy or other non-corrosive metal shall have a thickness greater than or equal to 17 gauge.

10.07: Example 1 - Slip Joint



10.07: Example 2 - Ground Joint



(7) Threaded Joints. All threaded pipe joints shall be in conformance with American National Taper Pipe Thread.

- (a) ABS or PVC (DWV) joints when threaded shall use the proper male or female threaded adapters.
- (b) Only thread tape, lubricant seal or other Product-accepted material as recommended by the manufacturer shall be used.

(8) Transition Joints Between Different Piping Materials:

(a) Cast Iron to Copper or Brass (DWV).

1. Copper or brass soil pipe adapter with caulked and poured lead joint.
2. Hub-less transition clamp installed in accordance with the clamp manufacturers' installation instructions.
3. Threaded using the proper copper or brass threaded adapter.
4. Shielded stainless-steel transition clamp

(b) Copper Tubing to Threaded Pipe.

1. Every joint transitioning from copper tubing to threaded pipe shall be made by using brass or wrought copper adapter fittings.

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10.07: continued

2. The joint between the copper pipe and the fitting shall be properly soldered and the connection between the threaded pipe and the fitting shall be made with a standard nominal pipe size connection.
Exception: Other Product Accepted forms of connecting copper to threaded pipe shall be allowed.
3. Dielectric unions and fittings shall be allowed and water heaters unless prohibited by the water heater manufacturer.
- (c) Threaded Pipe to Cast Iron. Joints between threaded brass, stainless steel, galvanized schedule 80 PVC/CPVC or materials listed in 248 CMR 10.13(2) and cast-iron pipe shall be either caulked or threaded or shall be made with approved adapter or transition fittings.
- (d) Plastic Pipe to Other Materials. Transitions shall be made with proper transition fittings listed by the manufacturer for their intended use.
 1. Cast Iron to PVC or ABS.
 - a. Spigot Hub joints shall be connected by caulking with lead and oakum or by using a compression gasket that is compressed when the plastic pipe is inserted in the cast iron hub end of the pipe. No adapters are required for this connection.
 - b. No-hub joints where the outside diameter of the two pipes or fittings to be joined are uniform in diameter may be joined with hub-less transition clamps.
 - (e) Aluminum DWV Pipe to Hub-less Cast-iron Pipe and Fittings. Joints for connecting aluminum DWV pipe or aluminum DWV pipe to hub-less cast-iron fittings shall be made with hub-less transition clamps.
 - (f) PVC to ABS. Joints for connecting PVC to ABS shall be made by:
 1. using a DWV male to female adaptor; or
 2. by a hub-less transition clamp.
 - (g) Special Joints and Connections: Unless specifically outlined in 248 CMR 10.07 or other applicable sections of 248 CMR 10.00, unlike piping materials shall be joined or connected to by use of adapters, transition fittings, prefabricated sealing ring or sleeve.
- (9) Unions (Water Supply & Distribution System).
 - (a) Ground joint connections that provide a rigid joint;
 - (b) Dielectric type for dissimilar metals.
- (10) Precast Requirements. Connection of piping concrete tanks shall be by means of an approved coupling with elastomeric gasket, waterproof flexible sleeve, or hydraulic cement.
- (11) Connections Between Drainage Piping and Certain Fixtures.
 - (a) Connections between drainage pipes and toilets, floor outlet service sinks, pedestal urinals, earthenware trap standards or other similar fixtures with floor outlets shall be fastened with brass, wrought copper, hard lead, iron or plastic flanges, that is caulked, soldered or solvent welded to the flanged connection.
 - (b) A gasket, washer or setting compound between the fixture and the flange is required.
 - (c) Brass, stainless steel or other corrosion resistant nuts and bolts shall be required.
 - (d) Flanges shall be secured to finished floor on which it sets using corrosion resistant screw or bolts.
- (12) Waterproofing of Openings.
 - (a) Joints terminating at the roof around roof drains and vent pipes shall be made watertight by the use of lead, copper, aluminum, or other flashing or flashing materials.
 - (b) Caps for extended roof flanges shall be made to fit tight to the inside circumference of the vent pipe. The cap shall not decrease the pipe opening by more than the thickness of the cap material.
 - (c) Exterior wall openings shall be made watertight.

10.08: Traps and Cleanouts

- (1) General Requirements. Fixture traps shall be of standard design, weight and in compliance with 248 CMR 10.06(2)(c) and (d). Exposed traps made of copper alloy tubing shall be a minimum of 17 gauge.

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10.08: continued

(2) Fixture Traps.

(a) Separate Traps for Each Fixture.

1. Separate Trapping Required.

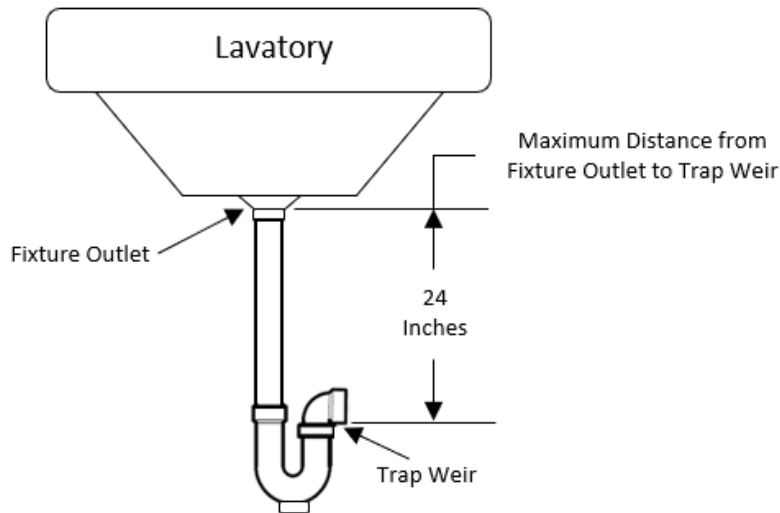
a. Individual plumbing fixtures shall be separately trapped by a water seal trap placed as close as possible to the fixture outlet. Exception: To the separate trapping requirements are as follows:

- i. Fixtures having integral traps.
- ii. A combination plumbing fixture may be installed on one trap provided one compartment is not more than six inches deeper than the other and the waste outlets are not more than 30 inches apart.
- iii. One trap may be installed for not more than three single compartment sinks or lavatories, immediately adjacent to each other, and in the same room. The trap is to be centrally located when three such fixtures are installed. The center-to-center measurement of the waste outlets shall not exceed 30 inches apart.

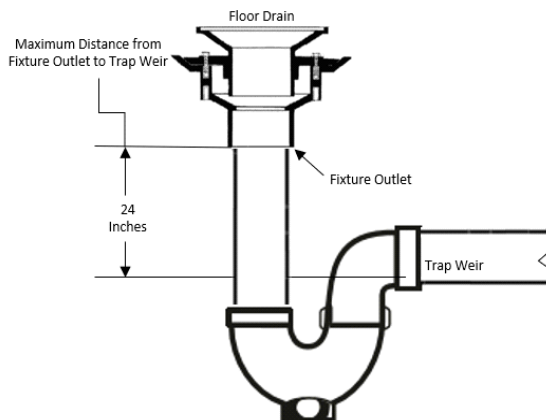
iv. The waste for a domestic dishwasher may be separately trapped, connected to the manufactured inlet side opening of a food waste disposer or connected between the outlet of the kitchen sink and the inlet of the trap using a "wye" fitting.

b. The vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches. *See 10.08: Examples 1 and 2.*

10.08: Example 1 - Vertical Distance from Fixture Outlet to Trap Weir



10.08: Example 2 - Vertical Distance from Fixture Outlet to Trap Weir



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10.08: continued

(b) Size of Fixture Traps.

1. The size of the fixture trap shall be sufficient to drain the fixture rapidly and in no case less than outlined in 248 CMR 10.08: *Table 1: Minimum Size of Fixture Traps.*
2. The fixture trap shall be the same pipe size as the drain into which it discharges.

Table 1
Minimum Size of Fixture Traps

PLUMBING FIXTURE	Trap Size in Inches
Bathtub (with or without overhead shower)	1½
Bidet	1½
Clothes washing machine connection	2
Combination sink and wash tray	1½
Combination sink and wash tray with food waste disposer unit	1½
Dental unit or cuspidor	1½
Dental Lavatory	1½
Drinking Water Station, with Drain	¼
Dishwasher, commercial	2
Dishwasher, domestic	1½
Floor drain	2
Food waste disposer	1½
Kitchen sink, domestic, with food waste disposer unit	1½
Kitchen sink (two compartments)	1½
Kitchen sink, domestic	1½
Lavatory, common	1½
Lavatory (barber shop, beauty parlor or surgeon's)	1½
Lavatory, (multiple type) (wash fountain or wash sink)	1½
Laundry sink (one or two compartments)	1½
Shower stall	2
Sink (surgeon's)	1½
Sink (flushing rim type with flushometer valve)	3
Sink (service type with floor outlet trap standard)	3
Sink (service trap with P trap)	2
Sink, commercial (pot, scullery, or similar type)	2
Sink, commercial (with food disposer unit)	2

(c) Prohibited Traps. The following type traps are prohibited.

1. Traps which depend upon moving parts to maintain their seal.
2. Bell traps.
3. Crown vented traps.
4. Separate fixture traps which depend on interior partitions for their seal.
5. Full "S" traps.

(d) Design of Traps.

1. Fixture traps shall be self-scouring and shall have no interior partitions except where such traps are integral with the fixture.
2. Slip or ground joints that are part of a trap shall meet the requirements on 248 CMR 10.07(6).
3. Each fixture trap shall have an accessible cleanout plug of ample size that is protected by the water seal.

Exception:

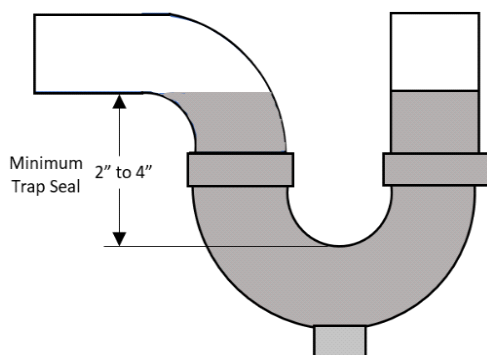
- a. Traps which are cast integrally or in combination with the fixture in which the trap seal is readily accessible or except when a portion of the trap is readily removable for cleaning purposes.
- b. Traps for floor outlet and similar fixtures including bathtubs and showers where a cleanout would not be accessible. A cleanout shall be installed in the nearest accessible location.

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(e) Trap Seal. Each fixture trap shall have a liquid seal of not less than two inches and not more than four inches, except where for special conditions, a deeper seal may be required. *See 10.08: Example 3.* The protection of trap seals from siphonage, aspiration, momentum, oscillation, back pressure, evaporation, or capillary action shall be accomplished by the appropriate use of soil or waste stacks, vents, re-vents, dry vents, wet vents, loop vents, circuit, or continuous vents, or combinations thereof, installed in accordance with the requirements of 248 CMR 10.16, so that at no time shall the trap be subjected to a pressure differential of more than one inch of water.

10.08: Example 3 - Minimum Liquid Trap Seal



(f) Trap Setting and Protection. Traps shall be set level with respect to their water seals and wherever necessary, shall be protected from freezing.

(g) Building and Running Traps.

1. Building and running traps shall not be installed unless in the opinion of the Inspector they are deemed necessary.

Exception: Where a trap in compliance with 248 CMR 10.08(2)(d) may be subject to freezing temperatures, a running trap may be installed in an area not subject to freezing but as close as possible to the fixture it serves.

2. Each building trap when installed shall be provided with an accessible cleanout and with a relieving vent or fresh air intake which need not be larger than $\frac{1}{2}$ the diameter of the drain to which it connects.

3. Open Parking Garages. Parking garages containing openings in exterior walls on two or more sides of each level of not less than 20% of the total perimeter wall space on that level.

a. Installation of traps for floors drains which are located on the open level(s) shall not be required.

b. A running trap shall be installed on the sanitary drain prior to entering the separation or containment system as required in 248 CMR 10.09(1)(a) and equipped with:

i. an accessible cleanout;

ii. a vent four-inch in size run independently through the roof.

c. Stacks shall be installed in intervals not exceeding 60 feet and in accordance with 248 CMR 10.16(3)(a).

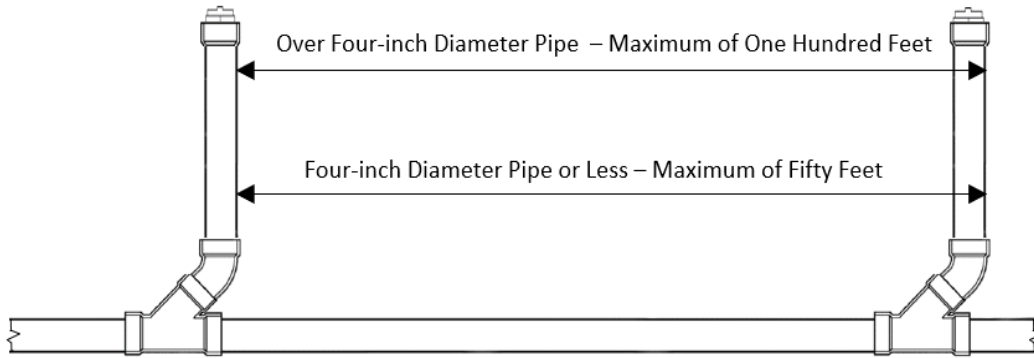
(h) Acid Resistant Trap. Where a vitrified-clay or other brittle ware, acid-resistant trap is installed underground, it shall be embedded in concrete extending six inches beyond the bottom and sides of the trap.

(3) Drainage Pipe Cleanouts.

(a) Location: Cleanouts shall be placed no more than 50 feet apart in all horizontal drainage piping and branch drain piping which is four-inch in diameter or less. On horizontal piping which is over four inch in diameter, cleanouts shall not be more than 100 feet apart. *See 10.08: Example 4.*

10.08: continued

10.08: Example 4 - Maximum Cleanout Distance on Horizontal Drain



(b) Cleanout plugs shall meet the following requirements.

1. Shall be composed of brass or plastic.
2. Shall meet the latest testing standards.
3. Shall have raised or countersunk square or hexagon heads.
4. If a tripping hazard may exist, only a countersunk head shall be used.
5. Plastic cleanout plugs shall be of the same material to which it connects.

(c) Underground Drainage. Cleanouts, when installed on underground drainage piping, shall be:

1. extended vertically to or above the finished grade level; or
2. extended to an accessible location immediately outside the building. *See 10.08: Example 9.*

(d) Change of Direction. Accessible cleanouts shall be installed:

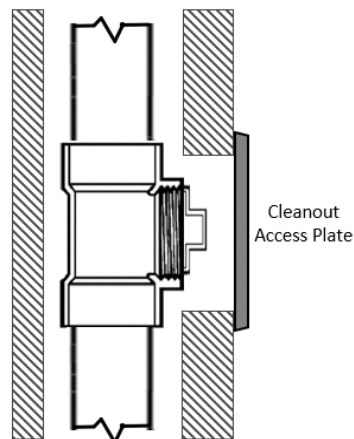
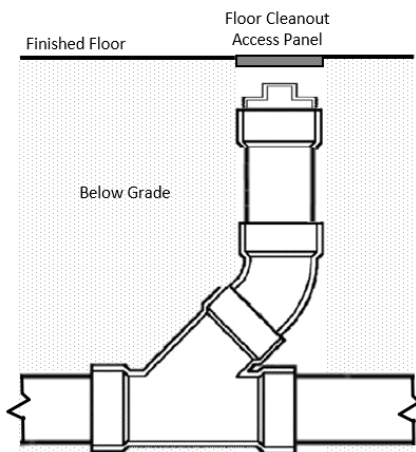
1. at each change of direction of the building drain; or
2. at each change of direction of horizontal waste or soil lines and branch lines, that are greater than 45°.

(e) Concealed Piping. Cleanouts on concealed piping shall be extended through and terminate flush with the finished wall or floor. Cleanouts located in floors, walls, pits, and chases may be left in the wall or floor provided an access panel of sufficient size to allow removal of the cleanout plug and proper cleaning of the system. *See 10.08: Example 5.*

10.08: Example 5

Concealed Cleanout in Floor

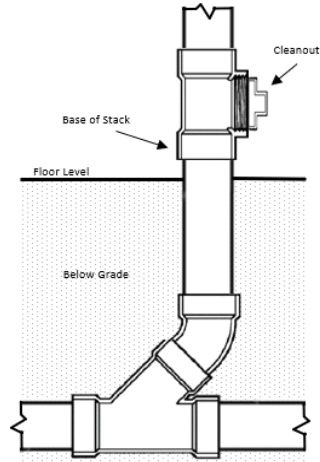
Concealed Cleanout in Wall



(f) Base of Stacks. A cleanout shall be provided at or near the base of each vertical storm water conductor, waste, or soil stack. *See 10.08: Example 6.*

10.08: continued

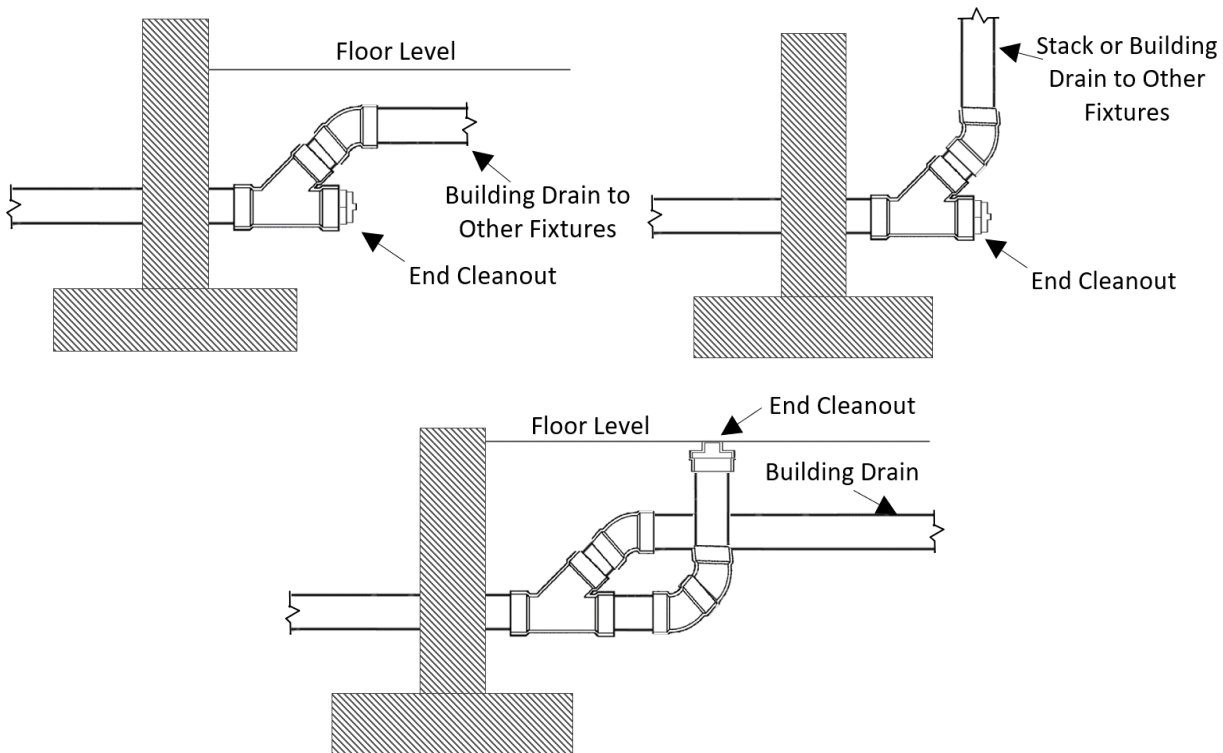
10.08: Example 6 - Cleanout at the Base of a Stack



(g) Building Drain at Foundation Wall.

1. There shall be a clean-out installed on the building drain so located as to provide accessibility in direct line through the building drain to building sewer.
2. If necessary, a pit or manhole shall be provided.
3. Piping configuration shall be installed as diagrammed in 10.08: *Example 7* and in compliance with 10.06: *Table 1* and consistent with the materials being installed.
4. An additional full-sized cleanout may be installed outside of the building but not more than five feet beyond the foundation wall.

10.08: Example 7 - Piping Configurations of Building Drains at Foundation Wall

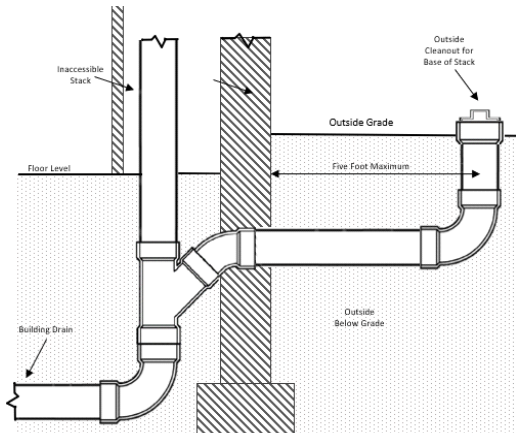


(h) Inaccessible Cleanouts. For buildings with concrete floors (slabs) or with less than 36 inches of crawl space under the floor, or where a cleanout is not easily accessible, the cleanout for the building drain may be installed outside of the building but not more than five feet beyond the foundation wall.

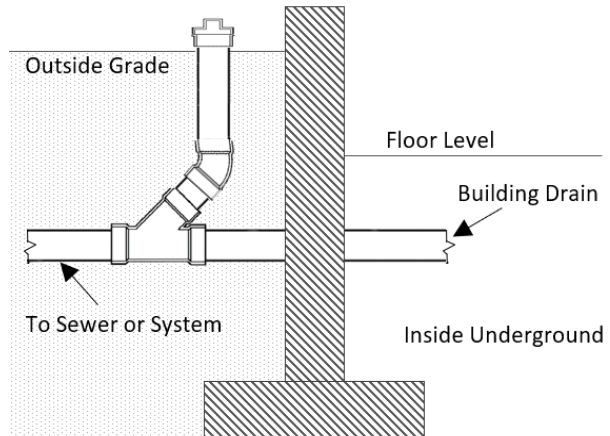
10.08: continued

10.08: *Examples 8 and 9*

10.08: Example 8
Inaccessible Cleanout at The Base of A Stack

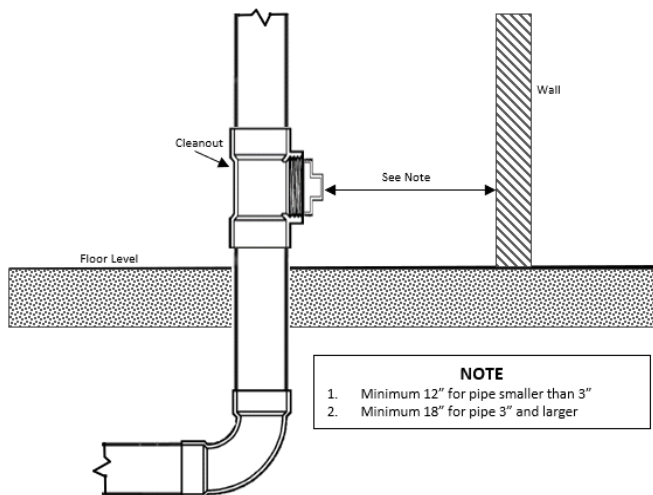


10.08: Example 9
Building Drain Cleanout Installed Outside



- (i) Direction of Flow. Every cleanout shall be installed so that the cleanout opens in the direction of the flow of the drainage line or at right angles thereto.
- (j) Cleanout Size: Cleanouts shall be of the same nominal size as the pipes up to four inches and not less than four inches for larger piping.
- (k) Cleanout Clearances. See 10.08: *Example 10*.
 1. Large Pipe - 18 Inch Clearance: Cleanouts on three inch or larger pipes shall be so installed that there is a clearance of not less than 18 inches for the purpose of clearing stoppages.
 2. Small Pipe - 12 Inch Clearance: Cleanouts smaller than three inches shall be so installed that there is a 12-inch clearance for the purpose of clearing stoppages.

10.08: Example 10 - Cleanout Clearances



- (l) Cleanouts Shall Be Kept Uncovered and Accessible.
 1. Cleanout plugs shall not be covered with cement, plaster, or any other permanent finishing material.
 2. Where it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided which will allow ready access to the plug for removal. See 10.08: *Example 5*.
- (m) Cleanout Equivalent: The cleanout equivalent may be satisfied by one of the following methods:
 1. a fixture trap that incorporate a union connection;

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2. a fixture with an integral trap; or
 3. roof drain covers that are readily removable without disturbing concealed rough piping.
- (n) Connections to Cleanouts Prohibited. Cleanout openings shall not be used for the installation of any new or additional plumbing except where another end-cleanout of equal access and capacity is provided.
- (o) Manholes for Large Pipes.
1. For underground and "dedicated system" piping that is over ten inches in diameter and is outside a building, manholes shall be provided and located at every change of size in diameter, alignment grade or elevation and at intervals of not more than 350 feet except when the total developed length of the drain is less than 150 feet, cleanouts may be installed at 75 intervals.
 2. Manholes shall conform to current standards and engineering practices.

10.09: Interceptors, Separators and Holding Tanks

(1) Interceptors, Separators and Holding Tanks Required. Interceptors, separators and holding tanks shall be provided to prevent the discharge of oil, gasoline, grease, sand, and other substances that are harmful or hazardous to building drainage systems, public and private sewer systems, systems governed by the Department of Environmental Protection (DEP), sewage treatment plants, or other environmentally sensitive areas. No wastes other than those requiring treatment or separation shall be discharged into any interceptor, separator, or holding tank.

(a) Separation or Containment of Gas, Oil, and Other Petroleum Distillates. Note: For purposes of 248 CMR 10.09, a motor vehicle shall be considered a self-propelled road vehicle, commonly wheeled, including but not limited to cars, buses, trucks, and tractors.

1. Required Locations. A separation or containment system shall be required for any building or structure containing:

- a. Motor vehicle parking, repair/maintenance, washing, and storage areas;
- b. Other spaces which are sufficiently large enough to allow access by motor vehicles.

Exception. A separation or containment system shall not be required for:

- i. Single family residential garages;
- ii. Multi-family, condominium, and apartment garages which are sufficiently small that they could only hold a maximum of six motor vehicles;
- iii. Buildings or structures whose floor is unfinished or paved such that the surface is sufficiently porous that any gas, oil, or other petroleum distillates would be absorbed by the surface prior to reaching any separation or containment systems;
- iv. Buildings or structures that are exclusively classified as a storage group pursuant to 780 CMR: *The Massachusetts State Building Code* which are sufficiently small that they could only hold a single motor vehicle and there is no other plumbing;
- v. Showrooms used for the purpose of selling used or new motor vehicles which are located within a structure classified by the Plumbing Code, 248 CMR 10.10(18): *Table 1*, as a mall (covered) or retail (mercantile) that is open to and used by the public; and
- vi. Installations where outside permanent bollards or other devices are spaced in front of entrances to the building or structure to prevent the entrance of a motor vehicle. Where permanent bollards are used, they shall be spaced no more than 48" apart.

c. Sump Pumps/Drains Used in Elevator Pits.

- i. Discharge from gravity drains or pumps entering the sanitary or storm drainage system shall comply with the requirements of 248 CMR 10.00. Elevators utilizing hydraulic oil or other petroleum distillates which may be harmful to the sanitary of storm drainage system shall discharge through a properly sized oil/water separator installed in compliance with 248 CMR 10.09.
- ii. Piping shall discharge into the building sanitary system.

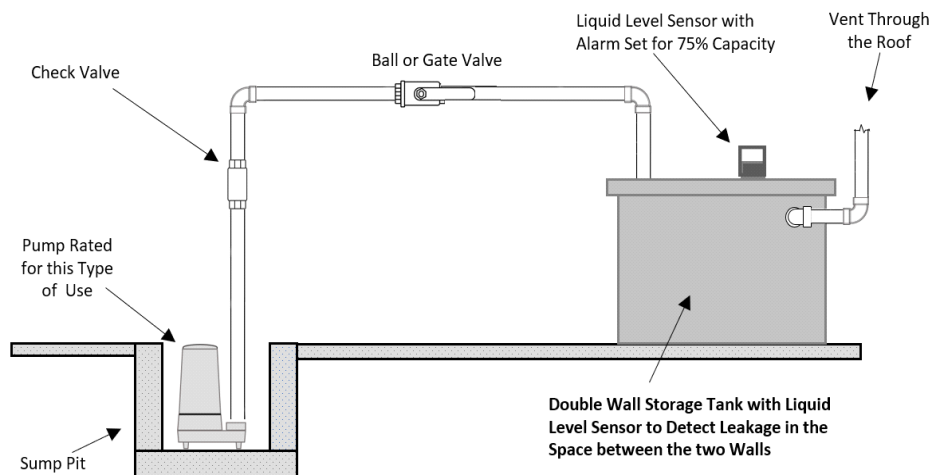
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Exception:

- i. Piping may discharge into the building storm drainage system if permitted by any local ordinance, bylaw, rule, or regulation.
 - ii. Product accepted pumps equipped with sensors which divert volatiles may be installed in lieu of a gas/oil separation system.
2. Rules for Separation Systems. For use when connecting to a sewer system
- a. In general, one of the following separation systems must be utilized:
 - i. A system meeting the design specifications outlined in 248 CMR 10.09: *Example 2* or such other specifications approved by the Board;
 - ii. A product accepted separation system;
 - iii. A separation system designed by a Massachusetts professional engineer who prepares all plans and specifications and certifies in writing to the inspector that the installation complies with these plans and specifications; or
 - b. Approvals of Other Agencies.
 - i. Where specifically noted, the approval of other agencies may be required to complete the installation of a separation system, however, said approvals shall not be deemed to supersede the requirements for a plumbing permit as well as full inspection by the plumbing inspector of all components and connections of a separation system. If the approval of another agency would necessitate a violation of 248 CMR 10.00 must be followed unless a variance is granted by the Board.
 - ii. Connection of a separation system to a sewer shall adhere to Massachusetts Department of Environmental Protection rules located at 314 CMR 7.00: *Sewer System Connection and Extension Permit Program.*
 - iii. When in an area governed by the Massachusetts Water Resources Authority (MWRA), notice of the installation of a separation system must be made to the MWRA prior to the issuance of a plumbing permit.
3. Rules for Containment Systems. When not connecting to a sewer system:
- a. When in an area governed by the Department of Environmental Protection, (DEP) notice of the installation of a containment system must be made to the DEP prior to the issuance of a plumbing permit.
 - b. For smaller installations involving a maximum of two vehicle bays, a pump connected to a double wall tank, both of which are rated by the manufacturer to hold volatile chemicals, meeting the following requirements. *See 10.09: Example 1.*
 - i. The tank must hold a minimum of sixty gallons per vehicle;
 - ii. The tank must be equipped with a liquid sensor to detect leaks; and
 - iv. The tank must be vented through a roof.
 - c. Piping for containment tanks shall comply with the following requirements:
 - i. The minimum inlet pipe size shall be four inch.
 - ii. The vent shall not be less than two inch and shall returned to the inside of the building and extend independently through the roof.
 - iii. Prior to being put into service, the tank and related piping shall be tested.
 - iv. Piping materials shall be limited to extra heavy, service weight and nu-hub.

10.09: Example 1 - Containment for Smaller Installations



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4. Vents for Floor and Trough Drains. The vents for floor/trough drains that convey waste from all gas, oil and other petroleum distillate separation or containment systems shall be independent of the sanitary DWV systems. Vents for these floor/trough drains may connect to the chamber vent of the separator or other containment system no less than six inches above the flood level rim of the floor/trough drain fixture. See 248 CMR (2)(g)3. for exception to trap requirements in open parking garages.

5. Design & Sizing of Separators. Where separators are required, they shall have a minimum volume of six cubic feet for the first 100 square feet of area drained, plus one cubic foot for each additional 100 square feet of area drained. In areas covered by 248 CMR 10.09 which may encounter excessive flow, separators shall be sized in accordance with manufacturers specifications.

a. Pre-cast or Built-in-place Separators. See 10.09: *Example 2.*

i. Shall be located outside of a building wherever possible and equipped with an access cover having a minimum diameter of 24 inches.

Exception: For separators which are installed inside a building, the access cover must be sealed tight.

ii. The minimum inlet pipe shall be four inch and the outlet shall be equal to or greater than the inlet.

iii. The invert of the inlet pipe shall be no less than four inches above the water line.

iv. The chamber vent shall be four inch in size and located as close as possible to the top of the tank.

v. The chamber and outlet vents shall be four inch in size, returned to the inside of the building and extend independently through the roof.

vi. All venting associated with the installation of a gas/oil separator shall be labelled.

vii. Access ladder steps shall be non-corrosive and spaced eighteen inches apart.

viii. All pre-cast separators shall meet or exceed the ASTM C-478 standard of 4,000 PSI

ix. Joint sections shall use butyl rubber joint sealant per ASTM C-990 standard.

x. All separator pipe penetrations shall be sealed using hydraulic cement or butyl rubber sealant per ASTM C-990 standard.

xi. All separators shall have a minimum liquid water seal depth of three feet.

xii. The distance from the outlet pipe to the base of the tank shall be a minimum of two foot six inches.

xiii. All piping penetrations on a pre-cast or built-in-place separator shall be sealed with hydraulic cement.

xiv. Prior to being put into service, the separator shall be filled with water and tested.

xv. Piping materials shall be limited to extra heavy, service weight and nu-hub cast iron.

xvi. Sizing of separator shall be in accordance with 248 CMR 10.09: *Table 10.09.*

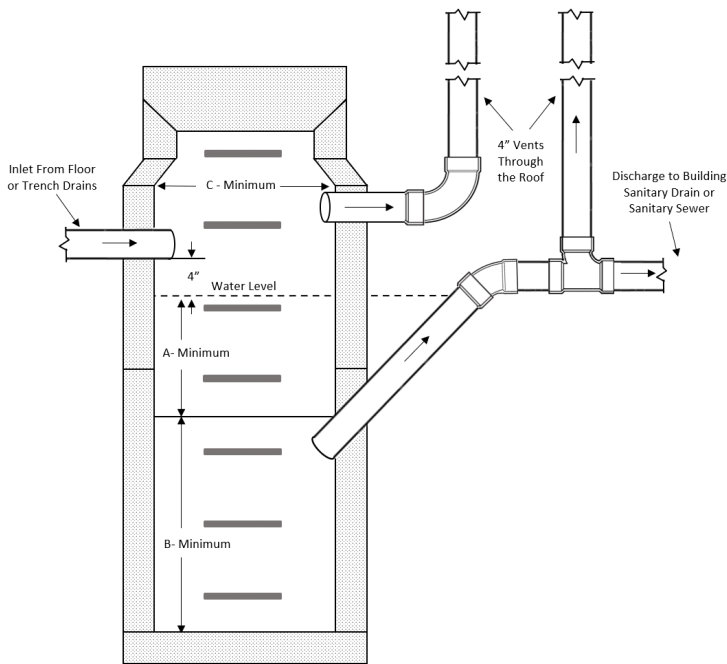
xvii. Discharge from storm separators may be connected directly to the building storm drain or storm sewer.

xviii. Discharge from sanitary separators may be connected directly to the building sanitary drain or sanitary sewer.

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10.09: Example 2 - Pre-cast



Inlet	A	B	
4"	3'-0"	2'-6"	3'-6"
5"	5'-0"	4'-0"	3'-6"
	3'-6"	3'-0"	4'-0"
	3'-0"	2'-6"	4'-6"
6"	5'-0"	4'-6"	4'-0"
	4'-0"	3'-6"	4'-6"
	3'-6"	3'-0"	5'-0"
8"	6'-0"	5'-0"	5'-0"
	4'-6"	4'-0"	5'-6"
	4'-0"	3'-6"	6'-0"
	3'-6"	3'-0"	6'-6"

(b) Grease Interceptors and Grease Removal Devices.

1. General Requirements.

Note: For purposes of 248 CMR 10.09, Grease Interceptors and Grease Removal Devices shall be considered "interceptors".

- Interceptors shall not be considered traps unless they meet the requirements of 248 CMR 10.08(2)(e)
- Interceptors shall be required to receive discharge from all fixtures and equipment which may produce grease-laden waste wherever food is prepared, or in other establishments where grease may be introduced into the sanitary drainage system.
- Only gravity interceptors, hydromechanical and engineered systems which have been tested and approved to the applicable standards shall be allowed.
- Grease removal is not required in dwellings or for fixtures which convey human waste.
- In unsewered areas refer to 310 CMR 15.00: *The State Environmental Code, Title 5: Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage* relative to grease removal at installations from which large quantities of grease can be expected to discharge.

2. Interceptors Installed Inside of Buildings.

- Properly sized interceptors may be installed on individual fixture waste branches or from multiple fixtures. *See 10.09: Example 3.*
- A vent shall be installed downstream of all interceptors
- Individual fixtures to be protected by interceptors shall include, but not be limited to:
 - pot sinks;
 - scullery sinks. Exception: Multiple Bay scullery sinks in patron areas for the purpose of serving alcohol, soda or other similar carbonated type beverages.
 - floor drains and floor sinks; Note: *See 248 CMR 10.09(1)(b)2.e.;*
 - automatic dishwashers regardless of temperature;
 - pre-rinse sinks;
 - soup kettles or similar devices;
 - wok-stations; and
 - automatic hood wash units.
- Waste branches for individual or multiple fixtures protected by interceptors may be sized equal to the inlet connection of the properly sized interceptor.

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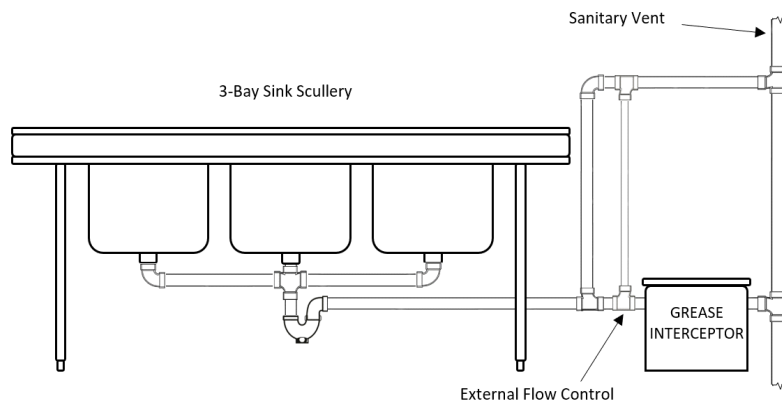
10.09: continued

e. Floor Drain, Floor Sink and Dishwasher Exception. Individual or multiple floor drains, floor sinks and commercial dish washing machines which may encounter grease shall be allowed to conduct grease directly to an outside grease trap or interceptor. Individual or multiple fixtures.

conducting grease to an outside grease trap or interceptor shall be considered a dedicated system.

f. Interceptors shall be located not more than 25 feet of the most remote fixture being served. Exception: When an exterior grease interceptor or trap is installed within 25 feet of the most remote fixture being served; an inside interceptor shall not be required.

10.09: Example 3 - For Individual or Multiple Fixtures



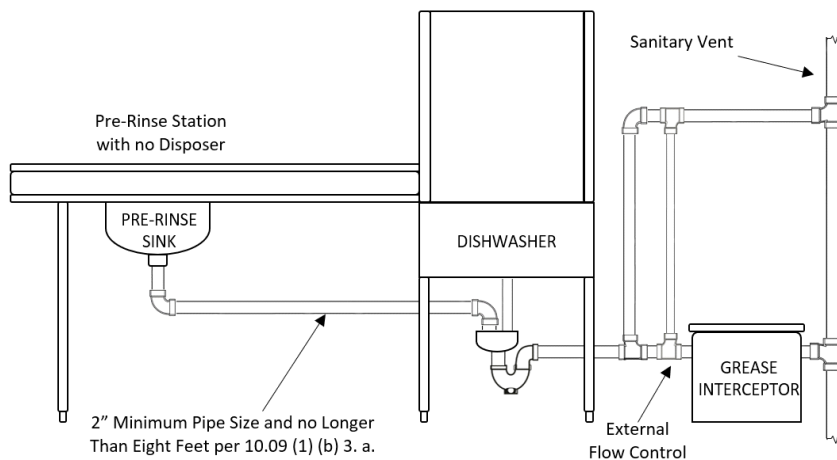
3. Food Waste Disposers and Pre-rinse Sinks.

a. A dishwasher pre rinse sink not equipped with a food waste disposer that conveys the waste discharge to a dish washing machine drain shall discharge through an interceptor and be a minimum diameter of two-inch. The total developed length of the horizontal waste drain from the dishwasher pre-rinse sink outlet to the weir of the dish washing machine trap shall not exceed eight feet. See 10.09: Example 4.

b. The waste discharge from a commercial food waste disposer shall not discharge into the sanitary drainage system through an interceptor. See 10.09: Example 5.

c. Dishwasher pre-rinse sinks equipped with food waste disposer shall be discharged in accordance with 248 CMR 10.10(4)(b).

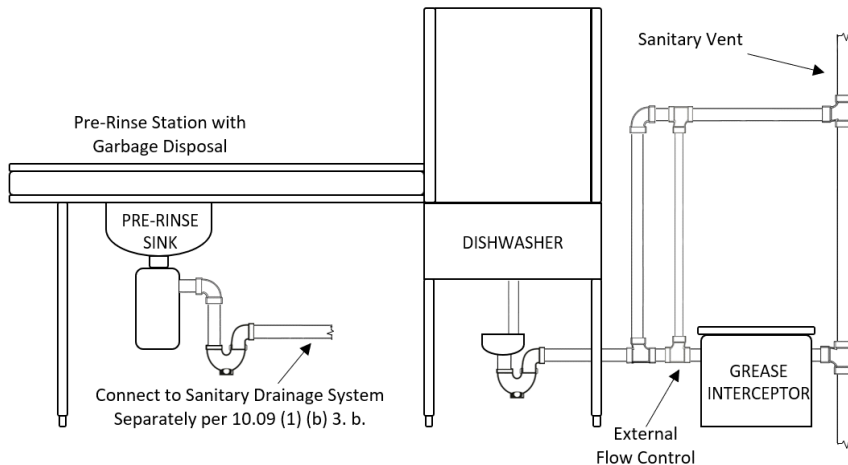
10.09: Example 4 - Pre-rinse Sinks and Dishwashers



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10.09 Example 5 - Pre-Rinse Sinks with Disposers



4. Sizing, Testing and Design. Interceptors shall be sized, tested, and designed in accordance with PDI-G101, PDI-G102, ASME A112.14.3, ASME A112.14.4, ASME A112.14.6 ANSI Z1001 or CSA B481 standards. The Board may authorize the use of alternate design interceptors in accordance with 248 CMR 3.04: *Product, Design, and Testing Standards.*
5. Capacity. Interceptors shall have a capacity of not less than two pounds of grease for each gallon-per-minute (GPM) of flow.
6. Flow Control Device.
 - a. Hydromechanical and Grease Removal Devices shall be equipped with flow control devices. A flow control device may be equipped with a vented (air intake) or be of an integral non-vented design. Integral non-vented flow control device shall be placed in accordance with manufacturers' installation instructions. A flow control device is required to be installed between the fixture and the interceptor in accordance with manufacturers' instructions.
 - b. When installing an interceptor with an external flow control, the vent for the flow control shall be connected to the buildings sanitary venting system. The flow control vent shall not be considered a fixture vent.
7. Water Cooled Interceptors/Separators. Water-cooled interceptors/separators are prohibited.
8. Interceptors Not Required.
 - a. Interceptors are not required for residential buildings, structures, dwellings, dwelling units or any private residence.
Exception: Interceptors shall be required in buildings deemed residential that incorporate commercial cooking accommodations.
 - c. Fixtures used for culinary purposes. *See* 248 CMR 10.12(1)(a)3.
9. Treatment Agents and Chemicals. Unless accepted by the Board, chemicals, liquids or agents of any type used for the primary purpose of emulsification and separation of grease that by formula allow grease to be transferred or conveyed from the trap or interceptor to the drainage system are prohibited.
10. Maintenance.
 - a. Grease and accumulated solids shall be removed from traps and interceptors and disposed of in accordance with applicable Federal, State and Local health code requirements by the owner or his/her agent. Federal, State and Local laws, regulations and by-laws may require monitoring and registration of installed traps and interceptors.
 - b. The local board of health official(s) or similar authority having jurisdiction may require other methods or programs to monitor maintenance of grease traps and interceptors.
11. Procedures for Sizing Grease Interceptors.
 - a. Recommended Procedures and Formulas for Installing Grease Traps and Interceptors. As a rule, it is recommended that traps and interceptors be sized in accordance with the formulas indicated in 248 CMR 10.09: *Tables 1 through 2.* It is favorable policy to size the interceptor so that its rated capacity is never less than forty percent of the individual fixture capacity in gallons.

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Example below: The actual fixture capacity is 59.8 Gal. and 40% of this is 23.9 Gal.

**248 CMR 10.09: Table 1:
Recommended Procedure for
Sizing Interceptors Inside Buildings
Example (Single Compartment)**

STEP 1. Determine the cubic content of the fixture by multiplying length x width x depth, (per compartment)	A sink 48" long by 24" width by 12" deep. Cubic content 48" x 24" x 12" = 13,824 cu. in. or Cubic contents 4' x 2' x 1' x 7.5 Gals. = 60 Gals.
STEP 2. Determine the total capacity in gallons. 1 gallon = 231 cubic inches	Contents in Gallons $\frac{13,824}{231} = 59.8$ Gals.
STEP 3. Determine actual drainage load. The fixture is normally filled to approximately 75% of the capacity with water. The items being washed displace about 25% of the fixture content, thus the actual drainage load = 75% of fixture capacity.	Actual Drainage Load .75 x 59.8 Gals. = 44.9Gals
STEP 4. Determine the flow rate and drainage period. In general, good practices dictate a one-minute drainage period, however where conditions permit, a two-minute period is acceptable. Drainage period is the actual time required to completely empty the fixture.	Calculate flow rate for one-minute period. Flow rate $\frac{44.9 \text{ Gals.}}{1 \text{ min.}} = 44.9$ G.P.M. For two-minute period Flow rate $\frac{9 \text{ Gal.}}{2 \text{ min.}} = 22.5$ G.P.M.
STEP 5. Select the interceptor which corresponds to the flow rate calculated. Note: Select larger size when flow rate falls between two sizes listed.	

NOTE: The example above is representative of acceptable method(s) when purchasing an interceptor based on the total fixture flow rate capacity in gallons. When purchasing an interceptor based on grease retention pounds only, multiply the total gallon flow rate capacity of the fixture by two.

**248 CMR 10.09: Table 2:
CAPACITY OF INTERCEPTORS**

Total Flow Through Rating (G.P.M.)	Grease Trap/Interceptor Retention Capacity (lbs.)
4	8
6	12
7	14
9	18
10	20
12	24
14	28
15	30
18	36
20	40
25	50
35	70
50	100
75	150
100	200

Note: For total flow through ratings (G.P.M) more than 100, double the flow through rating to determine the proper grease retention capacity in pounds.

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12. Grease Interceptors or Traps Installed Outside of the Buildings.
 - a. General Requirements. When other authorities or agencies require the installation of an outside grease interceptor/trap, the entire installation within the property line shall comply with 248 CMR 10.03. Where required, the design of said systems shall be specified by the authority or agency requiring the installation, however, said requirements shall not be deemed to supersede the requirements of 248 CMR 10.00.
 - b. This installation shall require a chamber vent which shall:
 - i. be piped to the inside of the building in compliance with 248 CMR 10.16; and
 - ii. shall be not less than four-inch minimum pipe diameter;
 - iii. The chamber vent may connect into the buildings sanitary venting system.
- (c) Special Use Interceptors and Separators.
 1. General Requirements. Individual fixture traps shall be installed when special use interceptors or separators are connected to the drainage system which do not meet the requirements of 248 CMR 10.08(2)(d) and (e).
 2. Commercial establishments which need to be protected by special use interceptors and separators shall include, but not be limited to:
 - a. Repair Garages;
 - b. Laundries;
 - c. Bottling Facilities;
 - d. Slaughterhouses;
 - e. Other facilities where products that are harmful or hazardous and may enter the building drainage system.
 3. Special use interceptors shall be:
 - a. designed and located as to be readily accessible for cleaning; and
 - b. have a wire or sand basket capable of preventing the passage of sand or solids likely to cause a stoppage into the drainage system.
 4. Sand interceptors shall have a water seal of not less than six inches.

10.10: Plumbing Fixtures

- (1) General Requirements.
 - (a) Fixture Materials and Quality. Plumbing fixtures shall be constructed from Product-accepted materials have smooth and impervious surfaces and be free from defects. Exception: Slip resistant surfaces in showers and bathtubs when required per testing standards.
 - (b) Overflows.
 1. Design. When any fixture is provided with an overflow, the waste shall be arranged so 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.
 2. Connection. The overflow from any fixture shall discharge into the drainage system on the inlet or fixture side of the trap, except that the overflow from a flush tank serving a toilet or urinal shall discharge only into the fixture served.
 - (c) Installation.
 1. Cleaning. All fixtures must be installed to afford easy access for cleaning both the fixture and the areas around it.
 2. Joints. Where a fixture meets walls and floors, the joint shall be watertight.
 3. Securing Fixtures. Floor outlet fixtures and wall hung fixtures shall be rigidly secured to the finished floor or wall by corrosion resistant screws or bolts, or other methods in compliance with manufacturers' instructions and codified in 248 CMR 10.05(17).
 4. Wall-hung Carriers and Supports. Wall hung fixtures shall be rigidly supported by a concealed metal Product-accepted fixture carrier so that no strain is transmitted to the fixture discharge connection.
 5. Setting. Fixtures shall be set plumb, level and in proper alignment with reference to adjacent walls and other plumbing fixtures.

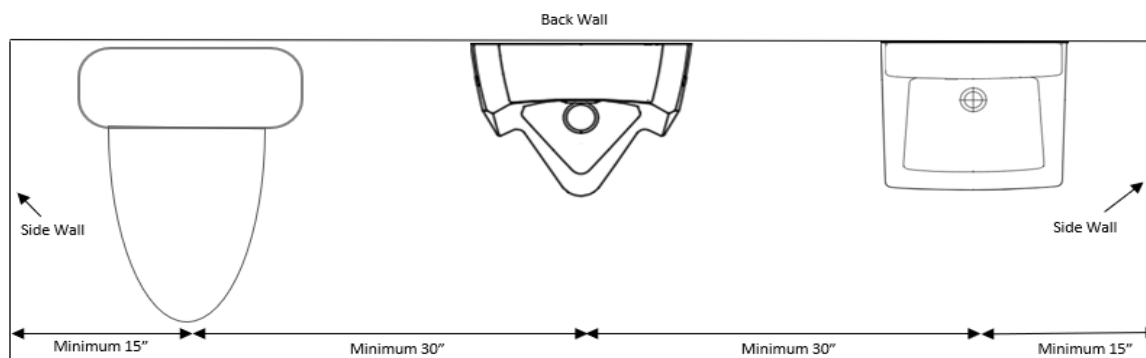
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6. Toilets, Urinals and Lavatories. Toilets, urinals, and lavatories in public and employee restrooms shall be located no less than 15 inches from the centerline of the fixture to the sidewall or 30 inches center-to-center to another fixture. See 10.10: *Example 1*. The minimum distance from the front of the fixture to an obstruction shall be no less than 21 inches.

Exception: Grab bars, paper holders or other accessories shall not be considered obstructions. These requirements shall not apply to fixtures for children covered under 606 CMR 7.00: *Standards for the Licensure or Approval of Family Child Care; Small Group and School Age and Large Group and School Age Child Care Programs*.

10.10 Example 1
Minimum Distances Public & Employee Rest Rooms



7. Lavatories. Lavatories in public and employee restrooms shall be located in the same rest room as the toilet.

Exception: Lavatories in hotels, motels and dwellings may be installed outside of but in close proximity to the bathroom.

8. Location of Fixtures. Plumbing fixtures or any other part of the plumbing system shall be installed in a manner as to not interfere with the proper operation of windows, doors or other equipment.

(d) Prohibited Fixtures. The following fixtures are prohibited.

1. Toilets with:
 - a. an invisible seal;
 - b. a mechanical seal;
 - c. a device that may allow siphonage from the bowl to the tank.
2. Urinals with:
 - a. trough drains;
 - b. stall type;
 - c. with an exposed trap;
 - d. an invisible seal.

(2) Toilets.

(a) Employee or Public. A toilet for public or employee use shall be of the elongated type. Exception: In facilities where fixtures are provided for use of children younger than six years old, toilets shall be sized suitable for their use.

(b) Flushing Device. A toilet tank shall have sufficient capacity to flush properly the toilet bowl with which it is connected.

(c) Float Valve and Ballcocks. A float valve or ballcock in a toilet flush tank shall be of anti-siphon design and shall provide sufficient water to refill the trap seal in the toilet bowl.

(d) Flushometer Valves.

1. A flushometer valve shall be so installed that it will be readily accessible for repairing.
2. When the valve is operated, it shall complete the cycle of operation automatically opening and closing positively under the service pressure.

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3. 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.
4. Means shall be provided for regulating the flushometer valve flow.
5. Not more than one fixture shall be served by a single flushometer valve.
6. Protection against backflow shall be provided as specified in 248 CMR 10.14(8).

(e) Seats. Toilets shall be elongated equipped with open-front seats of smooth non-absorbent material with or without covers. Seats must be of proper size to fit the related toilet.

Exception:

1. Elongated or round front toilets with closed front seats shall be permitted in single family dwellings, condominiums, apartments, dormitories, hotel and motel guest rooms and private office bathrooms.
2. Round front toilets with closed seats shall be allowed in daycare, pre-school, and kindergarten facilities in compliance with local Board of Health regulations.

(f) Toilets shall use a maximum of 1.6 gallons (6.0 liters) per flush.

(g) Toilets in public or employee rest rooms shall be installed using separate compartments to ensure privacy.

Exception:

1. Unisex/gender-neutral single user toilet rooms;
2. In childcare facilities where fixtures are provided for use of children younger than six years old.

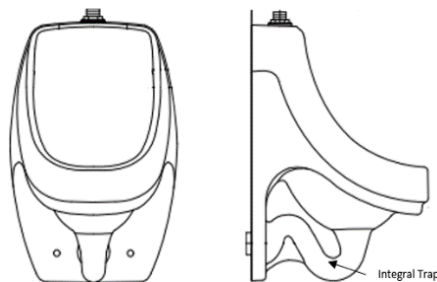
(h) Alternative Technology Toilet Systems.

1. Innovative alternative technology toilets may be installed in place of a liquid sealed toilet.
2. Alternative technology toilets are considered plumbing fixtures under 248 CMR 10.00 and therefore, plumbing permit requirements must be satisfied.
3. The alternative technology toilet system shall be manufactured to NSF/ASNI standards and shall be installed in compliance with the manufacturer's instructions.
4. For additional fixture requirements, refer to 248 CMR 10.10(15): *Table 1*.
5. Installations in areas where no potable water is available, hand sanitizer stations may be installed in *lieu* of the required lavatory with prior approval from the local board of health.

(3) Urinals.

(a) All urinals shall be of the type containing integral traps. *See 10.10: Example 2.*

10.10: Example 2 - Example of Urinal with Integral Trap



(b) Urinals shall be flushed only by means of an automatic flushing tank or flushometers equipped with a backflow preventer.

(c) Urinals shall use a maximum of one gallon (3.8 liters) per flush.

(d) Automatic Flushing Tank. A tank that flushes more than one urinal, shall be automatic in operation and shall be of sufficient capacity to provide the necessary water to flush and cleanse properly all urinals simultaneously.

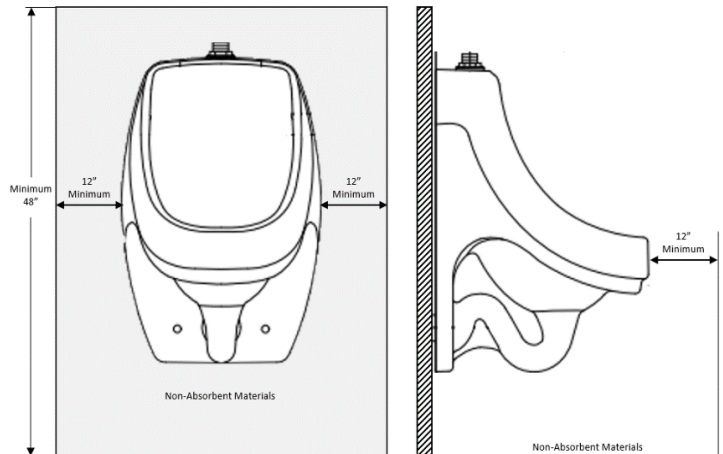
(e) Materials Surrounding Urinals in Facilities Other Than Private Residences.

1. The floor areas one foot in front of the urinal lip and one foot on each side of the urinal, and the wall areas to four feet above the floor, shall be finished with non-absorbent materials. *See 10.10: Example 3.*

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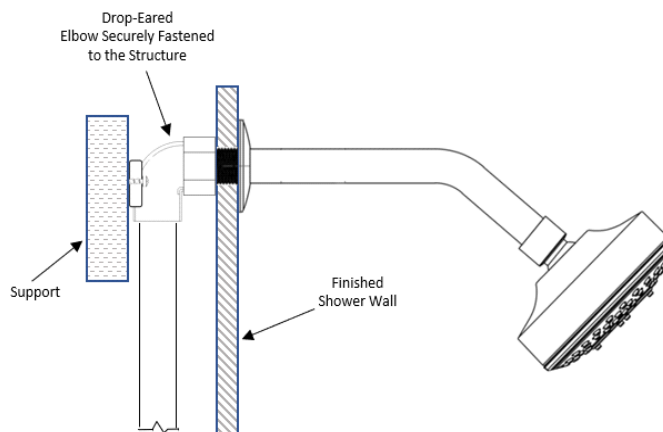
10.10: continued

10.10 Example 3 - Example Non-absorbent Materials Surrounding Urinals



- (f) Urinals shall be side shielded for privacy.
 - (g) Waterless Urinals.
 - 1. shall have a liquid barrier trap seal;
 - 2. shall be installed downstream of at least one water supplied fixture;
 - 3. shall have a water line roughed in for future use to each waterless urinal.
 - (h) Urinals may be substituted for toilets where indicated in 248 CMR 10.10, *Table 1 Minimum Facilities for Building Occupancy* and are listed by percentage.
 - (i) When urinals are installed in accessible rest rooms, at least one shall be set for handicapped use.
- (4) Bathtubs, Tub and Shower Units and Showers.
- (a) Shower Head Supply Riser. Every shower head supply riser or extension from the shower valve to the shower head outlet, whether exposed or not, shall be properly secured to the structure. *See 10.10: Example 4.*

10.10 Example 4 - Shower Head Securely Fastened to Structure



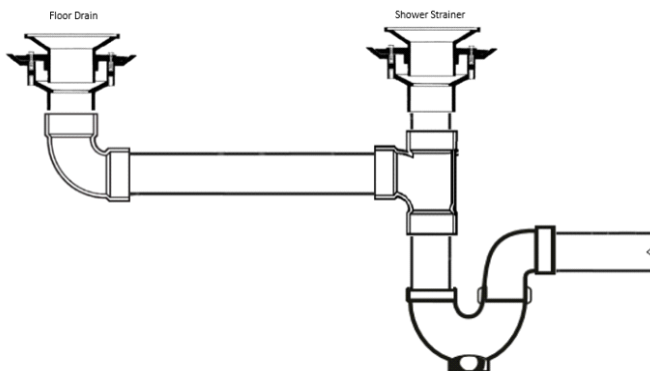
- (b) Drain Size
 - 1. The minimum size drain for a bathtub or tub and shower unit shall be 1½ inches.
 - 2. The minimum size drain for a shower with one 2.0 G.P.M shower head operating at one time shall be 1½ inches.
 - 3. The minimum size drain for a shower with more than one 2.0 G.P.M shower head which may operate simultaneously shall be two inches.
 - a. Multiple shower heads which operate simultaneously up to and including ten G.P.M shall have a minimum two-inch drain.
 - b. Multiple shower heads which operate simultaneously up to and including 20 G.P.M shall have a minimum three-inch drain.

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- c. Multiple shower heads which operate simultaneously up to and including 50 G.P.M shall have a minimum four-inch drain.
4. Waste outlets serving showers shall have removable strainers not less than three inches in diameter and shall have strainer openings not less than ¼ inch. Exception: Other shower strainers which are product-accepted.
5. Showers where multiple heads are installed and the individual shower space, area, stall or compartment is not provided with an individual waste outlet, the waste outlet shall be so located that the floor is designed and pitched so that wastewater from one shower head area does not flow over the floor area serving another shower head area.
6. Waste outlets shall be securely fastened to the waste pipe and make a watertight connection thereto.
7. Where a handicap accessible shower stall which does not incorporate a threshold is installed with an additional floor drain in the same bathroom, the waste outlet for the floor drain may connect to the vertical piping between the shower drain and the trap weir. See 10.10: *Example 5*.

10.10 Example 5 - Second Drain for Accessible Shower Stall with no Threshold



(c) Controls.

1. All control valves and diverters shall be installed to prevent by-passing of hot or cold water.
2. The water supply to a shower head shall be supplied through a Product-accepted individual thermostatic, pressure balancing or combination thermostatic/pressure balancing valve.
 - a. Hand-held showers shall also conform to 248 CMR 10.10(4)(c).
 - b. Hand-held showers shall be equipped with a properly installed vacuum breaker.
 - c. Hand-held showers shall be considered a shower head.
3. Shower heads shall use a maximum of 2.0 gallons per minute (G.P.M.).
4. All control valves shall be equipped with devices to limit the maximum outlet temperature of mixed water to 120°F and shall be adjusted by the installing plumber, prior to final inspection in accordance with 248 CMR 10.04(2)(b).
5. Central type automatic temperature control mixing valves may be used in *lieu* of individual control complying with ASSE 1070, provided that the temperature control mixing valve limits the maximum temperature of the hot water supplied to individual shower controls to 120°F during all periods when showers are in use.
 - a. A thermometer is required in the outlet piping of the automatic central control mixing valve for inspection and adjustment of temperature.
 - b. Check valves are required on the hot and cold-water inlets on all automatic central control mixing valves.
 - c. When the temperature in the incoming hot water supply piping to a shower station is controlled by an automatic temperature control mixing valve, individual shower controls maybe Product Accepted, two-handle or single-handle shower valves.

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(d) Showers.

1. Size. The interior height of all showers shall be at least 72 inches above the drain. Where glass enclosures are provided, the interior shall be capable of encompassing a 30" circle.

a. Square or Rectangular. The rough-in dimension of a square or rectangular shower shall be no less than 32 inches front to back and 32 inches side to side. *See 10.10: Example 6.*

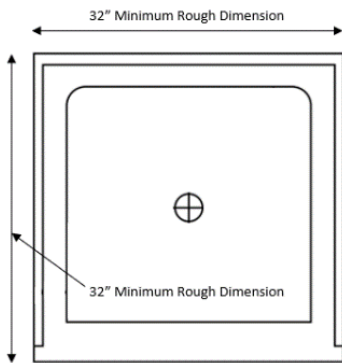
Exception: The minimum 32 inch rough-in dimension shall not apply to shower compartments with an overall rough-in dimension of not less than 30 inches in width provided the shower is at least 48 inches in length.

b. Neo-Angle. The rough-in dimensions of a neo-angle shower shall be no less than 38 inches

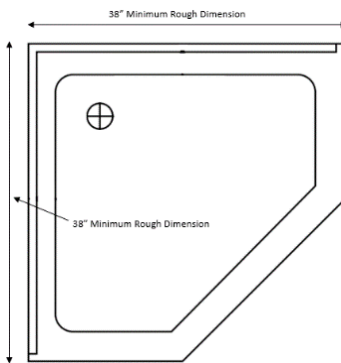
front to back and 38 inches side to side. *See 10.10: Example 7.*

c. Neo-round. The rough-in dimensions of a neo-round shower shall be no less than 36 inches front to back and 36 inches side to side. *See 10.10: Example 8.*

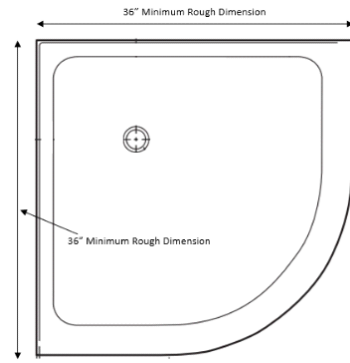
10.10: Example 6
Square or Rectangle



10.10: Example 7
Neo-Angle



10.10: Example 8
Neo-Round



2. Floors and Receptors.

a. Floors or receptors under shower compartments shall be laid on or be supported by a smooth and structurally sound base.

b. Manufactured shower pans, shower bases, and shower receptors shall be installed in accordance with the manufacturer's installation instructions.

b. Floors under shower compartments, other than those laid directly on the ground surface or where prefabricated shower base receptors have been provided, shall be lined, and made watertight by the provision of suitable shower pans of durable Product-accepted materials.

c. Shower pans shall turn up on all sides other than the threshold at least three inches above the finished threshold level when one is present.

d. Shower pans shall be securely fastened to the waste outlet at the seepage entrance making a watertight joint between the pan and the outlet.

e. Floor surfaces shall be constructed of smooth, non-corrosive, nonabsorbent, and waterproof materials.

f. Where showers are installed without a threshold and an additional drain is installed in the floor within the same bathroom, the waste for the second drain may be connected directly to the inlet side of a properly sized and vented trap. *See 10.10: Example 5.*

3. Outside Showers. Outside showers are not a requirement of 248 CMR.

a. When tempered water is provided, these showers shall meet the requirements of 248 CMR 10.10(4)(c).

b. Drains for outside, uncovered showers shall not be required.

(e) Built-in Bathtubs. The wall area above built-in tubs having installed shower heads shall be constructed of smooth, non-corrosive, and non-absorbent, waterproof materials to a height not less than 72 inches above the floor level. Such walls shall form a watertight joint with each other and with the bathing tub.

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- (f) Free Standing Tubs and Whirlpool Baths.
 - 1. The hot water supply temperature shall not exceed 120°F controlled by a temperature limiting device conforming to ASSE 1070.
 - 2. For whirlpool baths, access shall be provided for service, repair, or replacement of the circulation pump.

- (4) Food-Waste Disposers.
 - (a) Residential or Domestic Food-waste Disposers. Domestic food-waste disposer units shall be connected to a drain of not less than 1½ inches in diameter.
 - (b) Commercial Food-waste Disposers.
 - 1. Commercial food-waste disposers shall be connected to a drain of sufficient size to serve the unit, but in no case connected to a drain of less than two inches in diameter.
 - 2. Commercial food-waste disposers units shall be connected and trapped separately from other fixtures or compartments.
 - 3. These disposers shall be separately connected to a waste stack or branch drain.
 - 4. All Commercial food-waste disposers shall be provided with an adequate supply of cold water properly protected from backflow at a sufficient flow rate to insure proper functioning of the unit.

- (5) Drinking Fountains. (Drinking Water Station)
 - (a) The minimum size trap for a drinking water station shall not be less than one and one quarter inches in nominal diameter.
 - (b) All drinking water stations shall be of the self-closing type and comply with the requirements of NSF-61.
 - (c) Drinking water stations shall not be installed in toilet rooms.
 - (d) When installing a drinking water station without a drain, rough plumbing shall be installed to facilitate a future connection.
 - (e) For purposes of 248 CMR 10.00, bottle filling stations with a drain shall be considered as drinking water stations.
 - (f) With relation to 248 CMR 10.10: *Table 1*, bi-level drinking water stations shall be counted as one fixture.
 - (g) Drinking fountains shall be permitted to discharge directly or indirectly into the sanitary drainage System.

- (6) Floor/Trough Drains.
 - (a) Floor/trough drains shall have integral or separate traps providing a minimum water seal of three inches and shall incorporate removable strainers.
 - (b) Floor/trough drains shall be constructed so that they may be readily cleaned, and the drain inlet shall be easily accessible.
 - (c) Floor/trough drains subject to backflow shall be provided with back water valves.
 - (d) Floor/trough drains shall be of a size to serve efficiently the square foot floor area to be served or the purpose for which they are intended. Floor/trough drain outlets shall not be less than two inches in nominal diameter.
 - (e) Proper Installation and Protection Against Loss of Trap Seal.
 - 1. The design and installation of floor/trough drains shall be at a grade to enable complete floor drainage from all directions.
 - 2. All floor/trough drains shall be installed with a readily accessible automatic trap-resealing device. *See 10.10: Example 9.*

Exceptions:

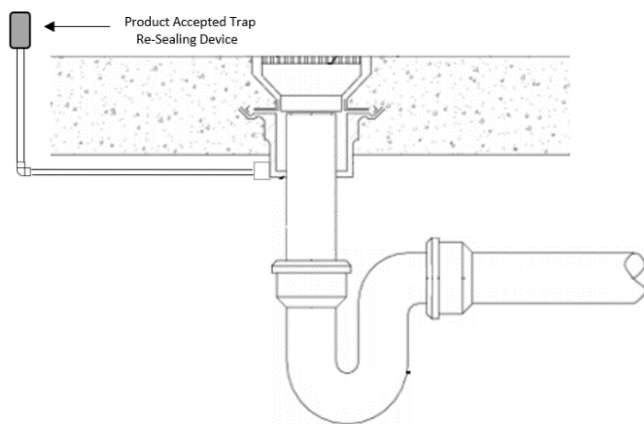
 - a. Floor/trough drains that receive a continuous or semi-continuous discharge from indirect waste fixtures pursuant to 248 CMR 10.12 may be allowed.
 - b. Product-accepted barrier type floor drain trap seal protection devices shall be allowed in a single room with multiple floor drains for up to 90% of the drains provided at least one automatic trap-priming device is present. These devices shall not be allowed in a single room with only one floor drain.
 - c. an accessible wall hydrant within the room may be substituted for a trap-priming device.

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3. Floor/trough drains that receive special hazardous waste shall comply with 248 CMR 10.13.
- (f) Floor/trough drains shall be required in all commercial/industrial and multi-family laundries.
- (g) Floor/trough drains shall be required in all commercial boiler rooms.
- (h) Floor drains shall be required in all commercial or public rest rooms containing more than one flushing fixture. Where a urinal is present, the floor drain shall be installed in the same vicinity.

10.10: Example 9 - Trap Resealing Device



- (7) Dishwashing Machines.
 - (a) Waste Discharge.
 1. Domestic. The waste discharge shall comply with 248 CMR 10.08(2)(a)1.c.iv.
 2. Commercial.
 - a. Dishwashing machines that discharge by gravity shall be indirectly connected except when the machine is located above or within five feet of a trapped floor drain, the waste may be connected directly to the inlet side of a properly vented floor drain trap.
 - b. Dishwashing machines that incorporate drainage discharge by pumping shall discharge waste to the sanitary drainage system in accordance with the manufacturer's recommendations.
 3. Portable Dishwashers. Residential portable dishwashing machines may discharge over the rim of a properly trapped and vented fixture.
- (8) Automatic Clothes Washing Machine.
 - (a) Requirements. A washing machine connection shall consist of a piping arrangement including hot and cold-water supplies and a properly sized trapped and vented drain connection in conformance with the following:
 1. One- and Two-family Dwellings. At least one washing machine connection. If only one washing machine connection is provided, it shall be located so that each occupant in the dwelling has access to the washing machine that may be affixed to the washing machine connection.
 2. Multiple Dwelling.
 - a. One washing machine connection for every ten dwelling units, or fraction thereof.
 - b. Dormitories. In dormitories, one washing machine connection for every ten dwelling units or fraction thereof. For purposes of post-secondary school residential dormitories, the Board considers one dwelling unit to be equivalent to four students.
 - c. Washing machine connections shall be located so that each occupant in the dwelling has access to the washing machine that may be affixed to the washing machine connection.
 - (b) Water Supply. The water supplies to clothes washers shall be protected against backflow by the use of an air gap or a backflow preventer.

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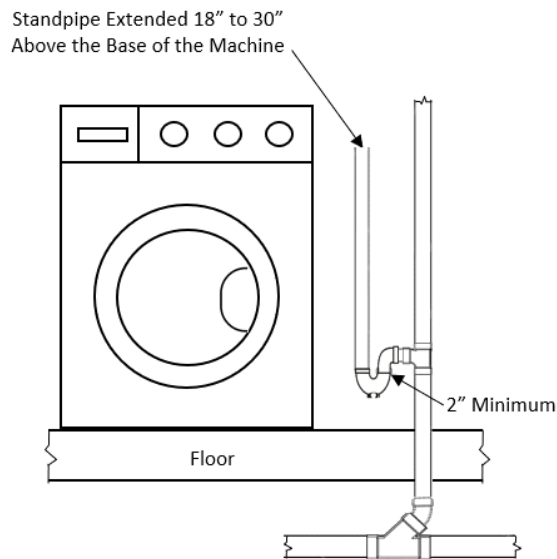
10.10: continued

(c) Waste Discharge.

1. Residential Machines.

- a. The waste from a clothes washer shall discharge through an air-break into a standpipe or laundry/kitchen sink provided the fixture trap is two inches or larger.
- b. The standpipe shall extend not more than 30 inches nor less than 18 inches above the base of the machine and shall not be less than two inches in diameter. The trap shall not be installed below floor level. *See 10.10: Example 10.*
- c. Discharge into a properly sized floor drain shall be allowed provided a standpipe receptor is tapped and properly installed in the cover of the floor drain.

10.10: Example 10 Residential Washing Machine Drain

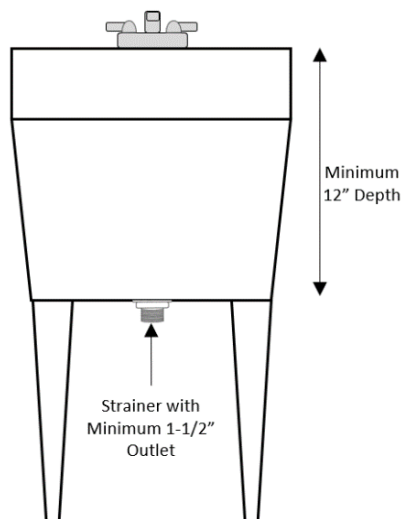


- 2. Commercial (Laundromats). The minimum size of a trap and standpipe shall be not less than two inches in diameter, and shall connect to a drain large enough in size to receive the simultaneous discharge of 75% of all clothes washing machines connected thereto.

(9) Laundry Sinks, Service Sinks, and Mop Receptors.

- (a) Laundry sinks shall have a minimum depth of 12 inches, a minimum waste outlet of one and one half inches and be equipped with a strainer. *See 10.10: Example 11.*
- (b) Service sinks and mop receptors shall have a minimum waste outlet of two-inch and be equipped with a removable strainer. The floor areas one foot in front of the sink/receptor, one foot on each side, and the wall areas to one foot above shall be finished with non-absorbent materials.

10.10: Example 11 - Laundry Sink



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(10) Lavatories and Hand Washing Sinks.

(a) Public and Employee.

1. The maximum hot water temperature for shall be 120°F.
2. The maximum flow rate for faucets shall not exceed 0.5 gallons per minute (G.P.M.)
3. The maximum flow rate for metering faucets shall not exceed 0.25 gallons per metering cycle.

(b) Residential. The maximum hot water temperature shall be 130°F.

(c) Multiple Type Lavatory (Group Wash Sink). For drain and water pipe sizing purposes, every 20 inches of usable length shall be considered one lavatory.

(11) Garbage/Trash Receptacle Washers.

(a) Garbage/Trash receptacle washers shall be separately trapped and vented.

(b) The fixture receiving the waste from garbage/trash receptacles shall be provided with a removable basket or strainer to prevent discharge of large particles into the building drainage system.

(c) Any water supply connection shall be protected against backflow by an air gap or Product-accepted backflow prevention device.

(12) Special Fixtures and Specialties. Baptisteries, ornamental and lily pools, aquaria, ornamental fountain basins, fish tanks and similar type fixtures when provided with water supplies, shall be protected from back siphonage. Exception: Baptistries and similar type fixtures shall be allowed to discharge separately and directly to a drywell in the ground. If discharged into a drywell, the drain would not need to be trapped or vented.

(13) Emergency Wash Systems. Wherever people are employed, emergency wash systems shall be required in all areas where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities or quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

(a) The systems shall include but not be limited to Drench/Deluge Showers, Hand-held Body/Face Washers and Deck Mounted Drench Hoses.

(b) The systems shall be in the same room and as close to the main door as possible but in no case exceeding locations that take no more than ten seconds to reach.

(c) Safety showers shall be capable of discharging a continuous spray at a rate of 20 Gallons Per Minute for 15 minutes at a temperature between 60°F and 100°F and sized for two emergency showers operating simultaneously.

(d) Piping for systems shall be installed in a manner that prevents the stagnation of water. Piping from the main to each individual emergency equipment fixture connection shall not exceed a developed length of 15 feet.

(e) The permit holder shall provide the local plumbing and gas inspector with a signed document from the owner or owner's agent assuring weekly flushing operation of each fixture as required by ANSI Z-358.1 and OSHA will be of long enough duration to empty the volume of supply water from the circulated tempered piping loop main to the fixture outlet.

(f) Additional design features for emergency systems may be designed by a Massachusetts professional engineer. The design shall assure that the piping installation, including pipe sizing, dimension, and other aspects, meet the requirements for proper functioning and safety. Once the installation is complete but prior to final inspection, the installer must provide the Inspector with written certification by a Massachusetts professional engineer that the installation complies with the design drawings and specifications. The Inspector shall not be responsible for approving or inspecting design specifications but must ensure the installation adheres to the provisions of 248 CMR.

(g) In existing facilities and smaller renovation projects consisting of five or less emergency fixtures where tempered water is inaccessible, cold potable water shall be permitted with prior permission of the fire prevention safety officer.

(h) Emergency Wash Stations are required and shall be installed in the laboratory classrooms of schools, colleges, and universities where corrosive materials, flammable liquids, and/or open flame devices are utilized.

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(14) Funeral Establishment Preparation Rooms. Funeral establishment preparation rooms shall comply with the provisions of 239 CMR 3.07: *Preparation Room*

(a) The preparation room of a Funeral establishment shall be provided with a floor drain and flushing rim sink with proper backflow protection compliant with 239 CMR 3.07(4).

(b) An additional reduced pressure zone backflow preventer shall be installed on the water distribution system to the building at the outlet side of the meter or main control valve.

(c) Emergency Wash Stations shall be installed and be compliant with the provisions of 239 CMR: *Board of Registration in Embalming and Funeral Directing*.

(15) Minimum Facilities.

(a) All inhabited buildings and structures shall contain plumbing facilities including persons with disabilities as required in 521 CMR: *Architectural Access Board*. 248 CMR 10.10 shall apply to new buildings, additions, and changes where a plumbing permit is required.

(b) Dwellings. Whenever plumbing fixtures are installed, the minimum number of each type of fixture shall comply with the requirements of 248 CMR 10.02(6)(b), 248 CMR 10.10(14): *Table 1 Minimum Facilities for Building Occupancy* and 105 CMR 410.00: *Minimum Standards of Fitness for Human Habitation State Sanitary Code, Chapter II*.

(c) Establishing Fixture Requirements.

1. Total fixture requirements shall be determined by using 50% male and 50% female. The occupancy ratio of 50% for each sex shall not be required when statistical data indicates the occupancy of the facility would be other than 50% for each sex.

a. In buildings or structures containing multiple classifications under 248 CMR 10.10: *Table 1*, all classifications shall be satisfied when determining the total fixture requirements.

2. If a fraction should occur while determining the number of plumbing fixtures required in 248 CMR 10.10(14): *Table 1 Minimum Facilities for Building Occupancy*, rounding up to the next fixture shall be required.

3. Separate facilities shall be provided for each sex.

Exception: In establishments other than residential where the maximum number of employees and patrons do not exceed 20 and the total gross square footage does not exceed 2,000.

4. In establishments other than residential, rest room facilities shall be clearly designated and no further than 400 feet in developed direct distance away from the regular place of daily work activity of any person for whose use it is required. Elevator usage may be taken into consideration when determining the developed direct distance. In multi-story buildings, access to the required toilet facilities shall not exceed one vertical story. Access to the required toilet facilities for customers shall not include passing through areas designated as for employee use only such as kitchens, food preparation areas, storage rooms, closets, or similar spaces. Toilet facilities accessible only to private offices shall not be included to determine compliance with 248 CMR 10.10(15).

5. In establishments other than residential or industrial where the total number of employees that can be accommodated at any one time is 20 individuals and the total gross space is less than 2,000 square feet, or do not have reasonable access (within 400 feet and on the same floor level) to core or common toilet facilities, one toilet room located within the establishment provided with the number of fixtures according to the standard set forth in 248 CMR 10.10(14): *Table 1 Minimum Facilities for Building Occupancy* for employee facilities shall meet the minimum requirement.

6. In every business or commercial establishment where only one person is employed, there shall be one toilet and one lavatory within the establishment or a core toilet facility located within 400 feet of the establishment. The number of fixtures in the core or common toilet facilities shall be in accordance with 248 CMR 10.10(14): *Table 1 Minimum Facilities for Building Occupancy or Employee Toilet Facilities, Non-industrial*.

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7. When individual rest rooms are installed in business or commercial establishments which also contain core facilities, the individual rest rooms may not be included in the core facility fixture count requirements of 10.10(14): *Table 1*.
8. Additional fixtures installed over and above the requirements of 248 CMR 10.10 shall be allowed.
9. Agricultural Buildings and structures used exclusively for agriculture including, but not limited to, farming and livestock and are uninhabited shall not be required to have facilities.
 - a. Dairy Farms. A facility or structure where cows are kept and all or part of the dairy products produced are sold or delivered for sale. The minimum fixture requirements shall be determined using the maximum number of employees on duty at any one time.
10. For Places of Assembly, the minimum fixture requirements shall be determined by:
 - a. The number of seats in the establishment; and
 - b. The maximum number of employees on duty at any one time.
 - c. For establishments serving food and/or beverages which may be consumed and the premises, inside and outside seating shall be included when determining fixture requirements if the outside seating is provided by the establishment for use by patrons only;
 - d. For places of worship which also have a function hall/multi-purpose area, the fixture requirements for the halls/areas shall be calculated separately based on the use. Core facilities shall be allowed provided enough fixtures are installed to accommodate the total occupancy for the worship area and the function hall/multi-purpose area combined, and the rest rooms are located within 40 feet within the same building. If core facilities are used, rest rooms shall be required on every other floor level.
 - e. For public beaches, fixture requirements shall be based on persons per parking spaces available.
11. For Places of Business, the minimum fixture requirements shall be determined by:
 - a. The average number of patrons visiting at any one time; and
 - b. The maximum number of employees on duty at any one time.
12. For Educational Facilities, the minimum fixture requirements shall be determined by:
 - a. Pre-school and Day Care.
 - i. The total combined number of staff and children
 - ii. Refer to 606 CMR 7.00: *Standards for the Licensure or Approval of Family Child-care, Small Group and School Age and Large Group and School Age Child-care Programs* for requirements regarding additional plumbing fixtures in this type of occupancy.
 - b. Public and Private Kindergarten through Post-secondary (Students). Seating capacity
 - c. Public and Private Kindergarten through Post-Secondary (Staff). The maximum number of staff on duty at any one time
 - d. Students Younger than Six Years Old.
 - i. Unisex/gender-neutral toilet facilities may be installed.
 - ii. Lavatories may be installed in classroom areas or the toilet rooms.
 - e. Public and private schools, kindergarten, elementary, middle, and high schools:
 - i. Separate toilet facilities shall be provided for teachers and other staff employees on every other floor-level.
 - ii. Rest rooms for students shall be provided on every floor level.
 - f. Post-Secondary schools:
 - i. Separate toilet facilities shall not be required for teachers and other staff employees
 - ii. Rest rooms for students shall be required on every other floor level.

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- g. All secondary and post-secondary schools that conduct sporting programs or physical activities on the school premises or grounds and include a gymnasium where the activities may be conducted shall provide separate men and women shower facilities to accommodate the students.
 - h. Where core rest rooms are installed, lavatories may be installed in an area common to both males and females directly outside the toilet facilities within the rest room area. The minimum number of lavatories shall be determined by the total fixture count as required in 248 CMR 10.10: *Table 1*.
13. For Industrial & Warehousing Facilities, the minimum fixture requirements shall be determined using the maximum number of employees on duty at any one time.
14. For Institutional Facilities, the minimum fixture requirements shall be determined by:
- a. Detainees: The total number of cells in the detention area.
 - b. Staff: The maximum number on duty at any one time.
15. For Medical Facilities, the minimum fixture requirements shall be determined by:
- a. Hospitals and Nursing Homes.
 - i. Patients: The total number beds.
 - ii. Staff: The maximum number on duty at any one time.
 - iii. Visitors: The maximum number of seats in the waiting rooms.
 - b. Facilities and Offices where Procedures may be Performed.
 - i. Patients: The maximum number who may be in the facility at any one time.
 - ii. Staff: The maximum number on duty at any one time.
 - iii. In facilities where the maximum number of employees does not exceed 15 and the maximum number of patrons and visitors does not exceed 15, one unisex/gender-neutral rest room may be installed for staff and one unisex gender-neutral rest room for patrons provided the total gross square footage does not exceed three thousand.
 - iv. Hand washing facilities shall be provided in all examination rooms.
 - c. Facilities and offices where medical procedures would not be performed.
 - i. Patients and Staff: The maximum number who may be in the facility at any one time. Separate rest rooms are not required for patients and staff.
 - d. Accessibility to all toilet facilities shall be direct and shall not require going from one medical office through another for access.
 - e. Handicap accessible rest rooms for patients and visitors shall be required on every floor level.
 - f. Limited-service Health Clinics.
 - i. Toilet facilities installed in compliance with 248 CMR shall be handicap accessible and open to the public. These facilities may be located within a locked area of the facility being served or in a common core area within four hundred feet of the clinic area so long as there is signage indicating the location of said facilities.
 - ii. Showers shall not be required.
 - iii. If above ground gravity drainage is not available within ten feet, the discharge for an exam sink may be pumped.
 - iv. A drinking water station without a drain shall be allowed. This may be located within the existing retail establishment.
16. For Mercantile Facilities, the minimum fixture requirements for employees when the occupancy exceeds employees and patrons shall be determined using the total square footage of the building divided by 300.
Example: A building measures 360 x 320 feet: Figure the area by multiplying 360 by 320 = 115,200 square feet. Divide 115,200 by 300 = 384 occupancy. 192 males and 192 females. In covered malls and other multistory mercantile facilities, public rest rooms shall be located on every floor level.
17. For Residential, the minimum fixture requirements shall be determined by:
- a. For single and multi-family dwellings follow the requirements as stated in 248 CMR 10.02(6).
 - b. For Hotels, Motels, Inns, Bed and Breakfast and similar facilities, fixtures requirements shall be based on the number of guest rooms.

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- c. For Dormitories, Sororities, Boarding Houses, Fraternities and similar facilities, fixture requirements shall be based on the number of occupants.
 - i. Bathrooms and rest rooms containing more than one toilet, or a combination of toilets and urinals shall be separated by walls or partitions providing privacy.
 - ii. Facilities utilizing core rest room and shower facilities shall be accessible from within the building and shall be placed so that passing through any part of another dwelling unit or room is not required.
 - iii. One laundry utility sink of every 50 persons.
 - iv. One washing machine connection for every ten dwelling units or fraction thereof. For purposes of 248 CMR 10.00, in post-secondary school residential dormitories, one dwelling unit shall be equivalent to four students. The washing machine connection shall be located so that each occupant in the dwelling has access to the washing machine that may be affixed to said connection.
 - v. Toilet facilities, shower rooms and bathing rooms for males and females shall be separate and so designated.
- d. For Adult Day Care Facilities, fixture requirements shall be based on the total combined number of staff and adults. Separate facilities for staff and adults shall not be required.
- e. For common areas of Assisted Living Facilities, fixture requirements shall be based on:
 - i. The total number of occupants;
 - ii. The maximum number of staff on duty at any one time;
 - iii. Facilities shall be located within 400 feet.
- 18. For Small Occupied Structures such as Ticket Booths, Guard Shacks, and similar facilities, fixture requirements shall be determined by:
 - a. No fixtures shall be required provided accessible rest rooms are located within 400 feet.
 - b. One unisex/gender-neutral rest room shall be installed if no rest rooms are located within 400 feet.
- 19. For unoccupied structures which may require maintenance such as pumping stations, sub-stations, and similar type facilities, one unisex/gender-neutral restroom shall be required within the facility.
- 20. For Facilities storing goods, vehicles, aircraft, marine, food products and similar type when no work is performed, the fixture requirements shall be based on the maximum number of people working at any one time.
- (d) Handicap Toilet Facility Requirement.
 - 1. The dimensional requirements for plumbing fixtures in public rest rooms shall be in accordance with 521 CMR 30.00: *Public Toilet Rooms.*
 - 2. Unisex/gender-neutral handicap toilet facilities may be allowed by the Board through the variance process as outlined in 248 CMR 3.04(2).
 - a. A variance is not required if the fixtures in an existing or proposed men's and women's toilet facility and the fixtures in a Unisex/gender-neutral handicapped toilet facility meet the minimum fixture requirements of 248 CMR 10.10(14): *Table 1 Minimum Facilities for Building Occupancy.* A Unisex/gender-neutral toilet may be counted only one time toward the total minimum fixture requirements.
 - b. These toilet facilities shall always be kept clear of obstructions in accordance with 105 CMR: *Department of Public Health.*
 - 3. Wherever drinking water stations are provided, they shall be accessible to the physically impaired.
 - 4. In facilities for the physically impaired, handicap toilet stalls placed within a fully compliant 248 CMR toilet facility may also provide an additional accessible handicap lavatory within the toilet stall area. The lavatory placement shall comply with the requirements of 521 CMR: *Architectural Access Board.*
- (e) Toilet Facilities General. Toilet facilities in all commercial and public rest rooms containing more than one flushing fixture shall be equipped with a floor drain and hose connection.
- (f) Bathroom Group Defined. A bathroom group shall consist of at least one bathtub or shower stall, one toilet, and one lavatory.

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(g) Use of Unisex/Gender Neutral Toilet Rooms. For purposes of the minimum fixture requirements of 248 CMR, wherever 248 CMR 10.00 requires two or more toilet fixtures designated by gender, those facilities may be replaced with single use gender-neutral toilet rooms pursuant to one of the following options:

1. Every gender designated toilet fixture is replaced with an equal number of single use unisex gender-neutral toilet rooms (such that there are no gender designated fixtures); or
2. Where the code requires four or more toilet fixtures combined for males and females, gender designated fixtures may be replaced by single use unisex/gender-neutral toilet rooms in increments of two such that for every male designated fixture replaced by a unisex/gender-neutral toilet room, a female designated fixture must also be replaced by a unisex/gender-neutral toilet room, and vice-versa (*e.g.* instead of three men's toilets, four female toilets, there may be installed two men's toilets, three female toilets, and two single use Gender unisex/neutral toilet rooms).

(h) Multi-user/Gender Neutral Toilet Rooms. For all buildings, the minimum fixture requirements of 248 CMR may be met by the use of one or more multi-user - Gender Neutral Toilet Rooms whereby multiple users may utilize the fixtures regardless of gender. The following rules govern the use of such rooms:

1. At least one Single User/Gender - Neutral Toilet Room must be installed on the same floor and within 300 feet of a Multi-user/Gender Neutral Toilet Room;
2. Each toilet must be separated by lockable partitions that extend from floor to ceiling to provide privacy;
3. Calculating Required Fixtures. Multi-user/gender-neutral toilet rooms shall be calculated as serving an equal number of individuals per gender. Installation of multi-user gender-neutral toilet rooms does not allow for the installation of multi-user toilet rooms for one gender but not the other.
4. For conversions of existing gender specific toilet rooms to Multi-user/Gender Neutral Toilet Rooms, existing partitions that are not floor to ceiling may remain so long as they have functional locking mechanisms. New partitions installed in the future must extend from floor to ceiling.

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10.10 Table 1: Minimum Facilities for Building Occupancy

CLASSIFICATION	DESCRIPTION OF USE	TOILETS		URINALS	LAVATORIES		DRINKING WATER STATIONS	BATHTUBS OR SHOWERS	OTHER FIXTURES	NOTES
		Female	Male		Female	Male				
Agricultural Unoccupied	Stables, Greenhouses, and similar buildings used exclusively for farming and/or livestock									
Agricultural Occupied	Dairy Farms, Greenhouses and similar buildings	1-25	1-50	Up to 50%	1 per 50	1 per 50	One for each set of rest rooms		One Mop Sink per floor	
Places of Assembly	Theaters, Concert Venues and Auditoriums with fixed seating	1-25 up to 200 1-50 201 to 500 Over 500 add 1 for every 100	1-50 up to 200 1-100 201 to 500 Over 500 add 1 for every 100	Up to 50%	1-50	1-50	One for each set of rest rooms		One Mop Sink per floor	
	Nightclubs and Pubs, Lounges, Restaurants, Food Courts and Service Plazas	1-25 up to 200 1-50 201 to 500 Over 500 add 1 for every 100	1-50 up to 200 1-100 201 to 500 Over 500 add 1 for every 100	Up to 50%	1-50	1-50			One Mop Sink per floor	
	Meeting Halls, Galleries, Libraries, Banquet Halls, Funeral Parlors, Gymnasiums without permanent seating.	1-25 up to 200 1-50 201 to 500 Over 500 add 1 for every 100	1-50 up to 200 1-100 201 to 500 Over 500 add 1 for every 100	Up to 50%	1-50	1-50	One for each set of rest rooms		One Mop Sink per floor	
	Indoor Recreational Facilities, Rinks, Swimming Pools, Gymnasiums and Others Without Spectator Seating (Patrons & Staff)	One per 40	One per 40	Up to 50%	1-50	1-50	One for each set of rest rooms	One per Men's Room One per Ladies Room	One Mop Sink per floor	
	Indoor Recreational Facilities, Rinks, Swimming Pools, Gymnasiums and Others with Spectator Seating (Patrons & Staff)	1-50 up to 200 1-100 201 to 2000 1 for each add '1 200 over 2000	1-100 up to 200 1-200 201 to 2000 1 for each add '1 400 over 2000	Up to 67%	1-75	1-75	One for each set of rest rooms	One per Men's Room One per Ladies Room	One Mop Sink per floor	
	Outdoor Stadiums and Indoor Arenas for Professional Sporting Events (Patrons & Staff)	1-25 up to 200 1-50 201 to 2000 1 for each add '1 100 over 2000	1-50 up to 200 1-100 201 to 2000 1 for each add '1 200 over 2000	Up to 67%	1-75	1-75	One for each set of rest rooms		One Mop Sink per floor	
	Quasi Professional Higher Education Outdoor Stadiums and Indoor Arenas (Patrons & Staff)	1-50 up to 200 1-100 201 to 2000 1 for each add '1 200 over 2000	1-100 up to 200 1-200 201 to 2000 1 for each add '1 400 over 2000	Up to 67%	1-75	1-75	One for each set of rest rooms		One Mop Sink per floor	
	Secondary School Outdoor Stadiums and Indoor Arenas (Patrons & Staff)	1-60 up to 300 1 for each add '1 150 over 300	1-120 up to 360 1 for each add '1 150 over 360	Up to 67%	1-75	1-75	One for each set of rest rooms		One Mop Sink per floor	
	Places of Worship	1-50	1-100	Up to 50%	1-50	1-50	One for each set of rest rooms		One Mop Sink per floor	
	Health Clubs and Spas With or Without Swimming Pools	1-40	1-40	Up to 50%	1-50	1-50	One for each set of rest rooms	One per Men's Room One per Ladies Room	One Mop Sink per floor	*One unisex shower allowed if total number of patrons and staff at any time does not exceed twenty.
	Public Beaches	1-500 up to 2,000 1 for each add '1 1000	1-1,000 up to 2,000 1 for each add '1 2,000	Up to 67%	1-250	1-250			One per each set of restrooms	
	Casino Gaming Areas	1-50 up to 200 1-100 201 to 2000 1 for each add '1 200 over 2000	1-100 up to 200 1-200 201 to 2000 1 for each add '1 400 over 2000	Up to 67%	1-75	1-75	One for each set of rest rooms		One Mop Sink per floor	

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10.10 Table 1: Minimum Facilities for Building Occupancy cont.

CLASSIFICATION	DESCRIPTION OF USE	TOILETS		URINALS	LAVATORIES		DRINKING WATER STATIONS	BATHTUBS OR SHOWERS	OTHER FIXTURES	NOTES
		Female	Male		Female	Male				
Places of Business	Buildings Offering Service Type Transactions. Banks, Salons, Laundries, Veterinary Clinics, Offices, Shops, Service Stations, and similar usage (Patrons & Staff)	1-20 up to 100 Over 100 add 1 for every 50	1-25 up to 100 Over 100 add 1 for every 50	Up to 50%	1-50	1-50	One for each set of rest rooms		One Mop Sink per floor	A single set of rest rooms may be used by patrons and employees when figuring the fixture requirements.
Educational Facilities	Public and Private Pre-School and Day Care	One per 20 Children & Staff	One per 20 Children & Staff		1 per 10	1 per 10	One for each set of rest rooms		One Mop Sink per Floor	One single user rest room allowed for up to 20 children and staff combined.
	Public & Private Schools. Kindergarten, Elementary, Middle & High School	1-25 up to 100 Over 100 add 1 for every 50	1-25 up to 100 Over 100 add 1 for every 50	Up to 50%	1 per 25	1 per 25	One for each set of rest rooms		One Mop Sink per Floor	
	Staff	1 per 20	1 per 25	Up to 33%	1 per 20	1 per 20				
	Public & Private Post-Secondary Schools including Staff	1-30 up to 120 Over 120 add 1 for every 60	1-34 up to 120 Over 120 add 1 for every 80	Up to 67%	1 per 50	1 per 50	One for each set of rest rooms		One Mop Sink per Floor	
Industrial, Warehousing, Research & Development facilities	Buildings & warehouses where employees assemble or process products that may be stored and/or shipped	1-20 up to 100 Over 100 add 1 for every 40	1-40 up to 120 Over 120 add 1 for every 80	Up to 67%	1 per 15	1 per 15	One for each set of rest rooms	One per 20 Males and One per 20 females	One Mop sink per floor	
Institutional Facilities	Correctional Facilities/Prisons	1 per cell	1 per cell		1 per Cell	1 per Cell		1 per 15 Inmates	One Mop Sink per Floor	See 013 CMR 920.08 for multiple inmates. See 920.07 for single cell
	Staff	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40	One per Each Set of Rest Rooms	1 Male & 1 Female	One Mop Sink per Floor	
	Detention Centers, Correctional Facilities and Juvenile Centers	1 per 8	1 per 8	Up to 67%	1 per 8	1 per 8	1 per Floor	1 per 8 Male 1 per 8 Female	One Mop Sink per Floor	
	Staff	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40	One per Each Set of Rest Rooms		One Mop Sink per Floor	
Medical Facilities	Hospitals & Nursing Homes, Addiction Recovery Centers, Psychiatric centers and similar Patients	1 per Room*			1 per Room*			1 per Room*		
	Staff	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40	One per Each Set of Rest Rooms		One Mop Sink per Floor	
	Waiting Rooms for visitors	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40	One per Each Set of Rest Rooms			
	Doctor/Dental offices, labs, and similar facilities where procedures may be performed.									
	Patients	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40	One per Each Set of Rest Rooms		One Mop Sink per Floor	
	Staff	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40	One per Each Set of Rest Rooms			
	Chiropractors, physical therapy and similar facilities where medical procedures are not performed***	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40	One per Each Set of Rest Rooms		One Mop Sink per Floor	

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10.10 Table 1: Minimum Facilities for Building Occupancy cont.

CLASSIFICATION	DESCRIPTION OF USE	TOILETS		URINALS	LAVATORIES		DRINKING WATER STATIONS	BATHTUBS OR SHOWERS	OTHER FIXTURES	NOTES
		Female	Male		Female	Male				
Mercantile Facilities	Retail Stores, Supermarkets, Shopping Centers, Big Box Stores Covered Malls, and similar types accessible to the public	1-25 up to 100 Over 100 add 1 for every 100	1-50 up to 200 Over 200 add 1 for every 100	Up to 50%	1 per 100	1 per 100	One per Each Set of Rest Rooms		One Mop Sink per Floor	
Residential Buildings	One and Two Family Dwellings	1 per Dwelling			1 per Dwelling			1 per Dwelling	1 Kitchen Sink per Dwelling	Laundry See 10.10 (8) (a) 1
	Dwellings Three Family and Above	1 per Dwelling			1 per Dwelling			1 per Dwelling	1 Kitchen Sink per Dwelling	Laundry See 10.10.(8) (a) 2
	Hotel, Motels, Inns and Similar	1 per Guest Room			1 per Guest Room			1 per Guest Room		
	Bed & Breakfast	1 per Every 3 Guest Rooms			1 per Every 3 Guest Rooms			1 per Every 3 Guest Rooms		
	Dormitories, Boarding Houses, Sororities, Fraternities, and Similar Facilities	1 per 6	1 per 8	Up to 33%	1 per 8	1 per 8		1 per 8 Male 1 per 8 Female	1 Mop Sink per floor	
	Custodial Adult Day Care	1 per 20 Including Staff			1 per 20 Including Staff				1 Mop Sink per floor	
	Assisted Living Facilities	1 per 6	1 per 8	Up to 33%	1 per 8	1 per 8		1 per 8	1 Mop Sink per floor	
	Staff	1-20 up to 100 Over 100 add 1 for every 40	1-25 up to 125 Over 125 add 1 for every 50	Up to 67%	1 per 40	1 per 40				
Small Occupied Structures	Ticket Booths, Guard Shacks, and Similar Facilities	None required if accessible facilities are located within 400 feet								
Unoccupied Structures	Pumping, Equipment, Sub-Stations, and Similar Facilities	1 Accessible unisex/gender-neutral rest room within the facility								
Storage Facilities	Goods, Vehicles, Aircraft, Marine, Food Products, Appliances and Similar where no work is being performed	1 per 150	1 per 150	Up to 67%	1 per 150	1 per 150	1 per Each Set of Rest Rooms		1 Mop Sink per Floor	One single user rest room shall be allowed for up to 20 visitors and staff combined.
* Patrons and Staff may be combined to determine total number of fixtures required.										
** Nursing Homes: 1 toilet and 1 lavatory with direct access from each bedroom shared by a maximum of 8 people. (May be Unisex/gender-neutral)										
*** May be shared between Staff, Patients, and Visitors										

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10.11 Hangers and Supports

- (1) General. Piping shall be installed with provisions, when necessary, for expansion, contraction and/or structural settlement. Piping shall not be supported by other piping which is connected to the plumbing system.
- (2) Material. Hangers, anchors, and supports shall be of metal or other material of sufficient strength to support the piping and its contents, except where piers may be of concrete, brick, or other acceptable material. Hangers, anchors and supports shall comply with piping and hanger manufacturers installation instructions.
- (3) Attachment to Building. Hangers and anchors shall be securely attached to the building at sufficiently close intervals to support the piping and its contents.
- (4) Intervals of Supports.
 - (a) Vertical Piping. Vertical pipe of the following materials shall be supported at not more than the following distance intervals:
 1. Cast Iron Soil Pipe: At base and at each story height.
 2. Threaded Pipe (SPS): Every other story height.
 3. Copper Tubing: At each story height but not more than ten-foot intervals.
 4. Plastic Pipe: At each story height, but not more than ten-foot intervals and elsewhere as required to maintain proper alignment.
 5. Stainless Steel Tubing: At each story height, but not more than ten-foot intervals.
 6. Aluminum DWV: At each story height, or at intervals not exceeding ten feet.
 7. For Cross-linked Polyethylene (PEX) Tubing: The licensee shall consult the individual manufacturers' installation instructions.
 - (b) Horizontal Piping. Conventional pipe clamps, brackets or strapping that have a bearing width of three quarters of an inch or more. Horizontal pipe of the following materials shall be supported at not more than the following distance intervals.
 1. Cast Iron Soil Pipe: At five-foot intervals except that where ten-foot lengths of cast iron soil pipe are used, ten-foot intervals between supports are acceptable.
 2. Threaded Pipe: At 12-foot intervals.
 3. Copper Tubing (1¼ inches or less): At six-foot intervals.
 4. Copper Tubing (1½ inches or over): At ten-foot intervals.
 5. Plastic Pipe (1½ inches or less): At three-foot intervals, (two inches or over): At four-foot intervals.
 6. For Cross-linked Polyethylene (PEX) Tubing: The licensee shall consult the individual manufacturers' installation instructions.
 7. Stainless Steel Tubing (1¼ inches or less): At six-foot intervals.
 8. Stainless Steel Tubing (1½ inches or over): At ten-foot intervals.
 9. Aluminum DWV Pipe: At ten-foot intervals.
 10. CPVC Pipe (one inch or less): At three-foot intervals.
 11. CPVC Pipe (1¼ inches or over): At four-foot intervals.
- (5) Base of Stacks.
 - (a) Bases of cast iron stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building, or by other generally accepted methods.
 - (b) Other piping material shall be properly supported so as not to cause any additional stress or strain at the base of the stack.

10.12: Indirect Waste Piping

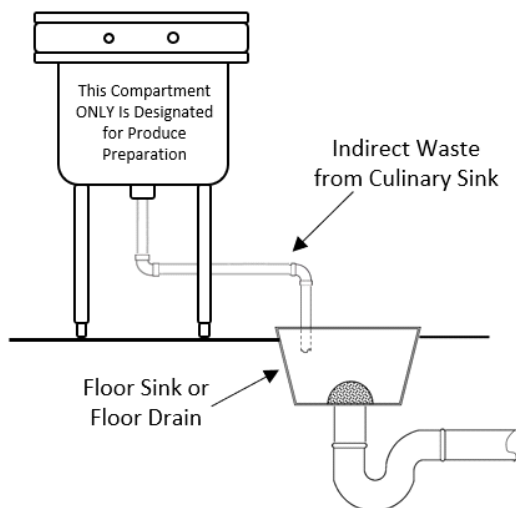
- (1) Indirect Wastes Required.
 - (a) Food and Beverage Handling Establishments.
 1. Food and beverage handling establishments engaged in the storage, preparation, selling, serving, processing, or in any manner the handling of food shall provide indirect waste piping for refrigerators, refrigerator coils, walk-in freezers or coolers, ice compartments, ice making machines, steam kettles, steam tables, potato peelers, egg boilers, coffee urns, coffee, soda and beverage trays and all similar types of equipment.

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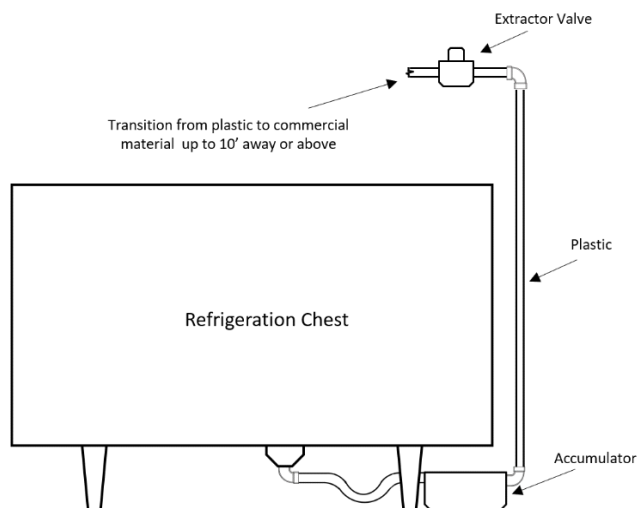
2. In establishments which serve soda and alcohol, individual sink compartments which store ice shall discharge independently into a floor drain or floor sink.
3. Dishwashing pre-rinse sinks installed in combination with a commercial dishwasher, pot sinks, scullery sinks, hand washing sinks and similar shall not be indirectly wasted and shall be directly connected to the sanitary drainage system.
4. Single compartment sinks or individual compartments of multi-bay sinks for culinary or produce shall be individually discharged into a properly vented floor sink or floor drain. These compartments shall be properly labeled for produce preparation using a laminated sign with letters two inches in height that reads: "This Compartment ONLY Is Designated for Produce Preparation." See 10.12: Example 1

10.12: Example 1 - Culinary Sink



5. All indirect waste shall discharge either through an air gap or air-break into a properly trapped and vented receptor. See 10.12, Example 4. An air gap shall be required if the indirect waste pipe is under vacuum.
6. Vacuum Systems for Food Service Facilities.
 - a. Vacuum drainage systems shall be installed in accordance with the equipment manufacturer's installation instructions or be designed by a Massachusetts professional engineer, regardless of discipline.
 - b. Plastic pipe and fittings shall be allowed within ten feet of the equipment or above the equipment being served prior to transitioning to commercial materials. See 10.12: Example 2.

10.12: Example 2 - Plastic with Vacuum Systems



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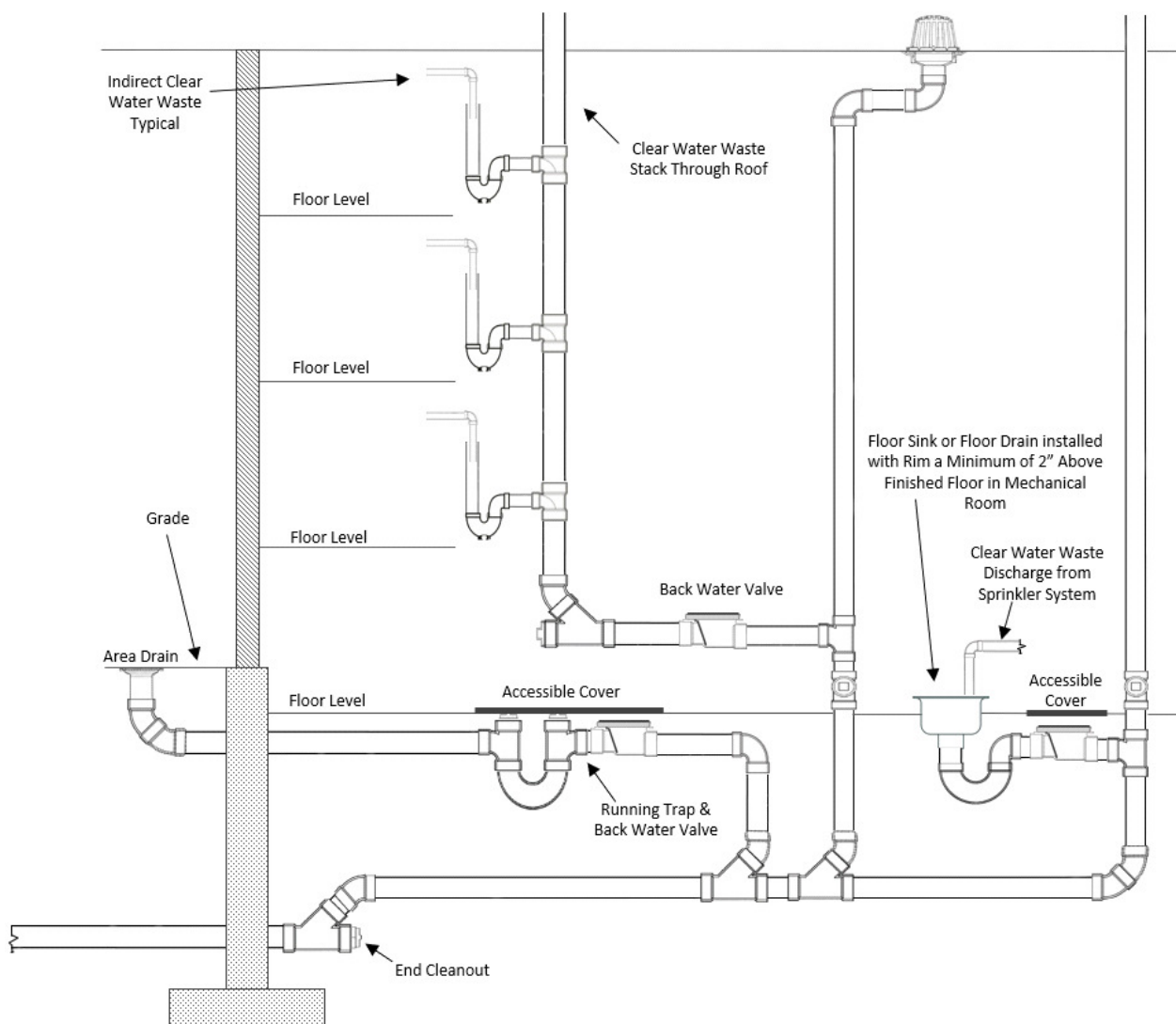
- (b) Connections from Water Distribution System. Indirect waste connections shall be provided for drains, overflows, or relief lines from the water distribution system by means of an air gap.
- (c) Sterilizers. Appliances, devices, or apparatus such as stills, sterilizers, and similar equipment requiring waste connections and used for sterile materials shall be indirectly connected by means of an air gap.
- (d) Drips or Drainage Outlets. Appliances, devices, or apparatus which have drips or drainage outlets may be indirectly discharged into an open receptacle through either an air gap or air-break.
- (e) Clear Water Wastes.
 - 1. All clear water waste shall be cooled to a temperature no greater than 150°F prior to discharging into the storm or sanitary drainage system.
 - 2. Expansion tanks, fire sprinkler systems, air conditioning equipment, drip, or overflow pans, or similar devices that waste clear water only, shall discharge into the building storm drainage system through an indirect waste by means of an air gap or air-break. The flood level rim of the indirect fixture shall be a minimum of two inches above floor level. *See 10.12: Example 3.*
 - 3. When clear water waste is discharged into a storm system through a vented trap, the vent for that trap shall be labeled “storm vent”. Labels shall be:
 - a. At a minimum of every ten feet:
 - b. At all changes of direction:
 - c. On each side of a penetration through a partition, wall, ceiling, or roof.

Exceptions:

- i. Clear water waste may discharge to sanitary systems in cities and towns with written authorization from the authority having jurisdiction whose system will be accepting the discharge.
- ii. The waste discharge from safe waste pans serving water heaters, storage tanks and boilers may discharge to a properly trapped and vented fixture to the sanitary drainage system.
- iii. Clear water condensate waste that is produced in cumulative amounts of 12.5 gallons per hour or 300 gallons per day or less in buildings by air conditioning equipment, air compressor blow-down discharge (free of petroleum hydrocarbons) or other similar apparatus or appliances may be discharged to the sanitary drainage system. The clear water waste requirement is not withstanding any local ordinance, by-law, rule, or regulation to the contrary.

10.12: continued

Example 3 -Clear Water Waste Discharge



(f) Safe Waste Pan.

1. Safe waste pans shall be installed under water heaters, storage tanks or boilers that have a storage capacity of six gallons or more and installed in a position elevated above any occupied space.

2. Safe waste pans shall be piped indirectly to properly trapped and vented fixtures or to a point within 12 inches of the lowest floor level. *See 10.12: Example 4, Drawing 1 for single heater installation and Drawing 2 for multiple heater installations.*

Exception: When installing a replacement water heater, storage tank or boiler, an acceptable alternate method may be to install a product accepted automatic water heater shut off device and a safe waste pan without the related drain piping. If this method is used, the water heater temperature and pressure relief valve shall discharge into the water heater safe waste pan. *See 10.12: Example 4, Drawing 3.*

3. The Minimum size waste pipe shall be one inch. *See 10.12: Example 4, Table for Sizing Safe Waste Pans.*

4. Where floor drains and other acceptable points of indirect discharge are installed on the same floor level, no safe waste shall be required.

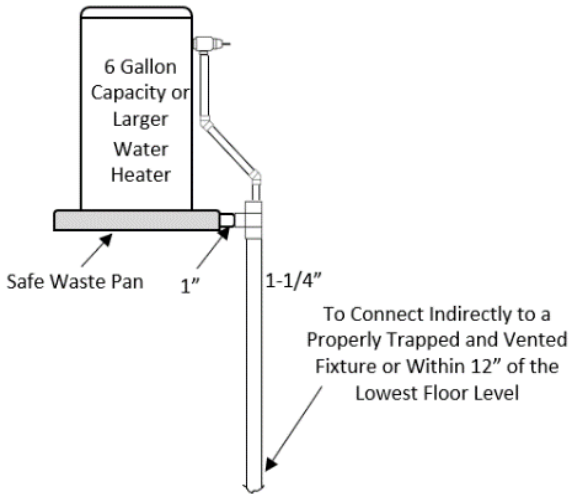
5. Safe waste pans shall be at least two inches deep and have a minimum clearance of two inches around the base of the appliance being served.

6. Materials for the Discharge Piping of Safe Waste Pans. Materials shall comply with materials covered under 248 CMR 10.06 relating to commercial and residential installations.

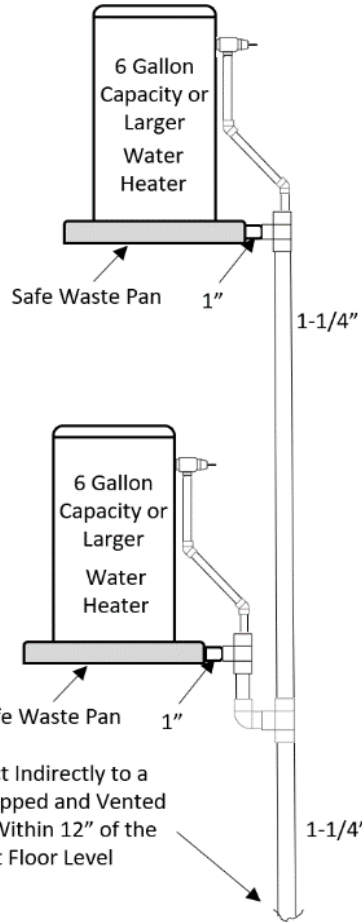
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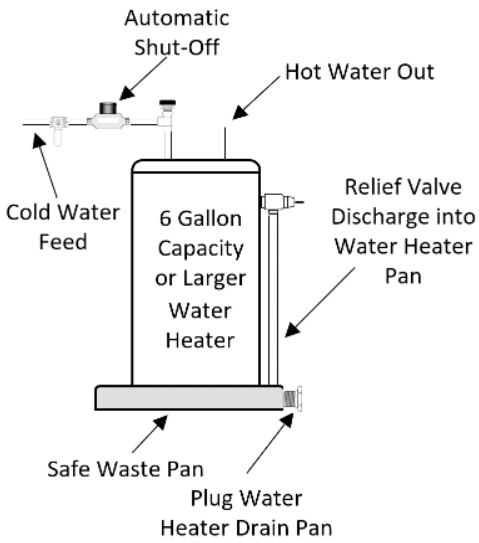
10.12 Drawing 1



10.12 Drawing 2



10.12 Drawing 3



10.12 Drawing 4

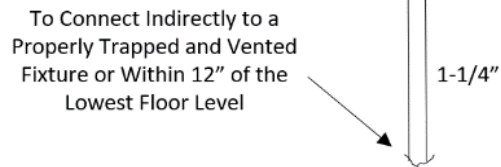
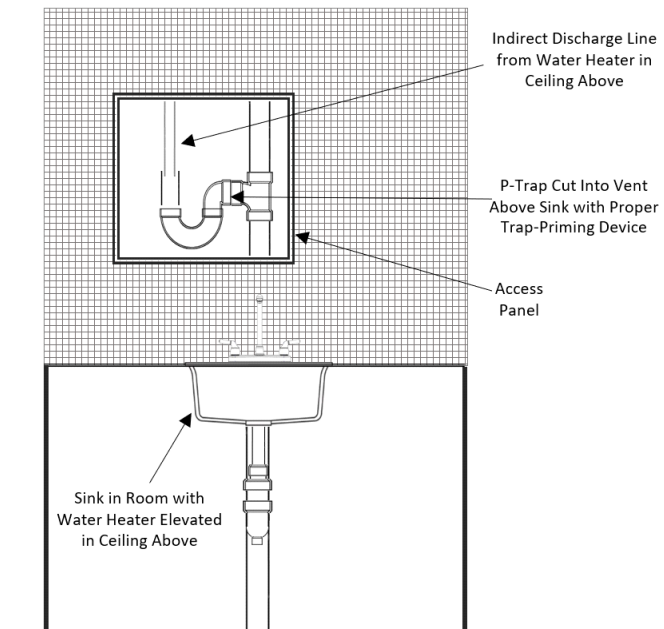


Table for Sizing Safe Waste Pan Mains

Relief Valve Size	Number of Heaters or Storage Tanks		
	2	3	4 or More
3/4"	1-1/4"	1-1/4"	1-1/2"
1"	1-1/4"	1-1/2"	1-1/2"
1-1/4"	1-1/2"	1-1/2"	2"
1-1/2"	2"	2"	2"
2"	2"	2"	2"



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(2) **Air Gap or Air-break Required.** All indirect waste piping shall discharge into the building sanitary or storm drainage system through an air gap or air-break, as stated in 248 CMR 10.12(1)(a)5., and in no instance shall the indirect waste be trapped ahead of the air gap or air-break.

(a) **Methods of Providing an Air Gap.** The air gap between the indirect waste and the building sanitary or storm drainage system shall be at least twice the effective diameter of the drain served and shall be provided by one of the following methods: *See 10.12: Example 5, Drawing 1.*

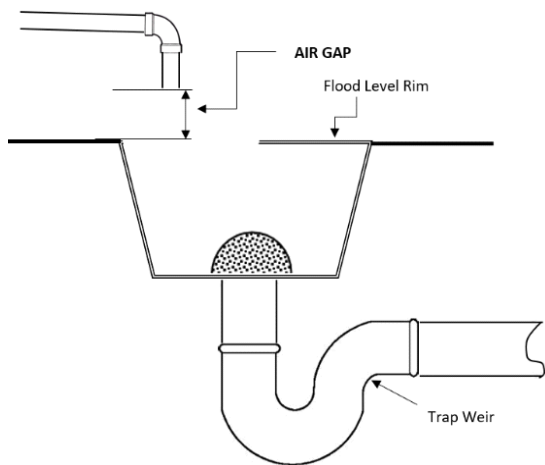
1. **To a Receptor.** Extend the indirect waste pipe to an open, accessible individual waste sink, floor drain or another fixture which is properly trapped and vented.

2. **To the Inlet Side of Trap.** Provide an air gap in the drain connection on the inlet side of the trap which receives the waste from the indirect waste.

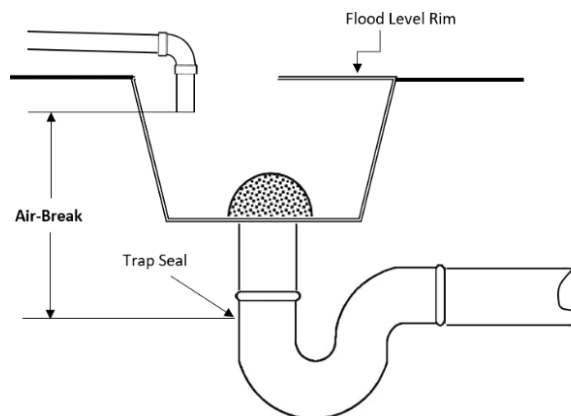
(b) **Methods of Providing an Air-break.** When an air-break is required between the indirect waste and the building sanitary or storm drainage system, the distance to which the outlet of the indirect waste pipe extends below the flood level rim of the receptacle into which it is discharging shall be prescribed in 248 CMR 10.12. *See 10.12: Example 5, Drawing 2.*

10.12: Example 5 - Use of Air-Gap and Air Break

Drawing 1: Use of Air Gap for Indirect Waste with a Floor Sink



Drawing 2: Use of Air-Break for Indirect Waste with a Floor Sink



(3) **Receptors or Sumps.**

(a) **Installation.** Indirect waste receptors and sumps serving indirect waste pipes shall not be installed in toilet facilities or in any location that is an inaccessible or unventilated space such as a closet, storeroom, or crawl space.

(b) **Size of Receptor.** The pipe size serving a receptor shall be a minimum of one size larger than the largest indirect waste it serves.

(c) **Cleanout Location.** If the indirect waste receptor is set below floor level, it shall be equipped with a running trap adjacent thereto with the trap cleanout brought level with the floor.

(d) **Strainers and Baskets.** Every indirect waste receptor shall be equipped with a readily removable metal basket over which all indirect waste pipes shall discharge, or the indirect waste receptor outlet shall be equipped with a beehive strainer not less than four inches in height.

(e) **Splashing to be Prevented.** All plumbing receptors receiving the discharge of indirect waste pipes, shall be of a design and capacity to prevent splashing or flooding of the adjacent area.

(f) **Domestic or Culinary Fixture Prohibited as Receptors.** No plumbing fixture which is used for domestic or culinary purposes shall be used to receive the discharge of an indirect waste pipe, except that in a residence a kitchen sink is acceptable for use as a receptor for dishwashers and portable clothes washing machines provided the kitchen sink drain in a minimum of two inch.

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(4) Condenser Sumps. No steam condenser waste pipe shall directly connect to any part of a sanitary or storm drainage system, nor shall any water above 150°F be discharged into any part of a sanitary or storm drainage system.

(5) Installation of Indirect Waste Piping.

(a) Accessibility. Indirect waste piping shall be installed to enable ready access for flushing, cleaning, or replacement.

(b) Sizing. Any fixture or piece of equipment to be indirectly wasted that has a waste outlet smaller than 1¼ in diameter shall be connected to an indirect waste pipe one size larger than said outlet.

(c) Indirect Waste Piping.

1. Individual Indirect Waste. An indirect waste which connects to one waste outlet and extends to the receiver shall be classified as an Individual Indirect Waste.

2. Indirect Waste Branch. An indirect waste which connects to one waste outlet and extends to either an indirect waste main or an indirect waste branch main shall be classified as an Indirect Waste Branch.

3. Indirect Waste Main. An indirect waste which connects to more than one waste outlet and extends to the receiver shall be classified as an Indirect Waste Main.

4. Indirect Waste Branch Main. A branch from an indirect waste main which connects to more than one waste outlet shall be classified as an Indirect Waste Branch Main.

(d) Traps.

1. A trap shall not be installed on an indirect waste main or on an indirect waste branch main.

2. A trap may be installed on any indirect waste branch or individual indirect waste where it is necessary or desirable to prevent the flow of air from inside the indirect waste piping through the indirect waste branch.

(e) Air Circulation Through Indirect Waste Piping.

1. Provision shall be made so that air can circulate freely through an individual waste, waste main or a waste branch main.

2. When a waste branch is trapped a properly sized vent shall be installed.

3. An indirect waste stack receiving the discharge from fixtures on two or more floors shall be extended to the outer air as required for a stack vent.

(6) Multiple Occupancy.

(a) When a system of indirect waste piping serves buildings or premises having more than one tenant occupancy, it shall be designated as a "Central Indirect Waste System" and connection to it from separate tenant occupancies shall be designated as "Separate Indirect Waste Systems."

(b) Separate indirect waste systems shall be connected to "Central Indirect Waste Systems" as follows:

1. The indirect waste branch to a separate occupancy shall be trapped, and this trap shall serve as a secondary indirect waste receiver for the separate indirect waste system.

2. The indirect waste branch to a separate occupancy may be from a horizontal indirect waste main or branch main, or from an indirect waste stack.

(c) Secondary Indirect Waste Receivers.

1. Traps serving secondary indirect waste receivers shall be protected from siphonage by adequate individual battery of stack vents.

2. Vents on indirect waste piping systems shall not be connected to the vents of any other piping system but shall be extended separately to the outer air as required for stack vents.

10.13: Piping and Treatment of Special Wastes

(1) General.

(a) In no case shall special wastes discharge into the plumbing system without being thoroughly neutralized or treated by passing through a properly constructed and acceptable diluting or neutralizing device.

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(b) Only special wastes shall be discharged into neutralization systems. Exception: Hand washing sinks and floor drains within a laboratory as designed by a Massachusetts professional engineer.

(c) The required neutralizing device shall be automatically provided with sufficient intake of neutralizing medium to make its contents non-injurious before being discharged into the drainage system. The neutralizing device shall have an accessible cover for maintenance.

(d) Special waste piping and treatment systems shall be designed by a Massachusetts professional engineer with reference to 314 CMR 12.00: *Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers*, 310 CMR 30.00: *Hazardous Waste*, 314 CMR 7.00: *Sewer System Extension and Connection Permit Program*, 257 CMR 2.00: *Certification of Operators of Wastewater Treatment Facilities* and 105 CMR 480.00: *Minimum Requirements for the Management of Medical or Biological Waste (State Sanitary Code Chapter VIII)* which contain others requirements applicable to wastewater discharges. No provision of 248 CMR 10.13 is intended to modify or affect the regulation of applicable wastes pursuant to the above regulations.

1. Plans stamped by a Massachusetts professional engineer with a list of special waste material to be discharged into the system shall be submitted to the local inspector prior to a plumbing permit being issued.

2. The design shall include a pH monitoring system with an audio/visual alarm. The installation, including pipe sizing, dimension, and other aspects shall meet the requirements for proper functioning, safety, and 248 CMR 10.00. *See 10:13: Example 3.*

3. Once the installation is complete but prior to final inspection, the installer must provide the plumbing inspector with written certification by the designing Massachusetts professional engineer stating the installation complies with the stamped drawings and specifications. The Inspector shall not be responsible for approving or inspecting design specifications, but must ensure the installation adheres to the provisions of 248 CMR 10.00.

4. All special waste piping shall be labeled in the following manner:

a. At a minimum of every ten feet;

b. At all changes of direction;

c. On each side of a penetration through a partition, wall, ceiling, or roof;

d. The labels shall be yellow with black lettering that:

i. indicate "Special Waste"; and

ii. the letters shall be sized equal to a minimum, the pipe diameter. However, for piping with a diameter exceeding two inches, said lettering does not need to be larger than two inches.

(e) Treatment and/or disposal of special waste shall be conducted in conformance with 310 CMR 30.00: *Hazardous Waste (DEP)* or other authorities if applicable.

(2) Materials.

(a) Primary. Materials used for primary piping systems shall include, but not limited to:

1. High silicon (14.5% cast iron);

2. Polypropylene;

3. Polyethylene;

4. Glass;

5. Chemical stoneware;

6. Stainless Steel Type #316-18-8;

7. Chemical resistant monolith epoxy resins.

(b) Secondary Containment. Materials for secondary piping systems shall include but not be limited to;

1. Poly-Vinyl Chloride (PVC);

2. All materials allowed for primary piping.

(3) Design and Installation Special Waste Systems.

(a) Special waste systems shall be designed to adjust the pH of waste to a level of between six and nine.

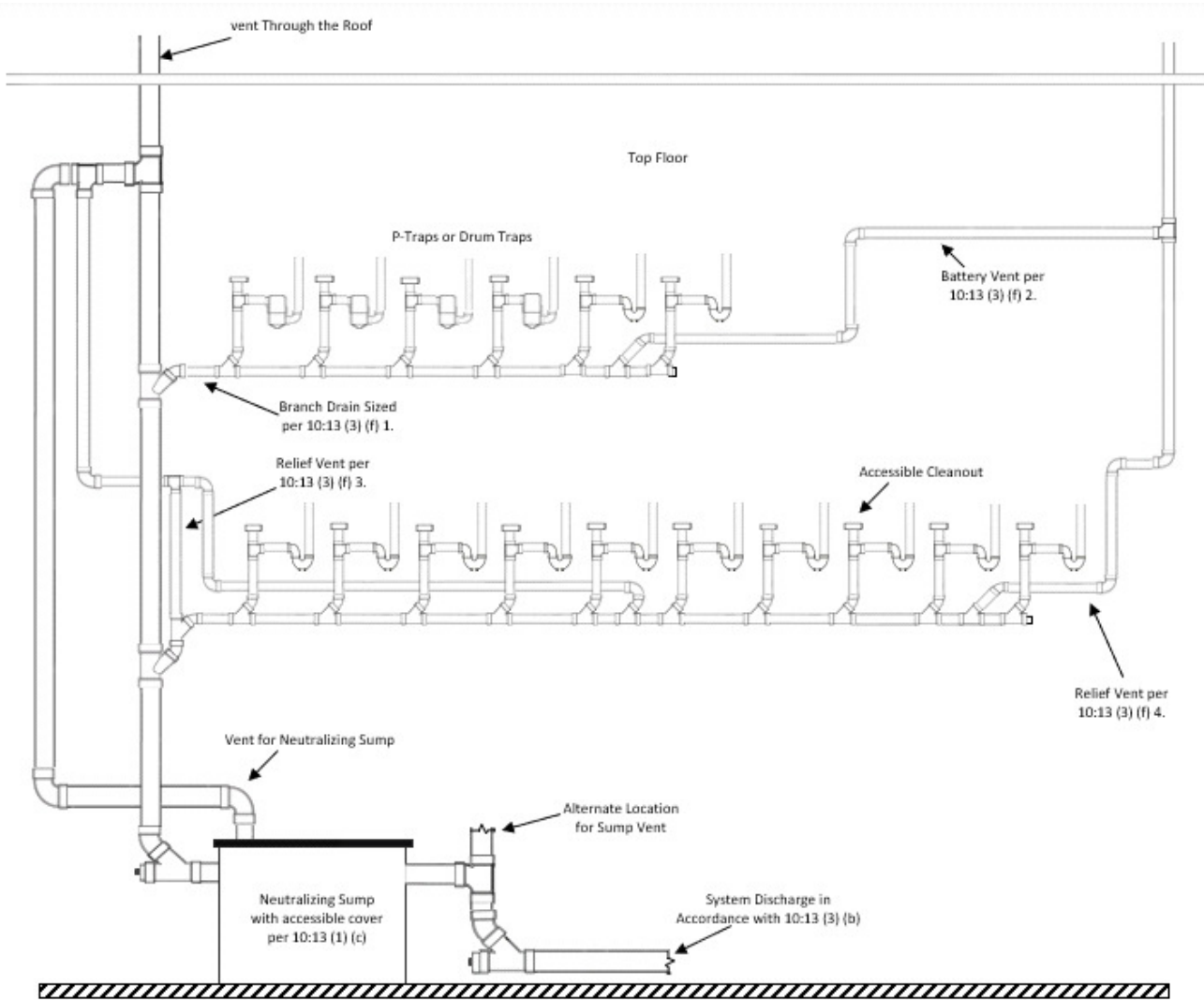
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- (b) Discharge from special waste treatment systems may connect to either the building sanitary drain or building sanitary sewer but in no case less than ten feet from the neutralization system.
- (c) Venting systems for special wastes shall be piped independent of the building sanitary venting system.
- (d) Pumps discharging special waste shall be designed specifically for a special waste system.
- (e) Fume Hoods and enclosed equipment shall be individually trapped and vented.
- (f) Battery Waste and Vent Piping. See 10.13: *Example 1*
 - 1. The main horizontal branch drain shall be one pipe size larger than that required by the fixture units connected to it. Cup sinks shall be figured as one fixture unit.
 - 2. The vent shall be connected to the drain between the last two fixture traps.
 - 3. A relief vent shall be connected to the branch upstream of the first fixture on all, but the highest branch connected to the stack.
 - 4. Additional relief vents are required on battery systems of waste and vent piping when the total number of traps served on any one main drain or branch main drain exceeds six, and each additional relief vent may serve from one to five additional traps.
 - 5. The minimum size relief vent shall be two inches.
 - 6. Any branch from a main battery waste which has a separate trap vent may be considered a relief vent.
 - 7. Every branch waste having a developed length exceeding ten feet shall be individually vented.
 - 8. The vent for a main battery waste shall be at least $\frac{1}{2}$ the diameter of the horizontal branch drain.
 - 9. Floor drains may be connected to the horizontal main battery drain with traps below the floor provided:
 - a. the minimum size of the branch shall be not less than three-inch.
 - b. a separate trap vent is not required unless the developed length from the floor drain trap weir to the horizontal main battery drain exceeds 15 feet.
 - c. Floor drain traps shall be included in determining relief vent requirements.
 - 10. Whenever the main horizontal branch of battery waste piping is below the floor on which the fixtures occur, either a drum trap or a P trap may be used. A cleanout shall be installed in the vertical waste above the floor.
- (g) When a secondary containment system for special waste is specified, it must be installed in compliance with 248 CMR 10.13 and tested in compliance with 248 CMR 10.04.

10.13: continued

Example 1 - Special Waste Piping System



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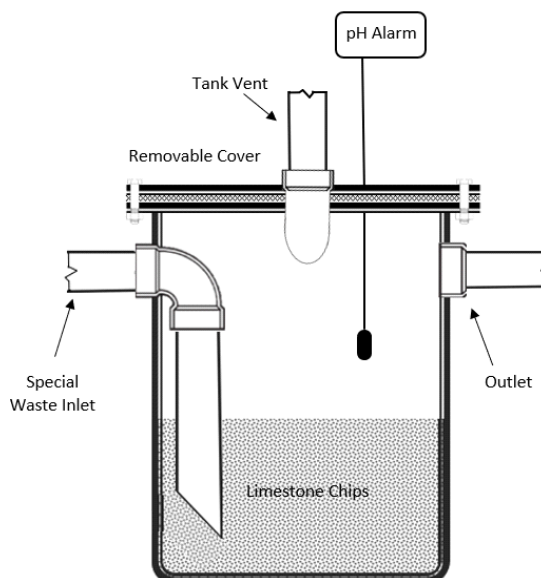
(4) Installation of Point-of-use Limestone Chip Tanks.

- (a) Product-accepted limestone chip tanks may be used when a full special waste system is not necessary. These tanks function on a flow-through basis and generally involve a vertical cylindrical tank filled with calcium carbonate (more commonly known as limestone). See 10.13: *Example 2*.
- (b) Tank installations shall comply with 248 CMR 10.13(1)(d)1., 2., and 3.
- (c) Point-of-Use tanks with a capacity of 15 gallons or larger must be chamber vented.
- (d) All tank installations shall include a pH monitoring system with an audio/visual alarm.
- (e) A laminated sign shall be stenciled on or in the immediate area of each chip tank in letters one inch high. This sign shall state the following:

IMPORTANT

"This tank must be inspected on a regular basis and the neutralizing media replenished when necessary. Failure to do so may result in serious damage to the building drainage system."

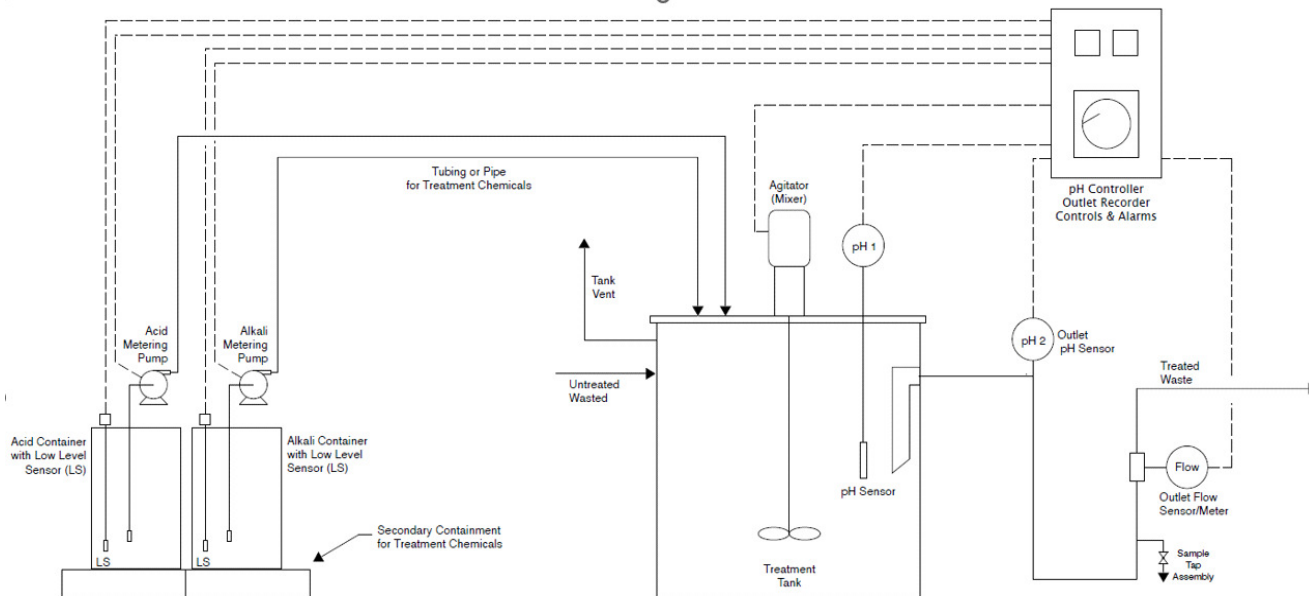
10.13: Example 2 - Chip Tank



- (5) Industrial Wastewater. Industrial wastewater treatment systems shall be designed by a Massachusetts professional engineer and plans and specifications shall be submitted to the Massachusetts Department of Environmental Protection (DEP) or other authorities as required.

10.13: continued

10.13: Example 3 - Example of pH Neutralization System



10.14: Water Supply and the Distribution System

(1) General. All water for human consumption shall comply with the requirements of the Safe Water Drinking Act (SWDA), 42 U.S.C. § 300f *et. seq.*

(a) NFPA 13D multipurpose residential fire sprinkler systems which utilize potable cold- water piping as part of a fire sprinkler protection system in one-and two-family dwellings shall comply with the requirements of 248 CMR 10.14. Installation of these systems includes the direct connection of sprinkler heads to potable water piping. When installing said system, the plumber shall adhere to the design plans of a Massachusetts professional engineer, who is responsible for ensuring the design complies with 248 CMR and NFPA 13D (2022 edition), including the requirements as to pipe sizing and dimensions to ensure the proper functioning of the system as well as the safety of the consumers who will rely on that system.

(b) Potable Water Supply.

1. Buildings.

- a. Every building used for human occupancy or habitation shall be provided with an adequate supply of potable water.
- b. Every building used for human occupancy or habitation shall be provided with an adequate supply of hot water.

2. Use of Non-potable Water Prohibited. Only potable water shall be accessible to plumbing fixtures supplying water for:

- a. drinking;
- b. bathing;
- c. culinary use; or
- d. the processing of food, medical or pharmaceutical products.

(c) Building Water Piping. The building water piping shall be of sufficient size to furnish water to the building in the quantities required elsewhere in 248 CMR 10.00.

(2) Designing and Sizing the Building Water Distribution System.

(a) Methods to Be Used.

- 1. The cold-water supply from the meter or main control valve when no meter is present to all branches, risers, final connection to fixtures and other connections shall be based on the total demand and procedures outlined within 248 CMR 10.14.
- 2. The minimum size of a fixture supply pipe shall be in accordance with 248 CMR 10.14(4): *Table 1*.
- 3. Sizing the building water main, branch distribution, risers and fixture supply piping shall be determined using 248 CMR 10.14(4): *Tables 1, 2, and 3*. Exception: A system designed by a Massachusetts professional engineer.

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4. A demand factor, as recognized in 248 CMR 10.14(4): *Table 2* shall be applied to determine the minimum diameter pipe size for the building main and water distribution system piping.
5. The minimum size of a fixture water supply pipe shall be in compliance with 248 CMR 10.14(4): *Table 1: Minimum Sizes of Individual Fixture Branches and Factor Values*.
6. The individual fixture branch shall be extended to the fixture connector and terminate with a fixture shut off valve.
7. Fixture connectors shall not exceed 30 inches and shall be product accepted by the Board.
Exception: Dishwashers, washing machines and icemakers.

Table 1
Minimum Sizes of Individual Fixture Branches
and Factor Values

Type of Fixture or Device	Nominal Pipe Size (Inches)	Factor Value
Bathtub (with or without single shower head)	1/2	2
Bidet	3/8	1
Drinking Water Station	3/8	1
Dishwasher (Domestic)	1/2	2
Dishwasher (Commercial)	3/4	6
Kitchen sink, Residential	1/2	2
Kitchen sink, Commercial (Pot and Scullery)	3/4	6
Vegetable Prep or Bar Sink (Residential)	1/2	2
Hand Wash Sinks	3/8	1
Shampoo Sinks	3/8	1
Lavatory	3/8	1
Utility Laundry Sinks 1, 2, or 3 compartments	1/2	2
Shower Valve (single head)	1/2	2
Shower Valve (Multiple heads)	3/4	6
Sinks (service, slop)	1/2	2
Sinks flushing rim	3/4	6
Laundry Valve	1/2	2
Urinal (flushometer type)	3/4	6
Toilet (tank type)	3/8	1
Toilet (flush valve type)	1	12
Hose Connections/Sillcocks/Wall Hydrants	1/2	2

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Table 2

Occupancy Use	Demand Factors
Residential	
One or Two Family Dwelling	0.50
Multi-residential	0.35
Hotel	0.70
School	
General	0.75
Shower Room	1.00
Institutional	
General	0.45
Assembly	
General	0.25
Restaurant, Café	0.70
Club House	0.60
Business and Mercantile	
General	
Industrial	0.25
Laundry	1.00
INDUSTRIAL	
General, Exclusive of Process Piping	0.90

Table 3

Capacity Values for Service, Mains, Risers and/or Branches

Nominal Pipe or Tubing Sizes (inches)	Capacity Value
½	1 to 4
¾	4.1 to 9
1	9.1 to 16.5
1¼	16.6 to 28
1½	28.1 to 55
2	55.1 to 107.5
2½	107.6 to 182.5
3	182.6 to 287.5
3½	287.6 to 425
4	425.1 to 700
5	700.1 to 1100
6	1100.1 to 1300

8. Example: 248 CMR 10.14(4): *Tables 1, 2 and 3* are used to determine the size of the cold water main for a one family residence having the following fixtures:

- A Two Toilets (Tank type)
- B Two Lavatories
- C One Bathtub
- D One Shower Stall
- E One Utility Sink or Laundry Valve
- F One Dishwasher (Domestic)
- G One Kitchen Sink
- H Two Wall Hydrants

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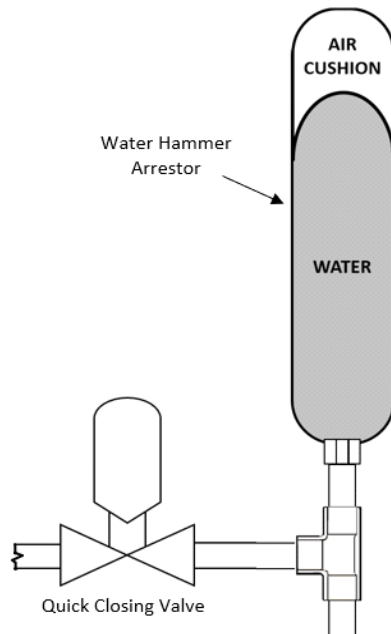
10.14: continued

Factor Values (248 CMR 10.14: from Table 1)

			Hot	Cold	
A	Two	Toilets (tank type) X 1		2	
B	Two	Lavatories X 1	2	2	
C	One	Bathtub	2	2	
D	One	Shower Stall	2	2	
E	One	Utility Sink or Laundry Valve	2	2	
F	One	Dishwasher (Domestic)	2		
G	One	Kitchen Sink	2	2	
H	Two	Wall Hydrant		4	
		<i>Total</i>	12	16	28

- a. 248 CMR 10.14(4): *Table 2* indicates a Demand Factor of 0.50 for a Single or Two family dwelling.
 - b. Multiplying the total Factor Value of 28 by the Demand Factor of 0.50 results in a Capacity Value of 14.0
 - c. A Capacity Value of 14 is between 9.1 and 16.5 in 248 CMR 10.14(4): *Table 3* and the related pipe size is equals to a one-inch diameter pipe.
- (b) Prevent Water Hammer.
1. Installation and Design Requirements.
 - a. All building water supply systems in which quick acting valves and solenoid valves are installed shall be provided with devices to absorb high pressures resulting from the quick closing of these valves.
 - b. These pressure-absorbing devices shall be air chambers that are provided with a means for restoring the air to the device should the chambers become waterlogged, or other Product-accepted mechanical devices.
 - c. Water pressure absorbers shall be placed as close as possible to the quick acting valves and shall be accessible for maintenance or replacement. *See 248 CMR 1.14: Example 2.*
 2. Pressure Absorbing Devices. A mechanical pressure absorbing device may be installed:
 - a. at the ends of long pipe runs of pipe; or
 - b. connected to piping serving batteries of fixtures.
 3. Mechanical Devices. Where mechanical devices are used, the manufacturer's specifications shall be followed as to location and method of installation.

10.14: Example 2 - Pressure Absorbing Device



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(c) Minimum Pressures Required in Water Distribution System. When sizing a water distribution piping system, the minimum flow pressure at the point of discharge for each fixture shall not be less than that shown in 248 CMR 10.14(4): *Table 4: Minimum Flow Pressure and Maximum Flow Rates.* Exception: On-demand domestic water heaters.

Table 4
Minimum Flow Pressure and Maximum Flow Rates

Fixture or Device	Flow Pressure PSI	Flow Rate G.P.M.
Lavatory Faucet (Residential)	8	1.5
Lavatory Faucet (Non-residential)	8	.5
Kitchen or Bar Faucet (Residential)	8	2.2
Sink Faucet (Non-residential)	8	4.5
Bathtub Faucet	8	6
Laundry Valve or Faucet (Residential)	8	5
Shower Head	8	2*
Tank-Type Toilet	8	1.28
Flushometer-Type Toilet	15-20	1.28
Flushometer-Type Urinal	15	.5
Drinking Water Station		0.75
Outside Faucet or Hydrant	10	5

* **Exception:** Emergency showers as defined in 248 CMR 10.10 (12)

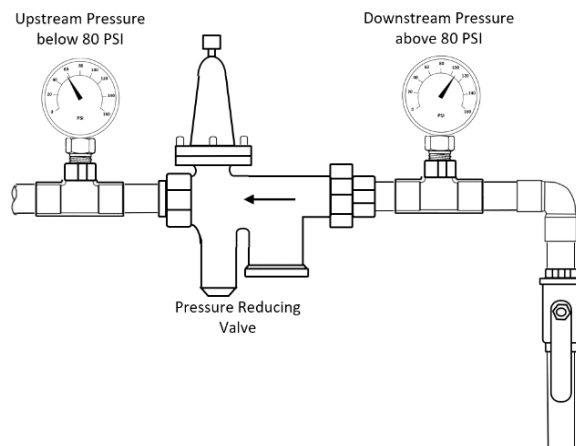
(d) Inadequate Water Pressure. Whenever water pressure from the street main, service, or other source of supply is insufficient to provide flow pressures at fixture outlets as required under 248 CMR 10.14(2)(c), a booster pump and pressure tank or other means in compliance with 248 CMR 10.00 shall be installed on the building water supply system.

1. Water Pressure Booster Systems. When water pressure in the public water main or individual water supply system is insufficient to supply the probable peak demand flow to all plumbing fixtures, a water pressure booster system shall be installed:

- a. In one, two and three-family dwellings, a properly sized booster pump shall be installed.
- b. In other than one, two and three-family dwellings, a booster system shall be designed by a Massachusetts professional engineer.

(e) Excessive Water Pressure. If the pressure at any plumbing fixture, device or appurtenance exceeds 80 PSIG, a pressure reducing valve shall be installed on the water piping upstream of the device, or appurtenance to limiting the pressure to 80 PSIG. Where pressure reducing valves are installed, a pressure gauge with a minimum range of 0-150 PSIG shall be installed within 24 inches downstream of the pressure reducing valve. *See 10.14: Example 3. Exception:* Water service supply piping upstream and downstream of a water pressure booster.

10.14: Example 3 - Pressure Reducing Valve



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(f) Return Circulation – Where Required. Hot water supply systems in buildings where the developed length of hot water piping from the source of the hot water supply to the farthest fixture supply exceeds 75 feet shall be of the total return circulation type. For purposes of 248 CMR 10.14, the "source" shall be the water heater or the recirculation loop. The minimum size recirculating line shall be ½ inch.

(3) Installation of the Building Water Distribution System.

(a) All valves shall be accessible.

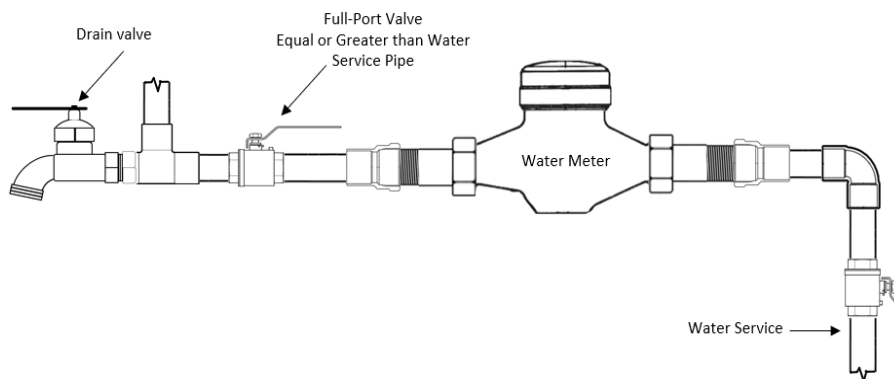
(b) Main Control Valve.

1. A full-port main control valve shall be installed in the water supply main on the discharge side of each water meter or on the incoming water service where no meter is present.

2. The valve shall be not less than the size of the building water service pipe. *See 10.14: Example 4.*

3. A draw off valve shall be installed upstream of main control valve on the discharge side of each water meter. *See 10.14: Example 4.*

10.14: Example 4 - Main Control Valve



(c) Branch and Riser Valves.

1. A full-port valve shall be installed at the base of each water supply riser when servicing multiple fixtures on levels above the first floor. A draw off valve shall be installed upstream of each riser valve. *See 10.14: Example 5.*

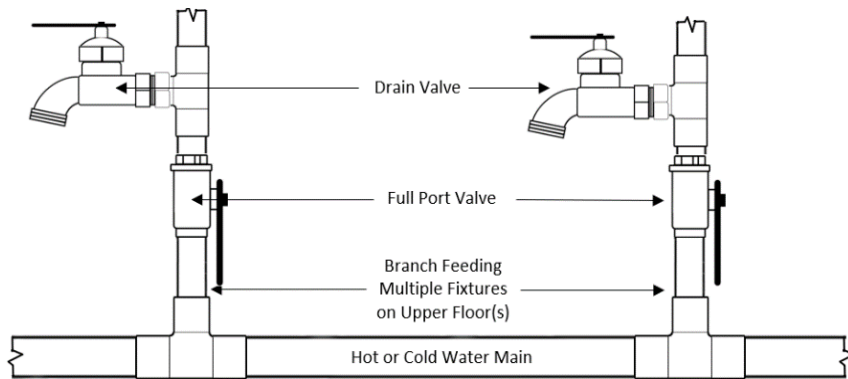
2. Branch valves installed servicing multiple fixtures shall be full port.

3. In multistory buildings, a full-port valve shall be installed at the top of each water supply that is an upstream supply pipe from a booster system.

4. Dead Ends shall not be allowed. (*see definition*).

10.14: continued

10.14: Example 5 - Risers



(d) Valves in Multiple Dwelling Units. One or more main control valve shall be provided so that the water to any unit may be shut off without stopping the flow of water to other units. These valves shall be accessible to the unit supplied without requiring access to other units.

(e) All main control valves, branch/riser valves and other devices installed on mains and branches of the water supply system shall be of the full-port type.

(f) Individual Fixture Valves.

1. In all buildings, water supply pipes feeding plumbing fixtures, devices, or appurtenances shall be provided with a valve to shut off the water to that fixture, device, or appurtenance. Exception: Residential shower valves, tub and shower valves, tub fillers and other similar type fixtures.

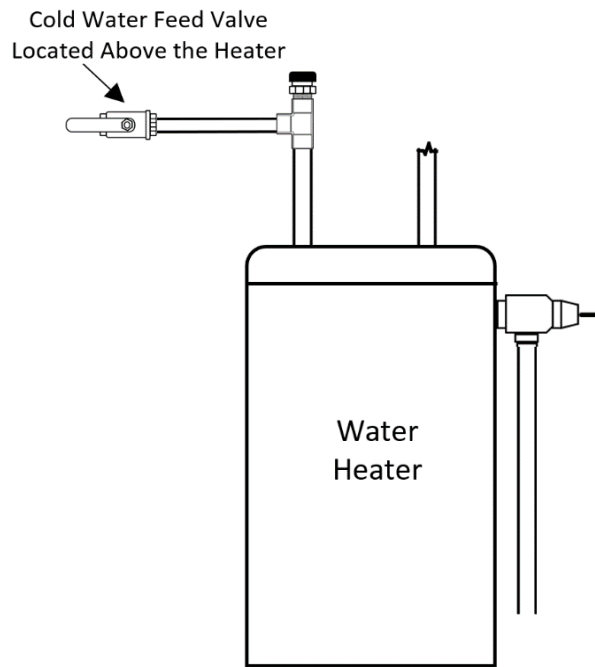
2. All outside sillcocks, hose bibbs and wall hydrants shall be separately controlled by a shutoff valve installed inside the building.

(g) Tank Controls. Supply lines from pressure or gravity tanks shall be provided with valves at or near the tanks.

(h) Water Heating Equipment Valve. The cold-water branch to each hot water storage tank or water heater shall be provided with a valve located near the equipment and above the top of the tank. See 10.14: *Example 6.*

10.14: continued

10.14: Example 6 - Valve for Water Heater



- (i) Drain Valves.
 - 1. In other than single family homes, a drain valve shall be installed at all low points of piping so that every portion of the water piping system can be drained.
 - 2. An accessible drain valve shall be required upstream and near the meter or main control valve. *See 10.14: Example 4.*
 - (j) Metering Devices with Check Valves. When a metering device with a check valve or backflow preventor is installed creating a closed system, a properly sized thermal expansion tank shall be installed as close as possible to the metering device.
 - (k) Hose Connections.
 - 1. Outside Hose connections, sillcocks or wall hydrants shall be installed in all residential buildings no more than 100 feet apart.
 - 2. In all commercial buildings, Sillcocks and hose connections shall only be required in:
 - a. mechanical rooms;
 - b. mechanical penthouses; or
 - c. mechanical areas of similar use and nature.
 - 3. A backflow preventer or vacuum breaker shall be installed on all sillcocks, hose connections and wall hydrants including faucets that incorporate a hose thread outlet.
 - (l) Prohibited Valves and Connections.
 - 1. Saddle valves.
 - 2. No water supply line shall be tapped, burned, welded, or drilled, other than mechanical devices that have been Product-accepted by the Board which are designed and engineered to create penetration in piping for specific joining methods may be used.
- (4) Disinfection of Potable Water System Piping. When necessary, the Inspector shall require that a Potable water distribution system, or any part thereof, which has been installed or repaired may require disinfection in accordance with one of the following methods before it is placed in operation:
- (a) The system, or part thereof, shall be filled with a water and chlorine solution which contains 50 parts per million of available chlorine; and the same shall then be allowed to stand six hours before the system, or part thereof, is flushed and returned to service.
 - (b) The system, or part thereof, shall be filled with a solution which contains 100 parts per million of available chlorine, and the same shall then be allowed to stand two hours before the system, or part thereof, is flushed and returned to service.

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(c) Where it is not possible to disinfect a potable water storage tank as provided by 248 CMR 10.14(7)(a) or (b), the entire interior of the tank shall be swabbed with a solution which contains 200 parts per million of available chlorine; and the solution shall then be allowed to stand two hours before the tank is flushed and returned to service. For a potable water filter or similar device, the Massachusetts Department of Environmental Protection shall determine the dosage.

(5) Hot Water Supply System.

(a) In all occupied premises and structures, hot water shall be supplied to all plumbing fixtures and equipment used for bathing, washing, culinary purpose, cleansing, laundry, or building maintenance.

(b) Hot water storage systems shall be designed to adequately accommodate the fixtures being served.

(c) The maximum temperature of domestic hot water in residential buildings shall not exceed 130°F. Plumbing fixtures requiring higher temperatures for their proper use and function, such as dishwashers and hot water dispensers shall be exempted from 248 CMR 10.14.

Minimum and Maximum Hot Water Temperatures

Hot Water Temperatures (Fahrenheit)		
	Minimum	Maximum
Residential	120	130*
Water Entering the Sanitary Drainage System		150
Shower Valve	120	120
Tub Filler	120	120
Public & Employee Lavatory	120	120
Residential Lavatory	120	130
Emergency Showers & Eyewash	60	100
Hand Sink in Commercial Kitchen	120	120
Kitchen Type Sink in Office	120	120
Service Sink & Scullery Sink	120	140
*See 10.14 (5)(c) for Exception		

(6) Tank Type Water Heaters and Storage Tanks.

(a) Working Pressure of Storage Tank. To determine the working pressure of a hot water tank as required by M.G.L. c. 142, § 18E, the street or service pressure only shall be considered, unless a water pressure booster system is used to raise the house pressure above the street pressure.

(b) Tank Drains. A storage tank shall be equipped with a drain valve for emptying at the tank lowest point accept when otherwise allowed by the Board.

(c) Cold Water Supply.

1. A check valve shall not be installed in the cold-water supply to any hot water heater or hot water storage tank.

2. A properly sized thermal expansion tank may be installed to prevent excessive pressure from developing due to thermal expansion.

(d) Prohibited Methods of Water Heating.

1. Hot Water Generators. No coils, boosters or other hot water heating devices shall be installed in direct contact with the heat generating source of any building heating system or heating unit.

2. Systems Without Automatic Control. No domestic hot water storage system, connected with or to, a direct heating device or appliance, shall be installed in any basement of any building or other unattended area unless such installation has fully automatic control to prevent raising of the temperature of the water in any part of the storage tank to 212°F.

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- (e) Large Volume Water Heaters and Storage Tanks.
1. Water heaters and storage tanks shall be stamped as ASME compliant when:
 - a. Installed in other than a private residence or a single condominium unit where the heater is serving only that unit;
 - b. Have a storage capacity of over 120 gallons and/or a recovery equal to or greater than 200,000 B.T.U.; and
 - c. are direct or indirect fired. When determining the B.T.U. rating for an indirect fired water heater, the maximum output of the stored or transferred energy shall be utilized.

Examples: An 80-gallon tank with a recovery rate 210,000 BTU must comply with ASME requirements. Two tanks installed, each with 100-gallon capacity with an indirect water heater with a recovery rate of 199,000 BTU feeding tanks shall meet ASME requirements.

Exception: Water heaters and storage tanks which meet the following requirements:

 - a. The tank conforms with the following UL-174 testing:
 - i. Section 33. Two times the maximum working pressure or 300 PSIG maximum;
 - ii. Section 22. 150 PSIG and 210° maximum.
 - b. The tank has a minimum of a ten year warranty
 - c. A maximum of four tanks may be installed in tandem.
 2. ASME Data Sheet.
 - a. Copies of an ASME data sheet attesting to the conformance with the requirements of the applicable section of the Code and signed by an authorized and qualified inspector shall be furnished to the owner and/or installing contractor.
 - b. A copy of the data shall be permanently displayed in a suitable mounting on a wall adjacent to the water heater.
- (f) Safety Devices for Water Heaters Safety devices to be used on hot water tanks, tankless and on-demand heaters shall be installed to comply with the provisions of M.G.L. c. 142, § 19 and Standard ANSI 221.22.
1. Pressure Relief Valves.
 - a. Pressure relief valves installed on direct-fired water heaters having up to 200,000 BTU per hour input shall have a listed rating of not less than the heater input.
 - b. Pressure relief valves for on-demand water heaters shall have a listed rating of not less than the water heater input.
 - c. For tankless heaters connected to low pressure steam and hot water heating boilers, the pressure relief valve shall be sized according to 248 CMR 10.14(6)(f): *Table 5*, as follows:

Table 5

Heater Rating (GPM)	Valve Size
Up to 5	½-inch
Over 5 up to 20 Standard Z21.22 applies	¾-inch
Over 20 up to 50	1-inch
Over 50 ASME Standard applies	1 - 1¼-inch

2. Combination Temperature and Pressure Relief Valves. (T&P) All storage water heating equipment capable of heating water in excess of 212°F shall be equipped with a properly sized T&P relief valve.
 - a. T&P relief valves shall meet the requirements of pressure relief valves as provided in 248 CMR 10.14(6)(f)1.
 - b. A T&P valve shall be installed in a tapping directly in or on the tank, within 12 inches of the top of a vertical tank, or within six inches of the top of a horizontal tank, with no fittings between the valve and the tank, except that a bushing may be used to reduce the tapping to fit the valve, or the valve shall be installed in the hot water outlet pipe as close to the top of the tank as possible but in no case more than five inches from the top of the tank.

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- c. The discharge outlet if the T&P relief valve shall be full-size and pipe using non-ferrous material or tubing rated to withstand the maximum relief valve temperature with no shut-off, to a fixture or a point to within twelve inches of the floor.
 - d. Heaters and storage tanks with ratings in excess of 200,000 BTU shall be equipped with T&P relief valves in compliance with the requirements of ASME and the current ANSI Z21.22 Standard.
3. Vacuum Relief Valves.
- a. Tank type water heaters and storage tanks shall be protected against loss of water from siphoning due to loss of supply pressure by a vacuum relief valve installed in the cold-water supply line at a level above the top of the heater or tank with no shut off valve installed between the vacuum relief valve and the tank.
 - b. Vacuum relief valves shall be a minimum of one pipe size smaller than the tank drain size.
 - c. Vacuum relief valves may be installed in multiples and in compliance with 248 CMR 10.14(6)(f)3. *Table 6.*

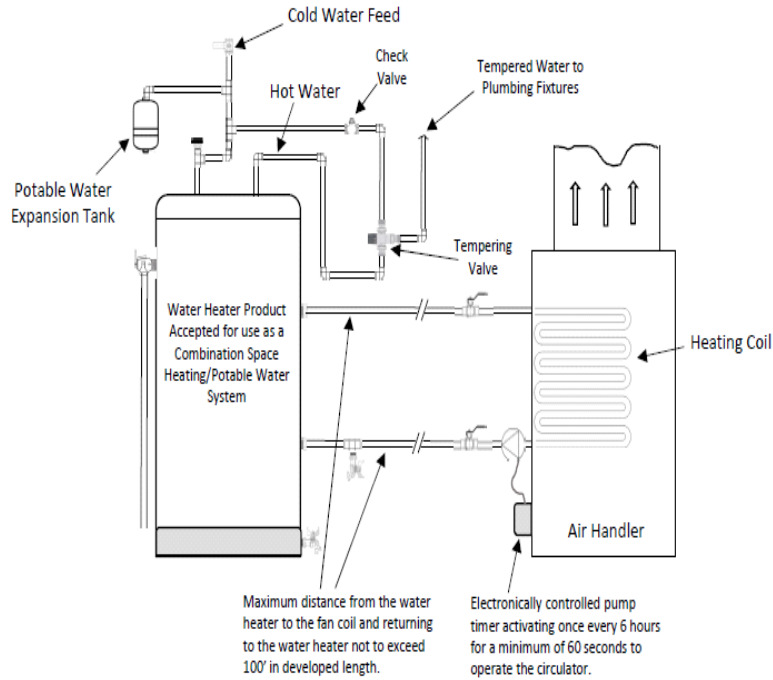
Table 6

Vacuum Valve Sizing Chart		
Size of Tank Drain	Number of 1/2" Valves Required	Number of 3/4" Valves Required
1/2"	1	
3/4"	1	
1"	2	1
1 3/4"	3	2
1 1/2"	4	3
2" and Larger	5	4

- (g) Combination Potable Water/Space Heating System. These systems shall comply with the following requirements. *See 10.14: Example 7.*
- 1. The maximum distance from the water heater to the fan coil and returning to the water heater shall not exceed 100 feet in developed length.
 - 2. All piping materials between the water heater and coil shall be in compliance with 248 CMR 3.04: *Product, Design, and Testing Standards* and 248 CMR 10.06.
 - 3. Must contain an electronically controlled pump timer which operates at least once every six hours for a minimum of 60 seconds.
 - 4. A properly sized potable water expansion tank shall be installed.
 - 5. A mixing valve for service to the plumbing fixtures shall be installed.

10.14: continued

10.14: Example 7
Combination Potable Water/Space Heating System



(h) Identification Tags for Water Heaters. Metal or foil tags permanently attach to most water heaters are considered in compliance with the provisions of M.G.L. c. 142, § 17.

(7) Protection of Potable Water Supply.

(a) General. A potable water supply system shall be designed, installed, and maintained in such manner as to prevent contamination from non-potable liquids, solids, or gases from being introduced into the potable water supply through cross connections or any other piping connections to the system.

(b) Identification of Potable and Non-potable Water. In all buildings where potable water and non-potable water is installed within the same building or structure, the following additional conditions must be satisfied as well as those conditions required for each individual piping system:

1. The potable and non-potable piping systems shall be labeled or painted in the following manner:

- a. at a minimum of every ten feet;
- b. at all changes of direction;
- c. on each side of a penetration through a partition, wall, ceiling or roof;
- d. at every shut off valve;
- e. for potable water (color-coded green) and non-potable water (color-coded yellow), the labels shall be:
 - i. black lettering indicating "safe water" for potable and "unsafe water" for non-potable;
 - ii. the letters shall be sized equal to a minimum of the pipe diameter. However, for piping with a diameter exceeding two inches, said lettering does not need to be larger than two inches.
- f. Non-potable water shall be identified at each outlet location.

(c) Cross Connection Control.

1. Cross connections between potable water systems and other systems or equipment containing water or other substances of unknown or questionable safety are prohibited; except when and where, as approved by the Massachusetts Department of Environmental Protection (DEP) or its designee, suitable protective devices such as the Reduced Pressure Zone Backflow Preventer or equal are installed, tested, and maintained to insure proper operation on a continuing basis.

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2. No plumbing permit shall be issued for cross connection installations that require Reduced Pressure Zone Backflow Preventers or Double Check Valve Assemblies until the application for a permit is accompanied by a letter of approval from the Massachusetts (DEP) or its designee.
 3. The (DEP) or its designee shall be the authority having jurisdiction for the type of cross connection control required. The (DEP) shall be responsible for preventing the contamination of drinking water to the last free flowing outlets or consumer's tap.
- (d) Interconnections.
1. Individual Water Supplies. Cross connections between an individual water supply and a potable public supply shall not be made unless specifically approved by the Massachusetts (DEP).
 2. Public Water Supplies. Interconnection between two or more public water supplies shall be permitted only with the approval of the health authority having jurisdiction.
- (e) Foreign Materials. No materials or substances that could produce either toxic condition, taste, odor, or discoloration in a potable water system shall be introduced into or used in such systems.
- (f) Used Piping. Piping which has been used for any other purpose than conveying potable water shall not be used for conveying potable water.
- (g) Self Feeding Water Connections to Heating Boilers.
1. Potable water connections to a heating boiler shall be provided with an approved back flow preventer or air gap in the water line to prevent cross connection.
 2. Backflow preventers shall not be required on manually controlled water supply lines to residential type steam and/or gravity fed hot water space heating systems.
- (h) Prohibited Connections to Fixtures and Equipment. Connection to the potable water supply system for the following shall be protected against backflow:
1. bidets;
 2. operating, dissection, embalming, and mortuary tables or similar equipment -- in such installation, the hose used for water supply shall terminate at least 12 inches away from every point of the table or attachments;
 3. pumps for non-potable water, chemicals, or other substances; note that priming connections may be made only through an air gap;
 4. building drainage, sewer, or vent system; and
 5. any other fixture of similar hazard.
- (i) Refrigerating Unit Condensers and Cooling Jackets.
1. Except where potable water provided for a refrigerator condenser or cooling jacket is entirely outside the piping or tank containing a toxic refrigerant, with two separate thicknesses of metal separating the refrigerant from the potable water supply the inlet connection shall be provided with an approved double check valve installation.
 2. Also adjacent to and at the outlet side of the check valve, an approved pressure relief valve set to relieve at five PSIG above the maximum water pressure at the point of installation shall be provided if the refrigeration units contain more than 20 pounds of refrigerants.
- (j) Chemical Cleaning Dispensers.
1. Devices directly connected to the potable water system. (hard piped)
 - a. Shall require a plumbing permit.
 - b. The public water supplier shall determine the proper backflow device to be installed.
 2. Devices connected to the hose end of a faucet:
 - a. Shall not require a plumbing permit;
 - b. All dispensers shall have an Air Gap or, an alternative Certification of Listing under the ASSE 1055B Standard.
 - c. A pressure bleeder device shall be provided which will visually free flow water through the atmosphere from the faucet connection to a sink or drain. The bleeder device shall connect to the water source utilizing a quick disconnect coupling.
 - d. The Device that attaches to the Faucet shall be so arranged, so it is one piece that will not allow the removal of the bleeder from the Quick disconnect portion of this device.

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- (k) Water Recycling/Re-use Prohibited.
1. Water used for cooling of equipment or other processes shall be discharged into the drainage system through an air gapped indirect waste. Under conditions where water shortage may occur, the water used for cooling may be used for non-potable purposes. Water used for cooling of equipment or other processes shall not be returned to the potable water system.
 2. Exceptions. Water recycling systems may be installed if Special-permission under 248 CMR 3.04(3) has been granted by the Board. Systems include, but limited to:
 - a. dedicated gray water systems;
 - b. black water systems;
 - c. on site wastewater treatments systems;
 - d. systems Product-accepted by the Board shall not require Special Permission.
- (l) Protection Against Backflow and Back siphonage.
1. Water Outlets. A potable water system shall be protected against backflow and back siphonage in accordance with M.G.L. c. 111, § 160A, and 310 CMR: *Department of Environmental Protection* relative to protection of the potable water supply.
 - a. Air Gap. An air gap as defined in 248 CMR 10.03 between the potable water outlet and the flood level rim of the fixture it supplies or between the outlet and any other source of contamination.
 - i. The minimum required air gap shall be measured vertically from the lowest end of a potable water outlet to the flood rim of the fixture or receptacle into which it discharges and shall be twice the effective opening of the potable water outlet.
 - ii. If the outlet is found to be at a distance that is less than three times the effective opening away from a wall or similar vertical surface; the minimum required air gap shall be three times the effective opening of the outlet.
 - iii. In no case shall the minimum required air gap be less than shown in 248 CMR 10.14(8): *Table 7: Minimum Air Gaps for Plumbing Fixtures:*
 - b. Backflow Preventer. A backflow preventing device or vacuum breaker to prevent the drawing of contamination into potable water system.

Table 7
Minimum Air Gaps for Plumbing Fixtures

Minimum Air Gaps For Plumbing Fixtures	Minimum Air Gap	
	When not affected by a near wall	When affected by a near wall
Lavatories and other fixtures with effective openings not greater than one half inch in diameter.	1 inch	1.50 inches
Sink, laundry sinks, goose neck bath faucets and other fixtures with effective openings not greater than three quarters of an inch diameter.	1.5 inches	2.25 inches
Over rim bath fillers and other fixtures with effective openings not greater than one-inch diameter.	2 inches	3 inches
Effective openings greater than one inch	2 times the diameter of the effective opening	2 times the diameter of the effective opening

2. Devices for the Protection of the Potable Water Supply. Approved backflow preventers or vacuum breakers shall be installed on any plumbing fixture or equipment where the potable water supply outlet may be submerged and cannot be protected by a minimum air gap.
 - a. Labeling.
 - i. Piping after each device shall be labeled as "Water Subject to Questionable Safety" in accordance with 248 CMR 10.14(8)(b)1.a. through f.

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3. Installation of Devices.
 - a. Vacuum Breakers.
 - i. Vacuum breakers shall be installed with the critical level at least six inches above the flood level rim of the fixture they serve and on the discharge side of the last control valve to the fixture.
 - ii. No shut-off valve or faucet shall be installed beyond the vacuum breaker.
 - iii. For closed equipment or vessels such as pressure sterilizers the top of the vessel shall be treated as the flood level rim but a check valve shall be installed on the discharge side of the vacuum breaker.
 - b. Reduced Pressure Zone Backflow. A reduced pressure zone type backflow preventer may be installed subject to full static pressure. Where damage may occur to the building or structure due to water discharge from the vent port precautions shall be taken.
 - c. Devices of All Types.
 - i. Backflow and back siphonage preventing devices shall be accessibly located preferably in the same room with the fixture they serve.
 - ii. Installation in utility or service spaces, provided they are readily accessible, is also permitted.
4. Tanks and Vats - Below Rim Supply.
 - a. Where a potable water outlet terminates below the rim of a tank or vat and the tank or vat has an overflow of diameter not less than given in 248 CMR 10.14(6): *Table 8: Sizes of Overflow Pipes for Water Supply Tanks*, the overflow pipe shall be provided with an air gap as close to the tank as possible.
 - b. The potable water outlet to the tank or vat shall terminate a distance not less than 1½ times the height to which water can rise in the tank above the top of the overflow.
 - c. This level shall be established at the maximum flow rate of the supply to the tank or vat and with all outlets except the air gap, overflow outlet closed.
 - d. The distance from the outlet to the-high water level shall be measured from the critical point of the potable water supply outlet.

Table 8
Sizes of Overflow Pipes for Water Supply Tanks

Maximum Capacity of Water Supply Line to Tank	Diameter of Overflow Pipe (inches ID)
0 – 50 G.P.M.	2
51 – 100 G.P.M.	2½
101 – 165 G.P.M.	3
166 – 355 G.P.M.	4
356 – 640 G.P.M.	5
641 – 1,040 G.P.M.	6
OVER 1,040 G.P.M.	8

5. Connections Not Subject to Back Pressure.
 - a. Where a water connection is not subject to back pressure, a non-pressure type vacuum breaker shall be installed on the discharge side of the last valve on the line serving the fixture or equipment.
 - b. A list of some conditions requiring protective devices of this kind is given in in 10.14 *Table 9: Cross Connections Where Protective Devices Are Required and Critical Level (C-L) Settings for Backflow Preventers.*

10.14: continued

Table 9
Sizes of Drain Pipes for Water Tanks

TANK CAPACITY (Gallons)	DRAINPIPE SIZE (Inches)
Up to 750	1"
751 – 1,500	1½"
1,501 – 3,000	2"
3,001 – 5,000	2½"
5,001 – 7,500	3"
7,500 and Larger	4"

6. Barometric Loop. Water connections not subject to back pressure where an actual or potential backflow or back siphonage hazard exists may in *lieu* of devices specified in 248 CMR 10.14(8)(k)2., be provided with a 35-foot barometric loop. Barometric loops shall precede the point of connection.
7. Pressure Type Vacuum Breakers. Water connections not subject to backpressure where an actual or potential backflow or back siphonage hazard exists may be protected by the installation of a pressure type vacuum breaker, provided that such device is installed with the critical level a minimum of 12 inches above the highest outlet or fixture served by the connection.
8. Anti-siphon or Backpressure Valves.
 - a. An anti-siphon or backpressure valve shall be installed on any chemical metering pump that pumps any chemical into a potable water supply to prevent back siphonage.
 - b. The anti-siphon or back-pressure valve must be spring loaded and set at a minimum of five PSIG (An example may be an anti-siphon or back-pressure valve installed on a positive displacement metering pump's discharge line and pumping sodium hypochlorite into a water main at a well house for disinfection purposed.)

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10.14: continued

Table 10
Cross Connections Where Protective Devices Are Required
and Critical Level (C-L) Settings for Backflow Preventers

Fixture or Equipment	Method of Installation
Aspirators and ejectors	C-L at least six inches above flood level or receptacle.
Dental units	On models without built-in vacuum breakers -- C-L at least six inches above flood level rim of bowl.
Dishwashing machines	C-L at least six inches above flood level of machine. Install on both hot and cold water supply lines.
Flushometers (closet and urinal)	C-L at least six inches above top of fixture supplied
Garbage can cleaning machine	C-L at least six inches above flood level of machine. Install on both hot and cold water supply lines.
Hose outlets	C-L at least six inches above highest point on hose line.
Laundry machines	C-L at least six inches above flood level of machine. Install on both hot and cold water supply lines.
Lawn sprinklers	C-L at least 12 inches above highest sprinkler or discharge outlet.
Steam tables	C-L at least six inches above flood level.
Tank and vats	C-L at least six inches above flood level rim or line.
Trough urinals	C-L at least six inches above perforated flush pipe.
Flush tanks	Must be equipped with approved ball cock. Where ball cocks contact tank water they must be equipped with a vacuum breaker at least one inch above the overflow outlets. Where a ball cock does not contact tank water install the ball cock outlet at least one inch above the overflow outlet or provide a vacuum breaker as specified above.

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Table 11
Acceptable Types of Backflow Preventers for
Prevention of Cross Connections on Potable Water

AG = Air Gap RPBP = Reduced Pressure Backflow Preventer DCVA = Double Check Valve Assembly AVB = Atmospheric Vacuum Breaker PVB = Pressure Vacuum Breaker BPIAV = Backflow Preventer w/Intermediate Atmospheric Vent						
Type of Hazard on Premises	Acceptable Types of Backflow Preventors					Comments*
	AG	RPBP	DCVA	AVB	PVB BFAV	
1. Sewage Treatment Plant	X	X				
2. Sewage Pumping Station	X	X				
3. Food Processing	X	X	X*			*If no health hazard exists
4. Laboratories	X	X	X*			*If no health hazard exists
5. Fixtures with hose threads on inlets	X	X	X	X		In addition to an air-gap separation, all fixtures that have threaded hose type connections shall at a minimum, be equipped with an AVB
6. Hospitals, Mortuaries & Clinics	X	X				
7. Plating Facilities	X	X				
8. Irrigation Systems**	X	X		X*	X**	Each case should be evaluated individually. *An AVB may be used if no back pressure is possible and no health hazard exists. ** A PVB should be installed if back pressure is possible.
9. Systems or Equipment Using Radioactive Material	X	X				
10. Submerged Inlets	X	X		X*		*If no health hazard exists and no back-pressure is possible
11. Dockside Facilities	X	X				
12. Valves Outlets or Fixtures with Hose Attachments	X	X		X*		Each case should be evaluated individually
						*If no health hazard exists and no back-pressure is possible

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AG = Air Gap RPBP = Reduced Pressure Backflow Preventer DCVA = Double Check Valve Assembly AVB = Atmospheric Vacuum Breaker PVB = Pressure Vacuum Breaker BPIAV = Backflow Preventer w/Intermediate Atmospheric Vent						
Type of Hazard on Premises	Acceptable Types of Backflow Preventors					Comments*
	AG	RPBP	DCVA	AVB	PVB BFAV	
13. Commercial Laundries & Dry Cleaners	X	X				
14. Commercial Dishwashing Machines	X	X		X*		*If no health hazard exists
15. High- and Low-Pressure Boilers	X	X*				*If chemicals are added
16. Low Pressure Heating Boilers					X	Residential and small commercial having no chemicals added
17. Photo Processing Equipment	X	X				
18. Reservoirs – Cooling Tower Recirculating Systems	X	X				
19. Fire Protection Systems: For cross connection control, fire protection systems may be classified on the basis of water source and arrangement of supplies as follows: (a) Class 1: Direct connection from public water system mains only; no pumps, tanks, or reservoirs; no physical connection from other water supplies; no antifreeze or other additives of any kind; all sprinkler drains discharge to atmosphere, dry wells, or other safe outlets. These systems may or may not have fire department connections. Refer to 310 CMR 22.22(9)(d)1.	X	X	X			A backflow prevention assembly does not have to be installed on existing fire protection systems installed prior to March 21, 1997, provided that the fire protection system is registered with the public water system, equipped with a UL listed alarm check valve that is properly maintained in accordance with NFPA 25 and has not undergone substantial modification defined within 310 CMR 22.22(9)(d)3. Alarm check maintenance records must be available for inspection by the Department, its designee or the public water system
(b) Class 2: Same as Class 1 except that booster pumps may be installed in the connections from the street mains These systems may or may not have fire department connections. Refer to 310 CMR 22.22(9)(a).	X	X	X			A backflow prevention assembly does not have to be installed on existing fire protection system installed prior to March 21, 1997, provided that the fire protection system is registered with the public water system and equipped with a UL listed alarm check valve that is properly maintained in accordance with NFPA 25. Alarm check maintenance records must be available for inspection by the Department, its designee or the public water system.

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AG = Air Gap RPBP = Reduced Pressure Backflow Preventer DCVA = Double Check Valve Assembly AVB = Atmospheric Vacuum Breaker PVB = Pressure Vacuum Breaker BPIAV = Backflow Preventer w/Intermediate Atmospheric Vent						
(c) Class 3: Direct connection from public water system mains, plus one or more of the following: elevated storage tanks; fire pumps taking suction from aboveground covered reservoirs, or tanks; and pressure tanks.	X	X*	X*			*RPBP or DCVA contingent on evaluation of auxiliary supply and on-site system in accordance with 310 CMR 22.22(9)(d)1.
(d) Class 4: Directly supplied from public water system mains, similar to Class 1 and Class 2 with an auxiliary water supply dedicated to fire department use and available to the premises, such as a non-potable water source located within 1700 feet of the fire department connection, (FDC).	X	X*				*RPBP on evaluation of auxiliary supply and onsite system in accordance with 310 CMR 22.22(9)(d)1.
(e) Class 5: Directly supplied from public water system mains, and interconnected with auxiliary supplies, such as pumps taking suction from reservoirs exposed to contamination, or rivers and ponds; driven wells; mills or other industrial water systems; or where antifreeze or other additives are used.	X*	X*				*RPBP or air gap contingent on evaluation of auxiliary supply and on-site system. Refer to 310 CMR 22.22(9)(d)1.
(f) Class 6: Combined industrial and fire protection systems supplied from the public water mains only, with or without gravity storage or pump suction tanks.	X	X*		X	X	*RPBP contingent on evaluation of on-site water system. Refer to 310 CMR 22.22 (9)(d)1.
(g) Residential fire protection systems for one and two family detached dwellings and manufactured homes only. Fire protection systems in three family dwellings meeting NFPA 13D requirements as provided in 780 CMR, Chapter 9, are included in this section.	X	X	X			Fire protection system in this category shall comply with the requirements set forth in class 1 through 4 as appropriate.
20. Solar Energy Systems	X	X			X*	Residential and small commercial having no chemicals or only USP Glycine added to water
21. Single Jacketed Heat Exchangers	X	X				Each case should be evaluated individually

Source of Table 8A is Department of Environmental Protection (DEP) 310 CMR 22.22(c)

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10.15: Sanitary Drainage System

- (1) Materials. Pipe, tubing, fittings, and traps to be used on any part of the sanitary drainage system in a building or adjacent to a building shall comply with all relevant sections of 248 CMR 3.00 through 10.00.
- (2) Determining Size of Drainage System.
 - (a) Fixture Units for Drainage Piping. The waste discharge calculations for the drainage system piping shall be computed in terms of drainage fixture units in accordance with 248 CMR 10.15: *Table 1: Fixture Unit Values for Various Plumbing Fixtures* and 248 CMR 10.15(2)(b).
 - (b) Values for Continuous Flow. Fixture unit values for continuous or semi-continuous flow into a building sanitary drainage system, such as from a waste pump, sewage ejector pump, or similar device that discharges sewage waste shall be computed on the basis of two fixture units for each gallon per minute of flow. Exception: Installation of ejector pumps installed in compliance with 10.15(9): *Table 5* with a maximum of 20 GPM.
- (3) Selecting the Size of Drainage Piping. Pipe sizes shall be determined from 248 CMR 10.15(7): *Table 1, 2 and 3* based on drainage fixture unit values calculated from 248 CMR 10.15(7): *Table 1: Fixture Unit Values for Various Plumbing Fixtures* and 248 CMR 10.15(2)(b).
- (4) Minimum Size of Soil and Waste Stacks. No soil or waste stack shall be smaller than the largest horizontal waste branch connected thereto, (*See 248 CMR 10.15(7): Table 1: Fixture Unit Values for Various Plumbing Fixtures and 248 CMR 10.15(7): Table 3: Maximum Loads in Fixture Units for Any One Branch Interval on Multistory Soil and Waste Stacks*).
- (5) Provision for the Installation of Future Fixtures. When future drainage provisions are considered regarding the potential installation of other fixtures, the drains provided shall be considered in determining the final required sizes of drains and vent pipes.
- (6) Size of Underground Drainage Piping.
 - (a) Underground or Basement Floor. No portion of the drainage system installed underground shall be less than two inches in diameter.
 - (b) Sanitary Piping Installed Through the Foundation Wall.
 1. Sanitary piping that pass through an exterior foundation wall shall be no less than four inches in diameter,
Exceptions:
 - a. When serving a Hazardous Waste System installed in accordance with (248 CMR 10.13).
 - b. When serving a residential laundry drain is conducted to a separate (Local Board of Health Authorized) dry-well disposal system. The minimum size drain shall be two inches in diameter.
 - c. When serving as a waste for baptistries or similar type fixtures, the drain shall be a minimum of two inches in diameter. *See 248 CMR 10.10(11)*.
 - d. When serving exclusively as the discharge from a semi-positive displacement grinder pump, and if so, the following shall be satisfied:
 - i. The minimum pipe size for a semi-positive displacement grinder pump discharge shall be 1¼-inch and shall provide a self-cleaning velocity of no less than two feet per second.
 - ii. The velocity in the pipe shall not be more than seven feet per second.
 - iii. A full port discharge valve and check valve shall be provided and made accessible inside the building.
 - iv. The waste discharge from semi-positive displacement grinder pumps shall be protected from freezing when the piping is installed less than four feet below grade in outside locations.
 - (i) The discharge shall be installed in accordance with the manufacturer's installation instructions:
 - (ii) shall be a minimum of 1¼ inch; and

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- (iii) an accessible check valve and full port shut off valve shall be installed on the discharge piping, and the discharge shall be properly protected from freezing.
- e. Secondary structures and cabanas located on residential properties which discharge into the sanitary drainage system or building sewer of the main structure. Piping shall be sized in accordance with 248 CMR 10.15 but in no case less than two inches in diameter.

Table 1
Fixture Unit Values for Various Plumbing Fixtures

Type of fixture or group of fixtures	Fixture Unit Value
Bathtub or Tub & Shower Unit	2
Bidet	2
Dental chair unit or cuspidor	1
Dental lavatory	1
Drinking fountain/Water Station	1
Dishwasher, commercial	6
Dishwasher, Residential	1
Floor/trench drain 2-inch	4
Floor/trench drain 3-inch	5
Floor/trench drain 4-inch	6
Kitchen sink Residential (with or without disposer)	2
Lavatory with 1-1/4" outlet	1
Laundry Connection Residential	3
Laundry/Utility Sink	2
Shower stall Residential	2
Showers (group) per head	2
Sinks:	
Surgeons	3
Flushing rim (with valve)	6
Service Sink with Trap Standard	3
Service Sink with P-Trap	2
Commercial Pot, scullery, etc. (each section) <i>See Note 1 Below</i>	4
Shampoo	2
Toilet, Tank Type	4
Toilet, Valve Operated	6
Urinal, pedestal, siphon jet blowout	6
Urinal, wall lip	4
Urinal, Waterless	1
Wash sink (circular or multiple) each 20 inches of usable length	1
<i>Sizes for fixtures not listed above:</i>	
1/4 inch or less	1
1/2 inches	2
2 inches	3
2 1/2 inches	4
3 inches	5
4 inches	6

Note 1: See 248 CMR 10.15(1)(b)2.d. for sizing using grease interceptors.

Note 2: See 248 CMR 10.15(2)(b) for method of computing fixture unit values of devices with continuous or semi-continuous flows.

Note 3: The size of floor drains shall be determined by the area of the floor surface to be drained in accordance with 248 CMR 10.10(10)(a).

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Table 2
Maximum Loads in Fixture Units for Horizontal Drains (F.U.)

Diameter of drain in inches	Horizontal Branch Drain (F.U.)	Building Drain		
		1/8 in./ft. (F.U.)	1/4 in./ft. (F.U.)	1/2 in./ft. (F.U.)
1½	3	---	---	---
2	6	---	---	---
2½	12	---	---	---
3	34*	---	40*	48*
4	160	180	216	250
5	360	390	480	575
6	620	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

* Not more than four water closets

Table 3
Maximum Loads in Fixture Units for Soil and Waste Stacks Having One or Two Branch Intervals

Diameter of Stack (inches)	Maximum Load on Stack (F.U.)
1½	4
2	8
2½	20
3*	48
4	240
5	540
6	930
8	2,100
10	3,750
12	5,850
15	10,500

*No more than four water closets

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10.15: continued

Table 4
Maximum Loads in Fixture Units for Any One Branch Interval
on Multistory Soil and Waste Stacks

The table is meant to be used for building with 15 or less branch intervals.

Please see formula and example below the table for buildings exceeding 15 branch intervals.

Diameter of Stack	Number of Branch Intervals													Maximum Total Load for Stack
	3	4	5	6	7	8	9	10	11	12	13	14	15	
2	3	----	----	----	----	----	----	----	----	----	----	----	----	10
2 ½	8	7	----	----	----	----	----	----	----	----	----	----	----	28
3*	20	18	17	16	15	14	13	12	11	10	10	10	10	102
4	100	90	84	80	77	75	73	72	71	70	69	68	68	530
5	225	205	190	180	175	170	165	162	159	157	156	154	153	1,400
6	385	350	325	310	300	290	285	280	275	271	268	266	263	2,900
8	875	785	735	700	675	655	640	630	620	612	606	600	594	7,600
10	1,560	1,405	1,310	1,250	1,205	1,170	1,140	1,125	1,110	1,095	1,180	1,075	1,062	15,000
12	2,435	2,195	2,045	1,950	1,875	1,825	1,790	1,755	1,730	1,705	1,685	1,670	1,655	26,000
15	4,375	3,935	3,675	3,500	3,380	3,280	3,210	3,150	3,110	3,060	3,030	3,000	2,975	50,000

* No more than three water closets In buildings with three-inch stacks and more than fifteen branch intervals, no single branch interval shall exceed more than ten fixture units.

Formula to be used for buildings in excess of 15 branch intervals

N = The permissible load on a stack with one or two branch intervals as shown in Table 3
n = Number of branch intervals on the stack to be sized

$$\frac{N}{2n} + \frac{N}{4}$$

Example: Stack size = 4"
10 Branch Intervals

Fixture Unit per Branch

$$\frac{240}{2(10)} + \frac{240}{4} = 12 + 60 = 72$$

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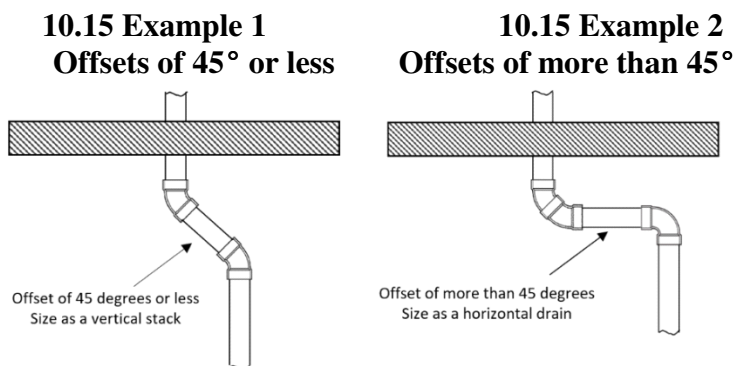
10.15: continued

(7) Sizing of Offsets on Stacks and Vertical Drainage Piping

(a) Offsets of 45° or Less. An offset with a change of direction of 45° or less from the vertical, may be sized as a straight vertical stack. In the event a horizontal branch connects to the stack within two feet above or below the offset, a relief vent shall be installed in accordance with 248 CMR 10.16(2)(d). *See 10.15: Example 1.*

(b) Offsets of More than 45°. A stack with an offset of more than 45° from the vertical shall be sized as a horizontal drain and as follows: *See 10.15: Example 2*

1. The portion of the stack above the offset shall be sized using 248 CMR 10.15: *Table 3* based on the total number of fixture units above the offset.
2. The offset shall be sized using 248 CMR 10.15: *Table 2*.
3. The portion of the stack below the offset shall be sized based on the total number of fixture units on the entire stack above including the offset.
4. In buildings of five stories or more, a relief vent for the offset shall be installed as required elsewhere in 248 CMR 10.16(2)(d).
 - a. In no case shall a horizontal branch connect to the offset or to the stack within two feet above or below the offset.



(c) Offsets Above the 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.

(d) Offsets Below the Lowest Branch. In the case of an offset in a soil or waste stack below the lowest horizontal branch, there shall be no change in diameter required if the offset is made at an angle of less than 45°. If such an offset is made at an angle greater than 45 degrees to the vertical, the required diameter of the offset and the stack below it shall be determined using 248 CMR 10.15: *Table 2*.

(8) Drainage Piping Installations.

(a) *See* 248 CMR 10.05 for the following:

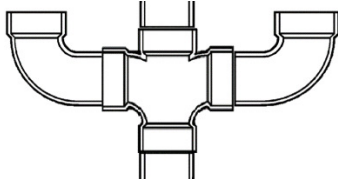
1. Pitch of horizontal piping.
2. Fittings used to change direction.
3. Prohibited fittings.
4. Heel or side inlet bends.
5. Obstructions to flow.

(b) Back to Back Fixtures When Using a Single Fitting.

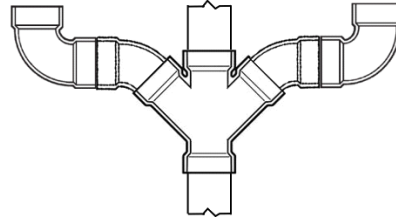
1. Horizontal: Shall be installed with the use of double sanitary wye fittings only to eliminate throw over.
2. Vertical: Shall be installed with the use of double sanitary drainage pattern tee fittings. *See 10.15: Example 2.* Exception: For water closets, double wye fittings may be used if required by the water closet manufacturer's installation instructions. *See 10.15: Example 3.*

10.15: continued

Example 2 Double Sanitary Tee



Example 3 Double Wye



(c) Kitchen Sink Wastes (Residential).

1. Not less than a 1½ inch branch waste or waste outlet shall be provided to receive the fixture drain from a kitchen sink, which shall connect independently to the sanitary drainage system.
2. A kitchen sink shall not waste into any horizontal drain smaller than three inches in diameter receiving discharge from a flat bottom fixture.
3. The roughed-in drain line for final connection to a kitchen sink shall be installed at a height to permit the installation of a food waste disposer.
4. A full-size cleanout shall be installed under all kitchen sinks.

Exception: A two-piece kitchen sink trap which may be disassembled for use in *lieu* of a clean-out.

(d) Laundries Drains in Multi-Story Buildings. In buildings where laundries are installed on more than three branch intervals, the waste line shall be connected to an independent laundry stack. *See 10.15: Example 4.*

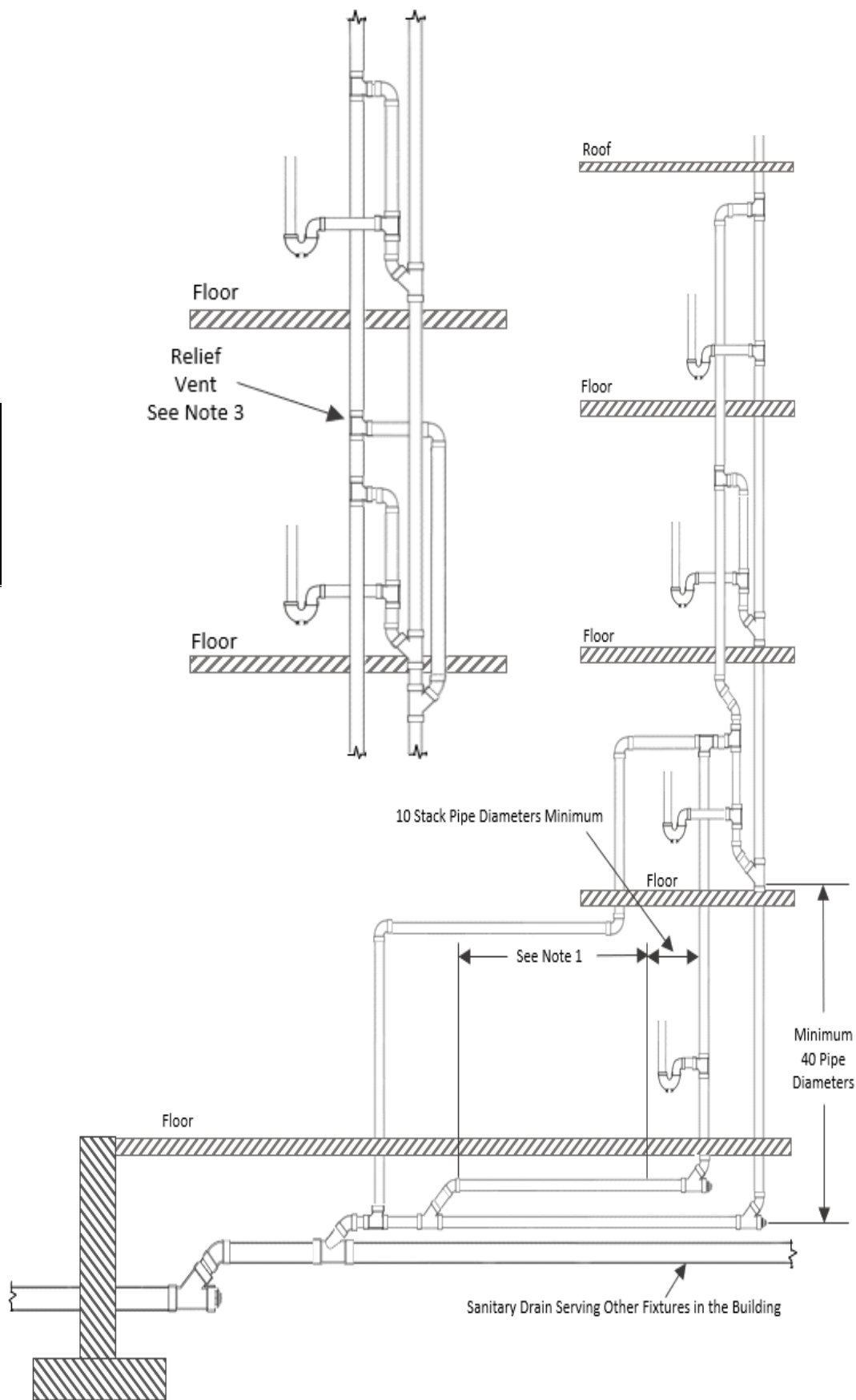
1. The independent laundry stacks shall connect to an independent laundry main drain.
2. The independent laundry main drain shall connect to the building drain a minimum of 40 pipe diameters upstream and downstream of any soil or waste stack.
3. A suds relief vent shall connect to the laundry main drain a minimum of 40 pipe diameters downstream from the base of the laundry stack. The suds relief vent shall connect to a vent a minimum of two branch intervals above the base of the laundry stack.
4. The Inspector may permit a variation from the above requirements when conditions will not allow compliance.

10.15: continued

10.15: Example 4 - Laundries Installed on More Than Three Branch Intervals

SUDS PRESSURE RELIEF VENT	
WASTE SIZE	RELIEF VENT SIZE
2"	2"
2"	2"
2-1/2"	2"
3"	2"
4"	3"
5"	4"
6"	5"
8"	5"

- NOTES:**
- 40 pipe diameters if change in direction is greater than 45 degrees
 - Long sweeps and dandy cleanouts may be used in lieu of wye's and 1/8 bends
 - If there are more than 10 branch intervals on the stack, a relief vent shall be installed in accordance with 10.16 (5) (c)



10.15: continued

(9) Sumps and Ejectors.

(a) Building Drains Below Building Sewer. Where it is not possible or practical for a drain to be discharged to the sewer by gravity flow, the drain shall be discharged into a tightly covered and vented sump, from which the contents shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment.

(b) Sewage Pumps and Ejectors.

1. In single-family dwellings, a sewage-ejector sump receiving the discharge of toilets and other fixtures shall be equipped with a sewage-ejector pump having a full-size discharge and a minimum discharge capacity of 20 gallons per minute.

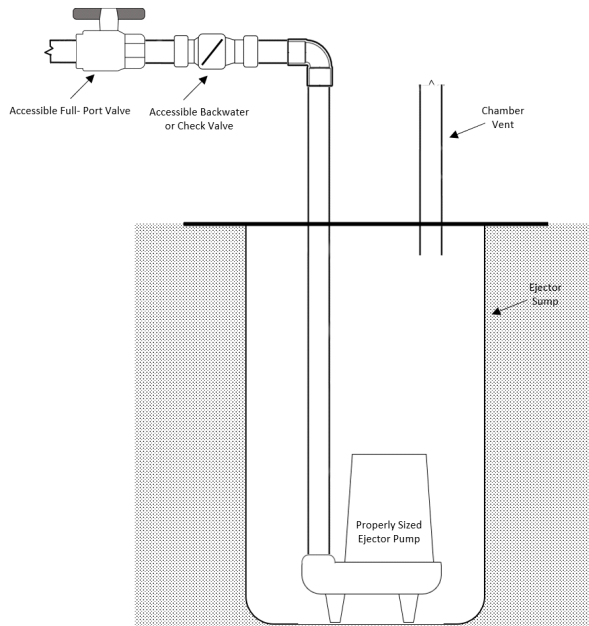
2. In all installations other than single-family dwelling, sewage-ejector pumps shall be equipped with a full-sized discharge and be sized in conformance with 248 CMR 10.15(10): *Table 5: Determining Capacities of Sewage Ejectors.*

3. The discharge piping from all sewage pumps and ejectors shall contain an accessible backwater or check valve and an accessible full port shut off valve installed downstream of the backwater or check valve. *See 10.15: Example 5.*

4. For systems not determined using 10.15: *Table 5*, a variance shall be required.

Exception: Systems designed by a Massachusetts professional engineer.

10.15: Example 5 Discharge Piping from Sewage Ejector



(c) Macerating Toilet Systems.

1. All macerating toilet systems shall be product accepted by the Board and in compliance with ASME A112.3.4 or CSA B45.9

2. Systems shall be suitable for the application and installed in accordance with the product manufacturer's installation instructions.

3. Shall have a minimum three-quarter inch discharge.

4. With the exception of toilets, all fixtures connecting to a macerating system shall be properly trapped and vented prior to connecting to the pumping unit.

(d) Pneumatic Ejectors.

1. The air pressure relief pipe from a pneumatic ejector shall not be connected to the regular venting system but shall be vented independently to the atmosphere through the roof.

2. The relief pipe shall be of sufficient size to relieve air pressure inside ejector atmospheric pressure within ten seconds but shall be not less than one inch in diameter.

(e) Grinder Pumps. Shall be product accepted, installed in accordance with the manufacturer's installation and with 248 CMR 10.15(6)(b)1.d.

(f) Duplex Equipment. Sewage pumps and ejectors, in other than one- or two-family dwellings receiving the discharge of six or more toilets shall be provided with duplex pumping equipment.

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10.15: continued

(g) Connections to the Building Drainage System. The discharge piping from a sewage pump or ejector shall be connected independently to the building drainage system.

(h) To calculate the discharge capacities of sewage pumps and ejectors, the following procedures shall be used.

1. 248 CMR 10.15(9): *Table 5*.
2. Any installation that does not meet the requirements of 248 CMR 10.15(9): *Table 5* shall be designed by a Massachusetts professional engineer.

Table 5
Determining Capacities of Sewage Ejectors

Number of toilets to be Served by each Ejector	G.P.M. Discharge of each Pump
1	20
2 - 3	75
4 - 5	100
6 - 7	125
8 - 10	150
11 - 15	200
16 - 20	250
21 - 25	300
26 - 30	350
31 - 35	375

(i) Ejectors Handling Other Fixtures. Generally, there will be a certain number of fixtures other than toilets emptying into the ejector sump. If the total amount of these fixtures exceeds four times the number of toilets used, the G.P.M. of the ejector pump should be increased at the rate of three G.P.M. for each fixture exceeding four times the number of toilets

Example:

GPM Pump Discharge of four Toilets	100 GPM
Number of additional fixtures to be handled	20
Excess Fixtures as calculated from above $20 - (4 \times 4) = 4$	4
Four @ 3 GPM	12 GPM
Correct Sewage Ejector Pump to use	112 GPM

(j) Individual Fixture Pumps.

1. Individual fixtures other than toilets, urinals or similar fixtures may discharge directly into:
 - a. a fixture mounted pump; or
 - b. into sumps and receivers with ejectors or pumps.
2. Individual fixture pumps may be used for sinks when unusual building structure conditions prevent the discharge of liquid waste by gravity.
3. Direct-mounted individual fixture pumps may be manually or automatically operated.
4. The individual fixture pumps shall be vented in accordance with the manufacturer's instructions. If individual fixture pumps provide an adequate water seal in accordance with 248 CMR 10.03 additional traps shall not be required.

(10) Drainage Fixtures Subject to Backflow.

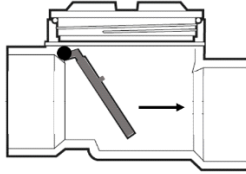
(a) Backwater valves may be installed in drain piping which receives the discharge only from fixtures or drains subject to backflow from the public sewer system. All other drains which are not subject to backflow shall not drain through a backwater valve. *See 10.15: Example 6.*

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10.15: continued

- (b) Materials for Backwater Valves. Backwater valves shall have all bearing parts of corrosion-resistant material.
- (c) Diameter of Backwater Valves. Backwater valves, when fully opened shall have an effective opening not less than that of the pipes to which they are installed.
- (d) Location of Backwater Valves. Backwater valves shall be installed so their working parts will be accessible for service and repairs.

10.15: Example 6 - Backwater Valve



10.16: Vents and Venting

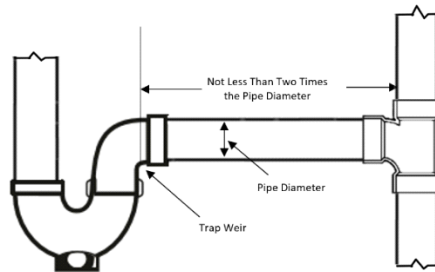
(1) Prohibited Venting.

(a) Combination Waste and Vent. A combination waste and vent system shall be prohibited without Special-permission by the Board and shall comply with the following:

- 1. A combination waste-and-vent system is limited to the installation of floor drains and sinks.
- 2. A combination waste-and-vent system consists of a wet vented installation of waste piping in which fixture drains are not individually vented.
- 3. Every drainage pipe in a combination waste-and-vent system shall be not less than two pipe sizes larger than the size required in 248 CMR 10.15.

(b) Crown Venting. No vent shall be installed within two pipe diameters of the trap weir. See 10.16: Example 1.

Example 1 - Crown Venting

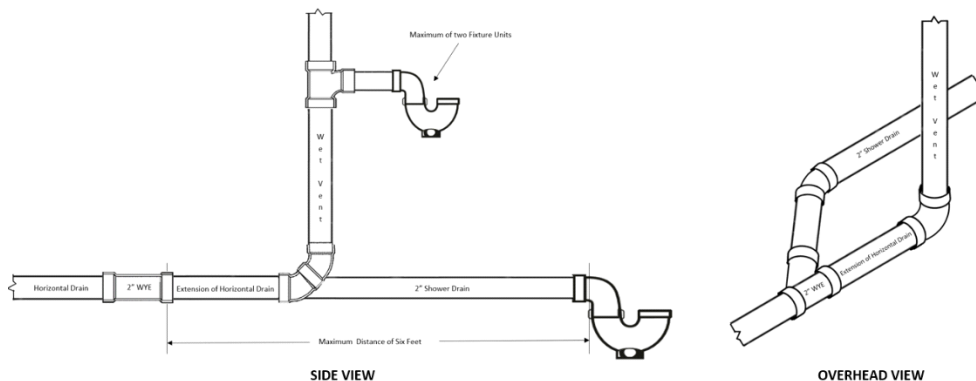


(c) Extension of Horizontal Drain. The extension or continuation of a horizontal soil or waste pipe shall not serve as a vent.

Exception:

- 1. When permitted under wet venting 248 CMR 10.16(5); and
- 2. When a fixture waste of not more than two fixture units is connected to the vertical extension of the extended horizontal piping. See 10.16: Example 2.

Example 2 - Wet Vent Extension of a Horizontal Drain



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10.16: continued

(d) Below Trap Weir. The vent pipe opening from a soil or waste pipe, except for water closets and similar fixtures shall not be below the weir of the trap.

(e) Automatic Vent Fittings and Air Admittance Valves: Automatic vents and air admittance valves are not permitted without Special-Permission from the Board.

(2) Vent Stacks and Stack Vents.

(a) All building drains within a structure shall, at minimum have at least one full size main stack vent or a vent stack no less than three inches in diameter. (See 248 CMR 10.16 (11): *Table 2: Size and Lengths of Vents* for fixture unit values to determine the appropriate stack vent or vent stack size). Buildings with three or more branch intervals shall have at least one main vent stack properly sized in accordance with 10.16: *Table 2* from the building drain through to the open air above the roof or connect back to a main stack vent six inches above the flood level rim of the highest fixture being served.

(b) A vent stack or a main vent shall be installed with a soil or waste stack whenever individual vents, relief vents, or other branch vents are required.

(c) Connections at Base and Top.

1. All main vents or vent stacks shall connect full size at their base to the drainage of the building or to the main soil or waste pipe, at or below the lowest fixture branch.

2. All vent pipes shall extend undiminished in size above the roof, or shall be reconnected with the main soil or waste stack a minimum of six inches above the flood level rim of the highest fixture discharging into it.

(d) Offsets in Buildings Five or More Stories in Height.

1. Except as provided in 248 CMR 10.15, offsets of more than 45° from the vertical in a soil or waste stack may be vented:

a. as two separate soil or waste stacks;

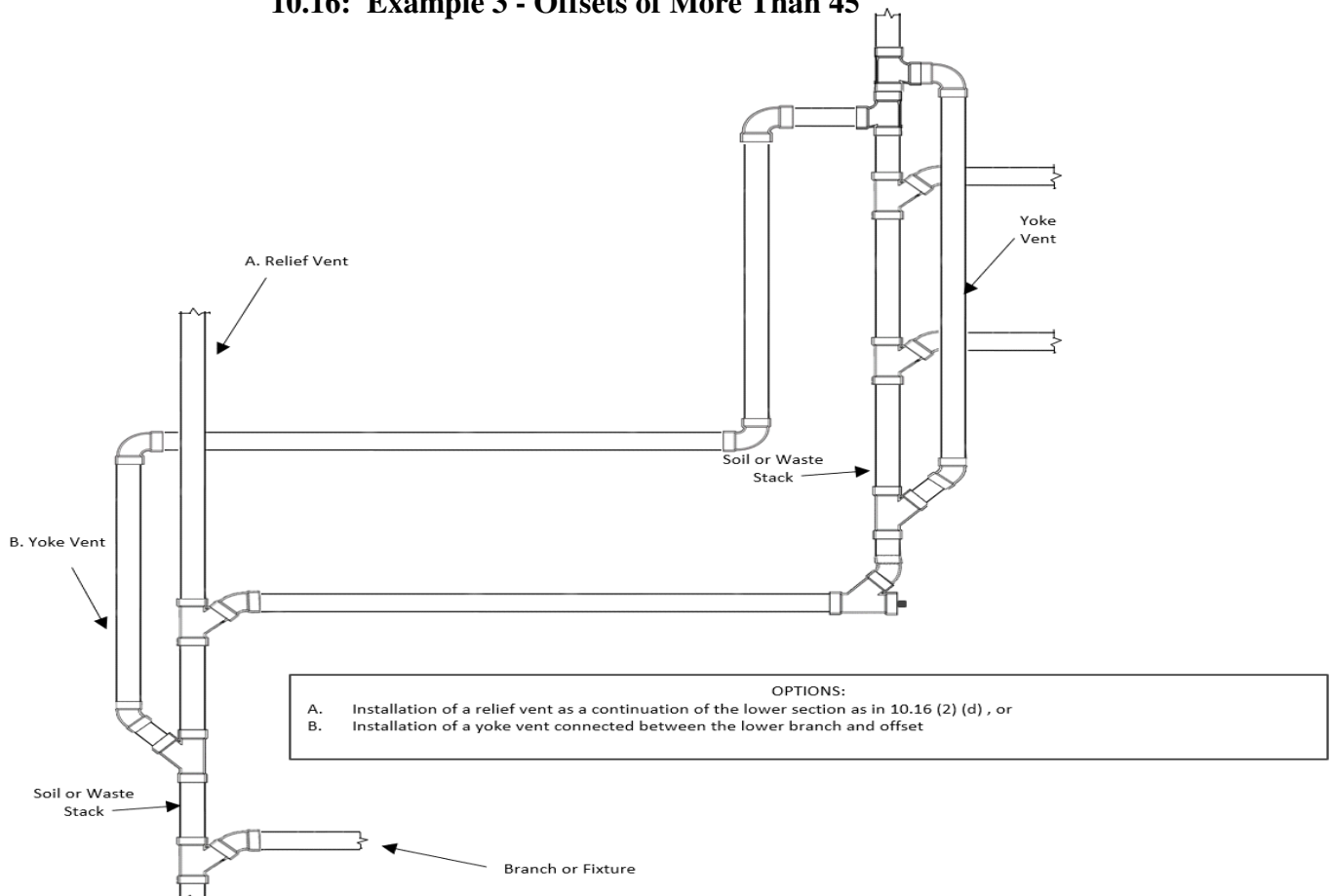
i. installing a relief vent as a vertical continuation of the lower section of the stack; or

ii. as a yoke vent connected to the lower section between the offset and the next lower fixture or horizontal branch.

iii. The upper section of the offset shall be provided with a yoke vent.

iv. 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. See 10.16: *Example 3*

10.16: Example 3 - Offsets of More Than 45°



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10.16: continued

(e) Vent Headers.

1. Where vent stacks and stack vents connect to a vent header, the connections shall be made at the top of the stacks.
2. The vent header shall connect to a vent extension through the roof.
3. When more than two four-inch soil or waste stacks are connected, the vent header extension through the roof shall be five inches in diameter.
4. When more than four four-inch stacks are connected, the diameter shall be six inches in diameter.

(f) Relief Vents for Vents in Buildings with More than Ten Branch Intervals.

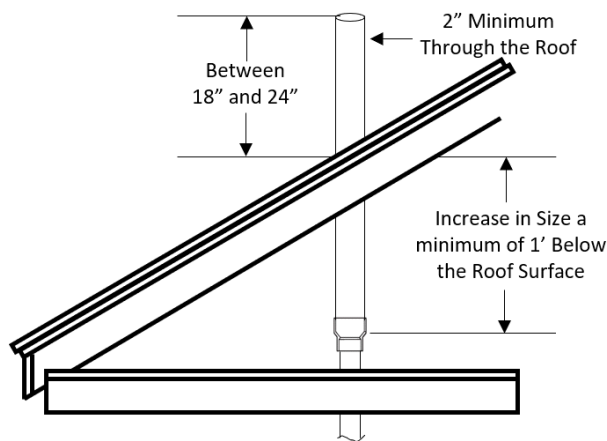
1. Soil and waste stacks in buildings having more than ten branch intervals shall be provided with a relief vent at each tenth interval installed, beginning from the top floor down.
2. The size of the relief vent shall be equal to the size of the vent stack to which it connects.
3. The lower end of each 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 three feet above the floor level.

(3) Vent Terminals.

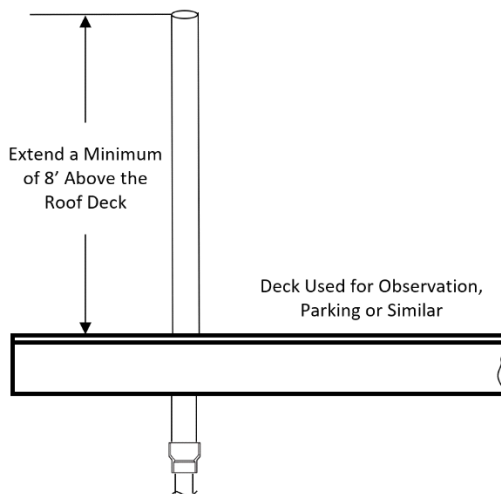
(a) Extension Above Roof.

1. The vent extension through a roof shall be no less than two inches in diameter and shall extend to a point between 18 and 24 inches above the penetration through the roof. *See 10.16: Example 4.*
2. If the roof area is used for gardening, a parking deck, observation deck or similar purposes, the vent shall extend no less than eight feet above the roof and be increased one pipe diameter. *See 10.16: Example 5.*
3. Increaser. The change in the diameter of a vent terminal shall be made using an increaser; and occur no less than one foot below the roof surface. *See 10.16: Example 4.*

Example 4 - Vent Extension Through Roof



Example 5 - Vent Extension Through Observation Deck or Similar



(b) Waterproof Flashings. Each vent terminal shall be made watertight with the roof by proper flashing.

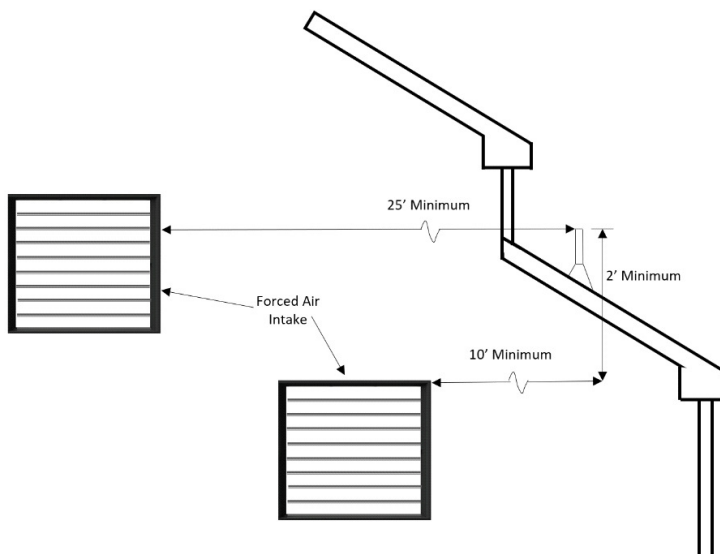
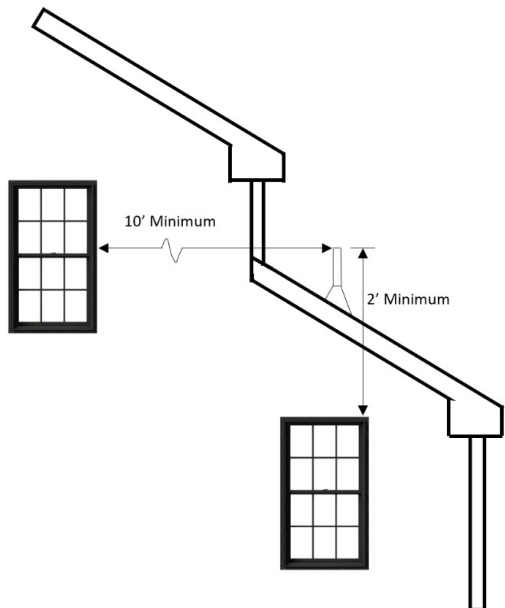
(c) Location of Vent Terminal.

1. No vent terminal shall be located directly beneath any building opening or within ten feet horizontally of the opening unless it is at least two feet above the top of said opening. *See 248 CMR 10.16: Example 6.*
2. Plumbing vent terminals shall be located no less than 25 feet horizontally from forced air intakes. Vents terminating no less than two feet above the top of the forced air intake may be located as close as ten feet from the forced air intake. 248 CMR 10.16(3)(a) does not apply in this case. *See 248 CMR 10.16: Example 7.*

10.16: continued

Example 6 - Location of Vent Terminal

Example 7 - Vent Terminal from Forced Air Inlet



(d) Vent Extensions Outside of the Building. All soil, waste or vent pipe extensions shall be installed inside the building.

Exception: For remodeling and alteration work only, vents may be installed outside the building when all other means of venting have been eliminated or are not practical and with prior permission of the Inspector.

(e) Frost Closure. Where frost closure is likely to occur, each vent extension through a roof shall be at least three inches in diameter.

(4) Vent Grades and Connections.

(a) Vent Grade. All vents shall be uniformly graded in accordance with 248 CMR10.05(2) and connected as to drain back to a soil or waste pipe by gravity.

(b) Vertical Rise.

1. Where vent pipes connect to a horizontal soil or waste pipe:
 - a. The vent shall be taken off above the center line of the soil or waste pipe drain.
 - b. For other than floor mounted fixtures, the vent pipe shall rise vertically, or at an angle of 45° from the vertical, to a point at least six inches above the flood-level rim of the fixture it is venting, before it may offset horizontally.
 - c. For floor mounted fixtures, the vent may be extended horizontally above the centerline of the drain of the fixture to the nearest practical location where it can rise vertically. The vent shall come off the soil or waste pipe above the centerline of the drain not less than 45° from the horizontal before running in a horizontal position.

(c) Height Above Fixtures.

1. All connection between a vent pipe and a vent stack or stack-vent shall be made at least six inches above the flood-level rim of the highest fixture served by the vent.
2. Horizontal vent pipes forming branch vents, relief vents, or loop vents shall be installed at least six inches above the flood-level rim of the highest fixture served.

(5) Wet Venting.

(a) Bathroom Wet Vent. In a bathroom having a two-inch horizontal waste, a two-inch extension of the horizontal drain connecting to a lavatory may serve as a wet vent for the fixtures it serves. See 10.16: Example 2. This would also apply to double or back-to-back bathrooms.

The lowest portion of the pipe serving as a wet vent shall break the centerline of the horizontal drain it serves. See 10.16: Example 11.

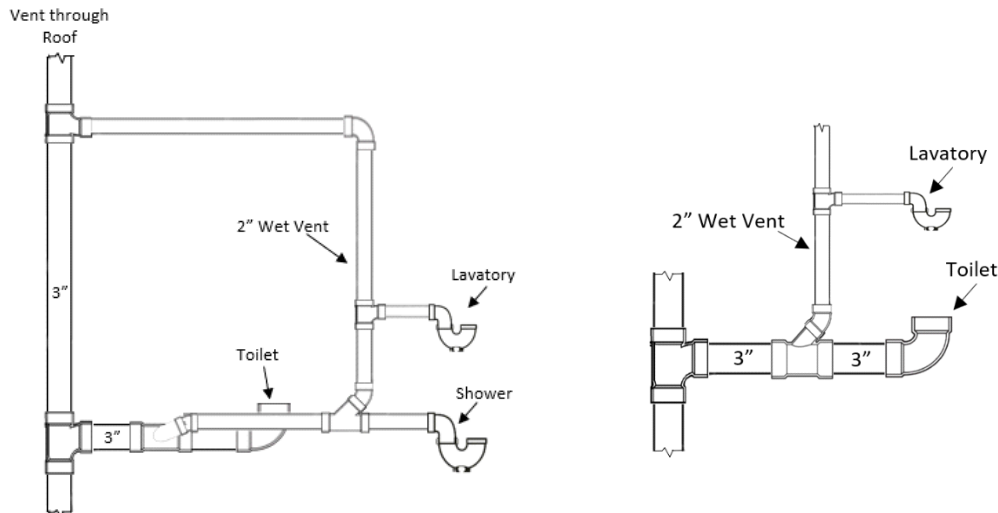
(b) Piping Not to Serve as Wet Vents. Waste and vent piping that serves:

1. Kitchen sink;
2. Garbage disposal;
3. Dishwasher;
4. Washing machine; and
5. Any fixture for culinary use.

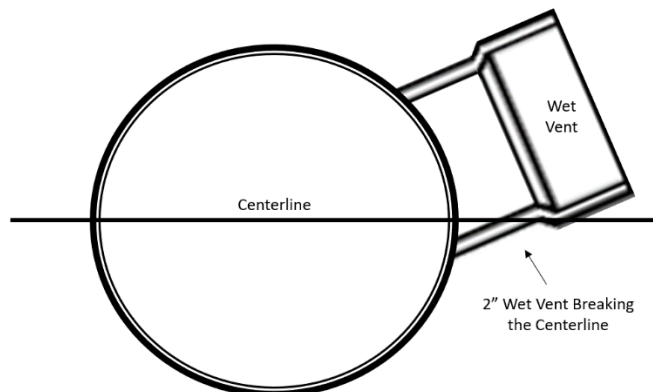
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10.16: continued

Example 10 - Miscellaneous Wet Venting



Example 11 - Wet Venting Breaking the Centerline



(6) Stack Venting.

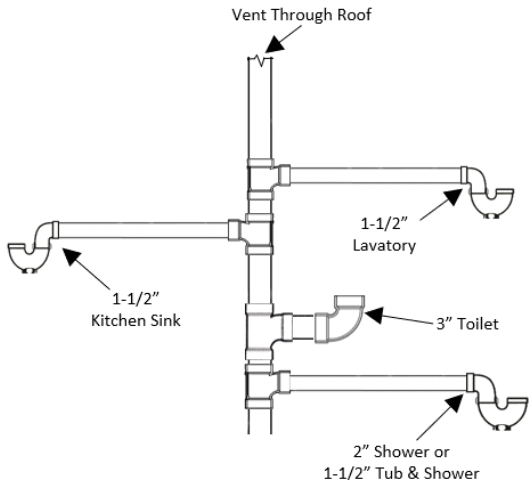
(a) Plumbing Fixtures at the Top Branch Interval of a Stack.

1. Plumbing fixtures at the highest level may enter a three-inch soil or waste stack.
2. The continuation of a three-inch soil or waste stack vented through the roof or re-connected to the venting system above the highest fixture shall be accepted, provided:
 - a. all such fixtures shall enter said stack independently;
 - b. the waste pipe from all fixtures shall have a pitch of not more than one quarter inch pitch per foot;
 - c. the toilet and bathtub or shower drain connect to the stack at the same floor level; and
 - d. the traps from all fixtures shall be placed in compliance with 248 CMR 10.16(10): *Table 1: Distance of Fixture Trap from Vent.* See 10.16: *Example 12* for Miscellaneous Stack Venting.

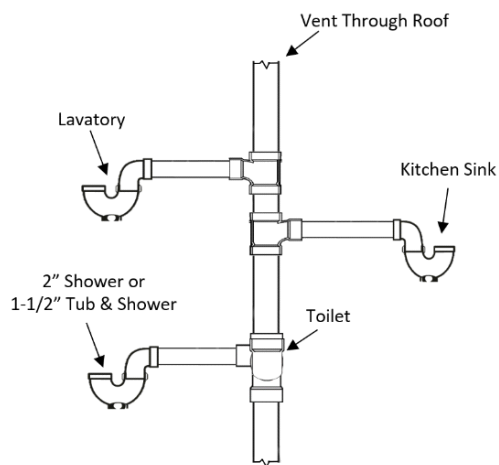
10.16: continued

Example 12 - Miscellaneous Stack Venting

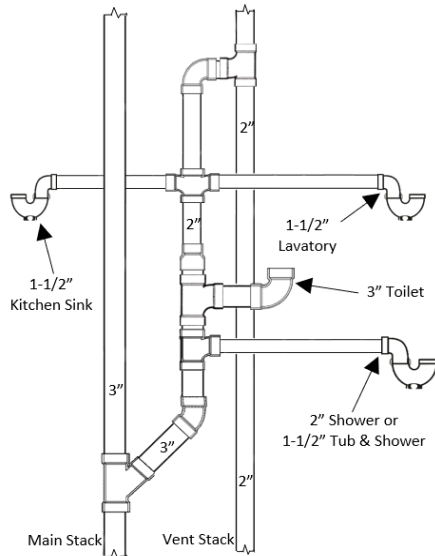
Stack Venting Top Floor



Stack Venting Top Floor with Estabrook



Stack Venting Lower Floors



(b) **Stack Venting.** Provided there is a soil and/or waste stack in a building as required under 248 CMR 10.16(2)(a), the continuation in an upwards direction of the vertical waste for a toilet may be reduced to two inch and serve as the vent for the toilet and the waste for a lavatory, bathtub, or shower stall, and a kitchen sink. See 10.16: *Example 12, Stack Venting on Lower Floors.*

(c) **Back to Back Installation (Stack Vented).** Bathroom groups installed back-to-back shall be permissible provided they comply with the provisions of 248 CMR 10.16(6)(a).

(7) **Common Vents.**

(a) **Individual Vent as Common 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.

(b) **Side by Side.** If two bathtubs or similar flat bottom fixtures are installed back to back or side by side, a common vent may be used in a vertical position to serve as the vent for both fixtures.

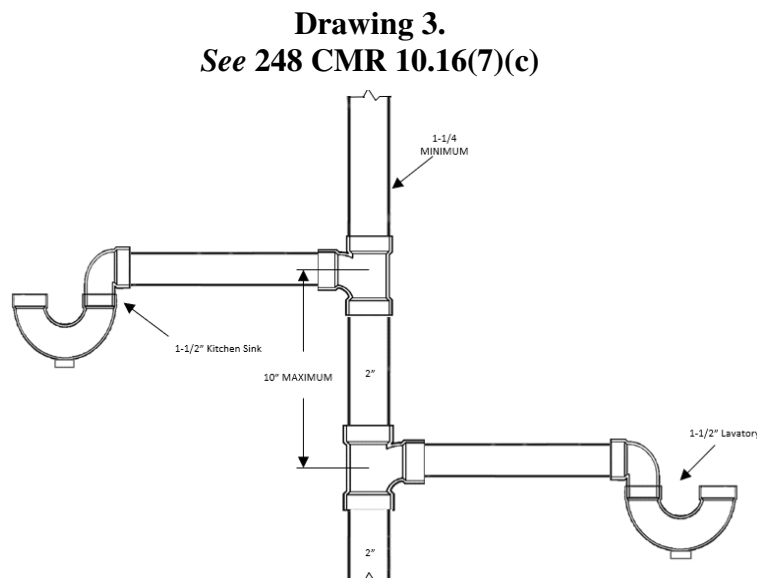
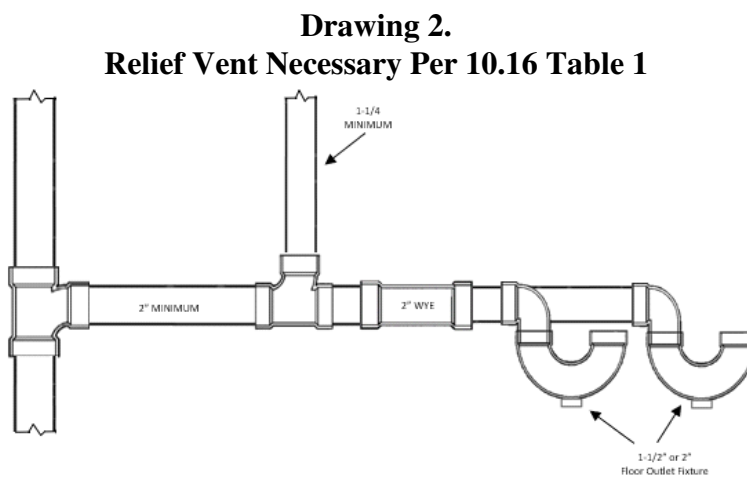
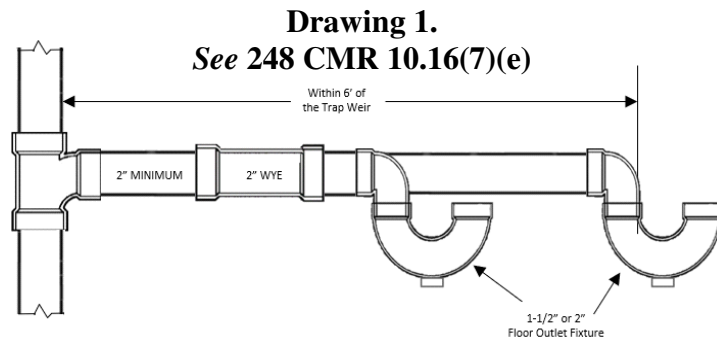
(c) **Different Levels.** A vertical vent may be used for two fixtures that are in the same branch interval but connected to the stack at different levels, not exceeding ten inches center to center, provided:

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1. The vertical drain is one pipe diameter larger than the upper fixture drain but is not smaller than the lower fixture drain, whichever is the larger.
 2. That both wastes for said fixtures conform to 248 CMR 10.16(10): *Table 1: Distance of Fixture Trap from Vent*. See 10.16: *Example 13, Drawing 3*.
- (d) **Back-to-back Fixtures.** Two fixtures installed back-to-back within the distance allowed between the trap and vent as stated in 248 CMR 10.16(10): *Table 1*, may have one continuous vent provided each fixture wastes separately into a double sanitary drainage tee fitting having inlet openings at the same level. See 248 CMR 10.15(8)(b).
- (e) **Horizontal Waste Branch.**
1. Two lavatories or similar fixtures installed adjacent or back-to-back within six feet of a main vented stack, proper wet vent, or continuous waste and vent, may be installed on a two-inch horizontal waste branch without installation of an independent vent, provided:
 - a. the horizontal waste branch is not less than two inches throughout its entire length; and
 - b. the fixture wastes are connected into the side center of the branch. See 10.16: *Example 13, Drawing 1*.

Example 13 - Miscellaneous Types Venting



10.16: continued

(8) Venting of a Battery Drainage System.

(a) A horizontal branch drain may be vented by either a circuit or loop vent installed downstream of the last fixture connection of the battery provided the branch drain has two, but not more than eight floor outlet fixtures that are connected in a battery and discharged into the side center of the horizontal battery branch drain.

1. A circuit vent shall be connected to a proper vent upstream of the horizontal battery drainage system.
2. A loop vent shall be connected to a proper vent downstream of the horizontal battery drainage system.

(b) In addition, lower floor branches serving fixtures as described above shall be provided with a relief vent installed vertically downstream of the first fixture in the battery and shall connect back to the circuit or loop vent. *See 10:16: Example 14.*

1. Where only two fixtures that are battery waste and vented are installed on the same branch, a relief vent as described above shall not be required.
2. Batteries of more than eight fixtures may be installed providing an additional vent is installed for each eight or less of the fixtures connected.

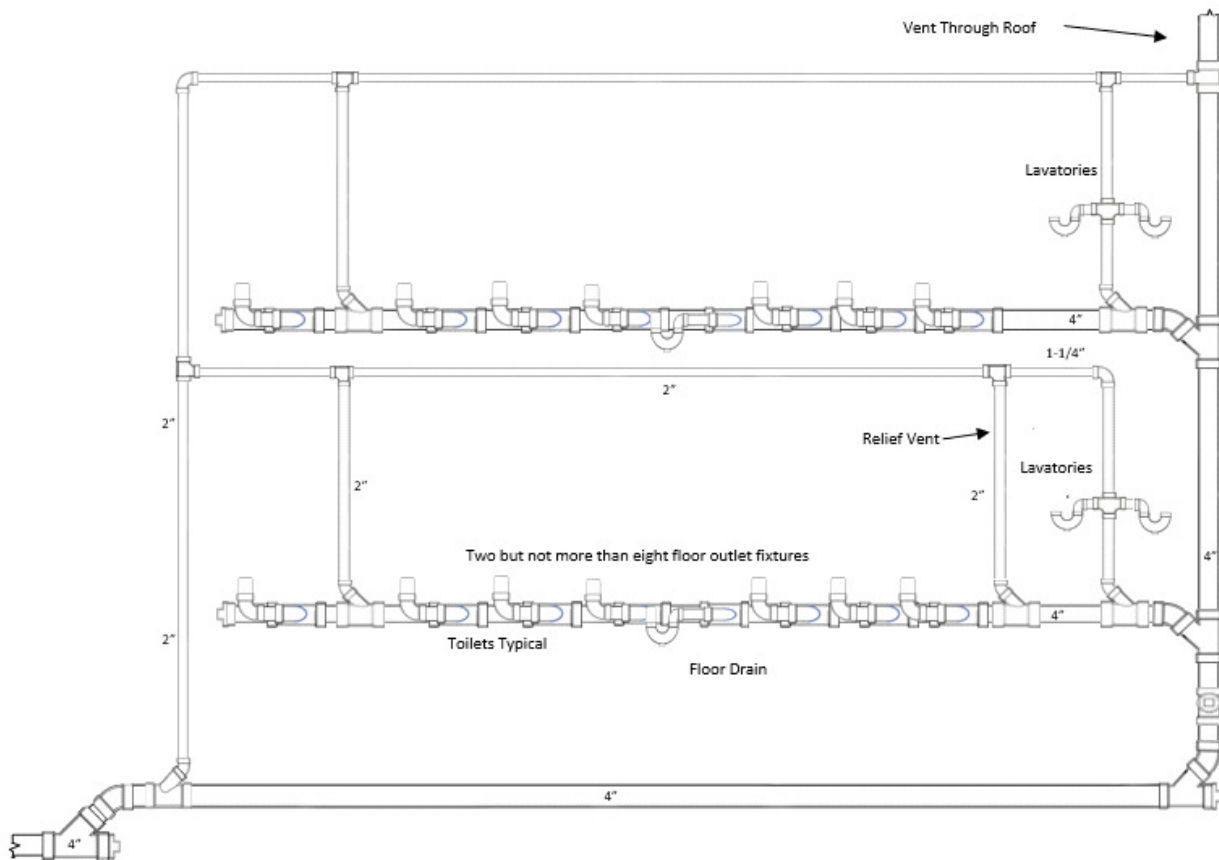
(c) Fixtures other than the floor outlet type may also connect to the battery drainage system but shall be either individual or common vented.

(d) Dual Branches. When parallel branches are installed, all the provisions and requirements of 248 CMR 10.16(8) shall prevail.

Exception: Fixtures connecting to each parallel horizontal branch shall be sized based on 50% of the fixture units permitted on a horizontal branch for a battery drainage system.

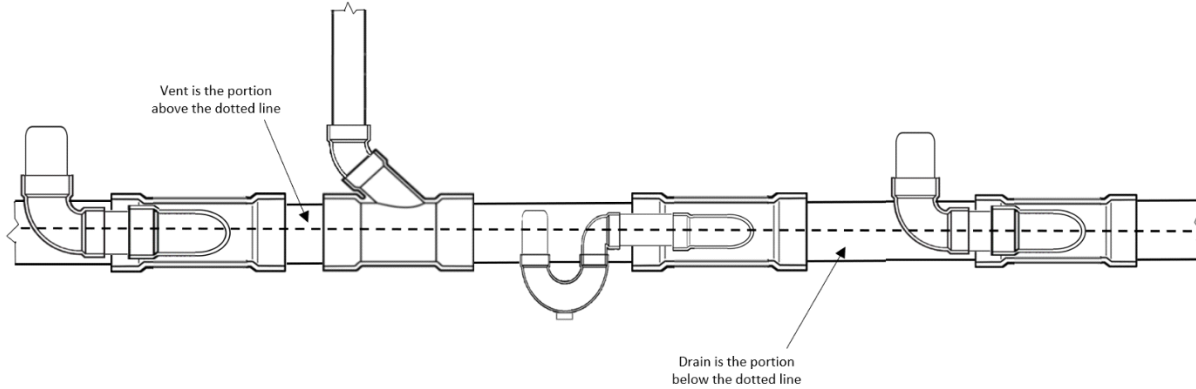
(c) Vent Connections. Vents installed in a battery drainage system shall be taken off at a vertical angle above the centerline of the drain or from the top of the horizontal branch.

Example 14 - Battery Venting Installations



10.16: continued

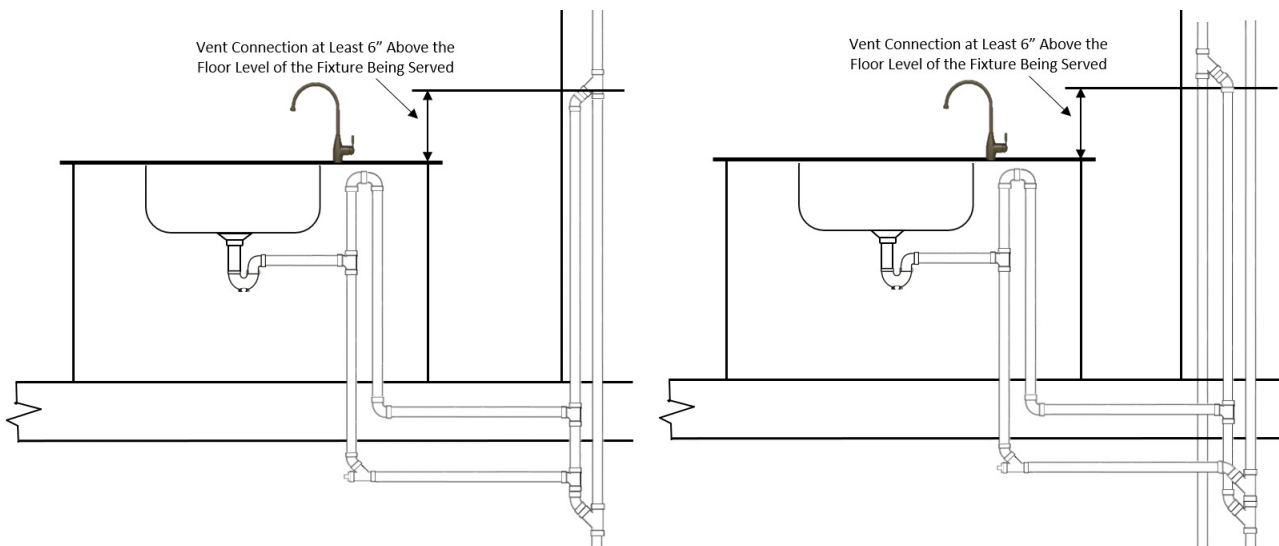
Example 15 – Circuit and Loop Venting
See 10.03: Definition of Circuit Vent and Loop Vent



(9) Bow Vents.

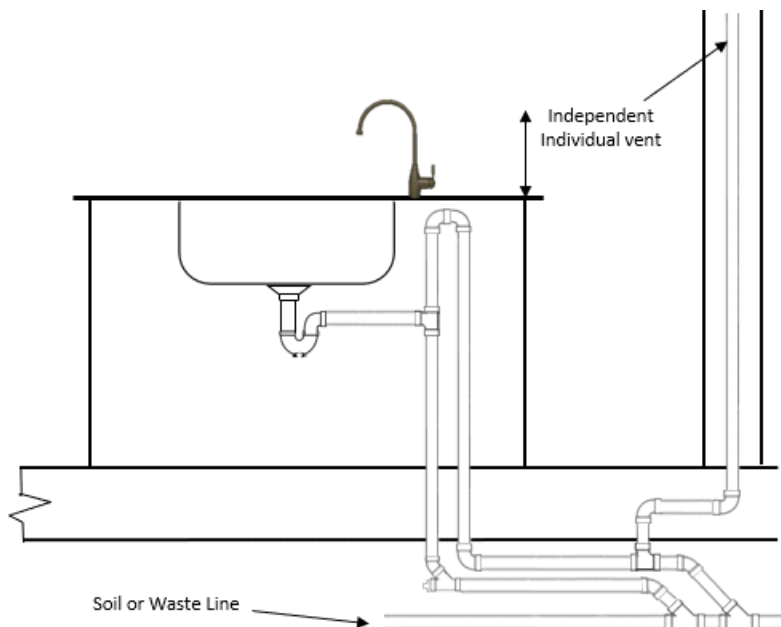
- (a) Bow vents are permitted when a vent for an individual sink or lavatory cannot rise six inches above the flood level rim of the fixture before turning horizontal.
- (b) The bow vent shall be sized in accordance with 248 CMR 10.16(11): *Table 2: Size and Lengths of Vents.*

Example 16 – Typical Bow Vent Installations



(10) Fixture Vents.

- (a) Distance of Trap from Vent. Each fixture trap shall have a vent with a developed length in the fixture drain from the trap weir to the vent fitting are within the requirements set forth in 248 CMR 10.16(12): *Table 1: Distance of Fixture Trap from Vent.*

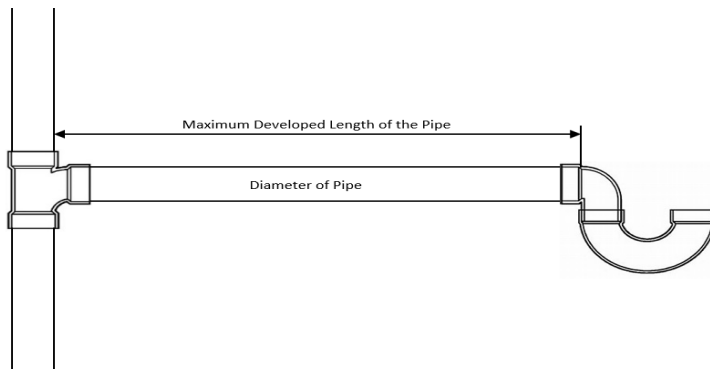


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10.16: continued

Table 1
Distance of Fixture Trap from Vent

Diameter of Pipe	Maximum Developed Length of the Pipe
1½	5"
2	6'
3	8'
4	10'
Slope not to exceed ¼" per foot	



(b) Venting of Fixture Drain Below Trap.

1. The vent pipe openings from a soil or waste pipe, except for toilets and similar fixtures, shall not be below the top weir of the trap.
2. An exception to 248 CMR 10.16(10)(b) shall be permitted if the following requirements are satisfied:
 - a. The fixture has a flat bottom with a minimum area of 144 square inches.
 - b. The horizontal section of the fixture waste must comply with 248 CMR 10.16(10): *Table 1: Distance of Fixture Trap from Vent* and the vertical section shall be at least one pipe size larger than the fixture trap and waste arm.
 - c. The vent opening shall be as high and close to the fixture as possible.

(c) Floor-mounted Fixture Outlet.

1. When installing the piping for a floor outlet type toilet or similar fixture, the vertical piping distance shall not exceed 20 inches from the finish floor of the fixture served to the center line of the horizontal drain serving such fixture.
2. If the vertical distance exceeds 20 inches the fixture shall be individually vented.

(11) Size and Length of Vents.

- (a) Size of Individual Vents. The minimum diameter of an individual vent shall be not less than 1¼ inch or less than ½ the diameter of the drain to which it connects.
- (b) Size of Circuit, Loop and Relief Vents. The diameter of a relief vent shall be not less than ½ the diameter of the soil or waste branch to which it connects when fixtures are battery connected.
- (c) Length and Size of Vent Stacks. The length and size of the vent stack or main vent shall be determined by the developed length from the lowest connect of the vent to the sanitary drainage system to the open air. See 248 CMR 10.16(11): *Table 2.*
- (d) Size of Vents. The vent pipe sizes shall be determined from their developed length and the total number of fixture units connected thereto, as listed in 248 CMR 10.16(11): *Table 2: Size and Lengths of Vents.* This table shall be used to size all vents, except for those vents that are specifically sized elsewhere in 248 CMR 3.00 through 10.00.
- (e) Size of Underground Vent Piping. No portion of the venting system installed underground or below a basement floor, shall be less than two inches in diameter.

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10.16: continued

Table 2
Size and Lengths of Vents

Diameter of Soil or Waste Stack or Branch in Inches	Total Fixture Units Connected to Stack or Branch in Fixture Units										
		1¼	1½	2	2½	3	4	5	6	8	10
1½	4	50	150								
2	10	25	50	150							
2½	28		30	100	300						
3	7		42	150	360	1040					
3	21		32	110	270	810					
3	53		27	94	230	680					
3	102		25	86	210	620					
4	43			35	85	250	980				
4	140			27	65	200	750				
4	320			23	55	170	640				
4	530			21	50	150	580				
5	190				28	82	320	990			
5	490				21	63	250	760			
5	940				18	53	210	640			
5	1,400				16	49	190	590			
6	500					33	130	400	1,000		
6	1,100					26	100	310	780		
6	2,000					22	84	260	660		
6	2,900					20	77	240	600		
8	1,800						31	95	240	940	
8	3,400						24	73	190	720	
8	5,600						20	62	160	610	
8	7,600						18	56	140	560	
10	4,000							31	78	310	960
10	7,200							24	60	240	740
10	11,000							20	51	200	630
10	15,000							18	46	180	570

Note 1: Table 2 shall also apply to the sizing of vents for branch soil and waste lines.

To determine size of vent, use the following procedure:

- a. Compute total number of fixture units, using 248 CMR 10.15(7): *Table 1: Fixture Unit Values for Various Plumbing Fixtures* and 248 CMR 10.15(2)(b).
- b. Knowing total fixture unit load, refer to 248 CMR 10.15(7): *Table 3: Maximum Loads in Fixture Units for Soil and Waste Stacks Having One or Two Branch Intervals* or 248 CMR 10.15(7): *Table 4: Maximum Loads in Fixture Units for any One Branch Interval on Multistory Soil and Waste Stacks* depending on number of intervals, to determine size of stack.
- c. With selected stack size and total fixture unit load refer to 248 CMR 10.16 (11): *Table 2: Size and Lengths of Vents* and determine size of vent. Follow same procedure to determine size of vents for branch soil and waste lines.

(12) **Future Venting.**

- (a) In the lowest level of any building there shall be an accessible future vent connection.
- (b) Buildings that require a main vent stack shall have a future vent connection full size of the vent stack. In all other buildings (including residential) there shall be a minimum of a two-inch future vent connection.
- (c) All future vent connections shall be drip connected identified and labeled “*Future Vent*”.

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10.16: continued

(13) Venting of Ejector Sumps.

(a) Size of Vents. The size and length of all vent pipes serving building sanitary ejector sumps shall be determined from, and in accordance with 248 CMR 10.16 (14) *Table 3: Size and Lengths of Sump Vents.*

(b) Pneumatic Ejector. The air pressure relief pipe from a pneumatic ejector shall not be connected to the regular venting system but shall be vented independently to the atmosphere through the roof.

Table 3
Size and Lengths of Sump Vents²

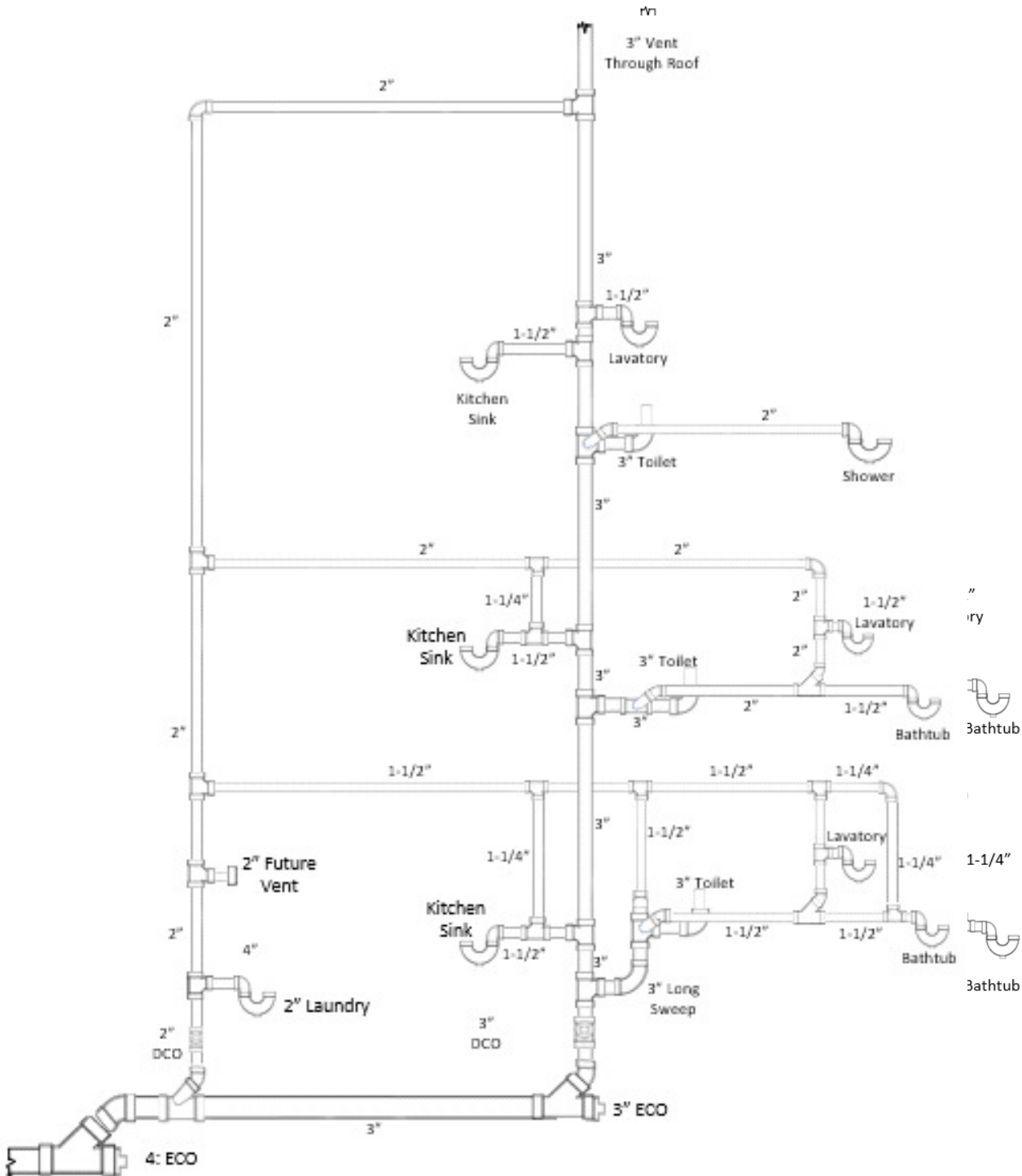
Diameter of Drain to Sump ¹	Diameter of Vent (inches)										
	1¼	1½	2	2½	3	4	5	6	8	10	12
2	23	52	290								
2½	5	13	89	290							
3		2	30	110	290						
4			1	17	57	280					
5					10	80	280				
6						20	97	280			
8							3	41	270		
10								1	53	250	
12										61	230

Note 1: Where more than one drain connects to the sump, size vent on the basis of a drain diameter having a cross sectional area equal to the sum of the areas of the multiple drains.

Note 2: The above values provide for a maximum of one-inch pressure drop in the system.

10.16: continued

Example 17
Individual Venting – Wet Venting – Stack venting



10.17: Storm Drains

- (1) Storm Water Drainage. Any pipe receiving the discharge from rain or surface water which at any point enters the building or structure shall be considered storm water drainage piping including, but not limited to, area drainage and clear water waste.
- (2) Storm Water Drainage to Sewer Prohibited. Storm water shall not be drained into sewers intended for sewage only.
- (3) Size of Building Storm Drain. The size of the building storm drainage system including all horizontal branches shall be based upon the maximum projected surface area to be handled according to 248 CMR 10.17(2): *Table 1: Size of Horizontal Storm Drains*.

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Exception: Siphonic Roof Drainage Systems.

(a) A Massachusetts professional engineer is, per 248 CMR, responsible for the design of the symphonic roof drainage system.

(b) As part of the design process, the Massachusetts professional engineer shall be responsible for assuring that the piping installation, including pipe sizing, dimension, and other aspects, meet the requirements for proper functioning as designed.

(c) The Local or State plumbing Inspector shall be responsible for all other aspects of the installation, as required by 248 CMR but is under no obligation to approve or otherwise involve themselves in the design process or ensuring the System meets the design specifications.

Table 1
Size of Horizontal Storm Drains

Diameter of Drain in Inches	Maximum Projected Area for Storm Drains of Various Slopes		
	1/8 Slope	1/4 inch Slope	1/2 inch Slope
	Square Feet	Square Feet	Square Feet
3		1,160	1,644
4	1,880	2,650	3,760
5	3,340	4,720	6,680
6	5,350	7,550	10,700
8	11,500	16,300	23,000
10	20,700	29,200	41,400
12	33,300	47,000	66,600
15	59,500	84,000	119,000

Note 1: Table 1 is based upon a maximum rate of rainfall four inches per hour.

(4) Vertical Storm Conductor. A vertical storm conductor shall be based upon the maximum projected area to be drained according to 248 CMR 10.17(2): *Table 2: Size of Vertical Storm Drain Conductors and Outside Leaders.*

Table 2
Size of Vertical Storm Drain Conductors and Outside Leaders

Maximum Projected Area (Square Feet)	Diameter of Storm Conductor or Outside Leader (Inches)	Maximum Projected Area (Square Feet)	Diameter of Storm Conductor or Outside Leader (Inches)
720	2	8,650	5
1,300	2½	13,500	6
2,200	3	29,000	8
4,600	4		

(5) Values for Continuous Flow. Where there is a continuous or semi-continuous discharge into the building storm drain or building storm sewer, as from a condensate pump, ejector, air conditioning equipment, or similar device discharging clear water waste, each gallon per minute of such discharge shall be computed as being equivalent to 24 square feet of roof area, (based upon a four-inch rainfall.)

(6) Building Sub-drains.

(a) Building sub-drains located inside the building below the gravity storm water drainage piping level shall discharge into a sump or receiving tank.

(b) The contents of the sump or receiving tank shall be automatically lifted and discharged into the storm drainage system as required for building sumps.

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(7) Sub-soil Drains.

(a) When a subsoil drain for a building is subject to backwater:

1. An accessibly located backwater valve shall protect the subsoil drain.
2. Sub-soil drains may discharge into a properly trapped area drain or sump.
3. Such sumps do not require vents.
4. Piping used for sub-soil drains shall not be less than four inches in diameter.

(b) Materials for sub-soil drains shall comply with 248 CMR 10.06 and the following requirements shall be satisfied.

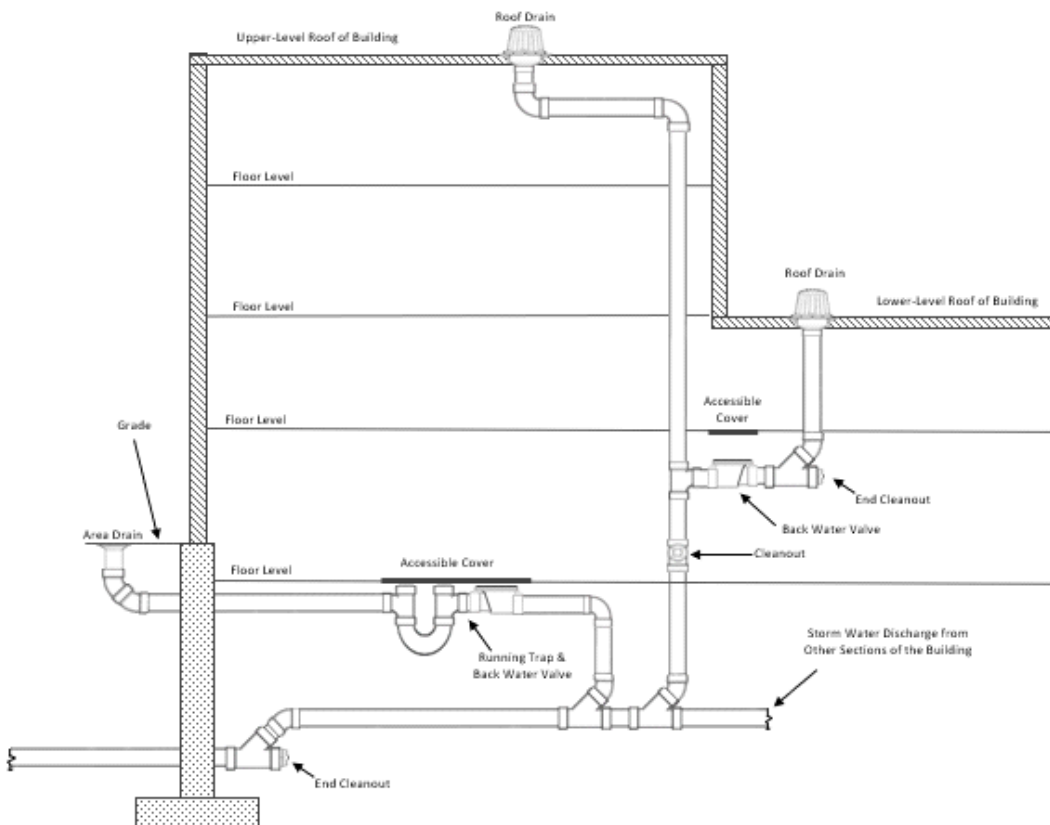
1. Piping may be either perforated PVC or installed with open joints.
2. Spigot end lengths shall have joints protected with screens securely fastened to pipes.
3. Screens and fastenings shall be non-ferrous or other approved corrosion resisting material.
4. Perforated piping shall be installed with sealed joints.
5. All sub-soil drain piping shall be installed with sufficient pea stone or similar aggregate to permit the flow of ground water to the piping.

(8) Storm Drainage Subject to Backflow.

(a) All roof, area and clear water waste piping subject to backflow shall be provided with a backwater valve with a trap installed in an accessible location that is not subject to freezing. See 248 CMR 10.17: *Example 1.*

(b) A backwater valve may be installed on area drains prior to connecting to the storm system. Refer for 248 CMR 10.15(10)(b), (c) and (d) for materials, diameter, and location.

Example 1
Backwater Valves for Roof, Area & Clear Water Waste Subject to Backflow



(9) Traps on Storm Drains and Leaders.

(a) Where Required. Conductors and storm drains serving low roofs when connected to a combined storm and sanitary system shall be trapped.

(b) Where Not Required. No traps shall be required for storm water drains that are connected to a system carrying storm water exclusively.

(c) Trap Size. Traps for individual conductors shall be the same size as the horizontal drain to which they are connected.

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(d) Method of Installation.

1. 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.
2. Conductor traps shall be located so that an accessible cleanout may be installed on the building side of the trap.

(10) Conductors/Leaders and Connections.

(a) Combining Storm with Sanitary Drainage.

1. The sanitary and storm drainage system of a building shall be entirely separate.
2. Where a combined sewer is available, the building storm sewer may be connected to the building sanitary sewer in the same horizontal plane through a single wye fitting to form a combined building sewer at least ten feet outside the inside face of the foundation wall.

(b) Offsets.

1. Offsets of 45° or less from the vertical, and offsets of more than 45° from the vertical that do not exceed ten feet in length, shall be sized according to 248 CMR 10.17(2): *Table 2: Size of Vertical Storm Drain Conductors and Outside Leaders.*
2. Offsets of more than 45° from the vertical in excess of ten feet shall be sized according to 248 CMR 10.17(2): *Table 1: Size of Horizontal Storm Drains.*

(11) Roof Drains.

(a) All roof drains shall be product-accepted.

(b) Roof Drain Assemblies.

1. General Use. Roof drain assemblies that serve vehicle parking decks or that serve the outside top level of open parking garages shall convey storm discharge to an independent gas, oil, and sand interceptor/separator in accordance with 248 CMR 10.09(1)(b) and shall discharge to the storm drainage system or other approved method of disposal.
2. Flat Decks. Roof drain assemblies 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 two times the area of the conductor to which the drain is connected.
3. Roof Drain Flashings Required. The connection between roofs and roof drains which pass into the interior of the building shall be made watertight using proper flashing methods and material.

(c) When a secondary roof drainage system is installed, it shall discharge independent of the primary building storm system and shall terminate the building at a minimum of 18" and a maximum of 60" above grade in an area that will be visible to the people who occupy the building. This system shall be compliant with all federal, state, and local codes.

10.18: Hospital Fixtures

(1) General. In general, all plumbing installed in hospitals shall comply with the requirements of 248 CMR 3.00 through 10.00 and the Massachusetts Department of Environmental Protection (DEP).

(2) Definitions.

Aspirator. An aspirator is a fitting or device supplied with water or other fluid under positive pressure which passes through an integral orifice or "constriction" causing a vacuum. Aspirators are often referred to as "suction" apparatus and are similar in operation to an ejector.

Autopsy Table. An autopsy table is a fixture or table used for the post-mortem examination of a body.

Bedpan Hopper (Clinic Sink). A bedpan hopper is a fixture meeting the design requirements of fixture, sometimes called a clinic sink.

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Bedpan Steamer. A bedpan steamer is a fixture used for scalding bedpans or urinals by direct application of steam.

Bedpan Washer. A bedpan washer is a fixture designed to wash bedpans and to flush the contents into the soil drainage system. It may also be provided for steaming the utensils with steam or hot water.

Bedpan Washer Hose. A bedpan washer hose is a device supplied with hot and/or cold water and located adjacent to a toilet or clinic sink to be used for cleansing bedpans.

Clinic Sink. *See* Bedpan Hopper and 248 CMR 10.18(3)(b).

Flushing Type Floor Drain. A flushing type floor drain is a floor drain which is equipped with an integral water supply, enabling flushing of the drain receptor and trap.

Local Vent Stack. A local vent stack is a vertical pipe to which connections are made from the fixture side of traps and through which vapor and/or foul air may be removed from the fixture or device used on bedpan washers.

Sterilizer, Boiling Type. A boiling type "sterilizer" is a fixture (non-pressure type) used for boiling instruments, utensils, and/or other equipment (used for disinfection). Some devices are portable, others are connected to the plumbing system.

Sterilizer Instrument. *See* Sterilizer, Boiling Type.

Sterilizer, Pressure Instrument Washer-sterilizer. A pressure instrument washer-sterilizer is a fixture (pressure vessel) designed to both wash and sterilize instruments during the operating cycle of the fixture.

Sterilizer, Pressure (Autoclave). A pressure sterilizer is a fixture (pressure vessel) designed to use steam under pressure for sterilizing. A pressure sterilizer is also called an Autoclave.

Sterilizer, Utensil. *See* Sterilizer, Boiling Type.

Sterilizer Vent. A sterilizer vent is a separate pipe or stack, indirectly connected to the building drainage system at the lower terminal, which receives the vapors from non-pressure sterilizers, or the exhaust vapors from pressure sterilizers, and conducts the vapors directly to the outer air, sometimes called vapor, steam, atmospheric or exhaust vent.

Sterilizer Water. A water sterilizer is a device for sterilizing water and storing sterile water.

Still. A still is a device used in distilling liquids.

(3) Fixtures.

(a) General. Product-accepted flush rim bedpan hoppers (clinic sinks), bedpan washers, and/or other acceptable fixtures and equipment shall be provided for:

1. the disposing of bedpan contents; and
2. the cleansing and disinfection of bedpans in soiled utility (hopper) rooms.

(b) Clinic Sink.

1. A clinic sink shall have an integral trap in which the upper portion of a visible trap seal provides a water surface.
2. The fixture shall be so designed as to permit complete removal of the contents by siphon and/or blowout action, and to reseal the trap.
3. A flushing rim shall provide water to cleanse the interior surface.
4. The fixtures shall have flushing and cleansing characteristics similar to a toilet.

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- (c) Prohibited Use of Clinic Sinks and Service Sinks.
 - 1. A clinic sink serving a soiled utility room shall not be considered as a substitute for, nor shall it be used as a janitor's service sink.
 - 2. A janitor's service sink shall not be used for the disposal of urine, fecal matter, or other human wastes.
- (d) Ice Prohibited in Soiled Utility Rooms.
 - 1. No machine for manufacturing ice, or any device for the handling or storage of ice shall be located in a soiled utility room.
 - 2. Machines for manufacturing ice, or devices for handling or storage of ice intended for either human consumption or packs may be located in clean utility room, floor pantry, or diet kitchen.
- (4) Sterilizer Equipment Requirements.
 - (a) De-scaling of Equipment Prohibited. It shall be unlawful to de-scale or otherwise submit the interior of water sterilizers, stills, or similar equipment to acid or other chemical solutions while the equipment is connected to the water and/or drainage system.
 - (b) ASME Standard. New pressure sterilizers and pressure instruments washer-sterilizers hereafter installed, shall always display in a location to be clearly visible, the ASME Standard symbol and data plate.
 - (c) Sterilizer Piping. All sterilizer piping and/or devices necessary for the operation of sterilizers shall be accessible for inspection and maintenance.
 - (d) Condensers.
 - 1. Pressure sterilizers shall be equipped with an acceptable means of condensing and cooling the exhaust steam vapors.
 - 2. Non-pressure sterilizers should be equipped with an acceptable device which shall automatically control the vapors in a manner to confine them within the vessel, or equipped with an acceptable means of condensing and cooling of vapors.
 - (e) Gas Fired Equipment. Gas fired equipment or apparatus shall be installed in accordance with the requirements of the Massachusetts Fuel Gas Code 248 CMR 4.00 through 7.00.
 - (f) Discharge from sterilizers into the sanitary drainage system shall be at a temperature of no more than 150°F.
- (5) Special Elevations.
 - (a) Control valves, vacuum outlets, and devices which protrude from a wall of an operating, emergency, recovery, examining, or delivery room, or a corridor and/or other locations where patients may be transported on a wheeled stretcher, shall be located at an elevation which will preclude bumping the patient or stretcher against the device.
 - (b) When necessary to install at a lower elevation, safety precautions should be taken to protect the personnel.
- (6) Plumbing in Hospitals for the Psychologically Impaired.
 - (a) In hospitals/facilities for the psychologically impaired exceptional consideration should be given to piping, controls, and fittings of plumbing fixtures given the nature of the patients.
 - (b) No pipes or traps shall be exposed and fixtures shall be substantially secured to walls.
- (7) Drainage and Venting.
 - (a) Ice Storage Chest Drains.
 - 1. Any drain serving an ice chest or box shall discharge over an indirect waste receptor separate from all other fixture wastes.
 - 2. Each terminal shall discharge through an air gap above the receptor.
 - 3. The end shall be covered with a removable screen of not less than ten-mesh per inch, and if discharging vertically, the terminal shall be cut at an angle of 45°.
 - (b) Bedpan Washers and Clinic Sinks. Bedpan washers and clinic sinks shall be:
 - 1. connected to the soil pipe system; and
 - 2. vented following the requirements as applied to toilets, except that bedpan washers require additional local vents.

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(8) Sterilizer Wastes.

(a) Indirect Wastes Required.

1. All sterilizers shall be provided with individual and separate indirect wastes, with air gaps of not less than two diameters of the waste tailpiece.
2. The upper rim of the receptor, funnel, or basket type waste fitting shall be not less than two inches below the vessel or piping, whichever is lower.
3. Except as provided in 248 CMR 10.18(8)(c) and (8)(e) a p-trap shall be installed on the discharge side of, and immediately below, the indirect waste connection serving each sterilizer.

(b) Floor Drain Required. In all recess rooms containing the recessed, or concealed portions of sterilizers, not less than one acceptable floor drain, connecting to the drainage system, shall be installed in a manner to drain the entire floor area.

(c) Recess Room Floor Drains, Trap Seal Maintenance.

1. The recess room floor drain waste and trap shall be a minimum diameter of three inches.
2. It shall receive the drainage from at least one sterilizer within the recess room to assure maintenance of the floor drain trap seal.
3. The sterilizer drain shall be installed on a branch taken off between the floor drain trap and the drain head.
4. No individual sterilizer waste trap shall be required on this type of installation.

(d) Prohibited Connections.

1. Branch funnel and branch basket type fittings, except as provided in 248 CMR 10.18(8)(e) are prohibited on any new installation or when relocating existing equipment.
2. Existing branch funnel or branch basket type installations shall be provided with an acceptable indirect waste below the branch connections.

(e) Battery Assemblies. A battery assembly of not more than three sterilizer wastes may drain to one trap, provided:

1. The trap and waste are sized according to the combined fixture unit rating.
2. The trap is located immediately below one of the indirect waste connections.
3. The developed distance of a branch does not exceed eight feet.
4. The branches change direction through a tee-wye or wye pattern fitting.

(f) Bedpan Steamers - Additional Trap Required. A trap with a minimum seal of three inches shall be provided in a bedpan steamer drain located between the fixture and the indirect waste connection.

(g) Pressure Sterilizer.

1. Except when an exhaust condenser is used a pressure sterilizer chamber drain may be connected to the exhaust drip tube before terminating at the indirect waste connection.
2. If a vapor trap is used, it shall be designed and installed to prevent moisture being aspirated into the sterilizer chamber.
3. The jacket steam condensate return, if not connected to a gravity steam condensate return, shall be separately and indirectly wasted.
4. If necessary, to cool a high temperature discharge, a cooling receiver, trapped on its discharge side may serve as the fixture trap.

(h) Pressure Sterilizer Exhaust Condensers.

1. The drain from the condenser shall be installed with an indirect waste as prescribed in 248 CMR 3.00 through 10.00.
2. If condensers are used on pressure sterilizers, the chamber drain shall have a separate indirect waste connection.

(i) Water Sterilizer. All water sterilizer drains, including tank, valve leakage, condenser, filter and cooling shall be installed with indirect waste or according to 248 CMR 10.18(8)(b).

(j) Pressure Instrument Washer-sterilizer.

1. The pressure instrument washer-sterilizer chamber drain, and overflow may be interconnected. They also may be interconnected with the condenser.
2. The indirect waste shall follow the provision set forth in 248 CMR 3.00 through 10.00.

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- (k) Aspirators.
 - 1. In operating rooms, emergency rooms, recovery rooms, delivery rooms, examining rooms, autopsy rooms, and other locations except laboratories where aspirators are installed for removing blood, pus and/or other fluids, the discharge from any aspirator shall be indirectly connected to the drainage system.
 - 2. The suction line of an aspirator shall be provided with a bottle or similar trap to protect the water supply.

- (9) Central Vacuum and/or Disposal Systems.
 - (a) Wastes. The waste from a central vacuum (fluid suction) system of the disposal type and/or which is connected to the drainage system whether the disposal be by barometric leg, collecting tanks, or bottles shall be directly connected to the sanitary drainage system through a trapped waste.
 - (b) Piping.
 - 1. The piping of a central vacuum (fluid suction) system shall be of corrosion resistant material having a smooth interior surface.
 - 2. No branches shall be less than one inch for one outlet and sized according to the number of vacuum outlets, and no main shall be less than one inch.
 - 3. The pipe sizing shall be increased according to the manufacturer's recommendation as stations are increased.
 - 4. All piping shall be provided with adequate and accessible clean-out facilities on mains and branches, and shall be accessible for inspection, maintenance, and replacements.
 - (c) Water Systems for Space Cooling and Heating Condensate Drains.
 - 1. The lowest point of a condensate riser or risers shall be trapped and discharged over an indirect waste sink.
 - 2. The trap may be either "P" or a "running trap" with a clean-out.
 - 3. A branch shall be installed upstream from the condensate drain trap for flushing and resealing purposes.
 - 4. The condensate drain and trap shall be located above the lowest floor level of the building.

- (10) Vent Material. Material for local vents serving bedpan washers and sterilizer vents serving sterilizers, shall be sufficiently rust proof, erosion and corrosion resistant to withstand:
 - (a) intermittent wetting and drying from steam vapors;
 - (b) the distilled water solvent action of the steam vapors; and
 - (c) frequent and immediate changes of temperatures.

- (11) Vent Connections Prohibited.
 - (a) Connections between local vents serving bedpan washers, sterilizer vents serving sterilizing apparatus, and/or normal sanitary plumbing systems, are prohibited.
 - (b) Only one type of apparatus shall be served by a given vent.

- (12) Local Vents and Stacks. Bedpan Washers.
 - (a) Bedpan washers shall be vented to the outer atmosphere above the roof by means of one or more local vents.
 - (b) The local vent for a bedpan washer shall be not less than a two-inch diameter pipe.
 - (c) A local vent serving a single bedpan washer may drain to the fixture served.

- (13) Multiple Installations.
 - (a) Where bedpan washers are located above each other on more than one floor, a local vent stack may be installed to receive the local vent on the various floors.
 - (b) Not more than three bedpan washers shall be connected to a two-inch local vent stack, six to a three-inch local vent stack, and 12 to a four-inch local vent stack.
 - (c) In multiple installations, the connections between a bedpan washer local vent and local vent stack shall be made by use of the tee or tee-wye sanitary pattern drainage fittings, installed in an upright position.

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(d) Trap Required.

1. The bottom of the local vent stack, except when serving only one bedpan washer, shall be drained by means of a trapped and vented waste connection to the plumbing sanitary drainage system.
2. The trap and waste shall be the same size as the local vent stack.

(14) Trap Seal Maintenance.

- (a) A water supply of not less than ¼-inch minimum tubing shall be taken from the flush supply of each bedpan washer on the discharge or fixture side of the vacuum breaker, trapped to form not less than a three-inch seal and connected to the local vent stack on each floor.
- (b) The water supply shall be so installed as to provide a supply of water to the local vent stack for cleansing and drain trap seal maintenance each time a bedpan washer is flushed.

(15) Sterilizer, Vents and Stacks.

(a) Connections.

1. Multiple installations of pressure and non-pressure sterilizers shall have their vent connections to the sterilizer vent stack made by means of inverted wye fittings.
2. Such vent connections shall be accessible for inspection and maintenance.

(b) Drainage.

1. The connection between the sterilizer vent stack shall be designed and installed to drain to the funnel or basket-type waste fitting.
2. In multiple installations, the sterilizer vent stack shall be drained separately to the lowest sterilizer funnel or basket-type waste fitting or receptor.

(16) Sterilizer Vent Stack Sizes.

(a) Bedpan Steamers.

1. The minimum size of a sterilizer vent serving a bedpan steamer shall be 1½ inches in diameter.
2. Multiple installations shall be sized according to 248 CMR 10.18(16): *Table 1: Stack Sizes for Bedpan Steamers and Boiling Type Sterilizers*, (number of connections of various sizes sterilizer vent stacks).

Table 1
Stack Sizes for Bedpan Steamers
and Boiling Type Sterilizers

Stack Size	Connection Size	
	1½ inches	2 inches
1½ - inch ¹	1	or 0
2 - inch ¹	2	or 1
2 - inch ²	1	and 1
3 - inch ¹	4	or 2
3 - inch ²	2	and 2
4 - inch ¹	8	or 4
4 - inch ²	4	and 4

Note 1: Total of each size

Note 2: Combination of sizes

(b) Boiling Type Sterilizers.

1. The minimum size of a sterilizer vent stack shall be two inches in diameter when serving a utensil sterilizer, and one inch in diameter when serving an instrument sterilizer.
2. Combinations of building type sterilizer vent connections shall be based on 248 CMR 10.18(16): *Table 1: Stack Sizes for Bedpan Steamers and Boiling Type Sterilizers*.

- (c) Pressure Sterilizers. Sterilizer vent stacks shall be 2½ inches minimum; those serving combinations of pressure sterilizer exhaust connections shall be sized according to 248 CMR 10.18(16): *Table 2: Stack Sizes for Pressure Sterilizers*.

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(d) Pressure Instrument Washer-sterilizer Sizes.

1. The minimum size of a sterilizer vent stack serving an instrument washer-sterilizer, shall be two inches in diameter.
2. Not more than two sterilizers shall be installed on a two-inch stack, and not more than four on a three-inch stack.

Table 2
Stack Sizes for Pressure Sterilizers

Number of Connections of Various Sizes Permitted to Various Size Vent Stacks							
	Stack Size			Connection Size			
	¾		1 inch		1¼ inch		1½ inch
1½ - inch ¹	3	or	2	or	1		
1½ - inch ²	2	and	1				
2 - inch ¹	6	or	3	or	2	or	1
2 - Inch ²	3	and	2				
2 - inch ²	2	and	1	and	1		
2 - inch ²	1	and	1	and	1		
3 - inch ¹	15	or	7	or	5	or	3
3 - inch ²			1	and	2	and	2
3 - inch ²	1	and	5	and			1

Note 1: Combination of sizes

Note 2: Total of each size

(17) Radioactive Materials.

- (a) All radioactive materials shall be disposed of in a manner so as to create no hazard to operation and maintenance personnel of the institution or to the public.
- (b) Specific permission shall be secured from the State Department of Public Health to dispose of any radioactive material to the drainage system.

(18) Water Supply.

- (a) Water Service. All hospitals shall have dual services installed in a manner to provide an uninterrupted supply of water in case of a water main break.
- (b) Hot Water Heater and Tanks.
 1. The hot water equipment shall have enough capacity to supply water at 125°F for hospital fixtures; water at 180°F for kitchens and laundries.
 2. Where direct fired hot water heaters are used, they shall be of an accepted high-pressure type.
 3. Submerged steam heating coils should be of copper. Storage tanks shall be fabricated of non-corrosive metal or be lined with non-corrosive material.
- (c) Hot Water Supply System.
 1. Hot water circulating mains and risers should be run from the hot water storage tank to a point directly below the highest fixture at the end of each branch main.
 2. Where the building is higher than three stories, each riser shall be circulated.
 3. Each main, branch main, riser and branch to a group of fixtures of the water system shall be provided with valves.

(19) Vacuum Breaker Installation.

- (a) Hose Connections. For ordinary hose connections the maximum height at which any hose is to be used shall be treated at its flood level.
- (b) Low Volume Flows.
 1. Where low volume flows might cause leaking or spitting at the vacuum breaker parts, back pressure may be developed by installing an acceptable minimum orifice valve on the discharge side of the vacuum breaker. This shall be in addition to the regular control valve.
 2. Low volume flow installation shall be subject to review and acceptance by the Inspector.

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- (c) Prohibited Toilet and Clinic Sink Supply.
 1. No jet or water supplied orifices, except those supplied by the flush connection, shall be located in and/or connected with a toilet bowl or clinic sink.
 2. 248 CMR 10.18 shall not prohibit an acceptable bidet installation.
- (d) Special Equipment, Water Supply Protection. 248 CMR 10.18(19): *Table 3: Hospital Fixtures and Their Water Supply Protection*, sets forth the requirements which shall be followed in protecting the water supply for hospital fixtures against backflow or back siphonage.

Table 3
Hospital Fixtures and Their Water Supply Protection

Fixtures	Type of Protection ¹	Remarks
Aspirators:		
Laboratory	Vacuum breaker	
Portable	Vacuum breaker	
Vacuum system	Vacuum breaker	
Bedpan:		
Washers	Vacuum breaker	
Washer hose	Vacuum breaker	Locate five feet above floor.
Boiling type sterilizer	Air gap	Not less than twice the effective opening of the water supply.
Exhaust condenser	Vacuum breaker	
Flush floor drain	Vacuum breaker	
Hose connection	Vacuum breaker	Locate six feet above floor.
Pressure instrument washer-sterilizer	Vacuum breaker	
Pressure Sterilizer	Vacuum breaker	
(rubber Tube Testers-Washers)	Vacuum breaker	
Vacuum systems		
Cleaning	Air gap or vacuum breaker	
Fluid suction	Air gap or vacuum breaker	

Note 1: Where vacuum breakers are used, they shall be installed after the last control valve.

(20) Clinical, Hydrotherapeutic and Radiological Equipment. All clinical, hydrotherapeutic, radiological, or any equipment, whether mentioned or not, which is water supplied and/or discharges to the waste system, shall meet the requirements of 248 CMR 10.18 and the regulations covering cross-connections, air gaps, vacuum breakers, and check valves.

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Special Equipment and Devices Found under These Classes Include:

Clinical	Hydrotherapeutic	Radiological
Dental cuspidors	Control units	Violet X-Ray
Surgical cuspidors	Arm bath	Diagnostic X-Ray
Dental (flush rim) lavatories	Leg bath	Therapy X-Ray
Colonic irrigation	Foot bath	X-Ray target
Sitz bath	Tub bath	X-Ray transformers
Emergency bath	Immersion bath	X-Ray oil tank
Receiving bath	Shower bath	Diffraction
Prenatal bath	Needle bath	X-Ray developing
Infant bath	Tank	Photographic developing
Prophylaxis	Pool	Film developing
Shampoo	Hose	Microscopic
Massage	Syringe	
	Douche	

(21) Condensate Drain Trap Seal.

- (a) A water supply shall be provided for cleaning, flushing, and resealing the condensate trap.
- (b) The source of the water supply shall be a refrigerator condenser discharge, a drinking water station waste, or other acceptable method of flushing and resealing the trap.
- (c) The water supply shall be not less than ½ inch diameter pipe.
- (d) The water supply shall discharge through an air gap not less than twice the diameter of the supply pipe.

(22) Valve Leakage Diverter. Each water sterilizer which may be filled with water through directly connected piping, shall be equipped with an acceptable leakage diverter and/or bleed-line on the water supply control valve to indicate and conduct any leakage of unsterile water away from the sterile zone.

10.19: Manufactured/Mobile Homes, Modular Homes, Construction and Temporary Use Trailers

(1) Manufactured/Mobile Home. Manufactured/Mobile home means a structure, transportable in one or more sections, which in the traveling mode is eight body feet or more in width or 40 body feet or more in length or which when erected on-site is 320 or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air-conditioning, and electrical systems contained in the structure.

- (a) Labeled. When referring to Manufactured/Mobile homes, labeled means a label, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling is indicated compliance with nationally recognized standards or tests to determine suitable usage in a specified manner.
- (b) Inspections. Plumbing and gas inspections for installation of Manufactured/Mobile homes shall be limited to connection of services to the existing structure.
- (c) Additions or Renovations. Additions and renovations made to the plumbing and/or gas systems of such units shall be made in compliance with all provisions of M.G.L. c. 142 and 248 CMR 3.00 through 10.00.

Exception: Individual fixture replacements which do not create a nuisance that may involve health or safety hazards.

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(2) Modular Home. A modular home is not a Manufactured/Mobile home; it is simply a home that is built off-site, as opposed to on-site. These homes are often called factory-built, system-built or prefab (short for prefabricated) homes. Modular and manufactured homes are not the same. Manufactured/Mobile homes are not placed on permanent foundations. A modular home conforms to the building codes that are required at the specific location where they'll be delivered and have been certified by the Board of Building Regulations and Standards (BBRS) 780 CMR.

(a) Disassembly Prohibited. Unauthorized destructive disassembly of certified buildings and building components shall not be performed in order to conduct tests and/or inspections of the plumbing system.

(b) Opening Panels. Nondestructive disassembly may be performed only to the extent of opening access panels and cover plates.

(3) Construction and Temporary Use Trailers. Trailers supplied with toilet facilities for use on a temporary basis. This would pertain to residential and commercial installations. These trailers are exempt from the material provisions of 248 CMR 10.06. Refer to Basic Principle No. 25.

10.20: Swimming Pools

(1) General.

(a) All swimming pools must be installed in full compliance with all provisions of 105 CMR 435.00: *Minimum Standards for Swimming Pools (State Sanitary Code: Chapter V)*.

(b) The issuing of permits, payment of fees, inspection, approval and installation of all swimming pools must also conform to all provisions of 248 CMR 3.00 through 10.00.

(2) Definitions.

Public Pool. Means every swimming, wading or special purpose pool, admission to which may be gained by the general public with or without the payment of a fee.

Residential Pool. Means a swimming or wading pool established or maintained by an individual for his or her own or family's use or for the use of personal guests of his or her household.

Semi-public Pool. Means a swimming, wading or special purpose pool on the premises of, or used in connection with a hotel, motel, trailer court, apartment house, condominium, country club, youth club, school, camp, or similar establishment where the primary purpose of the establishment is not the operation of the swimming facilities, and where admission to the use of the pool is included in the fee or consideration paid or given for the primary use of the premises. Semi-public pool shall also mean a pool constructed and maintained by groups for the purposes of providing bathing facilities for members and guests only.

Special Purpose Pool. Means a unit designed for recreational and therapeutic use which is shallow in depth and not meant for swimming or diving. These pools are not drained, cleaned, or refilled for each user. It may include, but not be limited to, hydro jet circulation, hot water, cold water mineral baths, air induction bubbles, or any combination thereof. Industry terminology for such a pool includes, but is not limited to, therapeutic pool, hydrotherapy pool, whirlpool, hot spa, hot tubs, float tanks, *etc.* This standard excludes residential units and facilities used or under the direct supervision and control of licensed medical personnel.

Wading Pool. Means a pool of water in a basin having a maximum depth of less than two feet intended chiefly as a wading place for children. It does not include any residential pool as defined in 248 CMR 10.20.

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- (3) Plan Approval. No person shall construct or install a Public or Semi-public swimming or wading pool or expand, remodel, or otherwise make any change which may affect the compliance of an existing Public or Semi-public swimming or wading pool with the requirements of 248 CMR 10.00: *Uniform State Plumbing Code* until the plans and specifications for the construction or change have been approved in writing by the Board of Health.
- (4) Cross Connection Control.
- (a) Cross Connection Potable water supplying any public, semi-public, wading or special purpose pool, either directly or to the recirculation system, shall be supplied through an air gap or reduced pressure backflow preventor. In addition, no piping arrangement shall exist that will permit sewage, wastewater or any water of unknown or questionable quality to enter the pool or pool piping system.
- (b) Pool drains or drains from filters, where the re-circulating system is used, shall be indirectly connected to sewers.
1. Such drains should discharge by an indirect connection to a properly trapped sump.
 2. Where such indirect connections are not possible, pumping of pool and filter-wash drainage may be necessary.
- (5) Pool Discharge.
- (a) Pipes that convey wastewater 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 indirectly wasted.
- (b) Circulation pumps may be utilized to lift wastewater when the indirect waste line is below the sewer grade.
- (c) Wastewater may discharge to the storm or sanitary systems in cities and towns only with written authorization from the authority having jurisdiction and may need to be treated prior to discharge.

10.21: Vacuum Powered Sanitary Drainage Systems

- (1) General. 248 CMR 10.21 shall include all fixtures, piping, connections, vacuum equipment, associated tanks and the method of receiving discharge from or discharging to a conventional drainage system as regulated in 248 CMR 10.15.
- (a) Vacuum drainage systems may be designed by a Massachusetts professional engineer.
- (b) Vacuum drainage systems shall be installed in accordance with the equipment manufacturer's installation instructions.

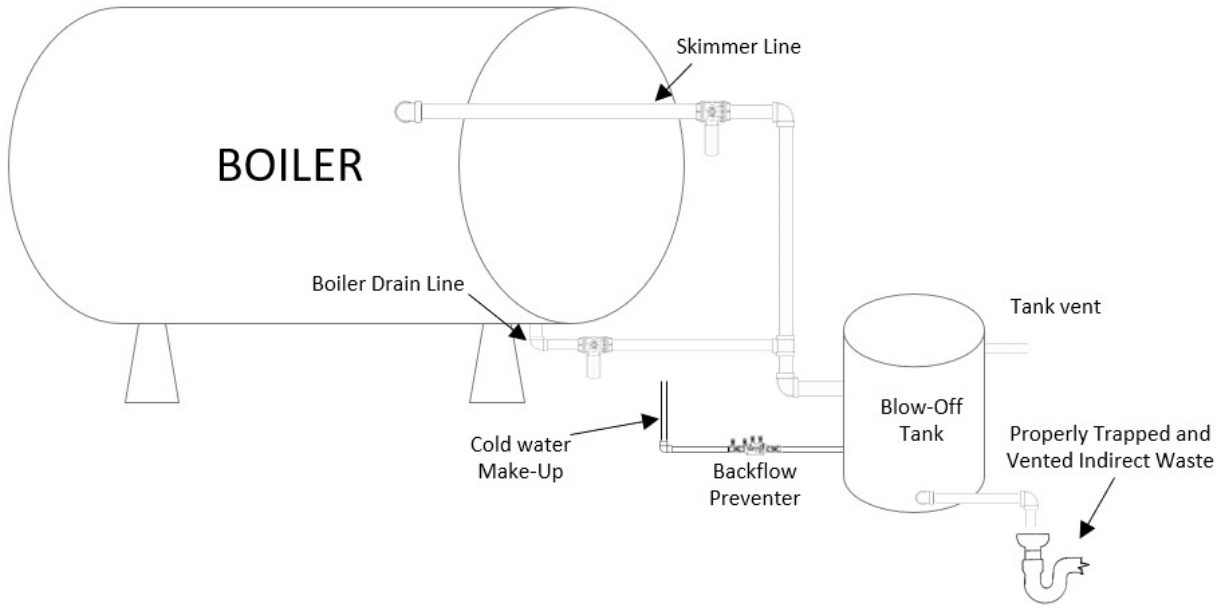
10.22: Boiler Discharge to the Building Drainage System

- (1) General.
- (a) Water entering the building drainage system shall not exceed 150°F.
- (b) The pressure of boiler discharge into the building drainage system shall not exceed five PSI.
- (c) Steam discharge shall not be directly connected to a building, drainage system but shall first pass through a proper drain water tempering system or device.
- (d) Potable water connection to blow-off tank must be properly protected by a backflow preventer.
- (e) Types of devices shall include, but not be limited to, boiler blow-off tanks, automatic cooling facilities and drain water tempering devices.

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10.22: continued

Figure 1: Illustration of Boiler Blow off Tank



REGULATORY AUTHORITY

248 CMR 10.00: 248 CMR 10.00: M.G.L. c. 112, § 61; M.G.L. c. 142, §§ 13 and 21.

(PAGES 213 THROUGH 254 ARE RESERVED FOR FUTURE USE.)