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

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Section

3.01: Scope and Application

(1) Scope. The provisions of 248 CMR 3.00 govern the administrative requirements regarding the installation, removal, alteration, repair, and inspection of all plumbing and gas fitting work pursuant to M.G.L. c. 142, §§ 13 and 21. 248 CMR 3.00 also governs the administrative functions of the Board in sanctioning Licensees who engage in the installation, alteration, repair and Inspection of plumbing and gas fitting work pursuant to M.G.L. c. 142, §§ 13 and 21, and M.G.L. c. 112, § 61.

(2) Sections Declared Independent. Each Section of 248 CMR 3.00 through 11.00 and every part of each Section is hereby declared to be an independent Section and the holding of any Section or part of Section to be void and ineffective for any cause shall not be deemed to affect any other Section or part of Sections.

3.02: Definitions

For the purpose of 248 CMR 3.00 through 11.00 the following terms shall have the meanings indicated in 248 CMR 3.02. No attempt is made to define ordinary words that are used in accordance with their established dictionary meaning except where it is necessary to define their meaning to avoid misunderstanding. Definitions in M.G.L. c. 142 are not repeated here unless further clarity is required.

Apprentice Gas Fitter. A person not less than 16 years of age who is licensed by the Board and learning and working at the business of gas fitting under the direct supervision of a master gas fitter or journeyman gas fitter while in the employ of a master gas fitter.

Apprentice Plumber. A person not less than 16 years of age who is licensed by the Board and learning and working at the business of plumbing under the direct supervision of a master plumber or journeyman plumber while in the employ of a master plumber.

Board. State Board of Examiners of Plumbers and Gas Fitters as established in M.G.L. c. 13, § 36 and defined as the Examiners in M.G.L. c. 142, § 1.

Code. 248 CMR 3.00 through 11.00, subsequent amendments thereto, or and any emergency rule or regulation that the Board promulgates.

Direct Supervision. Supervision that is on-site and present during the conducted work.

Executive Director. The Executive Secretary of the Board as provided for in M.G.L. c. 13, § 36.

Generally Accepted Standard. A specification, code, rule, guide, or procedure recognized and accepted throughout the plumbing and gas fitting profession as authoritative.

Inspector. Either the Local Inspector or the State Inspector, as determined in 248 CMR 3.05(1)(a), who is responsible for granting or denying Permit applications and performing Inspections of plumbing and/or gas fitting work.

Inspection. The Inspector's act of reviewing plumbing or gas fitting workmanship for compliance with the provisions of 248 CMR.

3.02: continued

Licensee. A person duly holding a license issued by the Board.

Local Inspector. The Inspector of plumbing and gas fitting who is appointed by the building inspector, board of health, or mayor of each city and town in the Commonwealth pursuant to M.G.L. c. 142, §§ 11 and 12 and who administers and enforces the provisions of 248 CMR 3.00 through 10.00. For purposes of these regulations, Assistant, Alternate, or Deputy Inspectors shall also be deemed Local Inspectors.

Permit. A written notice that the Inspector grants to a plumber or gas fitter to commence work on a given installation. The Permit may contain limitations and conditions of the work to be performed. The uniform permit application form approved by the Board may be considered a Permit after issuance by the Inspector.

Permit Holder. A non-apprentice Licensee who has signed the uniform application for permit, is authorized to be granted a Permit under 248 CMR, and who has received a Permit from the Inspector.

Principal. A licensed master plumber or master gas fitter who is in charge of the plumbing and/or gas-fitting operations of a business entity subject to licensure under 248 CMR 3.00. For purposes of these regulations, a principal need not have an ownership interest in the business entity.

Product-accepted (Product-acceptance). A plumbing or gas fitting product that may be installed pursuant to 248 CMR 3.00 through 10.00 based on the Board's determination that it meets the standards of 248 CMR 3.00 through 10.00.

Special-permission. Explicit permission from the Board that is required before installing certain products, materials, or systems because the product, material, or system raises special safety considerations.

State Inspector. A person employed by the Commonwealth of Massachusetts's Division of Professional Licensure who grants Permits and performs Inspections of the plumbing and gas fitting work in all state owned, used, leased (including sub-leased) or constructed buildings that are subject to the provisions of M.G.L. c. 142, § 21.

3.03: Business and Apprentice Licenses, Renewal, and Inspector Requirements

(1) Business Licensure

(a) Licenses Required. All corporations, LLC's, partnerships, or other such entities that have plumbing or gas-fitting employees are required to maintain a business license. Such business entities shall be properly constituted and chartered business organization recognized by the Secretary of the Commonwealth, such as a general partnership, limited partnership (LP), limited liability partnership (LLP), limited liability company (LLC), corporation or professional corporation (PC). Individuals practicing under their own name or a DBA do not require a business license. A business license shall be a certificate for purposes of M.G.L. c. 142, § 3B.

(b) Exceptions. Businesses employing licensed plumbers or gas-fitters do not need to have a business license if they meet one of the following criteria:

1. A non-plumbing/gas-fitting business does not need a business license if it employs one or more licensed plumbers or gas-fitters and the only work performed by licensees is for the premises owned/leased and operated by that non-plumbing/gas-fitting business.

2. Businesses solely engaged in work regarding undiluted liquefied petroleum gas installation do not require a business license so long as all individuals doing the work hold the proper license.

(c) Applications. Applicants for Plumbing or Gas Fitting Business licenses shall meet the following criteria for licensure:

3.03: continued

1. submission of an application completely and properly filled out in the manner prescribed by the Board, attested to under the pains and penalties of perjury by a master plumber or master gas fitter, as the case may be, who is a principal of the entity, and accompanied by such other information that the Board may require.

2. all principals of the entity shall be of good moral character as determined by the Board;

3. applicants for licensure must pay the non-refundable fee as established by the Secretary of Administration and Finance pursuant to M.G.L. c. 7, s. 3B and 801 CMR 4:00: *Rates*.

4. Corporations

   a. Applications for Plumbing or Gas Fitting Corporations must include a signed and stamped copy of the Articles of Organization. Out of State Corporations must provide a signed and stamped copy of the filed Foreign Corporation Certificate or such other document as required by the Massachusetts Secretary of State.

   b. The installation of plumbing work for a plumbing corporation, or the installation of gas fitting work for a gas fitting corporation, must be specifically stated and documented as one of the disciplines of the corporation on the Articles of Organization that is submitted.

   c. The applicant for a plumbing corporation must be a master plumber who is a listed officer of the corporation; the applicant for a gas fitting corporation must be a master gas fitter who is a listed officer of the corporation.

5. Limited Liability Companies (LLC's)

   a. Applications for Plumbing or Gas Fitting LLC's must include a signed and stamped copy of the Certificate of Organization. Out of State Corporations must provide a signed and stamped copy of the filed Foreign LLC Certificate or such other document as required by the Massachusetts Secretary of State.

   b. The installation of plumbing work for a plumbing LLC, or gas fitting work for a gas fitting LLC, must be specifically stated and documented as one of the disciplines of the LLC on the Certificate of Organization that is submitted.

   c. The applicant for a plumbing LLC must be a master plumber who is a listed manager of the LLC; the applicant for a gas fitting LLC must be a master gas fitter who is a listed manager of the LLC.

6. General Partnerships, Limited Partnerships, and Limited Liability Partnerships (LLP's)

   a. All partners in a general partnership, limited partnership, or LLP shall possess current Master Plumber or Master Gas Fitter licenses.

   b. In the case of a general partnership, applicants must include with their application a notarized written agreement signed by all partners creating the general partnership.

   c. In the case of a Limited Partnership or LLP, Applicants must include a signed and stamped copy of the partnership certificate filed with the Massachusetts Secretary of State.

3.03: continued

(d) Responsibilities and duties of the Licensee of Record for Business Licenses

1. All business licenses are issued to the applicant for licensure who is a master plumber or master gas fitter. Business licenses are not transferable.

2. Once licensed, the master plumber or master gas fitter who is considered the licensee on record for the business is required to ensure that:

a. all plumbing and gas fitting work performed by the business is accomplished by individuals with valid, current licenses; and

b. all licensees comply with the requirements of 248 CMR 3.00 to 11.00.

(e) Changes in the Licensee of Record for Businesses licensed by the Board.

1. Routine changes and expiration of the licensee of record's license

a. To withdraw as licensee of record from a business, a licensee must immediately notify the Board in writing and return all business licenses.

b. So long as all other individuals performing plumbing or gas fitting for the business are validly licensed, the business may continue operating so long as a new application for a business license is filed by a licensed master plumber or gas fitter, as the case may be, within fifteen (15) days of the withdrawal of the licensee of record. The business may not continue to operate after sixty (60) days or if the Board denies this application, whichever comes first.

c. In the event the qualifying officer's master license expires, the business may treat the expiration date as the equivalent of the date of withdrawal of the licensee of record from the business, however, any work performed by the master licensee with an expired license may lead to such disciplinary action as allowed by law.

2. Discipline against the licensee of record

a. Any discipline against a licensee of record shall be considered discipline against the business, discipline against the business shall likewise apply against the licensee of record.

b. Should the license of the licensee of record be suspended or revoked, the business may not operate in the plumbing or gas fitting industry until such time as the suspension or revocation is lifted or a new license is granted by the Board by application of a new licensee of record.

3. Death of the licensee of record

a. In the event its licensee of record dies, a business must notify the Board in writing of said death within fifteen (15) days.

b. So long as all other individuals performing plumbing or gas fitting of the business are validly licensed, the business may continue operating for sixty (60) days. For good cause shown, the Board may extend this period.

(2) Apprentices.

(a) General Provisions

1. No person shall work as an Apprentice unless he or she has been issued a license by the Board. Applicants for the Apprentice license must:

a. in conjunction with his/her employing master, complete an Apprentice registration form; and

b. submit the required fee and registration form to the Board.

2. The Apprentice license shall be exhibited whenever required by an Inspector.

3. The Apprentice and the employing Master Plumber or Master Gas Fitter shall be jointly responsible for completing the Apprentice registration form.

4. No Apprentice shall solicit by sign, listing or any other form of advertisement, work regulated or controlled by 248 CMR or M.G.L. c. 142.

5. Individuals learning the practice of undiluted liquefied petroleum gas installation pursuant to 248 CMR 11.00 under the direct supervision of a properly licensed individual do not require an apprentice license.

6. Apprentices must retain all W-2 records demonstrating their employment throughout their apprenticeship as well as for a period of at least seven years after obtaining a journeyman license.

(b) Master's Duties Regarding Apprentice Licensure:

1. Before a prospective Apprentice begins employment as an Apprentice gas fitter or Apprentice plumber with a Master Plumber or Master Gas Fitter, the employing Master Plumber or Master Gas Fitter shall be responsible for insuring that the apprentice has complied with all licensing requirements.

2. The Apprentice license application form shall be signed by the Apprentice and the employing Master Plumber or Master Gas Fitter.

3. The Master Plumber or Master Gas Fitter shall not charge a fee to the Apprentice in relation to the master's completion of the Apprentice license application form.

4. The master and/or licensed business entity must retain payroll records and other employment documentation for all apprentices so employed. These records must be made available to the Board upon request and must be retained by the master for at least seven years after the apprentice ceases employment with the master or such later date as allowed by law.

5. In the event an apprentice leaves the employment of a master prior to completing their apprenticeship, the master must provide the apprentice a signed statement of experience.

6. In the event the master separates from a business entity, thus ending a supervisory relationship with an apprentice, the master will be deemed to have satisfied the requirements of this section if he/she provides the apprentice with a signed statement of experience when leaving the business entity. However, the Board may seek employment records from the business entity as it deems necessary.

(3) Inspectors

(a) No plumber or gas fitter may act as or claim to be a Local Inspector of plumbing or gas fitting unless appointed by a city or town inspector of buildings, board of health, or mayor as described in M.G.L. c. 142, §§11 and 11A.

(b) Inspector notification to the Board and continuing education

1. To ensure compliance with Board enforced statutory mandates, a plumber or gas fitter appointed to be a Local Inspector of plumbing or gas fitting must notify the Board in

writing, via completing a Board approved form, within fifteen (15) days of appointment. Said form must include:

a. The name and license number of the journeyman or master plumber or gas fitter appointed as a Local Inspector;

b. The mailing address where the Local Inspector will receive official correspondence related to local inspections; and

c. A letter on city or town letterhead certifying the appointment of the Local Inspector. In the event that two or more towns have formed an inspection district pursuant to M.G.L. c. 142, §10, the Local Inspector must either produce a letter from each town he or she would be inspecting in or a letter from one town appointing the Local Inspector which states that the town is part of an inspection district and specifies which other towns are a part of said district.

2. Any Local Inspector who will cease duties as a Local Inspector must notify the Board in writing within fifteen (15) days of their last day as an Inspector.

(c) Inspector continuing education requirements

1. Pursuant to M.G.L. c. 142, s. 11B, Inspectors must complete 12 hours of Board approved continuing education each year. This continuing education is separate from continuing education approved by the Board for non-Inspector plumbers and gas fitters as described in 248 CMR 11.00. Exemptions in 248 CMR 11.00 do not apply for Inspector continuing education.

2. Inspector continuing education must be approved by the Board and must be completed during the Inspector's personal license renewal cycle. The completion of said continuing education is a condition of being an Inspector and shall also be considered a condition for the renewal of the Inspector's personal license.

3. Upon appointment, the amount of continuing education that an Inspector must complete may be pro-rated by the Board based upon the time of appointment so long as the Inspector has completed the equivalent amount of continuing education specified in 248 CMR 11.00 for the period of time prior to the Inspector's appointment.

(d) The plumbing or gas-fitting license of any Inspector may be subject to disciplinary action for any violations of this section. Should the Board suspend or revoke the license of an Inspector, or should the Inspector let his or her plumbing or gas fitting license lapse, that individual may not inspect again unless he or she obtains a valid license issued by the Board.

(4) Any person licensed by the Board may carry on the work within the scope of their license.

(5) These regulations, in conjunction with M.G.L. c. 142, shall be deemed to occupy the whole field of the licensing of plumbers, gas fitters, and undiluted liquefied petroleum gas installers in Massachusetts.

(6) Procedures for Renewal of Licenses

(a) Licensees must renew their licenses every two years;

(b) Individuals must submit to the Board, or its agent, a completed written or electronic renewal application and the required fees prior to the expiration date of the license;

(c) Individuals must fulfill and document, as specified by the Board, the satisfactory completion of any continuing education requirements.

3.03: continued

(d) Each licensee shall disclose in writing to the Board any finding made against him or her made by a court, other state or federal agency or, where applicable, by a licensing board of another jurisdiction within fifteen (15) days of said finding. This requirement shall not require disclosure of civil traffic offenses or dismissals of actions brought by the licensee. The provision of such disclosures shall be considered a condition of license renewal.

(e) It shall be the responsibility of all Licensees to notify the Board of any changes of address within fifteen (15) days of relocation. Licensees who fail to so notify the Board may be subject to disciplinary action and are responsible for any failure to receive official Board correspondence including renewal applications.

3.04: Product, Design, and Testing Standards

(1) Board Required Product-acceptance. Only products and materials that have been listed by the Board as Product-accepted shall be used for plumbing and gas fitting work performed in the Commonwealth and governed by M.G.L. c. 142 and 248 CMR. The Board accepts products to ensure compliance with M.G.L. c. 142 and 248 CMR. The Board additionally requires manufacturers to provide information/testing to ensure their products meet applicable standards and are safe for public use. In making such acceptances, the Board does not relieve manufacturers of their independent obligations to only sell products that are safe for public use.

(a) Record. The Board shall maintain a list of Product-accepted materials or products.

(b) Product-acceptance.

1. For products not already listed as Product-accepted by the Board, each manufacturer of materials and equipment used in the construction, installation, alteration, repair, or replacement of any plumbing or gas fitting system shall apply to the Board for product-acceptance of each individual item or model number that is to be made available for installation in the Commonwealth.

2. Should the Board grant product-acceptance, the grant shall be valid for such period as designated by the Board. The product will then be listed by the Board as Product-accepted. All permanent Product-approvals granted in the past are null and void.

3. No product that is subject to a product acceptance request shall be installed before the Board has voted to grant the product-acceptance request.

4. An applicant for an product-acceptance request shall:

a. provide a completed product acceptance application in compliance with 248 CMR 3.00;

b. a non-refundable application fee in the amount set by the Commission of Administration and Finance and made payable to the Commonwealth of Massachusetts;

c. at the Board's request, appear at the Board meeting wherein the Product acceptance application is scheduled to be discussed; and

d. fulfill any testing requirements or meet any applicable standards in their entirety required by the Board.

5. All modifications to a previously accepted product or material, including substantive changes to installation instructions, must be resubmitted to the Board.

6. At the Board's discretion, in lieu of granting an applicant's product- acceptance request, the Board may convert such a request to a request for a Test-site under these regulations.

3.04: continued

7. In lieu of requiring the renewal of a product's acceptance, the Board may periodically require applicants to certify that:

a. the product and its instructions have not been altered since first accepted by the Board; and

b. the product continues to meet the requirements of 248 CMR 3.00 to 10.00.

(c) Board suspension/rescission of product acceptance

1. Board acceptance of a product may be withdrawn whenever any of the following conditions exist:

a. Plumbing laws or regulations have changed affecting the legal installation of the product;

b. The product has become the subject of a recall by the manufacturer;

c. The product has been deemed unsafe or defective by the Consumer Product Safety Commission, a court of competent jurisdiction, or other such legal entity operating under a state or federal law;

d. The product has been modified without Board notice and acceptance;

e. The installation of the product requires, but cannot meet, provisions of any non-plumbing laws/regulations;

f. The manufacturer has not responded to Board requests/investigations, including any Board requests to certify the product continues to comply with 248 CMR 3.04.;

g. Board acceptance of the product was based on incomplete or incorrect information; or

h. The Board has substantial evidence that continued use of the product would pose a threat to the public's health, safety, or welfare.

2. The rescission of a product's acceptance may, if necessary for public safety, occur prior to the manufacturer being provided with an opportunity to respond to the Board with grounds that may challenge the rescission. The provision of this opportunity shall not be interpreted to create any hearing or other due process rights other than those required by law.

(d) The Board may waive the need for a product to be accepted per 248 CMR 3.04(1)when in the best interests of the public's health, safety, or welfare.

(2) Variances.

(a) The Board may allow an applicant to use an alternative method, material, system or product that does not comply with 248 CMR 3.00 through 10.00 when:

1. in the Board's opinion there is an unusual or extraordinary circumstance or an established hardship that warrants special terms or conditions; and

2. the applicant seeks permission from the Board for using the alternative method, material, system, or product for one instance at one location.

(b) No plumbing or gas-fitting work that is subject to a Variance request shall begin before the Board has voted to grant the Variance request. The Board may make an exception to this rule subject to the following limitations:

1. The work was performed, prior to a variance being requested, by an individual licensed by the Board operating pursuant to a validly issued permit;

2. Variances after the fact shall be granted only if a hardship can be established which would have justified the variance if sought prior to the work being performed. For purposes of this requirement, any work or costs incurred to remove non-compliant work or costs incurred to obtain compliant products or materials shall not be considered a qualifying hardship.

3. The applicant for the variance must be the licensee responsible for the work performed. This applicant must be able to certify the following in writing and using a form approved by the Board in order to qualify for a variance after the fact:

   A. That the work performed violates specific provisions of M.G.L. c. 142 and/or 248 CMR as cited by the inspector in writing which the applicant must provide to the Board;

   B. The applicant must certify that he/she understands how the provisions of M.G.L. c. 142 and/or 248 CMR have been violated and that the licensee will ensure all his/her future work will conform to those requirements;

   C. That the non-compliant work was unintentionally non-compliant due to a condition that the applicant who was responsible for the work could not have reasonably foreseen;

   D. That the applicant notified the inspector immediately when the work was discovered to be non-compliant; work performed after this notification shall not be eligible for a variance; and

   E. That the applicant agrees that the non-conforming work is subject to immediate removal if the Board, in its discretion, rejects the variance.

4. The availability of such an exception shall not relieve a licensee of their obligation to adhere to applicable plumbing and gas fitting laws and regulations governing their work; failing to adhere to these requirements may subject a licensee to disciplinary action.

(c) The Variance application shall:

1. be made to the Board before filing for the related Permit application to the Inspector;

2. be submitted in writing and using the forms provided by the Board;

3. include a copy of the petition for a Variance that was made to the Board of Health or to the Health Department for variance applications that involve plumbing work that is not under the jurisdiction of state inspectors; and

4. include a copy of the Board of Health or Health Department's response to the petition for variance applications that involve only plumbing work that is not under the jurisdiction of state inspectors. The Board may waive this requirement so long as it may confirm that the petition was made in a timely manner.

(d) The applicant for a Variance request shall:

1. provide a completed application;

2. include a non-refundable fee in the amount set by the Secretary of Administration and Finance and made payable to the Commonwealth of Massachusetts;

3. appear at the Board meeting wherein the Variance application is scheduled to be discussed; and

4. fulfill any testing requirements and/or meet any other applicable standards in their entirety required by the Board.

(3) Special-permission.

(a) When safety is of special consideration, provisions of 248 CMR 3.00 through 10.00 may require that a Licensee obtain Special-permission from the Board before installing or using a given product, system, design, or method.

(b) To obtain Special-permission an applicant shall:

1. submit a request to the Board; and

2. at the Board's request, appear at a Board meeting where the request is scheduled to be discussed.

(c) The Special-permission request shall include:

1. a non-refundable fee in the amount set by the Secretary of Administration and Finance and made payable to the Commonwealth of Massachusetts;

2. a completed application;

3. a certification that the system was designed or engineered by a qualified individual;

4. the submission of a set of construction documents that have been stamped by a Massachusetts Registered Professional Engineer; and

5. any other requested documentation.

(4) Test-site.

(a) The Board may allow an applicant to use an alternative method, material, system or technology that does not comply with 248 CMR to determine its feasibility or safety.

(b) A Test-site is appropriate when an applicant anticipates that the alternative method, material, system, or technology may be used for more than one installation and at more than one location.

(c) No work that is subject to a Test-site request shall begin before the Board has voted to grant the Test-site request.

(d) The Test-site application shall be made to the Board before filing for the related Permit application to the Inspector.

(e) The applicant for a Test-site request shall:

1. provide a completed application;

2. include a non-refundable fee in the amount set by the Secretary of Administration and Finance and made payable to the Commonwealth of Massachusetts;

3. appear at the Board meeting wherein the product Test-site application is scheduled to be discussed; and

4. fulfill any testing requirements or applicable standards in their entirety required by the Board.

3.04: continued

(f) Should testing prove nonconformance of the product, material, system, technology, or method at issue, the test-site grant may be subject to additional tests or rescission.

(5) Required Tests.

(a) For the purpose of verifying a claim relating to an application made for Product- acceptance, Variance, Test-site, or Special-permission, the Board may require that tests be performed and that such Board recognized tests are performed at the expense of the applicant.

(b) Any tests required by the Board for the purpose of verifying a claim relating to an application made under this section shall be conducted in accordance with industry recognized standards acceptable to the Board.

(6) Board recognized testing

(a) The Board no longer approves testing laboratories. All previous approvals shall be deemed null and void.

(b) The Board will only recognize testing performed by laboratories that have been certified to meet industry-based guidelines to ensure appropriate testing.

(c) Laboratory certification shall be performed by:

1. Neutral/third party accreditation bodies;

2. Neutral/third party conformity assessment bodies; and

3. Governmental bodies.

(d) The Board reserves the right to reject tests from laboratories that lose their certification and/or fail to meet standards necessary for reliable testing.

(e) The Board may recognize field testing performed by certified third party testing agencies.

3.05: Permits and Inspections

(1) Permits.

(a) Jurisdiction of Inspectors.

1. State Inspectors. Permits to perform plumbing and/or gas fitting work in buildings owned, used, leased, or constructed by the Commonwealth pursuant to M.G.L. c. 142, § 21, shall be submitted to State Inspectors who shall grant or deny such Permit applications and who shall perform the related Inspections.

2. Local Inspectors. For all buildings that are not owned or constructed by the United States Government or that are not owned, used, leased or constructed by the Commonwealth, pursuant to M.G.L. c. 142, §§ 11, 11A and 12, all Permit applications shall be submitted to the Local Inspectors who shall grant or deny all such Permit applications and who shall perform the related Inspections.

3. For those buildings owned or constructed by the United States Government, Permits and Inspections for those buildings are only required at the request of the Federal Government.

4. In cases of emergency, a plumbing fixture or gas appliance may be installed, repaired, or turned on temporarily by the licensee prior to obtaining a permit provided:

a. the licensee has performed all testing required by 248 CMR;

b. the licensee and gas supplier (if applicable) are satisfied that the installation or repair will assure safe operation; and

c. the Inspector is notified and a regular inspection is made at the earliest opportunity and in no case later than the next working day.

(b) Requirements.

1. Until a Permit has been issued by the Inspector, plumbing or gas fitting work shall not be:

   a. installed;

   b. altered;

   c. removed;

   d. replaced; or

   e. repaired.

2. Any application for such Permit shall be made in writing to the Inspector before work commences.

3. Each application for the Permit shall include:

   a. a statement of the work to be performed;

   b. the location of the building; and

   c. the names of the people or companies for and by whom the work is to be done.

   d. for applications for permit sought for work performed by students in a Board approved vocational school program, the application must include explicit written approval by the Board for the work to be performed.

4. Each Permit that is issued by the Inspector shall be subject to the express conditions set forth therein as to compliance with M.G.L. c. 142 and 248 CMR.

5. The Inspector may require the applicant to submit a set of construction or engineered plans.

6. A minimum of one Permit is required for each building.

7. Permits to perform plumbing work shall be issued in compliance with the following:

   a. Permits shall be issued to properly licensed individuals only.

   b. Where a person seeks a Permit on behalf of a corporation or LLC, only the Master Plumber who has been granted the license to conduct the plumbing business as a corporation or LLC and who is a manager of the LLC or an officer of the corporation under M.G.L. c. 142, § 3B shall be issued the Permit.

   c. Where a person seeks a Permit on behalf of a general partnership, limited partnership, or LLP, only the Master Plumbers who are partners in the partnership under M.G.L. c. 142, § 3B shall be issued the Permit.

8. Permits to perform gas fitting work shall be issued in compliance with the following:

a. Permits shall be issued to properly licensed individuals.

b. Where a corporation or LLC seeks a Permit, only the Master Plumber or the Master Gas Fitter who is a manager of the LLC or the officer of the corporation under M.G.L. c. 142, § 3B shall be issued the Permit.

c. Where a general partnership, limited partnership, or LLP seeks a Permit, only the Master Plumbers or the Master Gas Fitters who are partners in the partnership under M.G.L. c. 142, § 3B shall be issued the Permit.

9. A business entity who is changing its master licensee due to non-disciplinary reasons (routine or death, as outlined in 248 CMR 3.03(1)(e)) may have a master or journeyman employee file a permit application so long as they provide documentation that they have notified the Board of the change pursuant to these regulations. Once a new master takes over for the entity, that master must notify the Inspector in each city or town where the business has existing permits, and assumes responsibility for the existing permits taken out by the entity.

10. An Inspector may deny a permit to a licensee if the licensee has left another work site in a hazardous condition. For purposes of this section, gas turned on to a piping system or other such equipment without an approved inspection shall be deemed a hazardous condition.

(c) Exceptions to the Permit Requirement: A Permit is not required for

1. the repair of leaks in a faucet, valve, or other working part of a plumbing fixture;

2. the clearance of a stoppage; and

3. Adjustment of gas appliance controls when said adjustment does not require any changes to the connection to the gas supply or associated piping.

(d) Permit Termination.

1. When any of the work outlined in the Permit has commenced but the Permit Holder will not complete the work outlined in the Permit, the Permit shall be terminated by:

a. the Permit Holder; or

b. the person or entity who hired the Permit Holder.

2. Termination consists of sending written notice to the Inspector who issued the Permit, wherein the notice includes:

a. the Permit number;

b. a description of the work completed; and

c. a description of the work not to be completed.

3. The Inspector shall perform an Inspection on the work that was completed under the original Permit.

(e) Invalidity. Permits shall be invalid if work is not started within 90 days of the date of the Permit, unless the holder of the Permit or Permits can satisfactorily prove that failure to start within the 90 day period was beyond his or her control.

(f) Response Time for Permit Applications. Within two working days upon the Inspector's receipt of the Permit application, the Inspector must act upon a Permit application received from a licensee. Acting does not constitute an approval or issuance of a Permit.

3.05: continued

(g) Permit Applications and Fees.

1. Permit applications must be accepted by the Inspector if submitted in person or by mail, however, applicants may choose to utilize electronic means if offered by the Inspector.

2. The Inspector must issue the Permit to the applicant in person, by mail, or the inspector may utilize other electronic means if acceptable to the permit applicant.

3. Internet Permit Applications

a. Inspectors may accept permit applications over the internet, however, to ensure uniformity throughout the Commonwealth, the internet application must be based solely on, and require no more or less information than the permit application approved by the Board.

b. No Inspector shall deny a licensee a permit to perform plumbing or gas fitting because the licensee chooses not to utilize an internet permit application.

4. Fees charged for locally issued permits shall be determined by cities and towns, said fees shall not be subject to Board review.

(h) Notification that Permit has been granted. Prior to issuing a formal permit, an Inspector may notify an applicant that a Permit has been granted, the permit applicant may treat this notification as the equivalent of receiving a Permit for purposes of commencing work. However, this notification is subject to the following requirements:

1. The notification must inform the applicant that a formal Permit is being issued;

2. The notification cannot be oral, it must be made in a reproducible medium, such as an email or writing, which must be retained by the Applicant until receipt of a formal Permit; and

3. The notification must be issued directly by the Inspector and cannot be delegated to anyone else.

(2) Plans and Specifications.

(a) Whenever plans and specifications are necessary or requested by the Inspector for any plumbing or gas fitting work, the applicant shall submit such plans to the Inspector. The Inspector may review the plans for up to 30 days prior to issuing the Permit.

(b) The plans and specifications shall include:

1. the name and address of the designer;

2. a certification by the designer that said plans and specifications are in compliance with 248 CMR; and

3. the stamp of a Massachusetts Professional Engineer.

(c) Plans and specifications shall not be required for minor repairs and alterations.

(3) Inspections

(a) To insure compliance with all the requirements of M.G.L. c. 142 and 248 CMR, the Inspector shall inspect:

1. all work where a Permit is required;

3.05: continued

2. all the Permit related plumbing and gas fitting work; and

3. all portions of existing systems that may be directly affected by the plumbing or gas fitting work outlined in the related Permit application.

(b) The Inspector may require that at least two Inspections be performed, one rough Inspection and one final Inspection.

(c) The Inspector may require that a test be performed as part of the Inspection process.

(d) Notification.

1. It shall be the duty of the Permit Holder or other non-apprentice licensee employed by the Master Plumber or gas fitter to give notice to the Inspector when plumbing or gas fitting work is ready for Inspection.

2. The non-apprentice licensee or the Permit Holder shall establish that the work will stand the prescribed test and that the roughing-in has been completed as far as practicable before giving the notification.

3. If the Inspector determines that the work will not pass the test and/or requirements of 248 CMR 3.00 through 10.00, necessary corrections shall be made and the work shall be resubmitted for Inspection. The inspector must cite the provision of 248 CMR for any findings justifying a determination that the work performed is deficient.

(e) Within two working days upon the Inspector's receipt of proper notification that the plumbing or gas fitting work is ready for Inspection, the Inspector must act upon the request for Inspection. Proper notification shall mean that the Permit Holder has had direct communication with the Inspector.

(f) Covering of Work.

1. New plumbing and gas fitting work as well as portions of existing systems that may be directly affected by new work shall not be covered until it has been tested if required by the Inspector, and the Inspector has certified that the work is in compliance with M.G.L. c. 142 and 248 CMR 3.00 through 10.00.

2. If new plumbing and gas fitting work and such portions of existing systems that may be directly affected by new work are covered before being tested and approved by the Inspector, the work shall be uncovered for Inspection after the Inspector has issued a notice to uncover the work to the Permit Holder responsible.

(g) Defective Materials and Poor Workmanship. If, at the time of Inspection, any leaks, defective or patched materials, or evidence of unskilled or inferior workmanship are found with a plumbing or gas installation, regardless of who installed the work or whether it was within the scope of the permit, the following procedures shall be followed:

1. The Inspector shall condemn the same affected part(s) or entire system.

2. The Inspector shall order the Licensee to remove or correct the defective parts, or unskilled or inferior workmanship.

3. No further progress shall be allowed on the work until the defective parts or the unskilled or inferior workmanship is made to be compliant with 248 CMR.

(4) Right of Entry. Subject to compliance with all relevant federal and state laws, the Inspector shall, after showing proper identification, have the right to enter any premises for the purpose of conducting an Inspection of a plumbing or gas fitting system at such times as may be reasonably necessary to protect the public health.

3.05: continued

(5) Material and Labor for Inspection and Tests. The equipment, materials, power, and labor necessary for the Inspection and any required tests shall be furnished by the licensed plumber or licensed gas fitter.

(6) Advisory Opinions and Appeal Procedure.

(a) State Inspector Advisory Opinion.

1. Any party who disagrees with or is aggrieved by the decision or interpretation of a Local Inspector may seek an Advisory Opinion from the State Inspector.

2. A request for an Advisory Opinion may be made by phone, by letter, or by electronic means to the State Inspector.

3. The State Inspector may respond to the request for an Advisory Opinion by requesting information from the relevant parties and then offering his or her interpretation of the pertinent portions of 248 CMR.

4. The State Inspector's interpretation is a nonbinding statement of opinion on a matter submitted for that purpose.

5. At the State Inspector's discretion, his or her Advisory Opinion may be issued in writing or orally.

6. State Inspector advisory opinions shall not be considered to be official policies or rulemaking by the Board and do not constitute advisory opinions by the Board pursuant to M.G.L. c. 30A, s. 8.

(b) Appeal before the Board. Any person who disagrees with or is aggrieved by the decision or interpretation of an Inspector may appeal to the Board for a hearing.

1. The appeal shall be in writing on a form approved by the Board.

2. The appeal shall be accompanied by a fee in the amount set by the Secretary of Administration and Finance and made payable to the Commonwealth of Massachusetts.

3. The fee shall be submitted by the appellant with the Executive Director of the Board who shall schedule the hearing and notify all interested parties.

4. The decision of the Board is final.

3.06: Grounds for Imposition of Disciplinary Sanctions

(1) Grounds for Imposition of Disciplinary Sanctions.

(a) Any violation of or failure to comply with any of the laws or regulations of the Commonwealth relating to the practice of plumbing or gas fitting, including but not limited to:

1. M.G.L. c. 142;

2. M.G.L. c. 112, §§ 61 through 65A;

3. Any violation of 248 CMR 3.00 through 11.00, which is considered unprofessional and improper conduct.

(b) A Licensee is convicted of or admits to sufficient facts or pleads nolo contendre to a crime in any jurisdiction, whether felony or misdemeanor, in the Commonwealth or outside of the Commonwealth, regardless of adjudication or sentence, that relates to the practice of plumbing or gas fitting.

3.06: continued

(c) No person shall, aid or abet any plumber or gas fitter to violate the provisions of M.G.L. c. 142, M.G.L. c. 112, §§ 61 through 65A, or 248 CMR 3.00 through 11.00.

(d) No person shall employ an unlicensed person or employ any unlicensed person in the performance of any work that requires a license by M.G.L. c. 142 or 248 CMR 3.00 through 11.00.

(2) Deceptive Advertising. The following advertising practices are considered fraudulent, false, deceptive or misleading and are prohibited:

(a) advertising that contains a misrepresentation of facts or false statements regarding the Licensee's professional achievements, degrees, trained skills, and qualifications;

(b) advertising that makes only a partial disclosure of relevant facts, such as advertising a discounted price without identifying the specific discounted product or service or without specifying the usual price for the discounted product or services;

(c) advertising that contains a representation that a continuing education or training program is approved by the Board, if the content of the program departs from the content approved by the Board or is not in fact approved;

(d) advertising that contains any representation, statement or claim that the Board determines is misleading or deceptive to the public; or

(e) any sign, listing or advertisement authorized by the Licensee which does not contain his or her designation and license number.

(3) Ethical Standards and Professional Conduct. Requirement to respond to the Board

(a) A Licensee shall respond within 10 days to a written communication from the Board or its designee and shall make available to the Board any relevant and authorized records with respect to an inquiry or complaint about the Licensee. The 10-day period commences on the date the Board sends the communication to the Licensee's last known address. This deadline may be extended by the Board or its designee with good cause.

(b) A Licensee shall cooperate with any reasonable request from the Division of Professional Licensure's agent or employee acting on behalf of the Board while investigating a complaint or allegation regarding the Licensee.

(c) A Licensee shall not provide any services beyond the scope of their Board issued license(s).

(d) Each Licensee shall fully inform persons served of the nature, possible effects, and limitations of services rendered or to be rendered.

(e) A Licensee shall not charge for services not rendered.

(f) Unless required by law, a Licensee shall not reveal to any unauthorized person any confidential information obtained from the client that the Licensee serves professionally without the client's permission.

(g) Each Licensee shall take all reasonable precautions to avoid injuring persons and property in the delivery of professional services.

(h) Each Licensee shall not discriminate on the basis of race, religion, gender, sexual orientation, age, or against any other class defined by law.

(i) Licensees shall maintain objectivity in all matters concerning the welfare of persons served professionally.

3.07: Complaint Handling Process

(1) Any person, organization, agent or employee of the Division of Professional Licensure, or member of the Board may file a complaint or provide information to the Board that alleges misconduct by a Licensee or unlicensed individual. If complainant is not anonymous, the complainant shall provide his or her name, address, and telephone number and a detailed description of the alleged act(s) that prompted the complaint. The complaint form shall be signed by the complainant or an authorized representative. The Board, at its discretion may investigate anonymous complaints.

(2) Inquiry and Investigation. After receipt and review of a written complaint, the Board may conduct any reasonable inquiry or investigation it deems necessary to determine the truth and validity of the allegation(s) set forth in such complaint. If the Board or an authorized agent of the Board determines that the complaint is lacking in merit, it may close the complaint.

(3) Request for Response and Response. If the Board or its duly authorized agent determines that a complaint has merit, the Board or its duly authorized agent may request that the Licensee or unlicensed individual who is the subject of the complaint provide a response to the complaint. A Licensee or unlicensed individual shall respond to a request for response, and such response may be made either personally or through an attorney. A response shall address the substantive allegation(s) set forth in the complaint or request for response and be provided in writing in a timely manner in accordance with 248 CMR 3.00.

(4) Investigative Conference. To facilitate disposition, the Board or its duly authorized agent may request any person to attend an investigative conference to discuss the complaint and response at any time prior to the commencement of a formal hearing conducted pursuant to M.G.L. c. 30A.

(5) Board Action Required. If a Licensee or unlicensed individual fails to respond as requested by the Board or its duly authorized agent, or at any other point in the course of investigation or inquiry into a complaint, the Board or its duly authorized agent determines that there is reason to believe that the alleged acts occurred and constitute a violation for that a Licensee or unlicensed individual may be sanctioned by the Board, the duly authorized agent or the Board may issue an order to show cause or offer to resolve the complaint by consent agreement.

248 CMR 4.00: MASSACHUSETTS FUEL GAS CODE

4.01: Purpose

248 CMR 4.00 through 8.00, collectively the Massachusetts Fuel Gas Code, governs the installation of fuel gas piping systems, fuel gas utilization equipment, and related accessories throughout the Commonwealth.

4.02: Definitions

For the purpose of 248 CMR 4.00 through 8.00 the following terms shall have the meanings indicated in 248 CMR 4.02. No attempt is made to define ordinary words that are used in accordance with their established dictionary meaning except where it is necessary to define their meaning to avoid misunderstanding. Definitions in M.G.L. c. 142 are not repeated here unless further clarity is required. These definitions shall not be interpreted to conflict with or otherwise expand or reduce the scope of the provisions of M.G.L. c. 142.

Buildings under construction. Any structure being built including tents, which utilize gas on a temporary basis.

Fuel Gas. Any gas, including hydrogen, natural gas, oxygen, and others, which, by themselves or mixed with other gases (ex. hydrogen mixed with oxygen) is combusted for power, refrigeration, heating or illuminating purposes. Hazardous industrial type gases or Category M liquids as defined in M.G.L. c. 146, §81 which are not used for power, refrigeration, heating or illuminating purposes, but are instead used for processes, biopharma or semi-conductor manufacturing, shall not be considered fuel gases.

4.02: continued

NFPA 54. The 2012 Edition of the National Fuel Gas Code published by the National Fire Protection Association.

NFPA 58. The 2011 Edition of the National Liquefied Petroleum Gas Code published by the National Fire Protection Association including Errata Number 58-11-1 issued October 29, 2010 and Errata Number 58-11-2 issued November 30, 2011.

NFPA 85. The 2011 Edition of the Boiler and Combustion Systems Hazards Code published by the National Fire Protection Association including Errata Number 85-11-1 issued April 29, 2011.

NFPA 86. The 2011 Edition of the Standard for Ovens and Furnaces published by the National Fire Protection Association including Errata Number 86-11-1 issued February 13, 2014, Tentative Interim Amendment TIA 11-1 issued August 5, 2010, Tentative Interim Amendment TIA 11-2 issued August 5, 2010, Tentative Interim Amendment TIA 11-3 issued March 1, 2011, and Tentative Interim Amendment TIA 11-4 issued March 1, 2011.

Piping system beyond a gas meter outlet or regulator. All components of a piping system beyond a specialized flow meter installed by a serving gas supplier or initial specialized device which serves to reduce the pressure of a provided fuel gas installed by a serving gas supplier; such a system shall also include all piping for the intake of fuel gases such as oxygen which are not provided by a serving gas supplier.

Power, refrigeration, heating or illuminating purposes. Shall mean use for the production of energy, cooling, heat, or light, but shall not mean the conversion of a gas to another gas, liquid, or solid form, which is then used for a manufacturing or industrial purpose which does not require combustion.

4.03: Scope of the Massachusetts Fuel Gas Code and Adoption of Relevant Codes

The Massachusetts Fuel Gas Code is comprised of the following:

(1) For most installations of gas piping systems in Massachusetts, the Board adopts NFPA 54 as modified by 248 CMR 5.00: *Amendments to NFPA 54*. The scope of this adoption shall be governed by NFPA 54 Chapter 1, Administration, subject to the following modifications:

(a) Replace NFPA 54 sub-section 1.1.1.1(A) with the following:

Jurisdiction of gases as defined in subsection 3.3.51 of NFPA 54 shall extend from the point of delivery to the provided connections with each gas utilization device as follows:

1. For natural and manufactured gas systems, the point of delivery shall be considered the outlet of the service meter assembly or the outlet of the service regulator or service shut off valve where no meter is provided.

2. For undiluted liquefied petroleum gas systems, the point of delivery shall be considered the supply source, or, if it exists, the outlet of the first regulator located at the cylinder/vessel.

3. This code shall regulate piping systems in permanent structures, buildings under construction, as well as exterior installations.

(b) Replace NFPA 54 sub-section 1.1.1.1(B) with the following:

All gas piping systems shall be low pressure, not in excess of 0.5 P.S.I.G. or 14 inch water column. Systems may exceed these requirements if designed and installed in accordance with 248 CMR 5.05(4)(B).

(c) Delete NFPA 54 sub-section 1.1.1.2 and replace with the following:

The provisions of NFPA 54 shall not apply to applications utilizing acetylene, hydrogen, ammonia, carbon monoxide, oxygen, or nitrogen; such installations shall be governed by 248 CMR 4.03(6).

(d) Delete NFPA 54 section 1.4

(2) For installations of undiluted liquefied petroleum gas not explicitly covered by NFPA 54 as modified, the Board adopts NFPA 58 as modified by 248 CMR 8.00: *Amendments to NFPA 58*. The scope of this adoption shall be governed by NFPA 58 Chapter 1, Administration, subject to the following modifications:

(a) Delete NFPA 58 sub-section 1.1 and replace it with the following:

1.1 Scope

This code applies to the installation of undiluted liquefied petroleum gas systems and appliances.

(b) Delete NFPA 58 sub-section 1.3.1 and replace it with the following:

1.3.1 Application of the Code

This code shall apply to the installation of undiluted liquefied petroleum gas systems commencing upon the point of delivery. For purposes of this code, the point of delivery shall be considered the supply source, or, if it exists, the outlet of the first regulator located at the cylinder/vessel. This code shall regulate piping systems in permanent structures, buildings under construction, as well as exterior installations.

(c) Delete NFPA 58 subsections 1.3.2(3), (4), (5), (6) and (11)

(3) For installations of fuel gas boilers with an input of 12,500,000 BTU per hour or greater or fuel gas fired steam generators, the Board adopts NFPA 85 chapters 1 to 8. The scope of this adoption shall be governed by NFPA 85 Chapter 1, Administration, subject to the following modifications:

(a) Delete NFPA 85 sub-section 1.1 and replace it with the following:

1.1 Scope

This code applies to the installation of single burner boilers, multiple burner boilers, and atmospheric fluidized bed boilers with a fuel input rating 3.7 of MWt (12.5 million BTU/hr) or greater. This code also applies to fuel gas fired steam generators used to recover heat from combustion turbines and other combustion turbine exhaust systems at any heat input rate.

4.03: continued

However, this code shall not be deemed to apply to any equipment that does not utilize a fuel gas.

(b) Delete NFPA 85 sub-sections 1.1.8, 1.1.9, and 1.1.9.1.

(4) For installations of fuel gas fired ovens, dryers, furnaces, thermal oxidizers, and other heated enclosures used for the processing of materials and related equipment, the Board adopts NFPA 86. The scope of this adoption shall be governed by NFPA 86 Chapter 1, Administration, subject to the following modifications:

(a) Modify NFPA 86 sub-section 1.1.7 by adding sub-section 1.1.7(5) as follows:

Installations of equipment that utilize oil or any other non-gas liquid fuel.

(b) Delete NFPA 86 sub-section 1.3.5, 1.3.7, and 1.3.8.

(5) All installations of fuel gas utilization equipment not governed by NFPA 85 or 86 (as amended) having inputs over 400,000 BTU per hour per combustion chamber shall be governed by 248 CMR 7.00: *Large Gas Utilization Equipment*.

(6) For all other fuel gas installations not referred to, including, but not necessarily limited to, installations of piping systems conveying acetylene, hydrogen, ammonia, carbon monoxide, oxygen, nitrogen, or any other gas used as a fuel gas, from the supply source, or, if it exists, beyond a gas meter outlet or regulator, the system must be designed by a Massachusetts registered professional engineer. The design must assure that the piping installation, including pipe sizing, dimension, and other aspects, meet the requirements for proper functioning, safety, and this code. The installer must submit drawings to the Inspector stamped by the engineer reflecting this design prior to being issued a permit.

4.04: Order of Precedence

When a conflict is identified, the following order of precedence shall be adhered to (from highest priority first):

(1) 248 CMR 4.00;
(2) NFPA 85 as modified by 248 CMR 4.00;
(3) NFPA 86 as modified by 248 CMR 4.00;
(4) 248 CMR 7.00: *Large Gas Utilization Equipment*;
(5) NFPA 54 as modified by 248 CMR 5.00: *Amendments to NFPA 54*; and
(6) NFPA 58 as modified by 248 CMR 8.00: *Amendments to NFPA 58*.

4.05: Equivalency

The provisions of this code are not intended to prevent the use of any material, method of construction, or installation procedure not specifically prescribed by this code provided any such alternative is acceptable to the Board. The Board shall require that sufficient evidence be submitted to substantiate any claims made regarding the safety of such alternatives.

248 CMR 5.00: AMENDMENTS TO NFPA 54

5.01: Modifications to Chapter 1, Administration

See 248 CMR 4.00: *Massachusetts Fuel Gas Code* for modifications to Chapter 1.

5.02: Modifications to Chapter 2, Referenced Publications

No modifications have been made to this Chapter.

5.03: Modifications to Chapter 3, Definitions

(1) Replace subsection 3.2.2 with the following:

Authority Having Jurisdiction (AHJ). Inspector as defined in 248 CMR 3.02: *Definitions*, the Board, or such other authority approved by the Board.

(2) Add to subsection 3.2.4 the following at the end of the subsection:

Listed equipment must meet product acceptance requirements in 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*.

(3) Delete subsection 3.3.85 Qualified Agency

(4) Add to subsection 3.3.102 the following after the word "seal":

including pipe dope and pipe thread sealing tape (e.g. Teflon).

(5) Add a new subsection 3.3.112 as follows:

3.3.112 Downstream.

Outlet or discharge side of equipment, a fixture, an appurtenance, or other device from which gas, liquid, or other substances exit. This term may also be utilized to describe the direction in which a gas, liquid, or other substance is flowing.

(6) Add a new subsection 3.3.113 as follows:

3.3.113 Upstream.

Inlet or supply side of equipment, a fixture, an appurtenance, or other device into which gas, liquid, or other substances flow. This term may also be utilized to describe the direction from which a gas, liquid, or other substance has originated.

5.04: Modifications to Chapter 4, General

(1) Delete section 4.1 Qualified Agency

(2) Revise subsection 4.2.1 as follows:

Replace the term "qualified agency" with "licensee"

(3) Add a new section 4.4 as follows:

4.4 Workmanship

Workmanship and installations shall:

(a) comply with all applicable code requirements;

(b) conform to generally accepted good mechanical work practice. Particular attention shall be applied to all gas piping and vent piping installations with regards to the alignment of said connections. All gas piping and vent piping arrangements shall be installed straight, level or plumb and be compliant with applicable grade or slope requirements;

(c) The performance of gas-fitting 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; and

(d) Gas equipment and appliances shall be installed in a manner so as not to prohibit the removal and replacement of other gas equipment and appliances.

5.05: Modifications to Chapter 5, Gas Piping System Design, Materials, and Components

(1) Delete sub-section 5.1.1 and replace with the following:

5.1.1 Installation of Piping Systems over five million BTU/hr

In addition to the permit requirements of 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*, for gas installations of over 5,000,000 BTU/hr the following is required:

(a) All piping systems over 5,000,000 BTU/hr shall be designed by a Massachusetts registered professional engineer. The design shall assure that the piping installation, including pipe sizing, dimension, and other aspects, meet the requirements for proper functioning, safety, and this code. The installer must submit drawings to the Inspector stamped by the engineer reflecting this design prior to being issued a permit. The installer shall also submit with the drawings a written statement from the serving gas supplier that it is able to provide fuel meeting the volume, pressure, and maximum gas demand required by the drawings as well as that required by any existing gas systems.

(b) Once the installation is complete but prior to final inspection, the installer must provide the Inspector with a written certification by a Massachusetts registered professional engineer that 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 5.00.

(2) Add a new sub-section 5.1.3 as follows:

5.1.3 Dual Fuels Installed in Buildings and Structures

When Utility/Natural Gas and Undiluted Liquefied Petroleum Gas (Propane Gas) systems are installed within the same building or structure, the following additional conditions must be satisfied as well as those conditions required for each individual fuel system:

(a) Written permission for the installation must be obtained by local fire officials and applicable utilities.

(b) The natural gas and propane gas piping systems shall be labeled in the following manner:

1. at a minimum of every ten feet;

2. at all changes of direction;

3. on each side of a penetration through a partition, wall or ceiling;

4. at every gas shut off valve;

5.05: continued

5. for natural gas (color-coded yellow) and propane gas (color coded light green), the labels shall be;

a. black lettering indicating the type of gas within the piping system;

b. 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.

(3) Add a new sub-section 5.4.2.3 as follows:

5.4.2.3 Diversity Factor for Domestic Ranges

Diversity factor is an important factor determining the correct gas piping size to be used for supplying domestic ranges in multiple family dwellings; it applies to domestic ranges only and shall not apply to any other gas appliances.

TABLE 5.4.2.3
Multi-Family Dwellings
Diversity Factor in Percent of Total Load for
Domestic Gas Ranges with connected Load Ratings
of 63,000 Btu/hr. or more per Range

No. of Ranges	Demand cubic ft/hour	Percent of Rating	No. of Ranges	Demand cubic ft/hour	Percent of Ratings
1	63	100	13	270	33
2	107	85	14	283	32
3	132	70	15	293	31
4	151	60	16	312	31
5	173	55	17	332	30
6	189	50	18	340	30
7	198	50	19	346	29
8	212	42	20	353	28
9	225	39	21	358	27
10	233	38	22	374	27
11	243	37	23	390	27
12	257	35	24 & Over	408	27

(4) Replace sub-section 5.5.1 with the following:

5.5.1 Maximum Design Operating Pressure

(a) General Rules

See 248 CMR 4.03(1)(b)

(b) Elevated Pressure

1. All elevated pressure systems shall be designed by a Massachusetts registered professional engineer. The design shall assure that the piping installation, including pipe sizing, dimension, and other aspects, meet the requirements for proper functioning, safety, and this code. The installer must submit drawings to the Inspector stamped by the engineer reflecting this design prior to being issued a permit. The installer shall also submit with the drawings a written statement from the serving gas supplier that it is able to provide fuel meeting the volume, pressure, and maximum gas demand required by the drawings as well as that required by any existing gas systems. The provisions of this paragraph shall not be in effect until July

1, 2015. Prior to July 1, 2015, elevated pressure systems shall be subject to the special permission requirements of 248 CMR 3.04(3).

2. Once the installation is complete but prior to final inspection, the installer must provide the Inspector with a written certification by a Massachusetts registered professional engineer that 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 5.00.

3. When the maximum design operating pressure exceeds five PSIG, all piping shall be welded in accordance with subsection 5.6.2.2.1.

4. Elevated pressure 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 or ceiling;

   d. At every gas shutoff valve; and

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

      (1) indicates the type of gas and the pressure contained within the piping system, and

      (2) 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; and

      (3) for elevated dual fuel applications, labels for propane systems shall be color-coded light green.

   f. Labeling shall not be required for elevated pressure piping that is between the first and second stage regulator in a liquefied petroleum gas installation.

5. Exceptions. The requirements of a professional engineer for elevated pressure installations shall not be required for:

   a. installations of propane gas piping systems utilizing elevated pressure that are located between the first and second stage regulator when the second stage regulator is located on the exterior of a building; and

   b. installations of gas piping between a meter and a regulator not installed/supplied by a gas company when the gas piping from the meter to the regulator does not exceed ten feet.

(5) Add a new sub-section 5.5.1.1 as follows:

5.5.1.1 Gas Pressure Boosters

Gas pressure boosters may be installed in that portion of the gas piping system extending from the outlet of the meter set assembly to the inlet of the equipment requiring elevated or increased pressure when the following conditions have been satisfied:

(a) All gas pressure boosters must meet Product-acceptance requirements;

(b) the serving gas supplier has provided written authorization;

5.05: continued

(c) If not part of the booster, the equipment served by the booster shall be equipped with a manual re-set low gas pressure switch and a check valve upstream of the booster. By-passes for pressure boosters shall include a manual shut off and a check valve;

(d) A pressure regulator shall be provided to maintain a constant outlet pressure and be installed immediately downstream of the booster except when the pressure booster is equipped with an integral pressure regulator;

(e) Gas pressure boosters shall be installed on a firm foundation or surface capable of supporting the imposed load, and the booster shall be kept free of vibration by the installation of vibration arrestors; and

(f) Gas pressure boosters shall be located in well ventilated spaces and be readily accessible for examination, maintenance or replacement.

(6) Add a new sub-section 5.6.2.2.1 with the following:

5.6.2.2.1 Welding of Steel and Wrought Iron Pipe

(a) Welding shall not be construed as the practice of gas-fitting, however, a licensed plumber or gas fitter may not utilize welded pipes and fittings unless they conform to the specifications cited in subsections 5.6.2.2 and A.5.5.1 (1).

(b) Gas piping systems with pressures under or equal to 70 P.S.I.G shall only be permitted to utilize welded pipes and fittings when:

1. The inspector has performed a visual inspection as to the quality of the weld; and

2. The test pressure used during an Inspection complies with the following:

a. Systems with a maximum operating pressure of ten P.S.I.G. or less, shall be tested to a minimum of three P.S.I.G. or ten times the operating pressure, whichever is greater.

b. Systems with an operating pressure greater than ten P.S.I.G. and less than or equal to 70 P.S.I.G. shall be tested at 100 P.S.I.G.

c. The test duration shall be one hour for every 100 feet of pipe, or fraction thereof. The minimum test duration shall be one hour and the maximum test duration shall be 24 hours, irrespective of system design.

(c) Gas piping systems with pressures over 70 P.S.I.G. may only utilize welded pipes and fittings when:

1. All welds are of full penetration; and

2. The welds are subjected to the following tests:

a. All welds are subjected to a 100% X-ray or 100% Ultrasonic Examination (UT) test unless they are socket welded;

b. All socket welded type joints must be subjected to a magnetic particle test or other non-destructive test;

c. The gas piping system shall be pressure tested to a minimum of 1.25 times the gas piping systems working pressure. However, the test duration must be a minimum of one hour and the test must be witnessed by the Inspector; and,

d. Any testing company or field agent that provides a (UT) field examination must meet the requirements of 248 CMR 3.04(6). A copy of the testing certification shall be submitted to the Inspector.

3. Repairs that are made to welded joints that fail the X-Ray or (UT) test shall be re-tested and re-certified. For future reference; the failed welded joint that is re-tested shall be identified by stenciling ½ inch high white lettering at the weld location the date of the re-test.

4. The Inspector shall require an affidavit signed by the individual who performed the X-ray or (UT) examination for the testing agency. The affidavit shall state that all welds meet the requirements of the applicable specifications and tests.

(7) Add a new sub-section 5.6.2.7 as follows:

5.6.2.7 Galvanized

Galvanized pipe shall not be used.

(8) Replace sub-section 5.6.3.4 with the following:

5.6.3.4 Corrugated Stainless Steel

(a) CSST Fittings. All fittings and accessories used in the installation of CSST piping systems shall be approved by the CSST manufacturer for use with their system and shall only be installed by licensees who have completed manufacturer training/certification acceptable to the Board.

(b) CSST Concealed Fittings

1. Where gas piping is to be concealed:

a. connections shall only be made with CSST fittings listed for use in concealed spaces; and

b. connections shall be produced by the manufacturer of the CSST piping system.

2. Malleable fittings shall be permitted in concealed locations when used in combination with CSST fittings.

3. For each malleable fitting there shall only be a single CSST connection.

(c) Repairs to Concealed CSST Piping

1. Repairs required in a CSST system which is concealed, or otherwise not readily accessible, shall be repaired with a fitting listed for the CSST system being used.

2. Installation of an access panel shall be required at the repair site.

(d) Interior Meter Connections

Interior meter connections may be directly connected to the CSST system as long as the meter is securely affixed to the building, and the CSST is secured to the building structure when 24 inches or more of tubing is exposed.

(e) Exterior Meter Connections

1. No CSST shall be connected to an exterior meter.

2. The tubing shall terminate at the foundation wall with a termination fitting, and the meter shall be rigidly connected with steel piping to the building structure.

(f) Sleeved Gas CSST

1. CSST shall be sleeved when passing through a metal or concrete deck to protect the integrity of the tubing. Licensees should be aware that the tubing may be required to be fire stopped/rated per 780 CMR: *Massachusetts Amendments to the International Building Code 2009*. If applicable, this requirement will be regulated/enforced by the Building Inspector, not the Inspector as defined in 248 CMR 3.01: *Definitions*.

2. The sleeve shall be Schedule 40 black or galvanized pipe and shall extend a minimum six inches from the top of the finished floor and the underside of the deck.

(g) Only manifolds for CSST systems supplied and listed by the CSST manufacturer may be concealed.

1. Assembled manifolds shall be installed in an accessible location.

2. Assembled manifold is a piping combination made up of close nipples and malleable tees.

(h) Fireplace Log Installations

1. CSST shall terminate with a termination fitting at the entrance to the masonry fire box.

2. The workmanship shall be performed and completed in such a manner so that the termination will not be exposed to any adverse effects.

(i) Fixed Appliance Connection Using CSST

CSST may be directly connected to a fixed appliance when the following conditions are met.

1. The tubing is securely attached to the building structure or other means of solid support.

2. Tubing shall not run exposed for a distance greater than or equal to 30 inches without being physically attached to the building structure or other means of solid support.

3. CSST terminates with a proper fitting and gas cock.

(j) CSST Used Underground

1. When in contact with the earth or other material that could corrode the piping, the CSST shall be installed within a sleeve designed to withstand the superimposed loads.

2. Except for pre-engineered sleeves that are Product-accepted by the Board, the sleeve shall allow free movement of the CSST.

3. All sleeve ends shall be sealed liquid tight.

4. An acceptable tape marking system shall be in place no more than six inches from the top of the grade indicating that a gas line is below.

5. The minimum depth for buried gas piping as describe herein is 18 inches from the top of grade.

(k) CSST Used as an Appliance Connection

5.05: continued

CSST shall not be used as a flexible appliance connector downstream of the appliance shutoff device.

(l) Sizing CSST Systems

CSST systems shall be sized and installed with a maximum 14 inch water column (0.5 P.S.I.G.) gas pressure.

(m) CSST Installation and Modifications

Installation of CSST in the Commonwealth of Massachusetts shall be in strict compliance with the manufacturer's instructions and the Massachusetts State Plumbing and Gas Code 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth* through 7.00: *Large Gas Utilization Equipment*.

(n) Testing Requirements for CSST Systems

1. Before any piping is covered, when CSST piping systems are installed in new construction or remodeling, the system shall be tested as part of the Inspection as prescribed under Section 7.1 as modified under 248 CMR 5.05.

2. Before piping is connected to any appliance the licensed plumber or gas fitter shall do a second test of the system.

3. A tag shall be:

   a. affixed to the meter or service manifold acknowledging this test; and

   b. signed and dated by the licensed plumber or gas fitter.

(o) Liquid Leak Detector

No corrosive liquids shall be used in the testing of the CSST system. Some household soaps and detergents may be corrosive to gas and plumbing products.

(p) Exposed CSST Tubing

When CSST is installed outdoors or is subject to corrosive chemicals, exposed stainless CSST tubing (where the jacket has been removed) shall be recovered with tape as specified by the CSST manufacturer. Said re-covering of CSST shall occur following the testing.

(q) CSST Piping Installed on Roofs: CSST shall be installed for roof top equipment only when it is supported by one of the following methods:

1. The CSST tubing with a UV stabilized jacket is supported the full length of the CSST run.

   a. The tubing shall be affixed to a wooden plank or a steel channel that is securely attached by an appropriate method every six feet to the roof structure.

   b. The tubing shall be attached directly to the support every six feet.

2. The CSST tubing is installed within a metal or plastic conduit that is securely attached by an appropriate method every six feet to the roof structure. Where the piping system requires a tee to be installed within the line, the sleeve shall terminate no more than 12 inches from the tee on both runs and the branch line.

3. For CSST tubing having sizes of 1.5 and two inches and having a UV stabilized jacket, the following requirements shall be satisfied:

5.05: continued

a. the CSST shall be supported on blocks which are spaced not more than forty eight inches apart.

b. The blocks shall be constructed of materials appropriate for outdoor conditions and shall be securely attached by an appropriate method to the roof structure, and:

c. The method used to attach the CSST to the block shall not damage the plastic coating.

d. The maximum length of tubing not supported by any method listed shall not exceed 30 inches when connected to a gas fired roof top unit or similar gas equipment.

(9) Replace subsection 5.6.8.4(1) with the following:

Pipe and Fittings in excess of four inches in diameter shall be welded.

(10) Amend subsection 5.6.8.4(2) by deleting "or cast iron"

(11) Replace subsection 5.6.8.4(5) with the following:

Cast iron is only permitted for flanges, valves, strainers, and filters.

(12) Add a new subsection 5.6.8.5 as follows:

5.6.8.5 Other Fittings

Notwithstanding the provisions of this section, metallic piping joints and fittings which do not otherwise meet the requirements of this section may be utilized if approved by the Board or otherwise have met the product acceptance requirements of 248 CMR 3.04(1): *Board Required Product-acceptance*.

(13) Add a new subsection 5.7.6 as follows:

5.7.6 Limitation

The provisions of this section shall only apply to premises owned gas meters, which are comprised of a secondary meter and meter assembly installed on the downstream portion of the gas piping system of a serving gas supplier's meter.

(14) Replace section 5.12 with the following:

5.12 Manual Shutoff Valves

Acceptable Shutoff Devices: Gas Cocks and Ball Valves installed for use shall be listed. The Valves shall:

(a) Have clearly indicated open and closed positions and rigidly secured stops to limit both extremes of rotation;

(b) shall be marked in a conspicuous place with the manufacturer's name or registered trademark; and

(c) Where in contact with material or atmosphere exerting a corrosive action, a corrosion resistant handle shall be utilized.

5.06: Modifications to Chapter 6, Pipe Sizing

No modifications have been made to this Chapter

5.07: Modifications to Chapter 7, Gas Piping Installation

(1) Replace section 7.1.6 with the following:

7.1.6 Piping Underground Beneath Buildings

When the installation of gas piping underground beneath buildings is unavoidable, the piping shall be encased in a vented conduit that is listed, certified by the manufacturer, or designed by a professional engineer to be capable of withstanding the imposed load and influences of the underground environment.

(a) Conduit Ventilation

1. Conduit vents shall be sized no less than fifty percent of the conduit.

2. Conduit vents shall terminate at the exterior of the building or structure, be a minimum of four feet above finished grade, and shall be installed so as to prevent the entrance of water and insects.

(b) Undiluted Liquefied Petroleum Gas

Undiluted Liquefied Petroleum Gas shall not be conveyed in piping and through this type of conduit due to the characteristics and behavior properties of this gas.

(2) Add the following to the end of sub-section 7.2.5.4

Supports added for piping on rooftops must be installed in such a manner that they do not compromise the integrity of the roof. However, should the performance of gas-fitting work impact the structural integrity of roofing components, necessary corrective work falls outside the scope of this code. See 780 CMR: *Massachusetts Amendments to the International Building Code 2009* or 271 CMR: *Board of Examiners of Sheet Metal Workers*, if applicable, for licensing and other requirements for said work.

(3) Add a new sub-section 7.3.4.1 as follows:

7.3.4.1 CSST Tubing in Partitions

CSST installed vertically and horizontally in concealed wall spaces or partitions shall be protected in accordance with Table 7.3.4.1 below:

Table 7.3.4.1
Protection of CSST Tubing Installed in Concealed Wall Spaces and partitions

Tubing Orientation and Location	**Insulation Type**	**Tubing Size less than one inch**	**Tubing Size equal to or greater than one inch**
Vertical Wall	None	1. Single runs only. 2. Tubing not secured to structure. 3. CSST manufacturer specified strike plates at points of penetration. 4. CSST Strike plates on both sides of wall.	Same as CSST less than one inch with CSST manufacturer specified shielding device along entire length in concealed space.
Vertical Wall	Non-Rigid	1. Single runs only. 2. Tubing not secured to structure. 3. Tubing installed between insulation and wall board. 4. CSST manufacturer specified strike plates at points of penetration	
Vertical Wall	Rigid	Schedule 40 pipe or CSST manufacturer specified shielding device along entire length and at points of penetration.	
Horizontal Wall	N/A	CSST manufacturer specified shielding device along length between studs and strike plates at points of penetration on both sides of wall.	Same as CSST less than one inch with CSST manufacturer specified shielding device along entire length in concealed space.

5.07: continued

(4) Replace sub-section 7.9.2.4 with the following:

7.9.2.4 Emergency and Other Shutoff Valves for Laboratories

Each laboratory room or space containing a gas outlet installed on tables, benches, or in hoods in educational, research, commercial, and industrial occupancies shall have an emergency shutoff valve through which all gas outlets are supplied. The emergency shutoff valve must be in a readily accessible space adjacent to the laboratory's egress door and identified as such. Additional non-emergency shutoff valves shall be provided in an accessible location for each individual table, bench, or hood equipped with gas outlets.

(5) Delete sub-section 7.13.2 and replace with the following:

7.13.2 CSST

CSST systems shall be bonded in accordance with subsection 7.13.1 unless such bonding would be in conflict with manufacturer installation instructions. However, to the extent the manufacturer's installation instructions require additional bonding which falls within the scope of electrical licensure, this code shall not govern such requirements. In such instances, the installation may not be approved by a plumbing or gas inspector unless there is proof that an electrical permit has been obtained to perform such bonding.

5.08: Modifications to Chapter 8, Inspections, Testing and Purging

(1) Delete sub-section 8.1.1* and replace with the following:

8.1.1* General

(a) Inspection of a new or rough gas piping system: Inspections shall conform to the requirements of 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth* in addition to the following:

1. Unless an emergency exists, gas shall not be turned on and gas piping systems shall not be placed into service until the following conditions have been satisfied:

   a. The gas piping system shall be tested in the presence of the Inspector and approved to insure that it meets the requirements of 248 CMR; and

   b. Where any part of the gas piping system is to be enclosed or concealed, the testing shall be conducted prior to the covering of any portion of the gas piping system.

2. Gas piping systems that extend from the outlet of the service meter assembly to the closed shutoff valve at each appliance shall satisfy the following:

   a. withstand a pressure test of not less than six inches of mercury or three PSIG for a period of not less than ten minutes without showing any drop in pressure;

   b. the pressure shall be measured with a mercury manometer, slope gauge or an equivalent device so calibrated as to read in increments of not less more than 0.1 PSIG; and

   c. Where new branches are installed to an existing gas piping system, the newly installed branch(s) shall be required to be tested in compliance with this section so long as the newly installed branch(s) can be isolated from

existing branch(s). Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or leak detecting methods as authorized by this code.

3. Gas piping systems in excess of one million BTU input shall be tested at a pressure not less than ten times the proposed maximum working pressure of the gas system and:

   a. the test duration shall be not less than one hour per 100 linear feet of piping or a fraction thereof: and:

   b. The maximum test duration shall not exceed a 24 hour time period irrespective of the piping system design, and:

   c. The maximum test pressure shall not exceed 100 PSIG.

4. For undiluted liquefied petroleum gas systems, all piping located upstream of the second stage regulator shall:

   a. be tested to a pressure not less than one and one half times the maximum operating pressure of said piping system; and

   b. the pressure shall be measured with a device so calibrated as to read in increments of not greater than one tenth PSIG.

(b) Inspection of the Final Gas Piping System

1. After the test of the rough gas piping system, the gas piping system may be turned on and the appliance may be tested at normal operating pressure by means of:

   a. a non-corrosive leak detection fluid; or

   b. a properly calibrated electronic leak detector.

2. Following the successful testing and approval of a gas piping system, the inspector shall attach a permanent tag in a conspicuous place. The tag shall indicate that the gas piping system has been tested and approved.

(c) Minor repairs and additions are not required to be pressure tested, provided that the work is inspected and connections are tested with a non-corrosive leak detection fluid, a properly calibrated electronic leak detector or other method acceptable to the inspector.

(2) Delete sub-section 8.1.4

(3) Delete sub-section 8.1.5.2

(4) Delete sub-section 8.1.5.3 and replace with the following:

8.1.5.3 Defective or Damaged Piping

Whenever there is reason to believe the gas piping system of a building or structure is defective or damaged, it shall be subject to a test and inspection, and any defects or life safety hazards found shall be corrected as required and documented in writing to the inspector.

(5) Delete sub-section 8.2.1

(6) Delete sub-section 8.2.3* and replace with the following:

8.2.3* Leak Check

5.08: continued

Immediately after the gas is turned on to a new or old gas piping system that has been tested, inspected and approved, the connected appliances shall:

(a) be checked for leakage and proper operation, and:

(b) where leakage or defective appliances or equipment are encountered, the gas supply to the appliance or equipment shall be shut off until the necessary repairs have been made.

5.09: Modifications to Chapter 9, Appliance, Equipment, and Accessory Installation

(1) Delete sub-section 9.1.1* and replace it with the following:

9.1.1* Appliances, Equipment, and Accessories to be Approved

Board Required Product Acceptance. Only products and materials that meet the product acceptance requirements of 248 CMR 3.04(1): *Board required Product-acceptance* may be utilized in gas fitting work in Massachusetts unless the Board has waived the necessity for product acceptance per 248 CMR 3.04(1)(h).

(2) Delete sub-section 9.1.1.1

(3) Delete sub-section 9.1.1.3 and replace with the following:

9.1.1.3 Unlisted appliances, equipment, and accessories

Acceptance of unlisted gas appliances, equipment, and accessories shall require a variance by the Board.

(4) Delete sub-section 9.1.1.4

(5) Add a new sub-section 9.1.19.1 as follows:

9.1.19.1 Vent Lines

(a) Vent lines shall be steel, wrought iron pipe, or corrugated stainless steel tubing (CSST). Vents shall be:

1. sized as specified in this section; and

2. run to the outside of the building or structure using the shortest practical route and shall not be trapped or installed in a manner that restricts air flow.

(b) Vent Lines shall be supported in accordance with subsection 7.2.5.

(c) Vent lines that terminate outside a building or structure shall be located no less than:

1. four feet away from any building opening or air intake; and

2. ten feet away from forced air intakes

(d) Vent lines that penetrate roofs and sidewalls shall be run through metallic sleeves that are sealed from the weather and insects, and:

1. extend no less than 18 inches above a roof surface when penetrating the roof or:

2. terminate through the sidewall to a safe location

(e) CSST vent lines shall not penetrate roofs or sidewalls and shall transition to steel, wrought iron pipe no less than one foot inside the building or structure.

5.09: continued

(f) Appliance pressure regulators shall not be connected to a common manifold.

TABLE 9.1.19.1
Minimum Schedule 40 Pipe Size/CSST for
Venting of Gas Components

Gas Components	Maximum lengths of iron pipe or corrugated stainless steel tubing (CSST) from components to outside the building		
	0 - 40 feet	0 - 100 feet	0 - 200 Feet
Main Gas Pressure Regulator - Steel Pipe Size - CSST Size (Low Pressure Gas only)	¾ inch IPS 30/31 EHD	1 inch IPS 37 EHD	1¼ inch IPS 46/48 EHD
High & Low Gas Pressure Switches When Manifolded - Steel Pipe Size - CSST Size (Low Pressure Gas only)	¾ inch IPS 30/31 EHD	1 inch IPS 37 EHD	1½ inch IPS 60/62 EHD
Block and Bleed Valves (when used) - Steel Pipe Size - CSST Size (Low Pressure Gas only)	Full IPS Relief	Increase IPS/CSST one Size	Increase IPS/CSST two Sizes

(6) Delete sub-section 9.1.22 and replace with the following:

9.1.22 Installation Instructions

(a) The licensee shall conform to the equipment manufacturer's specific requirements in completing an installation unless those requirements conflict with or are less stringent then this code.

(b) The licensee shall also leave the manufacturer's installation, operating, and maintenance instructions in a location at the premises where they will be readily available for reference and guidance.

(c) When required by the Inspector, a copy of the manufacturer's installation, operating, and maintenance instructions shall be provided within two working days prior to calling for a final Inspection.

(7) Delete sub-section 9.1.23 and replace with the following:

9.1.23 Carbon Monoxide Protection

No installation or replacement of a vented gas appliance shall be permitted unless a battery powered or electrically hard wired carbon monoxide detector is present on the same floor as the appliance or on the next adjacent floor when the appliance is located in a crawl space unless the appliance is located in a detached, uninhabitable garage. For all residential dwellings, a carbon monoxide detector must also be present on each habitable level of the dwelling. These requirements shall not be deemed to waive any additional requirements imposed by M.G.L. c. 148 §26F1/2.

(8) Amend sub-section 9.2.1 by inserting the following at the end of the subsection:

Sufficient clearance must also be provided to allow the total replacement of the appliance or equipment.

(9) Add a new sub-section 9.6.1.4 as follows:

9.6.1.4 General Requirements for connectors.

5.09: continued

(a) The maximum length of a connector shall not exceed 48 inches; however, this restriction shall not apply to connectors utilized for a gas appliance subject to the provisions of sub-section 9.6.1(4) or sub-section 9.6.1.1.

(b) A connector shall not be used for gas pressure in excess of 0.5 PSIG (14" water column).

(c) A connector shall not be re-used except when used for disconnecting and reconnecting the original gas equipment or appliance for servicing.

(10) Add a new sub-section 9.6.3.5 as follows:

9.6.3.5 Flexible gas hoses used to connect portable and mobile industrial appliances shall not exceed a length of 20 feet.

(11) Amend sub-section 9.6.8 by inserting the following at the end of the subsection:

Such piping shall also be installed in a manner not to interfere with the total replacement of the appliance or equipment.

5.10: Modifications to Chapter 10, Installation of Specific Equipment

(1) Delete sub-section 10.1.2 and replace with the following:

10.1.2 Installation in a bedroom or bathroom;

Gas utilization equipment shall not be installed so its combustion, ventilation, or dilution air is obtained from a bedroom or bathroom:

EXCEPTION: Type 1 clothes dryers may be installed in bathrooms when the air for combustion and ventilation is introduced to the space in accordance with the following:

(a) A single air intake shall be installed and the minimum size of the single air intake shall be equal to the size of the exhaust vent area of the dryer, and:

(b) The air for combustion shall not be obtained from a bedroom or bathroom, and;

(c) The air for combustion shall be obtained from a space that is sized in compliance with Section 9.3, and:

(d) The dryer is installed in compliance with Section 10.4.

(2) Delete sub-section 10.2.5

(3) Delete sub-section 10.3.2.7

(4) Delete sub-section 10.3.2.8

(5) Delete sub-section 10.3.2.9

(6) Delete sub-section 10.3.5 and replace with the following:

10.3.5 Safety Control

Each steam and hot water boiler shall be equipped with a control which will prevent firing of the boiler in the event of insufficient water in the boiler.

(7) Delete sub-section 10.3.7.1

(8) Delete sub-section 10.3.7.2

(9) Delete sub-section 10.3.7.3

(10) Delete sub-section 10.3.8

(11) Delete sub-section 10.3.9

(12) Delete sub-section 10.6.1 and replace with the following:

10.6.1 Prohibited Installations

(a) Decorative appliances that are designed for installation in vented fireplaces when installed in bedrooms or bathrooms shall be Direct Vent Appliances as defined in sub-section 3.3.6.3.

(b) When decorative appliances are installed in vented fireplaces other than bedrooms and bathrooms, the flue damper shall be removed or welded in a fully open position.

(13) Delete sub-section 10.7.1 and replace with the following:

10.7.1 Prohibited Installations

Vented gas fireplaces installed in bedrooms or bathrooms shall be Direct Vent Appliances as defined in sub-section 3.3.6.3.

(14) Add a new sub-section 10.8.2.3 as follows:

Direct Gas-Fired Industrial Air Heaters may not be utilized unless the manufacturer has specified that there is no more than 50 P.P.M. of Carbon Monoxide in the total volume of air discharged from the unit.

(15) Add a new sub-section 10.9.2.3 as follows:

Direct Gas-Fired Industrial Air Heaters may not be utilized unless the manufacturer has specified that there is no more than 50 P.P.M. of Carbon Monoxide in the total volume of air discharged from the unit.

(16) Delete sub-section 10.12.2 and replace it with the following:

10.12.2 Prohibited Appliances

The following equipment shall be prohibited:

(a) gas range ovens, broilers, or top burners for space heating purposes;

(b) gas ranges with match-lit ovens;

(c) any commercial cooking range without a listed oven safety pilot; and

(d) appliances not in compliance with the statutory requirements of M.G.L. c. 148, §25E.

(17) Add a new sub-section 10.12.9 as follows:

10.12.9 Gas Valves installed for fire protection/suppression systems

(a) All gas valves shall be mechanical type with manual reset and shall be installed in close proximity to the cooking equipment and shall shut off the gas supply to the equipment served by the hood and duct system protected by the extinguisher/suppression system.

(b) A permanent notice shall be posted at the reset device and gas meter or propane regulator cautioning the operator to shut off the gas to all appliances before resetting the device.

(c) Actuation of the gas valve shall be made in the presence of the Inspector at the time of the gas piping tests.

(18) Delete sub-section 10.13.3

(19) Delete sub-section 10.13.4

(20) Delete sub-section 10.14.2

(21) Delete sub-section 10.15.1.1(4)

(22) Delete sub-section 10.16.2

(23) Delete sub-section 10.18.2(2)

(24) Delete sub-section 10.19.2

(25) Delete sub-section 10.20.2

(26) Delete sub-section 10.21.2(3)

(27) Delete sub-section 10.21.3.1

(28) Delete sub-section 10.21.4

(29) Delete sub-section 10.23.1* and replace with the following:

10.23.1* Prohibited Installations

(a) Room heaters shall not be installed in bathrooms, bedrooms, or other sleeping quarters unless permitted by M.G.L. c. 148, §25A and 527 CMR 30.04: *Installation*.

(b) Exception: Notwithstanding sub-section 10.23.1*(a), room heaters may be utilized which are direct vented as defined in sub-section 3.3.6.3.

(30) Replace sub-section 10.23.2 with the following:

10.23.2 Unvented Room Heaters

(a) Unvented room heaters shall be installed in accordance with M.G.L. c. 148, §25A and 527 CMR 30.00: *Unvented Propane or Natural Gas-fired Space Heaters*.

(b) With regards to the installation of unvented room heaters, in the event of a conflict between 248 CMR 5.00 and M.G.L. c. 148, §25A and 527 CMR 30.00: *Unvented Propane or Natural Gas-fired Space Heaters*, the provisions of M.G.L. c. 148, §25A and 527 CMR 30.00: *Unvented Propane or Natural Gas-fired Space Heaters* shall prevail.

(c) In addition to complying with the permit requirements of 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*, a permit shall be obtained from the head of the fire department.

(d) A final inspection by the Inspector shall not be performed until proof is provided that the head of the fire department having jurisdiction has granted a permit.

(e) Installations shall be of a permanent type, with a permanently piped fuel supply. LPG appliances shall be subject to the storage requirements in accordance with 527 CMR 6.00: *Liquefied Petroleum Gas Containers and Systems*.

(f) Unvented room heaters shall not exceed a maximum of 40,000 BTU input per room or space.

(g) At least one listed carbon monoxide detector, that is installed in accordance with the manufacturer's instructions, shall be installed and maintained in the same room where the heater is located, or otherwise in the location specified by the manufacturer's instructions.

(h) Unvented room heaters may not be the primary source of heat for any room or building.

(31) Delete sub-section 10.23.3

(32) Delete sub-section 10.23.4 and replace with the following:

10.23.4 Clearance

A room heater shall be placed so as not to cause a hazard to walls, floors, curtains, furniture, doors when open, and so on, and to the free movements of persons within the room. Heaters designed and marked "For use in noncombustible fireplace only" shall not be installed elsewhere. Only listed room heaters shall be installed and must be installed in accordance with the manufacturer's installation instructions. In no case shall the clearances be such as to interfere with combustion air and accessibility.

(33) Add a new-subsection 10.24.2 as follows:

10.24.2 Stationary Gas Engines used for life/safety

When a dedicated gas fuel line is installed for a stationary gas engine used for life/safety purposes, it shall be installed immediately downstream of the meter assembly or shut off valve (if no meter is provided) and shall meet the following requirements:

(a) The fuel line for the stationary gas engine and the fuel line for the remaining appliances shall have shut off valves installed immediately downstream of the meter assembly to enable each line to operate independently;

(b) When pressure regulators are installed, they shall enable each fuel line to operate independently and not adversely affect the gas pressure of the other fuel line, and:

(c) The fuel line for the stationary gas engine shall be labeled at each shutoff valve with the following:

<u>WARNING: Gas used for life/safety, avoid shutting off gas unless necessary</u>

(34) Delete sub-section 10.26.2.1(2)

(35) Delete sub-section 10.26.2.2(3)

(36) Delete sub-section 10.28.2.2

(37) Delete sub-section 10.28.3

(38) Delete sub-section 10.28.4

(39) Delete sub-section 10.28.5

(40) Delete sub-section 10.32.2 and replace with the following:

5.10: continued

Listed outdoor open flame decorative appliances do not require any product acceptance under 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*.

(41) Add a new section 10.33 as follows:

10.33 Gas-Fired Kilns

Gas Fired Kilns must meet product acceptance requirements in 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*.

5.11: Modifications to Chapter 11, Procedures to Be Followed to Place Appliance in Operation

No modifications have been made to this Chapter

5.12: Modifications to Chapter 12, Venting of Appliances

(1) Delete sub-section 12.4.4.2 and replace with the following:

12.4.4.2 Venting via a damper or with a power means of exhaust

Where gas appliances or equipment are vented through a ventilating or exhaust system equipped with a damper or with a power means of exhaust, provisions shall be made to allow the flow of gas to the main burners only when the damper is open to a position to properly vent the appliance or equipment when the power means of exhaust is in operation. All gas lines serving such appliances or equipment shall be equipped with a solenoid valve which meets the following criteria:

(a) The solenoid valve may not be bypassed.

(b) The solenoid valve must be equipped with or connected to a manual reset device controlled by one of the following options:

1. at least one audible hard wired carbon monoxide detector listed for the environment in which the appliance or equipment is being installed. This carbon monoxide detector must be interlocked with the solenoid valve such that it will close the solenoid valve if an unsafe level of carbon monoxide is reached in the room or the detector becomes defective.

2. a draft proving switch which allows the solenoid valve to be open only when:

i. the equipped damper is 100 percent open; or,

ii. the power means of exhaust is fully operational.

(c) Notwithstanding the provisions of subsection 1.3 (Retroactivity), installers of replacement appliances or equipment used in connection with ventilating hoods or exhaust systems must ensure that the gas line(s) serving the replaced appliances or equipment meet the requirements of subsection 12.4.4.2.

(2) Delete sub-section 12.5.2 and replace with the following:

Plastic Piping. Plastic piping may only be used for venting appliances when explicitly allowed by the appliance manufacturer's installation instructions.

5.12: continued

(3) Replace sub-section 12.6.4.2, *Exception* with the following:

Exception: *Chimneys which are tile lined or existing chimneys which do not meet the requirements of sub-section 12.6.4.2 may be utilized with the replacement or*

installation of a gas appliance, including a gas appliance replacing an oil appliance, when the following requirements are met:

(a) *The existing appliance must have operated with a non-positive vent static pressure that did not create condensation in the chimney;*

(b) *Existing chimneys may not be utilized when replacing an atmospheric appliance with a fan assisted appliance; and*

(c) *An existing chimney may only be utilized with one or multiple gas appliances if the interior area of the chimney is no greater than seven times the area of the smallest flue to be connected to that chimney.*

(4) Add a new sub-section 12.7.6.1 as follows:

12.7.6.1 Marking of schedule 40 PVC and other non-metallic piping

Schedule 40 PVC and other non-metallic piping used for ventilation, make-up, or combustion air intake shall be labeled as follows:

(a) Throughout the entire developed length:

1. Labels must be placed every ten feet for exposed/visible piping; or

2. Labels must be placed every three feet for concealed piping.

(b) At all changes of direction;

(c) On each side of a penetration through a partition, wall or ceiling; and

(d) The labels shall be black lettering that:

1. indicates that the piping is used for ventilation, make-up, or combustion air intake, and

2. 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.

(5) Delete the last sentence of sub-section 12.9.4.

(6) Add a new subsection 12.9.7 as follows:

12.9.7 Signage

Whenever any through-the-wall vent is installed less than seven feet above the finished grade, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight feet above grade directly in line with the exhaust vent terminal. The sign shall read, in print size no less than 0.5 inches in size, **"GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".**

(7) Add a new sub-section 12.9.8 as follows:

12.9.8 Vent termination or intake

A side wall horizontal exhaust vent termination or intake for gas fueled equipment installed in every dwelling, building or structure shall be located no less than three feet from a gas meter. When manufacturer's installation instructions reference snow lines or levels in establishing a minimum height for the installation of an exhaust vent termination or intake, snow lines or levels shall be determined as follows:

(a) from the manufacturer installation requirements when those requirements are specific as to the source and method for the calculation of snow lines/levels;

(b) when the installation instructions are not specific as to how snow lines/levels are calculated, the city or town may, by ordinance, designate how snow lines/levels are calculated in that location; or

(c) In the absence of specific manufacturer instructions or ordinances, snow lines/levels shall be calculated from the average monthly maximum depth of snow accumulation as indicated by the National Weather Service's 10 year statistics for the installation location/geographical area.

(8) Delete section 12.10.

(9) Delete sub-section 12.11.6 and replace with the following:

12.11.6 Joints

Joints between sections of connector piping and connections to flue collars or draft hood outlets shall be fastened in accordance with one of the following methods:

(a) The fastening of single wall metal piping shall utilize no less than three corrosion resistant fastening devices to secure each joint;

(b) Vent connectors of listed vent material assembled and connected to flue collars or draft hood outlets in accordance with the manufacturers' instructions; or

(c) Other approved means.

248 CMR 7:00: LARGE GAS UTILIZATION EQUIPMENT

7.01: Definitions

Air Shutter. An adjustable device for varying the size of the air inlet or inlets regulating primary or secondary air.

Boiler. See NFPA 85, subsection 3.3.20

Breeching. (See Chimney Connector.)

Burner. A device for the final conveyance of the gas, or a mixture of gas and air to the combustion zone.

(a) Injection (Bunsen) Type Burner. A burner employing the energy of a jet of gas to inject air for combustion into the burner and mix it with the gas.

(b) Atmospheric Injection Type Burner. A burner in which the air at atmospheric pressure is injected into the burner by a jet of gas.

(c) Luminous or Yellow Flame Burner. A burner in which secondary air only is depended on for combustion of the gas.

(d) Power Burner. A burner in which either gas or air or both are supplied at pressures exceeding, for gas, the line pressure and, for air, atmospheric pressure; this added pressure being applied at the burner. A burner for which air for combustion is supplied by a fan ahead of the appliance is commonly designated as a forced draft burner.

(e) Premixing Burner. A power burner in which all or nearly all of the air for combustion is mixed with the gas as primary air.

(f) Induced Draft Burner. A burner which depends on the draft induced by a fan beyond the appliance for its proper operation.

(g) Pressure Burner. A burner which is supplied with an air-gas mixture under pressure (typically from 0.5 to 14.0 inches of water and occasionally higher).

Burner Head That portion of a burner beyond the outlet end of the mixer tube which contains the ports.

Burner, Automatically Lighted. One where fuel to the main burner is normally turned on and ignited automatically.

Burner, Manually Lighted. One where fuel to the main burner is turned on only by hand and ignited under supervision.

Chimney. A vertical shaft enclosing one or more flues for conveying flue gases to the outside atmosphere.

(a) Factory-built Chimney. A listed chimney.

(b) Masonry Chimney. A chimney of solid masonry units, bricks, stones, listed masonry chimney units or reinforced concrete, lined with suitable flue liners.

(c) Metal Chimney. A field-constructed chimney of metal.

Chimney Connector. The pipe which connects a fuel-burning appliance to a chimney.

Combustion. The rapid oxidation of fuel gases accompanied by the production of heat or heat and light.

Combustion Control. A control which automatically regulates the firing rate at predetermined air-fuel ratios in accordance with load demand.

(a) High-low Firing. The action of a combustion control which positions the air and fuel supply for low-fire and for high-fire in accordance with load demand.

(b) Modulating. The action of a combustion control which gradually varies the air and fuel supplies within limits in accordance with load demand.

Combustion (Input) Control Valve. An automatic gas-control valve for regulating equipment input.

Combustion Products. Constituents resulting from the combustion of a fuel gas with the oxygen of the air, including the inert, but excluding excess air.

Condensate. The liquid which separates from a gas (including flue gases) due to a reduction in temperature.

Controls. Devices designed to regulate gas, air, water or electrical supply to equipment. These may be manual, semi-manual, semi-automatic or automatic.

Control, Limit. An automatic control responsive to changes in liquid level; in fuel, steam or air pressure; in air, gas or liquid flow; or in temperature; for limiting the operation of the controlled equipment.

Control, Primary Safety. A control responsive directly to flame properties; sensing the presence of flame and causing fuel to be shut off in the event of ignition or flame failure requiring manual reset.

Control, Safety. Automatic controls and interlocks (including relays, switches, and other auxiliary equipment used in conjunction therewith to form a safety control system which are intended to prevent unsafe operation of the controlled equipment).

Damper. A valve or plate for controlling draft or flow of the flue gases. A damper is generally considered as being located on the downstream side or the combustion chamber usually in a flue passage of the appliance or in the chimney or vent connector.

Damper, Automatically Operated. A damper operated by an automatic control.

Damper, Manually Operated. An adjustable damper manually set and locked in the desired position.

Draft Regulator, Barometric. A device which functions to maintain a desired draft in the appliance by automatically reducing the chimney draft to the desired value.

Equipment. Any gas utilization equipment having inputs of more then 400,000 BTU's per hour per combustion chamber. This includes, but is not limited to, steam boilers, hot water boilers, water heaters, generators, and other similar gas utilization equipment.

Flame Safeguard. (*See* Control, Primary Safety.)

Flue Gases. Products of combustion and excess air.

Interlock. A device to prove the physical state of a required condition, and to furnish that proof to the primary safety control circuit.

Labeled. Equipment or materials to which has been attached a label of a nationally recognized testing laboratory that maintains periodic inspection of production of labeled equipment or materials and by whose labeling is indicated compliance with nationally recognized standards or has been tested and found safe for use in a specified manner.

Listed. Equipment or materials included in a list published by a nationally recognized testing laboratory that maintains periodic inspections of production of listed equipment or materials and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found safe for use in a specified manner.

Low-fire Start, Proven. The firing of a burner with fuel and combustion air controls interlocked in a low-fire position to provide safe operating conditions during light off.

Lubricated Plug-type Valve. A valve of the plug-and-barrel type designed for maintaining a lubricant between the bearing surfaces.

Main Burner Flame-establishing Period. The length of time the main burner flue safety shutoff valves are permitted to be open before the flame sensing device is required to supervise the main burner flame.

Optimum Air-fuel Ratio. A ratio of air to fuel going to the furnace which will provide complete combustion of the fuel with sufficient range of excess air to maintain a stable flame envelope.

Pilot. A flame which is utilized to ignite the gas at the main burner or burners.

Pilot, Continuous. A pilot that burns without turndown throughout the entire time the burner is in service, whether the main burner is firing or not.

Pilot, Expanding. A continuously burning pilot that is automatically expanded so as to reliably ignite the main burner. This pilot may be turned down at the end of the main burner flame-establishing period.

Pilot Flame-establishing Period. The length of time fuel is permitted to be delivered to a proved pilot before the flame sensing device is required to detect pilot flame.

7.01: continued

Pilot, Intermittent. A pilot which is automatically lighted each time there is a call for heat. It burns during the entire period that the main burner is firing.

Pilot Interrupted. A pilot which is automatically lighted each time there is a call for heat. The pilot fuel is cut off automatically at the end of the main burner flame-establishing period.

Pilot, Proved. A pilot flame supervised by a primary safety control.

Purge. To free a gas conduit of air or gas, or a mixture of air or gas.

Regulator, Gas Pressure. An automatic gas pressure reducing device for the purpose of maintaining a uniform gas supply pressure.

Safety Shutdown. The action of shutting off all fuel and ignition energy to the appliance by means of a safety control or controls such that restart cannot be accomplished without manual reset.

Safety Shutoff Valve. A gas-control valve that is automatically closed by the safety control system or by an emergency device. The valve may be of the automatically or manually opened type.

Throttling. (*See* "Modulating" under Combustion Control.)

Trial-for-ignition Period. (*See* Main Burner Flame-establishing Period.)

Zero Governor. A regulating device which is normally adjusted to deliver gas at atmospheric pressure within its flow rating.

7.02: General Provisions

(1) Before arranging for the selection or installation of large gas equipment, the licensed plumber or gas fitter shall check with the serving gas supplier as to the availability of gas, specifying the gas input rating and the gas pressure required at the entrance to gas train. (*See* Figure 3 in 248 CMR 7.03).

(2) Combustion Air Supply and Ventilation.

(a) General.

1. Positive means for supplying an ample amount of outside air to permit combustion of the gas shall be provided. Automatic or manually adjustable control devices for outside air intake shall be interlocked with the burner.

2. To determine air requirements at the equipment, under standard atmospheric conditions (60□F and 30 inches mercury), the following minimum factors apply:

a. For equipment with draft hoods - 30 cubic feet per 1000 Btu input;

b. or equipment directly connected to a chimney without neutralizing air openings - 12 cubic feet per 1000 Btu input.

3. When equipment is located in an inside room or space, air supply shall be provided through ducts or openings leading to the outside air.

4. Openings to the outside shall be unobstructed and screens, if used, shall have a minimum of ½ inch mesh.

5. When a room or space in which equipment is installed is ventilated by mechanical means, air sufficient to replace that exhausted and consumed by combustion shall be supplied from a safe, uncontaminated source. The means for ventilation shall not create an unsafe pressure condition in the boiler room.

6. In addition to the combustion air required, sufficient air shall be supplied to the room to make the room safe for occupancy and proper operation of equipment.

(b) Equipment Equipped with Draft Hoods.

1. The effective cross-sectional area of the permanent outside air opening(s) to the room where equipment is located shall be large enough to supply the air required in that room.

2. For supplying combustion air, the area of the opening shall be of a size at least equal to the equipment breeching but not less than one square inch of free area per 5,000 Btu per hour input (approximately equal to 1.4 square feet per million Btu), except as noted in 248 CMR 7.02(2)(e).

(c) Equipment utilizing Barometric Dampers.

1. The effective cross-sectional area of the permanent outside air opening(s) to the room where the equipment is located shall be large enough to supply the air required in that room.

2. For supplying air, the area of the opening shall be of a size at least equal to the equipment breeching but not less than one square inch of free area per 14,000 Btu per hour input (approximately equal to 0.5 square foot per million Btu), except as noted in 248 CMR 7.02(2)(e).

(d) Equipment Directly Connected to Chimney without Neutralizing Air Openings.

1. The effective cross-sectional area of the permanent outside air opening(s) to the room where the equipment is located shall be large enough to supply the air required in that room.

2. For supplying air, the area of the opening shall be of a size at least equal to the equipment breeching but not less than one square inch of free area per 17,500 Btu per hour input (approximately equal to 0.4 square foot per million Btu), except as noted in 248 CMR 7.02(2)(e).

(e) Exceptions.

1. Ducts to a Room where equipment is located: In determining the cross-sectional area of duct(s) used to convey air from the outdoors to the boiler room, the resistance to air flow imposed by the duct(s) shall be considered.

2. Forced Air Supply to a Room where equipment is located: If mechanical means for room air supply are used, the size of the duct or opening may be reduced to not less than that needed to provide the required quantity of air.

(3) Accessibility for Cleaning and Inspection. Sufficient and reasonable accessibility shall be offered for Inspection, cleaning, repair and replacement of all burners, combustion controls, safety devices and boiler components.

(4) Venting of Flue Gases.

(a) Chimneys.

1. All equipment shall be securely connected to a chimney in good condition and of proper construction and ample size to carry away the flue gases and permit satisfactory burner operation under all weather and operating conditions.

2. The chimney shall be designed and built to sufficiently remove the maximum volume of flue gases which may be produced by the equipment connected to it, as well as any

other combustion equipment, under the least conditions of draft which can be encountered. The design should also provide proper construction to resist wind forces, weathering, interior corrosion and flue gas temperatures.

3. The chimney shall be pre-inspected and, if necessary, tested to determine whether it is in suitable condition to handle the flue gases to be dispersed. Any defects shall be corrected.

4. An existing chimney shall be checked as to cross-sectional area, arrangement, and height to determine if it will sufficiently remove the volume of flue gases produced by the equipment, under the least condition of draft that may be encountered. This shall include consideration of pressure and temperature conditions at which the flue gases enter the chimney and the effect of flue gases which may be fed into the chimney from other combustion equipment.

(b) Chimney Connectors.

1. Connectors from equipment to a chimney shall be of noncombustible material capable of withstanding the corrosion effects and temperatures of the flue gases to be handled. They shall have sufficient strength to withstand the physical stresses likely to occur under the conditions of use and shall be securely supported.

2. The connector shall be installed so as to avoid excessive turns or other construction features which create unnecessary resistance to flow of flue gases.

3. The joint between the connector and the chimney shall be sealed to prevent gas leakage or air infiltration.

4. A connector shall not extend into a chimney beyond the inner wall of the chimney flue.

5. The connector shall be sized as recommended by the equipment or burner manufacturer. If the manufacturer's recommendations are not available, the connector shall be the size of the flue collar, or if a draft hood is used, shall be the size of the outlet of the draft hood unless the connector is designed and installed in accordance with industry recognized and approved engineering methods.

6. On multiple installations, separate connectors should be run to the chimney. When this is not practical, each connector shall be y-connected to a common breeching, the cross-sectional area of which shall be not less than the combined areas of the individual connectors.

(c) Draft Control.

1. Equipment requiring controlled chimney draft shall be capable of automatically regulating the draft as recommended by the equipment manufacturer. Such controls may be of the barometric type which regulates the draft in the breeching or the mechanically operated damper type which controls the pressure in the equipment firebox or the draft hood type which is nonadjustable.

2. A double-acting barometric draft regulator, if used, shall be equipped with a device with a manual reset which will automatically shut off the fuel to the burner in the event flue gas spillage exceeds 60 seconds.

3. Mechanically operated dampers shall be designed to maintain a safe damper opening at all times and be arranged to prevent firing of the burner unless the damper is in the proper position.

7.02: continued

4. Draft Control:

a. When a draft control device is used, it shall be installed without alteration in accordance with the manufacturer's instructions.

b. In no case shall a barometric draft control device be installed in a false ceiling, in a different room or in any place or manner that will permit a difference in pressure between a draft relief opening and the combustion air supply.

c. A draft control device shall be installed in the position for which it was designed with reference to the horizontal and vertical planes and shall be located so that a relief opening is not obstructed.

d. When induced or forced draft devices are used, provision shall be made to prevent flow of gas to the burners upon failure of these devices.

5. Adjustable manual dampers should be removed except when a damper must be used to control excess chimney draft. Positive means shall then be provided to lock the damper in the proper position by welding or riveting. As an alternate, a portion of the damper can be removed to prevent full closure.

6. Full closing outlet isolation dampers shall be interlocked so that the boiler firing system cannot be operated unless its isolation damper is in the proper open position.

7. Adjustable (modulating) dampers, shall be arranged to maintain a safe fuel-air ratio over the full operating range. Linkage shall be arranged to resist accidental damage and disengagement. Any counter-balancing arms or weights attached to the damper shall be located or shielded as to prevent personal injury or damage to equipment in case of breakage.

8. When a draft hood is used, it shall be installed without alteration in accordance with the manufacturer's instructions. In no case shall a draft hood be installed in a false ceiling, in a different room, or in a manner that will permit a difference in pressure between the draft hood relief opening and the combustion air supply.

7.03: Installation of Burners and Controls

(1) Main Burners.

(a) Each burner assembly and its component parts shall be installed according to the manufacturer's instructions and shall be properly and firmly secured in place to maintain correct alignment in normal use.

(b) The burner assembly shall be installed so that sufficient accessibility is afforded for cleaning, inspection, repair, and replacement of all burners, controls and safety devices.

(c) Burner assembly parts, when adjustable, shall be provided with suitable locking devices to prevent accidental shifting.

(d) Provision shall be made to permit ready observation of each pilot and main burner flame during adjustment and under operating conditions.

(e) A burner assembly, when adjusted according to the manufacturer's instruction, shall maintain satisfactory operating characteristics as specified in 248 CMR 7.04(5) at all firing rates called for by input and air-gas ratio controls applied to the installation.

7.03: continued

(2) Control Application.

(a) Each control shall be supported in such a manner that it and its sensing element will remain in proper position. It shall be possible to determine by observation or test that each control is in its proper location and capable of functioning as intended.

(b) Nothing shall be provided for the purpose of permitting any safety control to be rendered ineffective or allowing firing of the burner assembly without the protection of all of the specified safety controls except as permitted by 248 CMR 7.03(2)(c).

(c) A low-water cutoff may be bypassed for blow-down purposes only. Such a bypass shall be of a type which must be manually held in the bypass portion and which is self-restoring when released.

(d) A burner assembly not equipped to provide safe automatic restarting shall be arranged to require manual restart after any control functions to cause the fuel supply to be shut off and the following restoration of an interrupted power supply.

(e) The safety-control circuit shall be two-wire, one side grounded, having a nominal voltage of 150 volts or less. The circuit shall be connected to a branch circuit that can be protected against over current at not more than the value appropriate for the rating of the electrical components included in the circuit.

(f) A safety control or protective device switch shall interrupt the ungrounded conductor(s).

(g) Safety controls shall not depend on electricity to attain the off position.

(3) Control of Combustion Air.

(a) An air shutter shall be capable of being readily adjusted to any desired setting and securely locked to prevent accidental change in setting.

(b) The air inlet(s) shall supply an adequate amount of air for combustion under the specified draft conditions and at the maximum firing rate of the burner assembly as installed. All air required for combustion shall be introduced in a manner so as to provide thorough mixing of the gas and air. If a burner is intended for installation with an air or wind box(es), it shall be supplied by the burner manufacturer or be built in accordance with the burner manufacturer's instructions.

(c) Linkage for controlling air and gas input rates shall be designed to reliably maintain the correct gas-air ratio and to resist accidental damage and disengagement.

(d) Equipment having forced or induced draft fans or both, shall be provided with means to automatically continue safe combustion or to shut off the gas supply upon failure of the equipment supplying the air.

(e) If air under pressure is mixed with the gas supply in a mixer, effective means shall be provided to prevent air from passing back into the gas line or gas into the air supply. The gas and air supply shall be controlled to prevent gas from entering burners until the air supply is available and, in the event of air failure, to shut off the gas supply.

(4) Primary Safety Control (Flame Safeguard).

(a) Unless a flame safeguard control is provided by the manufacturer, each burner assembly shall be provided with a non-recycling primary safety control that will de-energize the main gas safety shutoff valve(s) upon loss of flame at point of supervision.

(b) Safety control timings shall not exceed the values given in 248 CMR 7.03: *Table 1*.

(c) Gas to pilots shall be automatically shut off if the pilot is not proved, and safety shutdown established.

(d) Pilot supervision by the primary safety control shall be only at the point where the pilot flame will effectively ignite the gas at the main burner or burner group with the pilot burning at any flame that will actuate the safety control.

(e) Supervision of the main burner flame only shall begin at the end of the main burner flame-establishing period for:

1. Power burners having a firing rate per combustion chamber of 2,500,000 Btu per hour and over.

TABLE 1

Maximum Safety Control Timings

Maximum Firing Rate Per Combustion Chamber in Million Btu Per Hour

	2.5 or less	Over 2.5 to 12.5	Over 12.5
Pilot Flame Establishing Period	15 Seconds	10 Seconds	10 Seconds
Main Burner Flame Establishing Period (If Required)	15 Seconds *	10 Seconds	10 Seconds *
Flame Failure Response Time	4 seconds	4 Seconds	4 Seconds
Valve Closing Time	5 Seconds	1 Second	1 Second

* Main burner flame-establishing period may be 30 seconds for burner other than power burners equipped with a safety shutoff valve having a full opening time of not less than 25 seconds.

2. All types of burners with modulating or high-low firing rate per combustion chamber of 2,500,000 Btu per hour and over.

3. All types of burners with an interrupted pilot(s), and

4. Atmospheric type burners having a firing rate per combustion chamber of 5,000,000 Btu per hour and over. If the main burner flame is not proved, safety shutdown shall be established.

(f) A burner assembly shall be equipped so that no gas can flow to the main burner on burner group operating as a unit unless the pilot is proved.

(g) If two or more burner assemblies are installed in a single piece of equipment, the primary safety control of each burner assembly shall operate independently of the other, or equivalent safety features shall be provided so that in no case can any one burner operate unsafely.

(5) Limit Controls.

(a) Limit Control:

1. A limit control shall be provided to prevent excessive steam pressure in a steam boiler or excessive pressure or temperature in a hot water boiler.

2. Each steam and hot water boiler shall be equipped with a control which will prevent firing of the boiler in the event of insufficient water in the boiler.

3. The limit control shall be in addition to operating controls. Manual restart shall be required after a pressure or temperature limit control functions.

(b) A limit control which functions by opening a switch shall directly open the electrical circuit to the safety shutoff valve(s).

(6) Combustion (Input) Control Systems.

(a) The combustion (input) control system shall maintain predetermined air-fuel mixtures within the limits required by the burner for stable combustion throughout the entire operating range of the burner and during changes in the firing rate.

(b) To accomplish changes in the firing rate, the fuel and air supplies shall be maintained at a pre-determined optimum air-fuel ratio, either manually or automatically.

(c) Burners having a firing rate per combustion chamber of 1,000,000 Btu per hour and over shall be equipped with a proven low-fire start.

(d) Burners having a firing rate per combustion chamber of 2,500,000 Btu per hour and over shall be provided with combustion control.

(7) Pilots.

(a) Main burners shall be equipped with a supervised pilot adequate to provide safe main burner ignition under all conditions of operation. Multiple burner heads operated as a single burner unit shall use a sufficient number of supervised pilots to accomplish safe ignition.

(b) A pilot burner not automatically lighted shall be located so that it can be safely lighted manually.

(c) Gas supply pressure to the pilot or group of pilots:

1. The gas supply pressure to the pilot or group of pilots shall be regulated.

2. The regulator(s) shall be listed; and vented in accordance with 248 CMR 7.03(11)(c), unless constructed or equipped to limit the escape of gas from the vent opening in the event of diaphragm failure to not more that 2.5 cubic feet per hour.

3. The pilot supply line shall be connected upstream of all main burner valves and the main gas pressure regulator.

(d) Primary air openings and orifices shall be easily accessible for servicing.

(e) An electric ignition system shall ignite only a pilot.

(f) If means for ignition is cut off at the termination of either the main burner flame-establishing period, the ignition shall remain off for the duration of that firing cycle and for the specified purge period.

(g) A pilot burner, electric igniter, and pilot flame sensing device shall be supported in such a manner that their position relative to each other and to the main burner port(s) will remain fixed.

(8) Gas Valve Pressure Ratings.

(a) Gas valves shall be capable of withstanding without damage a pressure of not less than 10% above the relieving pressure of the nearest upstream relief device.

(b) In case no relief device is provided, the gas valves shall be capable of withstanding without damage a pressure of not less than the maximum inlet pressure of the nearest upstream gas pressure regulator or the maximum setting of the over-pressure protection device.

(9) Manually Operated Gas Shutoff Valves. (*See* 248 CMR 7.03 Figures 1 and 2.)

(a) A manually operated main burner shutoff valve shall be installed in the line supplying all main burners of each piece of equipment and upstream of all other main burner control valves.

(b) A manually operated main pilot shutoff valve shall be located in the gas supply line to the pilot burner.

(c) Manually operated main shutoff and pilot shutoff valves in sizes larger than two inches or for pressures greater than ½ psig shall be of the lubricated plug or ball type with stops. Manually operated valves shall have the handle securely attached parallel to the gas flow in the open position, shall be readily accessible, and shall clearly indicate the "on" and "off" positions.

(d) A manually operated main burner test valve (checking gas cock) shall be provided downstream from the safety shutoff valve for each main burner. On manually lighted burners, the valves shall be interlocked with the safety control circuit and arranged so that the main burner safety shutoff valves must be opened against their associated closed test valves.

(e) In multiple burner installations a manual valve shall be provided for each main and each pilot burner except those utilizing a single zero governor inspirator mixer for several burners in which case this valve shall be located at a point immediately upstream of the zero governor.

(f) Provisions shall be made so that the gas supply to equipment may be shut off from a location outside the room where said equipment is located.

FIGURE 1

Illustration of Manual Valving Arrangement for a Multiple Burner, Single Boiler Arrangement

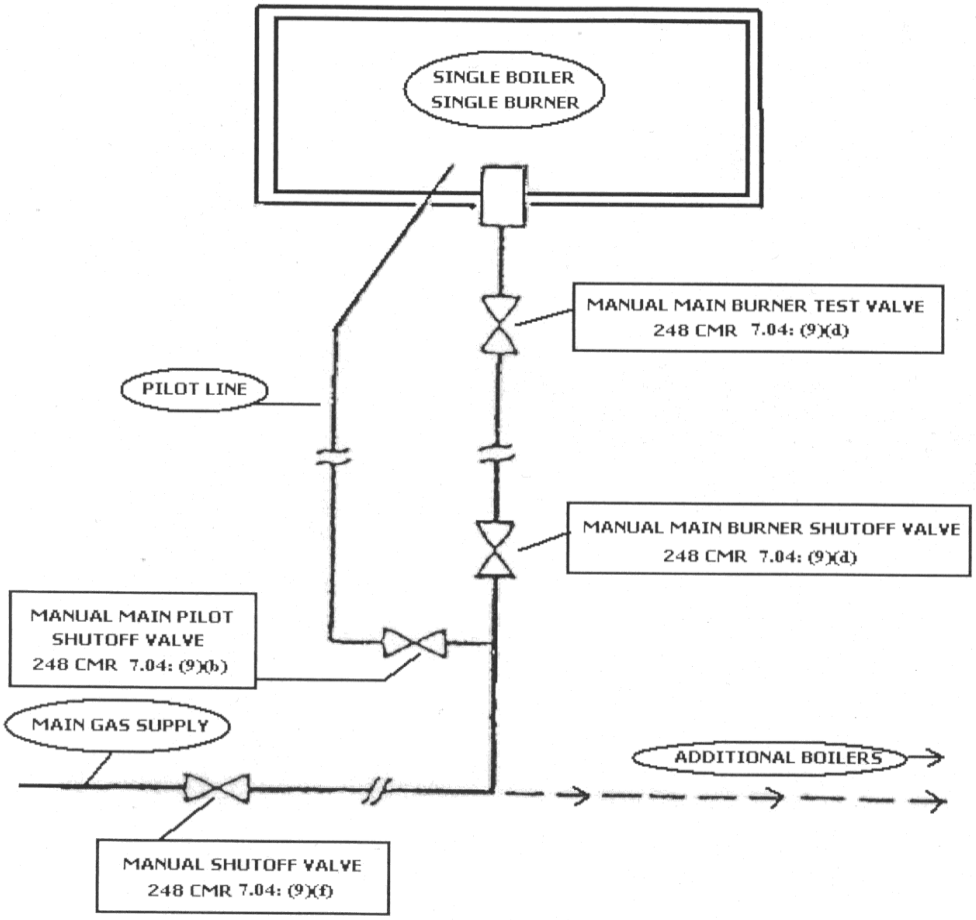
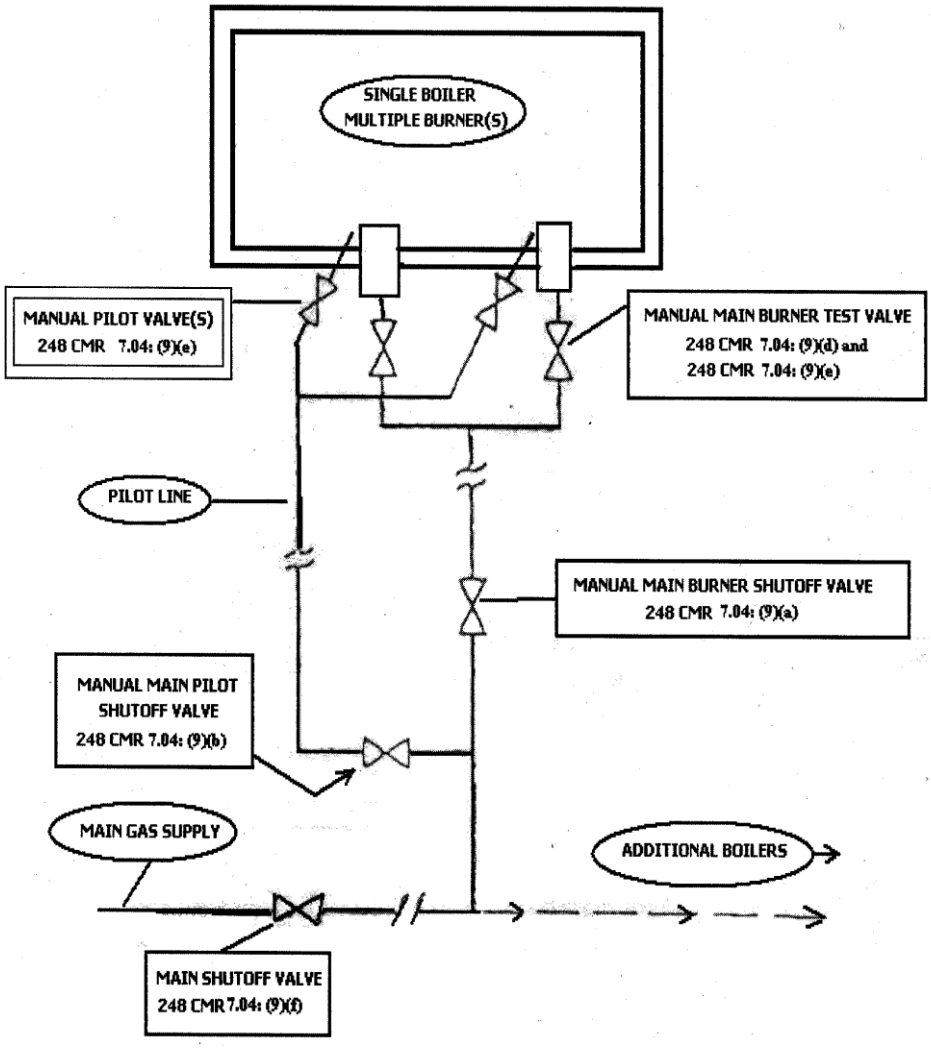


FIGURE 2
Illustration of Manual Valving Arrangement for a Multiple Burner, Single Boiler Arrangement



(10) Control and Safety Shutoff Valves. (*See* 248 CMR 7.03 Figure 3.)

(a) An automatic input control valve may be in combination with a safety shutoff valve.

(b) A bypass to provide for minimum flame may be installed around a valve to control input only. A bypass shall not be installed around a safety shutoff valve or a combustion input control and safety shutoff valve.

(c) Safety Valves:

1. Each main burner supply line and each pilot supply line shall be equipped with a safety shutoff valve(s) which will close independent of external force.

2. The safety shutoff valve(s) shall close with sufficient force to provide tight shutoff under normal operating conditions and when closed by the safety control system or by an emergency device.

3. If the maximum firing rate per combustion chamber exceeds 1,000,000 BTU/hour, the main burner supply line shall be equipped as indicated in 248 CMR 7.03(10)(c)3.a. and b.:

a. Two safety shutoff valves, in series, or one safety shutoff valve of the type incorporating a valve seal over-travel interlock, when the maximum firing rate per combustion chamber exceeds 1,000,000 BTU/hour but less than 5,000,000 BTU/hour.

b. Two safety shutoff valves, in series, one of which is of the type incorporating a valve seal over-travel interlock when the maximum firing rate per combustion chamber exceeds 5,000,000 BTU/hour. The Board may prescribe two safety shutoff valves in series, for combustion chambers with inputs less than 1,000,000 BTU/hour, in buildings of public assembly.

(d) Safety shutoff valves shall be suitable for the application and shall have a shutoff time not to exceed that specified in 248 CMR 7.03 Table 1. They shall be constructed so that they cannot be restrained or blocked in the open position. Such valves shall close upon being de-energized regardless of the positions of damper-operating levers or reset handles.

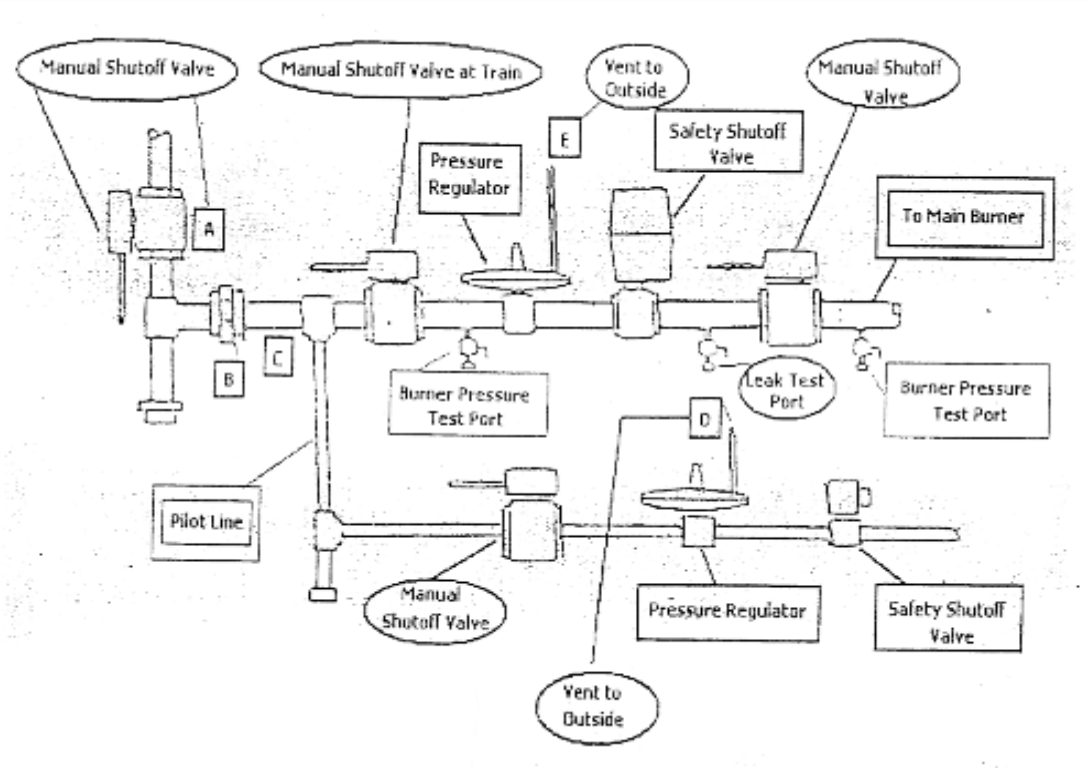
(e) An electrically operated safety shutoff valve shall not depend on electricity to shut off the gas supply.

(f) A pressure-operated safety shutoff valve shall close upon failure of its operating pressure.

(g) Permanent and ready means for making easy, accurate, periodic tightness tests of the main burner gas safety shutoff valves shall be provided in the piping.

FIGURE 3A

Illustration of Gas Train 248 CMR 3.00 through 7.00 requirements 400,000 to Less Than 1,000,000 BTU/hour Input



A = Shutoff Valve Within Six Feet of Entrance to Gas Train

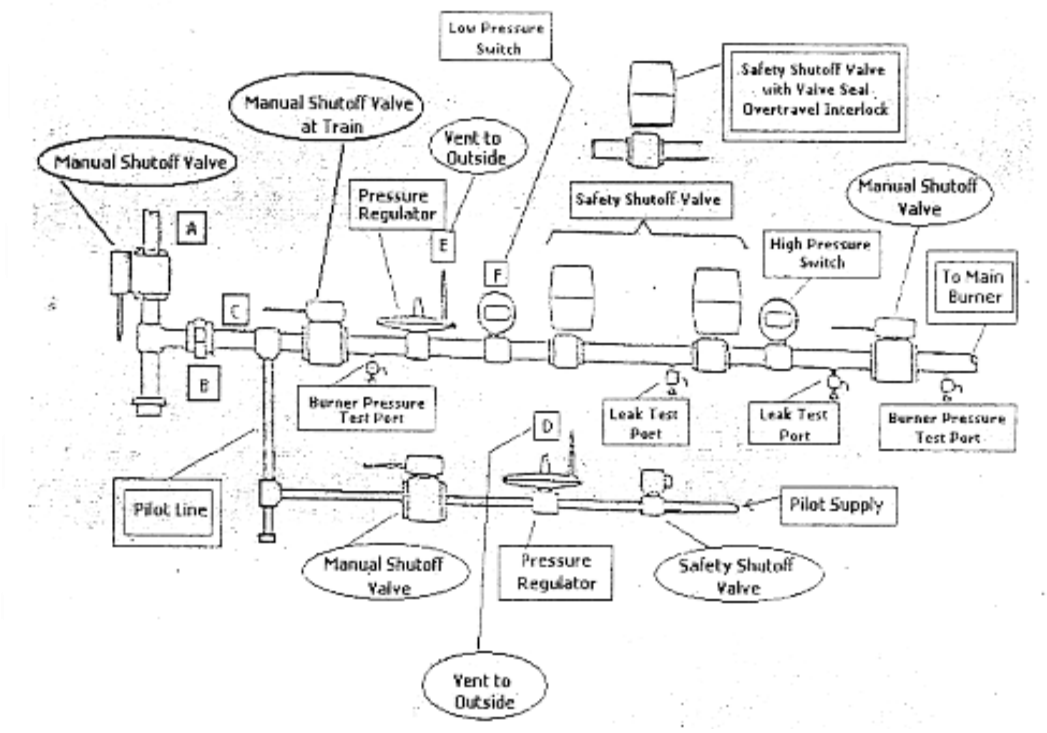
B = Union

C = Start of Gas Train

D = Pilot Line to Outside Unless Equipped with Limiting Device of 2.5 cu. Ft/hr

E = Vent to Outside Per Table 2

FIGURE 3B
Illustration of Gas Train 248 CMR 3.00 through 7.00 1,000,000 to less than 2,500,000 BTU/hour Input



A = Shutoff Valve Within Six Feet of Entrance to Gas Train

B = Union

C = Start of Gas Train

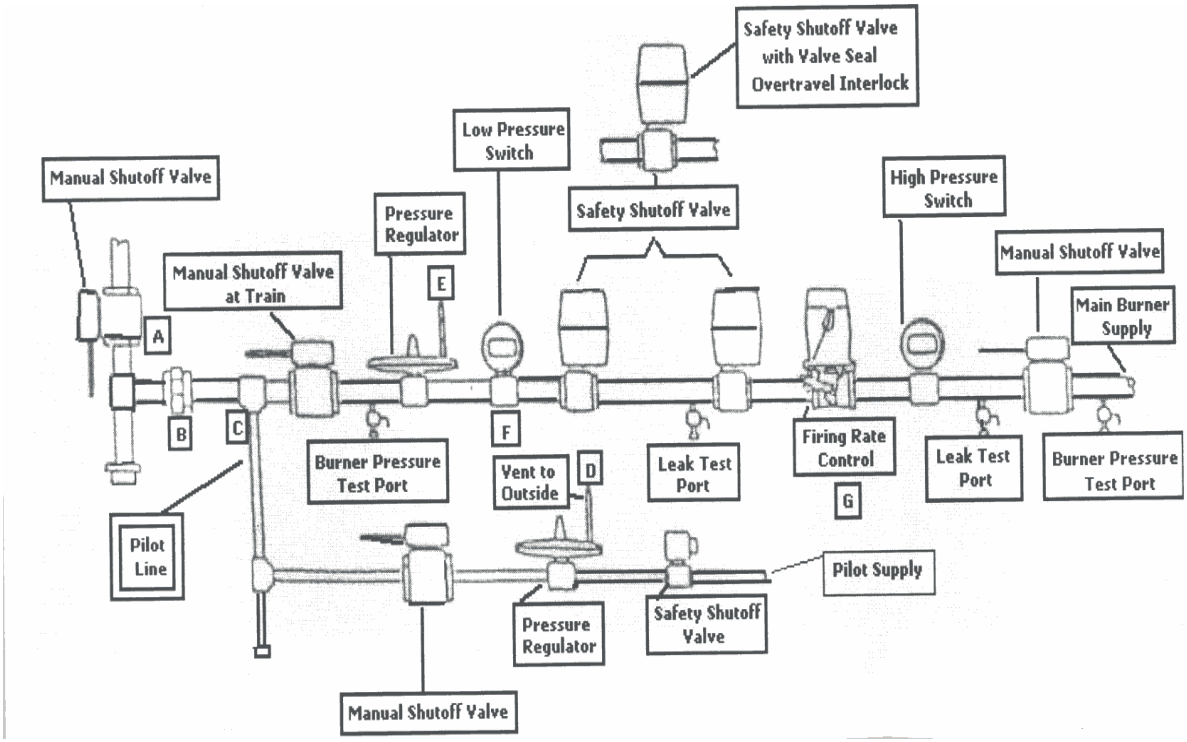
D = Inlet Vent to Outside Unless Equipped with Vent Limiting Device of 2.5 cu. ft/hr

E = Vent to Outside Per Table 2

F = Combination High and Low Pressure Switch Allowed at Low Pressure Switch Location

FIGURE 3C

Illustration of Gas Train 248 CMR 3.00 through 7.00 requirements for 2,500,000 to less than 5,000,000 BTU/hour Input



A = Shutoff Valve Within Six Feet of Entrance to Gas Train

B = Union

C = Start of Gas Train

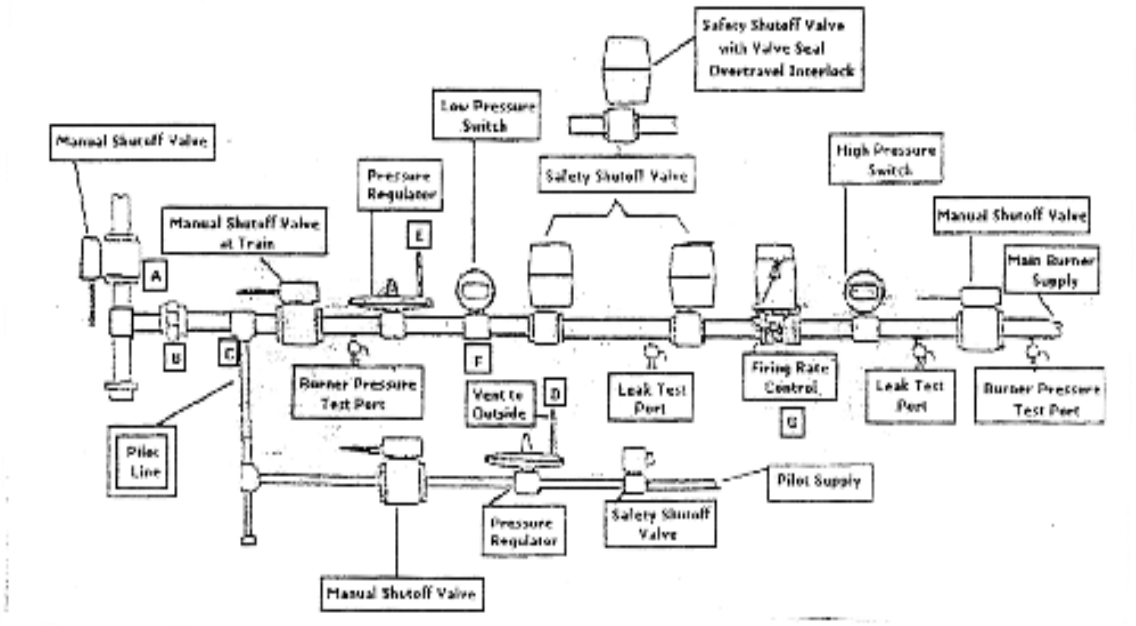
D = Pilot Vent to Outside Unless Equipped with Limiting Device of 2.5 cu. ft./hr

E = Vent to Outside per Table 2

F = Combination High and Low Pressure Pressure Switch Allowed at Low Pressure Switch Location

FIGURE 3D

Illustration of Gas Train 248 CMR 3.00 through 7.00 requirements for 5,000,000 to less than 12,500,000 BTU/hour Input



A = Shutoff Valve Within Six Feet of Entrance To Gas Train

B = Union

C = Start of Gas Train

D = Pilot Vent to Outside Unless Equipped with Limiting Device of 2.5 cu. ft./hr

E = Vent to Outside per Table 2

F = Combination High and Low Pressure Switch Allowed at Low Pressure Switch Location

G = May be Part of SSOV

(11) Main Gas Pressure Regulations and Gas Pressure Interlocks.

(a) Each burner assembly shall be equipped with a listed main gas pressure regulator that will regulate within plus or minus 10% of the operating pressure at all firing rates. *(See* 248 CMR 7.03 Figure 3 for Location).

(b) Spring or weight-loaded regulators shall have springs covered by a suitable housing. Under no circumstances shall a weight and lever type or regulator be used.

(c) Main Gas Pressure Regulators

1. Except where zero governors are used in connection with air-gas mixers, all main gas pressure shall be independently vented to a safe outdoor location.

2. Vent lines from main gas pressure regulators shall not be connected into a common line with the bleed line from gas operated diaphragm valves or from pressure relief valves.

3. Vent lines shall be steel, wrought iron pipe or corrugated stainless steel tubing (CSST) with Product-approved devices provided at termination points to prevent stoppage of the lines by foreign material, water or insects and, shall extend no less than 18inches above the roof surface.

4. Vent lines shall be sized as specified in 248 CMR 7.03 Table 2.

5. Vent lines shall be supported in accordance with 248 CMR 1.00 through 10.00.

6. Vent lines shall be run to the outside using the shortest practical route and shall not be trapped or installed in a manner that restricts air-flow.

7. Vent lines that penetrate roofs and sidewalls shall be run through metallic sleeves that are sealed from the weather and insects.

8. CSST vent lines that penetrate roofs shall transition to steel pipe no less than one foot inside the building.

9. Vent lines that terminate outside a building shall be located no less than four-feet away from any building opening or air intake and ten feet away from forced air intakes. Outside vent termination shall consist of steel pipe and malleable fittings.

(d) Pressure Switches.

1. If the maximum firing rate per combustion chamber is 1,000,000 BTU/hour or over, gas pressure supervision shall be provided by listed pressure switches, or listed combination high-low switch, interlocked to accomplish a non-recycling safety shutdown in the event of either high or low gas pressure.

2. Pressure setting shall be adjusted by the installer in accordance with the burner or equipment manufacturer's instructions.

3. Pressure switches that require venting to the outside atmosphere shall be vented in accordance with 248 CMR 7.03(11)(c). Pressure switches only may be manifolded.

(e) Accessible IPS plugged pressure tappings or connections shall be provided; one located upstream of the main gas pressure regulator and another located near the burner head to permit accurate measurement of gas pressure. (*See* 248 CMR 7.03 Figure 3.)

TABLE 2
Minimum Pipe Size/CSST for Venting
Gas Train Components in 248 CMR 7.04 Figures 3a, 3b, 3c, and 3d.

Gas Train Components	Maximum lengths of iron pipe or corrugated stainless steel tubing (CSST) from components to outside the building		
	0 - 40 feet	0 - 100 feet	0 - 200 Feet
Main Gas Pressure Regulator - Steel Pipe Size - CSST Size (Low Pressure Gas only)	¾ inch IPS 30/31 EHD	1 inch IPS 37 EHD	1¼ inch IPS 46/48 EHD
High & Low Gas Pressure Switches When Manifolded - Steel Pipe Size - CSST Size (Low Pressure Gas only	¾ inch IPS 30/31 EHD	1 inch IPS 37 EHD	1½ inch IPS 60/62 EHD
Block and Bleed Valves (when used) - Steel Pipe Size - CSST Size (Low Pressure Gas only	Full IPS Relief	Increase IPS/CSST one Size	Increase IPS/CSST two Sizes

(12) Operating Sequencing. (*See* also 248 CMR 7.04, Initial Start-Up and Final Adjustments). Each installation shall be equipped to provide for sequencing in accordance with the following and in the order listed.

7.03: continued

(a) Natural and mechanical draft systems with continuously burning pilot(s) capable of igniting any gas flowing from the main burner shall, upon demand for heat:

1. Prove all interlocks.

2. Prove combustion air flow for mechanical draft systems.

3. Prove in light-off position, if either an automatically operated damper, or an automatically operated air shutter, or both, are employed.

4. Prove combustion (input) control, if employed, in light-off position.

5. Prove pilot(s).

6. Admit fuel to main burner.

7. Prove main flame, if required, in accordance with 248 CMR 7.03(4)(e).

8. Release combustion (input) control.

9. Upon flame failure at point of supervision, shut off fuel by primary safety control.

10. Shut off fuel to main burner on release from demand.

(b) Natural draft systems with intermittent pilot or interrupted pilot shall, upon demand for heat:

1. Prove all interlocks.

2. Prove open for at least 90 seconds if either an automatically operated damper, an automatically operated air shutter, or both, are employed.

3. Prove in the light-off position if either an automatically operated damper, and automatically operated air shutter, or both are employed.

4. Prove combustion (input) control, if employed, in light-off position.

5. Prove pilot(s).

6. Admit fuel to main burner.

7. Prove main flame, if required, in accordance with 248 CMR 7.03(4)(e).

8. Release combustion (input) control.

9. Upon flame failure at point of supervision, shut off fuel by primary safety control.

10. Shut off fuel on release from demand.

11. If an automatically operated damper is employed, return to stand-by position.

(c) Mechanical draft systems with intermittent pilot or interrupted pilot shall, on demand:

1. Prove all interlocks.

2. If an automatically operated damper is employed, prove in open position.

3. Start fan(s) and prove air flow. Provide at least a four-air change purge of the combustion chamber and equipment passes. The four air changes must be accomplished in not more than 90 seconds with burners having maximum firing rate per combustion chamber of not more than 2,500,000 Btu per hour. With burners

having maximum firing rates per combustion chamber in excess of 2,500,000 Btu per hour, the four air changes shall be accomplished without time limitation by an air flow rate not less than 60% of the air flow provided for the maximum firing rate.

4. Prove combustion (input) control and automatically operated damper, if employed, in light-off position.

5. Prove pilot(s).

6. Admit fuel to main burner.

7. Prove main flame, if required, in accordance with 248 CMR 7.03(4)(e).

8. Release combustion (input) control.

9. Upon flame failure at point of supervision, shut off fuel by primary safety control.

10. Shut off fuel on release from demand.

11. If an automatically operated damper is employed, return to stand-by position.

7.04: Initial Start-up and Final Adjustments

(1) For gas equipment with an input of one million BTU's or more per combustion chamber, an authorized representative of the equipment or burner manufacturer shall perform the initial start-up, final adjusting and testing of the burner and controls in the presence of the gas inspector. Additionally, the serving gas supplier must be notified at least 48 hours in advance of the initial startup to be given the opportunity to attend the startup.

(2) Purging of gas equipment. The furnace, passes, and connected flue piping shall be thoroughly purged before lighting of pilots or burners. This shall be done by creating air flow through the setting by fully opening flue dampers and air shutters and by operation of induced and forced draft fans, if present.

(3) Control Operating Tests.

(a) All controls shall be thoroughly checked for proper operation and sequencing before the burner is put into operation. Manufacturer's instructions shall be followed.

(b) All safety shutoff gas valves shall be tested for gas tightness while in the closed position before being placed in service. During this test, gas shall be shut off to all burners downstream from the safety shutoff gas valve.

(4) Pilot Operation Tests.

(a) After the gas piping has been thoroughly cleared of air and any foreign materials, the pilot burner shall be lighted and adjusted with the main burner manual and automatic valves in the closed position. Adjustment to the pilot shall be made in accordance with manufacturer's instructions.

(b) Pilots shall not deposit carbon when adjusted according to the manufacturer's instructions.

(c) When escapement or bleed pilots are used, the discharge shall be in a fixed position and shall be freely ignited by the continuous burning pilot or vented to a safe location.

(5) Burner Operation Tests.

(a) The main burner shall be put into operation and tested only after 248 CMR 7.04(2), (3), and (4) have been completed. Manufacturer's instructions shall be followed for light-off and adjustment of the main burner.

(b) Pilots shall reliably effect immediate ignition of the main burner even when the gas supply to the pilot(s) is reduced to a point where the pilot flame is just sufficient to actuate or energize the flame detection device. Follow the manufacturer's instructions in conducting this test.

(c) Continuously burning pilot flames shall not become extinguished: when the main burners are turned on or off in a normal manner, either manually or by automatic controls, when the air flow through the burner is rapidly changed from maximum to minimum or vice versa after the main burners are shut off following operation of the equipment at its maximum capacity, nor during any normal operating conditions that will occur. The above tests shall be repeated three times.

(d) The pilot burner shall reliably ignite the main burner under any normal condition of operation.

(e) The arrangement of burners, valves, and pilots shall be such that when only the pilots supervised by the flame safeguard equipment are in operation, any burner or combination of burners shall be effectively ignited without delayed ignition or flash back.

(f) Burner flames shall not flash back when fired at any rate within the installed operating range of the burner.

(g) Burner flames shall not flash outside the equipment when the gas is turned on or off by the automatic control mechanism.

(h) Proper air-gas ratio shall be maintained and combustion shall be complete over the full installed operating range of the burner.

(6) Test for Venting. A check shall be made for proper venting with the burner operating at maximum installed input and with all building exhaust fans operating which are in communication with the room containing the equipment and with all outside closeable boiler room openings shut.

(7) Instructions to the Operator.

(a) Complete written or printed instructions including wiring diagrams shall be supplied and made conveniently available or posted in a permanent form in a prominent place near the equipment. These instructions shall include complete start up as well as normal and emergency shutdown procedures. Start- up shall be from the methods provided by the control system for that purpose.

(b) To guard against malfunctioning all controls should periodically be tested on a scheduled basis.

(c) Extended Shutdown. When equipment is shut down for an extended period it is recommended that in addition to closing all gas valves, as a further precaution, gas be prevented from leaking into the equipment by blocking off or disconnecting and capping or plugging the gas supply pipe.

248 CMR 8.00: AMENDMENTS TO NFPA 58

8.01: Modifications to Chapter 1, Administration

See 248 CMR 4.00: *Massachusetts Fuel Gas Code* for modifications to Chapter 1

8.02: Modifications to Chapter 2, Referenced Publications

No modifications have been made to this Chapter.

8.03: Modifications to Chapter 3, Definitions

(1) Replace sub-section 3.2.2* with the following:

Authority Having Jurisdiction (AHJ). Inspector as defined in 248 CMR 3.02: *Definitions*, the Board, or such other authority approved by the Board.

(2) Add to sub-section 3.2.5* the following at the end of the subsection:

All listed equipment must meet product acceptance requirements in 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work in the Commonwealth*.

8.04: Modifications to Chapter 5, LP-Gas Equipment and Appliances

(1) This code does not adopt sub-sections 5.1 to 5.7.

(2) This code does not adopt sub-sections 5.21.1 to 5.21.7.

8.05: Modifications to Chapter 6, Installation of LP-Gas Systems

(1) This code does not adopt sub-section 6.1.1*(2) and (3).

(2) This code does not adopt sub-sections 6.2 to 6.7.10.

(3) This code adopts sub-section 6.8 to the extent it applies to second stage regulators, however it does not adopt those portions applying to first-stage or two-stage regulators.

(4) This code does not adopt sub-sections 6.10 to 6.13.

(5) Delete sub-section 6.15 and replace it with the following:

6.15 Installation in Areas of Heavy Snowfall.

Piping, regulators, meters, and other equipment installed in the piping system, when exposed to the elements, must be protected from damage from accumulated snow by either following manufacturer's installation instructions when specific to such issues or, when no such instruction is provided, by otherwise reinforcing and/or sheltering any exposed equipment. However, should the performance of gas-fitting work impact the structural integrity of building or roofing components, necessary corrective work falls outside the scope of this code. See 780 CMR: *The Massachusetts State Building Code* or 271 CMR: *The Massachusetts Sheet Metal Code*, if applicable, for licensing and other requirements for said work.

(6) This code does not adopt sub-sections 6.16, 6.18, and 6.21 to 6.26.

8.06: Chapters of NFPA 58 not adopted

This code does not adopt NFPA 58 Chapters 4, 7, 8, 9, 10, 11, 12, 13, and 14.

8.07: Modifications to Chapter 15, Pipe and Tubing Sizing Tables

No modifications have been made to this Chapter.

248 CMR 10.00: UNIFORM STATE PLUMBING CODE

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 certain principles of public health environmental sanitation and safety through properly designed, acceptably installed, and adequately maintained plumbing systems. Some of the details of plumbing construction may vary but the basic sanitary and safety principles desirable and necessary to protect the health of people are the same everywhere. As interpretations may be required, and as unforeseen situations arise which are not specifically covered in 248 CMR 10.00, the final interpretation shall be made by the Board. The following principles shall comply with all Articles of the State Sanitary Code and Titles of the Environmental Code.

(1) Principle No. 1 -- All Occupied Premises Must Have Potable Water. All premises intended for human habitation, occupancy, or use must be provided with a supply of potable water. Such a water supply shall not be connected with unsafe or questionable water sources, nor shall it be subject to the hazards of backflow, backpressure, or back-siphonage.

(2) Principle No. 2 -- Adequate Water Required. Plumbing fixtures, devices, and appurtenances must be supplied with water in sufficient volume and at pressures adequate to enable them to function properly and without undue noise under normal conditions of use.

(3) Principle No. 3 -- Hot Water Required. Hot water must be supplied to all plumbing fixtures which normally need or require hot water for their proper use and function.

(4) Principle No. 4 -- Water Conservation. Plumbing must be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning.

(5) Principle No. 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 No. 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 per unit.
    b. Multiple Dwellings.

i. Non-elderly Housing. In multiple dwellings that are not restricted to the elderly, at least one washing machine connection for every ten dwelling units or fraction thereof that do not have a washing machine in the unit.

ii. Elderly Housing. In housing that is restricted to the elderly, at least one washing machine connection for every 20 dwelling units or faction 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.

(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 No. 7 -- Drainage System of Adequate Size. The plumbing drainage system must be installed, designed, arranged, constructed, and maintained to protect against fouling, deposit of solids, and stoppages. The drainage system shall incorporate adequate cleanouts placed in a manner that the drainage system may be readily cleaned.

(8) Principle No. 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 No. 9 -- Liquid Sealed Traps Required. Every fixture directly connected to the drainage system must be equipped with a liquid-seal trap.

(10) Principle No. 10 – Protection of Trap Seals. The drainage and 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.

(11) Principle No. 11 -- Exhaust Sewage Gases to Outside. 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 No. 12 -- Test the Plumbing System. The plumbing system must be subjected to such tests as will effectively disclose all leaks and defects in the work or the materials.

(13) Principle No. 13 -- Exclude Harmful Substances 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 building drainage system.

(14) Principle No. 14 -- Prevent Contamination by Installing Indirect Waste. Indirect drainage piping installations shall be provided to prevent 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 No. 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 No. 16 -- Individual Sewage Disposal Systems. If toilets or other plumbing fixtures are to be installed in buildings where there is no sewer within a reasonable distance, suitable provision shall be made for disposing of the sewage in compliance with 248 CMR and 310 CMR 15.00.

10.02: continued

(17) Principal No. 17 -- Prevent Sewer Flooding. Where a plumbing drainage system is subject to back-flow of sewage from the public sewer system suitable provision shall be incorporated to prevent the potential of overflow into the building.

(18) Principle No. 18 -- Proper Maintenance. Plumbing systems shall be maintained in a safe and serviceable condition from the standpoint of both mechanics and health.

(19) Principle No. 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 and cleansing.

(20) Principle No. 20 -- Structural Safety. Plumbing shall be installed with regard to the preservation of the strength of structural members and the prevention of damage to walls, floors and other structurally sensitive surfaces when performing fixture installations and through fixture usage.

(21) Principle No. 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 No. 22 -- Piping and Treatment of Hazardous Wastes. All waste discharge materials that may become detrimental to the health and welfare of the general 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 No. 23 -- Privacy for Toilets. 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.

(24) Principle No. 24 --Drinking Fountain. Drinking fountains shall be installed in safe, clean and hazard free areas. The installation of a drinking fountain in a rest room that incorporates toilets or urinals is prohibited.

(25) Principle No. 25 -- Temporary Construction Trailers. Temporary construction trailers are exempt from the material provisions of 248 CMR.10.06 the water and sewer connections shall be the same materials as supplied by the trailer manufacturer.

(26) Principle No. 26 --Materials and Design: The materials, products, devices, methods, systems, design, and installation of any and all aspects of a plumbing systems 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-Approved by the Board.

10.03: Definitions

For the purpose of 248 CMR 10.00, the terms defined in 248 CMR 3.00 have the meanings as defined therein. 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.

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

Air Break (Drainage System). A piping arrangement wherein a drain from a fixture, appliance, or device discharges 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.

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.

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.

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 so as to sit tight on increasing vacuum, and its positive pressure opening point shall is not less than five P.S.I.G.

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.

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

Black-water. Waste water 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.

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 degrees 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 are connected to the stack.

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 horizontal piping of a drainage system that extends from the base of the main stack to a terminating point ten feet outside the inner surface of a building's foundation wall, and is of sufficient size to receive the discharge from branch drains and/or stacks.

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 ten feet outside the inner face of a building's foundation wall and extends to a public sewer, septic tank, or other place of sewage disposal.

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.

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.

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 that conveys storm water from the roof to a storm drain or combined building sewer/storm sewer.

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 leading from a soil, waste, or vent pipe, building drain, or building sewer, and terminating at a developed length of two feet or more by means of a plug, cap or other closed fitting.

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

Dedicated Systems

(a) Dedicated Acid Waste and Special Hazardous Waste Systems. All acid drainage or special drainage and acid vent piping or special vent piping normally associated with exterior or interior acid neutralizing or hazardous waste treatment devices.

(b) Dedicated Gasoline, Oil and Sand Systems. All drainage and vent piping normally associated with exterior or interior gasoline, oil and sand Separators.

(c) Dedicated Grease Systems. All sanitary drainage and vent pipes normally associated with exterior grease interceptors/separators.

(d) Dedicated Gray Water Recycling System. Includes all piping, valves, pumps, meters, retaining tanks for exterior or interior gray water collection points.

(e) Dedicated Waste Water Recycling System. Shall be considered the assembly of all piping, valves, pumps, meters and retaining tanks for installation at exterior or interior waste water recycling system locations that shall include but not be limited to collection points and points of use.

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

Diameter. The nominal diameter as designated commercially.

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 waste water or waterborne waste in a drainage system.

Drainage System. Includes all the piping contained within a public or private premises that conveys sewage, rain water, 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.

Dual Vent. (*See* Common Vent)

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 habitable 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 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, that share exterior walls, a roof, and a foundation and where a common sewer connection and water supply are contained 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.

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.

Existing Work. A plumbing system or any part thereof installed prior to March 11, 2005.

Fire Line. A system of pipes and equipment used exclusively to supply water for extinguishing fires.

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 connected.

Fixture Branch. A pipe connecting several fixtures.

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

Fixture Supply. The water supply pipe that connects a fixture to either a branch water supply pipe or directly to a main water supply pipe.

Fixture Unit. The rate of discharge of water through a plumbing fixture wherein 7½ gallons per minute is equal to one fixture unit.

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.

Flush Valve. A device that is located at the bottom of a tank and that is used for flushing toilets and similar fixtures.

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.

Genetics. The branch of biology that deals with heredity and variations of organisms.

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

Gray-water. Used water out-flowing from a clothes-washer, shower, bathtub or bathroom sink and reused on the same site for below ground irrigation only. Gray-water is typically not treated.

Grease Interceptor. A passive interceptor whose rated flow exceeds 50 gpm (189 L/m). (*See* Interceptor)

Grease Trap. A passive interceptor whose rated flow is 50 gpm (189 L/m) or less. (*See* Interceptor)

Hangers. (*See* Supports)

Hazardous 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 for possible exemptions and for "Mixed waste."

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

Hazardous Waste Pipe. Pipes which convey hazardous wastes.

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 45E in reference to a horizontal plane.

Hot Water. Water at a temperature of at least 12o degrees.

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.

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 a roof or gutter drains.

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

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.

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.

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

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 or fractional level between a floor and a ceiling that projects in the form of a balcony over the floor and wherein the aggregate floor area of the intermediate or fractional level is less than 33% of the area of the floor over which it is located.

Non-potable Water. Water that does not meet the standards of potable 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, sewered, drained, cleaned or lighted, in 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, its 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.

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.

It is the interpretation of this Board that that portion of the plumbing system consisting of all building drains beginning from a point ten feet outside from the inside face of the foundation wall and running into the building structure shall be installed by a licensed plumber only. On public or private water supply systems, any pipe beginning on the house side of the metering device or, if none, the main control valve immediately inside the foundation wall to the point of actual connection to heating/cooling equipment, appliance, fixture, *etc*. shall be installed by a licensed plumber only. When a metering device is installed as part of the water supply and distribution system for a building or group of buildings at a location outside the foundation wall(s) of said building(s), the cutting, fitting, connection and testing of all water supply piping between the metering device and said building(s) shall be performed by a licensed plumber in accordance with the requirements of 248 CMR. Other work involved in the installation of such piping such as

trenching, tunneling, placement of assembled piping in the trenches, backfilling etc., may be performed by unlicensed personnel.

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, the regulations of the Massachusetts Department of Environmental Protection or to the pertinent local Board of Health regulations.

Private or Private Use. In the classification of plumbing fixtures, private shall apply to fixtures in residences, apartments, condominiums 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.

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.

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 State Pharmacopoeia.

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

Receptor. A 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 *hyper-filtration*.

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.

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.

Side Vent. A vent that connects to a drain pipe via a fitting where the angle of the vent is less than 45° from the vertical.

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)

Size of Pipe and Tubing. (*See* Diameter)

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.

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 rain water, 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 rain water, 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.

Sump Pump. A mechanical device, except for an ejector or bucket, 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 waste water 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/Handicap Toilet Room. A room containing one toilet and one lavatory available for use by either sex.

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 as a result of negative pressure in the drainage system to prevent trap siphonage, and closes gas and water tight 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 45E 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.

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 that passes through an isolated portion of the water piping distribution system. The system is defined as beginning at the outlet of a back-flow 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.

Water Vending Machine. Any self-service device which, upon receipt of payment, dispenses purified or drinking water in bulk without the necessity of replenishing the device between each vending operation. The device is connected to a public or private system.

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 (Relief Vent-foot). A pipe connecting 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) Surveyed. Prior to the commencement of work, all portions of existing systems that are directly affected by proposed plumbing work shall be surveyed by the licensed plumber to insure that the existing work is adequate to support the proposed work.

(2) Inspections of the Plumbing System. An Inspection is required for all plumbing work pursuant to 248 CMR 3.00. In addition, the following requirements shall be satisfied.

(a) Inspection of Rough Plumbing.

1. The piping of the plumbing, drainage, and venting systems shall be tested as part of the Inspection.

2. Upon proper notice of a request for an Inspection of the rough plumbing, the Inspector shall make the Inspection within two working days after receipt of such notice.

3. The Inspector shall proceed with the Inspection only if the licensed plumber requesting the Inspection is on site, with a current edition of 248 CMR the Massachusetts Fuel Gas and Plumbing Code.

4. 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. 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 P.S.I.G. or sufficient 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 15 minutes. The gauge used for this test shall be calibrated in increments no greater than 1/10 of a pound.

c. Peppermint Test.

i. 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 contain two ounces of oil of peppermint for every one gallon of hot water. This mixture shall be sufficient for testing a stack 50 feet in height or the equivalent of five branch intervals, (including the basement, if applicable).

ii. The mixture shall be poured down a main stack.

iii. The stack opening shall then be sealed.

iv. 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.

v. After the completion of the test and upon immediate inspection of the building, if the odor of peppermint is prominent in a given area, then the test indicates a defect in that portion of the system in that vicinity.

d. Smoke Test.

i. 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; manufacturer's recommendations shall be observed.

ii. 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 other similar compound.

iii. When the entire system or portion thereof is charged with smoke, air pressure equal to one-inch water column shall be applied.

iv. Defects, failures and leaks in the piping system will be revealed by plumes of smoke that will discharge through them.

5. 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) Final Test and Inspection.

1. Within five days after the plumbing work is sufficiently advanced so that Principle No. 6 in 248 CMR 10.02(6) is satisfied, the plumber who performed the work or the Permit Holder shall notify the Inspector.

2. 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. If requested by the Inspector, the licensed plumber shall be present with a current edition of 248 CMR.

3. If the installation is found in compliance with 248 CMR an Inspection approval tag shall be issued by the Inspector.

4. Defects.

a. Should the examination of work disclose any defects or violations of 248 CMR, the plumber 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 that may have been found and pointed out to him/her by the Inspector he/she shall not be granted any further permits until he/she has complied with 248 CMR. Other disciplinary action may be pursued by the Inspector as provided for in M.G.L. c. 142 and 248 CMR.

5. Defective Materials and Poor Workmanship. If at the time of testing and Inspection leaks, defective or patched materials, or evidence of unskilled or inferior workmanship is found with the plumbing installation, the following procedures shall be followed:

a. The Inspector shall condemn the affected part(s) or entire system.
b. The Inspector shall order that the defective parts, unskilled or inferior workmanship be removed and corrected.

c. No further progress shall be allowed with the installation until the defective parts, unskilled or inferior workmanship is compliant with 248 CMR 3.00 through 10.00.

6. Repairs and Alterations.
a. Deviations from the provisions of 248 CMR may be permitted in existing buildings or premises where plumbing installations are to be altered, repaired, or renovated. The deviations shall be negotiated by the Permit Holder and the Inspector prior to the installation. The deviations may be allowed provided that the deviations are found to be necessary and conform to the scope and intent of 248 CMR. 10.00.
b. Whenever compliance with all of 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 his or her agent in writing of the violations. The owner or his or her agent shall notify a licensed plumber to install such additional plumbing or equipment that may be found necessary by the Inspector.

7. 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, and any defects found shall be corrected as required in writing by the Inspector.
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 of the hazard in writing.

8. Maintenance. The plumbing and drainage system of any premises shall be caused to be maintained in a sanitary and safe operating condition by the owner or his or her agent.

9. 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(9)(a) shall also apply when a building, structure, dwelling or tenant space is to be demolished.

10. Personal Safety.
a. In General. All personnel working on plumbing systems water, waste, vents systems, fixtures and, appliances and appurtenances shall wear appropriate protected clothing and/or equipment and conform to M.G.L. c. 111F, § 2, the "Right to Know Law".
b. Special Labs. All licensed plumbers and plumbing apprentices installing pipe connections or working on drains to hospital waste and vent systems, mortuary waste and vent systems, laboratory waste and vent systems, dental waste and vent systems and plumbing systems in radioactive sensitive areas shall have the surface of their body and clothing protected by disposable or washable gowns similar or equal to the gowns, gloves and face masks worn by surgical staff.

10.05: General Regulations

(1) Conforming with 248 CMR 10.00. Except as otherwise allowed by specific exception granted by the Board under 248 CMR 3.00, all plumbing which is installed shall conform to the following general requirements as outlined in 248 CMR 10.00.

(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 ¼ inch per foot.

(c) Horizontal drainage piping which is larger than three inches in diameter shall be installed with a minimum uniform pitch of ⅛ inch per foot.
(d) Storm or sanitary drains shall be installed at a slope that produces a computed velocity of discharge of not less than two feet per second.

(3) Changes in Direction of Drainage Piping.
(a) Fittings to Be Used.
1. Changes in the direction of drainage piping shall be made by 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.
(b) Back to Back Fixtures. Back to back fixtures shall be installed:
1. with fittings that are designed to prevent the discharge of each fixture to mix prior to a change in horizontal direction; or
2. with fittings especially designed to eliminate throw over from the discharge of one fixture to the discharge of the other fixture without compromising venting requirements.

(4) Fittings and Connections Prohibited.
(a) Fittings Prohibited.
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. A fitting commonly referred to as a "Sisson Joint" is 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 this provision provided that the horizontal flow line or insert is continuous without forming a ledge.
(c) Dead Ends. Dead ends shall not be used as any part of a drainage system except where the use of a dead end is necessary to extend a cleanout so as to be accessible.
(d) 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.

(5) Trenching, Tunneling and Backfilling.
(a) Trenching and Bedding.
1. Trenches shall be of sufficient 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 so as 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 so as to provide a uniform bearing for the pipe between joints.
7. For PVC and ABS piping underground, *See* 248 CMR 10.06(2)(o)19.: *Piping Trench Installation*.

(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.
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.

(d) Safety Precautions. All laws, rules and regulations pertaining to safety and protection of workmen, other persons in the vicinity, and neighboring property shall be observed where excavating, trenching, blasting, or other hazardous operations are being conducted.

(6) Structural Safety. In the process of installing or repairing any plumbing installation, the finished floors, walls, ceilings, tile work or any other part of the building or premises that must be changed or replaced shall be returned to a safe structural condition upon completion of the plumbing work.

(7) Workmanship. Workmanship shall conform to generally accepted good practice. Particular attention shall be applied to all piping installations in regard to the alignment of piping (straight, level, plumb).

(8) 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) Cutting, Notching, or Drilling.
1. A structural member of any building shall not be weakened or impaired by cutting, drilling or notching.
2. 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*.

(c) Freezing Prevention.
1. No water supply or drainage piping shall be installed outside of or under a building in an exposed, open or unheated area.

2. For water supply or drainage piping that is installed 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.
3. The protection and covering of water and waste pipes shall be the responsibility of the installing plumber.

(d) Rat 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 rats cannot enter a building by following the water service pipe from the box into the building.

(e) Physical Damage. 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.

(9) Prevent Damage to the Drainage System or Sewer. No person shall discharge by any means into a building drain or sewer the following matter:
(a) ashes;
(b) masonry products;
(c) textiles;
(d) paints;
(d) solvents;
(e) flammables;
(f) corrosive or explosive liquid(s);
(g) gas;
(h) oil;
(i) grease; or
(j) any product that would or could obstruct, or damage a drain or sewer.

(10) 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.

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

(12) Second Hand or Previously Installed Plumbing Material.
(a) No person shall install second hand or previously installed plumbing material or a plumbing fixture unless the fixture or material complies with the minimum standards set forth in 248 CMR 10.00.
(b) If installation of a second hand or previously installed plumbing fixture is in compliance with 248 CMR 10.00, before installation, it shall be thoroughly cleansed and disinfected.

(13) 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.

(14) Drainage Below Sewer Level. Drainage piping which is located below the sewer shall be installed as provided in 248 CMR 10.15(10)

(15) 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.

10.05: continued

(16) Sewage Disposal Connections (Buildings).

(a) The plumbing of each building shall have an independent connection to a public sanitary sewer outside of building, unless, in the opinion of the Inspector, a single separate connection is not feasible.

(b) If a public sanitary sewer is not available, the sewage shall be discharged into a 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*.

(17) 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.

10.06: Materials

(1) Materials.

(a) Minimum Standards. All materials, systems, and equipment used in the construction, installation, alteration, repair, replacement, or removal or any plumbing or drainage system or part thereof, shall conform at least to the standards listed in 248 CMR 10.06, except that:

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 as permitted under 248 CMR 10.04(6)(a); or

2. materials not covered by the standards listed in 248 CMR 10.06 may be used with the approval of the Board as permitted under 248 CMR 3.04.

(b) Installation.

1. All materials installed in plumbing systems shall be so handled and installed as to avoid damage so that the quality of the material will not be impaired.

2. No defective or damaged materials, equipment or apparatus shall be installed or maintained.

3. All materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved by the Board, including the appendices of the standards, and in strict accordance with the manufacturer's instructions.

(c) Standards and Approval.

1. Materials not listed in 248 CMR 10.06: *Table 1* shall be used only as provided for in 248 CMR 10.06(1)(a) or as permitted in 248 CMR 3.04.

2. Abbreviations in 248 CMR 10.06: *Table 1* refer to the following organizations:

a. ANSI -- American National Standards Institute, 25 West 43rd Street, New York, New York 10036, 212-642-4900

b. ASSE -- American Society of Sanitary Engineering, 901 Canterbury Road, Suite A, Westlake, OH44145-1480, 440-835-3040

c. ASTM -- American Society for Testing & Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, 610-832-9598

d. American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990

e. AWS—American Welding Society, P.O. Box 351040, 550 N.W. Lejune Road, Miami, FL 33126

f. AWWA -- American Water Works Association, 6666 West Quincy Ave., Denver, COLO, 80235, 303-794-7711

g. CDA -- Copper Development Association, P.O. Box 1305, 140 Konhans Road, Mechanicsburg, PA 170555, 717-795-5495

h. CISPI -- Cast Iron Soil Pipe Institute, 5959 Shallowford Road, Suite 419, Chattanooga, TN 37421, 615-892-0137

i. CS – Commercial Standards/Commodity Standards Division, Office of Industry and Commerce, U.S. Department of Commerce, 14th St., between E & Constitution Ave., N.W., Washington, D.C. 20004, 202-377-2000
j. FS -- Federal Supply Service, Standards Division, General Services Administration, Washington, D.C. 20405, 202-472-1082
j. NAMA -- National Automatic Merchandising Association, 20 North Wacker Dr., Chicago, IL 60606, 312-346-0370
l. MSS -- Manufacturers Standardization Society, (of the) Valve and Fittings Industry, 127 Park St., N.E., Vienna, VA 22180, 703-281-6613
m. NIST -- National Institute of Standards and Technology, U.S. Dept. of Commerce, Quincy Orchard & I270, Gaithersburg, MD 20878, 301-948-2791
n. NSF -- International 789 North Dixboro Road, Ann Arbor, MI 48104, 734-769-5361
o. PDI -- Plumbing and Drainage Institute, 800 Turnpike Street, Suite 300 North Andover, MA 01845, 978-557-0720
p. PPI -- Plastic Pipe Institute, 1825 Connecticut Ave., NW, Suite 680, Washington, DC 20009, 202-462-9607
q. PS -- Product Standards (Published by Superintendent of Documents), U.S. Government Printing Office, North Capitol St., between G & H Sts., N.W. Washington, D.C. 20011, 202-783-3238
r. Water Quality Association, 4151 Naperville Road, Lisle, Illinois 60632, 312-369-1600

NOTE. Because material standards and specifications are subject to change, the designations carrying indication of the year of issue may thus become obsolete. 248 CMR 10.06, Table 1 gives the full designations of standards current when 248 CMR was last promulgated. This table will be reviewed and updated by the Board at regular intervals.

3. REFERENCED STANDARDS: The following is a listing of the standards referenced in 248 CMR 10.00, the effective date of the standard, the promulgating agency of the standard and the section(s) that refer to the standard. Many titles are referenced by both ANSI and ASME.

ANSI American National Standards Institute
25 West 43rd Street
New York, New York 10036

Standard Reference Number	Title
ANSI/ASME A112.6.1-1997 (R2002)	Supports for Off-the-Floor Plumbing Fixtures for Public Use
ANSI/ASME A112.14.1 (R2003)	Backwater Valves
ANSI/ASME A112.14.3 (2000)	Grease Interceptors
ANSI/ASME A112.14.4 (2001)	Grease Removal Devices
ANSI/ASME A112.18.1 (2003)	Plumbing Fixture Fittings
ANSI/ASME A112.19.1-94 (R2004)	Enameled Cast Iron Plumbing Fixtures with Supplement 1-1998 and Supplement 2-2000
ANSI/ASME A112.19.2 - 2003	Vitreous China Plumbing Fixtures and Hydraulic Performance Requirements for Toilets and Urinals

Standard Reference Number	Title
ANSI/ASME A112.19.3 - (R2004)	Stainless Steel Plumbing Fixtures (Designed for Residential Use) with Supplement 1-2002
ANSI/ASME A112.19.4 - 94 (R2004)	Porcelain Enameled Formed Steel Plumbing Fixtures with Supplement 1-1999 and Supplement 2-2000
ANSI/ASME A112.19.7 - 95	Whirlpool Bathtub Appliances
ANSI\ASME A112.19.8 (R1996)	Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Whirlpool Bathtub Appliances
ANSI\ASME A112.6.3-2001	Floor and Trench Drains
ANSI/ASME A112. 6.4-2003	Roof, Deck and Balcony Drains
ASSE 1010-2004	Performance Requirements for Water Hammer Arrestors
ANSI/ASME A112.36.2 - 91 (R2002)	Cleanouts
ANSI/AWS A5.31	Fluxes, Brazing, and Braze Welding
ANSI/AWS A5.8	Filler Metals, Brazing, Braze Welding
ANSI/AW C3.4	Torch Brazing
Z 21.10.1 - 98	Gas Water Heaters Volume I Storage Water Heaters with Input Ratings of 75,000 BTU per Hour or Less
Z 21.10.3. - 2001	Gas Water Heaters Volume III Storage, with Input Ratings Above 75,000 BTU per Hour, Circulating and Instantaneous Water Heaters
Z 21.22.86 - 99	Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems
Z124.1 - 95	Plastic Bathtub Units
Z124.2-95	Plastic Shower Receptors and Shower Stalls
Z124.3-95	Plastic Lavatories
Z124.4-96	Plastic Toilets Bowls and Tanks

ASME American Society of Mechanical Engineers
Three Park Avenue
New York, New York 10016-5990

Standard Reference Number	Title
ASME/ANSI A112.6.1- 97 (R2002)	Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME/ANSI A112.14.1 (R2003)	Backwater Valves
ASME/ANSI A112.18.1 (2003)	Plumbing Fixture Fittings
ASME/ANSI A112.19.1- 94 (R2004)	Enameled Cast Iron Plumbing Fixtures with Supplement 1 - 1998 and Supplement 2 - 2000
ASME/ANSI A112.19.2 (2003)	Vitreous China Plumbing Fixtures and Hydraulic Performance Requirements for Toilets and Urinals
ASME/ANSI A112.19.3 (R2004)	Stainless Steel Plumbing Fixtures (Designed for Residential Use) with Supplement 1 - 2002
ASME/ANSI A112.19.4- 94 (R2004)	Porcelain Enameled Formed Steel Plumbing Fixtures with Supplement 1-1999 ann Supplement 2 - 2000
ASME/ANSI A112.19.7- 95	Whirlpool Bathtub Appliances
ASME/ANSI A112.19.8 (1996)	Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Whirlpool Bathtub Appliances
ASME/ANSI A112.6.3 - 2001	Floor and Trench Drains
ASME/ANSI A112. 6.4 - 2003	Roof , Deck and Balcony Drains
ASME/ANSI B1.20.1 (R1999)	Pipe Threads, General Purpose (inch)
B16.3- 99	Malleable Iron Threaded Fittings
B16.4- 98	Cast Iron Threaded Fittings
B16.12- 98	Cast Iron Threaded Drainage Fittings
B16.14- 91	Ferrous Pipe Plugs, Bushings, and Locknuts with pipe threads
B16.15 (R1994)	Cast Bronze Threaded Fittings
B16.18 (R1994)	Cast Copper Alloy Solder Joint Pressure Fittings
B16.21- 92	Nonmetallic Flat Gaskets for Pipe Flanges
B16.22 (2001)	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
B16.23 (2002)	Cast Copper Alloy Solder Joint Drainage Fittings (DWV)
B16.28 (1988)	Cast Copper Alloy Fittings for Flared Copper Tubes
B16.29 (2001)	Wrought Copper and Wrought Copper Alloy Solder Joint Fittings for Drainage Fittings
B16.39- 98	Malleable Iron Threaded Pipe Unions
B16.45-97	Cast Iron Fittings for Sovent Drainage Systems
B16.50 (2001)	Wrought Copper and Copper Alloy Braze-joint Pressure Fittings

ASSE American Society of Sanitary Engineering
901 Canterbury Road, Suite A
Westlake, OH 44145 - 1480

Standard Reference Number	Title
1001- 2002	Performance Requirements for Pipe Applied Atmospheric Type Vacuum Breakers
1002- 99	Performance Requirements for Toilet Flush Tank Ball Cocks
1003- 2002	Performance Requirements for Water Pressure Reducing Valves
1005- 99	Performance Requirements for Water Heater Drain Valves
1006- 89R	Performance Requirements for Residential Use (Household) Dishwashers
1007- 92	Performance Requirements for Home Laundry Equipment
1008- 89R	Performance Requirements for Household Food Waste Disposer Units
1010- (2004)	Performance Requirements for Water Hammer Arrestors
1011- (2004)	Performance Requirements for Hose Connection Vacuum Breakers
1012- 2002	Performance Requirements for Backflow Preventers with Intermediate Atmospheric Vent
1013- 99	Performance Requirements for Reduced Pressure Principle Backflow Preventers
1014- (2004)	Performance Requirements for Hand-held Showers
1015- 90	Performance Requirements for Double Check Backflow Prevention Assembly
1016- (2004)	Performance Requirements for Individual Thermostatic, Pressure Balancing and Combination Control Valves for Bathing Facilities
1017- 2003	Performance Requirements for Temperature Activated Mixing Valves for Primary Domestic Use
1018- 2001	Performance Requirements for Trap seal Primer Valves
1019- (2004)	Performance Requirements for Wall Hydrants, Frost Resistant Automatic Draining, Types
1020- (2004)	Performance Requirements for Pressure Vacuum Breaker Assembly
1021- 2001	Performance Requirements for Drain Air Gaps for Domestic Dishwasher Applications
1023- 79	Plumbing Requirements for Hot Water Dispensers Household Storage Type Electrical (covered in ASME A112.18.1)
1037- 90	Performance Requirements for Pressurized Flushing Devices (Flushometers) for Plumbing Fixtures
1044- 2001	Performance Requirements for Trap Seal Primer Valves Drainage Type.

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Standard Reference Number	Title
A53- 2001	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Steamless
A74- 98	Specification for Cast Iron Soil Pipe and Fittings
A312- 2001	Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
A377- 99	Index for Specifications for Ductile-Iron Pressure Pipe
B42-02e1	Specification for Seamless Copper Pipe, Standard Sizes
B43- 98e1	Specification for Seamless Red Brass Pipe, Standard Sizes
B88- 2003	Specifications for Seamless Copper Water Tube
B302- 2002	Specification for Threadless Copper Pipe
B306- 2002	Specification for Copper Drainage Tube (DWV)
B370- 2003	Standard Specification for Copper Sheet Strip for Building Construction
B813- 2000e1	Standard specification for liquid and paste fluxes for soldering of copper and copper alloy tube
B819-00	Standard Specification for Seamless Copper Tube for Medical Gas Systems
B828-2002	Standard practice for making capillary joints by Soldering of copper and copper alloy tube and fittings
C12-86	Standard Practice for Installing Vitrified Clay Pipe Lines
C14- 99	Specification for Concrete Sewer, Storm Drain, and Culvert Pipe
C76- 2000	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C301-89	Standard Test Methods for Vitrified Clay Pipe
C361-89	Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
C425- 2002	Specification for Compression Joints for Vitrified Clay Pipe and Fittings
C443- 2001	Specifications for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C444-80	Standard Specification for Perforated Concrete Pipe
C564- 97	Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
C700- 2002	Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated
D1330-85	Standard Specification for Rubber Sheet Gaskets
D1527- 99	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Schedules 40 and 80
D1785- 99	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80 and 120
D2104- 2001	Standard Specification for Polyethylene (PE) Plastic Pipe, Schedule 40
D2235- 2001	Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
D2239- 2001	Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR)
D2241- 2000	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-Series)
D2282- 99	Specification for Acrylontrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)
D2321- 2000	Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
D2447- 2001	Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
D2464- 99	Specification for Threaded Poly (Vinyl Chloride) (PVS) Plastic Pipe Fittings, Schedule 80
D2466- 2001	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings Schedule 40

Standard Reference Number	Title
D2467- 2001	Specification for Socket-type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D2468- 96a	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40
D2564- 96a	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
D2609- 2000	Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe
D2661- 2001	Specifications for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe
D2665- 2001	Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe Fittings
D2672- 96a	Specification for Solvent Cement Joint Sockets on Belled PVC Pressure Pipe
D2729- 96a	Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D2737- 2001	Specification for Polyethylene (PE) Plastic Tubing
D2751- 96a	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
D2774-72	Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
D2846- 99	Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold Water Distribution Systems
D2852-89	Standard Specification for Styrene-Rubber (SR) Plastic Drain Pipe and Fittings
D2855- 96	Standard Practice for Making Solvent-Cemented Joints with Poly Vinyl Chloride) (PVC) Pipe and Fittings
D2949-2000a	Specification for 3.25-In Outside Diameter Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
D3034-2001	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D3122-95	Standard Specification for Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings
D3139-98	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D3212-96a	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
D3261-88	Standard Specification for Butt Heat Fusion Polyethlene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing discontinued
D3311-94	Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
D4068-2001	Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water Containment
F402-98(R99)	Recommended Practice for Safe Handling of Solvent Cements Used for Joining Thermoplastic Pipe and Fittings
F405-98	Specification for Corrugated Polyethylene (PE) Tubing and Fittings
F409-2002	Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings
F437-99	Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
F438-2001	Specification for Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
F439-2001	Specification for Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings. Schedule 80

Standard Reference Number	Title
F441-99	Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
F442-99	Specifications for Chlorinated Poly (Vinyl Chloride) (CPVC} Plastic Pipe (SDR-PR)
F493-97	Specifications for Solvent Cements for Chlorinated Poly (vinyl Chloride) (CPVC) Plastic Pipe and Fittings
F628-2001	Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core
F656-96a	Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
F789-95a	Standard Specification for Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings
F876-99A	Standard specifications for Cross-linked polyethylene (PEX) tubing.
F877-99A	Standard specifications for Cross-linked Polyethylene (PEX), plastic hot and cold water distribution systems.
F891-88A	Specifications for co-extruded, (Polyvinyl Chloride), (PVC) plastic pipe with a cellular core.
F1807-97	Standard specifications for metal insert fittings utilizing a copper crimp ring for SD9 Cross-linked Polyethylene (PEX) tubing.
F1960-99	Standard specifications for cold expansion fittings with (PEX) reinforcing rings for use with Cross-linked Polyethylene (PEX) tubing.

AWWA American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

Standard Reference Number	Title
C110/A21.10-98	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids
C111/A21.11-2000	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
C151/A21.51-96	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
C203-91a	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines Enamel and Tape- Hot Applied
C205-89	Cement-Mortar Protective Lining and Coating for Steel Water Pipe four inches and Larger - Shop Applied
C210-84	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
C213-2001	Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
C303-87	Reinforced Concrete Pressure Pipe, Steel Cylinder Type, Pretensioned, for Water and Other Liquids; Erratum
C606-97	Grooved and Shouldered Joints

CDA Copper Development Association Inc.
260 Madison Avenue, 16th Floor
New York, NY 100016

Standard Reference Number	Title
Design Assistance Publication-409-80	Copper Sovent Single Stack Plumbing System

CISPI Cast Iron Pipe Institute
Suite 419
5959 Shallowford Road
Chattanooga, TN 37421

Standard Reference Number	Title
301-2000	Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications

International Cast Polymer Alliance
1010 North Glebe Road, Suite 450
Arlington, VA 22201

Standard Reference Number	Title
LS-2-97	Property and Performance Standard for Cast Polyester Lavatories (Note: includes cultured marble and onyx)

FS Federal Specification that is available from the Supt. of Documents U.S. Government Printing Office Washington D.C. 20402-9325
General Service Administration
7th and D Streets
Specification Section
Room 6039
Washington, DC 20407

MSS Manufacturers Standardization Society of the Valve and Fitting Agency
127 Park Street, NE
Vienna, VA 22180

Standard Reference Number	Title
SP-58-2002	Pipe Hangers and Supports-materials, Design and Manufacture
SP-69-03	Pipe Hangers and Supports-selection and Application
SP-70-84	Cast Iron Gate Valves, Flanges and Threaded Ends

NAMA National Automatic Merchandising Association
20 N. Wacker Dr.
Chicago, IL 60606-3102

Standard Reference Number	Title
Section 900-2001	Standard for the Sanitary Design and Construction of Food and Beverage Vending Machines

NSF International
789 North Dixboro Road
Ann Arbor, MI 48104

Standard Reference Number	Title
14-2003	Plastics Piping Components and Related Materials
42-2002	Drinking Water Treatment Units-Aesthetics Effects
44-2002	Cation Exchange Water Softeners
53-2002	Drinking Water Treatment Units-Health Effects
58-2002	Reverse Osmosis Drinking Water Treatment Systems
61-2003	Drinking Water System Components - Health Effects

PPFA Plastic Pipe and Fittings Association
800 Roosevelt Road
Building C, Suite 20
Glen Ellyn, IL 60137

UL Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062

Standard Reference Number	Title
174-96	Household Electric Storage Tank Water Heaters
399-93	Drinking Water Coolers
499-97	Electric Heating Appliances
732-95	Oil-Fired Storage Tank Water Heaters
749-97	Household Dishwashers

WQA Water Quality Association
4151 Naperville Road
Lisle, IL 60532

Standard Reference Number	Title
S100-2000	Household Commercial and Portable Exchange Water Softeners
S200-2000	Household and Commercial Water Filters
S300-2000	Point-of-Use Low Pressure Reverse Osmosis Drinking Water Systems
S400-2000	Point-of-Use Distillation Drinking Water Systems

TABLE 1
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	**ANSI**	**ASTM**	**FS**	**OTHER**
Ferrous Pipe, Fittings and Valves				
Cast Iron Aerators and De-Aerators ASME Hubless Fittings	B16.45-1987	None	None	None
Cast Iron Drainage Fittings, Threaded	B16.12-1998	None	WW-P-46B-1967	None
Cast Iron Screwed Fittings (Threaded)	B16.4-1998	None	WW-P-501d-1967	None
Cast Iron Pipe (Threaded) DWV	None	None	WW-P356a-1967	None
Cast Iron Pipe, Thickness Design of	None	None	WW-P-421c-1967	None
Cast Iron Soil Pipe and Fittings Hub & Spigot	None	A74-98	WW-P-401e-1974	None
Cast Iron Water Pipe (2")	None	A377-99	WW-P-360b-1968	None
Cast Iron Water Pipe (Cast in Metal Molds)	None	A377-99	WW-P-421c-1967	None
Cast Iron Water Pipe (Cast in Sand-Lined Molds	None	A377-99	WW-P-421c-1967	None
Cast Iron Water Pipe Fittings	A21.10-1998	A377-99	None	*AWWA C110-98
Ductile-Iron Pipe	A21.51-1996	A377-99	WW-P-421c-1967	*AWWA C151-96
Grove & Shoulder Type Joints (Split-Couplings)	None	None	None	*AWWA C606-97
Cast Iron Soil Pipe and Fittings for				
Hubless Cast Iron Sanitary System	None	None	WW-P-104e-1974	CISPI 301-2000
Malleable Iron Screwed Fittings, 150 lbs. & 300 lbs.	B16.3-1985	None	WW-P-521f-1968	None
Nipples, Pipe, Threaded	None	None	WW-N-351b(1)-1970	
Pipe Fittings, Ferrous (Bushing, Plugs, and Locknuts) Threaded, 125 & 150 lb.	B16.4-198	None	WW-P47b-1970	None
Pipe Threads (except Dry Seal)	ASME B1.20.1-1992	None	None	NFS Handbook H28-Part II-1966
Steel Pipe, Stainless	None	A312-2001a	89	None
Steel, Stainless, Water-DWV Tubes	None	None	None	None
Steel Pipe, Welded or Seamless (for coiling) Black or Galvanized	None	A53-2001	WW-P-471b-1970 Int Amend 3-1971	None

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TABLE 1 (Continued)

STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Steel Pipe, Welded or Seamless Black or Galvanized	None	None	WW-P-406d(1)-1973	None
Steel Pipe (Cement-Mortar Lining and Reinforced Cement-Mortar (Coating)	None	None	SS-P-385a(1)-1968	AWWA C205-2000
Steel Pipe (Coal Tar Enamel or Cement Coated and Wrapped)	None	None	WW-P-1432-1970	*AWWA C203-91a
Unions, Pipe, Steel or Malleable Iron	B16.39-1986	None	WW-U-531c-1965	None
Valves, Ball	None	None	WW-V-35a-1965	None
Valves, Cast Iron, Gate 125 & 250 lb.	None	None	WW-V-58b-1971	MSS-SP-70-1984
Valves, Cast Iron, Swing Check	None	None	None	MSS-SP 02-1997
Non-Ferrous Metallic Pipe, Fittings and Valves				
* Aerator and De-aerator Copper Solder Joint Drainage Fittings	None	None	None	CDA-409-80
Aluminum Pipe, Drainage DWV	None	None	None	None
Brass Tube, Red, Seamless, Pipe, Standard Sizes	None	B43-98	WW-P-351a-1963	None
Bronze Pipe Flanges and Flanged Fittings	B16.24-1979	None	None	None
Cast Copper Alloy Fittings for Flared Copper Tubes	B16.26-2002	None	None	None
Cast Copper Alloy Solder-joint Pressure Fittings	B16.18-2001	None	WW-T-00725-1967	None
Cast Copper Alloy Solder-joint Drainage Fittings	B16.23-2002	None	None	None
Copper Pipe, Seamless, Standard Sizes	None	B42-98	WW-P377d-1962	None
Copper Pipe, Thread less	None	B302-2002	WW-P-377d-1962	None
Copper Tube, Drainage DWV	None	B306-99	None	None
Copper Tube, Water, Seamless, Types K, L, and M	None	B88-99	WW-T-799d-1971	NSF 61
Lead Pipes, Bends and Traps	None	None	WW-P-325a-1967	None
Pipe Fittings, Bronze, 125 and 250 Lbs. Cast	B16.15-1994	None	WW-P-460b-1967	None
Solder-joint Fittings, Pressure, Wrought Copper-copper and Copper Alloy	B16.22-2001	None	WW-T-00725-1967	None
Solder-joint Fittings, Drainage, DWV Wrought Copper and Copper Alloy	B16.29-2002	None	None	None
Unions, Brass or Bronze, 250 lbs.	None	None	WW-V-35a-1965	None
Valves, Angle Check and Globe, Bronze, 125 lb. Screwed, Flanged or Solder	None	None	WW-V51d-1967	None
Non-Metallic Pipe and Fittings				
Clay Pipe, Perforated, Standard and Extra Strength	None	*C700-2002	SS-P-361E	None

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TABLE 1
STANDARDS FOR PRODUCT APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Concrete Low Head Pressure Pipe Reinforced	None	C361-2003a	None	None
Concrete Pipe, Perforated	None	*C444-2003	None	None
Concrete Pipe (Sewer, Storm Drain and Culvert) Non-reinforced	None	*C14-88	SS-P-371e-1968	None
Concrete Pipe, Pressure, Reinforced Concrete, Pretensioned Reinforcement	None	None	SS-P-381A(1)-1989	AWWA
(Steel Cylinder Type)			SS-P-381A(2)-1972	C303-37
Concrete Pipe (Culvert, Storm Drain, and Sewer) Reinforced	None	C76-89	SS-P-375d-1970	None
Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80	None	D1527-99	None NSF1	*See* ASTM D2774for underground instal-lation procedure
Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, (SDR-PR)	None	*D2282-99	None	NSF14-2003 *See* ASTM D2774 for underground installation procedure
Socket-Type Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40	None	*D2468-96a	None	NSF14-2003
Socket-type Acrylonitrile- Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 80	None	None	None	NSF 14-2003
Threaded Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 80	None	None	None	NSF 14-2003
Acrylonitrile-Butadiene-Styrene (ABS) Plastic Drain, Waste, and Vent Pipe	None	*D2661-2001	L-P-332B-1973	NSF 14-2003 *See* ASTM Appendix XI for installation procedures
Acrylonitrile-Butadiene-Styrene (ABS) Plastic Drain, Waste & Vent Pipe Schedule 40 with Cellular Core	None	F628-2001	None	NSF 14-2003 *See* ASTM Appendix A1 for installation procedures
Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and fittings	None	D2751-96a	None	NSF 14-2003 *See* ASTM D2321 for underground installation procedures

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TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings	None	*D2235-2001	None	NSF 14-2003
Polyethylene (PE) Plastic Pipe, Schedule 40	None	*D2104-2001	None	NSF-14-2003
				See ASTM D2774 for underground installation procedures
Non-Metallic Pipe and Fittings				
Polyethylene (PE) Plastic Pipe, Schedules 40 and 80 Based on Outside Diameter	None	D2447-2001	None	NSF14-2003
				See ASTM D274 for underground installation procedure
Polyethylene (PE) Plastic Pipe, (SIDR-PR) Based on Controlled Inside Diameter	None	*D2239-2001	L-P315c-1972	NSF 14-2003
			L-P-315c2-1975	*See* ASTM D2774 for underground installation procedures
Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	None	D3261-2003	None	None
Butt Fusion Polyethylene (PE) Plastic Fittings, Schedule 40	None	None	None	NSF 14-2003
Butt Fusion Polyethylene (PE) Plastic Pipe Fittings, Schedule 80	None	None	None	NSF 14-2003
Plastic Insert Fittings for Polyethylene Plastic Pipe	None	D2609-2000	L-F-001546-1968	NSF 14-2003
Crosslinked Polyethylene (PEX) Tubing	None	F876-99	None	NSF14/61
Crosslinked Polyethylene (PEX) Water Distribution Systems	None	F877-99	None	NSF14/61
Metal Insert Fittings with Copper Crimp Rings for use with PEX Tubing	None	F1807-97	None	NSF14/61
Cold Expansion Fittings with PEX Reinforcing Rings for use with PEX Tubing	None	F1960-99	None	NSF14/61
Cold–expansion Fittings with Metal Compression Sleeves for use with PEX Tubing	None	F2080	None	NSF 14/61
Stainless Steel Clamps for Securing SDR-9 PEX Tubing to Metal Insert Fittings	None	F2098	None	NSF 14/61
Polyethylene (PE) Plastic Tubing	None	D2737-2001	None	NSF 14-2003
				See ASTM D2774 For underground installation procedures

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NOTE: * A standard also listed or approved by ANSI.

TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution System	None	D2846-99	None	NSF 14-2003
				See ASTM Appendix X2 for Installation procedures
Socket-Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings) Schedule 40	None	F438-2001	None	NSF 14-2003
Socket-Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80	None	F439-2001	None	NSF 14-2003
Non-Metallic Pipe and Fittings				
Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120	None	*D1785-99	L-P-1035A-1974	NSF 14-2003
				See ASTM D2774 for underground installation procedures. *See* ASTM D2855 Section 4.2.14
Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings	None	D2855-96	None	None
Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-Series)	None	D2241-2000	None	NSF 14-2003
				See ASTM D2774 for underground installation Procedures. *See* Section 4.2.14
Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)	None	F442-99	None	None
Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80	None	F441-99	None	NSF 14-2003
				See ASTM D2846
Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core	None	F891-2000	*See* ASTM	NSF 14-2003
			Appendixes X1, X2 X3 for Storage, Joining and Installation Procedures.	
Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings	None	F493-97	None	None

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TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	**ANSI**	**ASTM**	**FS**	**OTHER**
Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40	None	*D2466-2001	None	NSF 14-2003
				See ASTM D2855. *See* Section 4.2.14
Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80	None	*D2467-99	None	NSF 14-2003
				See ASTM D2855. *See* Section 4.2.14
Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings	None	*D2564-96a	None	NSF 14-2003
				See ASTM D2855 *See* Section 4.2.14
Primers for Solvent Cement Joints (PVC)	F656-96a	None	None	None
Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80	None	F437-99	None	NSF 14-2003
Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80	None	*D2464-99	None	NSF 14-2003
Joints for IPS PVC Pipe Using Solvent Cement	None	*D2672-96a	None	NSF 14-2003
				See ASTM D2774 for underground installa-tion Procedures *See* ASTM D2855 *See* Section 4.2.14
Non-Metallic Pipe and Fittings				
Poly (Vinyl Chloride) (PVC) Plastic Drain Waste And Vent Pipe and Fittings	None	*D2665-2000	L-P-320a-1966	NSF 14
Draien, Waste, and Vent (DWV) Plastic Fittings Patterns	None	D3311-94	None	None
Typ PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	None	D3034-2001	None	D2321-74e
				See ASTM for under-ground installation procedures. *See* ASTM D2855. *See* Section 4.2.14
Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings	None	F789-95a	None	None
				See ASTM D2855. *See* Section 4.2.14
Underground Installation of Flexible Thermoplastic Sewer Pipe	None	D2321-2000	None	None
				See ASTM D2855 *See* Section 4.2.14

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TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Styrene-Rubber (SR) Plastic Drain	None	*D2852-2002	None	*See* ASTM D2321 for
				Pipe and Fittings Underground installation procedures
Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings	None	*D3122-95	None	None
3.25-In. Outside Diameter Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, Vent Pipe and Fittings	None	D2949-2000a	None	NSF 14
Thermoplastic Accessible & Replaceable Plastic Tube & Tubular Fittings	None	F409-99a	None	None
Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	None	D2729-96a	None	None
Corrugated Polyethylene (PE) Tubing and Fittings	None	F405-98	None	None
Pipe Jointing Materials and Gaskets, and Supports				
Caulking, Lead Wool and Lead Pig Compression Joints and Vitrified	None	None	QQ-C-40(2)1970	None
Clay Bell and Spigot Pipe	None	*C425-2002	None	None
Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals	None	*D3139-98	None	None
Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals	None	*D3212-96a	None	None
Fixture Setting Compound	None	None	TT-P-001536 (1968) Revision of HHC 536a-1954	None
Pipe Jointing Materials and Gaskets, and Supports				
Non-Metallic Gaskets for Pipe Flanges	None	None	None	ASME B16.21-92
Neoprene Rubber Gaskets for Hub Spigot Cast Iron Soil-Pipe and Fittings	None	C564-97	None	None
Pipe Hangers and Supports	None	None	WW-H-171d-1970	*MSS-SP-58-83
Rubber Gaskets for Cast Iron Soil-Pipe and Fittings	None	C564-97	None	None
Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings	A21.11-2000	None	None	*AWWA C111-2000
Rubber Gaskets, Molded or Extruded, for Concrete Non Pressure Sewer Pipe	None	*C443-2001	HH-G-160B-1968	None
Rubber Gaskets, Sheet	None	D-1330-2002	None	None
Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints	None	None	SS-S-00210:(1965)	None
Sealing Compound, Sewer, Bituminous, Two-Component, Mineral-Filled Cold Applied	None	None	SS-S-168(2)1962	None

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TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Plumbing Appliances				
Dishwashing Machines, Household	None	None	None	*UL 749-1997
				ASSE-1006-1989
Drinking Water Coolers, self-Contained, Mechanical Refrigerated	None	None	None	*UL399-2002
				*YK439-78
Food Waste Disposer Units, Household	None	None	QQ-G-001513-	*YK439-78
			1968	ASSE 1008-1989
Home Laundry Equipment	None	None	None	*UL 560-1986
				ASSE 1007-1992
**Water Heaters, Automatic Storage Type	Z21.10.1a-1998	None	None	None
**Water Heaters, Circulating Tank	Z21.10.3a-1998	None	None	None
**Water Heater, Electric storage Tank	None	None	W-H-196j(j)1971	*UL 174-1996
**Water Heater, Oil Fired Storage Type	None	None	None	*UL 732-1997
**Water Heater, Side Arm Type	Z21.10.1-1998	None	None	None
Plumbing Fixtures and Appurtenances				
Accessories (Land Use)	None	None		None
Bathtubs	A112.19.1M.1999	None		None
Plastic	Z124.1.1995			
Fittings, Plumbing fixtures	A112.18.1M-2003	None	None	
Hand Held Showers, Performance Requirements	None	None	None	*ASSE 1014-1990
Hydraulic Requirements for Water Closet and Urinals	A112-19.6-1995	None	None	None
Individual Shower Control Valves, Anti-Scald Type	None	None	None	*ASSE 1016-1996
Lavatories	None	None		None
Lavatory, Cultured Marble	Z124.3-1995	None	None	CMI LS-2
Lavatories, Plastic	Z124.3-1995	None	None	
Plumbing Fixtures, General Specification	None	None		None
Plumbing Fixtures, Enameled Cast Iron	A112.19.1M-1999	None	None	
With Supplement 1 – 1998 and Supplement 2 -- 2000				
Plumbing Fixtures, Stainless Steel	A112.19.32000	None	None	With Supplement 1
				2002
Plumbing Fixtures, Vitreous China	A112.19.2-1998	None	None	
With Supplement 1 – 2002				
Plumbing Fixtures, Enameled Steel	A112.19.4M-1994	None	None	
With Supplement 1 –1999 and Supplement 2 2000				
Pressurized Flushing Devices Plumbing Fixtures (Flushometers)	None	None	None	ASSE 1037-1990
Shower Baths and Heads and Water Control Valves	A112.18.12003	None	None	

NOTE: Standards on materials do not imply that these materials may be used for a specific service. Materials permitted for a specific service shall be specified under the various sections of 248 CMR.

NOTE: * A standard also listed or approved by ANSI.
** All Water Heaters must comply with M.G.L. c. 142

TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Plastic Shower Receptors and Shower Stalls	Z124.2-1995	None	None	None
Sinks, Kitchen and Service, and Laundry Tub	A112.19.2 2002	None	None	
	A112.19.3--2000 With Supplement 1-2002			
Supports for off-the-floor Plumbing Fixtures for Public Use	A112.6.1-2002	None	None	None
Thermostatic Mixing Valves, Self-Actuated for Primary Domestic Use	None	None	None	*ASSE 1017-2003
Urinals	None		None	A112.19.2 2003
Toilets (Vitreous China Plumbing Fixtures) (1.6 GPF Max.)	A112.19.2 2003	None	None	
Plastic Toilet Bowls & Tanks (1.6 GPF Max.)	Z124.4-1996	None	None	None
Whirlpool Bathtub Appliances Suction Fittings for use in Whirlpool	A112.19.7-1995	None	None	None
Bathtub Appliances	A112.19.8-1996	None	None	None
Backflow Preventers				
Air Gap Standards	A112.1.2-2002	None	None	None
Air Gap Drains for Domestic Dishwashers	None	None	None	ASSE 1021-2002
Vacuum Breakers, Anti-Siphon	None	None	None	ASSE 1001-2002
Vacuum Breakers, Hose Connection	None	None	None	*ASSE 1011-1993
Double Check with Intermediate Atmospheric Vent	None	None	None	ASSE 1012-2002
Reduced Pressure Principle Backflow Preventer	None	None	None	ASSE 1013-1999
Double Check Valve, Back Pressure, Backflow Assembly	None	None	None	ASSE 1015-1999
Wall Hydrants, Freezeless, Automatic Draining, Anti-Backflow Type	None	None	None	*ASSE 1019-1999
Vacuum Breakers, Pressure Type	None	None	None	ASSE 1020-1994
Diverters for Plumbing Faucets with Hose Spray Anti-Siphon Type, Residential Application	None	None	None	ASME A112.18.1-
Miscellaneous and Installation Standards				
Arrestors, Water Hammer	None	None		ASSE 1010-1982
Toilet, Flush Tank, Fill Valves (Ballcocks)	None	None	None	*ASSE 1002-1999
Enamel, Coal-Tar (Protective Coating)	None	None	None	*AWWA C203-91a
Chlorinated Polyethylene (CPE) Sheeting for Concealed Water Containment				*AWWA C210-2003
Membrane	None	D4068-2001	None	None

NOTE: Standards on materials do not imply that these materials may be used for a specific service. Materials permitted for a specific service shall be specified under the various sections of 248 CMR.

NOTE: * A standard also listed or approved by ANSI.

TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	**ANSI**	**ASTM**	**FS**	**OTHER**
Clamps, hose	None	None	WW-C-440B(a)-	None
			1969	
Coating, Pipe, Epoxy, Fusion Bond	None	None	None	*AWWA C213-2001
Coating, Pipe, Thermoplastic Resin or Thermosetting, Epoxy	None	None	L-C-530B-1970	None
Connector, Water, Flexible Copper	None	None	None	IAPMO PS-14-99
Copper, Sheet and Strip for Building Construction	None	B370-98	None	None
Clay Pipe, Installation	None	*C12-2003	None	None
Clay Pipe, Testing	None	*C301-98	None	None
Cross-linked Polyethylene tubing	None	None	None	NSF 14 and 61
Drain, Floor	A112.6.3-2001	None	None	None
Drain for Prefabricated and Precast Showers	None	None	None	IAPMO PS-4-2000
Drain, Roof	A112.6.4-2003	None	None	None
Flux	None	B813-2000el	None	None
Lead, Sheet, Grade A	None	None	QQ-L-201f(2)1970	None
Plugs, Metallic Cleanout	A112.36.2-2002	None	None	None
Relief Valves	Z21.22-1999	None	None	None
Recommended Practice for Making Solvent Cemented Joints with Polyvinyl Chloride (PVC) Plastic Pipe and Fittings	None	*D2855-96	None	None
Reducing Valves, Water Pressure for	None	None	None	ASSE 1003-2002
Safe Handling of Solvent Cements Used for Joining Thermoplastic Pipe and Fittings Solder, Soft	None	F402-99	None	None
Shower Pan Liner	A118.10-93	None	None	None
Tape, Pipe Coating, Pressure Sensitive Polyethylene	None	None	L-T-0075(1)-1966	None
Tee, Diversion and Twin Waste Elbow	None	None	None	IAPMO PS-9-84
Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings	None	*F409-200.	None	NSF 14-2003
Underground Installation of Flexible Thermoplastic Sewer Pipe	None	*D2321-2000	None	None
Underground Installation of Thermoplastic Pressure Piping	None	*D2774-2001	None	None
Trap Seal Primer Valves, Water Distribution Type	None	None	None	ASSE 1018-2001
Drainage Type	None	None	None	ASSE 1044-2001
Valve, Backwater	A112.14.1-1975	None	None	IAPMO PS-8-77
Valve, Drain, Water eater	None	None	None	ASSE 1005-1999

Water Treatment Devices				
Activated Carbon Filter	None	None	None	WQA S200-2000
				NSF 42-2002
				NSF 53-2002

NOTE: Standards on materials do not imply that these materials may be used for a specific service. Materials permitted for a specific service shall be specified under the various sections of 248 CMR.

NOTE: * A standard also listed or approved by ANSI.

TABLE 1 (Continued)
STANDARDS FOR PRODUCT- APPROVED PLUMBING MATERIALS AND EQUIPMENT

Description	ANSI	ASTM	FS	OTHER
Reverse Osmosis	None	None	None	WQA S300-2000
				NSF 58-2002
Distiller	None	None	None	WQA S400-2000
				NSF 42-2002
				NSF 53-2002
Water Filter	None	None	None	WQA S200-2000
				NSF 42-2002
				NSF 53-2002
Water Softener	None	None	None	WQA S100-2000
				NSF 44-2002
Water Vending Machine	None	None	None	NAMA Section 900-2001

NOTE: Standards on materials do not imply that these materials may be used for a specific service. Materials permitted for a specific service shall be specified under the various sections of 248 CMR.

NOTE: * A standard also listed or approved by ANSI.

(d) Identification. Materials shall be identified as provided in the standard to which they conform.

(2) Allowable Materials.

(a) When installing fittings or piping for renovations or alterations within an existing soil stack, waste stack, vent stack or drain, the fitting or piping shall be of the same material as the existing stack or drain and be compliant with a joining method outlined in 248 CMR 10.07. Exception: In new residential construction cast iron pipe may be used exclusively with PVC for sound reduction.

(b) Sheet Lead. shall meet the following requirements:

1. For a safe pan the sheet lead shall not be less than four pounds per square foot.
2. For vent terminal flashing the sheet lead shall not be less than three pounds per square foot.
3. For bends or traps the sheet lead shall not have less than an ⅽ inch wall thickness.

(c) 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.

(d) Floor Flanges. A floor flange used for a toilet or other similar fixture shall conform to the following requirements.

1. If the flange is composed of brass, the flange shall have a minimum thickness of ⅽ inch.
2. If the flange is composed of cast iron the flange shall have a minimum thickness of ¼ inch, and the minimum caulking depth shall be two inches.
3. If the flange is composed of hard lead, it shall weigh at least one pound nine ounces and be composed of lead alloy with not less than 7.75% antimony by weight.
4. Copper and plastic flanges may be used.
5. A plastic flange must meet current NSF Standards and shall be of the same material to which it connects.

6. A flange shall be secured to the finished floor on which it sets by screwing or bolting and shall be connected to the specific piping by soldering, caulking or solvent welding as provided for in 248 CMR 10.07.

(e) Cleanouts. Cleanout plugs shall meet the following requirements.

1. Shall be composed of brass or plastic.
2. Shall meet the latest 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. A plastic cleanout plug shall be of the same material to which it connects.

(f) Building Drains (Inside Building). When the Sanitary Drain or Storm Drain is installed in a trench excavated to a uniform width and level and the trench will also encompasses the water service pipe, the drain piping shall be bell and spigot cast iron tarred soil pipe with lead and oakum joints.

(g) Storm and Sanitary Below Ground. The following materials may be used for storm and sanitary piping that is located below ground level, except for materials that are to be used for Special Hazardous Wastes (for Special Hazardous Wastes, *See* 248 CMR 10.13).

1. Extra heavy cast iron soil pipe and fittings, coated tar or asphaltum may be used provided that the joints are made with packed oakum and molten lead or resilient gaskets.
2. Iron size brass or copper pipe with cast brass drainage fittings.
3. Hard drawn type K or L copper tubing, with cast brass drainage pattern fittings.
4. Copper alloy tubing "Heavy" weight conforming to ASTM Standard, color coded aqua and incised marked as "Heavy" with cast brass drainage pattern fittings.
5. Grade H or SL copper coated stainless steel tubing conforming to ASTM Standard, made of Type 430 or Type 439 stainless steel, marked in conformance with 248 CMR 10.06(2)(q); provided that the fittings are cast in the brass drainage pattern.
6. ABS (Acrylonitrile-Butadiene-Styrene) Schedule 40 pipe and fittings as specified under 248 CMR 10.06(2)(p).
7. PVC (Polyvinyl-Chloride) Schedule 40 pipe and fittings as specified under 248 CMR 10.06(2)(o).
8. Epoxy re-enforced fiberglass piping system may be used only for storm water drainage.
9. Service weight cast iron soil pipe and fittings provided that the tarred or plain joints are made with packed oakum and molten lead or resilient gaskets.
10. Hubless Cast Iron Soil Pipe and Fittings.

a. Hubless cast iron soil pipe and fittings may be used if they are manufactured in accordance with CISPI Standard 301-75; and the following test requirements are satisfied:

(i) Every manufacturer shall perform the pressure and leak test as required under 248 CMR 10.06(2)(v).

(ii) Deflection Test. A test deflecting the free end of a ten-foot length of hubless cast iron soil pipe joined together with a coupling to a secured length of pipe. The test assembly shall be subjected to an internal hydrostatic pressure of ten P.S.I.G and a minimum deflection of one-inch per lineal foot and shall show no visible signs of leakage.

(iii) Shear Test. The shear test requires the application of a uniformly distributed force or weight of 50 pounds-per-inch of nominal diameter of the pipe over an arc of 120°, along a longitudinal distance of 12 inches of the unsupported end of the two coupled lengths of pipe immediately adjacent to the assembled joint. The opposite end of the test assembly shall be rigidly secured and the entire unit shall be under an internal hydrostatic pressure of ten P.S.I.G. and shall show no visible signs of leakage.

(iv) All tests shall be performed in the Commonwealth of Massachusetts and certified as per 248 CMR 10.06(2)(v)5.

b. Installations. Installations of hubless systems underground shall conform to 248 CMR 10.05(1)and (2)(a) through (d) and 10.06(1)(b).

c. Trenching, Tunneling and Backfilling. Trenching, tunneling and backfilling procedures for hubless systems underground shall conform to 248 CMR 10.05(5)(a) through (d) and 10.06(2)(g)10.d.

d. Hangers and Supports for hubless cast iron soil piping shall conform to the following requirements.

(i) General piping shall be installed with provisions for expansion, contraction or structural settlement.

(ii) Material. Hangers, anchors and supports shall be composed of metal having sufficient strength to support the piping and its contents, except that piers may be composed of concrete or brick.

(iii) Attachments to Buildings or Structures. Hubless cast iron soil pipe shall be supported in accordance with the manufacturer's recommendations or as outlined in the most recent edition of the Cast Iron Soil Pipe Institute (CISPI) Handbook.

(iv) Base of Stacks. Bases of stacks shall be supported on concrete, brick laid in cement mortar or metal brackets attached to the building or structure.

(v) Hubless Fittings.

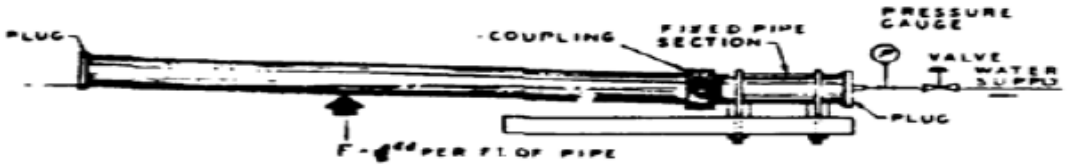
i. There shall be a hanger installed at each change of direction.

ii. When joining three or more fittings, there shall be a minimum of one hanger for every three-feet or part thereof.

(vi) Backfilling. The on-site licensed plumber or the holder of the permit for the underground hubless cast iron soil piping system shall notify the Inspector when the installation is to be backfilled. A licensed plumber shall be present during the backfilling procedure including when all concrete slabs are being poured. This notification provision shall not be subject to the 48 hour notice requirement of 248 CMR 3.05(3)(b).

11. Ductile pipe and approved compatible drainage fittings.
12. For Limited Use Only: Schedule 40 PVC, *See* 248 CMR 10.06(2)(o).

DEFLECTION TEST

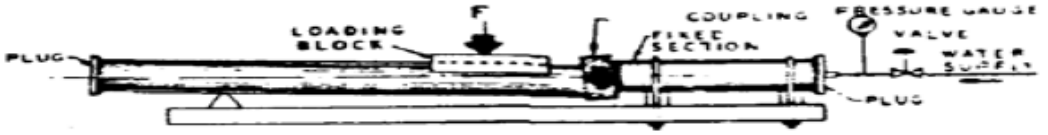


PROCEDURE: the free end of the 10ft. length of pipe was deflected 1" per foot of pipe length, while the length of pipe, on the other side of the coupling, was secured. The test assembly was subjected to an internal hydrostatic pressure of 10 PSI during the test.

RESULTS:

1½" coupling	no leakage was noted
2" coupling	no leakage was noted
3" coupling	no leakage was noted
4" coupling	no leakage was noted
5" coupling	no leakage was noted
6" coupling	no leakage was noted
8" coupling	no leakage was noted
10" coupling	no leakage was noted

SHEAR TEST



PROCEDURE: A force of 50 pounds per inch of nominal diameter of pipe per 12 inch longitudinal distance was applied over an arc of 120° and along the longitudinal dimension of the unsupported end of the two coupled lengths of pipe. The other end of the test assembly was rigidly secured. A Unite-O-Matic Universal Tester, with a load cell and a recorder, was used to apply the load. The load was held for one hour. the test assembly was subjected to an internal hydrostatic pressure of 10 PSI during the test. The maximum deflection of the coupling joining the two pieces of pipe was also noted.

RESULTS:

	Maximum Coupling Deflection
1½" coupling	no leakage
2" coupling	no leakage
3" coupling	no leakage
4" coupling	no leakage
5" coupling	no leakage
6" coupling	no leakage
8" coupling	no leakage
10" coupling	no leakage

(h) Storm and Sanitary Above Ground. The following materials may be used for storm and sanitary piping that is located above ground level, except the following materials shall not be to be used for Special Hazardous Wastes (for Special Hazardous Wastes, *See* 248 CMR 10.13).

1. Extra heavy cast iron soil pipe and fittings, tarred or plain provided that joints are made with packed oakum and molten lead or resilient gaskets.
2. Service weight cast iron soil pipe and fittings provided that tarred or plain joints are made with packed oakum and molten lead or resilient gaskets.
3. Hubless cast iron soil pipe and fittings that are manufactured in accordance with CISPI Standard 301-75, and joined with a product approved clamp.
4. Iron size brass or copper pipe with cast brass drainage fittings.
5. Hard drawn Type K, L, M or DWV copper tubing having cast brass or wrought copper drainage pattern fittings;
6. Copper alloy tubing "Heavy" and "Standard" weights conforming to ASTM Standard, color coded aqua and incised marked as either "Heavy" or "Standard" having cast brass or wrought copper drainage pattern fitting.
7. Grades H, G, SL or SM copper coated stainless steel tubing conforming to ASTM Standard, manufactured of Type 430 or Type 439 stainless steel that are plainly marked in conformance with 248 CMR 10.06(2)(q) and provided that the relevant fittings are cast in a brass or wrought copper drainage pattern.
8. Schedule 40 galvanized wrought iron or galvanized steel pipe provided that for sizes greater than two inches it has a plain or galvanized drainage pattern fittings.
9. Schedule 40 galvanized wrought iron or galvanized steel pipe for cases when pipe and fittings are end grooved and are to be joined with an approved split and bolted galvanized steel coupling with gasket;
10. Groove type couplings and fittings for applications that join storm water piping.
11. ABS (Acrylonitrile-Butadiene-Styrene) Schedule 40 pipe and fittings as specified under 248 CMR 10.06(2)(p).
12. PVC (Polyvinyl-Chloride) Schedule 40 pipe and fittings as specified under 248 CMR 10.06(2)(o).
13. For Storm Water Drainage Only. Approved epoxy re-enforced fiberglass piping system.
14. Aluminum DWV pipe with pipe end cap protectors manufactured and installed with hubless cast iron fittings manufactured according to CISPI Standard 301 and joined with a Product-approved stainless steel no hub pipe clamp and elastomeric sealing sleeve.
15. Ductile pipe and approved compatible drainage fittings.

(i) Vent Pipe and Fittings Below Ground. All materials listed under 248 CMR 10.06(2)(g)1. through 10.06(2)(g)11 may be used.

(j) Vent Pipe and Fittings Above Ground. For vent pipe and fitting above ground the following materials may be used.

1. All materials listed under 248 CMR 10.06(2)(h)1. through 10.06(2)(h)15.
2. Galvanized wrought or galvanized steel pipe not lighter than schedule 40, with cast iron or malleable iron screw or grooved end fittings, plain or galvanized.

(k) Water Service Piping (Outside Building). The materials used shall be those specified by the local municipality.

(l) Water Distribution Piping Below Ground (Inside Building). For water distribution piping that is installed inside a building and below ground, only the following materials may be used.

1. Type K or L tubing incised marked with cast brass fittings.
2. Copper alloy tubing "Heavy" weight conforming to ASTM Standard, color coded aqua and incised marked as "Heavy" with cast brass fittings.
3. Copper core pre-insulated cement pressure pipe that is PVC coated.
4. Any pipe, valve, pipe fitting, aerator, or faucet used in a potable water system shall comply with all applicable NSF-61 Standards.
5. Cross-linked Polyethylene (PEX) tubing and fittings installed in accordance with 248 CMR 10.06 and 248 CMR 10.08.

(m) Water Distribution Piping Above Ground (Inside Building). For water distribution piping that is installed inside a building and above ground, only the following materials may be used:

1. Iron size brass or copper pipe with cast brass fittings.
2. Type K or L hard drawn copper tubing that is incised marked and has cast brass or wrought copper fittings.
3. Copper alloy tubing "Heavy" and "Standard" weight incised marked, color coded aqua, conforming to ASTM Standard and having cast brass or wrought copper fittings.
4. Exposed galvanized wrought iron or galvanized steel pipe and galvanized fittings only when used for replacement in existing buildings or structures or when used for replacement of large size water mains.
5. CPVC (Chlorinated Polyvinyl Chloride) pipe and fittings may be used in the following situations provided that none of this material is located within 24 inches of any connection to a hot water tank as defined in M.G.L. c. 142, § 17:
   a. for hot and cold water distribution that is located only in the dwelling portion of a residential dwelling, multiple family dwelling, hotel, motel, inn, condominium and similar building six stories or 60 feet in height; or
   b. for the exclusive cold water supply distribution beginning at the outlet of the water meter (or the control valve inside a building) directly dedicated to a drinking water fountain(s) in state licensed or accredited school buildings only.
6. Mechanically grooved pipe couplings and fittings when the following requirements are satisfied.
   a. The couplings and fittings are used with exposed galvanized wrought iron pipe or exposed galvanized steel pipe on water supply distribution systems provided that the water supply systems operating condition temperature will not exceed 130°F.
   b. The coupling housings and fittings are cast of malleable galvanized iron as described in ASTM A-47 or all products that meet the requirements of ASTM A-269.
   c. The elastomeric gasket for the coupling has properties as designated by ASTM D-2000.
7. Cross-linked Polyethylene (PEX) Tubing and Fittings.
   a. PEX may be used for residential dwellings/ buildings if the installation conforms to the following requirements:
      i. The PEX tubing is used for hot and cold water distribution in residential dwelling/buildings up to and including three stories in height.
      ii. PEX tubing shall not be installed closer than 24-inches to any connection to a direct-fired water heater, tankless type hot water coil or heating boiler.
      iii. Mechanical compression type fittings shall not be concealed and must be accessible.
      iv. Fittings meet one of the ASTM, (standards for the fittings) listed in 248 CMR 10.06: *Table 1* unless otherwise Product-approved by the Board as provided for under 248 CMR. 3.04.
      v. PEX tubing and fittings shall be installed in accordance with the manufacturers recommendations and meet the U.L. flame spread requirements for return air plenums in commercial buildings in accordance with 780 CMR: *The Massachusetts State Building Code*.
   b. PEX tubing and fittings shall be used in commercial buildings if the installation conforms to the following requirements:
      i. PEX tubing is used in a commercial building for the purpose of conveying reverse osmosis or other similar technology processes that produce ("purified water" 248 CMR 10.03), from the point of treatment to a point or multiple points of use for drinking water.
      ii. PEX tubing shall be installed at a point which, begins on the outlet side of a Product-Approved reverse osmosis, ("purified water") drinking water device and terminates at a point or multiple points of use *e.g.* Product-approved dispensers and faucets.

iii. PEX tubing and fittings are not to be used for steam flushing of water purification systems. Only type 316 stainless steel tube and fittings shall be used for this purpose.

8. Polybutylene or polyethylene tanks when used for Storage Heaters and when the tanks have been reinforced with a Product-Approved material.

9. 316 stainless steel tanks when used for storage heaters.

10. Polybutylene, polyethylene, natural polypropylene, Type 1 Grade 1 polyvinyl chloride meeting ASTM standard D 1784 and D 1785, schedule 40 or 80 and cross-linked polyethylene shall be used for the purpose of conveying reverse osmosis purified water from a point of purification to a final point of use.

11. The use of a Product-Approved polypropylene homopolymer drain tube assembly that is designed to be vertically mounted in the downturned outlet of a horizontally mounted relief valve provided that the capacity of the relief valve served by the approved drain assembly does not exceed 100,000 BTU per hour.

12. Any pipe, valve, pipe fitting, aerator, or faucet used in a potable water system shall comply with all applicable NSF-61 Standards.

(n) Pipe, Fittings and Gaskets. Resilient gaskets specified for use with cast iron soil pipe shall be marked as follows.

1. The exposed lip shall be marked clearly and legibly to include:
   a. Manufacturer's name and/or registered trade-mark;
   b. Neoprene;
   c. Date of manufacture; and
   d. ASTM standard.

2. Gaskets for service weight cast iron soil pipe shall bear the letters "SV" on the exposed lip.

3. Gaskets for extra heavy cast iron soil pipe shall bear the letters "XH" on the exposed lip.

(o) PVC Plastic Pipe and Fittings. The following requirements apply to PVC plastic pipe and fittings.

1. PVC 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, except where provided for elsewhere in 248 CMR 10.06, *i.e.* 248 CMR 10.06(2)(o)2.

2. PVC, Schedule 40 Pipe and Fittings, may be used for the drains, waste and vent piping that serve the sanitary or storm drainage systems in the following buildings:
   a. residential dwellings;
   b. assisted living facilities;
   c. hotels;
   d. motels;
   e. inns;
   f. condominiums; and
   g. other residential buildings that are similar to 248 CMR 10.06(2)(o)2.a. through 10.06(2)(o)2.f. and that are no greater than ten stories in height.

3. Limited use of PVC for Commercial Buildings. PVC pipe and fittings may be installed for limited purposes in commercial buildings or establishments, provided that the following requirements are satisfied.
   a. PVC is used for the drains, waste, or vents when the piping serves only the fixtures that are necessary to accommodate waste generated as a direct result of the conduct of business that is particular to the type of commercial establishment itemized in 10.06(o)(3)b.
   b. PVC Schedule 40 may by used in the following buildings:
      i. beauty salons;
      ii. barber shops;
      iii. manicure salons;
      iv. pedicure salons;
      v. photo-labs; and

vi. in commercial buildings that incorporate patron areas for the purpose of serving alcohol, soda or other similar carbonated type beverages where the carbonated liquid waste shall drain directly into a floor sink or floor drain.

c. The PVC Schedule 40 shall be installed in compliance with the following:

i. No PVC schedule 40 pipe and fittings may be used for the toilet fixtures and other plumbing connections in the building.

ii. The piping shall be connected to a main drain or branch drain from other fixtures to provide a point of waste dilution.

iii. A label shall be affixed at the point of dilution that reads "Limited Use Waste Drain" in one inch high lettering shall identify the piping.

iv. The 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.

4. Use of PVC Schedule 40 for Dialysis Equipment. Type 1 PVC pipe and fittings may be used as indirect waste piping for dialysis equipment in medical buildings.

5. PVC Schedule 40 perforated pipe may be used for subsoil drainage in commercial buildings.

6. Pipe and Fittings shall be manufactured from Type I, Polyvinyl Chloride (PVC) materials having a deflection temperature of 169 degrees under a load of 264 P.S.I.G. when tested in accordance with ASTM D-648.

7. PVC materials shall be classified as self-extinguishing when tested in accordance with ASTM D-635 and have a flame spread rating of 0-25 when tested in accordance with ASTM E-84.

8. PVC materials shall meet the requirements of ASTM, CS, and/or NSF Standards.

9. At the request of the Board, the manufacturer of PVC pipe shall submit to the Board the results of tests conducted by an Approved-testing-lab in compliance with 248 CMR 3.00.

10. Identification of PVC Pipe.

a. The pipe shall be in a light color such as beige, buff, grey, white, cream, and shall be marked in accordance with listed standards.

b. The following Listed Standards shall appear on opposite sides of the pipe: Schedule 40, "Size", PVC, DWV-NSF stamp of approval, manufacturer's name and registered trademark, Type and Grade.

11. Pipe and Fittings.

a. Identification of Fittings. Fittings shall be in light color as for pipe and shall bear the following markings by molding on the body or hub:

i. Manufacturer's name or registered trademark;

ii. NSF-DWV stamp of approval;

iii. PVC 1; and

iv, Size.

b. Use PVC fittings ONLY with PVC pipe and ABS fittings ONLY with ABS. NEVER use PVC solvent weld on ABS pipe or ABS solvent weld on PVC pipe.

12. Transition Fittings. Fittings used to connect PVC to other Product-approved materials shall meet the proper standard and comply with the requirements of 248 CMR 3.04:

13. Installation. The following installation requirements and procedures shall be followed when assembling PVC and ABS piping materials.

a. Solvent Welded Joint.

i. Clean joining surfaces of pipe and fitting with PVC primer.

ii. With a natural bristle brush one inch or larger, apply a heavy coat of solvent cement to the pipe joining surface and then a light coat to the socket joining surface.

iii. Immediately insert the pipe to the full socket depth while rotating the pipe fitting ¼ turn to insure even distribution of solvent cement.

iv. Wipe excess solvent cement from the outside of the pipe at the shoulder of the fitting.

v. Do not turn pipe spigot in the socket while wiping.

vi. If a fillet or bead of solvent cement is not visible after a joint is assembled, a heavier coat of solvent cement should be used on the pipe spigot.

vii. The assembly can be handled with care within two minutes.

vii. Do not attempt to adjust the joint after the solvent cement has set or damage will result.

ix. Pipe and fittings conforming to these standards will normally have an interference fit, which maintains pressure between the joining surfaces during the solvent cementing process. Fittings that do not have an interference fit shall have not more than 0.009 inch clearance to produce strong watertight joints.

x. (NOTE --- CAUTION!) When using primers and solvents for plastics, plumbers and apprentices shall always follow directions carefully and be in a well ventilated area.

xi. The solvent cement shall conform to the requirements of ASTM D2564-67 or CS 272-65 latest issue. The cleaner is a solvent that has a limited effect on PVC but will remove dirt and grease. The solvent cement shall be labeled with the NSF Seal of Approval.

b. Threaded Joints (I.P.S.). When threads are required or used for connecting PVC-DWV pipe to other materials:

i. do not thread the pipe use proper PVC male or female threaded adapters for transitioning;

ii. note that threaded joints in a PVC-DWV system are primarily used for trap connections and clean out plugs.

14. Supports.

a. Conventional pipe clamps, brackets or strapping that have a bearing width of ¾ inch or more are suitable supports.

b. Supports for horizontal runs of pipe 1½ inches or less in diameter shall be at three-foot centers as a maximum.

c. Supports for larger diameters shall have a maximum spacing at four-foot centers.

d. Trap arms shall be supported at the trap discharge.

e. Vertical pipes shall be supported at each story height but not more than ten-foot intervals and elsewhere as required to maintain alignment.

f. All supports shall permit expansion and contraction of the pipe without binding.

g. Horizontal piping shall be supported at each change of direction.

15. Thermal Expansion.

a. Thermal expansion of PVC pipe occurs at the rate of approximately d inch per ten feet length per 100°F temperature change.

b. In a PVC-DWV system an expansion allowance of ½ inch per ten feet length of pipe is required.

c. Expansion fittings utilize a rubber o-ring that shall be lubricated with grease, petroleum jelly or other water-resistant grease to facilitate assembly.

d. Protect the operating end of the expansion fitting from grime.

e. Expansion joints shall be provided at every other branch interval up to and including ten stories in height.

f. The expansion fitting shall be installed in a accessible location in horizontal runs exceeding 20 feet in length.

g. Expansion joints shall not be required underground.

h. Expansion fittings shall be installed as designed in proper alignment with the piping being served.

i. The expansion joint shall be set for the maximum expansion or contraction rate based on the installation temperature and manufacturer's recommendations.

16. Roof Flashing. The piping that penetrates through the roof shall be made weather tight with an approved flashing.

17. Lead Joints.

a. The piping shall be connected to cast iron soil pipe hubs using oakum and no less than one-inch of molten lead.

b. Caulk the joint along the inside and outside edges after it has cooled for four minutes.

18. Sleeving.

a. The piping that penetrates concrete floors slabs or concrete walls shall be provided with sleeves. Maintain an annular space of one-inch between the pipe and sleeve.

b. Pipes that penetrate concrete slabs placed on grade shall also provide a sleeve. Maintain an annular space of one-inch between the pipe and sleeve.

19. Piping Trench Installations.

a. Prepare a smooth, uniformly compacted trench bottom using sand. 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 sand or other fine granular material, 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 the above four sentences shall be the responsibility of the on-site licensed plumber.

20. Installation Through Fire-walls or Rated Fire Separation Walls.

a. 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 20 inches on each side of the wall, floor or ceiling. The metal sleeve shall be 18 gauge (.040 in.) or heavier.

b. The annular space between the metal sleeve and the piping shall be sealed with approved non-combustible fire retardant material installed in accordance with 780 CMR: *The Massachusetts State Building Code*.

c. Alternate procedures and devices for fire-stopping may be used if installed in accordance with 780 CMR: *The Massachusetts State Building Code*.

d. The piping connections that penetrate fire-walls and ceilings in one and two family passenger car garages located beneath dwelling units are exempt and are not required to be encased.

e. 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.

(p) ABS Plastic Pipe and Fittings. The following requirements apply to ABS plastic pipe and fittings:

1. ABS shall not be used for drains, waste, or vents in the commercial kitchens, laundry rooms, public restrooms or other commercial areas located in assisted living facilities, hotels, motels, inns and similar establishments except where provided for elsewhere in 248 CMR 10.06, *i.e.* 248 CMR 10.06(2)(p).

2. ABS - DWV (Acrylonitrile - Butadiene - Styrene) Schedule 40 Pipe and Fittings, may be used only for the drains, waste and vent piping that serve the sanitary or storm drainage systems in the following buildings:

a. residential dwellings;
b. assisted living facilities:
c. hotels;
d. motels;
e. inns;
f. condominiums; and
g. other residential buildings that are similar to 248 CMR 10.06(2)(p)2.a. through 10.06(2)(p)2.f. and that are no greater than ten stories in height.

3. Limited use of ABS for Commercial Buildings: ABS pipe and fittings may be installed for limited purposes in commercial buildings or establishments, provided that the following requirements are satisfied.

a. ABS is used for the drains, waste, or vents when the piping serves only the fixtures that are necessary to accommodate waste generated as a direct result of the conducts of business that is particular to the type of commercial establishment as itemized in 10.06(2)(p)3.b.

b. ABS may be used in the following buildings:

i. beauty salons;
ii. barber shops;
iii. manicure salons;
iv. pedicure salons;
v. photo-labs; and
vi. in commercial buildings that incorporate patron areas for the purpose of serving alcohol, soda or other similar carbonated type beverages where the carbonated liquid waste shall drain directly into a floor sink or floor drain.

c. The ABS Schedule 40 shall be installed in compliance with the following:

i. No ABS schedule 40 pipe and fittings may be used for the toilet fixtures and other plumbing connections in the establishment.
ii. The piping shall be connected to a main drain or drain from other fixtures to provide a point of waste dilution.
iii. A label at the point of dilution that reads "Limited Use Waste Drain" in one inch high lettering shall identify the piping.
iv. The vent piping from the fixture discharging limited use waste shall extend to a point six inches above the flood rim of the fixture and then shall transition back to compliant material in a commercial building.

4. Installation. ABS-DWV pipe and fittings shall be installed

a. using the same methods and requirements as stated in:

i. 248 CMR 10.06(2)(o)13.a.ii. through x.;
ii. 248 CMR 10.06(2)(o)12.; and
iii. 248 CMR 10.06(2)(o)14. through 18.

b. In addition, the following requirements shall be satisfied:

i. For solvent welded joints clean joining surfaces of pipe and fittings shall be made with an ABS primer.
ii. Expansion joints are not required.
iii. An ABS solvent that is recommended by the manufacturer that meets the required standard shall be used for solvent welding or cementing in connecting the ABS materials.
iv. The solvent cement shall conform to the requirements of ASTM D2564-67 or CS 272-65 latest issues. The cleaner is a solvent that has a limited effect on ABS but will remove direct and grease. The solvent cement shall be labeled with the NSF Seal or Approval.

5. Identification of Pipe and Fittings.

a. Identification of Pipe and Fittings. The pipe and fittings shall be black in color and shall be marked in accordance with listed standard. The following markings shall appear on two (opposite) sides of the pipe:

i. ABS-DWV Schedule 40 and the listed standard;
ii. NSF-DWV stamp of approval;
iii. Manufacturer's name and/or registered trademark;
iv Type;
v. Grade; and
vi. Size.

b. Use PVC fitting ONLY with PVC pipe and ABS fittings ONLY with ABS pipes. NEVER use PVC Solvent weld on ABS or ABS solvent weld on PVC.

(q) Stainless Steel Tube Marking. Stainless steel tubing shall be in conformance with ASTM designated standard, Type 430 or Type 439, and shall meet the following marking requirements:

1. Tubing Grade H or SL shall be color-coded blue.
2. Tubing Grade G or SM shall be color-coded red.
3. Tubing shall be marked at intervals no greater than three feet in length in letters not less than 1/8 inch in height, with the following:

a. manufacturer's name or registered trademark; and
b. the ASTM designation nominal diameter and grade.

4. The name of the manufacturer shall be permanently incised in each tube at intervals not greater than 18 inches in length.

(r) Urinal Wastes. Urinal waste branches and urinal fixture wastes shall conform to the following:

1. They shall be made of:
   a. extra heavy or service weight cast iron soil pipe and fittings with caulked joints
   b. threaded cast iron pipe with cast iron drainage fittings; or
   c. iron size copper or brass pipe with cast brass drainage fittings.
2. Resilient gaskets and no hub clamps with elastomeric sealing sleeves shall not be used when in direct contact with urinal wastes drains or branches until a intersecting point of dilution with other fixtures in the drainage system is attained.
3. PVC and ABS schedule 40 plastic pipe and fittings may be used only in residential type buildings. (Refer to 248 CMR 10.07(4)(f) for (alternative) schedule 80 nipple requirements for carriers.)

(s) Sumps and Tanks for Sewage. All sumps and tanks for receiving sewage removed by mechanical or ejector methods, shall be constructed as follows:

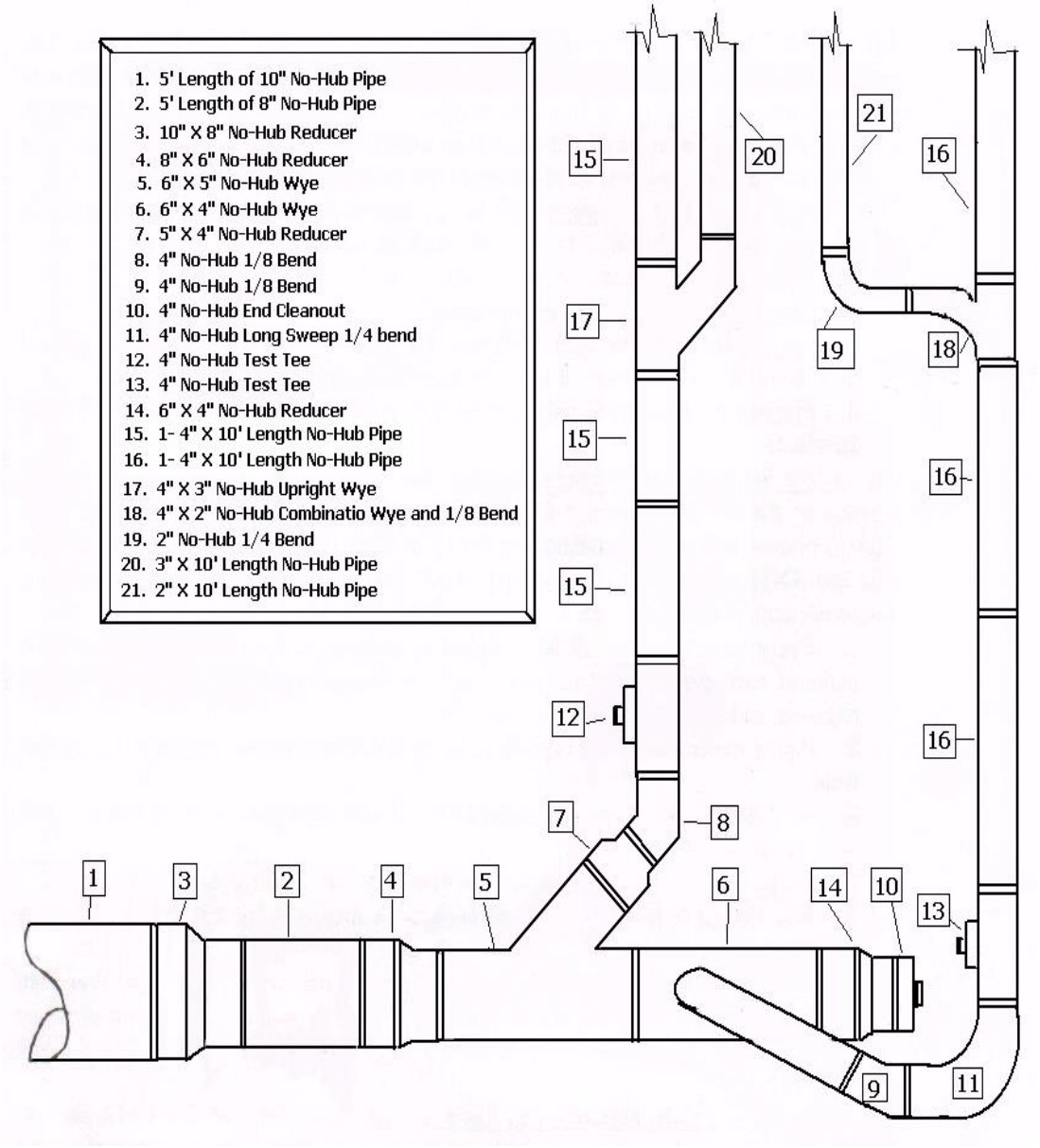
1. Concrete. Three-inch minimum wall.
2. Cast Iron. Minimum ¼ inch thickness.
3. Steel.
   a. Minimum ⅛ inch thickness for above ground.
   b. For below ground installation the sump or tank shall be encased in concrete having a thickness of at least three-inches.
4. Fiberglass. Reinforced polyester resin glass fibers that comply with ANSI listed standards.

(t) Single Stack Sanitary Drainage System-("So-Vent"). An engineered single stack system employing the use of aerator and de-aerator fittings, designed in compliance with *Cast Iron Sovent Design Manual No. 802* and ANSI standard ASME/ANSI B16.45-87 may be used in buildings provided the following requirements are satisfied:

1. Every such system shall be:
   a. designed or engineered by a qualified person;
   b. plans of such system shall be approved by a Massachusetts registered professional engineer; and
   c. Special-Permission must be sought and granted by the Board pursuant to 248 CMR 3.04 before installation of such system.
2. Piping material shall be Type K, L, M, or DWV hard drawn copper tubing or cast iron.
3. All fittings shall be made of cast brass or drawn wrought copper or cast iron and must be of DWV design.
4. No part of a copper system shall receive the waste from urinals.
5. Any change or redesign in the So-Vent system shall be subject to the requirements of 248 CMR 10.06(2)(t).
6. Every So-Vent system shall have at least one full size vent stack that meets the following requirements:
   a. The diameter of the full size vent stack is no smaller than three inches.
   b. The vent stack shall run undiminished in size from the base of the soil or waste stack to a point 18 to 24 inches above the roof or reconnect to a stack vent installed in accordance with 248 CMR 10.16(4)(b).

(u) 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-approval, a Variance, or a Test-site status pursuant to 248 CMR 3.00.

Figure 1
No-Hub Coupling Test Configuration Design



(v) Presure and Leak Test Procedure for Stainless Steel Couplings Used on Cast Iron Hubless Soil Pipe. Every manufacturer shall perform the tests as outlined in 248 CMR 10.06 (2)(v) for the purpose of determining liquid and/or gas leaks for pressures which may exist in a sanitary and/or storm drainage system. The administration of the test shall meet the following requirements:

1. The testing shall be performed by an Approved-testing-lab pursuant to 248 CMR 3.04(4).
2. Testing shall be completed at the expense of the manufacturer who shall perform such test.
3. The Approved-testing-lab shall give at least two weeks advance notice to the Board of the date scheduled for the test.
4. The test shall be conducted with:
   a. hubless pipe and fittings manufactured in compliance with CISPI Standard Specification 301 latest issue; and
   b. joints that have been assembled in accordance with the manufacturer's instructions and/or recommendations.
5. The test shall be for an eight-hour period of time, under a 30-foot hydrostatic head of water and at 13-P.S.I.G. and shall show no visible signs of leakage.
6. The test assembly shall employ gauges at each end with means of expelling air and the gauges shall be graduated so that, at maximum test, the indicator on the gauges shall be approximately mid-point on said gauges.
7. The test results shall be certified by the Approved-testing-lab that conducted the testing and also by a Massachusetts registered professional engineer or a registered engineer having a reciprocal agreement with the Board of Professional Engineers for the Commonwealth of Massachusetts.
8. The test assembly and configuration shall employ pipe and fittings listed and as shown in 248 CMR 10.06, Figure 1 and shall be installed in accordance with the pertinent provisions of 248 CMR 10.00.
9. All repair and transition friction type couplings and clamps shall conform to the requirements stated in 248 CMR 10.06(2)(v).

(w) 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 1.00 through 10.00 the following requirements are satisfied:
1. Each system shall be designed or engineered by a Massachusetts registered professional mechanical engineer and Special-Permission must be granted by the Board.
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. Any change or redesign in the vacuum drainage system shall be subject to the requirements of 248 CMR 10.06(2)(w) and 10.23.

10.07: Joints and Connections

(1) Consistency of Materials. When installing a fitting or inserting piping into an existing portion of a soil stack, waste stack, vent stack or drain, the fitting or piping shall be of the same material as the existing stack or drain using a joining method outlined in 248 CMR 10.07.

(2) Types of Joints for Piping Materials.
(a) Copper Tubing Joints (Potable Water Supply Systems in Buildings).
1. Joints shall be made with one of the following:
   a. Copper water tube complying with ASTM B88.
   b. Cast bronze fittings complying with ANSI Standard B16-18.
   c. Wrought copper fittings complying with ANSI-ASME B16-22.
   d. Flared or brazed connections for all underground piping inside the building. The joining method of copper underground shall be brazed or flared fittings.
2. Joints may employ the use of cast bronze flanges complying with ANSI Standard B16-24.
3. The joining method between copper and copper alloy tube and fittings shall be by soldering in accordance with ASTM B828-standard practice for making capillary joints by soldering of copper and copper alloy tube and fittings-latest issue or brazing in accordance with ANSI/AWS C3.4.

4. Fluxes used in the soldering or brazing of copper and copper alloy tube and fittings shall meet one of the reference standards listed in 248 CMR 10.06: *Table 1* and be lead free.

5. Filler metals for soldering or brazing of copper and copper alloy tube and fittings shall meet one of the reference standards listed in 248 CMR 10.06: *Table 1* and be lead free.

6. Fluxes used with brazing filler metals or solder filler metals shall be lead free.

(b) Burned Lead. Every burned (welded) lead joint:

1. shall be lapped; and

2. the lead shall be fused together to form a uniform weld at least as thick as the lead being joined.

(c) Caulked Cast Iron Soil Pipe. Every lead caulked joint for cast iron bell and spigot soil pipe shall:

1. be firmly packed with oakum or hemp;

2. be filled with molten lead that is not less than one inch-deep and does not extend more than c inch below the rim of the hub;

3. not have paint, varnish, or other coatings on the jointing material until after the joint has been tested and approved; and

4. have lead run in one continuous pour and shall have the lead caulked tight.

(d) Expansion. Every expansion material shall conform with the type of piping in which it is installed.

(e) Flared.

1. Copper Tubing. Every flared joint for soft-copper water tubing shall be expanded with a flaring tool.

2. Cross-linked Polyethylene (PEX). Every flared (metal insert or cold expansion) joint for cross-linked polyethylene (PEX) water tubing shall be:

a. made with fittings meeting approved standards; and

b. installed in accordance with manufacturer's recommended procedures.

(f) Hot Poured. Hot poured compound for clay or concrete sewer pipe or other materials shall conform to the following requirements:

1. It shall not be water absorbent and when poured against.

2. A dry surface shall have a bond of greater than or equal to 100 P.S.I.G. All surfaces of the joint shall be cleaned and dried before pouring. If wet surfaces are unavoidable, a suitable primer shall be applied.

3. The compound shall not soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 160 degrees.

4. The compound shall not be soluble in any of the waste carried by the drainage system.

5. Approximately 25% of the joint space at the base of the socket, shall be filled with jute or hemp.

6. A pouring collar, rope or other device shall be used to hold the hot compound during pouring.

7. Each joint shall be poured in one operation until the joint is filled. Joints shall not be tested until one hour after pouring.

(g) Mechanical (Flexible or Slip Joint).

1. Cast Iron Pipe or Ductile Iron Pipe. Every mechanical joint in cast iron pipe or ductile iron pipe shall be:

a. made with a flanged collar, rubber ring gasket, and appropriate number of securing bolts; or

b. made with a preformed molded ring secured by pulling the pipe together in such a way as to compress the molded ring.

2. Clay Pipe. Flexible joints between lengths of clay pipe may be made by using resilient materials both on the spigot end and in the bell end of the pipe.

3. Concrete Pipe. Flexible joints between lengths of concrete pipe may be made using rubber materials both on the spigot end and in the bell end of the pipe.

4. Hubless Cast Iron Soil Pipe No-hub. Joints for hubless cast iron soil pipe and fittings shall be made with:

a. elastomeric sealing sleeve; and

b. stainless steel clamp, clamping screw and housing.

5. Split Couplings. Galvanized couplings made in two or more parts, with compression gaskets, may be used with grooved end pipe and fittings as specified under 248 CMR 10.06.

6. Aluminum DWV Pipe. Joints for connecting aluminum DWV pipe or aluminum DWV pipe to hubless 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.

(h) Plastic.

1. ABS, PVC and CPVC.

a. Every joint in ABS, PVC and CPVC piping, except as specified under 248 CMR 10.13: *Piping and Treatment of Hazardous Wastes*, shall be made with fittings by solvent weld connections.

b. Solvent weld connections shall be made only with solvent cement manufactured specifically for the materials to be joined.

2. Cross-linked Polyethylene (PEX).

a. All joints shall be made with fittings that a joined in the following manner:

i. metal insert fittings with copper crimp rings;

ii. stainless steel press sleeves;

iii. cold expansion fittings with (PEX) reinforcing rings; or

iv. compression fittings (with formed gaskets) or mechanical joints.

b. All joints connecting to other materials shall be made with a transition fitting.

c. All joining methods are to conform to existing standards found in 248 CMR 10.06, Table 1 unless a Variance has been granted by the Board as specified in 248 CMR. 3.04(2)

d. Exception: Metallic fittings used in purified water systems shall be type 316 stainless steel.

(i) Precast Requirements.

1. Every precast collar shall be formed in both the spigot and bell of the pipe in advance of use.

2. Collar surfaces shall be conical with side slopes of three-degrees with the axis of the pipe and the length shall be equal to the depth of the socket.

3. Prior to making joint contact, surfaces shall be cleaned and coated with solvents and adhesives as recommended in the standard.

4. When the spigot end is inserted in the collar, it shall bind before contacting the base of the socket.

5. Material shall be inert and resistant to both acids and alkalies.

(j) Slip Requirements.

1. Every slip joint shall be made using approved packing or gasket material, or ground joint brass compression rings.

2. Ground joint brass connections that allow the adjustment of tubing while providing a rigid joint when made up shall not be considered slip joints.

3. Slip joints may be used on the inlet ("house-side") of the trap only.

(k) Soldered.

1. Every soldered joint for tubing shall be made with fittings.

2. Surfaces to be soldered shall be properly cleaned, reamed and returned to-full-bore.

3. The joints shall be fluxed properly and fastened using lead free solder.

4. Joints in copper water tubing shall be made by appropriate use of brass or wrought copper water fittings and be properly soldered together.

5. Soldered joints in copper alloy tube and fittings shall be fabricated in accordance with ASTM B-828 and shall utilize solder fluxes that meet the requirements of ASTM B-813.

6. Solder filler metals used in the fabrication of solder joints in potable water applications shall be lead free.

(l) Threaded.

1. Every threaded joint shall conform to American National Taper Pipe Thread.

2. All burrs shall be removed.

3. Pipe ends shall be reamed and returned to size of full bore, and all chips shall be removed.

4. Product-approved pipe compounds and tapes shall be used on male threads only.

5. Threaded joints used in the piping systems of the potable water supply system of a building shall be made with lead free polyetrafluorethylene sealant (such as Teflon^{R}), which shall be applied to the male thread only.

6. Threads in drainage fittings shall be tapped to provide proper grade and slope.

(m) Unions.

1. Drainage System.

a. Unions may be used only in the trap seal or on the inlet side of the trap.

b. Unions shall have metal-to-metal ground seats.

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

(n) Wiped.

1. Every joint in lead pipe or fittings, or between lead pipe or fittings and brass or copper pipe, ferrules, solder nipples, or traps, shall be full wiped joints.

2. Wiped joints shall have an exposed surface on each side of a joint that is greater than or equal to ¾ inch in width and be as thick as the material being joined.

3. Wall or floor flange lead-wiped joints shall be made by the use of a lead ring or flange placed behind the joints at the wall or floor.

4. Joints between lead pipe and cast iron, steel, or wrought iron shall be made by means of a caulking ferrule, soldering nipple, or bushing.

(o) Brazed Joints.

1. Brazing flux, when required, shall meet the requirements of ANSI/AWS A5.31.

2. 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.

(p) Victaulic Joints:

1. The victaulic press shall be used for joining pipes and fittings for copper, galvanized Schedule 40 and stainless steel pipe.

2. The victaulic press 304 system shall be used for joining victaulic type 304 stainless steel pipe that meets the requirements of ASTM A-269 grade 304/304L (TP 304 UNS designation 530400).

(3) Types of Joints Between Different Piping Materials.

(a) Cast Iron to Copper Tubing. Every joint between cast iron and copper tubing shall be made by the use of a brass caulking ferrule and properly soldering the copper tubing to the ferrule.

(b) Cast Iron to Vitrified Clay.

1. Every joint between cast iron piping and vitrified clay piping shall be made either of hot poured bitumastic compound or by a preformed bituminous ring.

2. This ring shall, after ramming, completely fill the annular space between the cast iron spigot and the vitrified clay hub.

(c) Copper Tubing to Threaded Pipe Joints.

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

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.

(d) Lead Cast Iron, Wrought Iron, or Steel. Every joint between lead and cast iron, wrought iron, or steel pipe shall be made by means of wiped joints to a caulking ferrule, soldering nipple, bushing, or by means of a mechanical adapter.

(e) Threaded Pipe to Cast Iron. Every joint between wrought iron, steel, or brass, and cast iron pipe shall be either caulked or threaded or shall be made with approved adapter fittings.

(f) 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.

(g) ABS or PVC Plastic to Other Materials.

1. Threaded Joints.
   a. ABS or PVC (DWV) joints when threaded shall use the proper male or female threaded adapter.
   b. Only thread tape or lubricant seal or other Product-approved material as recommended by the manufacturer shall be used.
2. Cast Iron Spigot Hub Joints.
   a. Joints shall be connected by caulking with lead and oakum or by the use of a compression gasket that is compressed when the plastic pipe is inserted in the cast iron hub end of the pipe.
   b. No adapters are required for this connection.
3. No Hub Joints.
   a. Joints where the outside diameter of the two pipes or fittings to be joined are uniform in diameter may be joined with an elastomeric sealing sleeve and stainless steel no hub clamp.
   b. PVC to ABS connection shall be implemented by:
      i. using a DWV male to female adaptor; or
      ii. by a no hub clamp.

(h) Aluminum DWV Pipe to Hubless Cast Iron Pipe or Fittings. Joints for connecting aluminum DWV pipe or aluminum DWV pipe to hubless cast iron fittings shall be made with an elastomeric sealing sleeve and stainless steel clamp, clamping screw and housing and end protector caps.

(4) 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. Only brass or stainless steel nuts and bolts shall be used.

d. The floor flange shall be fastened to a structurally firm base.

e. The use of commercial putty or plaster as a setting compound is prohibited.

f. Schedule 80 PVC or ABS threaded nipples may be used to connect toilets and urinals to carriers of such fixtures.

(5) Tightness. Joints and connections in the plumbing system shall be gastight and watertight for the pressure required by test, with the exceptions of those portions of perforated or open joint piping that are installed for the purpose of collecting and conveying ground or seepage water to the underground storm drains.

(6) 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.

(7) Increasers and Reducers. When interconnecting pipes and fittings, fittings and fittings, or pipes and fittings that have different sizes the size of the increaser or reducing fittings shall be selected and installed so as to prevent the restriction of flow between the interconnection.

10.08: Traps and Cleanouts

(1) 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.

b. The developed length distance from the fixture outlet to the trap weir shall not exceed 24 inches.

c. No fixture shall be double trapped.

2. A fixture need not be separately trapped. Exceptions to the separate trapping requirements are as follows:

a. Fixtures having integral traps.

b. 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.

c. 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.

d. The waste for a domestic type dishwasher may be separately trapped, or may connect to the manufactured inlet side opening of a food waste grinder. A "wye" fitting may be installed between the outlet of the food waste grinder and the inlet of the trap serving the kitchen sink.

(b) Size of Fixture Traps.

1. Fixture trap size (nominal diameter) 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. No trap shall be larger than the drainage pipe 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 washer (domestic)	1½
Combination sink and wash tray	1½
Combination sink and wash tray with food waste grinder unit	1½
Dental unit or cuspidor	1½
Dental Lavatory	1½
Drinking fountain	1½
Dishwasher, commercial	2
Dishwasher, domestic	1½
Floor drain	2
Food waste grinder	1½
Kitchen sink, domestic, with food waste grinder 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, flush valve supplies)	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 grinder 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 joints or couplings may be used on the trap inlet or within the trap seal of the trap if a metal-to-metal ground joint is used.

3. Each fixture trap, except a trap that is 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, shall have an accessible cleanout plug of ample size that is protected by the water seal.

(e) Fixture Trap and Connection Material (HOUSE SIDE) shall meet ASME A112.18.2-2002.

1. Fixture traps shall be made of cast brass, with a wall thickness of not less than .01 inches, or of schedule 40 ABS or PVC.

2. Cast iron traps may be used in connection with floor drains, slop sinks, building (house) traps, conductors (when necessary) and similar installations, weights and thicknesses to comply with like materials under 248 CMR 10.06.

3. Slip nuts used to connect fixture and appliance outlet piping to the trap, shall be composed of brass, copper or schedule 40 ABS or PVC.

4. Tubing traps made of brass or copper shall be of a thickness equal to a minimum of 17 gauge.

5. When devices including strainers, P. O. (pull out) plugs, tail pieces, waste arms, bathtub wastes and overflows, and any other similar fixture to trap connection, when of metal, shall be made of brass or other non-corrosive metal, and the device shall have a thickness greater than or equal to 17 gauge.

6. All items listed in 248 CMR 10.08(1)(e)4. and 10.08(1)(e)5. when made of ABS or PVC may be used, provided that they all comply with ASME A112.18.2 for PVC and ABS Tubular Traps and Fittings.

(f) 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.

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

(h) Building Traps.

1. Building (House/running traps) traps shall not be installed, unless in the opinion of the Inspector they are necessary.

2. Each building trap when installed shall be provided with a cleanout and with a relieving vent or fresh air intake which need not be larger than ½ the diameter of the drain to which it connects.

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

(2) Drainage Pipe Cleanouts.

(a) Location. Cleanouts shall not be placed more than 50 feet apart in all horizontal drainage piping and branch drain piping that is four inch nominal diameter or less. On piping that is over four inch nominal diameter the cleanouts shall not be more than 100 feet apart.

(b) Underground Drainage. Cleanouts, when installed on an 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.

(c) 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°.

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

(e) Base of Stacks. A cleanout shall be provided at or near the base of each vertical storm water conductor, waste or soil stack.

(f) Inaccessible Stack Cleanouts. For buildings with concrete floors (slabs) or with less than 18 inches of crawl space under the floor, or where a stack cleanout is not easily accessible, the following shall be provided in lieu of a cleanout at the base of the stack.

1. The building drain shall be extended to the outside of the building and terminated in an accessible area.

2. The accessible area for the cleanout shall be not more than five feet beyond the foundation/building wall.

(g) Building Drain at Foundation Wall.

1. There shall be a cleanout 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 in a location determined by the Inspector.

3. When cast iron soil pipe and fittings are used, the joining methods shall comply with 248 CMR 10.07(2)(c)1. and shall be installed as diagramed in 248 CMR 10.22: *Figure 18*.

(h) 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.

(i) 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.

(j) Cleanout Clearances.

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.

(k) 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.

(l) Cleanout Equivalent. The cleanout equivalent may be satisfied by one of the following methods if accepted by the Inspector:

1. a fixture trap that incorporates a union connection;
2. a fixture with an integral trap; or
3. roof drains that are readily removable without disturbing concealed roughing work.

(m) Connections to Cleanouts Prohibited. Cleanout openings shall not be used for the installation of any new or additional plumbing, except when:

1. approved in writing by the Inspector; and
2. where another end-cleanout of equal access and capacity is provided.

(n) Manholes for Large Pipes.

1. For underground "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 300 feet except when the total developed length of the drain is less than 150 feet cleanouts may be installed at 75 foot intervals.

2. Manholes shall conform to current standards and engineering practices.

10.09: Interceptors, Separators and Holding Tanks

(1) Interceptors, Separators and Holding Tanks.

(a) Interceptors Required.

1. Interceptors and separators shall be provided to prevent the discharge of oil, gasoline, grease, sand, and other substances, that are harmful or hazardous to the building drainage system, the public sewer, or sewage treatment plant or other sewage treatment processes.

2. No wastes other than those requiring treatment or separation shall be discharged into any interceptor or separator.

(b) Separators or Holding Tanks Required.

1. Requirements.

a. Gasoline, oil and sand separators subject to 248 CMR 10.09(1)(c). An applicant for a plumbing permit to install a separator that is subject to 248 CMR 10.09(1)(b) in the MWRA (Massachusetts Water Resource Authority) Sewage District, shall file a notice with the MWRA. This notice shall be filed at the same time as the plumbing application for a permit is filed with the Inspector.

b. Except as provided in 248 CMR 10.09(4)(c), there shall be floor drains installed in all commercial motor vehicle:

i. parking and storage accommodations;

ii. repair garages, repair facilities or auto body repair facilities;

iii. service facilities with or without grease racks and grease pits;

iv. wash rack areas;

v. wash areas (including automatic car wash structures); and

vi. facilities where motor oils, gasoline, anti-freeze and similar hazardous liquid wastes are potentially generated or may potentially spill.

The floor drains waste shall be conveyed through waste piping installed in accordance with 248 CMR 10.15 and shall discharge into a gas, sand and oil separator installed in accordance with 248 CMR 10.09(4)(d)1.a. and 248 CMR 10.23: *Figure 15* and be connected to a municipal sewer system. In unsewered areas, a holding tank that meets the requirements of 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* (The Department of Environmental Protection) and policies shall be used in lieu of a municipal sewer connection.

c. Connections to municipal sewers shall be installed and maintained in accordance with 314 CMR 7.00.

d. All holding tanks and the associated drainage and vent piping is considered a dedicated system as defined in 248 CMR 10.03(b). The chamber of the holding tank shall be vented independently back to the building it serves and through the roof in accordance with 248 CMR 10.09(4)(f)(1).

e. The entire installation within the property line shall comply with all related provisions of 248 CMR 3.00 through 10.00.

2. Vents for Floor and Trough Drains. The vents for the floor/trough drains that convey waste to a gasoline, oil and sand separator shall be independent of the sanitary DWV systems. Vents for the floor/trough drain(s) in facilities served by a gasoline, oil and sand separator may connect to the chamber vent of the separator no less than six inches above the flood level rim of the floor/trough drain fixture.

3. Floor Drains and Trough Drains Required. Separators and floor drains/trough drains shall be required in condominium structures or multi-family residential structures with residential garages:

a. that have over six car capacity and have living units above or below; and

b. if the vehicles share a common area.

4. Facilities, as defined in 248 CMR 10.09(1)(b) not connected to a municipal sewer system or a holding tank, as defined in 248 CMR 10.09(1)(b), constructed, existing, and operating prior to January 9, 1992 shall:

a. connect to a municipal sewer system as per the requirements of 248 CMR and 314 CMR 7.00 and all other applicable laws, codes, rules, and regulations;

b. connect to a holding tank (as defined in 248 CMR 10.09(2)(b); or

c. seal the floor drains with caps or plugs in accordance with 248 CMR 10.07, provided that, an application for sealing of floor drains that includes a WS-1 form from the Department of Environmental Protection Waste Minimization Program Procedures (DEP Form WS-1) is filed and approved by the Inspector before commencing any work. A copy of the form indicating the Inspector's approval shall be returned to the DEP by the applicant, as indicated on the document.

(d) Approval of Separators.

1. Size, Type and Location.

a. The size (capacity), type, and location of each separator, shall be in conformance with 248 CMR 10.22: *Figure 15* (Gasoline-oil and Sand Separator). Alternate design separators may be used *see* 248 CMR 3.04(2) or (3).

b. No wastes other than those requiring treatment or separation shall be discharged into any separator.

2. All Separators to Follow Type Approved. No separator shall be installed which does not comply in all respects with drawings and specifications shown in the appropriate section of 248 CMR 10.00.

3. Municipalities Interconnected with Massachusetts Water Resources Authority (MWRA) Sewerage System.

a. In all cities and towns, where the sewage disposal is discharging into the Massachusetts Water Resources Authority Sewage System, separator installations shall be inspected by the Inspector and approved by the MWRA.

b. Notice of a pre-planned separator installation shall be submitted to the MWRA before an application for a plumbing permit is filed with the Inspector pursuant to 248 CMR 3.05.

(e) Separation of Liquids. A mixture of light and heavy liquids having different specific gravities may be treated and then separated in a receptacle.

(f) Venting.

1. Interceptors and separators shall be so designed that they will not become air bound, when closed covers are used.

2. Each interceptor shall be properly chamber vented to comply with 248 CMR 10.16 and each separator to comply with Drawing and Specification (248 CMR 10.22: *Figure 15*).

(g) Accessibility.

1. Each interceptor and separator shall be so installed that it is readily accessible.

2. The removal of the cover shall be accessible for the purpose of service and maintenance.

3. The use of ladders or moving of heavy objects in order to service interceptors or separators shall constitute a violation of accessibility.

(h) Maintenance. Interceptors and separators shall be maintained in efficient operating condition by the periodic removal of accumulated grease, scum, oil, or other suspended substances, solids and silt deposits accumulated at the bottom of the interceptor or separator.

(2) Grease Traps and Interceptors When Installed Inside of Buildings.

(a) Grease traps and interceptors shall be installed in the following establishments to prevent the discharge of fats, oils, and grease into the drainage system:

1. restaurants;
2. cafeterias;
3. hotels;
4. hospitals;
5. institutional facilities;
6. factories;
7. clubs;
8. bars where food is prepared and served; and
9. all commercial kitchens; food and meat packing and processing establishments; super markets, bakeries, and other establishments where fats, oils and grease may be introduced into the building sanitary drainage system in quantities that can cause waste line obstruction or hinder sewage disposal,

(b) Grease traps and interceptors may be installed on individual fixture waste branches.

(c) Plumbing fixtures to be protected by grease traps and interceptors shall include:

1. pot sinks (with bowl depths exceeding ten inches);
2. scullery sinks (with bowl depths exceeding ten inches),
3. floor drains;
4. floor sinks;
5. automatic dishwashers regardless of temperature;
6. pre-rinse sinks;
7. soup kettles or similar devices;
8. wok stations; and
9. automatic hood wash units;

(d) 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.

(e) Floor Drain Exception: Floor drains that may encounter grease residue and are specifically designed for this purpose may conduct grease to an outside grease interceptor. Grease interceptors may be installed on a separate building drain and shall only receive the discharge from fixtures or equipment which would allow fats, oils or grease to be discharged to the sanitary drainage system.

(f) Food Waste Grinders and Pre-rinse Sinks.

1. The waste from dishwasher pre-rinse sinks that are not equipped with food waste grinders shall be discharged to the drainage system through a grease trap interceptor.

2. A dishwasher pre rinse sink drain not equipped with a food waste grinder that conveys the waste discharge to a dish washing machine drain as shown in 248 CMR 10.22: *Figure 22* shall 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.

3. The waste discharge from a commercial food waste grinder (garbage disposal) shall not discharge to the sanitary drainage system through a grease trap. Dishwasher pre-rinse sinks equipped with food waste grinders shall be discharged in accordance with 248 CMR 10.10(8)(b), (c), and (d).

(g) Sizing, Testing and Rating.

1. Grease traps and interceptors shall not be installed unless sized, tested, and certified according to PDI-G101 or ASME A112.14.3 or ASME A112.14.4.

2. Grease traps and interceptors must bear the certification seal of the Plumbing and Drainage Institute (P.D.I.) or AMSE. The Board may authorize the use of alternate design traps and interceptors in accordance with 248 CMR 3.04(2) or (3).

(h) Capacity. Installed grease traps and interceptors shall have a grease retention capacity of not less than two pounds of grease for each G.P.M (gallon-per-minute) of flow.

(i) Flow Control Device.

1. Grease traps and interceptors 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 recommendations. A flow control device is required to be installed between the fixture and the grease trap/interceptor in accordance with manufacturers instructions.

2. The flow control device is designed to regulate the flow and discharge rate of waste water through the trap or interceptor.

3. The vented external flow control device air intake when installed in combination with a *Grease Trap*, may terminate to the free atmosphere provided it terminates a minimum of six inches above the flood level rim of the fixture(s) being served.

4. The vented external flow control devices when installed in combination with a *Grease Interceptor* may connect to the sanitary venting system of a building or structure provided that the external flow control and fixture(s) are protected by a trap installed in accordance with all applicable provisions of 248 CMR 10.00.

5. A flow control device will not be required for interceptor/separators that are designed to provide a retention capacity of 30 minutes or less.

(j) Water Cooled Interceptors/Separators. The use of water- cooled interceptors/separators is prohibited.

(k) Interceptors Not Required.

1. Grease traps and interceptors are not required for residential building(s), structure(s), dwellings or dwelling units or any private residence.

2. Grease traps and interceptors shall be required in buildings deemed residential that incorporate commercial cooking accommodations.

(l) Treatment Agents and Chemicals. 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.

(m) Maintenance.

1. 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.

2. 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.

3. A laminated sign shall be stenciled on or in the immediate area of the grease trap or interceptor in letters one-inch high. The sign shall state the following in exact language:

IMPORTANT

This grease trap/interceptor shall be inspected and thoroughly cleaned on a regular and frequent basis. Failure to do so could result in damage to the piping system, and the municipal or private drainage system(s).

(n) Procedures for Sizing Grease Interceptors.

1. Grease traps and interceptors shall be sized in accordance with the following Recommended Procedures For Sizing Grease Interceptor and 248 CMR 10.22: *Figure 22*.

2. Recommended Procedures and Formulas for Installing Grease Traps and Interceptors. As a general rule it is recommended that traps and interceptors be sized in accordance with the formulas indicated in 248 CMR 10.09: *Tables 1* through *3*. It is favorable policy to size the interceptor so that its rated capacity is never less than 40% of the individual fixture capacity in gallons. In the example below the actual fixture capacity is 59.8 Gals. and 40% of this would be 23.9 Gals. It is understood that a drainage period other than one or two minutes can be used.

248 CMR 10.09: *Table 1*:
RECOMMENDED PROCEDURE FOR SIZING
GREASE TRAPS AND INTERCEPTORS INSIDE BUILDINGS
EXAMPLE (Single Compartment)

STEP 1. Determine the cubic content of the fixture by multiplying length x width x depth, (of each comp)	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 13,824/231 = 59.8 Gals.
STEP 3. Determine actual drainage load. The fixture is usually filled to approximately 75% of the capacity with waste water. The items being washed displace about 25% of the fixture content. Actual drainage load = 75% of fixture capacity.	Actual Drainage Load .75 x 59.8 Gals. = 44.9Gals
STEP 4. Determine the flow rate and the 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 1 minute period. Flow rate 44.9 Gals.1/min. = 44.9 G.P.M. For 2 minute period Flow rate 44.9 Gals./2min. = 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*:
SIZING FORMULAS FOR LARGE CAPACITY
GREASE INTERCEPTORS (INSIDE OR OUTSIDE BUILDINGS)

For Restaurants:	Other Establishments with Commercial Kitchens:
(S) X (GS) X (HR/12) X (LF) = Effective Capacity of Grease Traps and Interceptors in Gallons	(M) X (GM) X (LF) = Effective Capacity of Grease Traps and Interceptors in Gallons
WHERE:	WHERE:
S = Number of Seats in Dining Area GS = Gallons of Waste Water Per Seat: HR = Number of Hours Restaurant is Open. LF = Loading Factor Use 25 Gallons for Restaurants with China Dishes and/or automatic dishwashers Use 10 Gallons for Restaurants with Paper or Baskets and No Dishwashers.	M = Meals Prepared Per Day GM = Gallons of Waste Water Per Meal (Use 5 Gallons) LF = Loading Factor Use 1.00 with dishwashing machines and 0.75 without dishwashing machine.
Loading Factors:	
Use 2.00 Interstate Highway, Use 1.00 Main Highway, Use 0.75 Other Highways Use 1.50 Other Roadways Use 1.25 Recreational Areas	

248 CMR 10.09: *Table 3*:
CAPACITY OF GREASE TRAPS AND INTERCEPTORS

Total Flow Through Rating (g.p.m)	Grease Trap/Interceptor RetentionCapacity (pounds)
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

(3) Grease Interceptors Installed Outside of the Buildings

(a) General Requirements for Outside Interceptors. When an outside grease interceptor is installed, the entire installation within the property line shall comply with 248 CMR 10.03: *Dedicated Systems*, and the installation shall be designed by a registered professional mechanical engineer.

(b) This installation shall require a chamber vent which shall:

1. be piped to the inside of the building in compliance with 248 CMR 10.16(5)(e); and
2. shall be not less than four inch minimum pipe diameter.

(4) Special Use Installations

(a) Sand Interceptors -- Floor Drains.

1. Wherever a floor drain discharges waste to an oil and gasoline separator, the floor drain shall be equipped with an approved sediment and sand control basket, or the floor drain shall discharge through a sand interceptor.
2. Multiple floor drains may discharge into one sand interceptor.

(b) Sand Interceptors -- Commercial Establishments. Sand and similar interceptors for heavy solids shall:

1. be so designed and located as to be readily accessible for cleaning; and
2. have a water seal of not less than six inches.

(c) Laundries. Commercial laundries shall be equipped with an interceptor having a wire basket or similar device, removable for cleaning, that will prevent passage into the drainage system of solids ½ inch or larger in size, string, rags, buttons, or other materials detrimental to the public sewerage system.

(d) Bottling Establishments. Bottling plants shall discharge their process waste into an interceptor that provides for the separation of broken glass or other solids, before discharging liquid wastes into the drainage system.

(e) Slaughter Houses. Slaughtering room and dressing room drains shall be equipped with interceptors approved by the Plumbing Drainage Institute which shall prevent the discharge into the drainage system of feathers, entrails, and other materials likely to cause stoppage of the drainage system.

10.10: Plumbing Fixtures

(1) Fixture Materials and Quality. Plumbing fixtures shall be constructed from Product-approved materials, have smooth and impervious surfaces and be free from defects, and, except as provided elsewhere in 248 CMR 10.00, shall conform to the applicable standard listed in 248 CMR 10.06: *Table 1*.

(2) Overflows.

(a) 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.

(b) 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.

(3) Installation.

(a) Cleaning. All fixtures must be installed so as to afford easy access for cleaning both the fixture and the area about it.

(b) Joints. Where a fixture comes in contact with walls and floors, the joint shall be watertight.

(c) Securing Fixtures. Floor outlet fixtures and wall hung fixtures shall be rigidly secured to the finished floor or wall by screws or bolts, or other methods in compliance with manufacturers instructions and codified in 248 CMR 10.05(7).

(d) Wall-hung Bowls. Wall hung toilet bowls shall be rigidly supported by a concealed metal Product-approved fixture carrier so that no strain is transmitted to the toilet discharge connection, or the wall.

(e) Setting. Fixtures shall be set plumb, level and in proper alignment with reference to adjacent walls.

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

(a) A pan, valve, plunger, offset, washout, frost proof latrine, or other toilet which has an invisible seal, mechanical seal or an unventilated space.

(b) A toilet that has walls that are not thoroughly washed at each discharge.

(c) A toilet that may enable siphonage of the contents of the bowl back into the tank.

(d) Trough urinals and floor stall urinals.

(e) Wall hung urinals connected to an exposed trap.

(5) Toilets.

(a) Public Use. A toilet for public use shall be of the elongated type.

(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.

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(7).

(e) Seats. A toilet shall be equipped with a seat of smooth non-absorbent material. The seat of a toilet that is provided for public or semi-public use shall be of the open front type.

(f) Alternative Technology Toilet Systems.

1. Areas subject to 310 CMR 15.00 or where sewers are unavailable innovative alternative technology toilets may be installed in place of a liquid sealed toilet. These are considered plumbing fixtures under 248 CMR 10.00 and therefore the permit requirements must be satisfied.

2. The alternative technology toilet system shall be manufactured to NSF-41 standards and shall be installed in compliance with the manufacturer's instructions.

(6) Urinals.

(a) Urinal Fixtures.

1. Only pedestal urinals and wall hung urinals with integral traps shall be used.

2. Urinals shall be flushed only by means of an automatic flushing tank or flushometers equipped with a back flow preventer.

(b) 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.

(c) Materials Surrounding Urinals for Public or Semi-public Use.

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 so as to be non-absorbent.

2. Wood and fiber boards are prohibited in the above noted areas.

(d) Every urinal shall be side shielded for privacy.

(7) Shower Baths, Stalls and Compartments.

(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 securely attached to the structure.

(b) Shower Waste Outlet.

1. Waste outlets serving shower stalls and compartments that are not part of bathtubs shall be no less than two inches in diameter, shall have removable strainers not less than three inches in diameter, and shall have strainer openings not less than ¼ inch in minimum dimension.

2. In shower rooms or in an area that multiple shower 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 waste water from one shower head area does not flow over the floor area serving another shower head area.

3. Waste outlets shall be securely fastened to the waste pipe and make a watertight connection thereto.

(c) Shower Compartments.

1. Shower compartments and stalls shall have at least 900 square inches of floor area and be not less than 30 inches in minimum dimension measured from its finished interior dimension as the side of a rectangle, altitude of a triangle or diameter of a circle or other angular shape.

2. The minimum required area and dimension shall be measured from its finished interior dimension at a height equal to the top of the threshold and at a point tangent to the centerline of the threshold.

3. The wall area above built-in tubs having installed shower heads and in shower compartments or stalls shall be constructed of smooth, non-corrosive, and non-absorbent, waterproof materials to a height not less than six feet above the floor level. Such walls shall form a watertight joint with each other and with the bathing tub, floor receptor, shower floor or base.

4. The waste outlet opening for individual shower compartments shall be two inches in diameter.

(d) Shower Floors or Receptors.

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

2. 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-approved materials.

3. Shower pans shall turn up on all sides at least above the finished threshold level.

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

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

(e) Shower Controls.

1. When a flow control valve or shower head is designed to completely shut-off and is installed on the outlet pipe from a shower control unit, check valves shall be provided in the hot and cold water supplies to the unit to prevent by-passing of hot or cold water. An exception to the requirement above is when Product-approved shower control units are designed to prevent bypassing.

2. All showers, shower stalls, shower compartments, gang showers, and shower baths, either multiple or single, shall be equipped with an approved adjustable self-cleaning and draining shower head.

3. The water supply to a shower head shall be supplied through a Product-approved individual thermostatic, pressure balancing or combination thermostatic/pressure balancing valve complying with ASSE 1016. The device shall conform to the following requirements:

a. the device shall incorporate a design that limits the maximum deliverable temperature of hot water to 112 degrees; and

b. the device shall be designed to prevent bypassing of water.

4. Automatic Temperature Control Mixing Valves:

a. A central type automatic temperature control mixing valve may be used in lieu of individual thermostatic, pressure balancing or combination thermostatic/pressure balancing valve 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 112 degrees during all periods when showers are in use.

b. A thermometer is required in the outlet piping of the automatic central control mixing valve for inspection and adjustment of temperature.

c. Check valves are required on the hot and cold water inlets to the automatic central control mixing valve.

d. The automatic temperature control mixing valve is a secondary control for hot water that is supplied to individual shower stations and is in addition to the primary controls used to maintain the water temperature in the domestic hot water system.

e. When the temperature in the hot water supply piping to a shower stations is controlled by an automatic temperature control mixing valve, individual shower controls may be Product-approved two handle or single handle shower valves.

f. All automatic temperature control mixing valve devices shall be adjusted by the installing plumber, prior to a Final Inspection in accordance with (248 CMR 10.04(3)(e). The device shall be set to deliver tempered water at a temperature not to exceed 110 degrees to 112 degrees.

(8) Food-waste Grinder Units.

(a) Residential or Domestic Food-waste Grinder-waste Outlets. Domestic food-waste grinder units shall be connected to a drain of not less than 1½ inches in diameter.

(b) Commercial Food-waste Grinder Outlets.

1. Commercial food-waste grinder units 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-grinder units shall be connected and trapped separately from other fixtures or compartments.

3. These grinders shall be separately connected to a waste stack or branch drain.

(c) Water Supply Required. All food-waste grinder units shall be provided with an adequate supply of cold water from faucets at sufficient flow rate to insure proper functioning of the unit.

(d) Commercial Food-waste Grinders Required. All establishments summarized in 248 CMR 10.09(2)(a), (restaurants, cafeterias, hotels…) that are served by a municipal sanitary sewer and can seat 20 patrons or more shall incorporate food waste grinders.

(9) Drinking Fountains.

(a) Design and Construction. A drinking fountain shall conform to the listed ANSI standard in 248 CMR 10.06: *Table 1*.

(b) Protection of Water Supply. Stream projectors shall be assembled to provide an orifice elevation as specified by ANSI Air Gaps in Plumbing Systems and ANSI Backflow Preventers. *See* 248 CMR 10.06: *Table 1*.

(10) Floor/Trough Drains.

(a) Floor/Trough Drains.

1. Floor/Trough drains shall have integral or separate traps providing a minimum water seal of three inches. The Floor/Trough drain shall incorporate removable strainers.

2. The Floor/Trough drain shall be constructed so that it can be readily cleaned, and the drain inlet shall be easily accessible at all times.

3. Floor/Trough drains subject to backflow shall be provided with back water valves.

4. Size of Floor/Trough Drains. 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. The Floor/Trough drain outlet pipe shall not be less than two inches in nominal diameter.

5. Proper Installation and Protection Against Loss of Trap Seal.

a. The design and installation of floor drains and trough drains shall be at a grade to enable complete floor drainage from all directions.

b. All floor drains and trough drains shall be installed with a, readily accessible automatic trap-priming device, except that floor drains or trough drains that will receive a continuous or semi-continuous discharge from other indirect waste fixture(s) pursuant to 248 CMR 10.12 may be allowed by the Inspector.

6. Special Hazardous Wastes. Floor drains that may receive special hazardous waste shall comply with 248 CMR 10.13.

(11) Dishwashing Machines.

(a) Waste Discharge.

1. Domestic. The waste discharge shall comply with 248 CMR 10.08(1)(a)(2)(d).

2. Commercial. Commercial 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.

3. Commercial. Dishwashing machines that incorporate drainage discharge by pumping shall discharge waste to the sanitary drainage system in accordance with the manufacturer's recommendations.

(b) Portable Dishwashers. Portable dishwashing machines (domestic) may discharge over the rim of a properly trapped and vented fixture.

(12) Automatic Clothes Washing Machine.

(a) Water Supply. The water supplies to clothes washers shall be protected against backflow by the use of an air gap or a back flow preventer.

(b) Waste Discharge.

1. Domestic Machines.

a. The waste from a clothes washer shall discharge through an air break into a laundry utility sink or standpipe.

b. The standpipe shall extend to a minimum height of 30 inches above the base of the machine and shall not be less than 1½ inches in diameter.

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

(13) Multiple Type Lavatory (Wash Sink). Provided that hot and cold or tempered water for hand washing is available for each 20 inch interval of a multiple use lavatory sink, every 20 inch unit of usable length or circumference or of a straight-line or circular multiple use lavatory shall be considered equivalent to one lavatory as it affects the drainage and water supply piping sizes and fixture usage requirements.

(14) 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-approved backflow prevention device.

(15) Special Fixtures and Specialties. Baptisteries, ornamental and lily pools, aquaria, ornamental fountain basins, fish tanks and similar constructed decorative water monuments when provided with water supplies, shall be protected from back siphonage.

(16) Sacrarium.

a. The liquid discharge from a Sacrarium shall be conducted separately and directly to a drywell in the ground, and shall not be used for any other drainage purpose.

b. In no case shall the waste from a Sacrarium be connected to the building storm drainage, or sanitary drainage waste and vent system.

c. The waste from a Sacrarium shall not be trapped or vented.

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

(18) Minimum Facilities for Building Occupancy Other Than Residential.

(a) Application of Standards and Establishing Occupancy.

1. Applicability of Changes: the requirements set forth in 248 CMR 10.10(18): *Table 1*: *Minimum Facilities for Building Occupancy* shall apply only to plumbing system installation, alteration or extension projects in which the process of designing the plumbing work to be performed begins on or after June 3, 1994.

2. When determining the number of plumbing fixtures after the population has been established by the authority having jurisdiction, should a fraction occur, round up to next fixture.

(b) Classification of Places of Assembly.

1. Assembly (General).

a. All places in which alcoholic or non-alcoholic beverages are sold, or offered for sale, to be consumed on the premises; any room or space used for public or private banquets, feasts, dances, socials, card parties, weddings or for lodge or meeting halls or rooms; skating rinks, gymnastics, public swimming pools, billiard, pool, bowling, and table tennis rooms; halls or rooms used for public or private catering purposes, funeral parlors, recreation rooms; broadcasting studios; private clubs and all other places of similar occupancy shall be classified as general places of assembly.

b. Toilet facilities for each sex shall be provided in the amount specified in 248 CMR 10.10(18): *Table 1* for assembly.

2. Assembly (Dedicated).

a. All places of worship, arenas, stadiums, theaters, cinemas, restaurants, pubs, and nightclubs shall be classified as dedicated places of assembly and toilet facilities for each sex male and female shall be provided in the amount specified in 248 CMR 10.10(18): *Table 1* for dedicated assembly.

b. Where the capacity is more than 2,000 persons, the number of toilets for the first 2,000 persons shall be calculated using the ratios in 248 CMR 10.10(18): *Table 1*. For the number of persons in excess of 2,000, the number of toilets shall be calculated at ratio of one per 100 for women and one per 200 for men.

c. In restaurants, pubs and nightclubs where the total combined number of employees and patrons that can be accommodated at any one time is less than 20 individuals and the total gross space is less than 1,200 square feet, one unisex, handicapped accessible toilet facility for use by both employees and the patrons shall meet the minimum fixture requirements of 248 CMR.

3. Nothing in 248 CMR 10.10(18)(b)2.a. through c. shall apply to single or multiple family dwellings, or to a place of incarceration or detention, a convent, or a monastery.

4. Plumbing fixtures for employees shall be included in 248 CMR 10.10(18): *Table 1* for this type of occupancy.

5. When the occupancy ratio of 50% for each sex is not used to define fixture counts, the Inspector shall be notified in writing before construction begins, indicating the occupancy of each sex for the purpose of establishing fixture amounts.

(c) Assembly (Places of Worship - Church, Synagogue etc.).

1. In no case shall there be less than one toilet and one lavatory provided for each sex to accommodate a congregation worship area.

2. Refer to 248 CMR 10.10(15) and 10.10(16) for baptistery and Sacrarium requirements.

3. For places of worship, which also have a function hall/multi-purpose area, the fixture number requirements for the halls/areas shall be calculated separately.

4. If sufficient fixtures are installed to accommodate the total occupancy for the worship area and the fixtures are located within 300 feet of toilet facilities in the same building the requirements of 248 CMR 10.10(18)(c)1. and 248 CMR 10.10(18)(c)3. shall not apply.

(d) Bathing Beach Toilet Facilities (Public). When the occupancy of a beach area can exceed 4,000, toilets for the capacity in excess of 4,000 shall be installed at the rate of one per 1,000 for women, and one per 2,000 for men.

(e) Day Care Toilet Facilities.

1. Refer to 102 CMR 7.00: *Standards for the Licensure or Approval of Group Day Care and School Age Child Care Programs* (Office for Children), for requirements regarding plumbing fixtures for this type occupancy.

2. Unisex toilet facilities (one toilet, and one lavatory) may be installed for children six years of age or younger. 248 CMR 10.10(18): *Table 1* shall apply where more fixtures are required.

(f) Police Station Lockup/Detention Area Facilities.

1. A combination toilet and lavatory with a protective detention shroud shall be provided in each cell in where a person is detained for any part of a 24 hour day.

2. The lavatory shall be connected to the hot and cold water distribution systems.

3. Where individual toilet facilities are not required by 248 CMR 10.10(18)(f)1., fixtures shall be installed at the rate listed in 248 CMR 10.10(18): *Table 1* for this type occupancy.

(g) Dormitory Toilet Facilities.

1. Toilets in dormitory toilet facilities shall be of the elongated style and shall be equipped with solid plastic non-porous seats of the open front type.

2. In a toilet facility that contains more than one toilet or a toilet and an urinal, each toilet and urinal shall be separated by walls or partitions that will provide privacy.

3. Toilets, showers and lavatory 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.

4. One laundry utility sink shall be installed for each 50 persons.

5. Toilet facilities, shower rooms and bathing rooms for males and females shall be separate and so designated.

(h) Educational (School, College and University *etc*.) Toilet Facilities.

1. Each toilet facility shall have at least one lavatory except as provided by 248 CMR 10.10(18)(h)2.

2. In kindergarten or primary grades, unisex toilet facilities may be installed for children six years of age or younger. Lavatories may be installed in classroom areas or the toilet rooms. 248 CMR 10.10(18): *Table 1* shall apply where more fixtures are required.

3. In auditoriums and multipurpose rooms that will be used at any time for community service, toilet facilities shall be provided as follows:

i. Women: one toilet for each 200 seats or majority fraction thereof.

ii. Men: one toilet for each 600 seats and one urinal for each 200 seats or majority fraction thereof.

Women and men's toilet facilities shall be located within 300 feet.

4. Separate toilet facilities shall be provided for teachers and other staff employees. These toilet facilities shall be in addition to the requirements of 248 CMR 10.10(18): *Table 1*, *See* Educational Use Group E (staff) for teacher occupancy toilet facility requirements.

5. In addition to 248 CMR 10.10(18)(h) 4., there shall be separate toilet facilities for kitchen (staff) employees, which shall comply with the requirements of 248 CMR 10.10(18)(i)1. through 3. and *Table 1*, Educational Use Group E (staff) for kitchen employee toilet facility requirements.

6. 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.

7. All schools, which incorporate vocational trade programs where students may happen to become unclean due to work activities, shall comply with 248 CMR 10.10(18)(h)6.

8. Emergency Wash Stations are required and shall be installed in the laboratory classrooms of schools, colleges and universities where flammable liquids and open flame devices are used. *See* 248 CMR 10.13(1)(l)

. (i) Employee Toilet Facilities for (Non-industrial) Establishments.

1. In each establishment where people are employed, there shall be separate toilet facilities for male and female employees. The toilet facilities shall be located in the tenant establishment and shall be plainly designated for male or females.

2. Toilet facilities in establishments referred to in 248 CMR 10.10(18)(j)1. within two branch levels shall be acceptable. Toilet facilities shall not be required for mezzanines. *See* 248 CMR 10.03: *Mezzanine*. In no case may a toilet facility be located more than 300 feet in developed direct distance away from the regular place of daily work activity of any person for whose use it is required. Except where elevators accessible to the employees are provided.

3. Unisex toilet facilities may be allowed if they meet the requirements of 248 CMR 10.10(18)(m).

4. In business or commercial establishments (except industrial) that contain less than 1,200 gross square feet of floor area or do not have reasonable access (within 300 feet and on the same floor) 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(18): *Table 1* for employee facilities, shall meet the minimum requirement.

5. In every business or commercial establishment where only one person is employed or works, there shall be one toilet and one lavatory for use by the tenant provided in the establishment or a core toilet facility shall be located within 300 feet of the tenant establishment. Core or common facilities (defined in 248 CMR 10.10(18)(i)4.), located on the same floor as the establishment being serviced and having separate designated male and female toilet facilities may be used to meet this requirement. The number of fixtures in the core or common toilet facilities shall be in accordance with 248 CMR 10.10(18): *Table 1* for employee toilet facilities (non-industrial).

6. Where core toilet facilities are permitted and are in compliance with the occupancy requirements as outlined in 248 CMR 10.10(18): *Table 1* additional designated (male and female) toilet facilities shall be permitted within the establishment. These fixtures shall not be credited towards the fixture count requirements of 248 CMR 10.10(18): *Table 1*.

(j) Employee Toilet Facilities for (Industrial) Buildings.

1. In every industrial establishment, all toilet facilities, where such toilet facilities include the number and type of plumbing fixtures, the floors, walls, windows, ceilings, lighting, ventilation, doors, partitions, design and location of the toilet facilities, shall comply with 454 CMR 2.00, *Toilets in Industrial Establishments*.

2. Separate toilet facilities shall be provided for each sex and shall be plainly so designated male and female. *See* 248 CMR 10.03: *Mezzanine*.

3. The number of toilets and lavatories shall be provided within reasonable access (as defined in 248 CMR 10.10(18)(j)4.) and in accordance with 248 CMR 10.10(18): *Table 1* for industrial facilities.

4. Distance of direct access for industrial establishments requires that; in no case may a toilet facility be located more than 300 feet in developed direct distance away from the regular place of daily work activity of any persons for whose use it was designed. Except where service elevators, accessible to the employees, are provided.

5. Each 20 linear-inches, or 18-inch circumference-inches of usable sink access will be considered the equivalent of one lavatory.

6. In industries and manufacturing facilities with departments where there is excessive exposure to substances or liquids or where the work performed may create dust and grit conditions, one lavatory sink may be required for every five persons and in all cases, a potable water supply of hot and cold water shall be provided.

(k) Medical and Health Care Building Toilet Facilities.

1. In all medical and health care buildings there shall be separate designated toilet facilities on each floor for male and female patients and visitors.

2. The toilet facilities may be located in a common or core area on each floor so long as the toilet facilities are within 300 feet of all offices.

3. Accessibility to the toilet facilities shall be direct; it shall not require going from one medical office through another for access to the toilet facilities.

4. Handicap toilet facilities are required on each floor.

5. A minimum of one drinking fountain shall be installed for each set of toilet facilities.

(l) Covered Malls Toilet Facilities.

1. In all covered malls there shall be separate designated public toilet facilities for male and females. These toilet facilities shall be centrally located in the common core area on each floor.

2. These facilities are in addition to the requirements of 248 CMR 10.10(18)(i) regarding toilet facilities for male and female employees.

3. When the occupancy exceeds 9,000, toilets shall be installed at the rate of one per 1,500 for women and one per 3,000 for men. Lavatories shall be installed as listed in 248 CMR 10.10(18): *Table 1*.

(m) Handicap Toilet Facility Requirement. Facility for the physically handicapped person:

1. Plumbing fixtures shall be installed in conformance with 521 CMR 30.0: *Public Toilets* (for fixture dimension requirements only).

2. When public toilet facilities are to be installed, handicap plumbing fixtures shall comply with the requirements of 248 CMR 10.10(18)(m).

3. Unisex handicap toilet facilities may be allowed by the Board by 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 handicapped toilet facility meet the minimum fixture requirements of 248 CMR 10.10(18): *Table 1*. A unisex toilet may be counted only one time toward the total minimum fixture requirements.

b. These toilet facilities shall be kept clear of obstructions at all times in accordance with 105 CMR.

4. Wherever drinking fountains are provided, a drinking fountain shall accessible to the physically impaired.

5. Additional sanitary 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.

(n) Toilet Facilities General.

1. Toilet facilities accessible to the public which have two or more toilets or urinals, or two or more thereof in any combination, shall provide a floor drain equipped with an automatic trap priming device and a valved hose connection equipped with a backflow preventer. The hose connection is for the purpose of floor cleaning in the toilet facility.

2. Floor drains shall be installed in the vicinity of the urinal(s) and placed at a grade to enable floor drainage to the floor drain from all directions.

3. Toilets for public use shall be of the elongated style and the seats shall be solid plastic, non-porous and of the open front type. *Refer* to 248 CMR 10.10(5)(a) through (e).

4. When a urinal(s) is provided in a toilet facility 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 finished floor surface, shall be protected by non-absorbent building products and material. Wood and fiber boards are prohibited in these areas. *Refer* to 248 CMR 10.10(7)(c).

5. In a toilet facility with more than one toilet, or with a toilet and a urinal, each toilet shall be enclosed. Each urinal shall be side shielded for privacy.

6. When two or more urinals are required, a shield shall be provided between urinals.

(o) Laundries. Laundry facilities 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:

1. One and Two Family Dwelling: At least one washing machine connection.
2. Multiple Dwellings:
   a. Non-elderly Housing: In multiple dwellings that are not restricted to the elderly, one washing machine connection for every ten dwelling units, or fraction thereof.
   b. Elderly Housing: In housing that is restricted to the elderly, one washing machine connection for every 20 dwelling units or faction thereof.
   c. 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 the washing machine connection.

(p) Urinals.

1. Urinals may be substituted for toilets where indicated in 248 CMR 10.10(19): *Table 1* are listed by percentage.
2. Urinals listed for elementary, secondary, post secondary and industrial factory/warehouse are in addition to the toilets required.
3. When urinals are used at least one shall be set for handicapped use.

(q) Bathroom Group Defined. a bathroom group shall consist of one bath tub or shower stall, one toilet, and one lavatory.

Table 1: Minimum Facilities For Building Occupancy.
(*Optional by owner)

Building Clarification	Use Group	Toilets		Urinals Males	Lavatories Each Sex	Drinking Fountain	Bath/ Show.	Other Fixtures	Pertinent Regulations. 248 CMR 10.10(19)
		Females	Males						
Theaters	A-1	1 per 30	1 per 60	50%	1 per 100	1 per 1000		1 service sink per floor	(b), (i)1., (m), (n), (p)
Nightclubs, Pubs	A-2	1 per 30	1 per 50	50%	1 per 75				(b), (m), (n), (p)
Restaurants	A-3	1 per 30	1 per 60	50%	1 per 200				(b), (m), (n), (p)
Hall, Museums, Libraries Etc.	A-3	1 per 50	1 per 100	50%	1 per 200				(b), (i)1., (m), (n), (p)
Coliseums, Arenas	A-3	1 per 30	1 per 60	50%	1 per 150				(b), (i)1., (m), (n), (p)
House of Worship	A-4	1 per 50	1 per 100	50%	1 per 200				(b), (c), (m), (n), (p)
Stadiums Etc.	A-5	1 per 30	1 per 60	50%	1 per 150				(i)1., (m), (n), (p)
Pool	A-5	1 per 40 bathers	1 per 40 bathers	33%	1 per 60 bathers	At least one source	1 for every 40 bathers		(i)1., (m), (n), (p). *See* 105 CMR for bather load.
Bathing (Public Beaches)		1 per 200	1 per 500	33%	1 per 1000		1 per 1000	1 Service Sink	(d), (m), (n), (p)
Day Care Facility (Child)	E-I-3	1 per 20	1 per 20		1 per 20			1 Service Sink	(e), (m), (n)
(Staff)	N/A	1 per 20	1 per 25	33%	1 per 40				(i), (m), (n), (p)
Detention Facility (Detainee)	I-3	1 per 6	1 per 8	33%	1 per 6		1 per 8		(f), (m), (p)
(Staff)	N/A	1 per 20	1 per 25	33%	1 per 40				(i), (m), (n), (p)
Dwellings (Single)	R	One Bathroom Group and One Kitchen Sink							(o), (q)
(Multiple)	R	One Bathroom Group and One Kitchen Sink per Unit							(o), (q)
(Hotel/Motel)	R	One Bathroom Group per Unit							(m), (q)
(Dormitories)	R-2	1 per 6	1 per 8	33%	1 per 8		1 per 8	1 Service Sink per Floor	(g), (m), (n), (p)
Educational (Kindergarten)	E	1 per 20	1 per 20		1 per 20	1 per 75		1 Service Sink Per Floor	(h), (i), (m), (n), (p)
(Elementary)	E	1 per 30	1 per 60	1 per 60	1 per 60	1 per 75			
(Secondary)	E	1 per 30	1 per 90	1 per 90	1 per 90	1 per 75			
(Post Secondary)	E	1 per 90	1 per 180	1 per 180	1 per 180	1 per 75			
Staff)	E	1 per 20	1 per 25	33%	1 per 40				
Employee (Non-Industrial)*		1 per 20	1 per 25	33%	1 per 40		1 per 15*	1 Service Sink per Floor	(i), (m), (n), (p)

Building Clarification	Use Group	Toilets		Urinals Males	Lavatories Each Sex	Drinking Fountain	Bath/ Show.	Other Fixtures	Pertinent Regulations. 248 CMR 10.10(19)
		Females	Males						
Employee (Industrial Factory/ Warehouse and Similar Usage	F	1 per 15	1 per 20	1 per 40	1 per 30		1 per 15		(j), (m), (n), (p)
Institution Hospital (Private/Semi)	I	1 per Room Nursing Homes: 1 toilet and 1 lavatory with direct access from each bedroom (shared by 8 beds max), can be unisex.			1 per Room	1 Per each set of rest-rooms	1 per 15 (in ICU) 1 per 12 (inpatient facilities other than ICU) 1 per 6 patients (Psychi-atric Hosp.) 1 per 8 (Rehab facility)	1 Service Sink Per Floor	(i), (m), (n)
Nursing Homes (Ward)		1 per 8	1 per 10	33%	1 per 10		1 per 15	1 Service Sink Per Floor	(i), (m), (n), (p)
Malls (Covered)	M	1 per 750	1 per 1500	50%	1 per 2000	1 per 2000			(i), (l), (m), (n), (p)
Medical/Health Care Building	B	1 per 45	1 per 55	50%	1 per 200	1 Per each set of rest-rooms	1 per each set of rest-rooms		(i), (k), (m), (n), (p)
Office Buildings	B	1 per 20	1 per 25	33%	1 per 50	1 per Floor			(i), (m), (n), (p)
Retail (Mercantile)	M	1 per 20	1 per 20	33%	1 per 40				(i), (m), (n), (p)
Waiting Rooms (Airports, Railroad and Bus Stations)	A	1 per 35	1 per 75	50%	1 per 200	1 per 500			(b), (m), (n), (p)

(19) Funeral Establishment Preparation Rooms. Funeral establishment preparation rooms shall comply with the provisions of 239 CMR 3.07.

(a) The preparation room of a Funeral establishment shall be provided with a floor drain and flooring that is compliant with 239 CMR 3.07(3).

(b) The preparation room shall include a flushing rim sink and the preparation room shall be protected by proper backflow devices.

(c) 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.

(d) Emergency Wash Stations shall be installed and be compliant with the provisions of 239 CMR.

10.11: Hangers and Supports

(1) General. Piping shall be installed with provisions, when necessary, for expansion, contraction or structural settlement.

(2) Material. Hangers, anchors, and supports shall be of metal or other material of sufficient strength to support the piping and its contents, except that piers may be of concrete, brick, or other Product-Approved material.

(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 (PVC and ABS) 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 height, or at intervals not exceeding ten feet.

(b) Horizontal Piping. Horizontal pipe of the following materials shall be supported at not more than the following distance intervals.

1. Cast Iron Soil Pipe -- 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 -- 12 foot intervals.
3. Copper tubing (1¼ inches or less) -- six-foot intervals.
4. Copper tubing (1½ inches or over) -- ten-foot intervals.
5. Plastic (PVC and ABS) pipe (1½ inches or less) -- three-foot intervals, (two inches or over) --- four-foot intervals, (*Refer* to 248 CMR 10.06(2)(o) and 248 CMR 10.06(2)(p).
6. Cross-linked Polyethylene (PEX) Tubing shall meet the following requirements:
   a. the maximum hanger spacing is to be 32-inch intervals for all sizes;
   b. the tubing is to be secured rigidly to studs or joist with hangers and supports that enable adequate expansion and ease of movement;
   c. Plumber shall consult the individual manufacturers recommendations for other specific installation methods.
7. Stainless steel tubing at each story height, but not more than ten foot intervals.
8. Stainless Steel Tubing (1¼ inches or less) -- six-foot intervals.
9. Stainless Steel Tubing (1½ inches or over) -- ten-foot intervals.
10. Aluminum DWV pipe -- ten foot intervals.11. CPVC pipe sizes one inch or less shall be supported at three-foot intervals and sizes 1¼ and greater shall be supported 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 methods approved by the Inspector.

(b) Other piping material shall be so anchored as to take the load off the stack at the base.

(6) Piping in Masonry.

(a) Piping which is installed in and parallel to the faces of reinforced concrete or masonry walls shall be installed in adequately sized pipe space chases formed in the concrete or masonry walls.

(b) The pipe chase spaces shall be accessible, or the piping shall be otherwise installed free of the reinforced concrete or masonry.

10.12: Indirect Waste Piping

(1) Indirect Wastes Required.

(a) Food Handling Establishments.

1. Food 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 enclosed equipment.

2. Dishwashing pre-rinse sinks installed in combination with a commercial dishwasher, pot sinks, scullery sinks and other sinks are excluded from the indirect waste requirement and shall be directly connected to the sanitary drainage system.

3. Single compartment culinary/produce sinks or individual culinary/produce sink compartments specifically designated and **labeled* for produce preparation shall convey the waste from these fixtures or compartments indirectly to a properly trapped and vented floor sink. The produce preparation compartment shall be authorized and approved by the Local Board of Health or other designated municipal health official.

4. The produce preparation label must be a laminated sign with letters two-inches in height that reads: "This Compartment ONLY Is Designated For Produce Preparation."

5. All indirect waste shall discharge through an air gap or air break into a properly trapped and vented receptor except that an air gap is required where the indirect waste pipe may be under vacuum (less than atmospheric pressure).

(b) Connections from Water Distributions 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 not regularly classed as plumbing fixtures but which have drips or drainage outlets, may be drained by indirect waste pipes discharging into an open receptacle through either an air gap or air break.

(e) Clear Water Wastes.

1. Expansion tanks, fire sprinkler systems, air conditioning equipment, drip or overflow pans, or similar devices that waste clear water only, shall discharge waste into the building storm drainage system. The clear water waste shall discharge through an indirect waste by means of an air gap, except:

2. The waste discharge from *safe waste pans* serving water heaters or hot water storage tanks is exempt from this requirement and may discharge to a properly trapped and vented fixture by means of an air gap to the sanitary drainage system.

3. 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 in accordance with 248 CMR 10.12(1)(a)5. The clear water waste requirement is not withstanding any local ordinance, by-law, rule or regulation to the contrary.

(f) Swimming Pools.

1. Pipes that convey waste water from swimming or wading pools including pool drainage, back wash from filters, water from scum gutter drains or floor drains which serve walks around pools, shall be installed as an indirect waste.

2. Circulation pumps may be utilized to lift waste water when the indirect waste line is below the sewer grade.

3. The indirect waste shall discharge into the storm drainage system through an air gap.

4. All indirect waste from swimming pools shall be free of chlorine prior to discharge to the storm drainage system.

(g) Pressure Tanks, Boilers and Relief Valves. The drains from pressure tanks, boilers, relief valves and similar equipment when connected to the storm drainage system shall discharge through an indirect waste by means of an air gap.

(h) Safe Waste Required.

1. A safe waste pan shall be installed under a water heater or hot water storage tank that is installed in a position elevated above any occupied space.

2. The safe waste pan shall be installed under water heaters and hot water storage tanks where there is occupancy below and shall be piped indirectly to a properly trapped and vented fixture.

3. The Minimum size waste pipe is to be 1¼-inch pipe.

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

(i) Safe Waste Pans.

1. Safe waste pans shall be at least two inches deep and have a minimum clearance of two inches around the base of the hot water storage tanks.

2. Safe waste pans shall be installed for hot water storage tanks that are six gallons in capacity or larger. *See* 248 CMR 10.22: *Figure 14*.

(j) 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.

(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 set forth 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:

1. To a Receptor:

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

b. The indirect waste shall terminate a sufficient distance above the flood level rim of the receiving fixture to provide the required air gap, and shall be installed in accordance with 248 CMR 10.00.

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 10.00.

(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) 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.

(c) 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.

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

(e) 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.

(f) The Stand Pipe Receptors. The stand pipe receptor for an automatic clothes washing machine shall be installed in one of the following ways:

1. The stand pipe receptor shall be individually trapped and vented.
2. The stand pipe shall be no more than 30 inches nor less than 18 inches above its trap and in no case shall the trap be installed below the floor.
3. The stand pipe receptor shall be installed in the cover of a floor drain provided that the cover is properly tapped to receive the stand pipe.
4. The floor drain or trench drain shall be sized based on the discharge rate of the automatic clothes washer.

(4) Condenser Sumps.

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

(b) Steam condenser piping may require temperature control by discharging to an approved boiler blow-off tank. Steam condenser piping shall be connected by discharging into an indirect waste receptor connected to the sanitary drainage system.

(5) Installation of Indirect Waste Piping.

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

(b) Material, Slope, Sizing, and Approval.

1. The piping material to be used, its size and the slope at which it is installed shall meet the requirements of 248 CMR 10.00.
2. Any fixture or piece of equipment to be indirectly wasted that has a waste outlet smaller than 1¼ inches in diameter shall be connected to an indirect waste pipe one size larger than said outlet.

(c) Indirect Waste Piping Described.

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 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.
3. 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.
4. 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.

(d) Traps.

1. Prohibited. A trap shall not be installed on an indirect waste main or on an indirect waste branch main.
2. Where Allowed. 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 indirect waste, an indirect waste main or an indirect waste branch main.
2. Only an indirect waste branch may be trapped and when the trapping of indirect waste branch or branches will interfere with the free flow of air through the indirect waste main or branch main, additional ventilation outlets shall be provided to enable the free flow of air.
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 Hazardous Wastes

(1) General.

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

(b) The required diluting or neutralizing device shall be automatically provided with a sufficient intake of diluting water or neutralizing medium so as to make its contents non-injurious before being discharged into the drainage system.

(c) All plans and specifications for special hazardous waste piping and treatment systems shall be prepared by a registered professional engineer and shall be submitted to the local Inspector.

(d) Systems requiring special consideration by the engineer are those handling organisms containing recombinant DNA molecules, radioactive, nuclear, solvents and perchloric wastes.

(e) When required, the plans, specifications, and other pertinent data, as requested, shall be submitted by the designer to the Department of Environmental Protection (DEP) or other authorities for their review and approval.

(f) Permits shall be applied for on the basis of plans approved under 248 CMR 10.13(1)(c) and inspections shall be conducted for the work described in 248 CMR 10.13 in accordance with the requirements noted in 248 CMR 10.13.

(g) All special hazardous wastes shall be conveyed in separate piping systems

(h) 248 CMR 10.13 shall include, but shall not be limited to, all special hazardous wastes such as organisms containing recombinant DNA molecules, chemical, nuclear, radioactive, deionized liquids, acids, perchloric, solvents and alkalines from laboratories and industrial activities.

(i) Nuclear or radioactive waste treatment and/or disposal shall conform to the standards of the Nuclear Regulatory Commission, N.R.C.

(j) Color Marking requirements:

1. Lines conveying special hazardous wastes shall be painted yellow.

2. This requirement may be met by painting three inch wide bands at intervals of not more than 25 feet and at points where piping passes through walls, floors and roofs, in which case the bands shall be applied to the piping on both sides of the walls and both above and below the floor or roof.

3. Snap-on bands marked "special hazardous wastes" may be used and spaced as described herein for painted bands.

4. Points of outlet for special hazardous wastes shall also be color-coded yellow.

(k) Special hazardous waste of material treatment and/or disposal shall be conducted in conformance with 310 CMR 30.00: *Hazardous Waste* (DEP) and local bylaws.

(l) Emergency Wash Systems shall meet the following requirements:

1. The systems shall be required in every school, college, university, or building laboratory newly constructed or renovated, or any room used for similar purposes wherein:

a. corrosive or flammable liquids are handled;

b. chemicals are stored or used; or

10.13: continued

c. where open flame devices are used.

2. The systems shall include Drench/Deluge Showers, Hand Held Body/Face washers and Deck Mounted Drench Hoses.

3. The permanently mounted showers shall be located as close to the main door of the laboratory as possible *(to provide escape route)*, but shall not be located greater than 50 feet from an experimental area.

4. The permanently mounted shower shall be capable of discharging a continuous spray at a rate of 30 Gallons Per Minute.

5. The systems shall be tempered to between 70EF and 90EF and be installed in a manner that prevents the stagnation of water in the piping that supplies permanently mounted showers and face/eye wash stations.

6. An exception to the tempered water requirement is: in existing buildings where tempered water is inaccessible, cold potable water shall be permitted with prior permission of the fire prevention safety officer and Inspector.

7. Existing laboratories shall be compliant with the most recent provisions of 527 CMR 10.02(2): *Fire Extinguishers* from the Board of Fire Prevention Regulations.

(2) Product-approved Materials: Fixtures and Piping Systems.

(a) List of Fixture Materials

PRIMARY	SECONDARY
1. High silicon (14.5% cast iron)	A. All items 1 – 8 Primary
2. Polypropylene	B. Poly-Vinyl Chloride (PVC)
3. Polyethylene	
4. Glass	
5. Chemical stoneware	
6. Stainless Steel Type #316-18-8	
7. Chemical resistant monolith epoxy resins	

(b) All materials listed in 248 CMR 10.13(2)(a) shall be installed and joined in accordance with the manufacturer's recommendation and 248 CMR 10.11.

(c) Pipes shall be furnished in straight lengths and each length shall be marked with the manufacturer's name and the type of material.

(d) For applicable material standard, *refer* to 248 CMR 10.06.

(3) Installation Methods for Special Hazardous-waste Piping: Installation for special Hazardous-waste piping shall conform to 248 CMR 10.13(3): *Tables 1* and *2*:

248 CMR 10.13(3): *TABLE 1*

PIPE AND FITTINGS PRIMARY

Materials	Joining Methods	Above Ground	Below Ground
High Silicon cast iron	Acid Resistant Packing with caulked lead joint or Mechanical Clamp	Yes	Yes
Glass Pipe	Mechanical Clamp	Yes	Yes (a)(c)
Polypropylene Sch. 40 or 80	Heat Fusion	Yes (b)(e)	Yes (e)
Polypropylene Sch. 40 or 80	Mechanical Joints Clamp or Flange	Yes (b)(d)(e)	Yes (c)(e)
Polyethylene	Heat Fusion	Yes (b)(e)	Yes (e)
Polyvinylidene	Heat Fusion	Yes (b)(d)	Yes
Polyvinylidene	Mechanical Joints	Yes (b)(d)	No

(a) Buried glass pipe shall be sleeved with rigid foam casing.
(b) Shall be flame retardant above ground.
(c) Only stainless steel mechanical joint clamps or heat fusion joining method shall be used underground.
(d) Flanges may be used above ground with proper gasket material for corrosive resistance to the waste carried and compatibility with the piping material.
(e) I.P.S. threaded joints may be used on schedule 80 polypropylene, polyethylene.

248 CMR 10.13(3): *TABLE 2*
PIPE AND FITTINGS SECONDARY

Material	Joining Methods	Above Ground	Below Ground
a. All items listed above for primary	all items listed above for primary	Yes	Yes
b. Poly Vinyl Chloride	Injection Bonding, Solvent cement, Approved mechanical joints	Yes	Yes

(4) Vents Serving Special Hazardous Wastes. Vent pipes shall not be connected to vents of the sanitary system but shall be extended through the roof with acid resistant pipe vents from biomedical facilities and shall be designed in accordance with the NIH guidelines.

(5) The Design and Installation of New Special Hazardous Waste Systems Including Additions, Renovations, Alterations or Revisions To Existing Systems.
(a) The owner shall submit a notarized letter stating the materials to be disposed of, or discharged into the special hazardous waste system. This letter shall be attached to the plans submitted per the requirements in 248 CMR 10.13(1), and will be the basis of the engineer's design.
(b) The special hazardous waste system receiving the discharge of corrosive liquids, regardless of the size or number of fixtures, shall be installed separately from the other parts of the building plumbing system.
(c) The waste shall terminate at a point ten feet beyond the outlet of the final treatment or the inner face of the exterior foundation wall and shall be a minimum size of four inches.
(d) That portion of piping from the outlet of the neutralizing and treatment device to a point ten feet beyond the inner face of the foundation wall shall be of a material that is Product-approved specifically for special hazardous waste systems.
(e) Pumps that discharge special hazardous waste shall be constructed of pressure rated pipe and fittings, and be of material compatible with Product-approved material specifically for special hazardous waste systems.
(f) Pump wetted parts, pit lining, pit frames, and pit covers shall be constructed of materials chemically resistant to the liquids being collected and discharged.
(g) Alternate design of a system, materials and/or termination points shall be considered only where evidence is presented that the standard contained in 248 CMR 10.13(4)(a) through (f) cannot reasonably be complied with. Before a permit may be issued, plans for an alternative special hazardous waste system shall be submitted to the Inspector for review and approval.

(6) Plumbing Layouts for Laboratory Sinks and Tables.
(a) General. The installation of waste and venting system for piping handling special hazardous liquids shall be the same as sanitary waste and vent piping, except as modified in 248 CMR 10.13.
(b) Traps. A trap serving a fume hood or similar type piece of enclosed equipment may not be used to serve another fixture outside the hood enclosure and more than one fume hood may not be served by the same trap.
(c) Individual Venting of Traps.
1. Individual vents shall be provided whenever a battery waste and vent system is not being used.

2. When more than one fixture is served by a single continuous waste and vent, the branch fittings to receive the discharge from traps need not be at the same elevation.

(d) Battery Systems of Waste and Vent Piping.

1. The main horizontal branch drain shall be one pipe size larger than that required by the fixture units connected to it. (Figure cup sinks as one fixture unit.)

2. Horizontal piping size three inches and smaller shall have a minimum slope of ¼ inch per foot.

3. In battery venting, the vent shall be connected to the drain between the last and second last branches to fixture traps and a relief vent shall be connected to the main drain between the waste stack and the first branch to fixture trap on all but the highest connection to a 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. Minimum size of relief vents shall be two inches.

6. Any branch from a main battery waste which has a separate trap vent may be considered as a relief vent and every branch waste having a developed length exceeding ten feet shall be individually vented.

7. The vent for a main battery waste shall be at least ½ the diameter of the horizontal branch drain.

8. Floor drains may be connected to the horizontal main battery drain with traps below the floor. In such cases:

a. the minimum size of the branch shall be not less than three inches;

b. the main branch to which the floor drain waste is connected need not be larger than the branch to the floor drain;

c. a separate trap vent is not required unless the developed length from the centerline of the floor drain trap inlet exceeds 15 feet.

d. Floor drain traps shall be included in determining relief vent requirements.

9. 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 and a cleanout shall be installed in the vertical waste above the floor. *See* 248 CMR 10.22: *Figure 11*.

(7) Sizing for Neutralizing Sumps

(a) The normal laboratory sink will produce on the average about ten gallons per hour of affluent and this is the basis which should be used to size the neutralizing sump.

(b) The smallest size sump to be used should have a capacity of five gallons which will handle a single laboratory sink or a cup sink.

(c) To size a sump for more than one sink, the following Table 3 should be used.

248 CMR 10.13, TABLE 3

Maximum Number of Sinks Handled	Tank Capacity In Gallons	Minimum Inlet Outlet and Vent Sizes
1	5	2
4	15*	2
8	30	3
16	55	4
25	100**	4
40	150	4
60	200	4
75	250	4
100	350	4
150	500	4

*Sumps 15 gallons and larger shall be chamber vented.

**When in the judgement of the professional engineer, a neutralizing tank is to be equipped with a pH system, the pH system should be equipped with an audio-visual alarm. The regulatory agency may also require an "outflow" recorder for pH. The alarm and recorder shall function when the system is operating.

(c) The neutralizing materials to be used should be either:
1. For dilute acid waste water.
a. Limestone in pieces of one to three inches diameter size range must contain a high calcium carbonate content in excess of 90%.
b. If the neutralizing medium selected is limestone, then its fill level must be from the sump tank bottom to the invert of the inlet pipe.
2. For Acidic and Alkaline Waste. Caustic Soda (NaOH) and Sulfuric Acid (H_2SO_4) or other neutralizing agents may be added through metering pumps to control the pH.

(d) Maintenance of Neutralizing Sumps.
1. To insure the correct operation of this system, it shall be inspected monthly (by removing the cover, checking the level of limestone chips and adding chips if necessary) and neutralizing materials be replaced or replenished as required.
2. A sign shall be stenciled on or in the immediate area of the sump in letters one inch high. This sign shall read:

IMPORTANT
"This sump must be inspected on a regular and frequent basis and the neutralizing medium or agent replaced when necessary. Failure to do so will result in serious damage to the piping system."

(e) Materials of Sumps:
1. The following materials are Product-Approved by the Board:
a. High-Density Polyethylene***
b. Chemical Stoneware
c. Polypropylene
d. Fiber Glass Reinforced Plastic (FRP)***
e. Precast or poured in place concrete chambers with a liner resistant to the hazardous waste being discharged.
f. The use of materials other than those specified above must be Product-approved by the Board.
2. Sumps 15 gallons and larger shall be chamber vented.
3. When in the judgment of the professional engineer, a neutralizing tank is to be equipped with a pH system, the pH system should be equipped with an audio-visual alarm. The regulatory agency may also require an "outflow" recorder for pH. The alarm and recorder shall function when the system is operating.
4. Sump material subject to distortion by heat or other factors, when in use, such as Fiber Glass Reinforced Plastic, must be restrained or enclosed.

(f) Curbing Around Sumps. DEP standards require curbing around sumps above certain sizes.

(8) Discharge of Waste Through Troughs.
(a) Laboratory furniture and casework which utilize troughs for the discharge of wastes shall be independently trapped, wasted or vented unless the waste outlet is within 30" of a properly wasted and vented sink.
(b) Where troughs or floor trenches are required to intercept floor spills, or are required for tank or equipment drainage, the outlets from the trough or trenches shall be equipped with acid resisting grating and lining and the system shall be trapped and vented as hereinbefore specified.

***Sump material subject to distortion by heat or other factors, when in use, must be restrained or enclosed.

(9) pH Adjustment Tanks.

(a) Where it is inadvisable or impractical to install a neutralizing sump with either marble or limestone chips to bring pH factor of waste materials up to neutral zone or where the pH factor of anticipated wastes may vary from acid range through neutral zone and up into the alkaline range a pH adjustment tank shall be provided.

(b) pH adjustment tanks may be installed for partial or entire building systems.

(c) pH adjustment tanks will consist of an acid/alkaline resisting tank, receiving wastewater from one or more sinks. The tanks shall meet the following requirements:

1. This tank is to be sized according to 248 CMR 10.13(6).

2. The tank is to have an agitator, which will operate when lab sinks and cup sinks or other hazardous waste fixtures are in use.

3. The tank will also have a sensor, to detect the pH of tank contents, within a range of two to 12 (alkaline), where the sensor shall be electrically connected to a control panel. This control panel is to be connected to acid/alkaline pumps. Acid/alkaline pumps are to be inserted into tanks containing neutralizing agents to bring tank contents up from an acid pH or down from an alkaline pH to a range of six to nine. The discharge of each pump is to run directly to the top of the adjustment tank. *See* schematic sketch in 248 CMR 10.13(8): FIGURE 1.

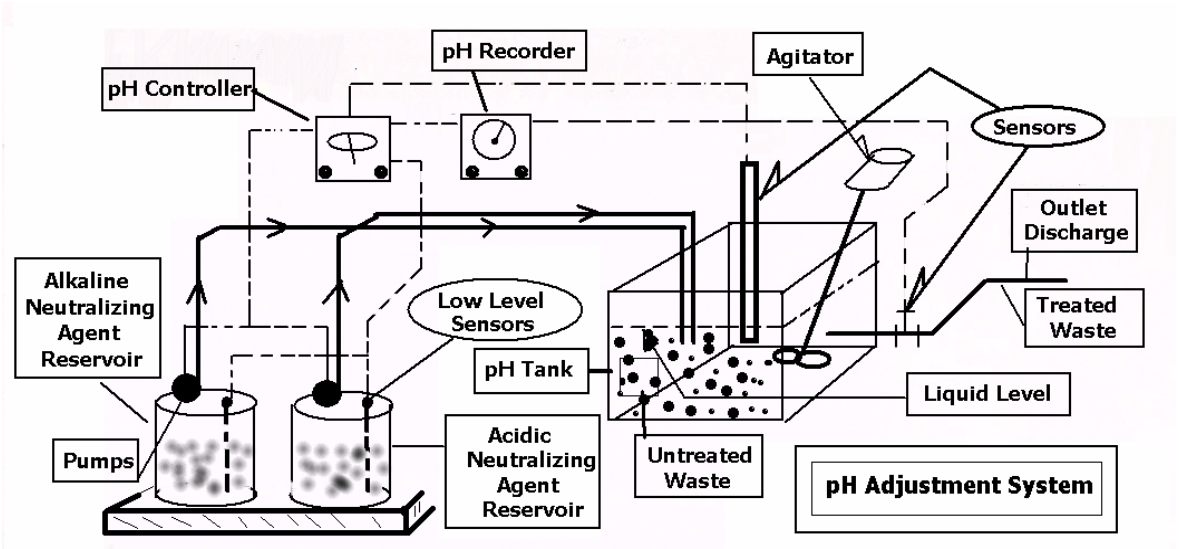
(d) When in the judgement of the professional engineer a neutralized tank is to be equipped with a pH system, the pH system shall be equipped with an audio-visual alarm, which shall function at all times the system is operating

(e) The regulatory agency may also require an "outflow" recorder for pH, which shall function at all times the system is operating.

(f) Solvent bearing waste shall not be introduced into the building drainage system or sewer but shall be disposed of according to the applicable regulations of the DEP, EPA or other appropriate regulating agency.

(g) Acidic wastes shall be neutralized before being discharged into the building's drainage system.

FIGURE 1



(10) Recombinant D.N.A. Laboratory Wastes

(a) Viable organisms containing recombinant deoxyribonucleic acid (DNA) as defined in the latest revision of the National Institutes of Health Guidelines for Research Involving Recombinant DNA Molecules (NIH guidelines), except those qualifying as Good Large Scale Practice (GLSP) organisms, shall not be introduced into the building drainage system or sewers without first being sterilized, treated or inactivated as described in 248 CMR 10.13(9)(b) and (c).

(b) In laboratories where both fermentation and purification take place, the waste for each shall be treated by methods proven to be effective and appropriate for the specific type of waste (as required by Massachusetts Law, 310 CMR 30.000: *Hazardous Waste*, and Water Resource Commission, Regulation of Waste into Sewerage Works) prior to their discharge into the building's drainage system or sewer.

(c) Laboratory wastes, generated by biomedical research or production laboratories, which contain viable recombinant DNA organisms not qualifying as GLSP organisms, shall be sterilized or treated according to the regulations and standards of the National Institute of Health (Recombinant DNA Guidelines and the Laboratory Safety Monograph) or the applicable requirement of other agencies having jurisdiction. The owner of the laboratory shall:

1. submit the proposed treatment procedures to the registered professional engineer who prepares the plans and specifications of the hazardous waste system;
2. submit the proposed treatment procedures to the relevant authorities, including the Inspector; and
3. receive their approval prior to connection to the building's drainage system.

(d) Waste containing recombinant DNA organisms shall be:

1. Sterilized or treated at the point of origin or, where there is more than one point of origin, these wastes may be collected in a central holding tank for sterilization and treatment.
2. The holding tank is to have a sampling device and a high water alarm.
3. The alarm shall be activated when the tank's contents have reached a predetermined level.
4. The sampling device is to consist of a pump or other device or means to transfer a selected sample into the control area of the laboratory for verification that it contains no living organisms.
5. When the sample contains no living organisms, the contents of the tank can then be allowed to enter the sewer system. If the sampling process discovers live cells, the contents of the tank shall be re-sterilized and re-tested before being allowed to enter into the sewer. *See* reference cited below concerning "steam sterilization" and chemical disinfection."

(e) Testing and Monitoring.

1. The adequacy of treatment methods as selected by an institution is to be monitored on a periodic basis.
2. Biomedical research or production laboratories shall maintain records indicating the results of such testing.
3. In the event of a testing failure, the system is to be corrected immediately.

(f) Neutralizing chambers or tanks employing marble or limestone chips shall not be used to adjust pH for wastes generated by biomedical research or production laboratories.

(g) Approved and recommended references for "steam sterilization" and "chemical disinfection".

1. Laboratory Safety Monograph (A supplement to the NIH Guidelines of Health and Human Services Section 11-E-8, Selecting Chemical Disinfectants in Recombinant DNA Research, 102-105.
2. Disinfection, Sterilization and Preservation 3rd Ed. Edited S. S. Bock, Lea and Febiger, Philadelphia, 1983. (Part 1 Chemical and Physical Sterilization, Chapter 1 Sterilization by Heat.)

(11) Industrial Wastewater. When usage of either a neutralizing sump or a pH adjustment tank would be inadequate to treat the industrial wastewater discharge and therefore not comply with applicable regulatory limits on hazardous waste, an industrial wastewater treatment system shall be designed by an engineer and plans and specifications shall be submitted to the Department of Environmental Protection (DEP) or other authorities as required.

(12) Secondary Containment.

(a) When a secondary containment system for hazardous waste is specified, it must be installed by a licensed plumber in compliance with 248 CMR 10.13.

(b) The system must be able to withstand a ten-foot hydrostatic head pressure.

(c) The outer system shall be air tested to five P.S.I.G. for ten minutes.

(d) The gauge used shall be calibrated in increments no greater than 1/10 P.S.I.G.
(e) The system shall allow for thermal expansion and contraction, and inner and outer piping support.

10.14: Water Supply and the Water Distribution System

(1) Potable Water Supply.
(a) Buildings.
1. Every building equipped with plumbing fixtures and used for human occupancy or habitation shall be provided with a potable supply of cold water in the amounts and at the pressures specified in 248 CMR 10.14.
2. For permanent residences or buildings in which people are employed, hot water shall be provided.
(b) Use of Non-potable Water Prohibited. Only potable water shall be accessible to plumbing fixtures supplying water for:
1. drinking;
2. bathing;
3. culinary use; or
4. the processing of food, medical or pharmaceutical products.

(2) Water Service.
(a) The water service pipe shall be of sufficient size to furnish water to the building in the quantities and at the pressure required elsewhere in 248 CMR 10.00.
(b) It shall, in no case, be less than ¾ inch nominal pipe diameter.
(c) Recommended methods for sizing the water service pipe shall be the same as required in 248 CMR 10.14(4): *Designing and Sizing the Building Water Distribution System*.

(3) Conservation of Water.
(a) Conservation of Hot Water.
1. Showers. Showers used for other than safety reasons shall be equipped with flow control devices to limit total flow to a maximum of 2.5 G.P.M. per shower head.
2. Lavatory faucets in public toilet facilities shall:
a. Limit the delivery of water to a maximum of .5 G.P.M. unless a metering faucet is provided that limits delivery to a maximum of 0.25 gallons per metering cycle.
b. Be equipped or installed with devices which limit the outlet temperature to a maximum of 110 degrees.
c. Metering faucets of any type are not required for toilet facilities designated and used by employees only.
3. The maximum temperature of the domestic hot water in residential buildings shall not exceed 130 degrees. 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.
(b) Conservation of Cold Water for Toilets and Urinals.
1. Flushometer Toilets.
a. Flushometer toilets that are floor mounted or wall mounted shall be low consumption toilets which use a maximum of 1.6 gallons (six liters) per flush.
b. Flushometer type urinals shall discharge a maximum of one gallon (3.8 liters) per flush.
c. The Board may grant Product-approval to standard flushometer toilets and urinals which do not meet the specific standards when, in the opinion of the Board the configuration of the building drainage system requires a greater quantity of water to adequately flush the system.
2. Tank Type Toilets.
a. All two-piece toilets shall be low consumption toilets, which use a maximum of 1.6 gallons (six liters) per flush.
b. In satisfaction of the requirements of 248 CMR 10.14, the Board shall permit the installation of tank-type toilets equipped with devices which are found by the Board to meet applicable standards, in toilets having a tank capacity in excess of 1.6 gallons (six liters).

3. All other toilets not covered in 248 CMR 10.14(3)(b)1. and 2. shall be low consumption toilets that use a maximum of 1.6 gallons (six liters) per flush.

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

(a) Methods to Be Used.

1. The design of the building's hot and cold-water distribution system shall conform to good engineering practices.

2. The methods used to determine pipe sizes shall be the procedure outlined in Appendix "D" of the United States Public Health Service publication #1038, or a system designed by a registered professional engineer, using the computation outlined in 248 CMR 10.14(4): *Tables 1*, *2*, and *3*. (An example of the use of these tables is shown following 248 CMR 10.14(4): *Table 3*: *Capacity Values for Service, Mains, Risers and/or Branches*).

3. The minimum size of a fixture supply pipe shall be in accordance with 248 CMR 10.14(4): *Table 1*.

4. The size of fixture supplies, the building main and branch distribution piping may be determined from 248 CMR 10.14(4): *Tables 1*, *2*, and *3*.

5. To size the hot and cold water main or distribution branches for a building, they shall be computed on an individual basis.

6. 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.

7. Size of Fixture Supplies.

a. The minimum sizes of a fixture water supply pipe shall be as shown in 248 CMR 10.14(4): *Table 1*: *Minimum Sizes of Fixture Water Supply Lines and Factor Values*.

b. The fixture water supply pipe shall be extended to within at least 30 inches of the point of connection to the fixture.

TABLE 1
MINIMUM SIZES OF FIXTURE WATER SUPPLY LINES AND FACTOR VALUES

TYPE OF FIXTURE OR DEVICE	Nominal Pipe Size (inches)	Factor Value
Bathtub (with or without single shower head)	½	2
Bidet	⅜	1
Drinking fountain	⅜	1
Dishwasher (Domestic)	½	2
Dishwasher (Commercial)	¾	6
Kitchen sink, Residential	½	2
Kitchen sink, Commercial (Pot and Scullery)	¾	6
Vegetable Prep or Bar Sink (Residential)	½	2
Hand Wash Sinks	⅜	1
Shampoo Sinks	⅜	1
Lavatory	⅜	1
Utility Laundry Sinks 1, 2, or 3 compartments	½	2
Shower Valve (single head)	½	2
Shower Valve (Multiple heads)	¾	6
Sinks (service, slop)	½	2
Sinks flushing rim	¾	6
Laundry Valve	½	2
Urinal (flush valve type)	¾	6
Toilet (tank type)	⅜	1
Toilet (flush valve type)	1	12
Hose Connections/Sillcocks/Wall Hydrants	½	2

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	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		
⅜	1		
½	1.1	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

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	One	Wall Hydrant		4	
		TOTAL	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-approved 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.

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.

(c) 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(4)(f), 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.

(d) Variable Street Pressures. Where street main pressures fluctuate, the building water distribution system shall be designed for the minimum pressure available.

(e) Supply Demand. The supply demand in gallons per minute in the building water distribution system shall be determined on the basis of the load in terms of supply fixture units and of the relationship between load and supply demand.

(f) Minimum Pressures Required in Water Distribution System.

1. Based on the minimum static water pressure available, pipe sizes shall be selected so that under conditions of peak demand a minimum flow pressure at the point of discharge shall not be less than that shown in 248 CMR 10.14(4): *Table 4*: *Minimum Flow Pressure and Flow Rates*.

1. In determining minimum pressures at the outlets, allowances shall be made for the pressure drop due to friction loss.

TABLE 4
MINIMUM FLOW PRESSURE AND FLOW RATES

FIXTURE OR DEVICE	FLOW PRESSURE P.S.I.	FLOW RATE G.P.M.
Ordinary basin faucet	8	2
Self closing basin faucet	8	2.5
Sink faucet, d inch	8	4.5
Sink faucet, ½ inch	8	4.5
Bathtub faucet	8	6
Laundry Valve, ½ inch	8	5
Shower valves	8	3
Ball-cock for toilet	8	3
Flush valves for toilets (Wide range due to variation in design and type of toilet)	15-20	15.35
Flush valves for urinal	15	15
Drinking fountains	15	0.75
Sillcock/wall-hydrant	10	5

(g) Excessive Water Pressure.

1. When the municipal service or other water service source provides water to a building that exceeds 80 P.S.I.G., a pressure reducing valve shall be installed in the water main pipe at the point of water service entrance to the building. This is to reduce the water pressure to a maximum of 80 P.S.I.G. or less. This requirement does not apply where the water service pipe supplies water directly to a water pressure booster system, an elevated water gravity tank, or to pumps provided in connection with a hydro-pneumatic or elevated gravity water supply tank system.

2. The Pressure at any fixture under no-flow conditions shall be limited to no more than 80 P.S.I.G.

(h) 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 100 feet shall be:

1. of the total return circulation type; or
2. shall be maintained at the design temperature using a self regulating heating cable.

(5) Installing The Building Water Distribution System.

(a) Meter Valve.

1. A gate valve or other full-port valve shall be installed in the water supply main on the discharge side of each water meter.

2. The valve shall be not less than the size of the building water service pipe.

(b) Riser Valves.

1. Except in single family dwellings, a valve shall be installed at the base of each water supply riser.

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

(c) Valves in Dwelling Units.

1. If individual fixture valves are not installed in two-family or multiple family dwelling units, one or more main control valves shall be provided so that the water to any unit may be shut off without stopping the flow of water to other units.
2. These valves shall be readily accessible inside the unit controlled.

(d) Individual Fixture Valves.

1. In buildings that are occupied other than residential dwellings, the water supply line to each fixture or other piece of equipment shall be provided with a valve or a fixture stop to shut off the water to the fixture.
2. All sillcocks, hose bibbs and wall hydrants shall be separately controlled by a shutoff valve inside the building.

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

(f) 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.

(g) Valves to be Accessible.

1. All water supply main control valves shall be placed so as to be accessible for service and maintenance.
2. All concealed tub or shower valves shall be provided with renewable seats.

(h) Main Control Valve Design. Except for single fixture shutoffs, main control valves on all water mains and branches, shall, when fully opened, have a cross sectional area not less than the cross sectional area of the pipe (full-port) in which they are installed.

(i) Draining Systems. Drain cocks or valves should be provided at all low points of piping so that every portion of the water piping system can be drained. A drain valve shall be required near the meter or main control valve.

(j) Metering Devices with Check Valves.

1. Where water meters or metering devices with check valves are installed, which can create a potential hazard or nuisance due to thermal expansion, a thermal expansion tank shall be installed as close as possible to the water meter or metering devices.
2. The thermal expansion tank shall be of adequate size and constructed of materials approved in 248 CMR 10.06.

(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) Saddle Valves.

1. Saddle valves are prohibited in the water supply line.
2. No water supply line shall be tapped, burned, welded, or drilled, except that mechanical devices that have been Product-approved by the Board which are designed and engineered to create penetration in piping for specific joining methods may be used.

(6) Water-Pressure Booster Systems.

(a) Water Pressure Booster Systems Required. 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 and other water needs freely and continuously with the minimum pressures and quantities, specified in 248 CMR 10.14(4)(f) or elsewhere in 248 CMR 10.00 and in accordance with good practice, the rate of supply shall be supplemented by:

1. a gravity water tank;
2. a hydro-pneumatic pressure booster system; or
3. A pressure tank installed in accordance with 248 CMR 10.14(4)(c).

(b) Support. All water supply tanks shall be supported in accordance with 780 CMR: *The Massachusetts State Building Code* or local building commissioner.

10.14: continued

(c) Covers.

1. All water supply tanks shall be covered to keep out unauthorized persons, dirt, and vermin.

2. The covers of gravity tanks shall be vented with a return bend vent pipe having an area not less than the area of the down feed riser pipe.

3. The vent shall be screened with corrosion resistant screen of not less than 16 x 20 mesh.

(d) Overflows for Water Supply Tanks.

1. Each gravity or suction water supply tank shall be provided with an overflow having a diameter not less than shown in 248 CMR 10.14(6): *Table 5*: *Sizes of Overflow Pipes for Water Supply Tanks*.

2. The overflow outlet shall discharge above and within not less than six inches of a roof or roof drain, floor or floor drain or over an open water supplied fixture.

3. The overflow outlet shall be covered by a corrosion resistant screen of not less than 16 x 20 mesh to the inch and by ¼ inch hardware cloth or shall terminate in a horizontal angle seat check valve.

4. Drainage from overflow pipes shall be directed so as not to freeze on roof walkways.

TABLE 5
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

(e) Low Pressure Cut-off Required on Booster Pumps. When a booster pump is used on a water pressure booster system and the possibility exists that a positive pressure of ten P.S.I.G. or less may occur on the suction side of the pump, there shall be installed a low pressure cut-off on the booster pump to prevent the creation of a vacuum or negative pressure on the suction side of the pump, thus cutting off water to other outlets.

(f) Potable Water Inlet Control and Location.

1. Potable water inlets to gravity tanks shall be controlled by a ball cock or other automatic supply valve so installed as to prevent the tank from overflowing.

2. The inlet shall be terminated so as to provide an accepted air gap but in no case less than four inches above the overflow.

(g) Tank Drain Pipes. Each tank shall be provided at its lowest point with a valve and pipe to permit emptying the tank which shall discharge as required for overflow pipes and not smaller in size than shown in 248 CMR 10.14(6): *Table 6*: *Sizes of Drain Pipes for Water Tanks*.

TABLE 6
SIZES OF DRAIN PIPES FOR WATER TANKS

TANK CAPACITY (Gallons)	DRAIN PIPE (Inches)
Up to 750	1
751 to 1,500	1½
1,501 to 3,000	2
3,001 to 5,000	2½
5,001 to 7,500	3
Over 7,500	4

(h) Prohibited Location of Potable Supply Tanks. Potable water gravity tanks or manholes of potable water pressure tanks shall not be located directly under any soil or waste piping.

(i) Pressure Tanks -- Vacuum Relief.

1. All potable water pressure tanks shall be provided with a vacuum relief valve at the top of the tank that will operate up to a maximum water pressure of 200 P.S.I.G and to a maximum water temperature of 200 degrees.
2. Vacuum relief valves shall be sized according to the following:
   a. The relief valves shall have a cross sectional area at the valve seat that is not less than one pipe size smaller than the cold water supply or the tank drain, whichever is larger.
   b. The minimum size of the vacuum relief valves shall be ½ inch.
   c. Valves shall have a minimum ½ diameter orifice.
   d. The air inlet opening on any vacuum relief valve shall not be smaller than the nominal pipe size of the valve.
3. Vacuum relief valves may be installed in multiples.

(j) Pumps and Other Appliances. Water pumps, filters, softeners, tanks and all other appliances and devices used to handle or treat potable water shall be protected against contamination.

(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 dual water distribution systems are installed, one potable water and the other non-potable water each system shall be identified by color bands or metal tags.

1. Color Marking.
   a. When color marking is employed, potable water lines shall be painted green and non-potable water lines shall be painted yellow.
   b. This requirement may be accomplished by painting three inch wide bands of green or yellow at intervals of not more than 25 feet and at points where piping passes through walls, floors and roofs. The colored bands shall be applied to the piping on both sides of the walls and above and below the floor or roof penetrations. Outlet locations, (the point of use) for non-potable water systems shall be marked with a tag or color coded identification.
2. Metal Tags.
   a. When tags are used, three-inch diameter metal tags bearing the legend SAFE WATER in letters not less than ½ inch in height shall identify potable water lines.
   b. Firmly attached metal tags having the shape of a four-inch equilateral triangle bearing the legend WATER UNSAFE in letters not less than 7/16 inches in height shall identify non-potable water supply lines.
   c. As in the use of color bands, tags shall be attached to pipes at intervals of not more than 25 feet and at either side of points where pipes pass through walls and above and below points where pipes pass through floors or roofs.

(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 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.
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 Department of Environmental Protection or its designee.

(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 Department of Environmental Protection.

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) Toxic Materials.

1. Construction. Piping conveying potable water shall be constructed of nontoxic material.

2. Materials and Substances. No materials or substances that could produce either toxic conditions, taste, odor, or discoloration in a potable water system shall be introduced into or used in such systems.

3. Painting of Water Tanks. The interior surface of a potable water tank shall not be lined, painted, or repaired with any material that will affect the taste, odor, color, or potable condition of the water supply when the tank is placed into service or returned to service following maintenance.

(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 a 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 P.S.I.G. 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) Water Recycling 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. Such systems include:

a. dedicated gray water systems;

b. black water systems; or

c. on site wastewater treatments systems.

(k) Protection Against Backflow and Backsiphonage.

1. Water Outlets. A potable water system shall be protected against backflow and backsiphonage 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: *Air-Gap Water Distribution* 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.

b. Backflow Preventer. A backflow preventing device or vacuum breaker to prevent the drawing of contamination into potable water system.

2. Minimum Required Air Gap.

a. How Measured. The minimum required air gap shall be measured vertically from the lowest end of a potable water outlet to the flood rim or line of the fixture or receptacle into which it discharges.

b. Size.

i. The minimum required air gap shall be twice the effective opening of a 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(7): *Table 7*: *Minimum Air Gaps for Plumbing Fixtures*:

(i) Side wall ribs or similar obstructions do not effect air gaps when they are spaced from the inside edge of a spout opening at a distance greater than three times the diameter of the effective opening for a single wall; or greater than four times the diameter of the effective opening for two intersecting walls.

(ii) Vertical wall, ribs, or similar obstructions extending from the water surface to or above the horizontal plane of the spout opening require a greater air gap when spaced closer to the nearest inside edge of spout opening than specified in 248 CMR 10.14(7)(k)2.b.iii.(i). The effect of three or more such vertical walls or ribs has not been determined. In such cases, the air gap shall be measured from the top of the wall.

TABLE 7
MINIMUM AIR GAPS FOR PLUMBING FIXTURES

MINIMUM AIR GAPS FOR PLUMBING FIXTURES	Minimum Air Gap	
	When not affected by near wall(INCHES)	When affected by near wall(INCHES)
Lavatories and other fixtures with effective openings not greater than ½ inch diameter.	1	1.50
Sink, laundry sinks, goose neck bath faucets and other fixtures with effective openings not greater than ¾ inch diameter	1.5	2.25
Over rim bath fillers and other fixtures with effective openings not greater than one inch diameter.	2	3.0
Drinking water fountains single orifice 7/16 (0.437) in. diameter or multiple orifices having total area of 0.150 sq. in. (area of circle 7/16 in. diameter)	1	1.50
Effective openings greater than one inch	2X diameter of effective opening	3X diameter of effective opening

3. Devices for the Protection of the Potable Water Supply. Approved backflow preventers or vacuum breakers shall be installed with any plumbing fixture or equipment, the potable water supply outlet of which may be submerged and which cannot be protected by a minimum air gap.

4. Certification of Devices.

a. Before any device for the prevention of backflow or backsiphonage is installed the following requirements shall be satisfied:

i. An Approved-testing-lab shall have first certified it as being acceptable.

ii. The Board has recognized it as being Product-approved.

iii. These backflow devices shall be maintained in compliance with 310 CMR 22.22: *Cross Connections Distribution System Protection*.

b. Labeling.

i. Piping after each device shall be labeled as "Water Subject to Questionable Safety", black lettering on yellow background, sizes of lettering and background determined by ANSI A13.1-85, *Scheme for the Identification of Piping Systems*.

ii. The labels shall be placed along the installation every 25 feet and at both penetration points where pipes pass through walls and both penetration points where pipes pass through floors or roofs.

5. 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.

iv. 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.

6. 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 5*: *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.

7. Protective Devices Required. Approved devices to protect against backflow and back-siphonage shall be installed at all fixtures and equipment where backflow and/or back siphonage may occur and where a minimum air gap cannot be provided between the water outlet to the fixture or equipment and its flood level rim.

8. 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 248 CMR 10.14(7): *Table 8*: *Cross Connections Where Protective Devices Are Required and Critical Level (C-L) Settings for Backflow Preventers*.

9. 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(7)(k)5., be provided with a 35 foot barometric loop. Barometric loops shall precede the point of connection.

10. 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.

11. 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-P.S.I.G. (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.)

TABLE 8

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.

TABLE 8A
ACCEPTABLE TYPES OF BACKFLOW PREVENTERS FOR PREVENTION OF CROSS CONNECTIONS ON POTABLE WATER

TYPE OF HAZAD ON PREMISES	AG = AIR GAP RPBP = REDUCED PRESSURE BACKFLOW PREVENTER DCVA = DOUBLE CHECK VALVE ASSEMBLY AVB = ATMOSPHERIC VACUUM BREAKER BFPAV = BACKFLOW PREVENTER WITH INTERMEDIATE ATMOSPHERIC VENT ACCEPTABLE TYPES OF BACKFLOW PREVENTER					COMMENTS*
	AG	RPBP	DCVA	AVB	BFPAV	
1. Sewage Treatment Plant	X	X				
2. Sewage Pumping Stations	X	X				
3. Food Processing	X	X	X*			* If no health hazard exists
4. Laboratories	X	X	X*			* If no health hazard exists
5. Sinks with hose threads on inlets	X	X		X		
6. Hospitals, Mortuaries, Clinics	X	X				
7. Plating Facilities	X	X				
8. Irrigation Systems**	X	X		X*		Each case should be evaluated individually
						* If no back pressure is possible
						** Pressure Vacuum Breakers can be installed if no health hazard exists and back pressure is not 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. Valved outlets or fixtures with hose attachments	X	X	X*	X**		Each case should be evaluated individually
						* If no health hazard exists
						** If no health hazard exists and no back pressure is possible
13. Commercial Laundries and 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 Recirculation Systems	X	X				

AG RPBP DCVA AVB BFPAV	AIR GAP REDUCED PRESSURE BACKFLOW PREVENTER DOUBLE CHECK VALVE ASSEMBLY ATMOSPHERIC VACUUM BREAKER BACKFLOW PREVENTER WITH INTERMEDIATE ATMOSPHERIC VENT					
TYPE OF HAZARD ON PREMISES	ACCEPTABLE TYPES OF BACKFLOW PREVENTER					COMMENTS*
	AG	RPBP	DCVA	AVB	BFPAV	
19. Fire Fighting Systems						
a. Any system which incorporates pumper connections into which chemical extinguishing agents or non-potable water may be pumped.	X	X	X			
b. Any system which incorporates storage tanks or fire pumps taking suction from covered tanks or reservoirs	X	X	X			
c. Any system incorporating connections to chemical extinguishing agents, anti-freeze, or auxiliary water supplies.	X	X				
20. Solar Energy Systems	X	X			X*	* Residential and small commercial having no chemicals or only USP Glycerin 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 (310 CMR 22.22)

(8) Hot Water Supply System.

(a) In residences and buildings intended for continuous occupancy, 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.

(9) Hot Water Tanks or Heaters.

(a) Domestic Hot Water Storage Tanks and Tankless Heaters: Performance Efficiency.

1. All automatic, electric, domestic hot water storage tanks shall have a stand-by loss not exceeding four W/ft.^{2} of tank's surface area; when tested in accordance with ANSI STANDARD C72-1 entitled *Household Automatic Electric Storage Type Heaters*.

2. All gas and oil fired, domestic hot water storage tanks shall have:

a. a recovery efficiency (E^r) not less than 75%; and

b. a stand-by loss percentage (S) not exceeding: S = 2.3 + 67/V; where….V = rated volume in gallons when tested in accordance with ANSI Standard 221.10.3-74 Gas Water Heaters Volume III, circulating tank, instantaneous and large automatic storage type water heaters.

3. EXCEPTIONS: All gas and oil fired heaters over 80 gallons capacity are exempt from the requirement on recovery efficiency. When using Std. RE-7, oil fired units have a CF = 1.0; Q equals total gallons of oil consumed; and H equals total heating value of oil in Btu/gal.

a. All gas and oil fired heaters with a Btu/h input rate over 75,000 are exempt from the requirements on recovery efficiency.

b. When using ANSI Z21.10.3-74, oil fired units have a CF = 1.0; Q equals total gallons of oil consumed; and H equals total heating value of oil in Btu/gal.

4. Insulation.

a. Heat loss from unfired hot water storage tanks shall be limited to a maximum of 15 Btu/h/sq. ft. of external tank surface area.

b. The design ambient temperature shall be no higher than 65 degrees for calculating heat losses.

5. Combination Domestic Hot Water/Space Heating Boilers. Service water heating equipment shall not be dependent upon year round operation of space heating boilers (that is, boilers that have winter space heating as another function), except for the following system:

Domestic Hot Water/Space Heating Boilers having a stand-by loss in Btu/h less than:

$$\{\underline{\mathbf{13.3}}\ \underline{\boldsymbol{pmd}}\ \underline{\mathbf{+\ 400}}\}\ \boldsymbol{pmd} = \textbf{probable maximum demand}$$
$$\boldsymbol{n}$$

n = fraction of year when outdoor daily mean temperature exceeds 64.9 degrees.

The stand-by loss is to be determined for a test period of 24 hour duration while maintaining a boiler water temperature of 90°F above ambient.

6. Temperature Controls.

a. Domestic hot water systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use.

b. Shut down:

i. A separate switch shall be provided to permit turning off the energy supplied to electric domestic hot water systems.

ii. A separate valve shall be provided to permit turning off the fuel supplied to the main burner(s) of all other types of domestic hot water systems.

(b) Minimum Capacity. The minimum capacity of a hot water storage tank or heater shall:

1. be based upon the hot water demand of the building which is served;
2. be in accordance with the generally accepted standards of engineering practice; and
3. comply with the minimum standards of 105 CMR 410.000: *Minimum Standards of Fitness for Human Habitation (State Sanitary Code, Chapter II)*.

(c) 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.

(d) Tank Drains. A storage tank shall be equipped with a brass drain cock or valve for emptying at the lowest point or a valve or cock approved by the Board.

(e) 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, unless Special-Permission has been granted by the Board.
2. Thermal check valves that have a minimum of a c-inch diameter hole drilled in the clapper are permitted. A thermal expansion tank may be required or necessary on any cold water supply system where installation of Backflow Prevention Devices or pressure reducing valves would create a closed system and constitute an operating hazard or nuisance.

(f) 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.

(g) ASME Requirements for Large Volume Water Heaters and Storage Tanks.

1. Water heaters shall be constructed to conform to the specific sections of the ASME Code when the heaters have the following features:
   a. Installed in other than a private residence.
   b. Having a storage capacity of over 120 gallons and/or a recovery equal to 200,000 B.T.U.
   c. Being unfired or heated by direct firing by means of oil, gas (natural, manufactured or bottled propane, etc.) or electric resistance elements.
   d. All safety controls required by ASME shall be supplied in strict compliance with ASME standards.
   e. Examples:
      i. An 80-gallon tank with a recovery rate 210,000 BTU must comply with ASME Standards.
      ii. Two tanks installed each with 100 gallon capacity with an indirect water heater with a recovery rate of 210,000 BTU feeding tanks shall meet ASME standards.
   f. The requirements of 248 CMR 10.14(10)(b)1. do not apply for water heaters installed in a single family dwelling only or a single Condominium unit having separate water heating source for the specific needs of that unit only.
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 for examination by the plumbing inspector.
3. All unfired water heaters within the limits specified under 248 CMR 10.14(10)(b)1. and heated by steam or boiler water from a remote boiler shall be constructed and stamped in accordance with all the requirements of the latest edition of ASME Code, Section 8.
4. All direct fired water heaters specified under 248 CMR 10.14(10)(b)1. and containing an intermediate heating medium at a temperature of over 200°F and not exceeding 250°F or 160 P.S.I.G. shall be constructed and stamped in accordance with all the requirements of ASME Code, Section 4.
5. All direct fired water heaters within the specified under 248 CMR 10.14(10)(b)1. and containing an intermediate heating medium at a temperature of over 250°F and not exceeding 300°F, and not exceeding an operating pressure of 75 P.S.I.G. shall:
   a. be constructed and stamped in accordance with all the requirements and guidelines of ASME Code, Section 1;
   b. be fully stress relieved; and
   c. have all welded joints fully radio graphed and found acceptable to the qualified inspector of the inspection agency.
6. Direct-fired Water Heaters:
   a. No direct-fired water heater employing a heat transfer medium or intermediate heating medium operating above 300°F and 75 P.S.I.G shall be installed.
   b. In no case shall the domestic water be heated by a direct-fired heater above 200°F.
   c. All direct fired heaters employing an intermediate heat transfer system shall be provided with an adequate space within the heat transfer system for expansion of the heat transfer fluid. This shall be equal to at least 10% of the volume of the heat transfer system. A separate expansion tank of equal volume may be furnished.
   d. All direct fired water heaters employing an intermediate heat transfer system shall be furnished with a relief valve in the vapor space of the expansion area or tank. The relief valve shall be ASME, National Board approved and rated and comply with Massachusetts Standards. The valve shall have a testing lever and shall be piped to an adequately size separated vent to the outside of the building.

(h) Safety Devices for Hot Water Tanks.

1. Safety devices to be used on hot water tanks and tankless heaters shall be installed to comply with the provisions of M.G.L. c. 142, § 19 and Standard ANSI 221.22.

2. Pressure Relief Valves.

a. Pressure relief valves installed on direct-fired water heaters, except for tankless heaters, having up to 200,000 BTU per hour input shall have a listed rating of not less than the heater input.

b. The minimum valve size shall be ¾-inch except that heaters with inputs of 15,000 BTU per hour or less may install ½-inch pressure relief valves.

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(9): *Table 9*, as follows:

TABLE 9

Heater Rating (Gal per Min)	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

3. Temperature Relief Valves. Temperature Relief Valves shall meet the requirements of M.G.L. c. 142, § 19 and Standard ANSI Z21.22 latest issue.

a. Valves shall be minimum ¾-inch size except that for heaters with input of 15,000 BTU per hour or less, the valve can be ½-inch size.

b. The automatic Temperature Relief Valve shall be self-closing and be equipped with a testing lever.

c. The thermostatic relieving element shall extend not more than five inches into the top of the tank.

d. The temperature relief valve shall have a minimum discharge in BTU per hour at least equal to the heat source input.

e. When the water heater is furnished with a separate relief valve tapping in the side and within the top six inches of the tank, the valve installed in such tapping may be equipped with either an extension or short thermostatic element.

f. The official A.G.A. listed rating of an approved valve will be considered in compliance with the requirements of 248 CMR 10.14.

4. Combination Temperature & Pressure Relief Valves.

a. A combination temperature and pressure relief valve shall meet the requirements of both the temperature and pressure relief valves as provided in 248 CMR 10.14(11)(b) and 10.14(11)(c).

b. For heaters over 200,000 BTU/Hr., input rating:

i. The valve shall have a minimum ASME temperature steam rating of 200,000 BTU;

ii. The valve shall comply with all construction and testing requirement of the current ANSI Standard Z21.22;

iii. The valve shall have minimum one-inch inlet and outlet pipe connections.

iv. The valve shall be ASME pressure steam rated; and

v. A temperature water rating, on the basis of 1250 BTU for each gallon per hour of water discharged at 30 lbs. working pressure and a maximum temperature of 210 degrees, will be acceptable for the temperature rating for heaters over 200,000 BTU/Hr. input rating. This rating must be certified by the valve manufacturer and must not be more than the ASME rating shown.

vi The use of a Product-approved polypropylene homopolymer drain tube assembly that is designed to be vertically mounted in the downturned outlet of a horizontally mounted relief valve provided that the capacity of the relief valve served by the approved drain assembly does not exceed 100,000 BTU per hour.

5. Vacuum Relief Valves.

a. 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.

b. Where heating equipment has a bottom supply, the cold water supply piping shall be carried above the top of the heater before dropping down to the supply connection and have a vacuum relief valve installed in it at a level above the top of the storage tank.

c. The vacuum relief valve shall be in compliance with the Standard ANSI Z21.22 at latest issue.

d. Valves marked with the A.G.A. symbol and listed by the American Gas Association Laboratories will be considered in compliance with 248 CMR 10.14. Valves shall have minimum ½-inch diameter orifice and the air inlet opening on any vacuum valve shall not be smaller than the nominal pipe size of the valve.

e. Vacuum relief valves shall be sized to have a cross sectional area equal to a pipe not less than one pipe diameter smaller than the tank supply or drain, whichever is larger.

f. Vacuum relief valves may be installed in multiples.

(12) Boiler Laws. *See* M.G.L. c. 142, §§ 17, 18, and 19.

(13) 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.

(c) Where it is not possible to disinfect a potable water storage tank as provided by 248 CMR 10.14(13)(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.

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.

(c) 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 in accordance with 248 CMR 10.12(1)(a)4. The clear water waste requirement is not withstanding any local ordinance, by-law, rule or regulation to the contrary.

(3) Selecting the Size of Drainage Piping. Pipe sizes shall be determined from 248 CMR 10.15(7): *Tables 1*, *2* and *3* on the basis of drainage fixture unit values calculated from 248 CMR 10.15(7): *Table 1*: *Fixture Unit Valves 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*). Exception: a 4 x 3 toilet connection shall not be considered as a reduction in pipe size.

(5) Minimum Size of the Stack Vent or Vent Stack. Any structure, in which a building drain is installed, shall have as a minimum one stack vent or a vent stack not less than three inches in diameter, (*See* 248 CMR 10.16(7): *Table 2*: *Size and Lengths of Vents* for fixture unit values when determining appropriate stack vent or vent stack sizing) that shall be carried undiminished in size through the roof.

(6) Provision for the Installation of Future Fixtures.

(a) When future drainage provisions are employed for the potential installation of other fixtures, the drains provided shall be considered in determining the final required sizes of drains and vent pipes.

(b) The future drain installations, (if provided) shall be terminated with approved material(s) and fittings.

(7) Size of Underground Drainage Piping.

(a) Underground or Basement Floor. No portion of the drainage system installed underground or below a basement floor, shall be less than two inches in diameter.

(b) Sanitary Piping Installed Through the Foundation Wall.

1. Sanitary pipes that pass through an exterior foundation wall shall be no less than four inches in diameter, except:

a. When serving a Hazardous Waste System installed in accordance with (248 CMR 10.13).

b. When serving a **domestic laundry*, wherein the laundry drain is conducted to a separate (Local Board of Health Authorized) dry-well disposal system and may be two inches in diameter.

c. When serving as the waste for a **church Sacrarium*, wherein the church Sacrarium drain may be two inches in diameter (*see* 248 CMR 10.10(16)).

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.

TABLE 1
FIXTURE UNIT VALUES FOR VARIOUS PLUMBING FIXTURES

Type of fixture or group of fixtures	Fixture Unit Value
Automatic clothes washer (1½-inch standpipe)	2
Automatic clothes washer (2-inch standpipe)	3
Bathroom group consisting of a toilet, lavatory and bathtub or shower stall:	
Flushometer valve closet	8
Tank type closet	6
Bathtub[1] (with or without overhead shower)	2
Bidet	3
Combination sink and drain board with food waste grinder	4
Combination sink and drain board with one 1½-inch trap	2
Combination sink and drain board with separate 1½-inch traps	3
Vegetable Prep Sink (Residential or Commercial)	2
Dental chair unit or cuspidor	1
Dental lavatory	1
Drinking fountain	½
Dishwasher, commercial	6
Dishwasher, domestic	1
Trough or trench drain 3-inch	5
Trough or trench drain 4-inch	6
Floor drains[2] with 2-inch waste	3
Kitchen sink, domestic, with one 1½-inch waste	2
Kitchen sink, domestic, with food waste grinder	2
Lavatory with 1¼-inch waste	1
Laundry Utility sink (1, 2 or 3 compartments)	2
Shower stall, domestic	2
Showers (group) per head	2
Sinks:	
Surgeons	3
Flushing rim (with valve)	6
Service (trap standard)	3
Service (P trap)	2
Commercial Pot, scullery, *etc*. (each section)	4
Shampoo	2
Toilet, tank operated	4
Toilet, valve operated	6
Urinal, pedestal, siphon jet blowout	6
Urinal, wall lip	4
Wash sink (circular or multiple) each 20 inches of usable length	1
Unlisted fixture drains or trap size:	
1¼ inch or less	1
1½ inches	2
2 inches	3
2½ inches	4
3 inches	5
4 inches	6

Note 1: A showerhead over a bathtub does not increase the fixture value.
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).

TABLE 2
MAXIMUM LOADS IN FIXTURE UNITS FOR HORIZONTAL DRAINS (F.U.)

Diameter of drain (inches)	Horizontal fixture branch[1] (F.U.)	Building drain or building sewer[2]		
		⊂ in./ft. (F.U.)	¼ in./ft. (F.U.)	½ in./ft. (F.U.)
1½	3	---	---	---
2	6	---	---	---
2½	12	---	---	---
3	34[3-4]	---	40[3-4]	48[3-4]
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

Note 1: Does NOT include fixture branches to the building drain.
Note 2: DOES include fixture branches to the building drain.
Note 3: No more than two toilets or bathroom groups on a horizontal fixture branch nor more than three toilets or bathroom groups on a fixture branch of the building drain.
Note 4: No more than three toilets or three bathroom groups on a three inch building drain.

TABLE 3
MAXIMUM LOADS IN FIXTURE UNITS FOR SOIL AND WASTE STACKS
HAVING ONE OR TWO BRANCH INTERVALS

Diameter of Sack (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

**Note 1: Not more than two toilets or bathroom groups within each branch interval nor more than three toilets or bathroom groups on the stack.

TABLE 4
MAXIMUM LOADS IN FIXTURE UNITS FOR ANY ONE BRANCH INTERVAL
ON MULTISTORY SOIL AND WASTE STACKS[1]

DIAMETER OF STACK	Number of Branch Intervals													Load Limit for All Stacks
	3	4	5	6	7	8	9	10	11	12	13	14	15	
2	3	----	----	----	----	----	----	----	----	----	----	----	----	10
2 ½	8	7	----	----	----	----	----	----	----	----	----	----	----	28
3[2]	20	18	17	16	15	14	13	12	11	10	10	10	10	1023
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

[1]These limits are applicable only when the maximum load within any one branch interval is not greater than where N= permissible load on a stack of one or two branch intervals, and n = number of branch intervals on the stack under consideration. **N – (1 over 2*n* + 1 over 4)**

[2] There shall not be more than two toilets or bathroom groups within each branch interval nor more than three toilets or bathroom groups on the stack.

[3]The formula contained in footnote 1 does not apply to three inch stacks. For three inch stacks above 15 branch intervals, no single interval shall exceed more than ten fixture units.

$$\textit{Max. Fixture Units Connected} = 2(10) \pm \frac{240}{4} \qquad \frac{240}{4} = 12 + 60 = 72$$

E.G. Find the maximum number of fixture to the branch units which can be connected to a four inch stack at any branch interval.

(8) Sizing of Offsets on Drainage Piping

(a) Offsets of 45E or Less.

1. An offset in a vertical stack with a change of direction of 45° or less from the vertical, may be sized as a straight vertical stack.

2. In the event of 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(5)(c).

(b) Offsets of More than 45°. A stack with an offset of more than 45° from the vertical shall be sized as follows:

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

2. The offset shall be sized as for a building drain as shown in 248 CMR 10.15(7): *Table 2*: *Maximum Loads in Fixture Units for Horizontal Drains*.

3. The portion of the stack below the offset shall be sized as for the offset or based on the total number of fixture units on the entire stack, whichever is the larger.

4. In buildings of five stories or more, a relief vent for the offset shall be installed as provided elsewhere in 248 CMR 10.16(5)(c) and in no case shall a horizontal branch connect to the offset or to the stack within two feet above or below the offset.

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

(d) Below 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 45E. If such an offset is made at an angle greater than 45E to the vertical, the required diameter of the offset and the stack below it shall be determined as for a building drain in 248 CMR 10.15(7): *Table 2*.

(e) Open Parking Garages.

1. The drainage system of open parking garages which are subject to freezing temperatures including open parking garages in which floor drains are installed, may exclude the use of traps.
2. Traps and their associated vents may be eliminated however, stacks shall be installed in accordance with 248 CMR 10.16(6)(a).
3. The maximum distance between stacks shall not exceed 60 feet intervals.

(9) Drainage Piping Installations.

(a) *See* 248 CMR 10.05: *General Regulations* 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.
6. Dead ends.

(b) Kitchen Sink Wastes (Domestic).

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 line that receives the waste from a bathtub or similar flat bottom fixture that is smaller than three inches in diameter.

(c) Roughing -- Food Waste Disposer.

1. The fittings used in all sanitary drainage systems which receive the fixture waste from a kitchen sink, shall be installed at a height to permit the installation of a food waste disposer, (approximate height 12 inches through 15 inches above the finished floor).
2. The fitting shall be installed notwithstanding the installation of the food waste disposer.

(d) Kitchen Sink Clean-outs.

1. An end or dandy clean-out fitting the same size as the drain to which it connects shall be installed under all kitchen sinks.
2. A two-piece trap that can be disassembled to clean this drain may be used in lieu of the clean-out.

(e) Laundries in Multi-Story Buildings.

1. Where laundries are installed in buildings with more than three Branch intervals, laundries shall be connected to an independent laundry stack.
2. The independent laundry stacks shall connect to a independent laundry main drain.
3. 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.
4. 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. (*See* 248 CMR 10.22, Figure 19: *Illustration of Laundries in Multi-story Buildings*.)
5. The Inspector may permit a variation from the above requirements when conditions will not allow compliance.

(10) Sumps and Ejectors.

(a) Building Drains Below Building Sewer.

1. Building drains that cannot be discharged to the sewer by gravity flow 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 or by any equally efficient method approved by the Inspector.

2. Only drains located below the building sewer or building drain shall discharge into sumps. All other drains shall be discharged by gravity.

(b) Design of Sumps and Ejectors. Sump and pumping equipment shall be so designed:
1. as to discharge all contents accumulated in the sump during the cycle of emptying operation; and
2. so that the storage of drainage in a sump or ejector does not exceed 12 hours.

(c) Duplex Equipment. Sumps or ejectors, in other than one or two family houses or residences, receiving the discharge of six or more toilets shall be provided with duplex pumping equipment.

(d) Drainage Pipe Venting. The system of drainage piping below the sewer level shall be installed and vented in a like manner to that of the gravity system to conform with 248 CMR 10.16.

(e) Prohibited Connections to Discharge Pipe. No fixtures or drains shall be connected to the sewage discharge pipe from an ejector or pump between the ejector or pump and the point where it enters the building drainage system or sewer.

(f) Drainage Backflow Prevention.
1. All sumps and ejectors shall be protected against backflow and backpressure from the building sewer or building drain by installing a backwater or check valve in the discharge pipe from the ejector or sump pump.
2. This required backflow protection shall also comply with 248 CMR 10.15(11).

(g) Size of Sumps and Pumps.
1. All sumps shall have a holding capacity sufficient to meet the demand of a period not to exceed 12 hours.
2. In single-family dwellings, a sewage ejector sump receiving the discharge of toilets and other fixtures shall be equipped with a sewage ejector pump that provides a minimum discharge capacity of 20 gallons per minute.
3. In all installations other than single-family dwelling, sewage ejector pumps shall be sized in conformance with 248 CMR 10.15(10): *Table 5*: *Determining Capacities of Sewage Ejections*.
4. To calculate the capacities of pumps used in Sewage Ejectors, it is recommended that the following procedures be used in all types of building occupancies. The safety factors included in 248 CMR 10.15(10): *Table 5*: *Determining Capacities of Sewage Ejections* are sufficient for all installations. Any installation that does not meet the requirements of this Table shall require Special-permission from the Board.

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

a. Ejectors Handling Other Fixtures.
i. Generally, there will be a certain amount of fixtures other than toilets emptying into the ejector sump.
ii. If the total amount of these fixtures exceed four times the amount 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 in excess of four times the amount of toilets.

b. 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 x 4) = 4	4
Four @ 3 GPM	12 GPM
Correct Sewage Ejector Pump to use	112 GPM

(h) Individual Sink 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. The waste discharge piping from the individual fixture pump shall have a check valve to prevent the discharged waste from returning to the pump or receiver.
3. Individual fixture pumps may be used for sinks that are located below the building drain.
4. Individual fixture pumps may be used for sinks when unusual building structure conditions prevent the discharge of liquid waste by gravity.
5. Direct-mounted individual fixture pumps may be manually or automatically operated.
6. The individual fixture pumps shall be vented in accordance with the manufacturer's instructions. Individual fixture pumps may provide an adequate water seal in accordance with 248 CMR 10.03 additional traps may not be required.

(11) Backwater Valves.

(a) Fixture Subject to Backflow.

1. A backwater valve shall be installed in a branch of the building drain which receives the discharge from a fixture or group of fixtures that is subject to reverse flow or backpressure.
2. Back Water Valves on Storm Drain Systems. A back water valve shall be installed in a branch of the building storm drain that serves lower roof areas in accordance with 248 CMR. 10.22: *Figure 23*: *Illustration of Combination of Upper and Lower Roof Drain Installations*.

(b) Materials for Backwater Valves. Backwater valves shall have all bearing parts of corrosion-resistant material.

(c) Construction of Backwater Valves. Backwater valves shall be constructed so a mechanical seal against backflow will be provided.

(d) 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.

(e) Location of Backwater Valves. Backwater valves shall be installed so their working parts will be readily accessible for service and repairs.

(f) Approval of Backwater Valves. In lieu of an acceptable standard for backwater valves, substitutes may be used after being Product-approved by the Board under 248 CMR 3.04.

10.16: Vents and Venting

(1) Materials.

(a) Above and Below Ground. All pipe and fittings to be used on the venting system, or any part thereof, shall comply with 248 CMR 10.06.

(b) Chemical Waste Systems. Vent piping on chemical and corrosive waste systems shall conform to that required for Hazardous Wastes under 248 CMR 10.13.

(2) Bow Vents.

(a) Bow vents are permitted for fixture installations in island cabinets and peninsula cabinets that cannot be vented in a conventional manner.

(b) The bow vent shall be sized in accordance with 248 CMR 10.16(16): *Table 2*: *Size and Lengths of Vents*.

(c) The installation should conform to 248 CMR 10.22: *Figures 13*(*a*), (*b*) or (*c*).

(3) Prohibited Venting.

(a) Combination Waste and Vent. A combination waste and vent system shall not be used unless no other system is possible or practicable, and only then after Special-Permission is granted by the Board. *See* 248 CMR 10.16(15)(a)

(b) Crown Venting Limitation. No vent shall be installed within two pipe diameters of the trap weir.

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

1. when permitted under wet venting 248 CMR 10.16(7), or

2. when a fixture waste of not more than two fixture units is connected to the vertical extension of the extended horizontal piping.

(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) Use Other than Venting. The sanitary vent system shall not be used for purposes other than the venting of the plumbing system.

(4) Protection of Trap Seals. 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, back 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.

(5) Vent Stacks and Stack Vents.

(a) Vent Stack Required.

1. Any structure, in which a building drain is installed, shall have as a minimum one full size main stack vent or a vent stack no less than three inches in diameter. Buildings that incorporate three or more branch intervals in which plumbing is installed shall have no less than one main vent stack, (*See* 248 CMR 10.15(5)) that shall run undiminished in size and as directly as possible, 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.

2. A vent stack or a main vent shall be installed with a soil or waste stack whenever back vents, relief vents, or other branch vents are required.

(b) 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 above the highest fixture connection discharging into it. The minimum size of any vent through the roof shall be two inches in diameter.

(c) Offsets in Building Five or More Stories.

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

a. as two separate soil or waste stacks;

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

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

ii. 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.

(d) 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.

(e) Relief Vents for Vents of 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 with the top floor.

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.

(6) 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 not more than 24 inches and not less than 18 inches through the roof.

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.

3. Increaser. The change in the diameter of a vent terminal shall be made by the use of an increaser; and occur no less than one foot below the roof surface.

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

(c) Flag Poling Prohibited. Vent terminals shall not be used for the purpose of flag poling, TV aerials, or similar purposes.

(d) Location of Vent Terminal.

1. No vent terminal shall be located:

a. directly beneath any door, window, or other ventilating opening of the building or of an adjacent building;

b. within ten feet horizontally of such an opening unless it is no less than two feet above the top of such opening.

2. Plumbing vent terminals shall be located no less than 25 feet horizontally from all fresh air intakes.

3. Plumbing vents that terminate no less than two feet above the top of the fresh air intake may be located as close as ten feet. 248 CMR 10.16(6)(a) does not apply in this case.

(e) Vent Extensions Outside of the Building.

1. All soil, waste or vent pipe extensions shall be installed inside the building.

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

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

(7) Vent Grades and Connections.

(a) Vent Grade. All vent and branch vent pipes shall be uniformly graded in accordance with 248 CMR 10.05(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. The vent pipe shall rise vertically, or at an angle of 45E 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.

2. If it is not possible or practical to vent the fixture trap as required in 10.16(7)(b)1.:

a. A vent serving a floor drain, floor sink, or similar floor mounted fixture may be extended horizontally above the centerline of the drain of the fixture to the nearest practical location where it can rise vertically.

b. The vent shall connect to soil or waste pipe above the centerline of the drain not less than 45º 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.

(8) Wet Venting.

(a) Wet venting of fixture traps as hereinafter described may be used provided that the entire sanitary waste and vent piping system meet all other code requirements of 248 CMR 3.00 through 10.00.

(b) Bathtub or Shower Wet Vent. In a single bathroom having a common horizontal waste for a lavatory and bathtub, a two inch waste and vent for the lavatory may serve as a wet vent for the bathtub or shower.

(c) Double or Back to Back Bath Installations. In a double bathroom having a common horizontal waste for lavatories and baths, a two inch waste and vent for the lavatory may serve as a wet vent for the baths.

(d) Miscellaneous Wet Venting.

1. A two inch or larger waste pipe installed with drainage fittings may serve as a wet vent.

2. The lowest portion of this horizontal pipe serving as the wet vent shall be above the top or above the center line of the horizontal drain it serves except as specifically prohibited in 248 CMR 10.16(8)(e).

3. Toilets in a bathroom below the top floor need not be individually vented if the two inch wet vented waste, serving the lavatories and bath tubs or showers connect directly to the horizontal portion of the fixture branch for the toilet by breaking the centerline or connect above the centerline of the horizontal fixture drain servicing the toilet.

(e) Piping Not to Serve as Wet Vents. A waste and vent that serves a kitchen sink, a garbage disposal, a dish washer, or other fixture installed for culinary use, or one that receives the discharge from a clothes washing machine may not serve as a wet vent for any other fixture.

(9) Stack Venting.

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

1. Plumbing fixtures at the highest level may enter into a three-inch soil or waste stack.

2. The continuations of the three-inch soil or waste stack as a vent through the roof or re-vented into the vent system above the highest fixture shall be accepted, provided that:

a. all such fixtures shall enter said stack independently;

b. the waste pipe from all fixtures shall have a pitch of not more than ¼-inch pitch per foot;

c. the toilet and bathtub or shower drain connect to the stack at the same level; and

d. the traps from all fixtures shall be placed in compliance with 248 CMR 10.16(12): *Table 1*: *Distance of Fixture Trap from Vent*.

(b) Stack Venting. Provided there is a soil and/or waste stack in a building as required under 248 CMR 10.16(5)(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, bath tub or shower stall, and a kitchen sink.

(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(9)(a).

(10) 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 located in the same branch interval but connected to the stack at different levels, not exceeding ten inches center to center, provided:

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(12): *Table 1*: *Distance of Fixture Trap from Vent*.

(d) Fixtures Back-to-back. Two fixtures set back-to-back, within the distance allowed between a trap and its vent, may be served with one continuous soil or waste vent pipe, provided that each fixture wastes separately into a double sanitary drainage tee fitting having inlet openings at the same level.

(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 re-venting, 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.

2. Back-to-back waste connections shall be through fittings with sufficient directional flow design to assure separate entrance of each waste into the horizontal branch.

3. The branch waste shall connect with its stack at a grade of not more than ¼-inch per foot.

(11) Circuit and Loop Venting.

(a) Battery Venting.

1. A horizontal branch drain soil or waste pipe may be vented by a circuit or loop vent that shall be installed downstream of the last fixture connection of the battery if the horizontal branch drain soil or waste pipe:

a. is uniformly sized; and

b. has connected to it two, but not more than eight floor outlet toilets, pedestal urinals, trap standard to floor fixtures, shower stalls, shower bases or floor drains, or any combination thereof, that are connected in battery and, discharge into the side and center of the horizontal battery branch drain.

2. In addition, lower floor branches serving fixtures as described above in 248 CMR 10.16(1)(b), shall be provided with a relief vent installed downstream of the first fixture connection of the battery and shall connect at the top of the horizontal battery branch drain to the circuit or loop vent.

3. 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.

4. When wall hung or wall outlet fixtures such as urinals, lavatories or similar fixtures discharge into the horizontal battery branch, the fixture waste from these fixtures shall be individual or common vented. (*See* 248 CMR 10.22: *Figure 8*: *Illustration of Battery Circuit Vent Multiple Floors* and 248 CMR 10.22: *Figure 9*: *Illustration of Battery Loop Vent Multiple Floors*).

5. Batteries of more than eight fixtures as described in 248 CMR 10.16(11)(a)1.b. may be installed, providing a vent as described above is installed for each eight or less of the fixtures so connected.

(b) Dual Branches. When parallel branches serve fixtures as described in 248 CMR 10.16(11)(a) all of the provisions and requirements of 248 CMR 10.16(11)(a) shall prevail, except that the fixture connections to each parallel horizontal branch shall be limited to 50% of the fixture connection permitted on a horizontal branch in 248 CMR 10.16(11)(a).

(c) Vent Connections. When the circuit, loop or relief vent connections are taken off the horizontal branch, the vent branch connection shall be taken off at a vertical angle above the centerline of the drain or from the top of the horizontal branch.

(d) Fixtures Back-to-back in Battery. When fixtures are connected to one horizontal branch through a sanitary tee installed in a vertical position:

1. A common vent for each two fixtures back-to-back or double connection shall be considered acceptable.

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

(12) Fixture Vents.

(a) Distance of Trap from Vent. Each fixture trap shall have a protecting vent so located that the slope and the developed length in the fixture drain from the trap 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.*

TABLE 1
DISTANCE OF FIXTURE TRAPFROM VENT

Size of Fixture Drain Inches	Distance Trap to Vent; Feet
1 ½	5”
2	6’
3	8’
4	10’
Slope not to exceed ¼” pwe door	

(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(12)(b) will 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(12): *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 and the vent piping shall be installed to comply with 248 CMR 10.16(7).

(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.

(13) Size and Length of Vents.

(a) Size of Individual Vents. The minimum diameter of an individual vent shall be not less than 1¼-inch nor less than ½ the diameter of the drain to which it connects.

(b) Size of 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) Size of Circuit or Loop Vents. The diameter of a circuit or loop vent shall be not less than ½ the diameter of the soil or waste branch to which it connects when fixtures are battery connected.

(d) Length and Size of Vent Stacks. The length and size of the vent stack or main vent shall be based on the total fixture units and its developed length from the lowest connection of the vent system with the soil stack, waste stack, or building drain, to the vent stack terminal to the open air.

(e) 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(16): *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 1.00 through 10.00.

(14) Future Venting.

(a) In the basement of every 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"*.

(15) Combination Waste-and-vent System. Special-Permission Required. *See* 248 CMR 3.04(3)(b).

(a) A combination waste-and-vent system is limited to the installation of floor drains and sinks.

(b) A combination waste-and-vent system consists of a wet vented installation of waste piping in which fixture drains are not individually vented.

(c) 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.

(16) Venting of Sumps and Ejectors.

(a) Size of Vents. The size and length of all vent pipes serving building sanitary sumps and ejectors shall be determined from, and in accordance with 248 CMR 10.16(16): *Table 3*: *Size and Lengths of Sump Vents*.

(b) Pneumatic Ejector.

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.

(c) Automatic Vent Fittings.

1. The automatic vent fitting shall be installed in the vertical position not less than six inches above the crown of the trap it serves.

2. The piping distance from the trap outlet to the automatic vent fitting shall not be more than 12 inches.

3. The tailpiece from the fixture to trap shall not be longer than 12 inches.

4. The automatic vent fitting shall be installed on the run of a T-Y in the vertical or branch of a T-Y in the horizontal with the T-Y installed so the direction of flow is with the flow of waste.

5. The automatic vent fitting shall be installed in a location readily accessible for inspection and replacement. It shall never be installed in a concealed location.

6. Automatic vent fittings are not permitted, except with Special-permission from the Board.

(d) Air Admittance Valves.

1. Air Admittance Valves are not permitted, except with Special-permission from the Board.

2. An individual vent, branch vent, wet vent, circuit vent, vent stack, or stack vent shall be permitted to terminate with a connection to an air admittance valve. Air admittance valves shall be installed in accordance with the manufacturer's installation instructions.

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(16): *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.

TABLE 3
SIZE AND LENGTHS OF SUMP VENTS[2]

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

10.17: Storm Drains

(1) Storm Water Drainage to Sewer Prohibited. Storm water shall not be drained into sewers intended for sewage only.

(2) Size of Building Storm Drain. The size of the building storm drainage system including all horizontal branches having a slope of ½ inch or less per foot, shall be based upon the maximum projected roof or paved surface area to be handled according to 248 CMR 10.17(2): *Table 1*: *Size of Horizontal Storm Drains*.

TABLE 1
SIZE OF HORIZONTAL STORM DRAINS

Diameter of Drain, Inches	Maximum Projected Roof Area for Storm Drains of Various Slopes		
	1/8 inch Slope	¼ inch Slope	½ 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.

(a) Vertical Storm Conductor. A vertical storm conductor shall be based upon the maximum projected roof 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 Roof Area (Square Feet)	Diameter of Storm Conductor or Outside Leader (Inches)	Maximum Projected Roof 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		

(3) 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.)

(4) Building Sub-drains.
(a) Building sub-drains located inside the building below the public gravity storm sewer 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.

(5) 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 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.
(c) Area Drains.
1. All area drains shall be connected to the storm water drainage system.
2. They shall be provided with a trap and back-water valve in an accessible location that is not subject to freezing.
(d) Size of Area Drains.
1. Area drains shall be of size to serve efficiently the square foot area for which they are intended to drain in accordance with 248 CMR 10.17(2): *Table 1*: *Size of Horizontal Storm Drains*.
2. The outlet pipe shall not be less than three inches in nominal diameter.

(6) Traps on Storm Drains and Leaders.
(a) Where Required. Conductors and storm drains serving low roofs when connected to a combined sewer shall be trapped.
(b) Where Not Required. No traps shall be required for storm-water drains that are connected to a sewer carrying storm water exclusively.
(c) Trap Material. Storm water traps, when required, shall be of cast iron.
(d) Trap Size. Traps for individual conductors shall be the same size as the horizontal drain to which they are connected.

(e) 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.

(7) Conductors/Leaders and Connections.

(a) Not to be Used Improperly.

1. Conductor pipes shall not be used as soil, waste, or vent pipes.
2. Sanitary drainage or vent pipes shall not be used as conductors.

(b) Protection of Rain Water Leaders. Rain water leaders installed along alley ways, driveways, or other locations where they may be exposed to damage shall be:

1. protected by metal guards; or
2. recessed into the wall.

(c) 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.

(d) Offsets.

1. Offsets of 45E or less from the vertical, and offsets of more than 45E 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 Strom Drains*.

(8) Roof Drains.

(a) Material of Roof Drains. Roof drains shall be of cast iron, copper, or other approved corrosion-resisting material.

(b) Roof Drain Strainers.

1. General Use.

a. All roof areas, except those draining to hanging scuppers and gutters, shall be equipped with roof drain assemblies having strainers that extend not less than four inches above the surface of the roof that is immediately adjacent to the roof drain assembly.

b. Strainers shall have an available inlet area, that lays upon the roof level, of not less than 1½ times the area of the conductor to which the roof drain assembly is connected.

c. Roof drain assemblies that serve vehicle parking decks or that serve the outside top level of open parking garages shall convey storm discharge to a 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 strainers for use on sun decks, parking decks, and similar areas, normally serviced and maintained, may be of the flat surface type, level with the deck and shall have an available inlet area not less than 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 by the use of proper flashing methods and material.

(9) Expansion Joints Required. Expansion joints or sleeves shall be provided where warranted by temperature variations or physical conditions.

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

10.18: Hospital Fixtures

(1) General. The plumbing system in a hospital shall conform to the following requirements.
   (a) It shall meet the criteria of 248 CMR 10.18.
   (b) It shall conform to all other requirements contained in the body of 248 CMR 3.00 through 10.00.
   (c) It shall conform to the requirements of the Massachusetts Department of Environmental Protection.

(2) Definitions.

The following definitions shall be used for 248 CMR 10.18.

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.

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-approved 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.

(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 display in a location to be clearly visible at all times, 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.

(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 45E.

(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.

(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 10.18(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 1.00 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.

(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 cleanout.

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.

(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*.

(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 sufficient capacity to supply water at 125EF for hospital fixtures; water at 180EF for kitchens; and water at 180EF for laundry.

2. Where direct fired hot water heaters are used, they shall be of an approved 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.

(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.

Special Equipment and Devices Found Under These Classes Include:

Clinical	Hydrotherapeutic	Radiological	Other
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 fountain 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: Plumbing in Manufactured Homes and Construction Trailers

(1) Definitions. The following definitions shall apply to 248 CMR 10.19.

Manufactured Home. Manufactured Home shall mean a structure, built in conformance to the National Manufactured Home Construction and Safety Standards which is 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 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 unit with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning, and electrical systems contained therein.

Label. Label means the adhesive-back aluminum foil decal which is permanently affixed to each transportable section of each manufactured home manufactured for sale in the United States and which serves as the certification by the manufacturer of conformance with the rules made under the Federal Manufactured Home Construction and Safety Standard in effect on the date of manufacture.

Temporary Construction Trailer. A temporary construction trailer when supplied with toilet facilities that would be used during construction of a building or structure only.

(2) Scope.
(a) Plumbing in manufactured homes shall comply to the latest Rules and Regulations established by the Secretary of the Department of Housing and Urban Development authorized by the National Manufactured Home Construction and Safety Standards.
(b) Such rules are to be effective as of June 15, 1976.
(c) These rules and regulations supersede all State Plumbing and/or Gas Codes.
(d) Additions or 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 1.00 through 10.00.

(3) Temporary Construction Trailers. Temporary construction trailers are exempt from the material provisions of 248 CMR. 10.06.
(a) The temporary water and sewer connection to a temporary construction trailer shall be the same material as supplied with the trailer by the manufacturer.

10.20: Public and Semi-public Swimming Pools

(1) General.
(a) All Public and Semi-public swimming pools must be installed in full compliance with all provisions of 105 CMR 435.000: *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 1.00 through 10.00.

(2) Definitions.

Public Swimming Pool means and includes every artificial pool of water having a depth of two feet or more at any point and used for swimming or bathing, located indoors or outdoors, together with the bathhouses, equipment, and appurtenances used in connection with the pool. It does not include any residential pool as herein defined nor does it include any pool used primarily for baptismal purposes or the healing arts.

Public Swimming Pool also means every swimming or wading pool admission to which may be gained by the general public with or without the payment of a fee.

Semi-public Pool:

(a) A semi-public pool is a swimming or wading pool on the premises of, or used in connection with a hotel, motel, trailer court, apartment house, country club, youth club school, camp, condominium 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.

(b) 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.

Residential Pool means a swimming or wading pool established or maintained by an individual for his own or family's use or for the use of personal guests of his household.

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 herein defined.

Operator means any person who:

(a) alone or jointly or severally with others owns a public or semi-public swimming pool or wading pool regulated by 248 CMR 10.00; or

(b) has case, charge or control of such a pool as agent or lessee of the owner or as an independent contractor.

Person means every individual, partnership, corporation, firm, association or group, including a city, town, county, or other governmental unit.

Board of Health means the appropriate and legally designated health authority of the city, town or other legally constituted governmental unit within the Commonwealth having the usual powers and duties of the board of health of a city or town, or his or its authorized agent or representative.

(3) Plan Approval.

(a) 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 until the plans and specifications for the construction or change have been approved in writing by the Board of Health.

(b) Nothing in 248 CMR 10.00 shall affect the authority of any person acting under appropriate sections of an applicable building, plumbing or electrical code, ordinance or regulation.

(4) Conformance.

(a) All work shall conform to plans and specifications as approved by the Massachusetts Department of Public Health or the Board of Health. 105 CMR 435.000: *Minimum Standards for Swimming Pools (State Sanitary Code: Chapter V)*.

(b) Changes to Plans or Specifications.

1. Any revision or change in the plans and specifications, as originally approved by the Massachusetts Department of Public Health or the Board of Health, which may affect the capacity or the health or safety features of the swimming or wading pool shall be submitted to the Board of Health for review.

2. Approval from the Board of Health of said change or revision of plans shall be obtained in writing before the work affected by the change is undertaken.

(5) Notification.

(a) The Board of Health shall be notified when a newly constructed, expanded, or remodeled swimming or wading pool is ready for use.

(b) Notification shall be given at least one week prior to the completion of the project so that a date can be arranged for a final inspection.

(c) Use of such pool shall not commence before a final inspection has been made and approval, in writing, to operate has been given by the Board of Health.

(6) Prohibited Connections.

(a) Under no circumstances shall piping systems be designed and constructed as to permit pool water to enter a potable-water-supply system nor waste water or sewage to enter the pool through backflow connections or interconnections.

(b) Cross-connections or interconnections in the pool piping system whereby pool water may under some conditions enter a potable-water-supply system should be avoided using the following means:

1. by providing for the admission of make-up water above the overflow elevation of the pool or by pumping from a pump suction well; or

2. where filters are installed and filter washing with the recirculation pump is not feasible, a wash-water pump of proper capacity should be installed and a suction well or small elevated tank used to supply water to the pump, the discharge to the suction well or tank being above the flow line.

(c) In no case should valved cross-connections, whereby water from a potable-water-supply may be admitted directly to the recirculation system for the purpose of filter washing, be permitted.

(d) No pool drains or drains from filters, where the re-circulating system is used, should be directly 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.

10.21: Boiler Blow-off Tank

(1) Boiler Blow-off Tank. (*See* 248 CMR 10.22: *Figure 1*: *Illustration of Boiler Blow Off Tank*). A vessel designed to receive the discharge from a boiler blow-out outlet and to cool the discharge to a temperature of 150 degrees or less which permits its safe discharge to the drainage system.

(a) Shall be in full accordance with the recommendations of the National Board of Boiler and Pressure Vessel Inspectors for Boiler Blow-off Equipment, Columbus, Ohio.

(b) The temperature of water entering drainage piping from discharge of blow-off equipment shall not exceed 150 degrees.

(c) The pressure of the blow-down leaving any type of blow-off equipment shall not exceed five P.S.I.G.

(d) The blow-off piping and fitting between the boiler and the blow-off tank shall comply with the ASME Power Boiler Code, Paragraphs P-307 through 312.

(e) All materials used in the fabrication of boiler blow-off equipment shall comply with material section of the ASME Boiler Code, Section II .

(f) All blow-off equipment shall be fitted with openings to facilitate cleaning and inspection.

10.21: continued

(g) The blow-off tank shall be designed in accordance with the ASME Boiler Construction Code, Section VIII for a working pressure of at least one fourth of maximum working pressure of the boiler to which it is connected. In no case, however, shall the plate thickness be less than ¼ inch.

(2) Direct Connections of Steam Exhaust, Blow-offs and Drip Pipes.

(a) Discharge into Building Drainage System:

1. A steam exhaust, blow-off, or drip pipe shall not be directly connected to a building, drainage system but shall first pass through a blow-off tank as shown in 248 CMR 10.22: *Figure 1*: *Illustration of Boiler Blow Off Tank*.

2. Such waste water when it is discharged into a building drainage system shall have a temperature of not more than 150°F.

(b) Automatic Cooling Facilities:

1. Steam condensate which is to be discharged to the drainage system shall be provided with automatic cooling facilities to reduce the temperature of the water to a maximum temperature of 150°F.

2. Automatic cooling facilities shall include storage so that heat may be dissipated and cooling water when required shall be added by use of a thermostatically controlled device and only that portion of condensate about to be discharged to the drainage system shall be cooled.

3. The requirements of 248 CMR 10.21(2)(b) apply particularly to systems of steam supply in which the steam condensate is discharged to waste rather than being returned to the steam generating plant such as steam supplied from street mains or from remote central steam generating plants.

10.22: Figures

Notes for Figures: The following applies for the figures in 248 CMR 10.22.

(1) All figures are general schematics for illustrative purposes only. The figures are not meant to show every fitting, change of direction or every situation. Deviations from the illustrated figures may be acceptable so long as the workmanship is in compliance with the relevant portion of 248 CMR.

(2) All fixture waste and traps, as represented in the figures, shall be in compliance with Table 248 CMR 10.15(2)(a).

(3) All cleanouts and locations, as represented in the figures, shall be in compliance with 248 CMR 10.08(2)(a) through 10.08(2)(n).

(4) All vents through the roof, as represented in the figures, shall be in compliance with 248 CMR 2.16(4)(a) through 2.16(5)(f).

(5) All branches and building drain sizes as per table 248 CMR 2.15(3)(a).

(6) All sizes of vents, vent stacks, branches etc. as represented in the figures, shall be in compliance with Table 248 CMR 2.16(12)(a).

(7) Symbols used in the figures in 248 CMR 10.22 have the following meanings. Note, for plans and specifications, these symbols may be used.

U.G.	Under Ground
A.G.	Above Ground
W&T	Waste and Trap
S.S.	Service Sink Trap Standard; Sanitary Sewer; or Storm Sewer (depending on context)
M.R.	Mop Receptor
F.D.	Floor Drain
F.V.	Future Vent
K.S.	Kitchen Sink (Single Compartment)
W.C.	Water Closet/Toilet
LAV.	Lavatories with 1¼ inch waste
V.T.R.	Vent through roof
C.I.	Cast iron
A.W.	Acid Waste

(8) All trap distances from vents as represented in the figures are in compliance with 248 CMR 10.16(11)(a): *Table 1*: *Distance of Fixture Trap from Vent*.

(9) *See* 248 CMR 10.13: *Piping and Treatment of Special Hazardous Wastes* before installation of any special hazardous waste system, Figure 16.

(10) Figures are not to scale.

FIGURE 1: Illustration of Boiler Blow Off Tank

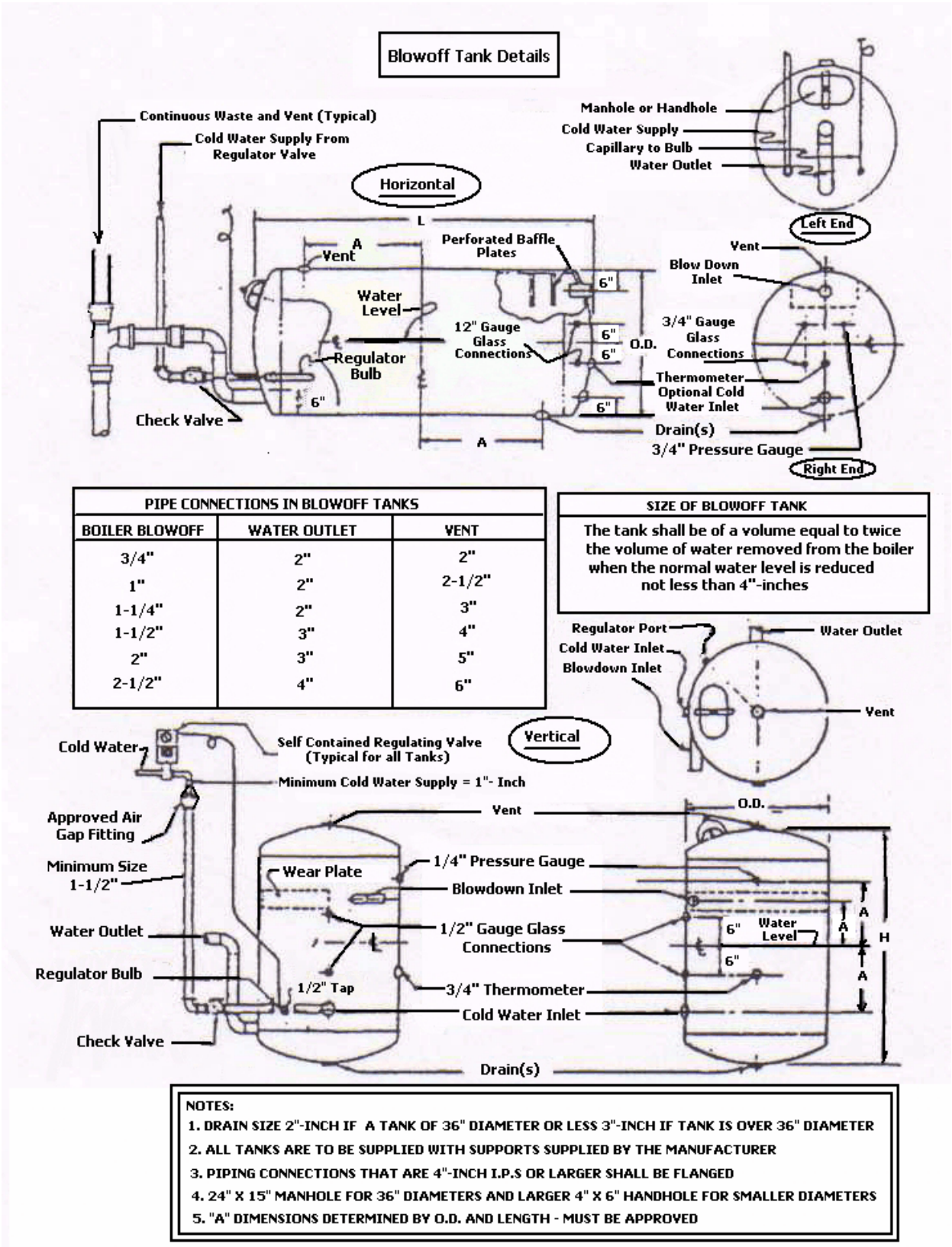
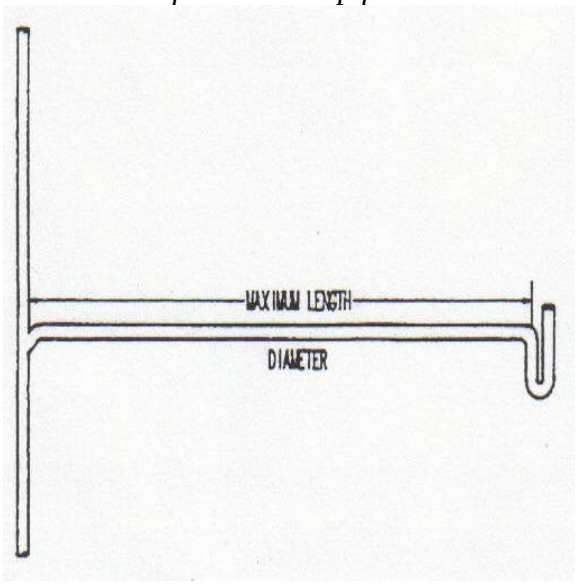


FIGURE 2: Illustration of Maximum Distance from Trap to Vent in Compliance with 248 CMR 10.16(12)(a): *Table 1*: *Distance of Fixture Trap from Vent*

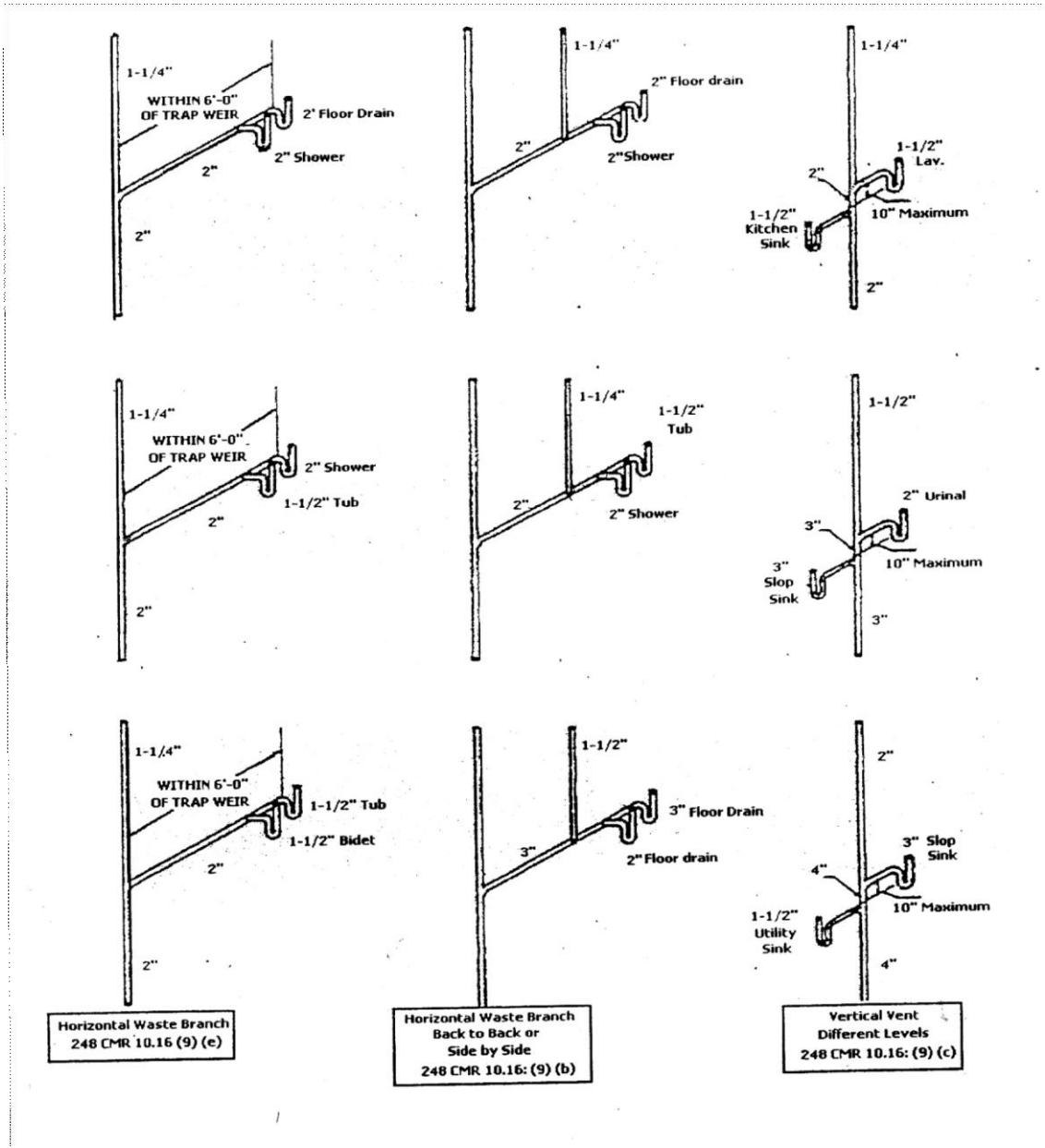


Note: These dimensions are from the vent to the weir of the trap along the developed length and the slope of the pipe in this distance is not greater than ¼ inch per foot.

Diameter of Pipe	Maximum Developed Length of the Pipe
1½ inch waste and trap	Five feet
2 inch waste and trap	Six feet
3 inch waste and trap	Eight feet
4 inch waste and trap	Ten feet

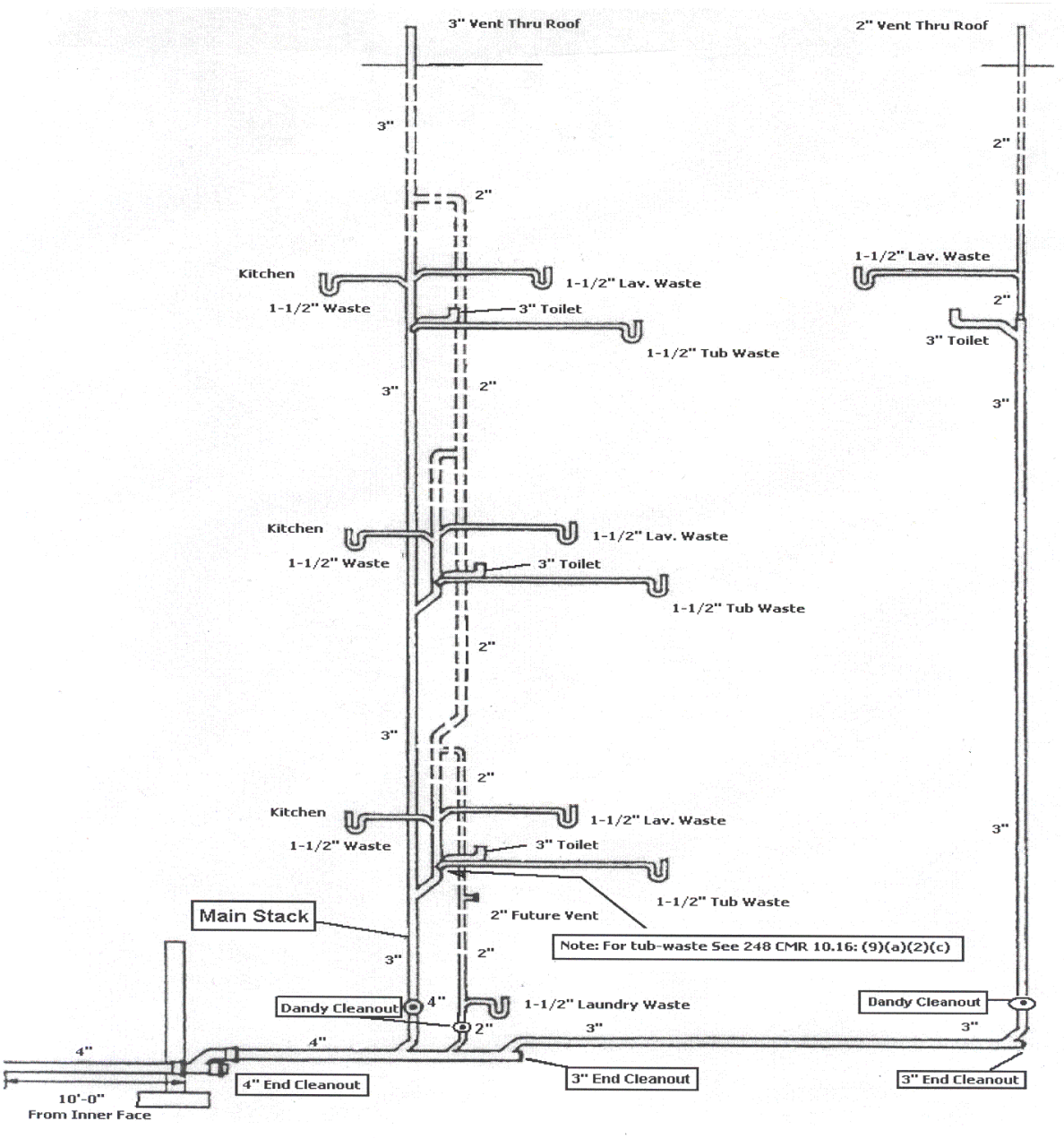
10.22: continued

FIGURE 3: Illustration of Miscellaneous Common Venting 248 CMR 10.16 (9)



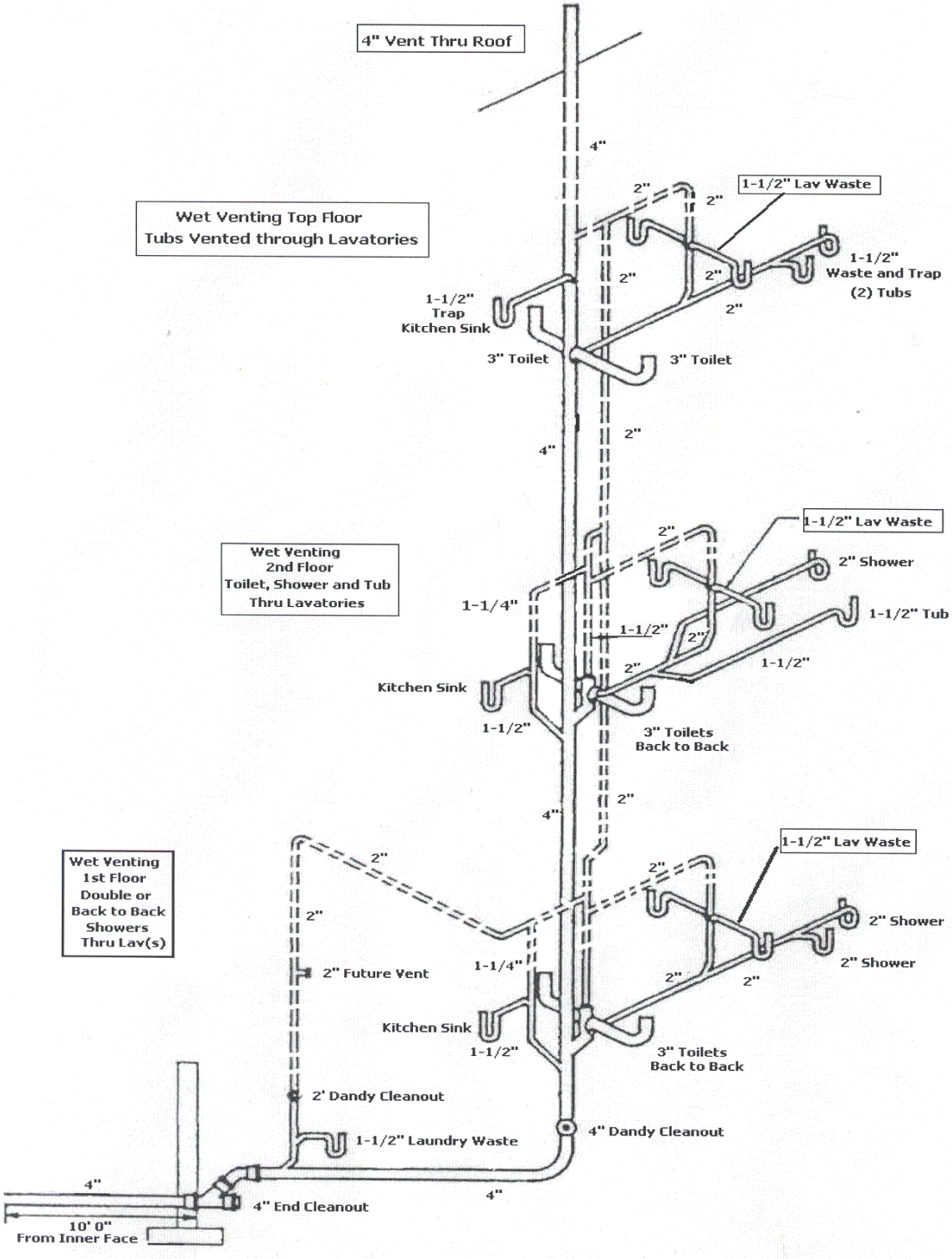
10.22: continued

FIGURE 4 Illustration of Stack Venting in Compliance with 248 CMR 10.16 (8)(a) and (b)



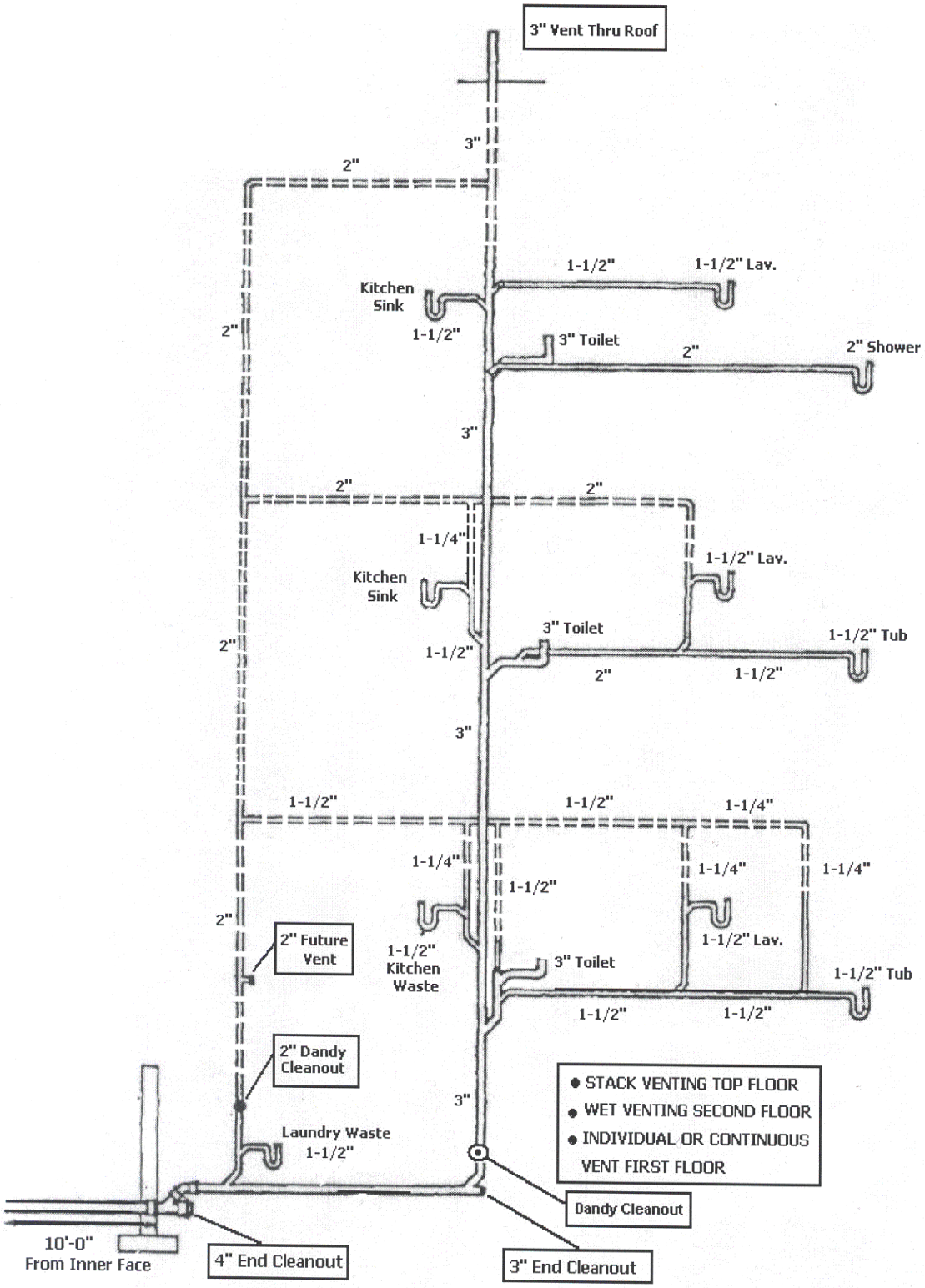
Include a bathtub or shower stall and a kitchen in the stack, on the extreme right hand side of the sketch. Such additional fixtures to be installed in accordance with 248 CMR 10.16 (8)(a)

FIGURE 5: Illustration of Wet Venting



10.22: continued

FIGURE 6: Illustration of Individual Vent First Floor, Wet Vent Second Floor and Stack Vent Third Floor



10.22: continued

FIGURE 7: Illustration of Battery Circuit Vent, First Floor and Battery Loop Vent Second Floor

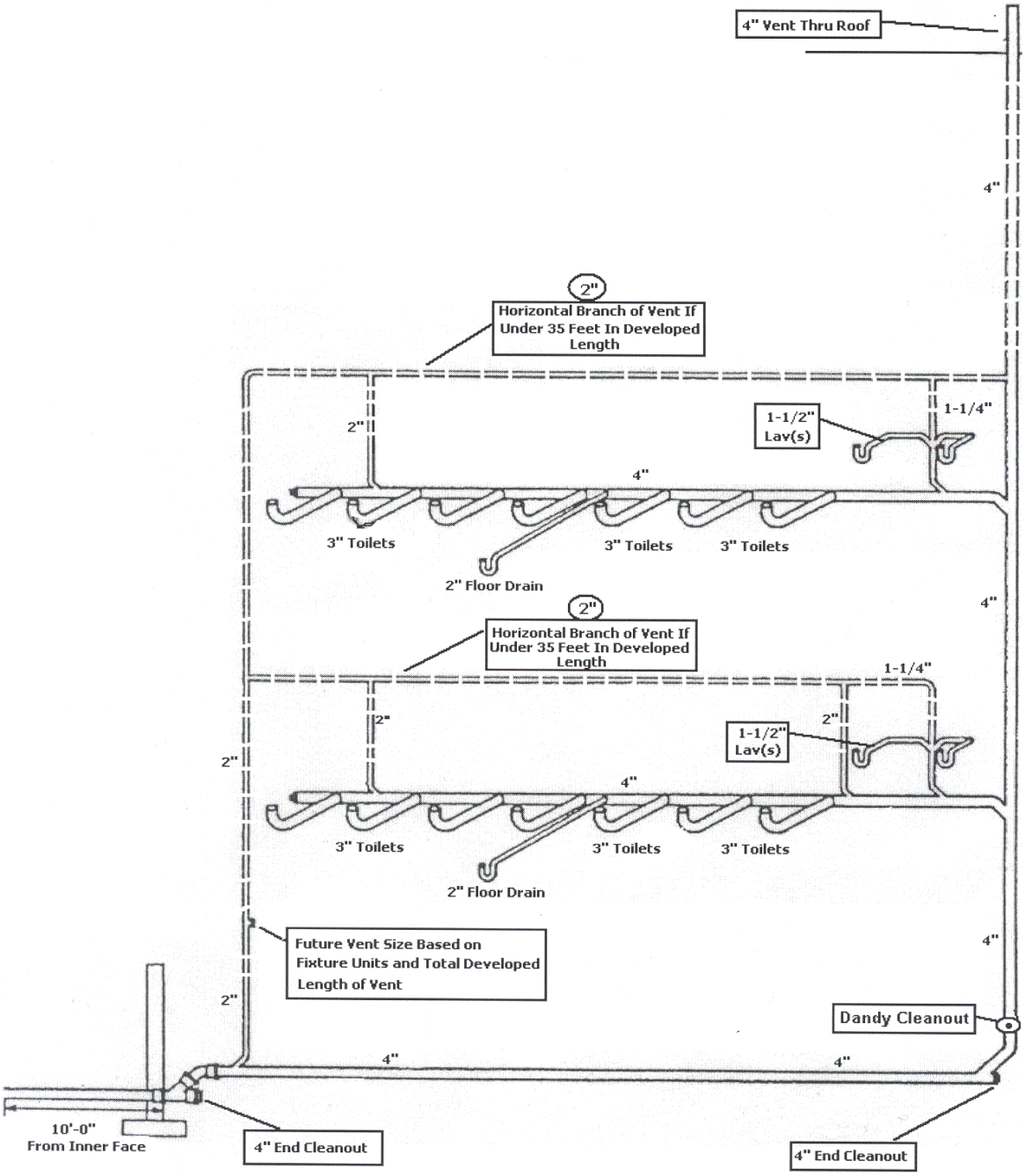
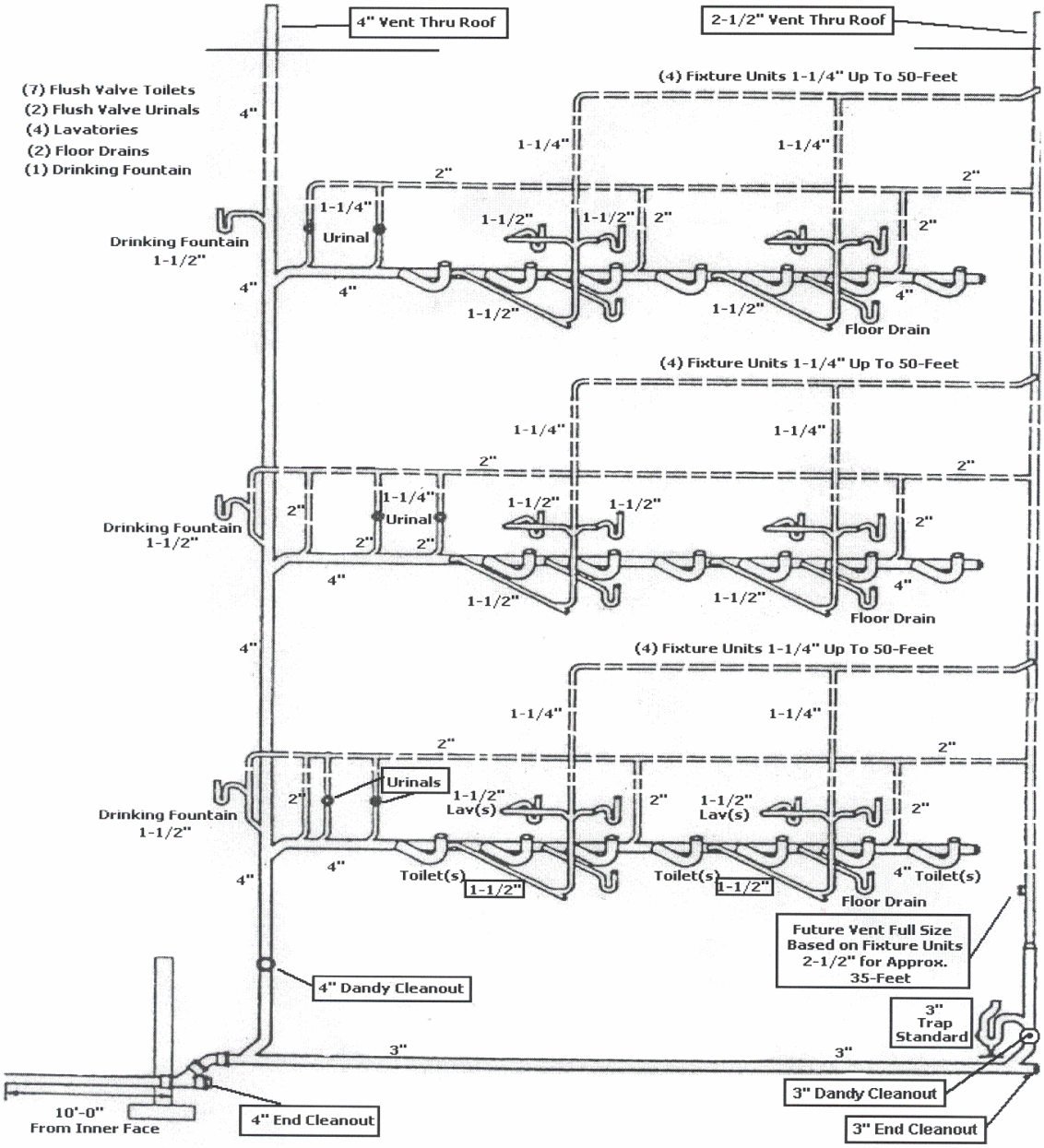


FIGURE 8: Illustration of Battery Circuit Vent Multiple Floors



10.22: continued

FIGURE 9: Illustration of Battery Loop Vent, Multiple Floors

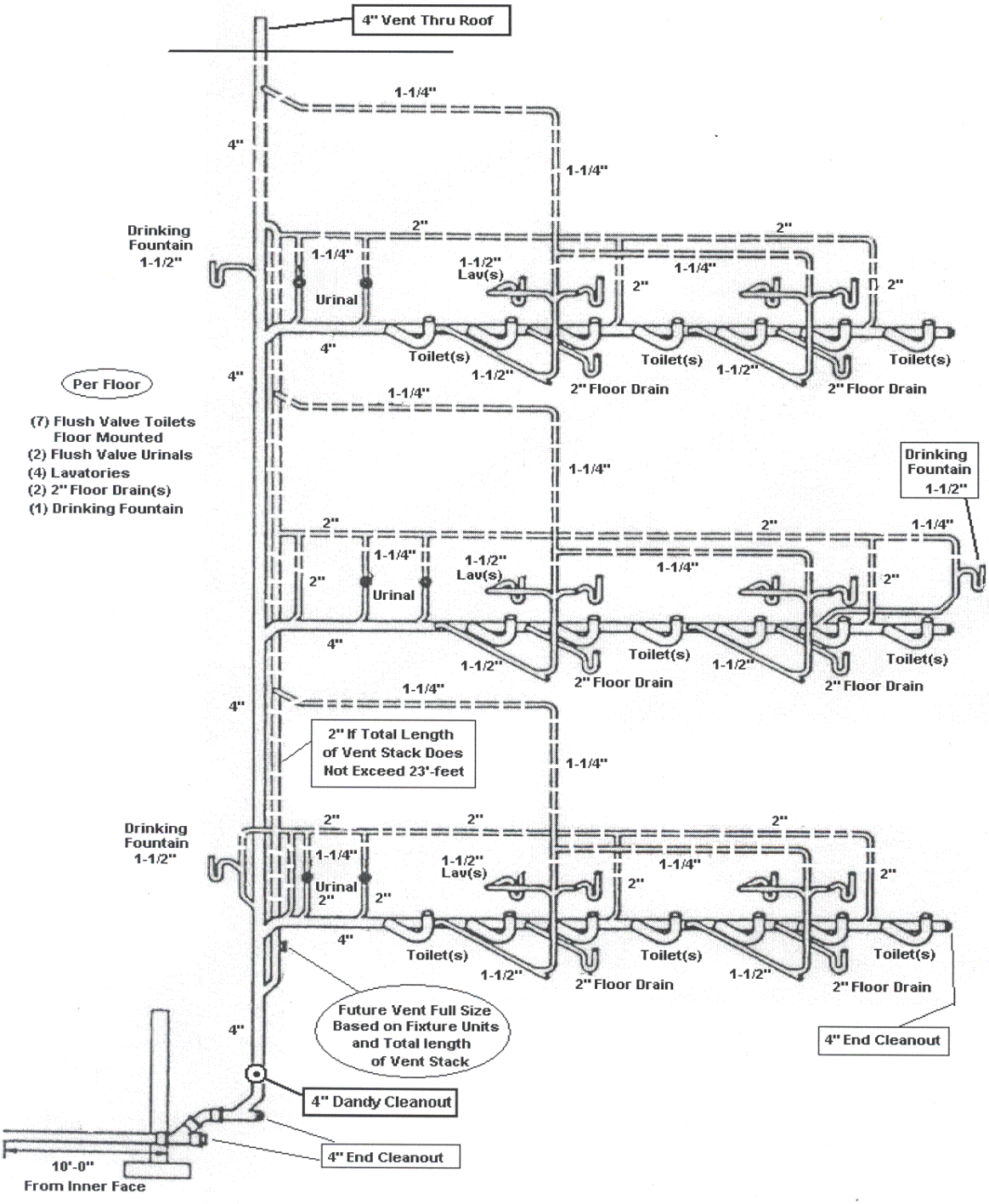


FIGURE 10: Illustration of Below the Floor Hazardous Waste Battery Venting
See 248 CMR 10.13 (5)(d)

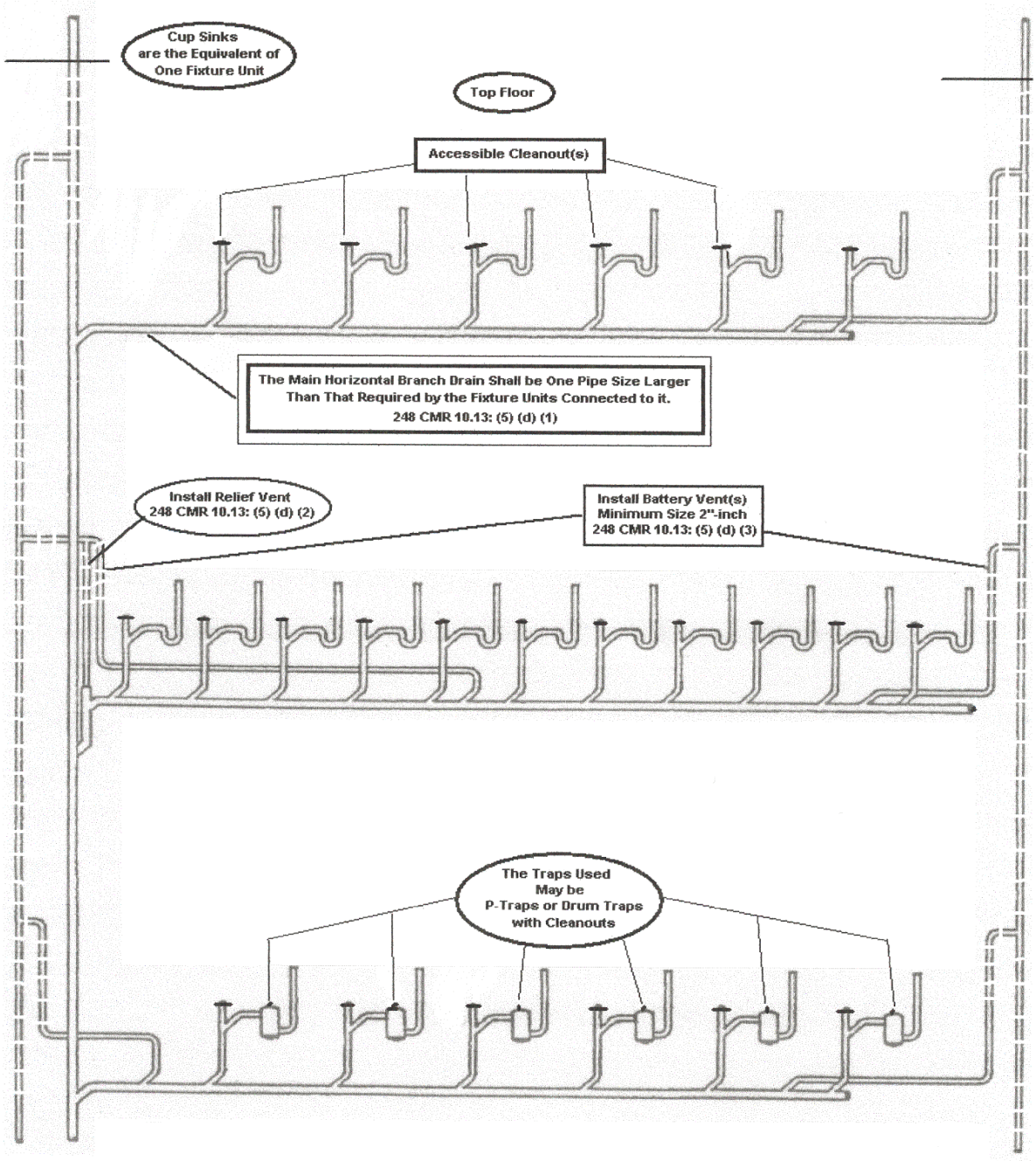
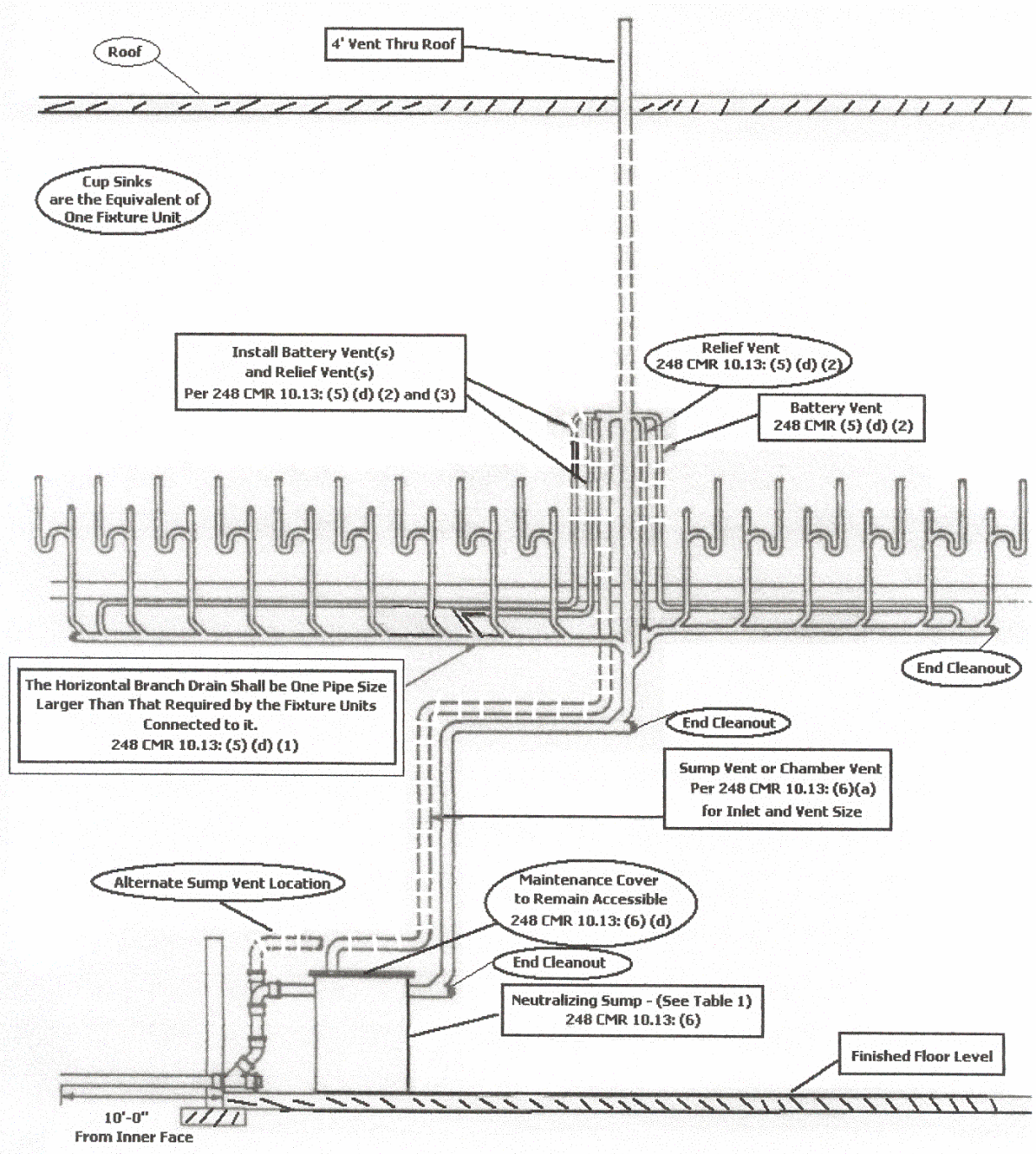


FIGURE 11: Illustration of Hazardous Waste Battery Vented Below Floor Level, in Compliance with 248 CMR 10.13



10.22: continued

(FIGURE 12: Reserved)

FIGURE 13A: Illustration of Bow Vent Single Installation

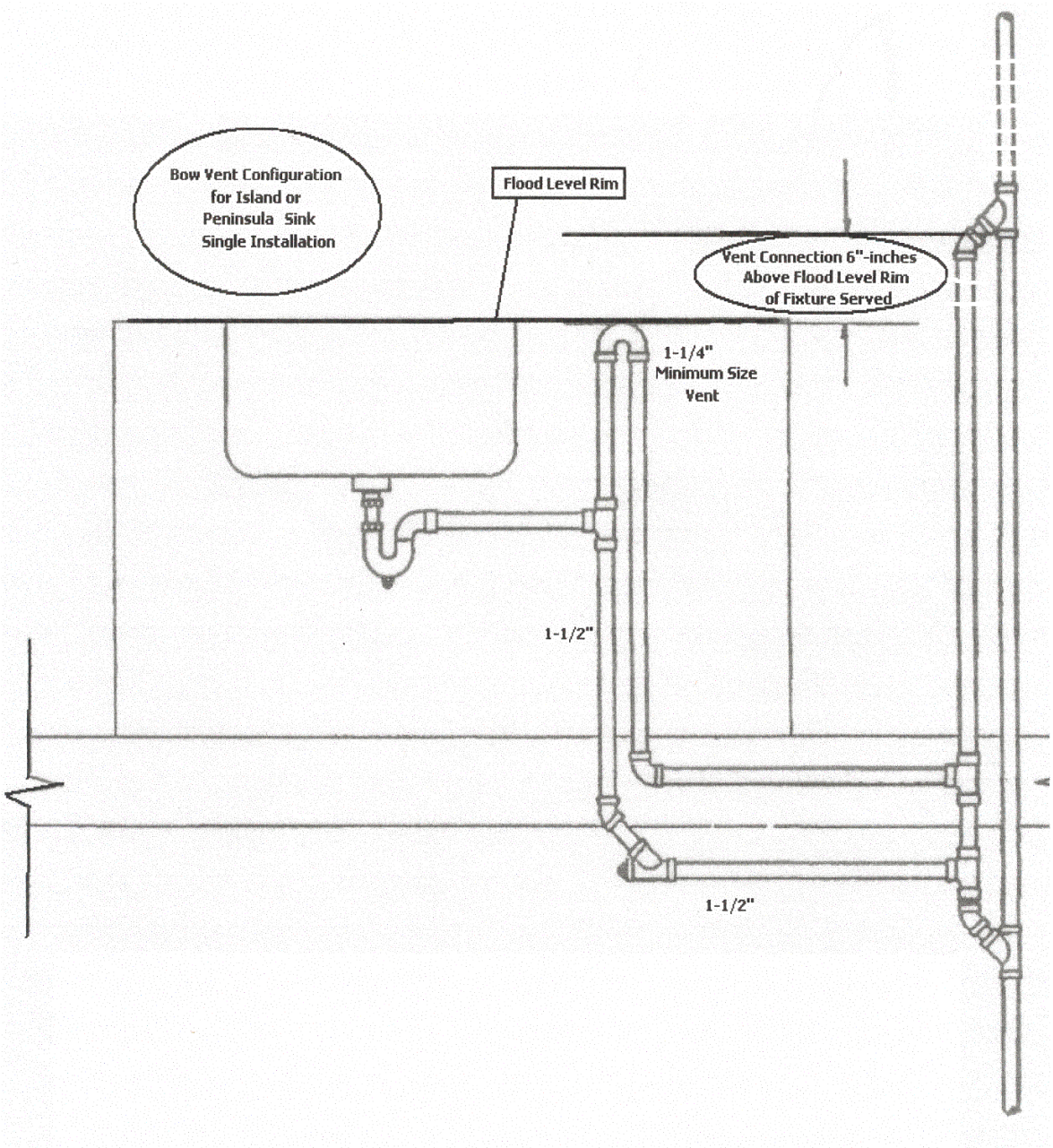


FIGURE 13B: Illustration of Bow Vent connection at Intermediate Floor

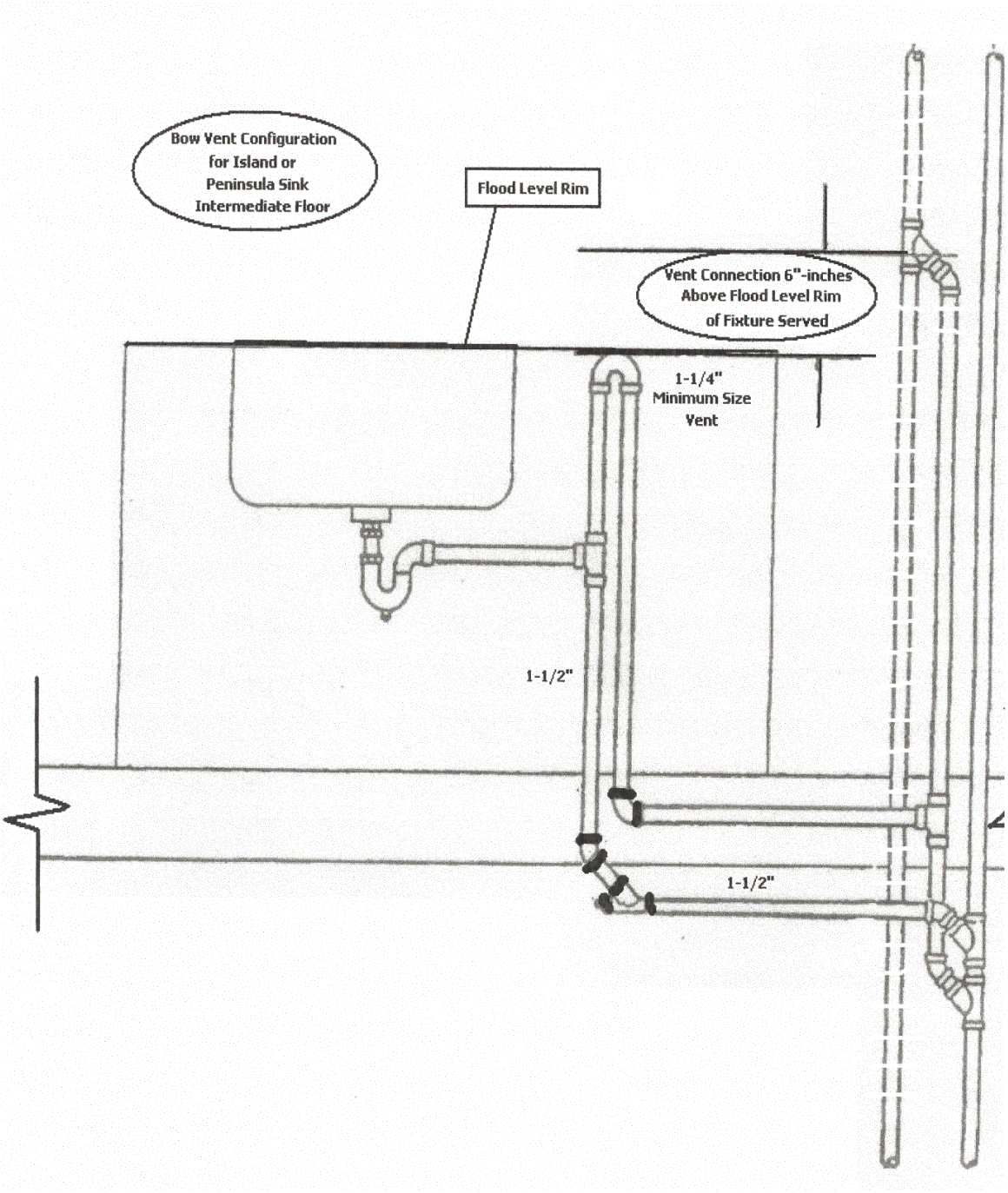
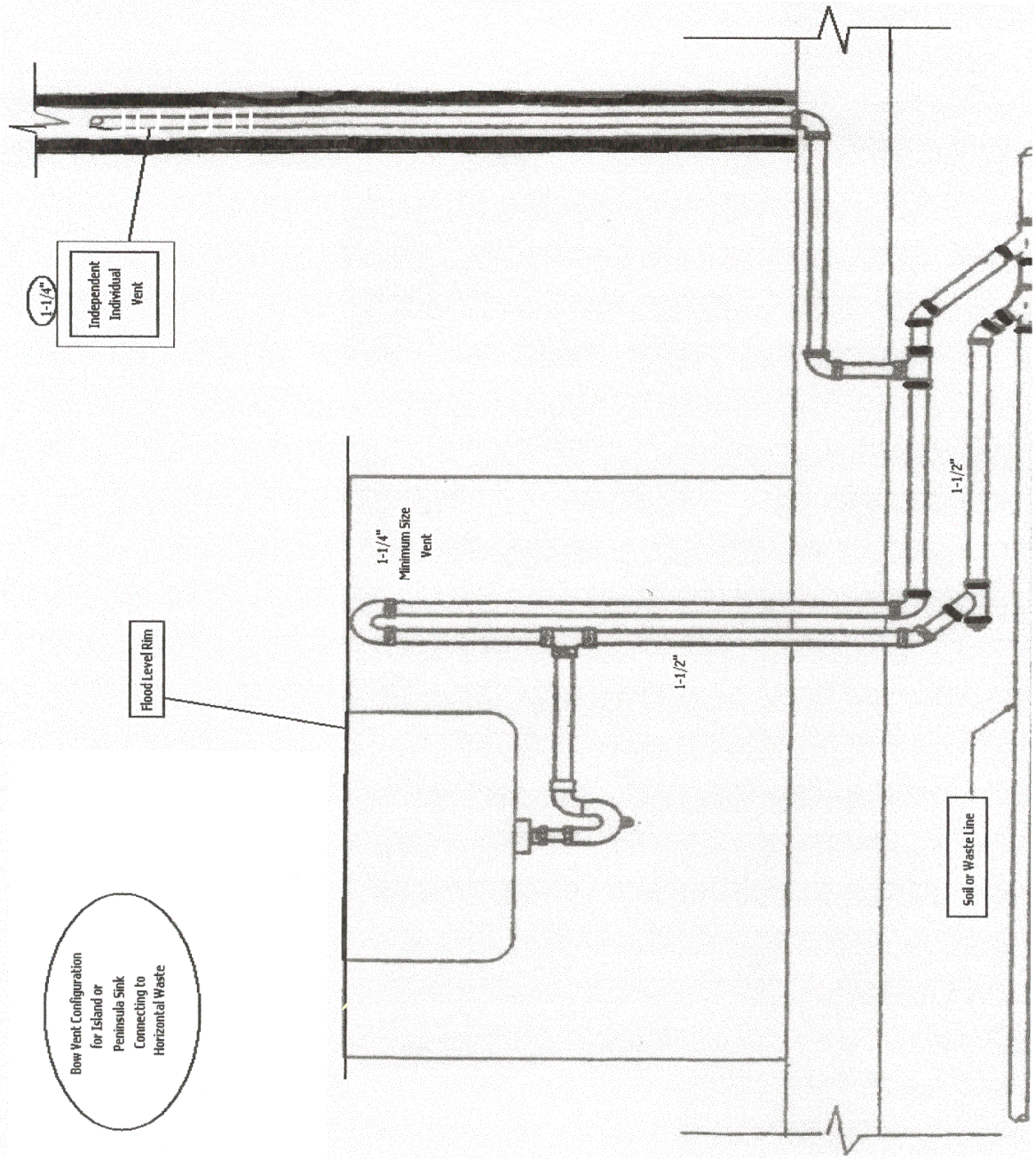
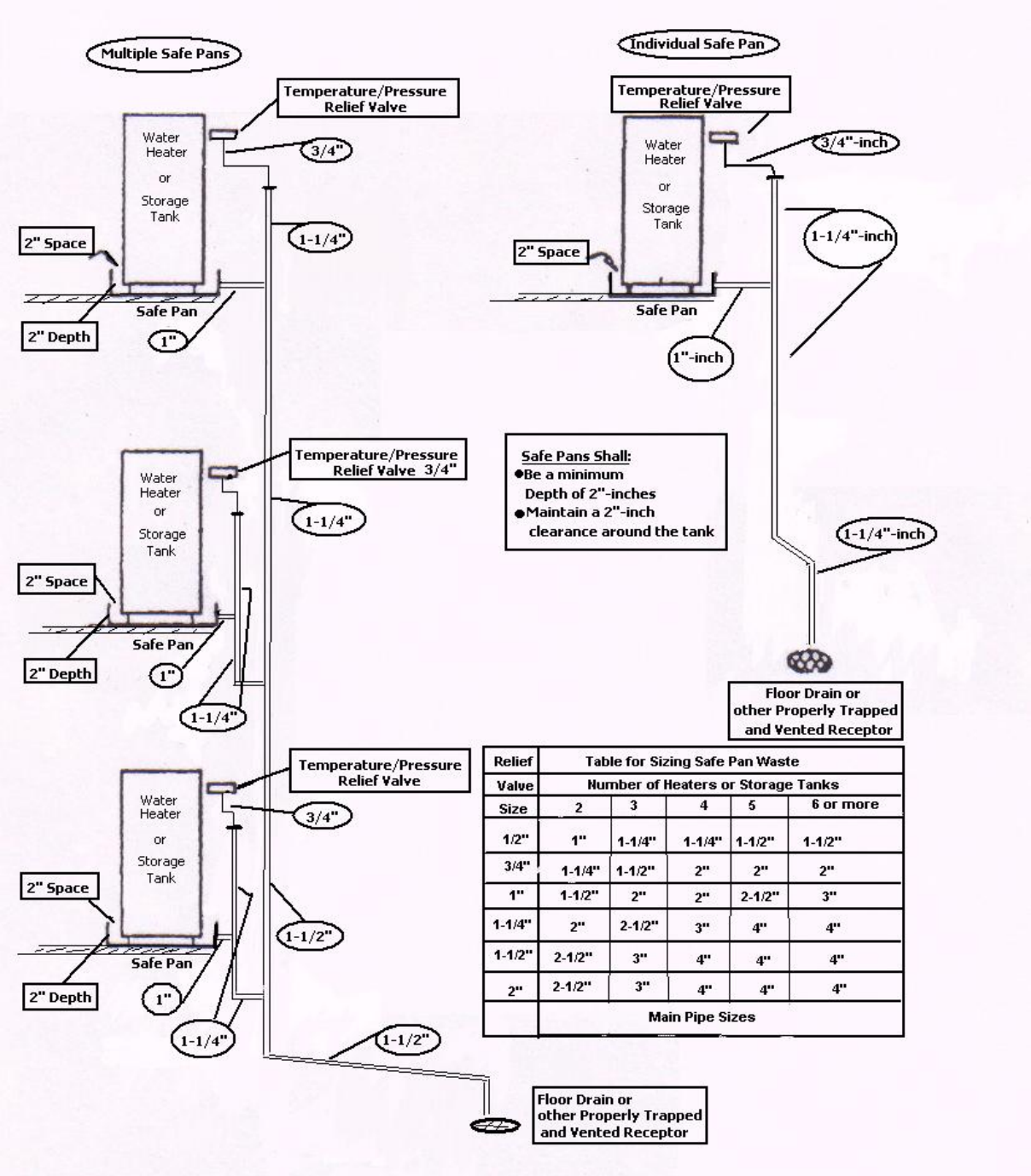


FIGURE 13C: Illustration of Bow Vent Connection to Horizontal.



10.22: continued

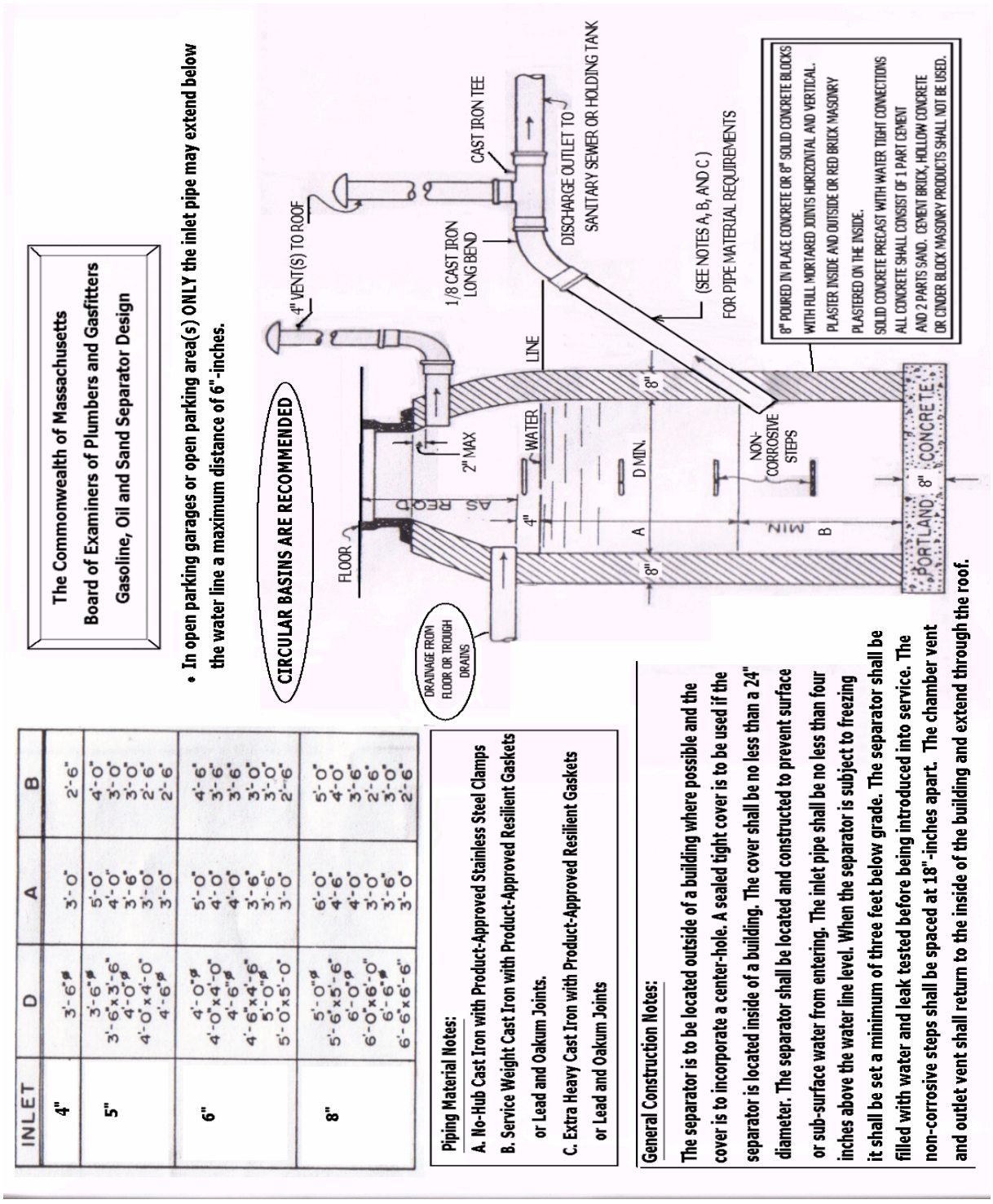
FIGURE 14: Illustration of Sizing for Safe Wast Pan Drains or Water Heaters. 248 CMR 10.12 (1)(h)



Relief Valve Size	Table for Sizing Safe Pan Waste — Number of Heaters or Storage Tanks				
	2	3	4	5	6 or more
1/2"	1"	1-1/4"	1-1/4"	1-1/2"	1-1/2"
3/4"	1-1/4"	1-1/2"	2"	2"	2"
1"	1-1/2"	2"	2"	2-1/2"	3"
1-1/4"	2"	2-1/2"	3"	4"	4"
1-1/2"	2-1/2"	3"	4"	4"	4"
2"	2-1/2"	3"	4"	4"	4"
	Main Pipe Sizes				

10.22: continued

FIGURE 15: Illustration of Gasoline, Oil and Sand Separator



INLET	D	A	B
4"	3'-6"ø	3'-0"	2'-6"
5"	3'-6"ø 3'-6"x3'-6" 4'-0"ø 4'-0"x4'-0" 4'-6"ø	5'-0" 4'-0" 3'-6" 3'-0" 3'-0"	4'-0" 3'-0" 3'-0" 2'-6" 2'-6"
6"	4'-0"ø 4'-0"x4'-0" 4'-6"ø 4'-6"x4'-6" 5'-0"ø 5'-0"x5'-0"	5'-0" 4'-0" 4'-0" 3'-6" 3'-6" 3'-0"	4'-6" 3'-6" 3'-6" 3'-0" 3'-0" 2'-6"
8"	5'-0"ø 5'-6"x5'-6" 6'-0"ø 6'-0"x6'-0" 6'-6"ø 6'-6"x6'-6"	6'-0" 4'-6" 4'-0" 3'-0" 3'-6" 3'-0"	5'-0" 4'-0" 3'-6" 2'-6" 3'-0" 2'-6"

Piping Material Notes:

A. No-Hub Cast Iron with Product-Approved Stainless Steel Clamps

B. Service Weight Cast Iron with Product-Approved Resilient Gaskets or Lead and Oakum Joints.

C. Extra Heavy Cast Iron with Product-Approved Resilient Gaskets or Lead and Oakum Joints

General Construction Notes:

The separator is to be located outside of a building where possible and the cover is to incorporate a center-hole. A sealed tight cover is to be used if the separator is located inside of a building. The cover shall be no less than a 24" diameter. The separator shall be located and constructed to prevent surface or sub-surface water from entering. The inlet pipe shall be no less than four inches above the water line level. When the separator is subject to freezing it shall be set a minimum of three feet below grade. The separator shall be filled with water and leak tested before being introduced into service. The non-corrosive steps shall be spaced at 18"-inches apart. The chamber vent and outlet vent shall return to the inside of the building and extend through the roof.

FIGURE 16: Illustration of Horizontal to Horizontal Change of Direction

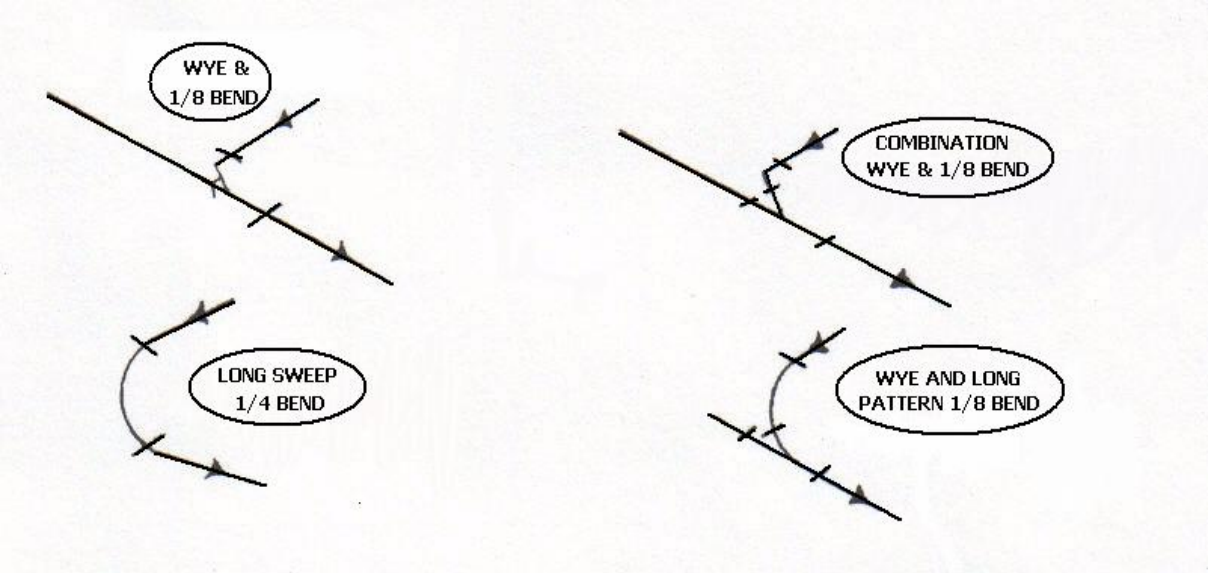


FIGURE 17: Illustration of Vertical to Horizontal Change of Direction

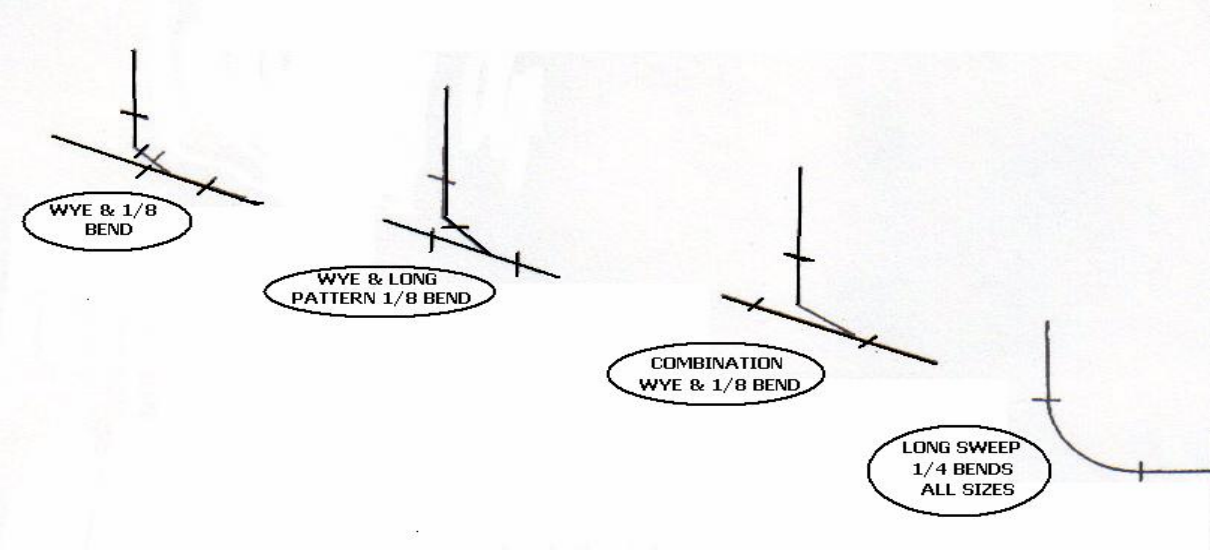
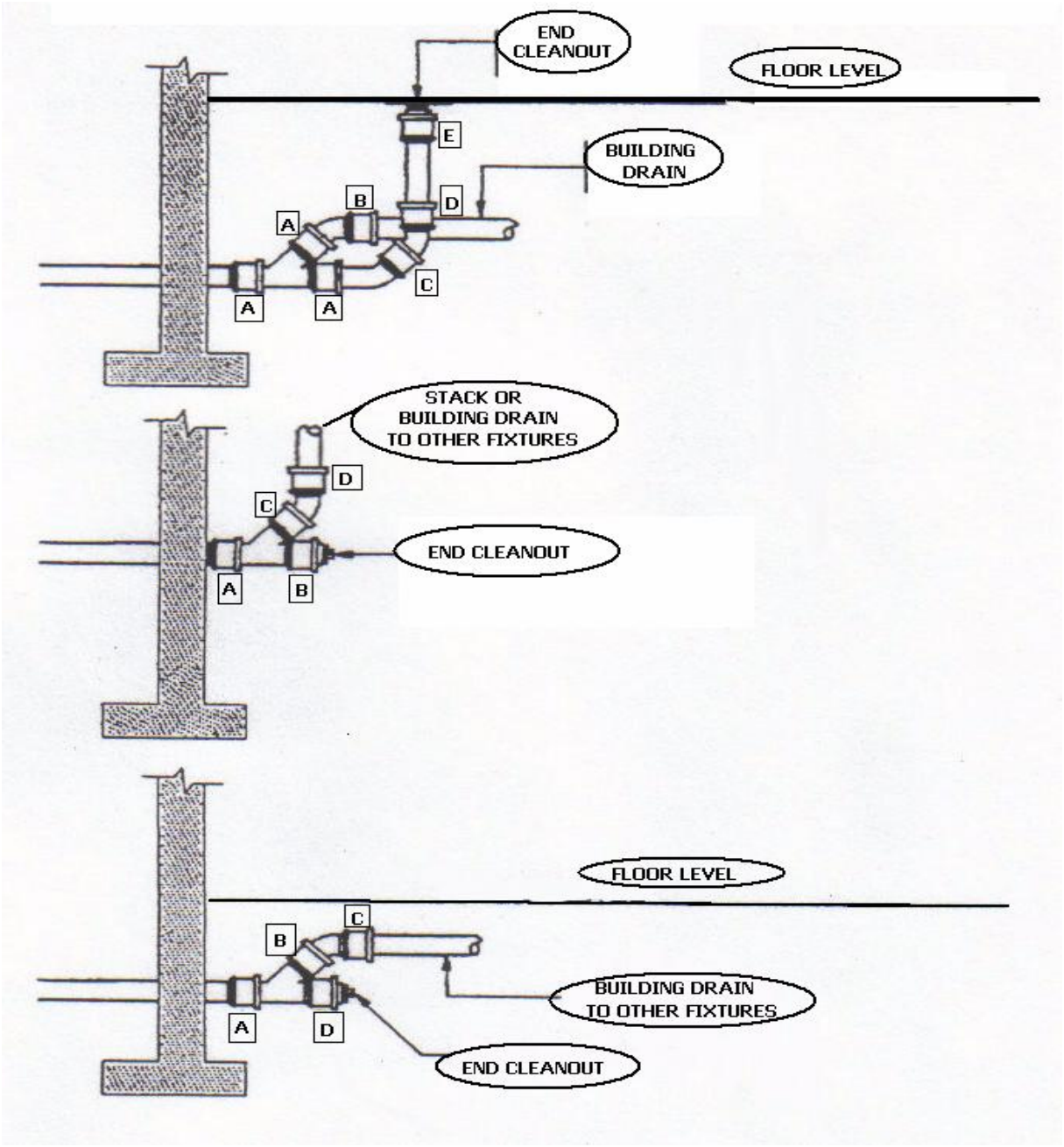


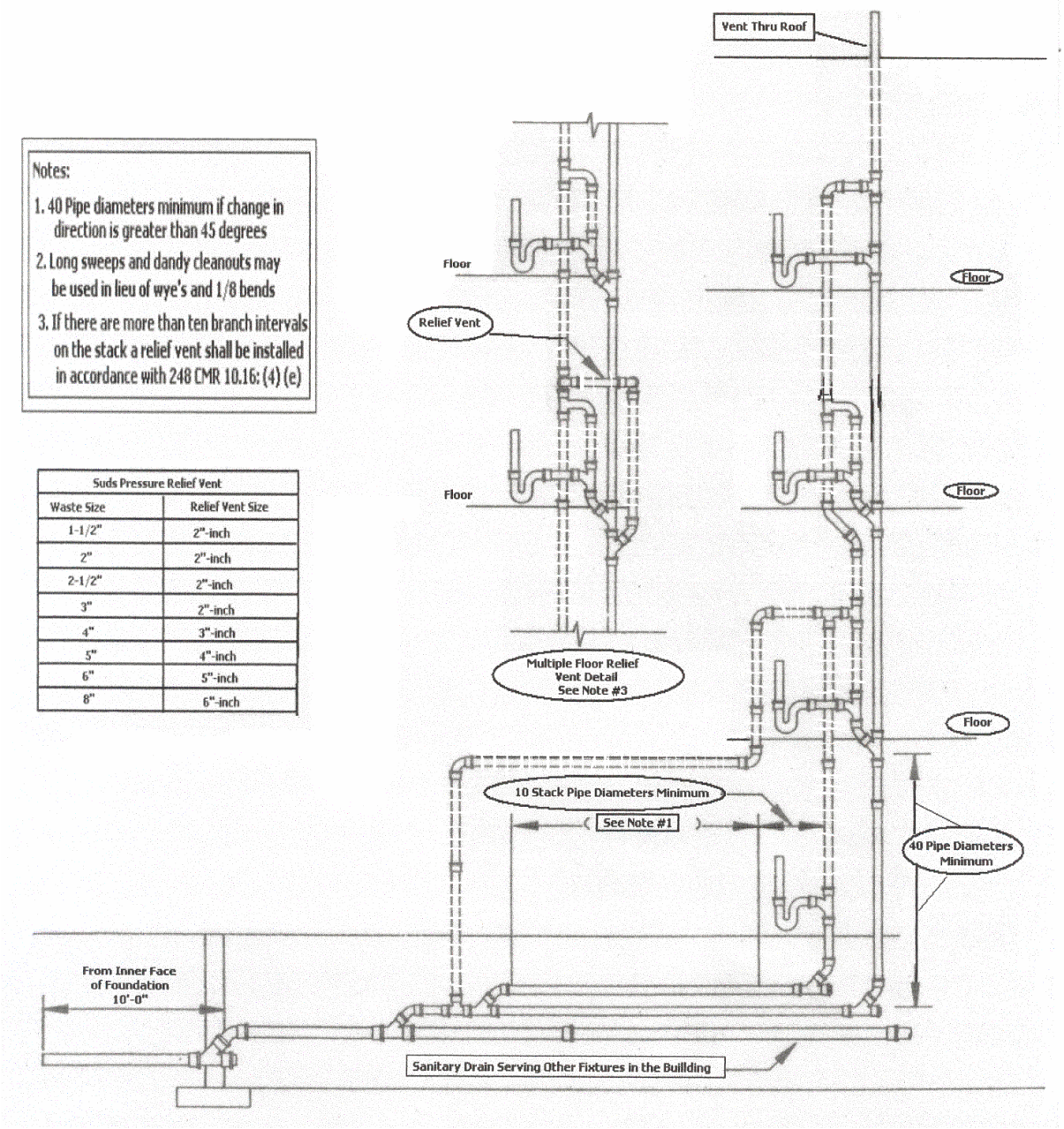
FIGURE 18: Illustration of Building Drainage at Foundation Wall.



Note: A, B, C, D & E on each figure shall be in compliance with 248 CMR 10.07 (1)(c) (Lead & oakum joints).

10.22: continued

FIGURE 19: Illustration of Laundries in Multi-story Buildings.



10.22: continued

FIGURE 20: Illustration of Offsets of More than 45E in Buildings of Five Stories or More in Compliance with 248 CMR 10.15(8)(b) and 10.16(4)(c).

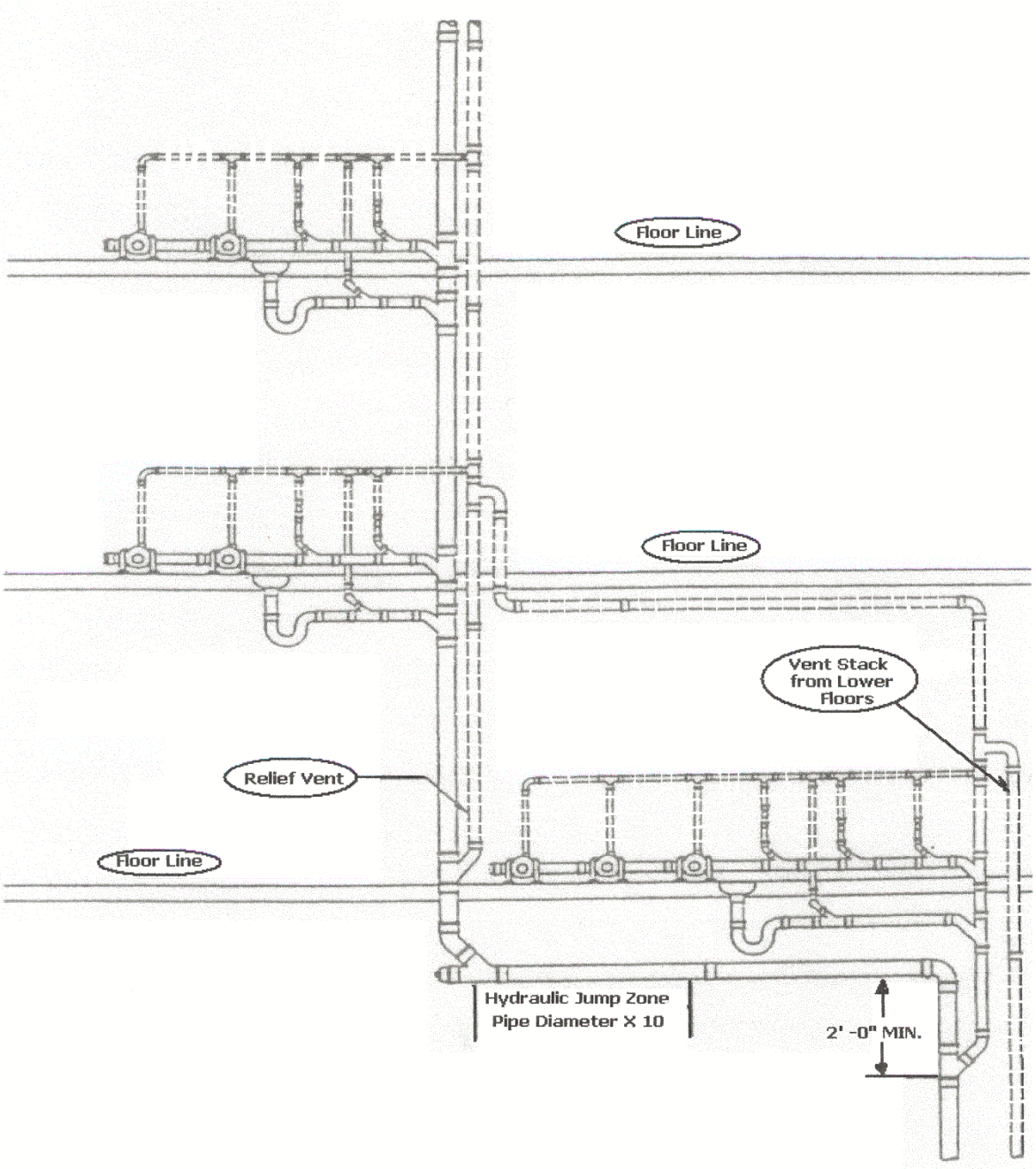
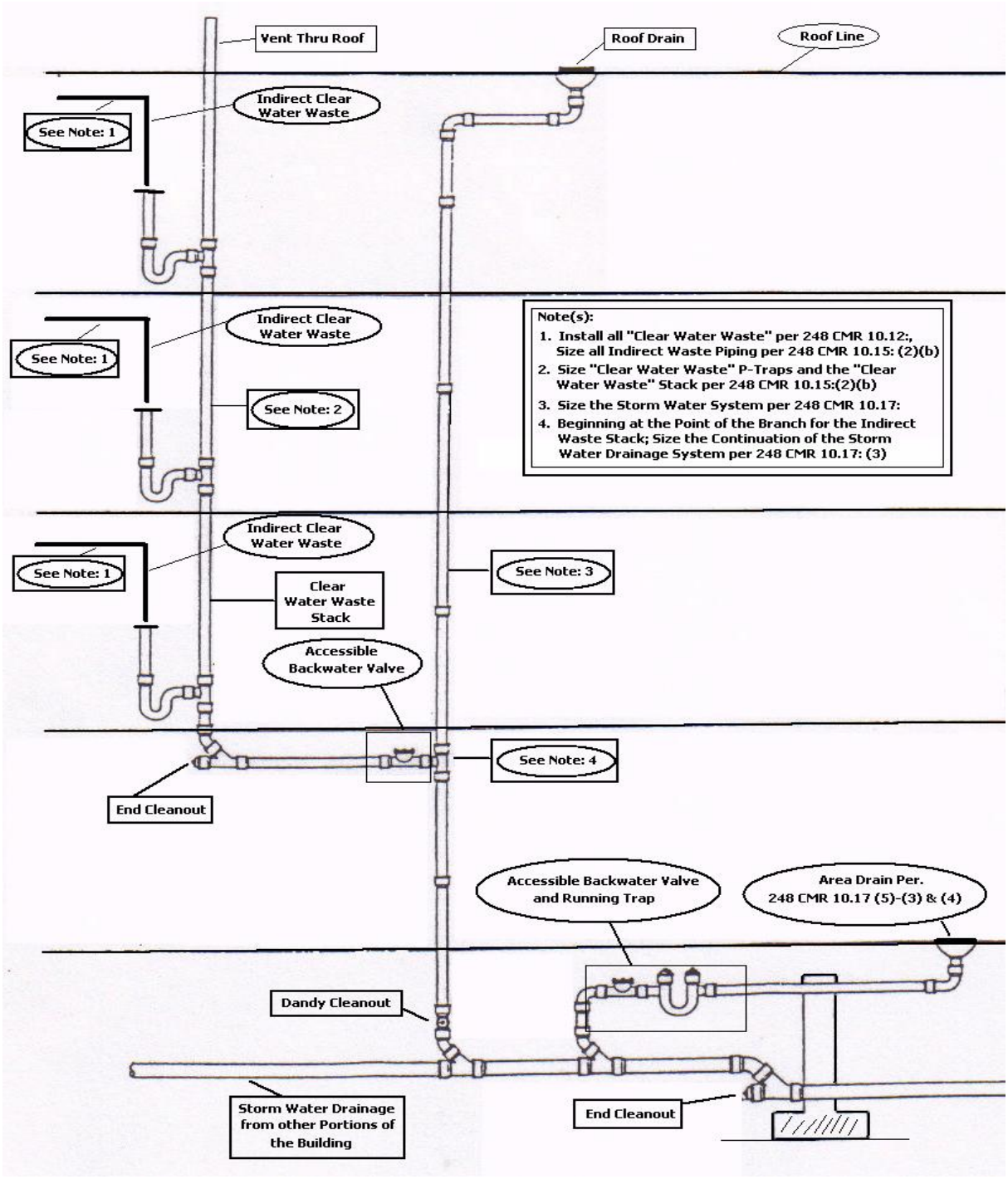
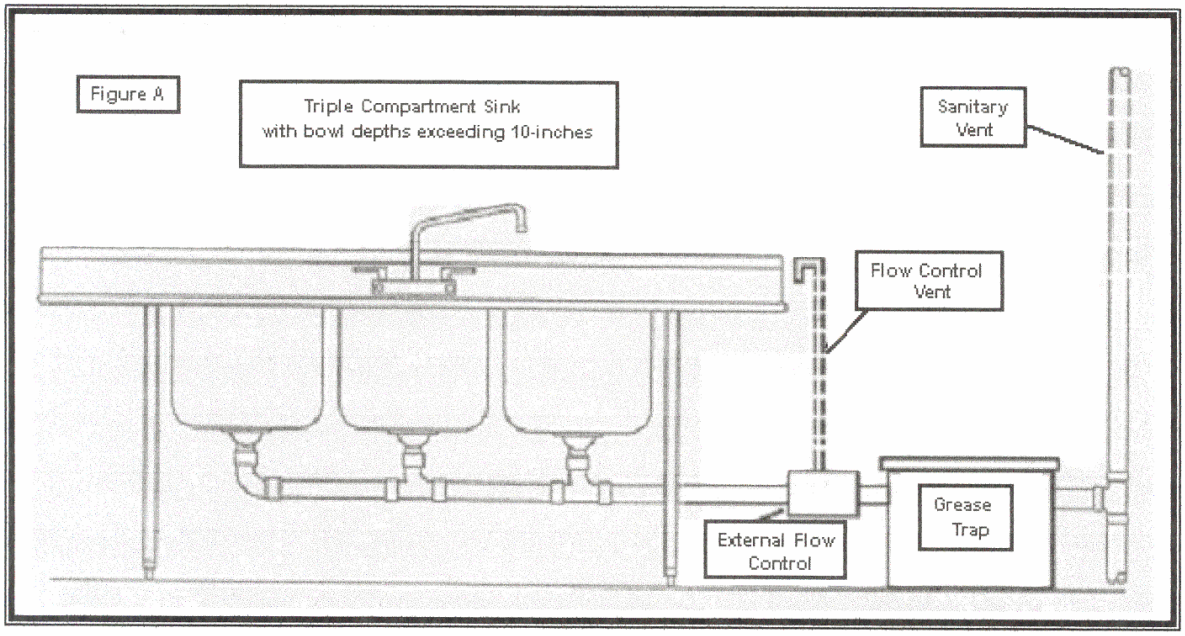


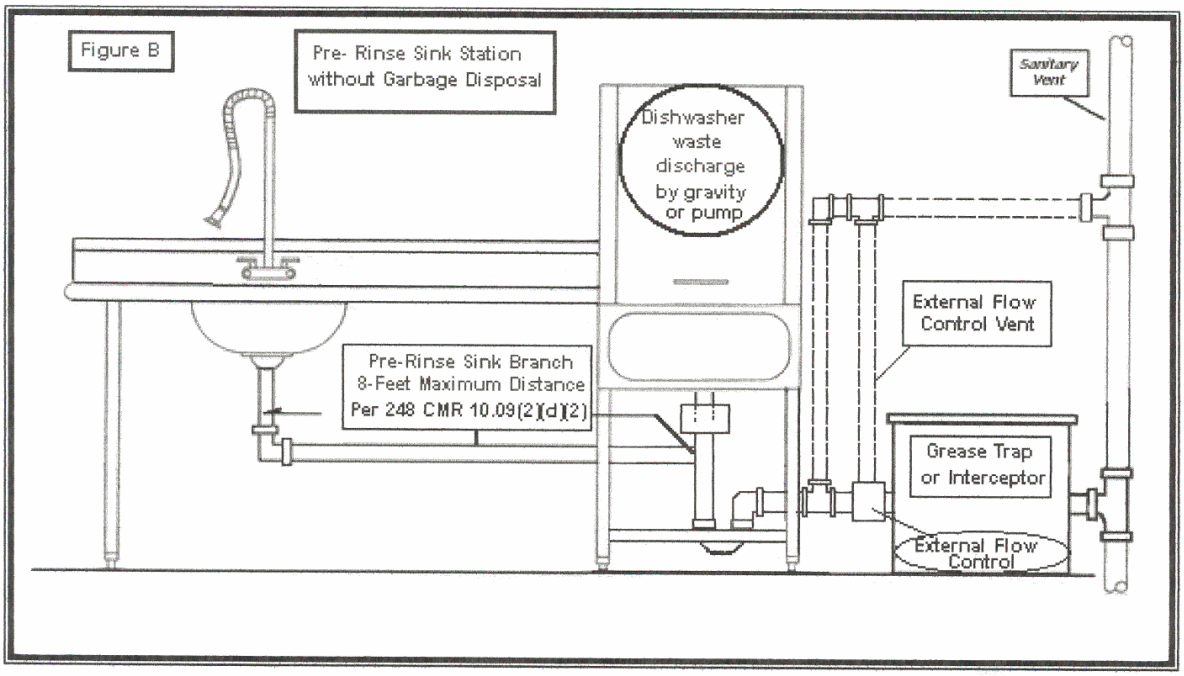
FIGURE 21: Illustration of Multiple Clear Water Waste Stack.



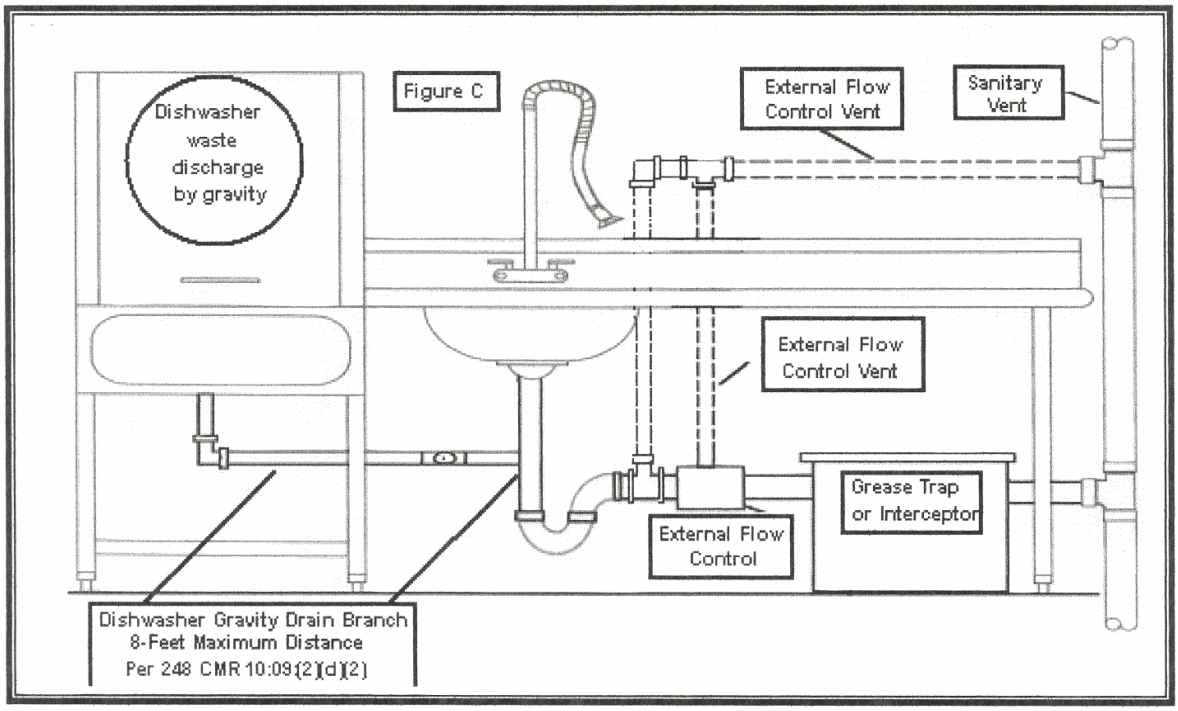
10.22: continued

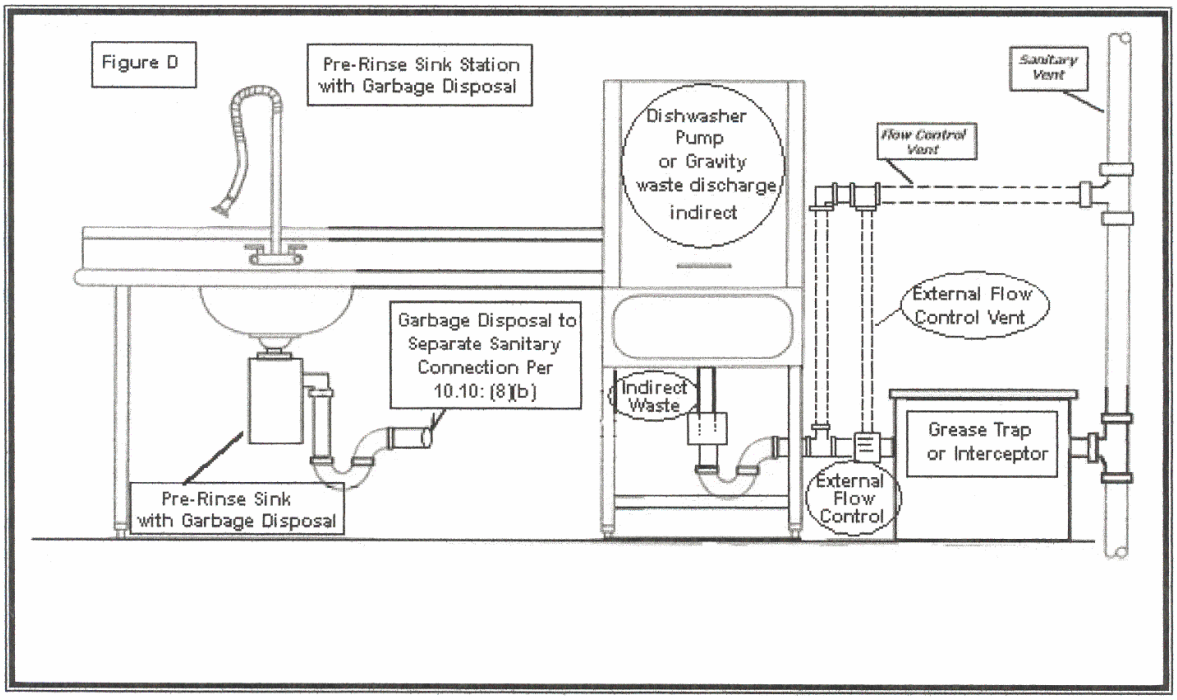
FIGURE 22: Illustrations of Installation of Grease Interceptors





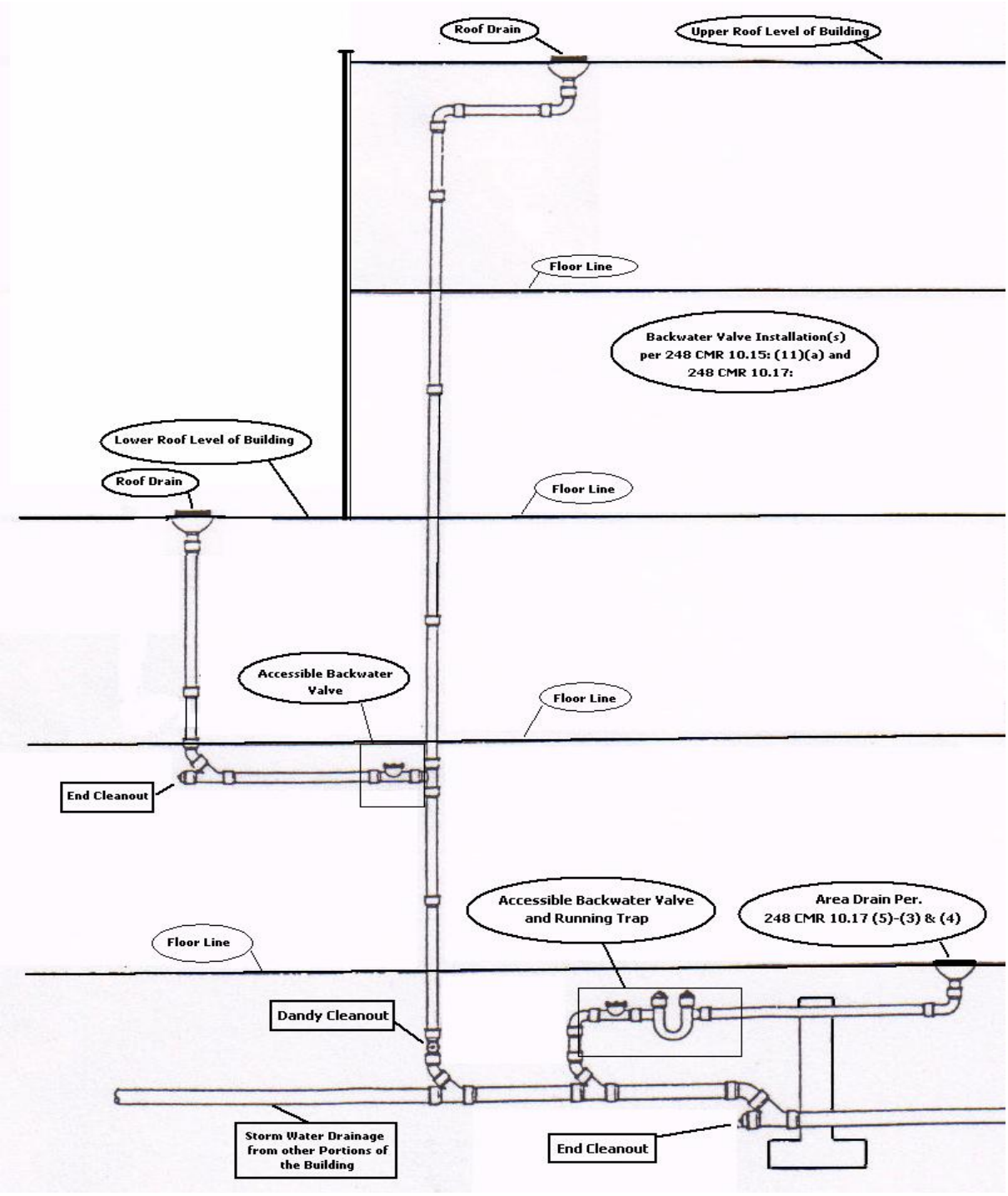
10.22: Figure 22 continued





10.22: continued

FIGURE 23: Illustration of Combination Upper and Lower Roof Drain Installations.



10.23: Vacuum Drainage Systems

(1) General.

(a) The purpose of 248 CMR 10.23 is to provide guidance to the Inspector in the evaluation as a proposed alternate and the requirements for the installation of vacuum powered sanitary drainage systems.

(b) The scope of 248 CMR 10.23 includes the 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: *Sanitary Drainage System*.

(c) The Inspector may require the plans, specification, calculations and operating instructions to be reviewed and approved prior to the issuance of a permit for installation. The costs for such review shall be borne by the applicant.

(2) Fixtures.

(a) General. All provisions and prohibitions of 248 CMR 10.10: *Plumbing Fixtures* shall be compiled with.

(b) Special Fixtures. Special fixtures designed and intended for connection to vacuum drainage systems shall be listed and approved for such use and shall be connected only to such systems.

(c) Conventional Fixtures. Conventional Fixtures designed and intended for use and connection to the gravity sanitary drainage systems may be connected to a vacuum drainage systems provided that all of the following conditions are met:

1. The fixtures discharge into a gravity sanitary drainage and vent system complying with 248 CMR 10.15: *Sanitary Drainage System* and 248 CMR 10.16: *Vents and Venting*;

2. The fixture shall be served by a trap complying with 248 CMR 10.08: *Traps and Cleanouts*; and

3. The gravity drainage system is connected to the vacuum drainage system by an interface device.

(3) Fixture Units.

(a) Vacuum Toilet Fixture Units. Vacuum drainage system sizing and design:

1. shall be determined from the manufacturer's data and engineering calculations; and
2. shall be approved by the Manufacturer.

(b) Conventional Fixture Units. Fixture units for gravity drainage systems discharging into or receiving discharge from vacuum drainage systems shall be determined as in 248 CMR 10.15(7): *Table 1*.

(c) Water Pipe Sizing. Factor Values for the purposes of water pipe sizing shall be in accordance with 248 CMR 10.14(4): *Table 1*: *Minimum Sizes of Fixture Water Supply Lines and Factor Values* as normal. In addition to Table 1, "Vacuum Toilets" shall be listed with a fixture unit value of one and shall be based upon ½ gallon consumption per flush.

(4) Traps and Vents.

(a) Conventional Traps. Conventional fixtures shall be provided with traps as in 248 CMR 10.23(2)(c)2.

(b) Conventional Venting. Conventional fixtures shall be provided with vents as in 248 CMR 10.23(2)(c)1.

(c) Special Venting.

1. A vent shall be installed where a vacuum interface device is installed for interfacing to a gravity drainage system to prevent clearing of the gravity traps.

2. The vent shall be no less than two inches in diameter and shall be sized in accordance with manufacturer's recommendations.

(5) Vacuum Drainage Piping.

(a) General. Detailed and fully dimensioned plans at a scale of not less than c-inch equal one foot shall be submitted with all necessary data and engineering calculations for review and approval.

(b) Material.

1. Vacuum drainage piping materials shall be composed of materials suitable for waste handling and shall have a smooth and uniform bore.

2. Joints and fittings shall provide a smooth interior transition.

(c) Fixture Connection. Vacuum drainage piping shall be connected to fixtures or gravity drainage systems by Product-Approved devices as required by 248 CMR 10.23(2)(c).

(d) Vertical Lifts.

1. The sum total of vertical piping used to lift discharges in a single system shall not exceed 20 feet unless documented by detailed engineering calculations.

2. There shall be no offsets in the vertical piping and the diameter of the lift piping shall not change throughout its height.

(e) Changes in Direction.

1. Changes of Direction in vacuum drainage systems shall be made by the appropriate use of fittings having no internal obstructions to flow.

2. The radius of such changes in direction whether by a single fitting or combination of fittings shall not be less than that formed by a long sweep ¼ bend of long radius 90E elbow.

(f) Horizontal Runs.

1. Horizontal piping shall be installed with a pitch of not less than 0.2% in the direction of flow.

2. A reforming pocket shall be installed in horizontal runs at intervals of no more than 150 feet or as indicated on the approved plans.

(g) Reforming Pockets.

1. When required to re-establish the waste slug, reforming pockets shall be installed. Reforming pockets shall consist of a wye and three ⊂ bends or 45's arranged such that the discharge enters the branch of the wye, is pocketed in a trap formed by the three bends and exits at an elevation equal to the entrance.

2. The depth of the trap formed shall be at least 1½ times the diameter of the piping. (*See* Figure F-1.) A cleanout plug shall be installed on the wye.

(h) Trapped Sections. Offsets to pass under obstructions in horizontal runs may be installed provided that such offsets are constructed as reforming pockets and do not exceed three feet in length, except that Offsets may exceed three feet in length if a second reforming pocket is installed at the terminus of the offset. (*See* Figure F-2.)

(i) Piping Connections. Vacuum Drainage system piping connections shall be as follows:

1. Horizontal piping connecting to horizontal piping shall enter from the top of the line by way of a wye fitting. (*See* Figure F-3.)

2. Vertical lift piping connecting to horizontal piping shall enter from the top of the line by way of a wye fitting. Where design drawings show a check valve to be installed in the horizontal piping between the lift piping and the branch inlet of the wye, such check valve shall be approved for use in vacuum waste drainage systems by the manufacturer of the system. The volume of the horizontal piping in direction of flow shall be at least ten times the volume of the vertical lift piping. (*See* Figure F-4.)

3. Horizontal piping connecting to vertical lift piping shall be by way of a reforming pocket. (*See* Figure F-5.)

4. Horizontal piping connection to vertical drop piping shall be by way of single wye branches. Multiple connections shall be at staggered levels. Double wyes or divided flow fittings are prohibited. (*See* Figure F-6.)

5. Vertical Drop piping connection to horizontal runs shall be by way of a combination wye and ⊂ bend. (*See* Figure F-7.)

(j) Pipe Sizing.

1. Vacuum drainage piping shall be sized in accordance with engineering principles.

2. The installation of piping shall be in conformance with the sizes and layouts shown on the approved plans.

3. The plans shall contain a statement attesting to review and acceptance of the proposed installation by the Product-Approved manufacturer of the system.

4. EXCEPTION: When approved by the Inspector, minor installations, additions or relocations may be permitted without the submission of additional plans when provisions for such were clearly made in the original approved plans.

(k) Cleanouts. Cleanouts shall be provided in the following locations:
1. Start of horizontal runs;
2. Top of stacks;
3. Reforming pockets;
4. Horizontal changes in direction equal to or greater than 90E;
5. Intervals of 50 feet in horizontal runs.

(l) Tank Connections. Vacuum drainage piping shall enter the vacuum tank at its top. A full-port valve shall be installed at the connection.

(m) Supports and Bracing.

1. Vacuum Drainage piping shall be supported every six feet on its vertical portions and every four feet on its horizontal portions.

2. The vacuum piping shall be braced to prevent any movement in the vertical and horizontal planes.

3. Piping shall not rely on fixtures, collection tank or pumps for any portion of its support. Seismic restraint shall be installed as required by 780 CMR: *The Massachusetts State Building Code*.

(n) Access. Service access shall be provided to cleanouts check valves and interface valves.

(6) Vacuum Collection Tank Assembly.

(a) General. A vacuum collection tank assembly shall be provided of sufficient capacity to maintain the required vacuum pressure when the collection tank is 75% filled with system discharge fluids. Size shall be calculated based on engineering principles and drawings shall contain a statement attesting to review and acceptance of the proposed installation by the approved manufacturer of the systems.

(b) Location. A vacuum collection tank assembly located within a building shall be in a well ventilated room and to which access is restricted to authorized personnel. Vacuum collection tanks shall be protected from freezing.

(c) Materials.

1. Vacuum collection tanks shall be constructed of vacuum tight, welded steel construction or other Product-approved materials and capable of withstanding a sustained vacuum pressure of 29 inches of mercury.

2. The interior of the tanks shall be treated to retard corrosion, the method of treatment shall be submitted with documentation for review and approval.

(d) Access Hatch.

1. A gas tight, bolted access hatch not less than 14 inches in diameter shall be provided. The cover of the hatch shall bear a permanently affixed warning label indicating the presence within of toxic and flammable gases.

2. The warning label shall contain directions regarding safety procedures to be observed when opening or entering the tank.

3. A clear pathway not less than three feet in width shall be maintained from the exit of the room to the access hatch.

(e) Vacuum Pumps.

1. The assembly shall be equipped with automatically operated, duplex vacuum pumps capable of drawing down to 19 inches of mercury, vacuum.

2. Pumps shall have the capacity to maintain an operating vacuum in the system of 16 inches of mercury.

(f) Sewage Discharge Pumps.

1. The assembly shall be equipped with automatically operated, duplex sewage discharge pumps each sized to accommodate the calculated flow.

2. Discharge to the gravity drainage system or sewer shall be as required for sewage ejector's.

(g) Vacuum Pump Discharge Piping.

1. Vacuum pump discharge piping shall be extended full size without creating traps to the exterior of the building.

2. The termination of the piping shall be direction downward to avoid entry of rain or debris.

3. The termination shall be located at least two feet above a roof surface or 15 feet above a pedestrian surface and no closer than ten feet to any opening into a building.

4. Discharge terminations may be horizontal through a wall. (*See* Figure F-8.)

(h) Indication and Alarm.

1. Vacuum tank assemblies shall provide separate indication and alarm of low vacuum conditions and high sewage level.

2. Alarm conditions may be in two or more stages.

3. Early stage alarm may be transmitted for alerting service personnel to potential problems.

4. Failure stage alarm shall automatically shut down the system and annunciate the problem.

5. Alarm indicator shall be at a location that has the approval of the Inspector.

(7) Tests and Demonstrations.

(a) General. Recorded proof of all required tests and demonstrations shall be submitted to the plumbing inspector.

(b) Vacuum Drainage Piping.

1. Prior to installation of any special fixtures or gravity to vacuum interface devices, the entire vacuum drainage piping system shall be pressurized to not less than 15 psig and shall show no loss in gauge pressure for at least ten minutes.

2. EXCEPTION: When approved by the inspector minor additions, alterations or repairs to an existing complying system may be done without the 15 psig air pressure test.

(c) Gravity Drainage Piping. Conventional waste and vent piping shall be tested as required by 248 CMR 10.15: *Sanitary Drainage Systems* and 248 CMR 10.16: *Vents and Venting*.

(d) Functional Test.

1. After completion of the entire system installation, the system shall be subjected to a vacuum pressure of 19 inches of mercury and shall be demonstrated to function as required by operating each device.

2. Such demonstration shall be conducted in the presence of the manufacturers authorized representative.

(8) Instructions.

(a) Operation and Maintenance. Prior to final approval, the Inspector shall satisfy himself that written instructions on the operation and maintenance of the entire system has been delivered to the owner and that the owner has received on site instruction from the installer and manufacturer.

FIGURE F-1
REFORMING POCKETS

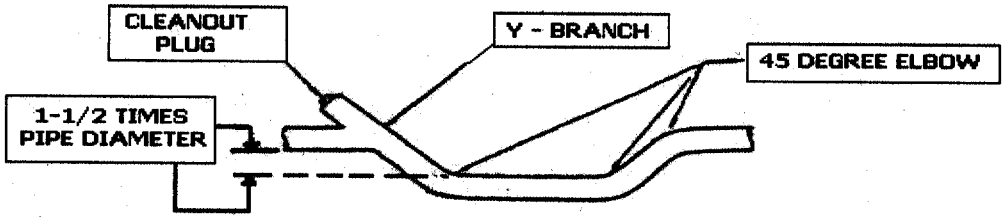


FIGURE F-2
TRAPPED SECTIONS

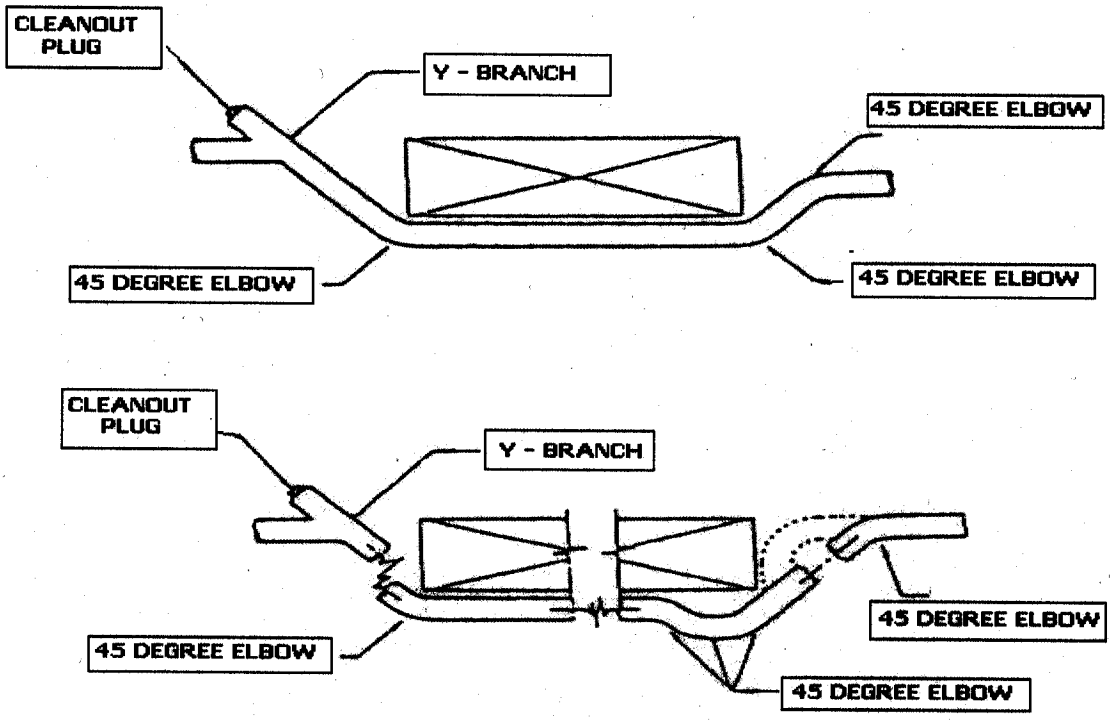


FIGURE F-3
HORIZONTAL TO HORIZONTAL CONNECTION

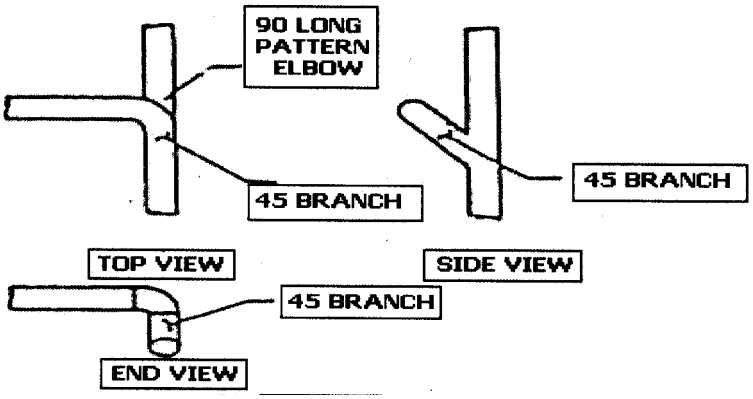


FIGURE F-4
VERTICAL LIFT TO HORIZONTAL CONNECTGION

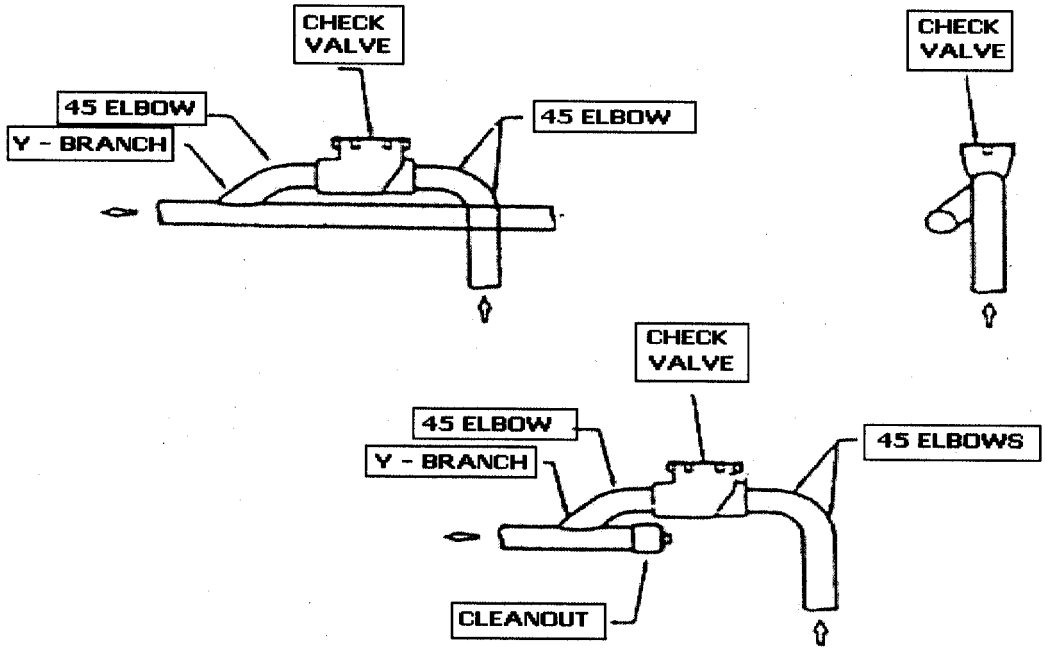


FIGURE F-5
HORIZONTAL TO VERTICAL LIFT CONNECTION

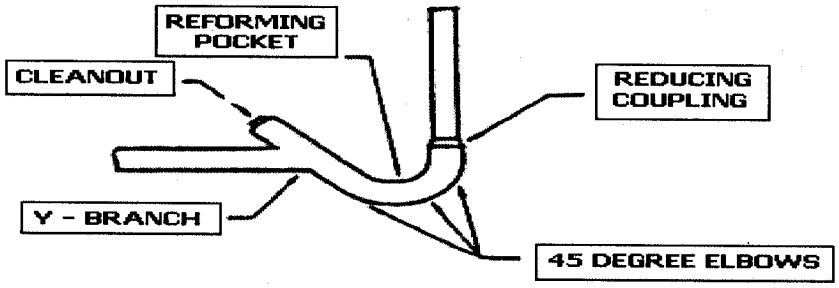


FIGURE F-6
HORIZONTAL TO VERTICAL DROP CONNECTION

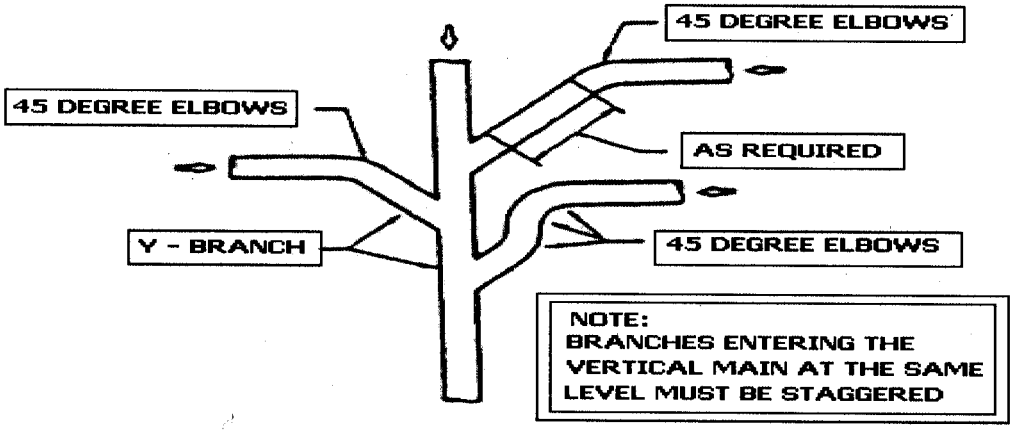


FIGURE F-7
VERTICAL DROP TO HORIZONTAL CONNECITION

FIGURE F-8
VACUUM PUMP DISCHARGE PIPE TERMINATION

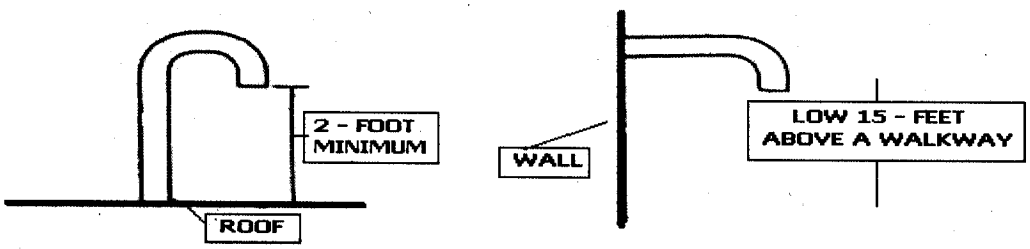


FIGURE F-9

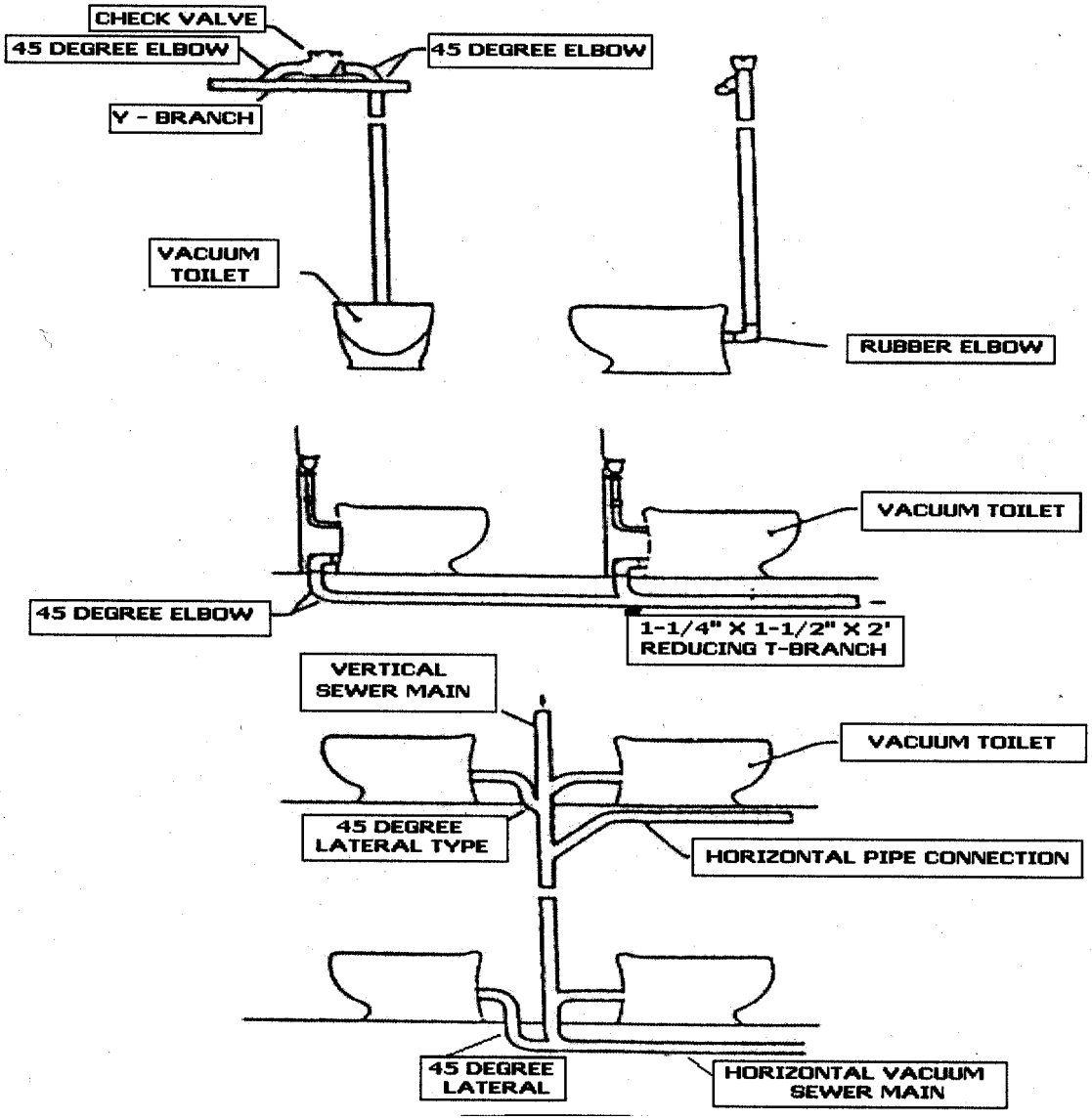
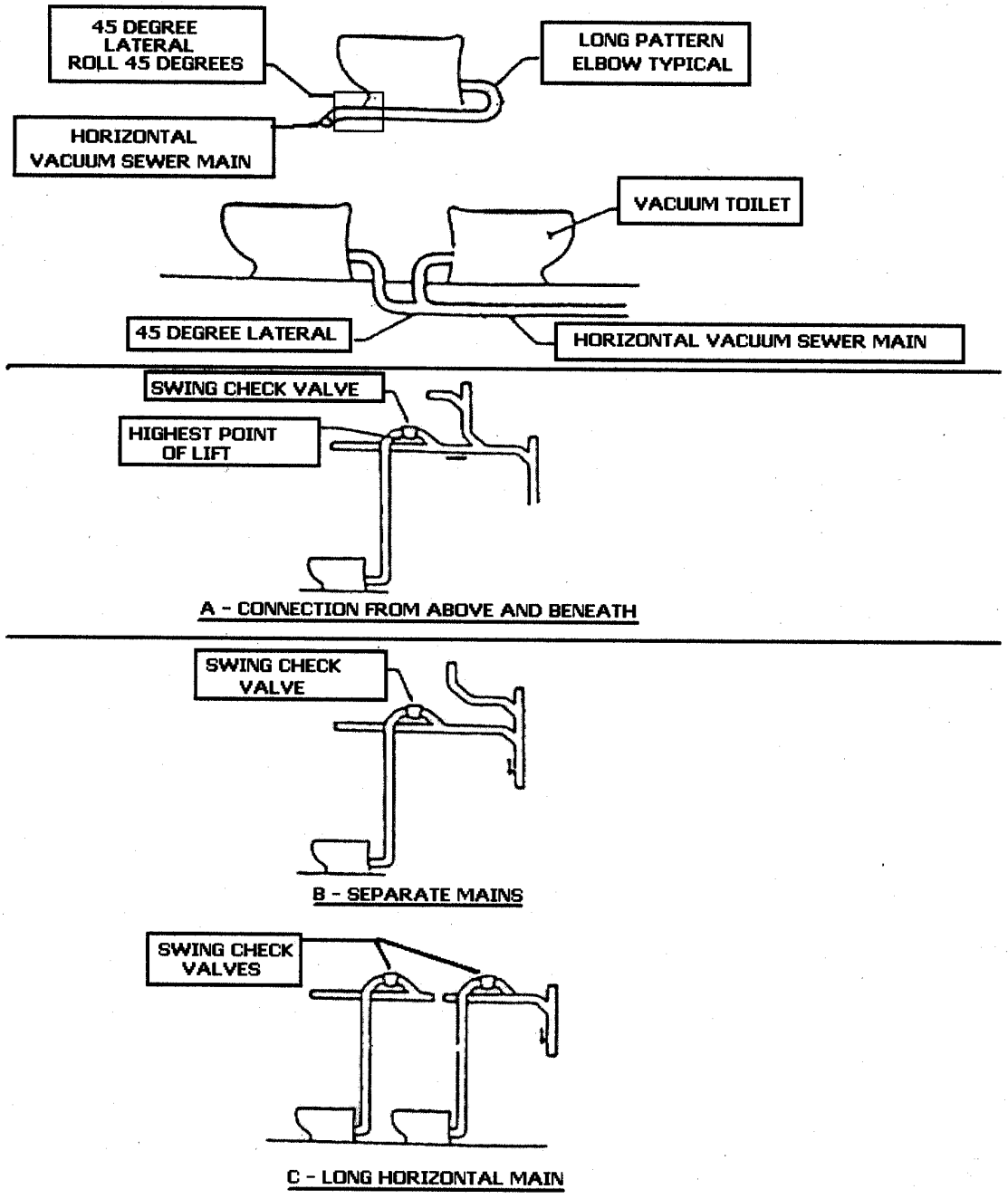
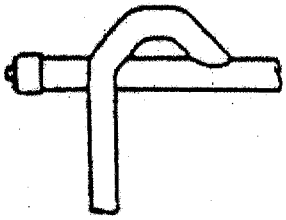


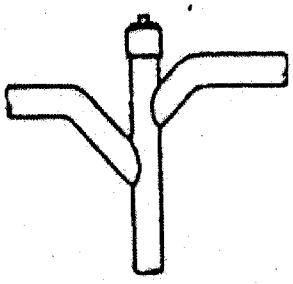
FIGURE F-9
TYPICAL VACUUM FIXTURE INSTALLATION
(CONTINUED)



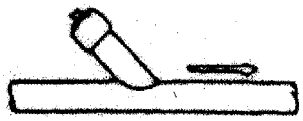
10.23: continued



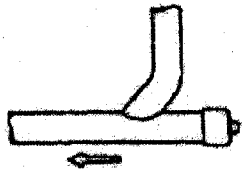
A - END OF HORIZONTAL MAINS



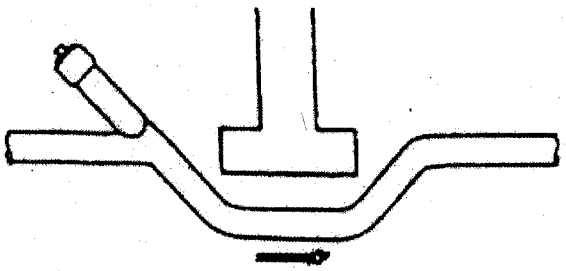
B - TOP OF VERTICAL TRUNKS



C - INTERVALS OF 50 FEET



D - 90 DEGREE BENDS



E - REFORMING POCKETS

FIGURE F-11

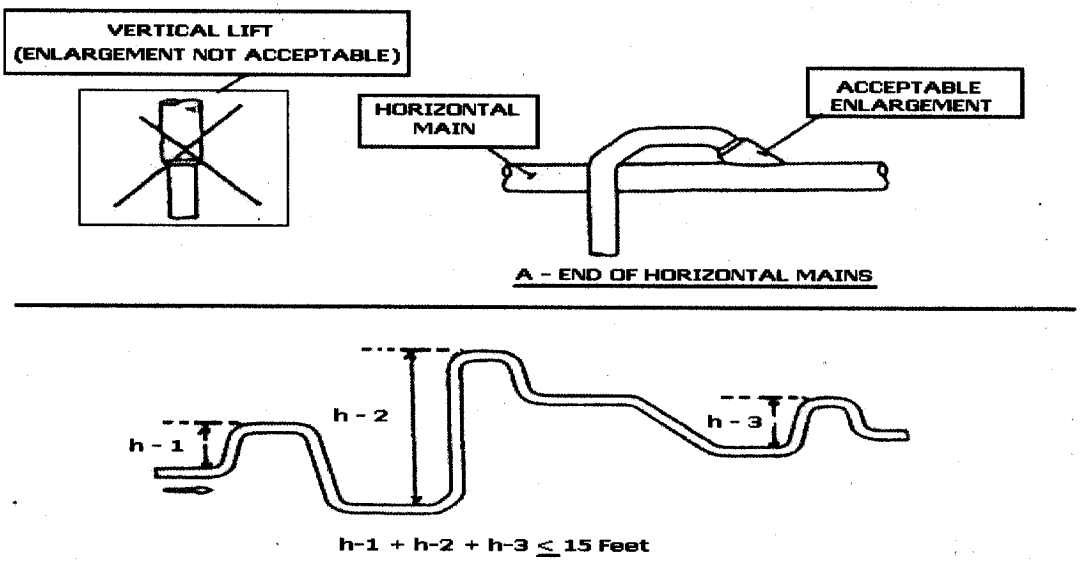
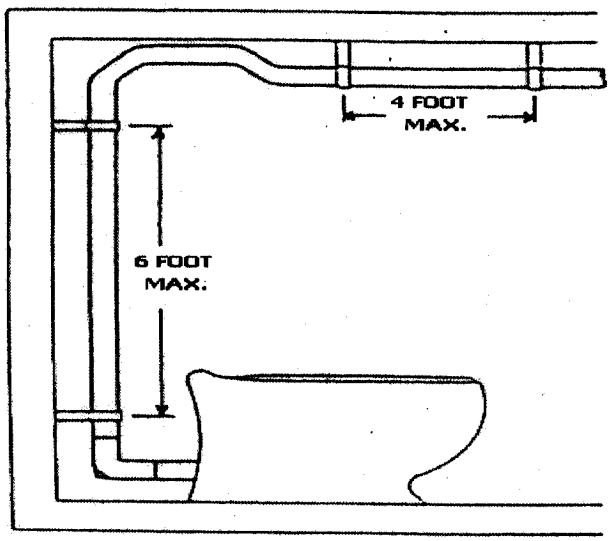


FIGURE F-12



REGULATORY AUTHORITY

248 CMR 10.00: M.G.L. c. 112, § 61; M.G.L. c. 142, §§ 13 and 21.

248 CMR 11.00: EDUCATION AND EXPERIENCE STANDARDS AND REQUIREMENTS FOR LICENSURE

Section

11.01: Scope and Application

(1) Scope. The provisions of 248 CMR 11.00 govern the educational and experience requirements for licensure as a journeyman plumber or journeyman gas fitter, licensure as a master plumber or master gas fitter and licensure as either an undiluted liquefied petroleum gas installer or limited undiluted liquefied petroleum gas installer. In addition, 248 CMR 11.00 governs the continuing education requirements for all licensed plumbers and gas fitters in the Commonwealth. Finally, the provisions of 248 CMR 11.00 govern the requirements for providers of plumbing and gas fitting primary and continuing education.

(2) Sections Declared Independent. 248 CMR 1.00 through 11.00 is hereby declared to be an independent section and part of section and the holding of any section or part of section to be void and ineffective for any cause shall not be deemed to affect any other section or part of section.

11.02: Education and Experience Requirements for Apprentices, Journeyman and Master Licensees; Education and Experience Requirements for Undiluted Liquefied Petroleum Gas Installers and Limited Undiluted Liquefied Petroleum Gas Installers

(1) Qualifications for admission to the Journeyman Plumber Examination.

(a) Apprentice Plumber Licensed before September 1, 2008. An applicant who is a licensed apprentice plumber and the apprentice license was received prior to September 1, 2008 in accordance with M.G.L. c. 142, § 3A or who commenced a plumbing program in a Massachusetts Public Comprehensive High School Career/Vocational Technical School Program on or before September of 2008, successfully completed that program, and obtained an apprentice license within five years of the commencement of that program, shall be required to fill out a Board approved application and meet the following requirements to be eligible for admission to the journeyman plumber examination:

1. Experience. The applicant shall furnish documentary proof satisfactory to the Board of having completed practical work experience performing plumbing and gas fitting that totals no less than 5,100 clock hours as a licensed apprentice working as an employee under the direct supervision of a Commonwealth of Massachusetts licensed master plumber or under the direct supervision of a Commonwealth of Massachusetts licensed journeyman plumber who is in the employ of a master plumber. Experience installing HVAC components for the installation of heating systems, steam piping and hydronic heat piping or other work not requiring a plumbing or gas fitting license shall not be considered qualifying experience.

2. Education

a. The applicant shall furnish documentary proof of having received a high school diploma or the equivalent; and

b. The applicant shall furnish documentary proof of having successfully completed 300 clock hours of plumbing and gas fitting theory culminating in a school or instructor designed examination to ensure competency. This education must take place over a period of no less than three years and must

meet the requirements of 248 CMR 11.00. For each calendar year, no more than 150 hours of education may be credited for licensure purposes.

3. Public Comprehensive High School Career/Vocational Technical School Program. An applicant who successfully completes a Public Comprehensive High School Career/Vocational Technical School Program following the CVTE (Career Vocational Technical Education) educational standard framework and who otherwise meets the requirements of 248 CMR 11.00 may be granted a maximum of 300 hours of educational theory credit and 1,700 hours of experience credit from that program. Such applicants must also present documentation demonstrating that he or she has been licensed as an apprentice for a period of no less than two years and completed no less than 3,400 clock hours of practical experience as a licensed apprentice working as an employee under the direct supervision of a master plumber or under a journeyman plumber who is in the employ of a master plumber in accordance with M.G.L. c. 142, § 3 in order to be eligible for admission to the journeyman plumber examination.

(b) Apprentice Plumber Licensed on or after September 1, 2008. An applicant who is a licensed apprentice plumber and the apprentice license was issued on or after September 1, 2008 in accordance with M.G.L. c. 142, § 3A not otherwise meeting the criteria outlined in 248 CMR 11.02(1)(a) shall be required to fill out a Board approved application and complete the following education and experience criteria to be eligible for admission to the journeyman plumber examination:

1. Experience. The applicant shall furnish documentary proof satisfactory to the Board of having completed practical work experience that totals no less than 8,500 clock hours as a licensed apprentice working as an employee under the direct supervision of a Commonwealth of Massachusetts licensed master plumber or under the direct supervision of a Commonwealth of Massachusetts licensed journeyman plumber who is in the employ of a master plumber. Experience installing HVAC components for the installation of heating systems, steam piping and hydronic heat piping shall not be considered qualifying experience.

2. Education.

a. The applicant shall furnish documentary proof of having received a high school diploma or the equivalent; and

b. The applicant shall furnish documentary proof of having successfully completed 550 clock hours of plumbing and gasfitting theory culminating in a school or instructor designed examination to ensure competency. This education must take place over a period of no less than five years and must meet the Board administrated requirements of 248 CMR 11.00.
For each calendar year, no more than 110 hours of education may be credited for licensure purposes.

c. Apprentices licensed on or after September 1, 2008 shall begin their education program within nine months of the initial issuance of that apprentice license.

3. Education and work experience must be contemporaneous. Absent special Board approval, an applicant will not receive credit for work experience and education unless they were completed in conjunction with one another as measured by calendar years. For each year in which an apprentice obtains 110 clock hours of education, that apprentice must accrue 1700 clock hours of qualifying work experience.

4. Public Comprehensive High School Career/Vocational Technical School Program. An applicant who successfully completes a Public Comprehensive High School Career/Vocational Technical School Program following the CVTE (Career

Vocational Technical Education) educational standard framework and who otherwise meets the requirements of 248 CMR 11.00 may be granted a maximum of 330 hours of educational theory credit and 1,700 hours of experience credit from that program. Such applicants must also:

a. present documentation demonstrating that he or she has been licensed as an apprentice for a period of no less than four years and completed no less than 6,800 clock hours of practical experience, working as an employee, as a licensed apprentice under the direct supervision of a master plumber or under a journeyman plumber who is in the employ of a master plumber in accordance with M.G.L. c. 142, § 3 in order to be eligible for admission to the journeyman plumber examination; and

b. present documentation demonstrating that he or she has completed 220 clock hours comprising Tier Four and Tier Five of the education outlined in these regulations.

(c) Limitation on Examination Attempts. A licensed apprentice shall not be permitted to attempt the journeyman license examination more than six times without special Board approval demonstrating good cause.

(d) Apprentice Plumber License Renewal Limited.

1. An apprentice license shall not be renewed (nor shall the licensee be eligible for a new license) after ten years from the date the license was initially granted or Sept. 1, 2018, which ever comes later.

2. A licensed apprentice who has not successfully obtained a journeyman plumber license through the examination process following six examination attempts shall not be renewed.

3. An apprentice whose license has not been renewed for non-compliance with the requirements of this section shall be permitted to petition the Board for reinstatement, for good cause, his or her apprentice license.

(2) Qualifications for admission to the Master Plumber Examination.

(a) An applicant who is a licensed journeyman plumber shall be required to file a completed application and meet the following education and experience criteria to be eligible for admission to the master plumber examination:

1. Experience. The applicant shall furnish documentation satisfactory to the Board demonstrating completion of no less than one year practical experience totaling a minimum of 1,700 clock hours of experience as the holder of a Commonwealth of Massachusetts journeyman plumber license and demonstrating that he or she has been actively engaged in or working at the business of installing repairing, or maintaining plumbing and gasfitting systems, apparatus, devices, fixtures or other appliances typical to the discipline of the plumbing and gasfitting industry only.

2. Education. The applicant shall furnish documentation satisfactory to the Board of having completed the 110 hour tier five of the five tier Plumber Educational Program as approved by the Board and described in 248 CMR 11.06. Individuals who completed this education as an apprentice shall not be required to complete any additional education.

(3) Qualifications for admission to the Journeyman Gasfitter Examination.

(a) Apprentice Gasfitter Licensed before September 1, 2008. An applicant who is a licensed apprentice gasfitter and the apprentice license was received prior to September 1, 2008 in

accordance with M.G.L. c. 142, § 3A shall be required to fill out a Board approved application and complete the following education and experience criteria to be eligible for admission to the journeyman gasfitter examination:

1. Experience. The applicant shall furnish documentation satisfactory to the Board demonstrating completion of practical work experience of no less than 3,400-clock hours as a licensed apprentice working as an employee under the direct supervision of a licensed master gasfitter or under the direct supervision of a licensed journeyman gasfitter who is in the employ of a master gasfitter in accordance with M.G.L. c. 142, § 3, installing, repairing, or maintaining gas piping systems, apparatus, devices, fixtures or other appliances typical to the discipline of the gasfitting industry only. Experience that is limited to installing HVAC components for the installation of heating systems, steam piping and hydronic heat piping shall not be considered qualifying experience.

2. Education.

a. The applicant shall furnish documentation to the Board of having received a high school diploma or the equivalent, and:

b. The applicant shall furnish documentary proof of having completed 150 clock hours of gasfitting theory culminating in a school or instructor designed examination to ensure competency. This education must take place over a period of no less than two years and must meet the Board administered requirements of 248 CMR 11.00.

(b) Apprentice Gasfitter Licensed on or after September 1, 2008. An applicant who is a licensed apprentice gasfitter and the apprentice license was received on or after September 1, 2008 in accordance with M.G.L. c. 142, § 3A shall be required to fill out a complete application and complete the following education and experience criteria to be eligible for admission to the journeyman gasfitter examination:

1. Experience. The applicant shall furnish documentation satisfactory to the Board demonstrating completion of practical work experience of no less than 5,100-clock hours as a licensed apprentice working as an employee under the direct supervision of a licensed master gasfitter or under the direct supervision of a licensed journeyman gasfitter who is in the employ of a master gasfitter in accordance with M.G.L. c. 142, § 3, installing, repairing, or maintaining gas piping systems, apparatus, devices, fixtures or other appliances typical to the discipline of the gas fitting industry only. Experience that is limited to installing HVAC components for the installation of heating systems, steam piping and hydronic heat piping shall not be considered qualifying experience.

2. Education.

a. The applicant shall furnish documentation to the Board of having received a high school diploma or the equivalent, and;

b. The applicant shall furnish documentary proof of having completed 330 clock hours of apprenticeship gasfitting educational theory culminating in a school or instructor designed examination to ensure competency. This education must take place over a period of no less than three years and meet the Board administered requirements of 248 CMR 11.00.

3. Education and work experience must be contemporaneous. Absent special Board approval, an applicant will not receive credit for work experience and education unless they were completed in conjunction with one another as measured by calendar years. For each year in which an apprentice obtains 110 clock hours of education, that apprentice must accrue 1700 clock hours of qualifying work experience.

(c) Limitation on Examination Attempts. A licensed apprentice shall not be permitted to attempt the journeyman license examination more than six times without special Board approval demonstrating good cause.

(d) Apprentice Gasfitter License Renewal Limited.

1. An apprentice license shall not be renewed (nor shall the licensee be eligible for a new license) after ten years from the date the license was initially granted or Sept. 1, 2018, which ever comes later..

2. A licensed apprentice gasfitter who has not successfully obtained a journeyman gasfitter license through the examination process following six examination attempts shall not be renewed.

3. An apprentice whose license has not been renewed for non-compliance with the requirements of this section shall be permitted to petition the Board for reinstatement, for good cause, his or her apprentice license.

(4) Qualifications for admission to the Master Gasfitter Examination.

(a) An applicant who is a licensed journeyman gas fitter shall be required to complete the following education and experience criteria to be eligible for admission to the master gasfitters examination:

1. Experience.

a. Applications Received Prior to September 1, 2011. The applicant shall furnish documentation satisfactory to the Board demonstrating completion of no less than six calendar months of practical experience totaling a minimum of 850 clock hours of experience as the holder of a journeyman gasfitter license and has been actively engaged in or working at the business of, installing repairing, or maintaining gasfitting systems, apparatus, devices, fixtures or other appliances typical to the discipline of the gasfitting industry only.

b. Applications Received on or after September 1, 2011. The applicant shall furnish documentation satisfactory to the Board demonstrating completion of no less than one year practical experience totaling a minimum of 1,700 clock hours of experience as the holder of a Commonwealth of Massachusetts journeyman gasfitter license and has been actively engaged in or working at the business of installing repairing, or maintaining gasfitting systems, apparatus, devices, fixtures or other appliances typical to the discipline of the gasfitting industry only.

2. Education. The applicant shall furnish documentation satisfactory to the Board of having completed 50 clock hours of gasfitting theory in a master gasfitter educational program, culminating in a school or instructor designed examination to ensure competency. This program must meet the Board administered requirements of 248 CMR 11.00. However, applicants who have completed the 110 hour tier three of the three tier Gas Fitter Educational Program as approved by the Board and described in 248 CMR 11.06 shall be exempt from having to obtain additional education.

(5) Qualifications for admission to the Undiluted Liquefied Petroleum Gas Installer Examination.

(a) An applicant for licensure as an undiluted liquefied petroleum gas installer shall be required to complete the education and experience requirements in order to be eligible for admission to the undiluted liquefied petroleum gas installer examination:

1. Experience. The applicant shall furnish documentation satisfactory to the Board demonstrating completion of practical work experience of no less than 3,400 clock hours over a period of no less than two years specifically in the discipline of undiluted liquefied petroleum gas installations working, as an employee, under the direct supervision of a Commonwealth of Massachusetts licensed undiluted liquefied petroleum gasfitting installer licensed in accordance with M.G.L. c. 142, § 3, installing, repairing, or maintaining propane gas piping systems, apparatus, devices, fixtures or other appliances restricted to the discipline of the undiluted liquefied petroleum gasfitting industry only. Experience that is limited to installing HVAC components for the installation of heating systems, steam piping, hydronic heat piping, and other work falling under the scope of the gas fitting license, shall not be considered qualifying experience. As of this time, individuals accruing experience under this section, who will be considered undiluted liquefied petroleum gas installers in training, are not required to hold a license in Massachusetts.

2. Education.

a. The applicant shall furnish documentation satisfactory to the Board of having received a high school diploma or the equivalent, and:

b. The applicant shall furnish documentary proof of having completed 220 clock hours of undiluted liquefied petroleum gas educational theory in a undiluted liquefied petroleum gas educational program culminating in a school or instructor designed examination to ensure competency. This program must meet the Board administered requirements of 248 CMR 11.00.

(b) Limitation on Examination Attempts. No individual shall be permitted to attempt the Undiluted Liquefied Petroleum Gas Installer license examination more than six times without special Board approval demonstrating good cause.

(6) Qualifications for admission to the Limited Undiluted Liquefied Petroleum Gas Installer Examination. An applicant for licensure as a limited undiluted liquefied petroleum gas installer shall be required to complete the following education and experience requirements to be eligible for admission to the limited undiluted liquefied petroleum gas installer examination:

(a) Education. Effective for all applications received on or after September 1, 2010. An applicant shall furnish documentary proof satisfactory to the Board of completing a ten (10) hour Occupational Safety and Health Administration course in construction safety and health.

(b) Experience. An applicant shall furnish documentary proof satisfactory to the Board of having a minimum of 1,700 hours of work experience. As of this time, individuals accruing experience under this section, who will be considered limited undiluted liquefied petroleum gas installers in training, are not required to hold a license in Massachusetts.

1. For Applications Received prior to September 1, 2010. The work experience must be gained in construction and familiarity with construction sites including supervised observation of and experience with the installation, connecting and relocating from place to place of portable construction type undiluted liquefied petroleum gas portable heating equipment.

2. For Applications received on or after September 1, 2010. The work experience must be accrued as follows:

a. One thousand (1,000) clock hours of general experience on construction sites, which shall be certified by a supervising individual holding a non-apprentice level construction related professional license.

b. Seven hundred (700) clock hours of experience installing, connecting and moving from place to place undiluted liquefied petroleum gas salamanders, space heaters and related equipment used in buildings under construction. This work must be under the direct supervision of a licensed limited undiluted liquefied petroleum gas installer or a licensed journeyman or master gas fitter.

(c) Examination. An applicant for a limited undiluted liquefied petroleum gas installer license shall be capable of demonstrating, by a practical and written examination, to the satisfaction of the examiner, competence and skill in the installation, connection, and movement of undiluted liquefied petroleum gas salamanders, space heaters and related equipment used in buildings under construction.

(7) Applicants with out-of-state or out of country education and work experience

(a) Education or Experience Waivers and Equivalency. Applicants seeking a Massachusetts license who received their education or work experience in another state or country may submit to the Board a written request petitioning that such experience or education be considered for approval as being substantially equivalent to the experience and education requirements required in Massachusetts. Unless Massachusetts has a reciprocity agreement with the relevant jurisdiction, all applicants will be required to pass the relevant examination for the license being sought.

1. Licenses from another United States Jurisdiction. An applicant who is licensed in another state or jurisdiction who is applying for the equivalent license in Massachusetts shall meet the following requirements:

a. Submit a completed application and the appropriate fee to the Board with documentation sufficient to demonstrate that the out of state license has been active for not less than the three years immediately preceding the date of application and documentation from the issuing jurisdiction that the requirements for obtaining and maintaining the license are substantially equivalent to the requirements in the Commonwealth of Massachusetts.

b. Submit a statement certified by the Keeper of Records of the issuing jurisdiction that such license is current, in good standing, and that there is no pending disciplinary action relating to the license.

2. Licenses from an International Jurisdiction. An applicant who is licensed in a jurisdiction outside of the United States as a journeyman or master plumber or the equivalent and who is applying for the equivalent licensure in the Commonwealth of Massachusetts shall meet the following requirements:

a. Submit a completed application and the appropriate fee to the Board with documentation, translated into the English language, sufficient to demonstrate that the international license has been active for not less than the three years immediately preceding the date of application and documentation from the issuing international jurisdiction that the requirements for obtaining and maintaining the license are substantially equivalent to the requirements in the Commonwealth of Massachusetts.

b. Submit a statement translated into the English language and certified by the Keeper of Records of the issuing international jurisdiction that such license or equivalent is current, in good standing, and that there is no pending disciplinary action relating to the license.

3. Individuals holding no licenses but possess out of state or out of country education/work experience. No out of state or out of country education or work

experience will be accepted unless the Board determines, in its discretion, that such credentials are substantially equivalent to those in Massachusetts. Individuals seeking such a determination must petition the Board to review those credentials prior to filing an application for any license.

(b) The Board reserves the right to request additional information regarding qualifications and may choose not to grant or grant only in part a request for education or experience waivers

(8) Unlicensed practice. Other then work performed under a Public Comprehensive High School Career/Vocational Technical School Program as described in these regulations, the Board shall not grant any work experience credit to an individual for any period in which they did not hold a valid license issued by the Board. This section shall not be construed as preventing the Board from taking additional disciplinary action against an individual for practicing without a license.

11.03: Application Requirements and Examination Administration

(1) Application Materials. It is the responsibility of the applicant for examination to make certain that all the required application documents and required supplementary documents demonstrating completion of experience and education requirements are completed before they are submitted for approval.

(a) Applications which are not complete, not legible, or are not accompanied by the required documentation, information and fee(s) shall not be accepted and shall be returned to the applicant.

(b) Veterans. Qualified applicants for examination who are Veterans when making application for examination shall file a copy of their DD-214 Discharge Papers/Separation Papers. The DD-214 shall include the date of induction into active service and date of separation. The Board shall grant a qualified applicant who is a veteran as defined in M.G.L. c. 4, § 7, Forty-third clause a credit of 2 1/2 % for the written theory portion of the exam and 2 1/2 % for the practical portion of the exam.

(2) Reasonable Accommodations for Examinations. Qualified applicants for examination who are physically impaired or challenged may receive upon request, Board authorized accommodations as required by law. The applicant's medical condition shall be documented by a Doctor/Physician when the application for examination is submitted.

(3) Examination Scores. Qualified applicants for examination shall achieve the following to qualify for licensure:

(a) Receive a score of no less than 70% on each portion of the examination;

(b) Applicants for examination who receive less than 70% and fail a portion of the exam shall be required to retake the portion they failed within one year from date of failure. Applicants who do not retest or pass the examination within one year from date of failure shall be required to retake all parts of the examination.

(4) Examination Review.

(a) Any applicant who does not achieve a passing score on any part of an examination may apply to the Board's designated exam administrator in writing for an opportunity to review the examination.

(b) Each applicant seeking review of an examination shall submit the required fee for such review.

(c) Applicants permitted to review an examination may not be accompanied by any person(s) while engaged in a review.

(d) The Board shall make all final decisions with respect to the validity of examination questions, applicant scores, and applicant licensure.

11.04: Mandatory Continuing Education (MCE) Requirements for Master and Journeymen Plumbers, Master and Journeyman Gasfitters and for Undiluted Liquefied Petroleum Gas Installers.

(1) General Continuing Education Provisions.

(a) Effective for all licenses expiring on or after April 30, 2010, Commonwealth of Massachusetts licensed plumbers, gasfitters, and undiluted liquefied petroleum gas installers, shall during every two year license cycle complete a course of continuing education without repetition. Apprentices shall not be required to complete continuing education.

(b) Continuing education policies, procedures, course content, and providers are subject to Board approval and must adhere to Board rules, regulations and policies. Continuing education courses shall focus on the Rules and Regulations of 248 CMR 3.00 through 11.00. In addition, the Board may approve continuing education courses that may include industry related business, law, technology or other subject matters.

(2) Requirements for License Renewal.

(a) Except as otherwise permitted in 248 CMR 11.00, each journeyman and master plumber, journeyman and master gasfitter ,or undiluted liquefied petroleum gas installer shall, as a condition of license renewal, complete the following as applicable:

1. 12-clock hours of approved continuing education courses for plumbers with an approved provider; and
2. six-clock hours of approved continuing education courses for gasfitters or undiluted liquefied petroleum gas installers with an approved provider

(b) Each licensee shall retain all Mandatory Continuing Education documentation for no less than three renewal cycles and shall furnish this documentation to the Board for verification of completion of the Continuing Education requirements if requested by the Board.

(c) Online and correspondence courses.

1. Licensees shall only be allowed to take Board approved online or correspondence courses. The Board may deny the right to take online or correspondence courses to individuals whose licenses have lapsed or have been subject to discipline.

2. The Board may impose additional requirements on Board approved online or correspondence courses, these requirements may include successfully completing an examination.

(d) It shall be the licensee's responsibility to ensure that their Provider has been authorized by the Board.

(3) Licensee Qualifications for Exemption of the (MCE) Mandatory Continuing Education Requirement.

(a) A licensee shall be exempt from completing mandatory continuing education requirements if one of the following applies prior to the end of the renewal cycle unless otherwise specified:

1. The licensee, as an approved instructor, has taught all courses which, without duplication, would fulfill their continuing education requirement for that renewal cycle;

2. The licensee is a qualified and duly appointed Inspector, Assistant Inspector or Alternate Inspector of Plumbing and/or Gasfitting appointed pursuant to M.G.L. c. 142, § 11b and has successfully completed the continuing education requirements of M.G.L. c. 142, § 11;

3. The licensee is a State Inspector/Investigator or is the Executive Director or Associate Executive Director for the Board of Examiners or Plumbers and

Gasfitters and employed by the Commonwealth of Massachusetts Division of Professional Licensure (DPL);

4. The licensee is an appointed member of the Board of Examiners of Plumbers and Gasfitters;

5. The licensee was issued their license for the first time during the current renewal cycle. However, this exemption shall not relieve a journeyman plumber or gas fitter from the continuing education requirement during a renewal cycle in which they obtain a master's license.

6. A Licensee who has appropriately petitioned the Board will be eligible for an exemption from the continuing education requirement starting the first full renewal cycle after the Licensee has attained 65 years of age. The Licensee shall still be responsible for completing continuing education in the renewal cycle in which they turn 65.

(b) Waivers for Other Good Cause.

1. The Board or Board authorized designee may consider the granting of a waiver of the mandatory continuing education requirements for other good cause shown. The waiver request shall be in writing and shall be accompanied by other supporting documentation that the licensee desires the Board to consider before ruling on the waiver request

2. Illness or Disability of the Licensee or Immediate Family Member. A request for a waiver based on illness, disability, or other medically-related condition shall be in writing and accompanied by a letter addressed to the Board written and signed by a licensed medical physician stating the nature of the licensee's or the immediate family member's medical condition and the correlation between that condition and circumstance and the licensee's inability to complete the required continuing education within the required period.

3. Unless the Board finds good cause for failing to do so, all requests for waiver of continuing education must be submitted prior to the expiration of the renewal cycle in which said education must be complete.

(4) Failure by a Licensee to Complete (MCE) Mandatory Continuing Education Requirement.

(a) Any licensee who does not complete the required clock hours of continuing education within the license renewal cycle shall be responsible for completing makeup classes covering the Board approved material for the continuing education missed.

(b) In addition to any makeup classes, all licensees who fail to complete continuing education requirements for any renewal cycle shall be subject to Board review and disciplinary action that may include, but not be limited to the issuance of fines, denial of a request for renewal, re-examination, suspension or revocation of existing licenses, and denial of applications for additional licenses. The Board is under no obligation to warn a licensee of non-compliance with continuing education requirements prior to commencing disciplinary action, however, said action shall be subject to any hearings required by law.

(5) Reinstatement of lapsed/expired/suspended licenses.

(a) Licensees who have failed to renew their licenses must fill out any applications required by the Board and must pay any back or late fees prior to board consideration.

(b) Licensees whose licenses have lapsed/expired must meet the following additional requirements for reinstating their licenses:

1. If expired for four years or less, licensees must complete all continuing education hours prior to applying to reinstate their license.

2. If expired for more than four years, licensees must complete the continuing education hours for the current renewal cycle and pass the full Board examination for their license prior to being reinstated. However, Licensees shall not be required to take the examination if they completed all Board required continuing education requirements for each two year cycle during the period in which their license was expired.

3. Without special Board approval, no waivers of continuing education granted under any other section of these regulations shall apply for purposes of reinstating a lapsed or expired license.

(c) Unless a decision or consent agreement explicitly states otherwise, licensees who are suspended must complete all continuing education in order to qualify for reinstating their licenses.

(d) This section shall not be deemed to sanction unlicensed practice. An individual practicing with an expired or suspended license may face disciplinary action up to and including revocation of the right to renew that license.

(6) Initial Certificate and Documentation of Completion of (MCE) Mandatory Continuing Education Requirements.

(a) Upon the successful completion of the clock hours of continuing education each licensee shall receive from his or her board approved continuing education provider a certificate of completion.

(b) Each licensee shall retain such documentation for three renewal cycles and shall furnish it to the Board for verification of completion of the mandatory continuing education requirements if so requested. Failure to provide proof of required documentation may result in non-renewal of a license or other disciplinary action by the Board.

(7) Duplicate (MCE) Mandatory Continuing Education Certificate.

(a) Any licensee whose certificate of completion has been lost or destroyed shall obtain a duplicate certificate from the original provider by forwarding a written request including the reason(s) for the duplicate and any fee required by the Provider.

(b) It shall be the responsibility of the licensee to make available all certificates to the Board if requested by the Board.

(8) Falsification of Information or Fraudulent Transfer of Mandatory Continuing Education Certificates of Completion. The falsification of any Mandatory Continuing Education or the transfer of a certificate of completion of continuing education to any individual in order to meet Mandatory Continuing Education license renewal requirements shall be grounds for the initiation of formal disciplinary proceedings against the licensees found to have engaged in such misconduct, up to and including suspension or revocation of any license(s) issued by the Board.

11.05: Qualifications and Requirements for Mandatory Continuing Education Providers and Instructors

(1) Qualifications and Requirements for Mandatory Continuing Education Providers.

(a) A Provider of Mandatory Continuing Education seminars or courses may include:

1. vocational schools;
2. association-sponsored programs;
3. labor training programs;
4. employer training programs;
5. private program.

(b) All Providers seeking Board approval to conduct programs for Mandatory Continuing Education shall meet the following requirements:

1. Complete and submit the Provider Application Form.
2. Complete and submit the Provider Agreement Form which shall be accompanied by the appropriate application fee.
3. Provide a detailed outline and lesson plan of each course of study offered, and the names and license numbers of all instructors annually.
4. Proof of liability insurance satisfactory to the Board shall be provided annually.
5. The applicant Provider shall provide a copy of an indemnification bond in such form and amount as shall be required by the Board annually.
6. Providers may need to meet additional requirements, as specified by the Board, to offer online or correspondence courses.

(c) The Board may withdraw without notice at any time its approval as issued to any Provider or issued for any program, course or instructor who, in the Board's opinion and in its sole discretion, no longer meets the requirements for approval established by the Board.

(2) Instructor Qualifications to Conduct (MCE) Mandatory Continuing Education Courses.

(a) Provider instructors shall be approved by the Board and must hold the requisite Board issued license, in good standing, before being authorized to serve as an instructor for any Mandatory Continuing Education course.

(b) Each Provider shall notify the Board in writing of any change of instructors for any course within ten days of the change.

(c) Instructors of plumbing courses must have a master plumbers license.

(d) Instructors of gas-fitting courses must have either a master plumber or master gas fitters license.

(e) Instructors of undiluted liquefied petroleum gas courses must have a master plumbers license, a master gas-fitters license, or a undiluted liquefied petroleum gas installers license accompanied by evidence of two years work experience.

(f) Subject to proper disclosure to the Division of Professional Licensure and to the Board, an agent or employee of the Division of Professional Licensure who would otherwise qualify as an instructor under this section may serve, when not on duty, as an instructor for a continuing education course put on by a private or non-profit entity. Such an individual may only serve as such an instructor so long as they take no part in any Board function regarding policies, procedures, approvals, or other official actions which would create a conflict of interest pursuant to relevant public ethics laws.

(g) The Board may approve other individuals who would not otherwise qualify as instructors of Mandatory Continuing Education courses where those individuals have a demonstrated competency in subject areas applicable to the plumbing and gas-fitting industry which is substantially equivalent to that held by normally qualified Board approved instructors. Additionally, the Board may approve individuals who possess specialized knowledge relating to the subject being taught.

(3) Mandatory Continuing Education Record Keeping Requirements.

(a) Mandatory Continuing Education Records. All authorized Providers shall maintain for a period of no less than three license renewal cycles complete and accurate records for each licensee to whom the provider has issued a Certificate of Completion of Continuing Education. In addition, records of class attendance shall be submitted to the Board electronically at the completion of each renewal cycle or when the provider ceases to provide continuing education courses.

(b) Mandatory Continuing Education Certificates of Completion. A Certificate of Completion of Mandatory Continuing Education Seminar Course record shall at minimum include all of the following information:

1. Three digit Provider number as issued by the Board.
2. Instructor's name and license number.
3. Instructor's actual or electronic signature signed under pains and penalties of perjury.
4. Course date and location (city or town)
5. Classroom clock hours of instruction and course subject matter.
6. Attendee name, his or her license number and designation.

(c) Providers shall possess and maintain electronic technology acceptable to the Board.

(d) Each approved Providers shall, at its own expense and in a format approved by the Board, electronically transmit to the Board or its designee certification of each licensee's completion of the continuing education course within five working days of the completion date of the course. The certification shall contain the following data and information:

1. Names and license number(s) of all licensees attending the continuing education course.
2. Date of the course.

(e) The Board may charge course providers a fee to recover costs for software and for training Providers in the use of that software.

(f) All records maintained by the provider shall be made available to the Board or its designee within ten days upon request.

(g) Each provider shall be responsible for the security of any Board issued provider numbers and authorization certificates in accordance with 248 CMR 11.00.

(h) Falsification of any information relating to Mandatory Continuing Education requirements by the Provider shall result in the revocation of any approval provided by the Board to any Provider engaging in such misconduct. In addition, the Board may initiate any other legal action it deems appropriate in the circumstances, including but not limited to criminal prosecution. Any licensee(s) participating in such misconduct shall be the subject of formal disciplinary proceedings, including but not limited to both administrative and criminal proceedings.

(4) Providers shall offer continuing education courses in any of the following formats:

(a) No more than six hours of classroom instruction may be presented in one day per instructor.
(b) No less than three hours of classroom instruction presented in one day per instructor.
(c) An online learning or written correspondence course approved by the Board.
(d) Providers shall limit the number of students for any continuing education class to no more than 49.
(e) Providers shall not advertise or promote the sale of specific goods and/or services during the course of any continuing education class.
(f) If an application is refused or not approved, written notice explaining the basis for the decision shall be provided to the applicant by the Board or its designee

(5) Expiration and denial of Board approval

(a) A provider's approval to offer instruction in Continuing Education expires on the last day of each license renewal cycle.

(b) The Board may withdraw without notice at any time its approval of any Provider instructor who fails to meet the educational criteria established in 248 CMR 11.00.

(c) The Board may deny approval of an application from a provider for any of the following reasons:

1. failure to comply with the provisions of 248 CMR 11.05(4);

2. inadequate or unprofessional coverage of the materials required to be included in the course materials; or

3. unsatisfactory evaluations of the course materials by instructors, licensees, the Board or its designee.

(6) Course Materials. The Board shall approve course materials to be used for Mandatory Continuing Education courses. Course materials are the printed materials that serve as the basis for the Mandatory Continuing Education courses provided to licensees. The following minimum criteria shall be used by the Board in considering approval of course materials:

(a) The course materials shall provide the basis for a minimum of three classroom hours of instruction per course as approved by the Board.
(b) Course materials shall not advertise or promote the sale of goods and/or services. Advertisements used in conjunction with course materials must be clearly identifiable as such and clearly labeled as advertising.
(c) The Board may approve the development of uniform course materials which all providers would be required to use.
(d) The provider of course materials must have legal ownership of, or the appropriate license for the use of all copyrighted material included within the course materials.
(e) All Board approved course materials shall contain a prominently displayed approval statement containing the following language: "THIS CONTINUING EDUCATION COURSE MATERIAL HAS BEEN APPROVED BY THE MASSACHUSETTS STATE BOARD OF EXAMINERS OF PLUMBERS AND GASFITTERS. BY APPROVAL OF THIS COURSE MATERIAL, THE BOARD DOES NOT ASSUME ANY RESPONSIBILITY FOR THE ACCURACY OF THE CONTENTS. THIS COURSE MATERIAL IS NOT BEING PUBLISHED BY, NOR IS IT A PUBLICATION OF, THE BOARD."

11.06: Education Hour and Course Content Requirements

(1) Board Certification Required

(a) All Public, Private, Proprietary, Occupational Trade Schools, College/University programs, or other educational programs must be certified by the Board in order to qualify for credit towards a Board issued license.

(b) Educational Programs not certified by the Board shall not be granted any credit towards licensure unless the Board deems, in its discretion, that there was good cause for the program's failure to obtain certification.

(c) All educational programs certified by the Board must divide the education provided into Tiers as described in these regulations

(2) Administrative Requirements for Educational Programs.

(a) Instructor Qualifications.

1. All instructors of plumbing courses must hold a master plumbers license.

2. All instructors of gas-fitting or undiluted liquefied petroleum gas installer courses must hold either a master gas-fitter or master plumbers license.

3. The Board may approve other individuals who would not otherwise qualify as instructors where those individuals have a demonstrated competency in subject areas applicable to the plumbing and gas-fitting industry which is substantially equivalent to that held by normally qualified Board approved instructors. Additionally, the

Board may approve individuals who possess specialized knowledge relating to the subject being taught.

4. Subject to proper disclosure to the Division of Professional Licensure and to the Board, an agent or employee of the Division of Professional Licensure who would otherwise qualify as an instructor under this section may serve, when not on duty, as an instructor for licensing education programs put on by a private or non-profit entity. Such an individual may only serve as such an instructor so long as they take no part in any Board function regarding policies, procedures, approvals, or other official actions which could create a conflict of interest pursuant to relevant public ethics laws.

(b) Education Hours Requirements for Apprentice Plumbers who must follow the 550-clock hour program.

1. The course shall be segregated into five Tiers.

2. Each Tier shall contain 110-clock hours.

3. Each Tier shall be consecutive and shall be designed to coincide with the years of experience of the apprentice student.

4. Each Tier shall be administered and designed in compliance with the standards issued by the Board.

5. Students shall be required to demonstrate proficiency and competency in each tier by passing an examination designed by the school and/or the instructor.

6. Each Tier shall include coverage in but shall not be limited to the following subject areas:

a. M.G.L. c. 142: Supervision of Plumbing;
b. The Board adopted most current edition of 248 CMR 3.00 through 11.00;
c. Occupational Safety and Health Administration (OSHA) Rules and Regulations including the Construction Outreach Training Program;
d. Material Safety Data Sheets (MSDS);
e. Dig Safe Systems in the Commonwealth of Massachusetts, M.G.L. c. 82 § 40.

7. Students may not advance from one Tier to another until the clock hour and examination requirements of the preceding Tier have been successfully completed.

(c) Education Experience for Apprentice Gasfitters who must follow the 330 clock hour program.

1. The 330-clock hour gas-fitting educational program shall be segregated into three Tiers.

2. Each Tier shall contain 110-clock hours.

3. Each Tier shall be consecutive and shall be designed to coincide with the years of experience of the apprentice student.

4. Each Tier shall be administered and designed in compliance with the standards issued by the Board.

5. Students shall be required to demonstrate proficiency and competency in each tier by passing an examination designed by the school and/or the instructor.

6. Each Tier shall include coverage in but shall not be limited to the following subject areas:

a. M.G.L. c. 142: Supervision of Plumbing;
b. 248 CMR 3.00: General Provisions Governing the Conduct of Plumbing and Gas Work Performed in the Commonwealth;
c. 248 CMR 4.00: Introduction and Massachusetts Modifications.
d. 248 CMR 5.00: Amendments to 2002 Edition of ANSI Z223.1 NFPA-54;
e. 248 CMR 7.00: Massachusetts Code for Gas Utilization Equipment in Large Boilers;
f. 248 CMR 11.00: Education and Experience Standards and Requirements for Licensure;
g. Occupational Safety and Health Administration (OSHA) Rules and Regulations including the Construction Outreach Training Program;
h. Material Safety Data Sheets (MSDS);
i. Dig Safe Systems in the Commonwealth of Massachusetts, M.G.L. c. 82 § 40.

7. Students may not advance from one Tier to another until the clock hour and examination requirements of the preceding Tier and the apprentice have been successfully completed.

(d) Education Experience for Undiluted Petroleum Gas Installer Applicants who must follow the 220 clock hour program.

1. The 220-clock hour gas-fitting educational program shall be segregated into two Tiers.

2. Each Tier shall contain 110-clock hours.

3. Each Tier shall be consecutive and shall be designed to coincide with the years of experience of the apprentice student.

4. Each Tier shall be administered and designed in compliance with the standards issued by the Board.

5. Students shall be required to demonstrate proficiency and competency in each tier by passing an examination designed by the school and/or the instructor.

6. Each Tier shall include coverage in but shall not be limited to the following subject areas:

a. M.G.L. c. 142: Supervision of Plumbing;
b. 248 CMR 3.00: General Provisions Governing the Conduct of Plumbing and Gas Work Performed in the Commonwealth;
c. 248 CMR 4.00: Introduction and Massachusetts Modifications;
d. 248 CMR 5.00: Amendments to 2002 Edition of ANSI Z223.1 NFPA-54;
e. 248 CMR 7.00: Massachusetts Code for Gas Utilization Equipment in Large Boilers;
f. 248 CMR 11.00: Education and Experience Standards and Requirements for Licensure;
g. Occupational Safety and Health Administration (OSHA) Rules and Regulations including the Construction Outreach Training Program;
h. Material Safety Data Sheets (MSDS);
i. Dig Safe Systems in the Commonwealth of Massachusetts, M.G.L. c. 82 § 40.

7. Students may not advance from one Tier to another until the clock hour and examination requirements of the preceding Tier and the apprentice have been successfully completed.

(e) No Grandfathering. All educational programs accepted by the Board for credit towards a license must meet the latest Board requirements regardless of when they were initially certified.