

Houston Amendments to the 2006 Uniform Plumbing Code



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CHAPTER 1
ADMINISTRATION

101.0 Title, Scope, and General.

101.1 Title.

~~This document~~ These regulations shall be known as the “Uniform City of Houston Plumbing Code,” may be cited as such, and will be referred to herein as “this code.” The Construction Code of the City of Houston, Texas, collectively includes this volume and certain other codes, pamphlets, specifications, and documents that are adopted in or by reference through the Adopting Ordinance, which appears in the preamble of the volume entitled "City of Houston Building Code."

~~**101.4.1.4 Conflicts Between Codes.** When the requirements within the jurisdiction of this plumbing code conflict with the requirements of the mechanical code, this code shall prevail.~~ **Conflicting provisions.** Where in any specific case, different provisions of the *City Code*, the *City of Houston Building Code*, the *City of Houston Electrical Code*, the *City of Houston Mechanical Code*, the *City of Houston Fire Code*, and this code specify different materials, methods of construction, or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

101.4.1.5 International Residential Code. Plumbing for detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories high with separate means of egress and their accessory structures shall comply with the *City of Houston Residential Code for One- and Two-Family Dwellings* as adopted and amended by this jurisdiction. Plumbing for residential occupancies to which the *City of Houston Residential Code for One- and Two-Family Dwellings* does not apply shall be governed by this code.

101.4.1.6 Energy. The *City of Houston Commercial Energy Conservation Code*, the *City of Houston Residential Energy Conservation Code* and the *City of Houston Residential Code for One- and Two-Family Dwellings* as adopted and amended by this jurisdiction, *Chapter 11*, and any amendments adopted as authorized by state law shall be enforced by this jurisdiction in accordance state law.

101.4.1.7 Irrigation Systems. Irrigation systems shall comply with standards and specifications regarding the design, installation, and operation of such systems in accordance with Chapter 344 of the Texas Administrative Code and Section 1903.053 of the Occupations Code and any rules adopted by the Texas Commission on Environmental Quality pursuant to Section 1903.053 of the Occupations Code

101.4.3 The provisions in the appendices are intended to supplement the requirements of this code and shall not be considered part of this code unless formally adopted as such.

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Appendices A, B, I, and L, as amended by this jurisdiction, are hereby adopted and shall be incorporated into and made a part of this code.

101.4.4 Exempt Installations. The provisions of this code shall not apply to: a) gas service mains from the street main to the meter, b) the installation of gas meters by the utility organization supplying gas, c) gas piping installations of the utility organization made on their own or public premises and part of the general gas supply and distribution for this jurisdiction and surrounding communities, or d) the installation of public sewers and public water distribution systems by this jurisdiction, its contractors, agents and employees.

101.4.5 Homeowners. In accordance with the Plumbing License Law, nothing in this code shall prevent any homeowner from installing and maintaining plumbing in a building owned and occupied by him as his homestead and done in compliance with the requirements of all applicable state adopted codes and ordinances of this jurisdiction. Such privilege does not grant the right to violate any of the provisions of this code or state adopted codes, nor is it to be construed as exempting any such property owner from obtaining a permit and paying the required fees therefor, except for work that is exempt from permitting under this code.

101.4.6 Basic principles. The general requirements of this code are enunciated as necessary principles for proper, basic environmental sanitation through properly designed, acceptably installed, and adequately maintained plumbing systems. The following principles shall serve to define the intent of this code:

Principle No. 1. All premises intended for human habitation, occupancy, or use shall be provided with a supply of potable water that is neither connected with unsafe water supplies nor subject to the hazards of backflow, backsiphonage, or back pressure due to dormant or inert periods.

Principle No. 2. Every building having plumbing fixtures installed and intended for human habitation, occupancy, or use and located on premises abutting on a street, alley, or easement in which there is a public sewer shall have a separate connection with such sewer. Where two or more buildings are located on one lot fronting 75 feet (22.9 m) or less on such street, alley, or easement and the lot is under one ownership, one sewer connection to the public main may be used for all buildings located thereon. On industrial tracts, apartment projects, or similar installations under one ownership where the sanitary sewers within the tract are maintained and operated by one owner, separate connections shall be made to the privately owned and maintained sewer, but only one connection need be made to the public sewer.

Principle No. 3. Each dwelling unit shall have not less than one water closet, one bathtub or shower, one lavatory, and one kitchen-type sink. Adequate 120 FE (48 CE) hot water shall be provided to the tub or shower, lavatory, and kitchen sink. All other structures for human occupancy or use on premises located within 300 feet (91.4 m) of a public sewer or having a private sewage-disposal system shall have adequate sanitary sewer facilities but in no case less than one water closet and one fixture for cleansing purposes.

Principle No. 4. Plumbing fixtures shall be made of smooth, nonabsorbent material, shall be free from concealed fouling surface, and shall be located in ventilated enclosures.

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Principle No. 5. Each fixture directly connected to the drainage system shall be equipped with a water-seal trap.

Principle No. 6. No substance that will clog the pipes, produce explosive mixtures, destroy the pipes or their joints or will interfere unduly with the sewage disposal process shall be allowed to enter the building drainage system.

Principle No. 7. Proper protection shall be provided to prevent contamination of food, water, sterile goods, and similar materials by backflow of sewage. When necessary, the fixture, device, or appliance shall be connected indirectly with the building drainage system.

Principle No. 8. No water closet shall be located in a room or compartment that is not properly lighted and ventilated.

Principle No. 9. If water closets or other plumbing fixtures are installed in buildings located on premises where there is no public sewer available as determined by the provisions of all applicable ordinances, suitable provisions shall be made for disposing of the building sewage by a method of sewage treatment and disposal approved by the Director of Public Works and Engineering. On-site sewage disposal systems shall additionally comply with Chapter 366, Texas Health and Safety Code.

Principle No. 10. Where a plumbing drainage system may be subject to backflow of sewage, suitable provisions shall be made to prevent its overflow in the building.

Principle No. 11. Plumbing shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls and other surfaces through fixture usage.

Principle No. 12. Sewage or other waste from a plumbing system that may be deleterious to surface or subsurface waters shall not be discharged into the ground or into any waterway unless it has first been rendered innocuous through subjection to a form of treatment that is approved by the Authority Having Jurisdiction and that meets the standards established by law.

102.2.3 Stop Orders. Whenever any work is being done contrary to the provisions of this code, the Authority Having Jurisdiction may order the work stopped by notice in writing served on any persons engaged in the doing or causing such work to be done, and any such persons shall forthwith stop work until authorized by the Authority Having Jurisdiction to proceed with the work.

At the time such stop order is issued, the person doing the work and the permit holder shall be given notice of a right to a hearing on the matter pursuant to Section 102.4 of this code. On request, such a hearing shall be held within three business days unless the permit holder or the person doing the work requests an extension of time. Any stop order that has been issued shall remain in effect pending any hearing requested on the matter unless the stop order is withdrawn by the Authority Having Jurisdiction.

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102.2.6 Liability. ~~The Authority Having Jurisdiction charged with the enforcement of this code, acting in good faith and without malice in the discharge of the Authority Having Jurisdiction's duties, shall not thereby be rendered personally liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of duties. A suit brought against the Authority Having Jurisdiction or employee because of such act or omission performed in the enforcement of any provision of this Code shall be defended by legal counsel provided by the jurisdiction until final termination of such proceedings.~~ Except as otherwise provided by law, the Authority Having Jurisdiction shall not personally be liable in damages for any act or omission arising out of any official action taken to implement and enforce the provisions of this code. Additionally, except as otherwise provided by law, the Authority Having Jurisdiction shall not be personally liable in damages for any action or omission taken in the course and scope of employment. Where and to the extent consistent with the provisions of Article X of Chapter 2 of the City Code, this jurisdiction shall provide legal representation and indemnification for any suit brought against the Authority Having Jurisdiction because of acts or omissions performed in the enforcement of this code.

102.3.1 Violations. It shall be unlawful for any person, firm, or corporation to erect, construct, enlarge, alter, repair, move, improve, remove, convert, demolish, equip, use, or maintain any plumbing or permit the same to be done in violation of this code. It shall be a violation to falsify any test required by this code.

102.3.2 Penalties. ~~Any person, firm, or corporation violating any provision of this code shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punishable by a fine and/ or imprisonment set forth by the governing laws of the jurisdiction. Each separate day or any portion thereof, during which any violation of this code occurs or continues, shall be deemed to constitute separate offense. Where no specific penalty is otherwise provided in this code, the violation of any provision of this code shall constitute a misdemeanor punishable upon conviction by a fine of not less than \$500.00 nor more than \$2,000.00. Each day that any violation continues shall constitute and be punishable as a separate offense. Where any conduct in violation of this code also constitutes a violation of state penal law, then the offense shall be punishable as provided in the applicable state law. In prosecutions under this code, the various provisions hereof that are designated as an "exception" or "exceptions" shall not be treated as exceptions within the meaning of Section 2.02 of the Texas Penal Code, and instead, they shall constitute defenses to prosecution within the meaning of Section 2.03 of the Texas Penal Code.~~

102.4 Hearing Procedures

102.4.1 Hearing notices. Whenever notice is to be given to any person concerning the right to a hearing, the notice may be given by personal delivery or by certified mail, return receipt requested. If notice is being given to a building owner or to a tenant therein, and the Authority Having Jurisdiction is unable to determine the name or address of such person after checking the building and the applicable records of the jurisdiction's Department of Public Works and Engineering, the County Appraisal District, the electrical utility company and the gas utility company, notice shall be mailed to the billing addresses of the building as shown on the records of the Water Division of the jurisdiction's Department of Public

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Works and Engineering and shall be posted on or in view of each entrance to the building. Additionally, if any notice is mailed to a building owner or a building tenant and is returned without delivery, notice shall be effective if posted on or in view of each entrance to the building.

102.4.2 Hearings. Except where otherwise specifically provided, all hearings held pursuant to this code shall be conducted by the director of the jurisdiction's Department of Public Works and Engineering or a representative, who shall hereinafter be referred to as the hearing official. The director shall not designate any person to be a hearing official under this code who has taken any part in the investigation of the matter that is the subject of the hearing or any person who directly supervised the investigation. The hearing official shall consider only the evidence presented at the hearing in rendering a decision. The decision of the hearing official shall be set forth in writing and shall be served on each party in the same manner as a notice of a right to a hearing.

103.1.2.3 This section shall be construed in a manner that is consistent with the Plumbing License Law, and no provision herein shall be construed to exempt work for which a permit is required to be obtained from this jurisdiction under State law.

103.1.3 Licensing. ~~Provision for licensing shall be determined by the Authority Having Jurisdiction.~~ **Irrigation Permit.** An installer of an irrigation system shall obtain a separate permit for each property before installing such a system.

103.2.1 Application. Upon application by a state-licensed master plumber or by a property owner of a building owned and occupied by him as his homestead to install storm and sanitary sewers, plumbing fixtures, appurtenances and appliances for drainage, gas, water and/or sewer lines, or medical gas, water treatment and/or irrigation lines and appurtenances, or by drain layer's license holders to install storm sewers, or by an installer of an irrigation system to install irrigation lines or systems, if the conditions and requirements of this code have been complied with and if there are adequate facilities or arrangements have been made to provide service to such plumbing installations, the Authority Having Jurisdiction shall issue a permit. No plumbing permit shall be issued until a building permit shall have first been issued where a building permit is required.

To obtain a permit, the applicant shall first file an application therefor in writing on a form furnished by the Authority Having Jurisdiction for that purpose.

Every such application shall:

103.2.1.4 Be accompanied by plans, diagrams, computations and other data as required in Section 103.2.2, and by the applicable fees as provided in Section 117 of the City of Houston Building Code.

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103.2.1.6 Give such other data and information as may reasonably be required by the Authority Having Jurisdiction to determine that the application is in compliance with applicable laws.

103.3.4 Expiration. ~~Every permit issued by the Authority Having Jurisdiction under the provisions of this code shall expire by limitation and become null and void if the work authorized by such permit is not commenced within one hundred eighty (180) days from the date of such permit, or if the work authorized by such permit is suspended or abandoned at any time after the work is commenced for a period of one hundred eighty (180) days. Before such work can be recommenced, a new permit shall first be obtained to do so, and the fee therefore shall be one half the amount required for a new permit for such work, provided no changes have been made or will be made in the original plans and specifications for such work, and provided further that such suspensions or abandonment has not exceeded one year.~~

~~— Any permittee holding an unexpired permit may apply for an extension of the time within which work may commence under that permit when the permittee is unable to commence work within the time required by this section for good and satisfactory reasons. The Authority Having Jurisdiction may extend the time for action by the permittee for a period not exceeding one hundred eighty (180) days upon written request by the permittee showing that circumstances beyond the control of the permittee have prevented action from being taken. No permit shall be extended more than once. In order to renew action on a permit after expiration, the permittee shall pay a new full permit fee. For purposes of this subsection, the determination whether work has commenced under a permit or whether work has been abandoned under a permit shall be based upon whether the permit holder requests an inspection of the work performed under the permit by the Authority Having Jurisdiction. If work is not commenced under a permit within 180 days of the date of issuance or is abandoned at any time for a period of 180 consecutive days, the permit shall lapse. An elapsed permit shall expire 180 days following the date that it lapsed unless, before the 180th day following the date that the permit lapsed, the permit holder obtains reactivation of the permit by:~~

- ~~(1) Requesting reactivation of the permit by the Authority Having Jurisdiction, and~~
- ~~(2) Requesting an inspection of work performed under the permit by the Authority Having Jurisdiction.~~

~~— A permit may only be reactivated one time, and it shall expire if the work is again abandoned for a period of 180 consecutive days. In order to recommence work under an expired permit, the permit holder shall pay the full permit fee applicable to the previously uninspected portion of the work.~~

Exception: The Authority Having Jurisdiction may upon request perform a final inspection of work for which the permit has expired or reactivate a permit for the purpose of issuing a certificate of occupancy.

103.3.5 Suspension or Revocation. After notice and a hearing pursuant to Section 102.4, the

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Authority Having Jurisdiction may, in writing, suspend or revoke a permit issued under the provisions of this code whenever the permit is issued in error or on the basis of incorrect information supplied or in violation of other ordinance or regulation of the jurisdiction.

103.4.1 Permit Fees. ~~Fees shall be assessed in accordance with the provisions of this section and as set forth in the fee schedule Table 1-1. The fees are to be determined and adopted by this jurisdiction. The fee for each permit shall be as set forth in Section 117 of the City of Houston Building Code.~~

103.4.3 Expiration of Plan Review. Applications for which no permit is issued within one hundred eighty (180) days following the date of application shall expire by limitation, and plans and other data submitted for review may thereafter be returned to the applicant or destroyed by the Authority Having Jurisdiction. The Authority Having Jurisdiction may ~~exceed~~ extend the time for action by the applicant for a period not to exceed one hundred eighty (180) days upon request by the applicant showing that circumstances beyond the control of the applicant have prevented action from being taken. No application shall be extended more than once. In order to renew action on an application after expiration, the applicant shall resubmit plans ~~and pay a new plan review fee.~~

103.4.5 Fee Refunds

103.4.5.1 The Authority Having Jurisdiction may authorize the refunding of any fee paid hereunder which was erroneously paid or collected due to an error by one or more jurisdiction employees. This provision shall not be applicable if the error occurred due to incorrect information provided by the applicant.

103.4.5.2 The Authority Having Jurisdiction may authorize the refunding of not more than ~~a percentage~~ ninety (90) percent of the amount in excess of \$25.00 of the permit fee paid, as determined by this jurisdiction when no work has been done under a permit issued in accordance with this code. If work has been done under the permit, no refund may be authorized.

103.5.6 Reinspections. A reinspection fee may be assessed for each inspection or reinspection when such portion of work for which inspection is called is not complete or when required corrections have not been made.

This provision is not to be interpreted as requiring reinspection fees the first time a job is rejected for failure to comply with the requirements of this code, but as controlling the practice of calling for inspections before the job is ready for inspection or reinspection.

Reinspection fees may be assessed when the approved plans are not readily available to the inspector, for failure to provide access on the date for which the inspection is requested, or for deviating from plans requiring the approval of the Authority Having Jurisdiction.

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To obtain reinspection, the applicant shall file an application therefore in writing upon a form furnished for that purpose and pay the reinspection fee in accordance with Table 1-1 Section 117 of the City of Houston Building Code.

~~—In instances where reinspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.~~

104.0 Licensing

104.1 General. Before any person shall engage in the plumbing business within the jurisdiction, the person shall secure a state license as a master plumber, as required by the Texas State Board of Plumbing Examiners under the current Plumbing License Law. A master license holder shall annually register his/her state plumbing license with the Authority Having Jurisdiction during the month of initial registration.

The Authority Having Jurisdiction shall not register a master plumber as a contractor until and unless the master plumber is listed on the Texas State Board of Plumbing Examiner's website.

No registration shall be effective at any time that the plumbing master fails to maintain current proof of insurance as required by state law.

104.2 License to do Plumbing Work. Each person engaged in the actual installation of plumbing shall be licensed either as a master or current journeyman plumber or registered as an apprentice by the Texas State Board of Plumbing Examiners under the Plumbing License Law. The Plumbing License Law is codified as Chapter 1301 of the Texas Occupations Code. A licensed master plumber must have a medical gas endorsement to engage in the installation of medical gas.

104.3 Licensing of Drain Layers. Before any person other than a master plumber engages in the business of laying sanitary or storm sewers, the person shall make an application for and secure a drain layer's license. The application for and issuance of such license shall be in accordance with Chapter 47 of the City Code.

104.3.1 Registered irrigators. Before any person other than a master plumber engages in the installation of lawn irrigation systems, the person shall obtain a certificate of registration (license) under state law and register with the Authority Having Jurisdiction. This requirement shall not extend to work that is exempt under this code and state law.

104.3.2 Certified Water Treatment Specialists. Before any person other than a master plumber engages in the business of installing water treatment equipment, the person must secure a State of Texas Water Treatment Specialist Certification under Chapter 341 of the Texas Health and Safety Code, and register the certification with the Authority Having Jurisdiction.

104.4 Illegal Work. Any person engaged in the plumbing or drain laying business whose work does not conform to this code, or whose workmanship or materials are of inferior quality, shall, upon notice from the Authority Having Jurisdiction, make necessary changes or corrections at once so as to conform to this code. If work has not been so changed 10 days after delivery of notice, the Authority Having Jurisdiction shall then refuse to issue any further permits to the person until the nonconforming work has been fully corrected in accordance with this code.

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104.5 Allowing One's Name or License to Be Used to Obtain Permit Fraudulently. No person engaged in the business of plumbing or laying drains shall allow his name to be used by any other person, directly or indirectly, to obtain a permit.

104.6 Identification of Vehicles Required. Each person engaged in the plumbing business in the jurisdiction shall identify all vehicles used in the business with signs showing the name of the business and master plumber's license number. This information shall be correct at all times, shall be painted on each side of each vehicle and shall be in full view and legible at all times. Lettering shall be a minimum of 2 inches (50.8 mm) high.

104.7 Registration Fee for Irrigators. The annual fee for irrigator registration required in Section 104.3.1 shall be \$25.

105.0 Board of Appeals

105.1 Creation and Composition. There is hereby created a Plumbing Code Review Board consisting of seven members. Each Board member, except the member in Position 7, shall be appointed by the Mayor and confirmed by the City Council. The Mayor shall designate the member to be chairman. Each of the seven positions shall be numbered:

1. Positions 1 and 2 shall be filled by professional engineers registered by the State of Texas who are actively engaged in the design of plumbing systems.
2. Positions 3 and 4 shall be filled by duly licensed master plumbers.
3. Position 5 shall be filled by a degreed engineer who is in the employ of a local gas utility company.
4. Position 6 shall be filled by a member at large.
5. Position 7 shall be filled by the chief plumbing inspector of this jurisdiction.

105.2 Terms of Office; Qualifications; Removal; Vacancy; Meetings. The terms of office for the appointees to Positions Nos. 1, 3, and 5 shall expire on the second day of January of odd-numbered years, and the terms of office for the appointees to Positions Nos. 2, 4, and 6 shall expire on the second day of January of even numbered years; however, each member shall continue in office until his/her respective successor shall have been appointed and qualified. The adoption of this code shall not terminate the term of office of any person currently serving in any position on the Board.

In addition to other qualifications herein above required, each member of the Board shall be a citizen of the United States. All members of the Board other than the appointee to Position 6 shall be selected on the basis of their technical and professional qualifications.

Each member of the Board shall be subject to removal by the Mayor. Whenever any position on the Board becomes vacant by reason of death, resignation, or removal, said vacancy shall be filled for the unexpired term of the member being replaced. The Mayor shall appoint, subject to confirmation by City Council, another qualified person to serve the unexpired term of such vacancy.

The Board shall hold meetings in this jurisdiction at times and places to be designated by the chairman, who is also authorized to call special meetings when deemed necessary. Each member

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of the Board shall receive \$50.00 for each meeting he/she attends at which a quorum is present; provided, however, those members who are employees of this jurisdiction will be paid only for those meetings they attend that are neither held during nor continue beyond their regular working hours. Members shall not be compensated for more than three meetings in any one calendar month.

105.3 Quorum. Four Board members present at any meeting shall constitute a quorum for the transaction of all business of said Board. A majority vote of the Board members present at any meeting constituting a quorum shall prevail.

105.4 Review of Action of Plumbing Inspectors. Disputes arising between plumbing inspectors and any person concerning the application of the provisions of this code to the installation of plumbing facilities to serve property of the person may be submitted to the Authority Having Jurisdiction. Any interested party (other than an inspector of this jurisdiction) who is dissatisfied with the decision of the Authority Having Jurisdiction on the matter may appeal that decision to the Board by making application therefor in writing to the Authority Having Jurisdiction.

The Authority Having Jurisdiction shall forward the application to the Board chairman. The Board chairman shall inform the applicant and the Authority Having Jurisdiction in writing of the date and time set for a hearing on the matter. If the applicant fails to appear at the hearing, either in person or by attorney, the dispute shall be decided against the applicant. Each party to the dispute shall be entitled to present his or her side of the matter to the Board, and the Board shall render its decision on the matter based upon its interpretation of the applicable provisions of this code. Any party to the dispute who is dissatisfied with the Board's decision shall have the right to appeal the decision to the City Council, by delivering a written notice of appeal to the office of the City Secretary within 10 days of the date of the Board's decision. The City Council shall affirm, reverse or modify the Board's decision based upon the City Council's interpretation of the applicable provisions of this code. The City Council's decision on the matter shall be final. All appeals to the City Council are subject to the rules of the City Council, which are codified in Section 2-2 of the City Code and are available from the City Secretary. Parties wishing to preserve their right of appeal must comply with the rules of the City Council, including Rule 12.

105.5 Review of New Materials, Methods and Interpretations of this code. Any person whose plumbing products are not specifically approved by this code may file a petition in writing for approval thereof with the Authority Having Jurisdiction, who shall determine whether the material or method should be approved pursuant to this code. If the Authority Having Jurisdiction denies approval of the material or method, the decision may be appealed to the Board. Such an appeal shall be by a petition delivered to the Authority Having Jurisdiction who in turn shall deliver the petition to the chairman of the Board. The Board shall, within 30 days after the date of filing of the petition, hear the petition and determine the merits of the material or method. The Board may establish any additional tests to which the product must be subjected if the Board finds the tests necessary to determine whether the product should be approved. Any and all tests shall be made at the petitioner's expense, and the petitioner shall deposit the cost with this jurisdiction before the tests are made. If additional tests are required, the Board shall render its decision within 30 days after the tests are completed.

In the event the Board is of the opinion that the plumbing should be approved, pursuant to Section 301.2 of this code, they shall so state in the minutes of the Board, and such plumbing shall be approved.

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TABLE 1-1
Plumbing Permit Fees

Permit Issuance

- 1. For issuing each permit*
- 2. For issuing each supplemental permit*

Unit Fee Schedule (in addition to items 1 and 2 above)

- 1. For each plumbing fixture on one trap or a set of fixtures on one trap (including water, drainage piping, and backflow protection therefore)*
- 2. For each building sewer and each trailer park sewer*
- 3. Rainwater systems per drain (inside building)*
- 4. For each cesspool (where permitted)*
- 5. For each private sewage disposal system*
- 6. For each water heater and/or vent*
- 7. For each gas piping system of one to five outlets*
- 8. For each additional gas piping system outlet, per outlet*
- 9. For each industrial waste pretreatment interceptor, including its trap and vent, except kitchen type grease interceptors functioning as fixture traps*
- 10. For each installation, alteration, or repair of water piping and/or water treating equipment, each*
- 11. For each repair or alteration of drainage or vent piping, each fixture*
- 12. For each lawn sprinkler system on any one meter including backflow protection devices therefore*
- 13. For atmospheric type vacuum breakers not included in item 12:
 - 1 to 5*
 - over 5, each*
- 14. For each backflow protective device other than atmospheric type vacuum breakers:
 - 2 inch (51 mm) diameter and smaller*
 - over 2 inch (51 mm) diameter*
- 15. For each graywater system*
- 16. For initial installation and testing for a reclaimed water system*
- 17. For each annual cross connection testing of a reclaimed water system (excluding initial test)*
- 18. For each medical gas piping system serving one to five inlet(s)/outlet(s) for a specific gas ..*
- 19. For each additional medical gas inlet(s)/outlet(s)*

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~~Other Inspections and Fees~~

- ~~1. Inspections outside of normal business hours*~~
- ~~2. Reinspection fee*~~
- ~~3. Inspections for which no fee is specifically indicated*~~
- ~~4. Additional plan review required by changes, additions, or revisions to approved plans
(minimum charge one half hour)*~~

~~* Jurisdiction will indicate their fees here.~~

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CHAPTER 2 DEFINITIONS

Section 203.0 ! A !

Alternate Water Source - Nonpotable source of water that includes gray water, on-site treated water, rainwater, and reclaimed (recycled) water.

Authority Having Jurisdiction – ~~The organization, office, or individual responsible for The jurisdiction’s Director of the Department of Public Works and Engineering enforcing the requirements of a code or standard, or for approving equipment, materials, installations, or procedures. The Authority Having Jurisdiction shall be a federal, state, local, or other regional department or an individual such as a plumbing official, mechanical official, labor department official, health department official, building official, or others having statutory authority. In the absence of a statutory authority, the Authority Having Jurisdiction may be some other responsible party.~~ This definition shall include the Authority Having Jurisdiction’s duly authorized representative or representatives.

Section 204.0 ! B !

Bathroom (Group) A group of fixtures consisting of a water closet, lavatory, bathtub or shower, and may include a bidet and emergency floor drain.

Bathroom, Half – A room equipped with only a water closet and lavatory.

Section 205.0 ! C !

City Code - The Code of Ordinances, Houston, Texas.

Section 206.0 ! D !

Debris Excluder – A screen or other device installed on the rainwater catchment conveyance system to prevent the accumulation of leaves, needles, or other debris in the system.

Section 207.0 ! E !

Excess Flow Valve – A valve designed to activate ~~close~~ when the fuel gas passing through exceeds a prescribed flow rate.

Section 209.0 ! G !

Gravity Grease Interceptor – A plumbing appurtenance or appliance that is installed in a sanitary drainage system to intercept nonpetroleum fats, oils, and greases (FOG) from a wastewater discharge and is identified by volume, 30-minute retention time, baffle(s), a minimum of two compartments, a minimum total volume of ~~300~~ 500 gallons, and gravity

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separation. [These interceptors comply with the requirements of Chapter 10 or are designed by a registered professional engineer.] Gravity grease interceptors are generally installed outside.

Gray Water – Untreated wastewater that has not come into contact with toilet waste, kitchen sink waste, dishwasher waste or similarly contaminated sources. Gray water includes wastewater from bathtubs, showers, lavatories, clothes washers and laundry tubs. Also known as grey water.

Gray Water Diverter Valve – A valve that directs gray water to the sanitary drainage system or to a subsurface irrigation system.

Section 210.0

! H !

Health Department – The jurisdiction's Health and Human Services Department.

Hydromechanical Grease Interceptor – A plumbing appurtenance or appliance that is installed in a sanitary drainage system to intercept nonpetroleum fats, oil, and grease (FOG) from a wastewater discharge and is identified by flow rate, and separation and retention efficiency. The design incorporates air entrainment, hydromechanical separation, interior baffling, and/or barriers in combination or separately, and one of the following:

- A – External flow control, with air intake (vent): directly connected
- B – External flow control, without air intake (vent): directly connected
- C – Without external flow control, directly connected
- D – Without external flow control, indirectly connected

[These interceptors comply with the requirements of Table 10-2.] ~~Hydromechanical grease interceptors are generally installed inside.~~

Section 214.0

! L !

~~**Lot** - A single or individual parcel or area of land legally recorded or validated by other means acceptable to the Authority Having Jurisdiction on which is situated a building or which is the site of any work regulated by this code, together with the yards, courts, and unoccupied spaces legally required for the building or works, and that is owned by or is in the lawful possession of the owner of the building or works. A portion or parcel of land considered as a unit.~~

Section 215.0

! M !

Mulch – Organic materials, such as wood chips and fines, tree bark chips, and pine needles that are used in a mulch basin to conceal gray water outlets and permit the infiltration of gray water.

Mulch Basin – A subsurface catchment area for gray water that is filled with mulch and of sufficient depth and volume to prevent ponding, surfacing or runoff.

Section 217.0

– O –

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On-Site Recycled Water – Nonpotable water that that has been collected and treated on-site and is suitable for direct beneficial use. The level of treatment and quality of the on-site recycled water shall be approved by the Texas Commission on Environmental Quality.

On-Site Treated Nonpotable Water – Nonpotable water, including gray water that has been collected, treated, and intended to be used on-site and is suitable for direct beneficial use. The level of treatment and quality of the on-site reclaimed (recycled) water shall be approved by the Texas Commission on Environmental Quality.

Section 218.0

! P !

Public or Public Use – ~~All buildings or structures~~ Applies to plumbing fixtures that are not defined as private or private use.

Section 220.0

! R !

Rainwater – Natural precipitation that has not been contaminated by use.

Rainwater Catchment System – A system that utilizes the principal of collecting, storing and using rainwater from a rooftop or other manmade, above ground collection surface. Also known as Rain Water Harvesting System.

Rainwater Storage Tank – The central component of the rainwater catchment system. Also known as a Cistern or Rain Barrel.

Reclaimed (Recycled) Water – Nonpotable water provided by a water/wastewater utility that, as a result of tertiary treatment of domestic wastewater, meets requirements of the Texas Commission on Environmental Quality for its intended uses. The level of treatment and quality of the reclaimed (recycled) water shall be approved by the Texas Commission on Environmental Quality.

Roof Washer – A device or method for removal of sediment and debris from a collection surface by diverting initial rainfall from entry into the cistern(s). Also known as a first flush device.

Section 221.0

! S !

Subsoil Irrigation Field – Gray water irrigation field installed in a trench within the layer of soil below the topsoil. This system is typically used for irrigation of deep rooted plants.

Subsurface Irrigation Field – Gray water irrigation field installed below finished grade within the topsoil.

Surge Tank – A reservoir to modify the fluctuation in flow rates to allow for uniform distribution of gray water to the points of irrigation.

Section 225.0

! W !

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Water Hammer Arrestor – A device designed to provide protection against absorb hydraulic shock in the building water supply system, ~~either of the air chamber or mechanical device design.~~

CHAPTER 3
GENERAL REGULATIONS

301.2 Alternate Materials and Methods of Construction Equivalency. Nothing in this code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code. Technical documentation shall be submitted to the Authority Having Jurisdiction to demonstrate equivalency. The Authority Having Jurisdiction shall have the authority to approve or disapprove the system method or device for the intended purpose ~~when determined to be equivalent or superior.~~

However, the exercise of this discretionary approval by the Authority Having Jurisdiction shall have no effect beyond the jurisdictional boundaries of said Authority Having Jurisdiction. Any alternate material or method of construction so approved shall not be considered as conforming to the requirements and/or intent of this code for any purpose other than that granted by the Authority Having Jurisdiction when the submitted data does not prove equivalency.

301.2.1.1 Tests shall be made in accordance with approved standards, by an approved testing agency at the expense of the applicant. In the absence of such standards, the Authority Having Jurisdiction shall have the authority to specify the test procedure.

301.3 Reserved. ~~Flood Hazard Resistance.~~

301.3.1 ~~General.~~ ~~Plumbing systems shall be located above the design flood elevation.~~

~~**Exception:** Plumbing systems are permitted to be located below the design flood elevation provided that the systems are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation.~~

301.3.2 ~~Flood Hazard Areas Subject to High Velocity Wave Action.~~ ~~Plumbing systems in buildings located in flood hazard areas subject to high velocity wave action shall meet the requirements of Section 301.3.1, and the plumbing systems, pipes, and fixtures shall not be mounted on or penetrate through walls that are intended to breakaway under flood loads as required by the building code.~~

301.4.6 Design Review. The Authority Having Jurisdiction shall have the authority to require testing of the alternative engineered design in accordance to section 301.2.1, including the authority to require an independent review of the design documents by a registered professional engineer selected by the Authority Having Jurisdiction, at the expense of the applicant.

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301.4.7 Inspection and Testing. The alternative engineered design shall be tested and inspected in accordance with the submitted testing and inspection plan and the requirements of this code.

316.1.7 Brazing and Welding. Brazing and welding shall conform to the applicable standard(s) in Table 14-1. Only brazing alloys having a liquid temperature above 1,000°F shall be used. All brazing on medical gas systems shall be performed by certified installers meeting the requirements of the Texas Board of Plumbing Examiners ANSI/ASME Boiler and Pressure Vessel Code, Section IX, welding and Brazing Qualifications, or AWS B2.2, Standard for Brazing Procedure and Performance Qualifications.

316.2.1 Copper Tubing to Screw Pipe Joints. Joints from copper tubing to threaded pipe shall be made by the use of brass adapter fittings. The joint between the copper tubing and the fitting shall be a soldered, brazed, flared, or pressed joint and the connection between the threaded pipe and the fitting shall be made with a standard pipe size screw joint. Solder shall conform to the requirements of Section 316.1.3. Brazed joints shall conform to the requirements of Section 316.1.7. Flared joints shall conform to the requirements of Section 316.1.4. Pressed joints shall conform to the requirements of 316.1.9.

319.5 Testing for gas systems shall be as required by Chapter 12.

**TABLE 3-2
Hangers and Supports**

Materials	Types of Joints	Horizontal	Vertical
<u>Polypropylene (PP)</u>	<u>Fusion weld 9 socket, butt, saddle, electrofusion), threaded (metal threads only), or mechanical</u>	<u>1 inch (2.5 cm) and smaller, 32 inches (800 mm), 1-1/4 inches (32 mm) and larger, 4 feet (1,219 mm)</u>	<u>Base and each floor. Provide mid-story guides. ⁶</u>

[remainder of table unchanged]

CHAPTER 4

PLUMBING FIXTURES AND FIXTURE FITTINGS

402.3.1 Nonwater Urinals. When nonwater urinals are installed they shall be listed and comply with the applicable standards referenced in Table 14-1. Nonwater urinals shall have a barrier liquid sealant to maintain a trap seal. Nonwater urinals shall permit the uninhibited flow of waste through the urinal to the sanitary drainage system. Nonwater urinals shall be cleaned and maintained in accordance with the manufacturer's instructions after installation. Where nonwater urinals are installed they shall have a water distribution line rough-in to the urinal location to allow for the installation of an approved backflow prevention device in the event of a retrofit. All urinals shall be provided with an accessible cleanout that is adjacent to, and connected to, the urinal waste above the flood rim level of the urinal.

402.4 Metered Faucets. Self-closing or self-closing metering faucets shall be installed on lavatories intended to serve the transient public, such as those in, but not limited to, service stations, train stations, airports, restaurants, and convention halls. Metered faucets shall deliver not more than 0.25 gallons (1.0 liter) of water per use.

Exception: When required by the Health Department to meet minimum temperature requirements.

411.8 When the construction of on-site built-up shower receptors is permitted by the Authority Having Jurisdiction, ~~one of the following means shall be employed:~~

~~(1) Shower receptors built directly on the ground:~~

~~Shower~~ receptors built directly on the ground shall be water-tight and shall be constructed from approved-type dense, nonabsorbent and noncorrosive materials. Each such receptor shall be adequately reinforced, shall be provided with an approved flanged floor drain designed to make a water-tight joint in the floor, and shall have smooth, impervious, and durable surfaces.

~~(2) Shower receptors built aboveground:~~

~~When shower receptors are built aboveground,~~ shall have the subfloor and rough side of walls to a height of not less than three (3) inches (76 mm) above the top of the finished dam or threshold and shall be first lined with sheet plastic,* lead,* or copper,* or shall be lined with other durable and water-tight materials.

Showers that are provided with a built-in-place, permanent seat or seating area that is located within the shower enclosure shall be first lined with sheet plastic,* lead,* or copper,* or shall be lined with other durable and water-tight materials that extend not less than three (3) inches (76 mm) above horizontal surfaces of the seat or the seating area.

—All Lining materials shall be pitched one quarter (1/4) inch per foot (20.8 9 mm/m) to weep holes in the subdrain of a smooth and solidly formed subbase. All such lining materials shall extend upward on the rough jambs of the shower opening to a point no less than three (3) inches

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(76 mm) above the horizontal surfaces of the seat or the seating area or the top of the finished dam or threshold and shall extend outward over the top of the permanent seat or seating area or rough threshold and be turned over and fastened on the outside face of both the permanent seat, permanent seating area, or rough threshold and the jambs.

Nonmetallic shower subpans or linings ~~may~~ shall be permitted to be built up on the job site of not less than three (3) layers of standard, grade fifteen (15) pound (6.8 kg) asphalt-impregnated roofing felt. The bottom layer shall be fitted to the formed subbase and each succeeding layer thoroughly hot-mopped to that below. ~~All~~ Corners shall be carefully fitted and shall be made strong and water-tight by folding or lapping, and each corner shall be reinforced with suitable webbing hot-mopped in place. ~~All~~ Folds, laps, and reinforcing webbing shall extend not less than at least four (4) inches (102 mm) in all directions from the corner, and ~~all~~ webbing shall be of approved type and mesh, producing a tensile strength of not less than fifty (50) psi (344.5 kPa) in either direction. Nonmetallic shower subpans or linings ~~may~~ shall be permitted to also consist of multilayers of other approved equivalent materials suitably reinforced and carefully fitted in place on the job site as elsewhere required in this section.

Linings shall be properly recessed and fastened to approved backing so as not to occupy the space required for the wall covering and shall not be nailed or perforated at any point that ~~may be~~ is less than one (1) inch (25.4 mm) above the finished dam or threshold. An approved-type subdrain shall be installed with every shower subpan or lining. Each such subdrain shall be of the type that sets flush with the subbase and shall be equipped with a clamping ring or other device to make a tight connection between the lining and the drain. The subdrain shall have weep holes into the waste line. The weep holes located in the subdrain clamping ring shall be protected from clogging.

~~All~~ Shower lining materials shall conform to approved standards acceptable to the Authority Having Jurisdiction.

*Note: Lead and copper subpans or linings shall be insulated from all conducting substances other than their connecting drain by fifteen (15) pound (6.8 kg) asphalt felt or its equivalent, and no lead pan or liner shall be constructed of material weighing less than four (4) pounds per square foot (19.5 kg/m²). Copper pans or liners shall be ~~at least~~ not less than No. 24 B & S Gauge (0.02 inches) (0.5 mm). Joints in lead pans or liners shall be burned. Joints in copper pans or liners shall be soldered or brazed. Plastic pans shall not be coated with asphalt-based materials.

412.1 Fixture Count. ~~Plumbing fixtures shall be provided for the type of building occupancy and in the minimum number shown in Table 4-1.~~ Each building shall be provided with sanitary facilities as prescribed in Chapter 29 of the City of Houston Building Code.

CHAPTER 5
WATER HEATERS

508.14 Installation in Residential Garages.

- (1) All new or replacement gas Gas-utilization equipment in residential garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit shall be installed so that all burners and burner-ignition devices are located not less than 18 inches (450 mm) above the floor unless listed as flammable vapor ignition resistant. [NFPA 54:9.1.10.1]
- (2) Such equipment shall be located or protected so it is not subject to physical damage by a moving vehicle. [NFPA 54:9.1.10.2]
- (3) When appliances are installed in a separate, enclosed space having access only from outside of the garage, such equipment may be installed at floor level, providing the required combustion air is taken from the exterior of the garage. [NFPA 54:9.1.10.3]

509.0 Equipment on Roofs.

509.1 General.

- (1) Gas-utilization equipment on roofs shall be designed or enclosed so as to withstand climactic conditions in the area in which they are installed. Where enclosures are provided, each enclosure shall permit easy entry and movement, shall be of reasonable height, and shall have at least a 30-inches (760mm) clearance between the entire service access panel(s) of the equipment and the wall of the enclosure. [NFPA 54:9.4.1.1]
- (2) Roofs on which equipment is to be installed shall be capable of supporting the additional load or shall be reinforced to support the additional load. [NFPA 54:9.4.1.2]
- (3) All access locks, screws, and bolts shall be of corrosion-resistant material. [NFPA 54:9.4.1.3]
- (4) Every attic, roof, mezzanine, or platform more than eight (8) feet (2438 mm) above the ground or floor level shall be made accessible by a pull-down stairway with a clear opening not less than 22 inches in width and a load capacity of not less than 350 pounds or a ladder permanently fastened to the building. Such a ladder or stairway shall not be more than eighteen (18) feet (5486 mm) in length between landings and not less than fourteen (14) inches (355 mm) in width. The ladder shall have rungs spaced not more than fourteen (14) inches (355 mm) center to center and not less than six (6) inches (152.4 mm) from the face of the wall. Each stile is to extend thirty (30) inches (762 mm) above the surface to be reached, or as high as possible, if height is limited. Permanent ladders for water heater access need not be provided at parapets or walls less than thirty (30) inches (762 mm) in height.

Exception: A portable ladder may be used for access for water heaters in attics in buildings with lift out ceilings.

CHAPTER 6
WATER SUPPLY AND DISTRIBUTION

601.0 Running Water Required.

601.1 Except where not deemed necessary for safety or sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary condition without danger of backflow or cross-connection.

Water closets and urinals shall be flushed by means of an approved flush tank or flushometer valve. ~~In jurisdictions that adopt Chapter 16, water closets, urinals, and trap primers in designated nonresidential buildings may be provided with reclaimed water as defined and regulated by Chapter 16 of this code.~~

~~**Exception:** Listed fixtures that do not require water for their operation and are not connected to the water supply.~~

In occupancies where plumbing fixtures are installed for private use, hot water shall be required for bathing, washing, laundry, cooking purposes, dishwashing or maintenance. In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes. This requirement shall not supersede the requirements for individual temperature control limitations for public lavatories, bathtubs, whirlpool bathtubs and shower control valves.

601.2.2 Color and Information Nonpotable Water ~~— Yellow background with black lettering, with the words “Caution: Nonpotable water, do not drink.”~~

Each system shall be identified with a colored pipe or band and coded with paints, wraps and materials compatible with the piping. Except as required in Sections 1610.0 and 1617.0, nonpotable water systems shall have a yellow background with black uppercase lettering, with the words “CAUTION: NONPOTABLE WATER, DO NOT DRINK.” Each nonpotable system shall be identified to designate the liquid being conveyed, and the direction of normal flow shall be clearly shown. The minimum size of the letters and length of the color field shall conform to Table 6-1.

A The background colored identification band and required information shall be indicated every twenty (20) feet (6096 mm) but at least not less than once per room, and shall be visible from the floor level.

~~Where vacuum breakers or backflow preventers are installed with fixtures listed in Table 14 1, identification of the discharge side may be omitted. Each outlet on the nonpotable water line that could be used for special purposes shall be posted as follows:~~

~~“Caution: Nonpotable water, do not drink.”~~

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

603.4.13 Water Treatment Units. Reverse osmosis drinking water treatment units shall meet the requirements of the appropriate standards referenced in Table 14-1. Waste or discharge from reverse osmosis or other types of water treatment units shall enter the drainage system through an airgap. Water supply for water softeners shall be protected by a double check valve assembly.

603.4.16.6 Where fire protection systems are supplied with potable water through an unmetered tap and supply line, the water supply shall be protected by one of the following:

- (1) Double check detector assembly
- (2) Reduced pressure detector assembly.

605.2 A fullway valve controlling all outlets shall be installed on the discharge side of each water meter and on each unmetered water supply. Water piping supplying ~~more than one building on~~ any ~~one~~ premises shall be equipped with a separate fullway valve to each building, so arranged that the water supply can be turned on or off to any individual or separate building; provided; however, that supply piping to a single family residence and building accessory thereto may be controlled on one valve. Such shutoff valves shall be accessible at all times. A fullway valve shall be installed on the discharge piping from water supply tanks at or near the tank. A fullway valve shall be installed on the cold water supply pipe to each water heater at or near the water heater.

605.8 A means for draining the building piping shall be installed at each building entry. The drain down valve shall not be installed in an underground service pipe, but shall be installed at a location in the pipe above ground before the pipe enters the building.

606.2.2 Plastic Fittings. Female PVC screwed fittings for water piping ~~shall be used with plastic male fittings and plastic male threads only are prohibited.~~

607.0 Gravity Supply Tanks. Gravity tanks for potable water ~~shall be tightly covered, and have not less than a sixteen (16) square inch (10,323 mm²) overflow screened with copper screen having not less than fourteen (14) nor more than eighteen (18) openings per linear inch (25.4 mm).~~

607.1 Water-supply Tanks. All potable water-supply tanks shall be properly covered or sealed to prevent entrance of foreign material into the water supply. Soil or waste lines shall not pass directly over nonpressure water-supply tanks or over manholes in pressure tanks.

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

607.3 Cleaning, Painting, Repairing Water Tanks. A potable water-supply tank for domestic purposes shall not be lined, painted or repaired with any material that is not in compliance with the current ANSI/AWWA D102 Standards and has not been approved by the Authority Having Jurisdiction.

607.4 When Required. When the water pressure from the public water main during flow is insufficient to supply fixtures that are likely to be in simultaneous operation, the supply shall be from a gravity house tank, pressure tank, or booster system.

No pumps are permitted to take suction directly from a jurisdiction main.

Exception: Pumps may be allowed to take suction from the jurisdiction main when approved by the Authority Having Jurisdiction if the main is of sufficient size as determined and approved by the Water Engineering Division of the jurisdiction's Public Works and Engineering Department.

607.5 Support and Construction. All water-supply tanks shall be supported in accordance with the City of Houston Building Code. Tanks shall be of approved construction.

607.6 Overflow for Water-Supply Tanks. Overflow pipes for gravity tanks shall discharge above and within 6 inches of a roof drain, floor drain or catch basin, or they shall discharge into an open hub drain or water supplied sink. Adequate overflow pipes properly screened against the entrance of insects and vermin shall be provided.

607.7 Drains. Water-supply tanks shall be provided with valved drain lines located at their lowest point and discharged as indirect waste or as required for overflow pipes.

607.8 Tanks. Below-rim supply.

- (1) Where a potable water outlet terminates below the rim of a tank, the tank shall have an overflow of diameter not less than that given in the following table:

Sizes of Overflow Pipes for Water-supply Tanks

<u>Maximum Capacity of Water Supply Line to Tank</u>	<u>Diameter of Overflow Pipe (inches ID)</u>	<u>Maximum Capacity of Water-supply Line to Tank</u>	<u>Diameter of Overflow Pipe (inches ID)</u>
<u>0-50 gpm</u>	<u>2</u>	<u>400-700 gpm</u>	<u>5</u>
<u>50-150 gpm</u>	<u>2½</u>	<u>700-1,000 gpm</u>	<u>6</u>
<u>100-200 gpm</u>	<u>3</u>	<u>over 1,000 gpm</u>	<u>8</u>
<u>200-400 gpm</u>	<u>4</u>		

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- (2) The potable water inlet to the tank or vat shall terminate a distance of not less than one and one half times the height to which water can rise in the tank above the top of the overflow.
- (3) The distance from the inlet to the high water level shall be measured from the critical point of the potable water supply overflow.

607.9 Protective Devices Required. Approved devices to protect against backflow and backsiphonage shall be installed at all fixtures and equipment where backflow and/or backsiphonage 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.

607.10 Construction of Tanks. Tanks used for potable water supply or to supply standpipes for fire-fighting equipment only shall be equipped with tight vermin-proof covers. Such tanks shall be vented with a return bend vent pipe having an area not less than one half of the area of the overflow riser. The vent opening and overflow riser shall be covered with a metallic screen of not less than 100 mesh. To provide an air gap, the top of the overflow riser shall not be less than 2 inches (50.8 mm) below the fill connection. The potable water supply shall be protected from contamination by the fire standpipe supply by a divided suction tank or a separate tank for potable water supply or by installing on the downstream side of the fire pumps an approved backflow preventer. When a divided tank is used, the tank shall be divided by a double wall partition extending to the top of the tank, and each wall shall be sealed with a continuous weld between the wall and four sides of the tank. There shall be an air space between the walls of the partition of not less than four inches (100.16 mm) with an opening (not threaded) at the bottom of the partition to give visual evidence of loss of integrity of the walls of the partition (see Figure 6.1). The air space between the partition walls shall be given a one PSI air test with all welds soaped to assure no leaks in the partition chamber. The tank fabricator shall furnish a certificate of compliance with this test and a metal nameplate on the tank giving the name of the fabricator, the date of fabrication, and a serial number. All tanks for potable water service shall be constructed of new material to assure against possibility of contamination from previous usage.

607.11 Piping. Water piping from potable gravity and suction tanks to the suction side of the water pumps and from the discharge end of the pumps to the check valve shall be galvanized.

607.12 Vacuum Breaker. Pressure tanks used for supplying water to the potable water distribution system, to both the fire standpipes and the potable system or to supply standpipes for fire equipment only, shall be equipped with an acceptable vacuum breaking device located on the top of the tank. The air inlet of this device shall be covered with a metallic screen of not less than 100 mesh.

607.13 Tankless Booster System. Tankless systems shall be designed to eliminate shock to the piping system when the pumps start and stop.

607.14 Disinfection of Potable Water-Supply Tanks. After a potable water-supply tank has been cleaned, painted or repaired and before it is returned to use, it shall be disinfected by one of the following:

- (1) By filling with a solution containing 50 ppm (parts per million) of available chlorine and allowing it to stand for four hours before flushing the tank and returning to use.
- (2) By filling with a solution containing 100 ppm of available chlorine and allowing it to stand for two hours before flushing the tank and returning it to use.

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608.2 Excessive Water Pressure. Where static water pressure in the water supply piping is in excess of eighty (80) pounds per square inch (552 kPa), an approved-type pressure regulator preceded by an adequate strainer shall be installed and the static pressure reduced to eighty (80) pounds per square inch (552 kPa) or less. A pressure regulator equal to or exceeding one and one-half (1-1/2) inches (38 mm) shall not require a strainer. Such regulator(s) shall control the pressure to all water outlets in the building unless otherwise approved by the Authority Having Jurisdiction. Each such regulator and strainer shall be accessibly located above ground or in a vault equipped with a properly sized and sloped bore-sighted drain to daylight, shall be protected from freezing, and shall have the strainer readily accessible for cleaning without removing the regulator or strainer body or disconnecting the supply piping. ~~All pipe size determinations shall~~ be based on eighty (80) percent of the reduced pressure when using Table 6-6.

An approved expansion tank shall be installed in the cold water distribution piping downstream of each regulator to prevent excessive pressure from developing due to thermal expansion and to maintain the pressure setting of the regulator. The expansion tank shall be properly sized and installed in accordance with the manufacturer's instructions and listing. Systems designed by registered engineers shall be permitted to use approved pressure relief valves in lieu of expansion tanks provided such relief valves have a maximum pressure relief setting of one-hundred (100) pounds per square inch (689 kPa) or less.

~~609.3.1 Ferrous piping shall have a protective coating of an approved type, machine applied and conforming to recognized standards. Field wrapping shall provide equivalent protection and shall be restricted to those short sections and fittings necessarily stripped for threading. Zinc coating (galvanizing) shall not be deemed adequate protection for piping or fittings. Approved nonferrous piping shall not be required to be wrapped. Approved materials may be installed without joints and must be sleeved where they penetrate the floor. Pipe sleeves shall have a minimum wall thickness of 1/16 inch. No portion of the water pipe shall be in contact with the concrete. In water services that are 3 inches or larger, one fitting may be installed under the slab within 5 feet of the exterior of the building. The fitting shall be installed to allow for replacement without any damage being done to the structure. Galvanized pipe shall not be used in or under slabs.~~

609.10 Water Hammer. ~~All building water supply systems in which~~ where quick-acting valves are installed shall be provided with ~~devices~~ water hammer arrester(s) to absorb ~~the hammer caused by~~ high pressures resulting from the quick closing of these valves. ~~These pressure absorbing devices~~ Water hammer arresters shall be approved mechanical devices in accordance with the applicable standard(s) referenced in Table 14-1 and. ~~Water pressure-absorbing devices~~ shall be installed as close as possible to quick-acting valves. Examples of quick-acting valves are: solenoid valves, single-handle valves, and flush-valves.

Exception: Quick acting valves installed as replacements.

**TABLE 6-2
Backflow Prevention Devices, Assemblies, and Methods**

Device, Assembly, or Method ¹	Degree of Hazard					Installation ^{2,3}
	<u>Applicable Standards</u>	Pollution (Low Hazard)		Contamination (High Hazard)		
		Back- Siphonage	Back- Pressure	Back- Siphonage	Back- Pressure	
Airgap		X		X		See Table 6-3 in this chapter.
Atmospheric Vacuum Breaker		X		X		Upright position. No valve downstream. Minimum of six (6) inches (152 mm) or listed distance above all downstream piping and flood- level rim of receptor. 4, 5
Spill-Resistant Pressure-Type Backflow Prevention Assembly (single check valve with air inlet vent and means of field testing)	<u>ASSE 1056</u>	X		X		Upright position. Minimum of six (6) inches (152 mm) or listed distance above all downstream piping and flood- level rim of receptor. 5

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<p>Double Check Valve Backflow Preventer Prevention Assembly (two independent check valves and means of field testing)</p>	<p><u>ASSE 1015;</u> <u>AWWA C510; CSA B64.5 or CSA B 64.5.1</u></p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>Horizontal unless otherwise listed. Requires one (1) foot (305 mm) clearance at bottom for maintenance. May need platform/ladder for test and repair. Does not discharge water.</p>
	<p><u>ASSE 1048</u></p>	<p><u>X</u></p>	<p><u>X</u></p>	<p>X</p>	<p><u>Horizontal unless otherwise listed. Requires one (1) foot (305 mm) clearance at bottom for maintenance. May need platform/ ladder for test and repair. Does not discharge water. Installation includes a fire protection system and is designed to operate under continuous pressure conditions.</u></p>
<p>Pressure Vacuum Breaker Backflow Prevention Assembly (loaded air inlet valve, internally)</p>	<p><u>ASSE 1020 or CSA B s64.1.2</u></p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>Upright position. May have valves downstream. Minimum of twelve (12) inches (305 mm) above all downstream piping and flood-</p>

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<p><u>loaded check valve and means of field testing)</u></p>						<p>level rim of receptor. May discharge water.</p>
<p>Reduced Pressure Principle Backflow Prevention Assembly (two <u>independently acting loaded check valves, a pressure relief valve and means of field testing)</u></p>	<p><u>ASSE 1047</u></p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>Horizontal unless otherwise listed. Requires one (1) foot (305 mm) minimum clearance at bottom for maintenance. May need platform / ladder for test and repair. May discharge water. <u>Installation includes a fire protection system and is designed to operate under continuous pressure conditions.</u></p>
	<p><u>ASSE 1013;</u> <u>AWWA C511; CSA B64.4 or CSA B 64.4.1</u></p>	<p><u>X</u></p>	<p><u>X</u></p>	<p><u>X</u></p>	<p><u>X</u></p>	<p><u>Horizontal unless otherwise listed. Requires one (1) foot (305 mm) minimum clearance at bottom for maintenance. May need platform/ ladder for test and repair. May discharge water.</u></p>

1 See description of devices and assemblies in this chapter.

2 Installation in pit or vault requires previous approval by the Authority Having Jurisdiction.

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3 Refer to general and specific requirement for installation.

4 Not to be subjected to operating pressure for more than 12 hours in any 24-hour period.

5 For deck-mounted and equipment-mounted vacuum breaker, see Section 603.4.15.

**TABLE 6-4
Materials for Building Supply and Water Distribution Piping and Fittings**

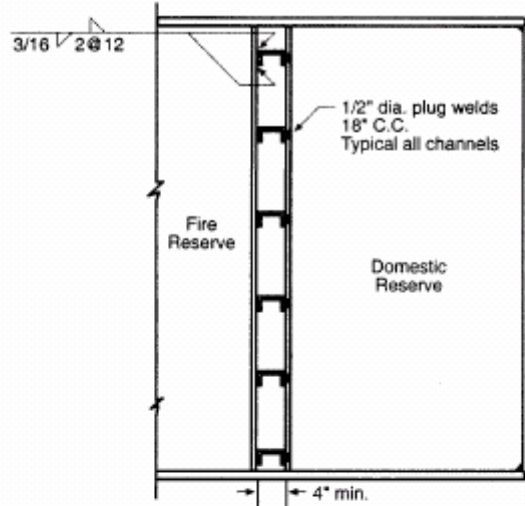
Material	<u>Building Supply Pipe and Fittings</u>	Water Distribution Pipe and Fittings	<u>Referenced Standard(s) Pipe</u>	<u>Referenced Standard(s) Fittings</u>
		Hot — Cold		
Asbestos- Cement	X [‡]	X — X	<u>ASTM C296, AWWA C400</u>	
Brass	X	X — X	<u>ASTM B43, ASTM B135</u>	
Copper	X	X — X	<u>ASTM B42, ASTM B75, ASTM B88, ASTM B251, ASTM B302, ASTM B447</u>	<u>ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.26</u>
CPVC	X	X — X	<u>ASTM D2846, ASTM F441, ASTM F442</u>	<u>ASTM D2846, ASTM F437, ASTM F438, ASTM F439, ASTM F1970</u>
Ductile- Iron	X	X — X	<u>AWWA C151</u>	<u>ASME B16.4, AWWA C110, AWWA C153</u>
Galvanized Steel	X	X — X	<u>ASTM A53</u>	

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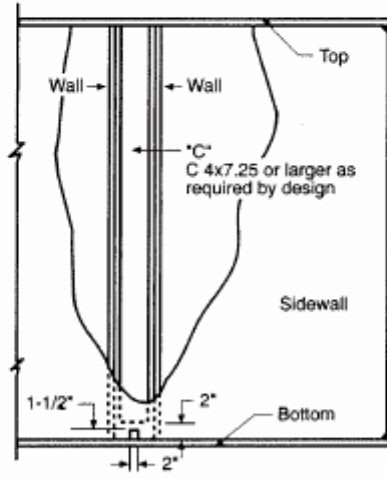
Malleable Iron	X	X——X		<u>ASME B16.3</u>
PE	X [†]	X——X	<u>ASTM D2239, ASTM D2737, ASTMD3035, AWWA C901, CSA 137.1</u>	<u>ASTM D2609, ASTM D2683, ASTM D3261, ASTM F1055, CSA B137.1</u>
PE-AL-PE	X	X——X	<u>ASTM F1282, CSA B137.9</u>	<u>ASTM F1282, ASTM F1974, CSA B137.9</u>
PEX	X	X	<u>ASTM F876 , ASTM F877, CSA B137.5</u>	<u>ASTM F877, ASTM F1807, ASTM F1960, ASTM F1961, ASTM F2080, ASTM F2159, CSA B137.5</u>
PEX-AL-PEX	X	X——X	<u>ASTM F1281, CSA B137.10, ASTM F2262</u>	<u>ASTM F1281, ASTM F1974, ASTM F2434, CSA B137.10</u>
PVC	X [†]		<u>ASTM D1785, ASTM D2241, AWWA C900</u>	<u>ASTM D2464, ASTM D2466, ASTM D2467, ASTM F1970</u>
<u>Stainless Steel</u>	<u>X</u>	X	<u>ASTM A269, ASTM A312</u>	

† For Building Supply or cold-water applications.

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Plan View with Top Removed



Elevation of Partition

1. Tank must have a minimum of a 24-inch manway on each compartment.
2. Tank must have a ladder on the outside to access both manways.
3. Tank must have interior ladders inside to access bottom of tank from each manway.

Figure 6-1

CHAPTER 7
SANITARY DRAINAGE

701.1 Drainage piping shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, Stainless Steel 304 or 316L, Schedule 40 ABS DWV, Schedule 40 PVC DWV, ~~extra-strength vitrified clay pipe~~ SDR 35 plastic pipe in sizes 8 inches or larger, or other approved materials having a smooth and uniform bore, except that:

701.1.1 No galvanized wrought-iron or galvanized steel pipe shall be used underground and shall be kept at least six (6) inches (152 mm) aboveground.

701.1.2 ABS and PVC DWV piping installations shall be installed in accordance with IS 5, IS 9, and Chapter 15 "Firestop Protection." Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, when tested in accordance with the Test for Surface - Burning Characteristics of the Building Materials. (See the Building Code standards based on ASTM E-84 and ANSI/UL 723.)

701.1.3 ~~Reserved No vitrified clay pipe or fittings shall be used aboveground or where pressurized by a pump or ejector. They shall be kept at least twelve (12) inches (305 mm) belowground.~~

701.1.4 Copper tube for drainage and vent piping shall have a weight of not less than that of copper drainage tube type DWV.

701.1.5 Stainless steel 30.4 pipe and fittings shall not be installed underground and shall be kept at least 6 inches (152 mm) aboveground.

701.3 Lead

See Table 14-1. Sheet lead shall be not less than the following:

For safe pans – not less than four (4) pounds per square foot (19.5 kg/m²) or 1/16 inch (1.6 mm) thick.

For flashings or vent terminals – not less than ~~three (3)~~ two and one half (2 1/2) pounds per square foot (~~15~~ 12.5 kg/m²) or 1.2 mm thick.

Lead bends and lead traps shall not be less than one-eighth (1/8) inch (3.2 mm) wall thickness.

701.3.1 Piping installed below a slab on grade or matt type foundation shall be not less than two (2) inches in diameter.

701.4 Ferrules and Bushings

701.4.1 Caulking ferrules shall be manufactured from bronze or copper and shall be in accordance with Table ~~7-1~~ 7-2(a).

701.4.2 Soldering bushings shall be of bronze or copper in accordance with Table 7-2 (b).

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TABLE 7-1
Materials for Drain, Waste, Vent Pipe and Fittings

<u>Material</u>	<u>Underground</u> <u>Drain,</u> <u>Waste,</u> <u>Vent Pipe</u> <u>and</u> <u>Fittings</u>	<u>Above ground</u> <u>Drain, Waste,</u> <u>Vent Pipe and</u> <u>Fittings</u>	<u>Building</u> <u>Sewer</u> <u>Pipe</u> <u>and</u> <u>Fittings</u>	<u>Referenced</u> <u>Standard(s)</u> <u>Pipe</u>	<u>Referenced</u> <u>Standard(s)</u> <u>Fittings</u>
<u>ABS (Schedule 40)</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>ASTM D1527,</u> <u>ASTM D2661,</u> <u>ASTM D2680¹,</u> <u>ASTM F628</u>	<u>ASTM D2661,</u> <u>ASTM D2680¹</u>
<u>Asbestos-Cement</u>			<u>X</u>	<u>ASTM C428¹,</u> <u>ASTM C14¹</u>	
<u>Brass</u>		<u>X</u>		<u>ASTM B43</u>	
<u>Cast-Iron</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>ASTM A74,</u> <u>ASTM A888,</u> <u>CISPI 301</u>	<u>ASME B16.12,</u> <u>ASTM A74,</u> <u>ASTM A888,</u> <u>CISPI 301</u>
<u>Co-Extruded ABS (Schedule 40)</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>ASTM F1488</u>	<u>ASTM, D2661,</u> <u>ASTM D2680¹</u>
<u>Co-Extruded PVC (Schedule 40)</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>ASTM F1488,</u> <u>ASTM F891</u>	<u>ASTM D2665,</u> <u>ASTM F794¹,</u> <u>ASTM F1866</u>
<u>Copper (Type DWV)</u>				<u>ASTM B75,</u>	<u>ASME B16.23,</u>

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	<u>X</u>	<u>X</u>	<u>X</u>	<u>ASTM B251,</u> <u>ASTM B302,</u> <u>ASTM B306</u>	<u>ASME</u> <u>B16.29</u>
<u>Galvanized</u> <u>Malleable Iron</u>		<u>X</u>			<u>ASME B16.3</u>
<u>Galvanized Steel</u>		<u>X</u>		<u>ASTM A53</u>	
<u>PVC (Schedule</u> <u>40)</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>ASTM</u> <u>D1785,</u> <u>ASTM</u> <u>D2665,</u> <u>ASTM F794¹</u>	<u>ASTM</u> <u>D2665,</u> <u>ASTM</u> <u>F794¹,</u> <u>ASTM</u> <u>F1866</u>
<u>Stainless Steel</u> <u>304</u>		<u>X</u>		<u>ASME</u> <u>A112.3.1</u>	<u>ASME</u> <u>A112.3.1</u>
<u>Stainless Steel</u> <u>316L</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>ASME</u> <u>A112.3.1</u>	<u>ASME</u> <u>A112.3.1</u>
<u>Vitrified Clay</u> <u>(Extra strength)</u>			<u>X</u>	<u>ASTM C700</u>	<u>ASTM C700</u>

¹ For Building Sewer applications.

TABLE 7-1 7-2(a)
Caulking Ferrules

Pipe Size (inches)	Inside Diameter (inches)	Length (inches)	Minimum Weight Each	
			lb.	oz.
2	2-1/4	4-1/2	1	0
3	3-1/4	4-1/2	1	12
4	4-1/4	4-1/2	2	8

Caulking Ferrules (Metric)

Pipe Size (mm)	Inside Diameter (mm)	Length (mm)	Minimum Weight Each
			(kg.)
50	57	114	0.454
80	83	114	0.790
100	108	114	1.132

TABLE 7-2(b)
Soldered Bushings

Pipe Size (inches)	Minimum Weight		Pipe Size (inches)	Minimum Weight	
	lb.	oz.		lb.	oz.
1-1/4	0	6	2-1/2	1	6
1-1/4	0	8	3	2	0
2	0	14	4	3	8

Soldered Bushings (Metric)

Pipe Size (inches)	Minimum Weight		Pipe Size (inches)	Minimum Weight	
	Each (kg)			Each (kg)	
32	0.168		65	0.622	
40	0.224		80	0.908	
50	0.392		100	1.586	

TABLE 7-3
Drainage Fixture Unit Values (DFU)

Inch	mm	h	mm
1-1/4	32	1/4	32
1-1/2	40	1/2	40
2	51	1/2	65
2-1/2	65		80
3	80		

Plumbing Appliance, Appurtenance, or Fixture	Min. Size Trap and Trap Arm ⁷	Private	Public	Assembly ⁸
Bathtub or Combination Bath/Shower.....	1-1/2"	2.0	2.0	
Bidet.....	1-1/4"	1.0		
Bidet.....	1-1/2"	2.0		
Clothes Washer, domestic, standpipe	2"	3.0	3.0	3.0

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⁵				
Dental Unit, cuspidor.....	1- 1/4"		1.0	1.0
Dishwasher, domestic, with independent drain ²	1- 1/2"	2.0	2.0	2.0
Drinking Fountain or Watercooler (per head).....	1- 1/4"	0.5	0.5	1.0
Food-Waste-Grinder, commercial.....	2"		3.0	3.0
Floor Drain, emergency.....	2"		0.0	0.0
Floor Drain (for additional sizes see Section 702).....	2"	2.0	2.0	2.0
Shower, single-head trap.....	2"	2.0	2.0	2.0
Multi-head, each additional.....	2"	1.0	1.0	1.0
Lavatory, single.....	1- 1/4"	1.0	1.0	1.0
Lavatory, in sets of two or three.....	1- 1/2"	2.0	2.0	2.0
Washfountain.....	1- 1/2"		2.0	2.0
Washfountain.....	2"		3.0	3.0
Mobile Home, trap.....	3"	12.0		
Receptor, indirect waste ¹ , ³	1- 1/2"			See footnote ^{1,3}
Receptor, indirect waste ¹ , ⁴	2"			See footnote ^{1,4}
Receptor, indirect waste ¹	3"			See footnote ¹
Sinks				
Bar.....	1- 1/2"	1.0		
Bar ²	1- 1/2" ²		2.0	2.0

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Clinical.....	3"		6.0	6.0
..				
Commercial with food waste.....	1- 1/2" ²		3.0	3.0
Special Purpose.....	1- 1/2"	2.0	3.0	3.0
(with or without food-waste grinder and/or dishwasher)				
² Special Purpose.....	2"	3.0	4.0	4.0
Special Purpose.....	3"		6.0	6.0
³ Kitchen, domestic.....	1- 1/2" ²	2.0	2.0	
² Laundry.....	1- 1/2"	2.0	2.0	2.0
(with or without discharge from a clothes washer)				
Service or Mop Basin.....	2"		3.0	3.0
Service or Mop Basin.....	3"		3.0	3.0
Service, flushing rim.....	3"		6.0	6.0
Wash, each set of faucets.....			2.0	2.0
Urinal, integral trap 1.0 GPF ²	2"	2.0	2.0	5.0
Urinal, integral trap greater than 1.0 GPF.....	2"	2.0	2.0	6.0
² Urinal, exposed trap.....	1- 1/2" ²	2.0	2.0	5.0
Water Closet, 1.6 GPF Gravity Tank ⁶	3"	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Tank ⁶	3"	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Valve ⁶	3"	3.0	4.0	6.0

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Water Closet, greater than 1.6 GPF Gravity Tank ⁶	3"	4.0	6.0	8.0
Water Closet, greater than 1.6 GPF Flushometer Valve ⁶	3"	4.0	6.0	8.0

- 1 Indirect waste receptors shall be sized based on the total drainage capacity of the fixtures that drain therein to, in accordance with Table 7-4.
- 2 Provide a 2" (51 mm) minimum drain.
- 3 For refrigerators, coffee urns, water stations, and similar low demands.
- 4 For commercial sinks, dishwashers, and similar moderate or heavy demands.
- 5 Buildings having a clothes-washing area with clothes washers in a battery of three (3) or more clothes washers shall be rated at six (6) fixture units each for purposes of sizing common horizontal and vertical drainage piping.
- 6 Water closets shall be computed as six (6) fixture units when determining septic tank sizes based on Appendix K of this code.
- 7 Trap sizes shall not be increased to the point where the fixture discharge may be inadequate to maintain their self-scouring properties.
- 8 Assembly [Public Use (See Table 4-1)].

704.3 Pot sinks, scullery sinks, dishwashing sinks, silverware sinks, commercial dishwashing machines, silverware-washing machines, and other similar fixtures shall be connected indirectly to the drainage system. ~~A floor drain shall be provided adjacent to the fixture, and the fixture shall be connected on the sewer side of the floor drain trap, provided that no other drainage line is connected between the floor drain waste connection and the fixture drain. The fixture and floor drain shall be trapped and vented as required by this code.~~

710.0 Drainage of Fixtures Located Below the Next Upstream Manhole or Below the Main Sewer Level.

710.1 Where a fixture is installed on a floor level that is lower than the next upstream manhole cover of the public or private sewer, serving such drainage piping, shall be protected from backflow of sewage by installing an approved type of backwater valve. Fixtures on floor levels above such elevation shall not discharge through the backwater valve. Cleanouts for drains that pass through a backwater valve shall be clearly identified with a permanent label stating "backwater valve downstream."

710.12.1 Discharge piping. The discharge piping shall be sized per the manufacturer's instructions and shall be not less than one and one fourth inches in diameter. A check valve and fullway-type shutoff valve shall be located within the discharge line.

711.0 Suds Relief.

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Drainage connections shall not be made into a drainage piping system within eight (8) feet (2438 mm) of any vertical to horizontal change of direction of a stack containing suds-producing fixtures. ~~Bathtubs, laundries, and washing machine standpipes, kitchen sinks, and dishwashers~~ shall be considered suds-producing fixtures. Where parallel vent stacks are required, they shall connect to the drainage stack at a point eight (8) feet (2,438 mm) above the lowest point of the drainage stack.

Exceptions:

- (1) Single-family residences.
- (2) Stacks receiving the discharge from less than three (3) stories of plumbing fixtures.

713.4 The public sewer may be considered as not being available when such public sewer or any building or any exterior drainage facility connected thereto is located more than ~~two~~ three hundred (~~200-300~~) feet (60.8 m) from ~~any proposed building or exterior drainage facility on~~ any lot or premises that abuts and is served by such public sewer.

715.1 The building sewer, beginning two (2) feet (610 mm) from any building or structure, shall be of such materials as prescribed in this code. Pipe sizes 6 inches and smaller shall be PVC Schedule 40, and pipe sizes 8 inches or larger may be SDR 35.

722.1 Every abandoned building (house) sewer, or part thereof, shall be plugged or capped in an approved manner within five (5) feet (1524 mm) of the property line. Before any building may be demolished, a sewer disconnect permit shall be obtained and an inspection made to verify that the sewer has been properly capped within 5 feet of the property line and that the water service has been disconnected and capped at the meter.

724.0 Private Sewage Disposal Systems

Private sewage disposal systems shall conform to all applicable state laws and regulations, including the Construction Standards for Private Sewage Facilities, as published by the Texas Commission on Environmental Quality.

CHAPTER 8
INDIRECT WASTES

804.3 Accessible indirect waste receptors may be fabricated utilizing a “P” trap, riser stub, and an increaser to form a funnel.

810.1 No steam pipe shall be directly connected to any part of a plumbing or drainage system, nor shall any water having a temperature above one hundred and forty (140)°F (60°C) be discharged under pressure directly into any part of a drainage system. Pipes from boilers shall discharge by means of indirect waste piping, as determined by the Authority Having Jurisdiction or the boiler manufacturer’s recommendations. Such pipes may be indirectly connected by discharging into an open or closed condenser or an intercepting sump of an approved type that will prevent the entrance of steam or such water under pressure into the drainage system. All closed condensers or sumps shall be provided with a vent that shall be taken off the top and extended separately, full size above the roof. All condensers and sumps shall be properly trapped at the outlet with a deep seal trap extending to within six (6) inches (152 mm) of the bottom of the tank. The top of the deep seal trap shall have a three-fourths (3/4) inch (19.1 mm) opening located at the highest point of the trap to serve as a siphon breaker. Outlets shall be taken off from the side in such a manner as to allow a waterline to be maintained that will permanently occupy not less than one-half (1/2) the capacity of the condenser or sump. All inlets shall enter above the waterline. Wearing plates or baffles shall be installed in the tank to protect the shell. The sizes of the blowoff line inlet, the water outlets, and the vent shall be as shown in Table 8-1. The contents of condensers receiving steam or hot water under pressure must pass through an open sump before entering the drainage system. Water above 113EF shall not be discharged to the jurisdiction's drainage system.

811.9 An approved vented neutralizing basin is a basin with a bolted removable cover and dip-pipe outlet that is constructed of acid-resistant material such as molded seamless polyethylene, one-piece acid-proof chemical stoneware, lined carbon steel, or other material approved by the Authority Having Jurisdiction. Neutralizing basins shall be sized according to Table 8-2.

TABLE 8-2

<u>Number of sinks</u>	<u>Tank Capacity (Gallons)</u>
<u>1</u>	<u>5</u>
<u>4</u>	<u>15</u>
<u>8</u>	<u>30</u>
<u>16</u>	<u>55</u>
<u>25</u>	<u>100</u>
<u>40</u>	<u>150</u>

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<u>60</u>	<u>200</u>
<u>75</u>	<u>275</u>
<u>100</u>	<u>350</u>
<u>200</u>	<u>675</u>
<u>300</u>	<u>1200</u>
<u>500</u>	<u>2000</u>

1. Tank capacities are measured from invert inlet.
2. Neutralization basins receiving intermittent discharge from equipment shall be sized according to the manufacturer’s recommendations. Sizing criteria shall be shown on drawings.

811.10 Neutralization basins shall be provided with neutralizing material such as pieces of marble or limestone, 1 inch to 3 inches in size, so as to render effluent to a pH not less than 6 nor more than 10 before the effluent is discharged into the sewer system.

812.0 Clear Water Wastes. Water lifts, elevator sump pumps, expansion tanks, cooling jackets, sprinkler systems, drip or overflow pans, or similar devices that discharge clear wastewater into the building drainage system shall discharge through an indirect waste.

814.0 Condensate Wastes and Control. See Houston Mechanical Code

~~**814.1 Condensate Disposal.** Condensate from air washers, air cooling coils, fuel-burning condensing appliances, the overflow from evaporative coolers, and similar water-supplied equipment or similar airconditioning equipment shall be collected and discharged to an approved plumbing fixture or disposal area. If discharged into the drainage system, equipment shall drain by means of an indirect waste pipe. The waste pipe shall have a slope of not less than 1/8 inch per foot (10.5 mm/m) or one percent slope and shall be of approved corrosion-resistant material not smaller than the outlet size as required in either Section 310.3 or 310.4 for air cooling coils or condensing fuel-burning appliances, respectively. Condensate or wastewater shall not drain over a public way.~~

~~**814.2 Size.** Air-conditioning condensate waste pipes shall be independent of any drainage and waste system and shall not be smaller than shown in Table 8-2.~~

**TABLE 8-2
Minimum Condensate Pipe Size**

Equipment Capacity in Tons of Refrigeration (kW)	Minimum Condensate Pipe Diameter in Inches (mm)
-----------------------------------------------------------------	----------------------------------------------------------------

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Up to 20 (Up to 70.34)	3/4 (20)
21-40 (73.85-140.67)	1 (25)
41-90 (144.19-316.6)	1-1/4 (32)
91-125 (320.03-439.6)	1-1/2 (40)
126-250 (443.12-879.2)	2 (50)

~~The size of condensate waste pipes may be for one unit or a combination of units, or as recommended by the manufacturer. The capacity of waste pipes assumes a one-eighth (1/8) inch per foot (10.5 mm/m) or one percent slope, with the following pipe conditions:~~

~~Outside Air — 20% — Room Air — 80%
 DB — WB — DB — WB
 90°F — 73°F — 75°F — 62.5°F
 (32°C) (23°C) — (24°C) (17°)~~

~~Condensate drain sizing for other slopes or other conditions shall be approved by the Authority Having Jurisdiction.~~

~~Air conditioning waste pipes shall be constructed of materials specified in Chapter 7.~~

814.3 Point of Discharge. ~~Air conditioning condensate waste pipes shall connect indirectly to the drainage system through an airgap or airbreak to a properly trapped and vented receptors dry wells, leach pits, or the tailpiece of plumbing fixtures.~~

~~Condensate waste shall not drain over a public way.~~

CHAPTER 9
VENTS

901.0 General

901.1 Vents Required.

Each plumbing fixture trap, except as otherwise provided in this code, shall be protected against siphonage and back- pressure, and air circulation shall be ensured throughout all parts of the drainage system by means of vent pipes installed in accordance with the requirements of this chapter and as otherwise required by this code.

901.2 Trap Seal Protection. The vent system shall be designed to prevent a trap seal from being exposed to a pressure differential that exceeds one (1) inch of a water column (249 Pa) on the outlet side of the trap.

903.0 Materials.

903.1 ~~Vent pipe shall be cast iron, galvanized steel, galvanized wrought iron, copper, brass, Schedule 40 ABS DWV, Schedule 40 PVC DWV, stainless steel 304 or 316L (stainless steel 304 pipe and fittings shall not be installed underground and shall be kept at least six inches (152 mm) aboveground), or other approved materials having a smooth and uniform bore~~ in accordance with the applicable standards referenced in Table 7-1, except that:

903.1.1 ~~No galvanized wrought iron steel or galvanized 304 stainless steel pipe shall be used installed underground and shall be kept at least~~ not less than six (6) inches (152 mm) above ground.

906.6 Lead. See Table 14-1. Sheet lead shall be not less than the following:

For safe pans – not less than four (4) pounds per square foot (19.5 kg/m²) or 1/16-inch (1.6 mm) thick.

For flashings or vent terminals – not less than ~~three (3)~~ two and one-half (2 ½) pounds per square foot (14.7 kg/m²) or 1.2 mm thick.

Lead bends and lead traps shall not be less than one-eighth (1/8) inch (3.2 mm) wall thickness.

908.0 Vertical Wet Venting.

908.1 Vertical Wet Venting.

908.1.1 Where Permitted. Wet venting is limited to vertical drainage piping receiving the discharge from the trap arm of one (1) and two (2) fixture unit fixtures that also serves as a vent for not ~~to exceed~~ more than four (4) fixtures. ~~All w~~Wet vented fixtures shall be within the same story; provided, further, that fixtures with a continuous vent discharging into a wet vent shall be

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within the same story as the wet vented fixtures. No wet vent shall exceed six (6) feet (1829 mm) in developed length.

908.1.2 Size. The vertical piping between any two (2) consecutive inlet levels shall be considered a wet vented section. Each wet vented section shall be ~~a minimum of~~ not less than one (1) pipe size ~~larger than~~ exceeding the required minimum waste pipe size of the upper fixture or shall be one (1) pipe size ~~larger than~~ exceeding the required minimum pipe size for the sum of the fixture units served by such wet vented section, whichever is larger, but in no case less than two (2) inches (51 mm).

908.1.3 Vent Connection. Common vent sizing shall be the sum of the fixture units served but, in no case, smaller than the minimum vent pipe size required for any fixture served, or by Section 904.0.

CHAPTER 10
TRAPS AND INTERCEPTORS

1007.0 Trap Seal Protection.

Floor drain or similar traps directly connected to the drainage system and subject to infrequent use shall be protected with a trap seal primer or other listed trap seal protector, except where not deemed necessary for safety or sanitation by the Authority Having Jurisdiction. Trap seal primers or other devices shall be accessible for maintenance.

1009.8 Sample Wells. Each interceptor shall be provided with a sample well on the discharge side of the interceptor.

1011.0 Minimum Requirements for Auto Wash Racks

Every private or public wash rack and/or floor or slab used for cleaning machinery or machine parts shall be adequately protected against storm or surface water and shall drain or discharge into an interceptor (clarifier) of an approved design for this use. See Appendix H, Drawing MT-1, for minimum size and construction criteria.

1012.0 Commercial and Industrial Laundries. Laundry equipment in commercial and industrial buildings that does not have integral strainers shall discharge into an interceptor having a wire basket or similar device that is removable for cleaning and that will prevent passage into the drainage system of solids one-half (½) inch (12.7 mm) or larger in maximum dimension, such as string, rags, buttons, or other solid materials detrimental to the public sewerage system. An approved lint interceptor shall be installed for all commercial laundries.

Exceptions:

(1) A laundry containing no more than 4 automatic clothes washers.

(2) A laundry in an R-2 Occupancy containing no more than 10 automatic clothes washers.

For other than a mechanical lint interceptor properly sized to manufacturer's instructions, see Appendix H, Drawings LT-1, LT-2, and LT-3, for minimum size and construction criteria.

1014.1.3 Food Waste Disposal Units ~~and Dishwashers~~. Unless specifically required or permitted by the Authority Having Jurisdiction, no food waste disposal unit ~~or dishwasher~~ shall be connected to or discharge into any grease interceptor. Commercial food waste disposers shall be permitted to discharge directly into the building's drainage system.

1014.3.5 Construction Requirements.

1014.3.5.1 Purpose. Gravity grease interceptors shall be designed to remove grease from effluent and shall be sized in accordance with this section. Gravity grease interceptors shall also

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be designed to retain grease until accumulations can be removed by pumping the interceptor. ~~It is recommended that a~~ A sample box well shall be located at the outlet end of all gravity grease interceptors so that the Authority Having Jurisdiction can periodically sample effluent quality.

**TABLE 10-2
Hydromechanical Grease Interceptor (HGI) Sizing Chart***

DFU	HGI Flow (gpm)
8	20
10	25
13	35
20	50
35	75
172	100
216	150
342	200
428	25
576	350
720	500

*Based on intermittent potentially full flow in drainage lines.

Hydromechanical Interceptor Sizing Using Gravity Flow Rates¹

<u>Diameter of Grease Waste Pipe</u>	<u>Maximum Full Pipe Flow (gpm)²</u>	<u>One-Minute Drainage Period (gpm)</u>	<u>Two-Minute Drainage Period (gpm)</u>
<u>2"</u>	<u>20</u>	<u>20</u>	<u>10</u>
<u>3"</u>	<u>60</u>	<u>75</u>	<u>35</u>
<u>4"</u>	<u>125</u>	<u>150</u>	<u>75</u>
<u>5"</u>	<u>230</u>	<u>250</u>	<u>125</u>
<u>6"</u>	<u>375</u>	<u>500</u>	<u>250</u>

1. For interceptor sizing by fixture capacity see the example below.

2. 1/4" (6.35 mm) slope per foot based on Manning's formula with friction factor N = .012

EXAMPLE FOR SIZING
HYDROMECHANICAL INTERCEPTOR(S) USING FIXTURE CAPACITY

Step 1: Determine the flow rate from each fixture.

$$[\text{Length}] \times [\text{Width}] \times [\text{Depth}] / [2.31] = \text{Gallons} \times [.75 \text{ fill factor}] / [\text{Drain Period (1 min or 2 min)}]$$

Step 2: Calculate the total load from all fixtures that discharge into the interceptor.

<u>Fixtures</u>	<u>Compartments</u>	<u>Load (gallons)</u>	<u>Size of Grease Interceptor</u>	
			<u>One-Minute Drainage Period (gpm)</u>	<u>Two-Minute Drainage Period (gpm)</u>
<u>Compartment size</u>				
<u>12" x 24" x 12"</u>	<u>2</u>	<u>44.9</u>		
<u>Hydrant</u>		<u>3</u>		
<u>Rated Appliance</u>		<u>2</u>		
		<u>49.9</u>	<u>50</u>	<u>25</u>

**TABLE 10-3
Gravity Grease Interceptor Sizing**

DFUs (1)	Intereceptor Volume (2)
8	500 gallons
21 (3)	750 gallons
35	1,000 gallons
90 (3)	1,250 gallons
172	1,500 gallons
216	2,000 gallons
307 (3)	2,500 gallons
342	3,000 gallons
428	4,000 gallons
576	5,000 gallons
720	7,5000 gallons
2112	10,000 gallons
2640	15,000 gallons

- (1) ~~The maximum allowable DFUs plumbed to the kitchen drain lines that will be connected to the grease intereceptor.~~
- (2) ~~This size is based on: the DFUs, the pipe size from this code; Table 7 5; Useful Tables for flow in half full pipes (ref: Mohinder Nayyar Piping Handbook, 3rd Edition, 1992).~~
- (3) ~~Based on 30 minute retention time (ref.: Metcalf & Eddy, Inc. Small and Decentralized Wastewater Management Systems, 3rd Ed. 1998). Rounded up to nominal intereceptor volume.~~

Pipe Diameter¹	Full Pipe Flow (nominal)²	Intereceptor size based on 30 minute retention time, Rounded up to the next nominal size.³
2"	19.44 gpm	750 gallons
3"	58.67 gpm	2000 gallons
4"	125.77 gpm	4000 gallons
5"	229.75 gpm	7500 gallons
6"	375.47 gpm	15000 gallons

¹ For interceptor sizing by fixture capacity see the example below.

² "(.240)slope per foot based on Mannings formula with friction factor N=.012; CAST IRON SOIL PIPE AND FITTINGS HANDBOOK; Ch. 8, Flow Theory And Capacity; pp: 130 – 134 [Full Pipe]; Cast Iron Soil Pipe Institute (CISPI); 5959 Shallowford Road, Suite 419; Chattanooga, Tn. 37421.

³ Based on 30 minute retention time (ref.) Metcalf & Eddy, Inc. 3rd Ed. Small and Decentralized Wastewater Management Systems.

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1998) and rounded up to nominal interceptor volume.

GRAVITY INTERCEPTOR SIZING USING FIXTURE CAPACITY

Calculation of fixture capacity:

[Length] X [Width] X [Depth] / [231] = Gallons X [.75 fill factor]

Add hydrant capacity (gpm supply); Add rated appliances such as dishwasher, water wash hood at manufactures ratings.

Interceptor Sizing = fixture capacity x 30

EXAMPLE:

<u>Fixture Compartment Size (in.)</u>	<u>Compartments</u>	<u>Load (gallons)</u>	<u>Recommended Interceptor Size Based on 30 minute retention time. Rounded up to the next nominal size.</u>
<u>24x24x12</u>	<u>2</u>	<u>44.9</u>	<u>1500 gallons</u>

CHAPTER 11
STORM DRAINAGE

1101.3 Material Uses. Rainwater piping placed within the interior of a building or run within a vent or shaft shall be of cast iron, galvanized steel, wrought iron, brass, copper, lead, Schedule 40 ABS DWV, Schedule 40 PVC DWV, SDR 35 for 8 inch or larger PVC, stainless steel 304 or 316L (stainless steel 304 pipe and fittings shall not be installed underground and shall be kept at least six inches (152 mm) aboveground), or other approved materials, and changes in direction shall conform to the requirements of Section 706.0. ABS and PVC DWV piping installations shall be installed in accordance with IS 5, IS 9, and Chapter 15 "Firestop Protection." Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, when tested in accordance with the Test for Surface-Burning Characteristics of the Building Materials (see the Building Code standards based on ASTM E-84 and ANSI/UL 723.).

1101.11.1 Primary Roof Drainage. Roof areas of a building shall be drained by roof drains or gutters. The location and sizing of drains and gutters shall be coordinated with the structural design and pitch of the roof. Unless otherwise required by the Authority Having Jurisdiction, roof drains, gutters, vertical conductors or leaders, and horizontal storm drains for primary drainage shall be sized based on a storm rainfall rate of 8 inches per hour ~~of sixty (60) minutes duration and 100-year return period. Refer to Table D-1 (in Appendix D) for 100-year, 60-minute storms at various locations.~~

1101.11.2.2 Combined System. The secondary roof drains shall connect to the vertical piping of the primary storm drainage conductor downstream of any horizontal offset below the roof. The primary storm drainage system shall connect to the building storm water that connects to an underground public storm sewer. The combined secondary and primary roof drain systems shall be sized in accordance with Section 1106.0 ~~based on double the rainfall rate for the local area.~~

1102.1.2 The inside of conductors installed above ground level shall be of seamless copper water tube, Type K, L, or M; Schedule 40 copper pipe or Schedule 40 copper alloy pipe; Type DWV copper drainage tube; service weight cast-iron soil pipe or hubless cast-iron soil pipe; standard weight galvanized steel pipe; stainless steel 304 or 316L (stainless steel 304 pipe and fittings shall not be installed underground and shall be kept at least 6 inches (152 mm) aboveground); or Schedule 40 ABS or Schedule 40 PVC plastic pipe; or SDR 35 plastic pipe.

1102.2.1 Leaders shall be constructed of materials specified in Table ~~14-1~~ 7-1.

1102.2.2 Leaders shall be of seamless copper water tube, Type K, L, or M; Schedule 40 copper pipe; Schedule 40 copper alloy pipe; type DWV copper drainage tube; service

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weight cast-iron soil pipe or hubless cast-iron soil pipe; aluminum sheet metal, galvanized steel sheet metal, or copper sheet metal; standard weight galvanized steel pipe; Class DL or XL lead pipe; stainless steel 304 or 316L (stainless steel 304 pipe and fittings shall not be installed underground and shall be kept at least 6 inches (152 mm) aboveground); or Schedule 40 ABS or Schedule 40 PVC plastic pipe; or SDR 35 plastic pipe.

1102.3 Underground Building Storm Drains. All underground building storm drains shall be constructed of materials specified in Table ~~14-1~~ 7-1.

~~1103.0 Traps on Storm Drains and Leaders.~~

~~**1103.1 Where Required.** Leaders and storm drains, when connected to a combined sewer, shall be trapped. Floor and area drains connected to a storm drain shall be trapped.~~

~~**Exception:** Traps shall not be required where roof drains, rain leaders, and other inlets are at locations allowed under Section 906.0, Vent Termination.~~

~~**1103.2 Where Not Required.** No trap shall be required for leaders or conductors that are connected to a sewer carrying storm water exclusively.~~

~~**1103.3 Trap Size.** Traps, when installed for individual conductors, shall be the same size as the horizontal drain to which they are connected.~~

~~**1103.4 Method of Installation of Combined Sewer.** Individual storm water traps shall be installed on the storm water drain branch serving each storm water inlet, or a single trap shall be installed in the main storm drain just before its connection with the combined building sewer. Such traps shall be provided with an accessible cleanout on the outlet side of the trap.~~

~~1104.0 Leaders, Conductors, and Connections.~~

~~**1104.1 Improper Use.** Leaders or conductors shall not be used as soil, waste, or vent pipes nor shall soil, waste, or vent pipes be used as leaders or conductors.~~

~~**1104.2 Protection of Leaders.** Leaders installed along alleyways, driveways, or other locations where they may be exposed to damage shall be protected by metal guards, recessed into the wall, or constructed from ferrous pipe.~~

~~1104.3 Combining Storm with Sanitary Drainage.~~

~~The sanitary and storm drainage system of a building shall be entirely separate, except where a combined sewer is used, in which case the building storm drain shall be connected in the same horizontal plane through single wye fittings to the combined building sewer at least ten (10) feet (3,048 mm) downstream from any soil stack.~~

TABLE 11-1
Sizing Roof Drains, Leaders, and Vertical Rainwater Piping^{1, 2, 3}

Size of Drain Leader or Pipe, Inches	Flow, gpm	Maximum Allowable Horizontal Projected Roof Areas Square Feet at Various Rainfall Rates						
		1 in./h	2 in./h	3 in./h	4 in./h	5 in./h	6 in./h	8 in./h
2	23	2176	1088	725	544	435	363	<u>272</u>
3	67	6440	3220	2147	1610	1288	1073	<u>805</u>
4	144	13840	6920	4613	3460	2768	2307	<u>7307</u>
5	261	25120	12560	8373	6280	5024	4187	<u>3140</u>
6	424	40800	20400	13600	10200	8160	6800	<u>5100</u>
8	913	88000	44000	29333	22000	17600	14667	<u>111000</u>

Notes:

1. The sizing data for vertical conductors, leaders, and drains are based on the pipes flowing 7/24 full.
2. For rainfall rates other than those listed, determine the allowable roof area by dividing the area given in the 1 inch/hour (25 mm/hour) column by the desired rainfall rate.
3. Vertical piping may be round, square, or rectangular. Square pipe shall be sized to enclose its equivalent round pipe. Rectangular pipe shall have at least the same cross-sectional area as its equivalent round pipe, except that the ratio of its side dimensions shall not exceed 3 to 1.

TABLE 11-2
Sizing of Horizontal Rainwater Piping^{1,2}

Size of Pipe, Inches	Flow a 1/8 in./ft. Slope, gmp	Maximum Allowable Horizontal Projected Roof Areas Square Feet at Various Rainfall Rates						
		1 in./h	2 in./h	3 in./h	4 in./h	5 in./h	6 in./h	8 in./h
3	34	3288	1,644	1,096	822	657	548	<u>411</u>
4	78	7,520	3,760	2,506	1,880	1,504	1,253	<u>906</u>
5	139	13,360	6,680	4,453	3,340	2,672	2,227	<u>1,670</u>
6	222	21,400	10,700	7,133	5,350	4,280	3,566	<u>2,675</u>
8	478	46,000	23,000	15,330	11,500	9,200	7,670	<u>5,750</u>
10	860	82,800	41,400	27,600	20,700	16,580	13,800	<u>10,350</u>
12	1384	133,200	66,600	44,400	33,300	26,650	22,200	<u>16,650</u>
15	2473	238,000	119,000	79,333	59,500	47,600	39,650	<u>29,750</u>

Size of Pipe, Inches	Flow a 1/4 in./ft. Slope, gmp	Maximum Allowable Horizontal Projected Roof Areas Square Feet at Various Rainfall Rates						
		1 in./h	2 in./h	3 in./h	4 in./h	5 in./h	6 in./h	8 in./h
3	48	4,640	2,320	1,546	1,160	928	773	<u>580</u>
4	110	10,600	5,300	3,533	2,650	2,120	1,766	<u>1,325</u>
5	196	18,880	9,440	6,293	4,720	3,776	3,146	<u>2,360</u>
6	314	30,200	15,100	10,066	7,550	6,040	5,033	<u>3,775</u>
8	677	65,200	32,600	21,733	16,300	13,040	10,866	<u>8,150</u>
10	1214	116,800	58,400	38,950	47,000	23,350	19,450	<u>14,600</u>
12	1953	188,000	94,000	62,600	47,000	37,600	31,350	<u>23,500</u>
15	3491	336,000	168,000	112,000	84,000	67,250	56,000	<u>43,000</u>

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Size of Pipe, Inches	Flow a 1/2 in./ft. Slope, gmp	Maximum Allowable Horizontal Projected Roof Areas Square Feet at Various Rainfall Rates						
		1 in./h	2 in./h	3 in./h	4 in./h	5 in./h	6 in./h	8 in./h
3	68	6,576	3,288	2,192	1,644	1,310	1,096	<u>822</u>
4	156	15,040	7,520	5,010	3,760	3,010	2,500	<u>1,880</u>
5	278	26,720	13,360	8,900	6,680	5,320	4,450	<u>3,340</u>
6	445	42,800	21,400	14,267	10,700	8,580	7,140	<u>5,350</u>
8	956	92,000	46,000	30,650	23,000	18,400	15,320	<u>11,500</u>
10	1721	165,600	82,800	55,200	41,400	33,150	27,600	<u>20,700</u>
12	2768	266,400	133,200	88,800	66,600	53,200	44,400	<u>33,300</u>
15	4946	476,000	238,000	158,700	119,000	95,200	79,300	<u>59,500</u>

Notes:

1. The sizing data for horizontal piping are based on the pipes flowing full.
2. For rainfall rates other than those listed, determine the allowable roof area by dividing the area given in the 1 inch/hour (25 mm/hour) column by the desired rainfall rate.

CHAPTER 12
FUEL PIPING

1201.0 Scope of Gas Piping.

- (A) Coverage of piping systems shall extend from the point of delivery to the connections with each gas utilization device. For other than undiluted liquefied petroleum 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 shutoff valve where no meter is provided. For undiluted liquefied petroleum gas systems, the point of delivery shall be considered the outlet of the final pressure regulator, exclusive of the line gas regulators, in the system. [NFPA 54: 1.1.1.1(A)]
- (B) Piping systems requirements shall include design, materials, components, fabrications, assembly, installation, testing inspection, operation, and maintenance. [NFPA 54: 1.1.1.1(C)]
- (C) This code shall not apply to the following (reference standards for some of which appear in Appendix L [NFPA 54:1.1.1.2]):
- (1) Portable LP-Gas equipment of all types that is not connected to a fixed fuel piping system.
 - (2) Installation of farm equipment such as brooders, dehydrators, dryers, and irrigation equipment.
 - (3) Raw material (feedstock) applications, except for piping to special atmosphere generators.
 - (4) **Reserved.** ~~Oxygen fuel gas cutting and welding systems.~~
 - (5) **Reserved.** ~~Industrial gas applications using gases such as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen, and nitrogen.~~
 - (6) Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms, and natural gas processing plants.
 - (7) Large integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by chemical reactions or used in chemical reactions.
 - (8) LP-Gas installations at utility gas plants.
 - (9) Liquefied natural gas (LNG) installations.
 - (10) Fuel gas piping in ~~power and~~ atomic energy plants.
 - (11) Proprietary items of equipment, apparatus, or instruments such as gas-generating sets, compressors, and calorimeters.
 - (12) LP-Gas equipment for vaporization, gas mixing, and gas manufacturing.

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- (13) LP-Gas piping for buildings under construction or renovations that are not to become part of the permanent building piping system—that is, temporary fixed piping for building heat.
- (14) Installation of LP-Gas systems for railroad switch heating.
- (15) Installation of LP-Gas and compressed natural gas systems on vehicles.
- (16) Gas piping, meters, gas-pressure regulators, and other appurtenances used by the serving gas supplier in distribution of gas, other than undiluted LP-Gas.
- (17) This chapter shall not be applicable to liquid petroleum gas facilities regulated by the Railroad Commission of Texas pursuant to Chapter 113 of the Texas Natural Resources Code.

(D) All fuel oil facilities and piping shall conform to the requirements of Article 79 of the City of Houston Fire Code.

1201.1 Gas Tests.

A permit shall be required for all gas tests. Gas systems shall require a complete test and inspection in the following circumstances:

- (1) During rough inspection and before startup of new installations.
- (2) Before resumption of use of a system where service has been interrupted for more than 365 days for any reason.
- (3) Before resumption of use of a system where service has been interrupted for any period of time because of one or more leaks or a fire.
- (4) When the system was found to be unsafe by the serving gas supplier or the Authority Having Jurisdiction.
- (5) Where required by the City of Houston Fire Code.
- (6) Where service is not commenced within 180 days following a gas test.

1202.0 General.

The regulations of this chapter shall govern the installation of all fuel gas piping in or in connection with any building or structure or within the property lines of any premises ~~up to 5 psi,~~ other than service pipe. Fuel oil piping systems shall be installed in accordance with NFPA 31.

Exception: Gas piping, meters, gas-pressure regulators, and other appurtenances used by the serving gas supplier in distribution of gas, other than undiluted LP-Gas [NFPA 54: 1.1.1.2(16)]

1204.3.1 Rough Piping Inspection.

This inspection shall be made after all gas piping authorized by the permit has been installed and before any such piping has been covered or concealed or any fixture or appliance has

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been attached thereto. This inspection shall include a determination that the gas-piping size, material, and installation meet the requirements of this code. This inspection shall also include a pressure test. The gas piping shall pass an air pressure test of 25 psi for a period of fifteen (15) minutes with no perceptible drop.

Exception: For metal welded piping, and for piping carrying gas at pressure in excess of fourteen (14) inches (0.4 m) water column pressure, the test pressure shall be not less than one hundred (100) psi (689 kPa) for thirty (30) minutes. These tests shall be made using air, CO₂, or nitrogen pressure only and shall be made in the presence of the inspector. All necessary apparatus for conducting tests shall be furnished by the permit holder.

1204.4 In cases where the work authorized by the permit consists of a minor installation of additional piping to piping already connected to a gas meter, the foregoing inspections may be waived at the discretion of the Authority Having Jurisdiction. In this event, the Authority Having Jurisdiction shall make such inspection as deemed advisable in order to be assured that the work has been performed in accordance with the intent of this code. Small sections of piping may be soap tested in the presence of the Authority Having Jurisdiction when the Authority Having Jurisdiction has determined that a complete test is not required to preserve life safety.

1209.6.2 Location.

- (A) Gas meters shall be located in ventilated spaces readily accessible for examination, reading, replacement, or necessary maintenance. [NFPA 54: 5.7.2.1]
- (B) Gas meters shall not be placed where they will be subjected to damage, such as adjacent to a driveway; under a fire escape; in public passages, halls, or coal bins; or where they will be subject to excessive corrosion or vibration. [NFPA 54: 5.7.2.2]
- (C) Gas meters shall be located at least 3 feet (0.9 m) from sources of ignition; or air intakes. [NFPA 54:5.7.2.3]
- (D) Gas meters shall not be located where they will be subjected to extreme temperatures or sudden extreme changes in temperature. Meters shall not be located in areas where they are subjected to temperatures beyond those recommended by the manufacturer. [NFPA 54: 5.7.2.3]

1211.1.6 Piping Underground Beneath Buildings. Where the installation of gas piping underground beneath buildings is unavoidable, the piping shall be encased in an approved conduit designed to withstand the superimposed loads. [NFPA 54: 7.1.6] The conduit shall extend into a normally usable and accessible portion of the building and, at the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any gas leakage. Where the end sealing is of a type that will retain the full pressure of the pipe, the conduit shall be designed for the same pressure as the pipe. The conduit shall extend at least 4 inches (100 mm) outside the building, be vented above grade to the outside, and be installed so as to prevent the entrance

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of water and insects. [NFPA 54: 7.1.6.1] Pipe must be removable without causing damage to the structure. Sleeves for corrugated stainless steel piping may terminate within the building.

1211.1.7 Plastic Pipe.

(A) **Connection of Plastic Piping.** Plastic pipe shall be installed outside, underground only. [NFPA 54: 7.1.7.1]

Exception No. 1: Plastic pipe shall be permitted to terminate aboveground where an anodeless riser is used.

~~**Exception No. 2:** Plastic pipe shall be permitted to terminate with a wall head adapter aboveground in buildings, including basements, where the plastic pipe is inserted in a piping material permitted for use in buildings.~~

(B) Connections made outside and underground between metallic and plastic piping shall be made only with ASTM D 2513, *Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings, Category I transition fittings*. [NFPA 54: 7.1.7.2]

(C) An electrically continuous corrosion resistant tracer wire (minimum AWG 14 yellow) or tape shall be buried with the plastic pipe to facilitate locating. ~~One~~ Both ends shall terminate be brought above ground at a building wall or riser. [NFPA 54: 7.1.7.3]

1211.2.6 Hangers, Supports, and Anchors.

(A) Piping shall be supported with metal pipe hooks, ~~metal pipe straps, bands,~~ brackets, or hangers suitable for the size of piping; be of adequate strength and quality; and located at intervals so as to prevent or damp out excessive vibration. Piping shall be anchored to prevent undue strains on connected equipment and shall not be supported by other piping. Pipe hangers and supports shall conform to the requirements of ANSI/MSS SP-58, *Pipe Hangers and Supports - Materials, Design and Manufacture*. [NFPA 54: 7.2.6.1]

(B) Spacings of supports in gas-piping installations shall not be greater than shown in Table 12-3. Spacing of supports for CSST shall be in accordance with the CSST manufacturer's instruction. [NFPA 54: 7.2.6.2]

(C) Supports, hangers, and anchors shall be installed so as not to interfere with the free expansion and contraction of the piping between anchors. All parts of the supporting equipment shall be designed and installed so they will not be disengaged by movement of the supported piping. [NFPA 54: 7.2.6.3]

1211.3.2 Connections. Where gas piping is to be concealed, unions, tubing fittings, ~~right and left couplings,~~ bushings, swing joints, and compression couplings made by combinations of fittings shall not be used. Connections shall be of the following type: [NFPA 54: 7.3.2]

- (1) Pipe fittings such as elbows, tees, and couplings.
- (2) Joining tubing by brazing (see Section 1209.5.8.2).

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- (3) Fittings listed for use in concealed spaces that have been demonstrated to sustain, without leakage, any forces due to temperature expansion or contraction, vibration, or fatigue based on their geographic location, application, or operation.
- (4) Where necessary to insert fittings in gas pipe that has been installed in a concealed location, the pipe shall be reconnected by welding, flanges, or the use of right or left couplings ~~a ground joint union with the nut center punched to prevent loosening by vibration.~~

1211.3.5 Piping in Floors. In industrial occupancies, gas piping in solid floors such as concrete shall be laid in channels in the floor and covered to permit access to the piping with a minimum of damage to the building. Where piping in floor channels could be exposed to excessive moisture or corrosive substances, the piping shall be protected in an approved manner. [NFPA 54: 7.3.5.1]

~~**Exception:** In other than industrial occupancies and where approved by the Authority Having Jurisdiction, gas piping embedded in concrete floor slabs constructed with portland cement shall be surrounded with a minimum of 1 1/2 inches (38 mm) of concrete and shall not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. All piping, fittings, and risers shall be protected against corrosion in accordance with Section 1209.5.6. Piping shall not be embedded in concrete slabs containing quick-set additives or cinder aggregate. [NFPA 54: 7.3.5.2]~~

1211.14 Electrical Bonding and Grounding.

1211.14.1 Pipe and Tubing other than CSST. ~~(A)~~ Each aboveground portion of a gas piping system other than CSST that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping other than CSST shall be considered to be bonded when it is connected to ~~gas utilization equipment appliances~~ that is are connected to the ~~equipment grounding appliance grounding~~ conductor of the circuit supplying that ~~equipment appliance~~. [NFPA 54: 7.13.1]

1211.14.2 CSST gas piping systems shall be bonded to the electrical service grounding electrode system at the point where the gas service enters the building. The bonding jumper shall be not smaller than (6) AWG copper wire. [NFPA 54-09:7.13.2]

~~(B)~~ **1211.14.3** CSST Gas piping shall not be used as a grounding conductor or electrode. [NFPA 54-09:7.13.3] [NFPA 54: 7.13.2] This does not preclude the bonding of metallic piping to a grounding system.

1211.14.4 Where a lightning protection system is installed, the bonding of the gas piping system shall be in accordance with NFPA 780, *Standard for Installation of Lightning Protection Systems*. [NFPA 54-09:7.13.4]

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1212.1 Connecting Gas Equipment. Gas utilization equipment shall be connected to the building piping in compliance with Sections 1212.4 and 1212.5 by one of the following: [NFPA 54: 9.6.1]

- (1) Rigid metallic pipe and fittings.
- (2) Semirigid metallic tubing and metallic fittings. Aluminum alloy tubing shall not be used in exterior locations.
- (3) Listed flexible gas connectors in compliance with ANSI Z21.24, *Standard for Connectors for Gas Appliances*. The connector shall be used in accordance with the terms of their listing that are completely in the same room as the equipment.
- (4) CSST where installed in accordance with the manufacturer's instructions.
- (5) Listed nonmetallic gas hose connectors in accordance with 1212.2.
- (6) Gas-fired food service (commercial cooking) equipment listed for use with casters or otherwise subject to movement for cleaning, and other large and heavy gas utilization equipment that can be moved, shall be connected in accordance with the connector manufacturer's installation instructions using a listed appliance connector complying with ANSI Z21.69, *Standard for Connectors for Movable Gas Appliances*. [NFPA 54: 9.6.1.1]
- (7) Movement of appliances with casters shall be limited by a restraining device installed in accordance with the connector and appliance manufacturer's installation instructions. [NFPA 54- 09:9.6.1.2]
- (8) In 1212.1(2), (3), and (5), the connector or tubing shall be installed so as to be protected against physical and thermal damage. Aluminum alloy tubing and connectors shall be coated to protect against external corrosion where they are in contact with masonry, plaster, or insulation or are subject to repeated wettings by such liquids as water (except rain water), detergents, or sewage.

1214.0 Pressure Testing and Inspection.

1214.6 Purging Requirements. The purging of piping shall be in accordance with Sections 1214.6.1 through 1214.6.10.

1214.6.1 Piping Systems Required to be Purged Outdoors. The purging of piping systems shall be in accordance with Sections 1214.6.1 through 1214.6.5 where the piping system meets either of the following:

1. The design operating gas pressure is greater than 2 psig (14 kPa).
2. The piping being purged contains one or more sections of pipe or tubing greater than 2 inches and exceeding the lengths in Table 12-5.

1214.6.1-2 Removal From Service. ~~When~~ Where gas piping is ~~to be~~ opened for servicing, addition, or modification, the section ~~to be worked on that is opened~~ shall be turned off isolated from the gas supply ~~at the nearest convenient point~~ and the line pressure vented ~~to the outdoors or to ventilated areas of sufficient size to prevent accumulation of flammable mixtures~~ in accordance with Section 1214.6.4. ~~Where gas piping meeting the criteria of~~

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Table 12-5 is removed from service, the residual fuel ~~The remaining gas in this section of piping shall be displaced with an inert gas as required by Table 12-5.~~ [NFPA 54: 8.3.1.1]

TABLE 12-5
Size and Length of Piping Requiring Purging with Inert Gas for Servicing or Modification
 [NFPA 54: Table 8.3.1.1]

Nominal Pipe Size (in.)	Length of Piping (ft.)
2 ½	> 50
3	> 30
4	> 15
6	> 10
--8 or larger	Any length

For SI units: 1 ft = 304.8 mm.

1214.6.23 Placing in Operation. ~~When~~ Where piping ~~full of containing air and meeting the criteria of Table 12-5 is placed in operation, the air in the piping shall be displaced with fuel an inert gas, in accordance with Section 1214.6.4 except where such piping is required by Table 12-6 to be purged with an inert gas prior to introduction of fuel gas. The air can be safely displaced with fuel gas provided that a moderately rapid and continuous flow of fuel gas is introduced at one end of the line and air is vented out at the other end. The fuel gas flow shall be continued without interruption until the vented gas is free of air. The point of discharge shall not be left unattended during purging. After purging, the vent shall then be closed. Where required by Table 12-6, the air in the piping shall first be displaced with an inert gas, and the inert gas shall then be displaced with fuel gas.~~ [NFPA 54: 8.3.1.2]

TABLE 12-6
Length of Piping Requiring Purging with Inert Gas Before Placing in Operation
 [NFPA 54: Table 8.3.2]

Nominal Pipe Size (in.)	Length of Piping (ft.)
3	> 30
4	> 15
6	> 10
8 or larger	Any length

For SI units: 1 ft = 305 m

1214.6.34 Outdoor Discharge of Purged Gases. ~~The open end of a piping systems being pressure vented or purged shall not discharge into confined spaces or areas where there are sources of ignition unless precautions are taken to perform this operation in a safe manner by ventilation of the space, control of purging rate, and elimination of all hazardous conditions directly to an outdoor location. Purging operations shall comply with all of the following requirements:~~

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1. The point of discharge shall be controlled with a shutoff valve.
2. The point of discharge shall be located at least 10 feet (3 m) from sources of ignition, at least 10 feet (3 m) from building openings and at least 25 feet (7.6 m) from mechanical air intake openings.
3. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with Section 1214.5.
4. Purging operations introducing fuel gas shall be stopped when 90 percent fuel gas by volume is detected within the pipe.
5. Persons not involved in the purging operations shall be evacuated from all areas within 10 feet (3 m) of the point of discharge.

[NFPA 54: 8.3.1.3]

1214.6.5 Combustible Gas Indicator. The combustible gas indicator used during purging operations shall be listed and shall be calibrated in accordance with the manufacturer's instructions and recommended schedule. The combustible gas indicator used for pipe discharge monitoring shall numerically display a volume scale from 0% to 100% with a resolution of not greater than 1% increments.

1214.6.6 Piping Systems Allowed to Be Purged Indoors or Outdoors. The purging of piping systems shall be in accordance with the provisions of Section 1214.6.7 where the piping system meets both of the following:

1. The design operating pressure is 2 psig (14 kPa) or less.
2. The piping system being purged is constructed entirely from pipe or tubing of 2-in. nominal size or smaller, or larger pipe or tubing with lengths shorter than specified in Table 12-5.

1214.6.7 Purging Procedure. The piping system shall be purged in accordance with one or more of the following:

1. The piping shall be purged with fuel gas and shall discharge to the outdoors.
2. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.
3. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.
4. The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with Section 1214.6.8. Purging shall be stopped when fuel gas is detected.
5. The piping shall be purged by the gas supplier in accordance with written procedures.

1214.6.8 Combustible Gas Detector. The combustible gas detector used during purging operations shall be listed and shall be calibrated or tested in accordance with the

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manufacturer's instructions and recommended schedule. The combustible gas detector used for pipe discharge monitoring shall indicate the presence of fuel gas.

1214.6.9 Purging Appliances and Equipment. After the piping system has been placed in operation, appliances and equipment shall be purged before being placed into operation.

1214.6.410 Placing Equipment in Operation. After the piping has been placed in operation, all equipment shall be purged and then placed in operation, as necessary. [NFPA 54: 8.3.1.4]

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Use 2009 reference chapter dates for NFPA

CHAPTER 13

HEALTH CARE FACILITIES AND MEDICAL GAS AND VACUUM SYSTEMS

Part I – Special Requirements for Health Care Facilities.

1302.1 The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper operation, testing, and maintenance of the medical gas and vacuum systems. Copies of the manufacturer's instructions shall be left with the system owner. [NFPA 99-~~5.1.10.6.9.1, 5.1.10.6.9.2, 5.1.10.10.9.1, 5.1.10.6.9.3~~ 5.1.10.10.9.3]

1302.2 The installation of medical gas and vacuum systems shall be made by qualified, competent technicians who are experienced in making such installations. Installers of medical gas and vacuum systems shall meet the requirements of ANSI/ASSE Standard 6010, *Professional Qualification Standard for Medical Gas and Vacuum System Installers*. [NFPA 99 ~~5.1.10.6.11.1, 5.1.10.10.11.1 – 5.1.10.6.11.2~~ 5.1.10.10.11.2]

1302.3 Brazing shall be performed by individuals who are qualified under the provisions of Section 1311.6. [NFPA 99-~~5.1.10.6.11.3~~ 5.1.10.10.11.3]

1302.4 Prior to any installation work, the installer of medical gas and vacuum piping shall provide and maintain documentation on the job site for the qualification of brazing procedures and individual brazers that is required under Section 1311.6. [NFPA 99-~~5.1.10.6.11.4~~ 5.1.10.10.11.4]

1303.2 Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be protected. [NFPA 99 ~~5.1.10.6.2.1~~ 5.1.10.10.2.1]

1304.0 Psychiatric Patient Rooms.

Piping and drain traps in psychiatric patient rooms shall be concealed. Fixtures and fittings shall be resistant to vandalism. [~~NFPA 101~~]

1305.0 Locations for Ice Storage.

Ice makers or ice storage containers shall be located in nursing stations or similarly supervised areas to minimize potential contamination. [~~See NFPA 101~~]

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1309.1 The provisions herein shall apply to the installation, testing, and verification of medical gas and vacuum piping in hospitals, clinics, dental facilities, and other health care facilities.

1309.4 This chapter does not apply to portable compressed gas systems. [~~NFPA 99-4-1.3~~]

1309.7 An existing system that is not in strict compliance with the provisions of the standard (Code) shall be permitted to be continued in use as long as the Authority Having Jurisdiction has determined that such use does not constitute a distinct hazard to life. [~~NFPA 99-4-1.4:5.1.1.4~~] (~~Same as the 2002 edition of NFPA 99 5.1.1.3.~~)

1310.2 Critical Care Area – Those special care units, intensive care units, coronary care units, angiography laboratories, cardiac catheterization laboratories, delivery rooms, operating rooms, postanesthesia recovery rooms, emergency departments, and similar areas in which patients are intended to be subjected to invasive procedures and connected to line-operated, patient-care-related electrical appliances. [~~NFPA 99-3.3.135.2:3.3.138.1~~]

1310.3 General Care Areas – General care areas are patient bedrooms, examining rooms, treatment rooms, clinics, and similar areas in which it is intended that the patient will come in contact with ordinary appliances such as a nurses-call system, electric beds, examining lamps, telephones, and entertainment devices. [~~NFPA 99-2-2:3.3.138.2~~]

1310.4 Manifold – A device for connecting outlets of one (1) or more gas cylinders to the central piping system for that specific gas. [~~NFPA 99-2-2:3.3.103~~]

1310.5 Medical Air – For purposes of this standard, medical air is air supplied from cylinders, bulk containers, medical air compressors, or has been reconstituted from oxygen USP and oil-free, dry nitrogen NF. Medical air shall be required to have the following characteristics [~~NFPA 99:3.3.106~~]:

- (1) Be supplied from cylinders, bulk containers, medical air compressor sources, or be reconstituted from oxygen USP and oil-free dry nitrogen NF.
- (2) Meet the requirements of medical air USP.
- (3) Have no detectable liquid hydrocarbons.
- (4) Have less than 25 ppm gaseous hydrocarbons.
- (5) Have equal to or less than 5 mg/m³ of permanent particulates sized 1 micron or larger in the air at normal atmospheric pressure. [~~NFPA 99-3.3.106;5.1.3.5.1 (1)-(5)~~]

1310.10 Patient Care Area – Any portion of a health care facility wherein patients are intended to be examined or treated. [~~NFPA 99-2-2:3.3.138~~]

1310.13 SCFM – Standard cubic feet per minute. [~~NFPA 99-3.3.159:3.3.163~~]

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1310.16 Station Outlet – An inlet point in a piped medical/surgical vacuum distribution system at which the user makes connections and disconnections. [NFPA ~~3.3.167~~:3.3.172]

1310.17 Use Point – A room or area of a room where medical gases are dispensed to a single patient for medical purposes. A use point is permitted to be comprised of a number of station outlets of different gases. [NFPA ~~99-2-2~~:3.3.180]

1310.19 Vacuum System – Level 1 – A system consisting of central vacuum-producing equipment with pressure and operating controls, shutoff valves, alarm warning systems, gauges, and a network of piping extending to and terminating with suitable station inlets at locations where patient suction could be required. [NFPA ~~99-2-2~~:3.3.91]

1310.25 Waste Anesthetic Gas Disposal – The process of capturing and carrying away gases vented from the patient breathing circuit during the normal operation of gas anesthesia or analgesia equipment. [NFPA ~~99-3.3.178~~:3.3.184]

1311.1.2 Materials used in central supply systems shall meet the following requirement [NFPA ~~99:5.1.3.4.4~~]:

In those portions of systems intended to handle oxygen or nitrous oxide at gauge pressures of less than 2,070 kPa (300 psi), material construction shall be compatible with oxygen under the temperatures and pressures to which the components can be exposed in the containment and use of oxygen, nitrous oxide, mixtures of these gases, or mixtures containing more than 23.5 percent oxygen. [NFPA ~~99-5.1.3.4.3 (2)~~:5.1.3.4.4(1), (2)]

1311.2 Certification of medical gas and medical vacuum systems shall conform to the requirements of Section 1328.0 of this code, the Authority Having Jurisdiction, and NFPA 99, *Standard for Health Care Facilities* Section 5.1.12 [~~NFPA 5.1.12~~].

1311.3 Prior to any installation work, the installer of medical gas and vacuum piping shall provide and maintain documentation on the job site for the qualification of brazing procedures and individual brazers that are required under Section 1311.6. [NFPA ~~99 5.1.10.6-11.4~~:5.1.10.10.11.4]

1311.4 All medical gas and medical vacuum systems shall be supplied from a source consisting of at least two (2) units – primary and secondary, e.g., a manifold consisting of two (2) cylinder banks with ~~at least~~ not less than two (2) cylinders in each bank, ~~a minimum of~~ not less than two (2) air compressors, or ~~a minimum of~~ not less than two (2) vacuum pumps. However, two (2) supply pipelines are not required.

~~1311.5 Health Care Organization personnel shall be permitted to install piping systems if all the requirements of this chapter are met during installation. [NFPA 99 4 3.1.2.10(b)]~~ Piping and installation procedures shall comply with NFPA 99C, latest edition, as adopted by the Texas Department of Health.

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1311.6 Brazing procedures and brazer performance for the installation of medical gas and vacuum piping shall be qualified in accordance with either *Section IX, Welding and Brazing Qualifications*, of the ASME Boiler and Pressure Vessel Code, or AWS B2.2, *Standard for Brazing Procedure and Performance Qualifications*, both as modified below. [NFPA ~~5.1.10.6.12.1~~99:5.1.10.10.12.1]

1311.6.1 Brazers shall be qualified by visual examination of the test coupon followed by sectioning. [NFPA ~~5.1.10.6.12.2~~99:5.1.10.10.12.2]

1311.6.2 The Brazing Procedure Specification (BPS) shall address cleaning, joint clearance, overlap, internal purge gas purge gas flow rate, and filler metal. [NFPA 99~~4-3.1.2.12(b)~~:5.1.10.10.12.3]

1311.6.3 The brazing procedure specification and the record of brazer performance qualification shall document filler metal used, cleaning, joint clearance, overlap, internal purge gas, and flow rate during brazing of coupon, and the absence of internal oxidation in the completed coupon. [NFPA ~~5.1.10.6.12.4~~ 99:5.1.10.10.12.4]

1311.6.4 Brazing procedures qualified by a technically competent group or agency shall be permitted under the following conditions:

- (1) The brazing procedure specification and the procedure qualification record meets the requirements of this standard.
- (2) The employer obtains a copy of both the brazing procedure specification and the supporting qualification records from the group or agency and signs and dates these records, thereby accepting responsibility for the qualifications that were performed by the group or agency.
- (3) The employer qualifies at least one brazer following each brazing procedure specification used. [NFPA ~~5.1.10.6.12.5~~ 99:5.1.10.10.12.5]

1311.6.5 An employer shall be permitted to accept brazer qualification records of a previous employer under the following conditions:

- (1) The brazer has been qualified following the same or an equivalent procedure that the new employer uses.
- (2) The new employer obtains a copy of the record of brazer performance qualification tests from the previous employer and signs and dates these records, thereby accepting responsibility for the qualifications performed by the previous employer. [NFPA 99 ~~5.1.10.6.12.6~~:5.1.10.10.12.6]

1311.6.6 Performance qualifications of brazers shall remain in effect indefinitely unless the brazer does not braze with the qualified procedure for a period exceeding six months, or there is a specific reason to question the ability of the brazer. [NFPA 99 ~~5.1.10.6.12.7~~:5.1.10.10.12.7]

1316.0 Materials. The provisions of this section apply to the field-installed piping for the distribution of medical piped gases. [NFPA ~~4-3.1.2.7~~]

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~~**1316.1** Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service by the manufacturer prior to installation in accordance with CGA 4.1, *Cleaning Equipment for Oxygen Service*, except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer. [NFPA 99: 5.1.10.1.1]~~

~~**1316.2** Each length of tube shall be delivered plugged or capped by the manufacturer and kept sealed until prepared for installation. Fittings, valves, and other components shall be delivered sealed, labeled, and kept sealed until prepared for installation. [NFPA 99: 5.1.10.1.2, 5.1.10.1.3]~~

1316.3 1 Tubes shall be hard-drawn seamless copper ASTM B 819 medical gas tube, Type L, except that where operating pressures are above a gauge pressure of one-hundred and eighty-five 185 psi (1,275 kPa (~~185 psi~~), Type K shall be used for sizes exceeding larger than DN80 (NPS 3) (3-1/8 in. O.D.).

ASTM B 819 medical gas tube shall be identified by the manufacturer's markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in blue (Type L) or green (Type K). [NFPA 99:5.1.10.1.4, 5.1.10.1.5]

Piping for vacuum systems shall be constructed of any of the following:

(1) Hard-drawn seamless copper tube:

- (a) ASTM B 88, *Standard Specification for Seamless Copper Water Tube*, copper tube (Types K, L, M).
- (b) ASTM B 280, *Standard Specification for Seamless Copper Tubing for Air Conditioning and Refrigeration Field Service*, copper ACR tube.
- (c) ASTM B 819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, copper medical gas tubing (Type K or L).

(2) Stainless steel tube [NFPA 99:5.1.10.2.1]:

Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures.

Mains and branches in medical gas-piping systems shall be not less than DN15 (NPS 1/2) (5/8 in. O.D.) size.

Mains and branches in medical-surgical vacuum systems shall be not less than DN20 (NPS 3/4) (7/8 in. O.D.) size.

Drops to individual station outlets and inlets shall be not less than DN15 (NPS 1/2) (5/8 in. O.D.) size.

Runouts to alarm panels and connecting tubing for gauges and alarm devices shall be permitted to be DN8 (NPS 1/4) (3/8 in. O.D.) size. [NFPA 99 ~~5.1.10.1.4, 5.1.10.1.5, 5.1.10.10.1:5.1.10.10.1.1 – 5.1.10.10.1.5~~]

1316.42 Turns, offsets, and other changes in direction in welded or brazed medical gas and vacuum piping shall be made with wrought-copper capillary fittings complying with ASME B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings*, or brazed fittings complying with ASME B16.50, *Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings*. [NFPA 99:5.1.10.3.1]

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1316.42.1 Cast-copper alloy fittings shall not be permitted. [NFPA 99:5.1.10.3.2]

1316.42.2 Branch connections in vacuum piping systems shall be permitted to be made using mechanically formed, drilled, and extruded tee-branch connections that are formed in accordance with the tool manufacturer's instructions and brazed. [NFPA ~~5.1.10.3.1, 5.1.10.3.2, 99:5.1.10.3.3, 5.1.10.5.8 (4)-(7)~~]

1316.53 The following special fittings shall be permitted to be used in lieu of brazed joints:

- (1) Memory-metal couplings having temperature and pressure ratings joints not less than that of a brazed joint.
- (2) Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint.
- (3) Dielectric fittings where required by the manufacturer of special medical equipment to electrically isolate the equipment from the piping distribution system.
- (4) Axially swaged, elastic strain preload fittings providing metal to metal seal having pressure and temperature ratings not less than that of a brazed joint and, when complete, are permanent and nonseparable.

1316.64 The following joints shall be prohibited throughout medical gas and vacuum distribution pipeline systems:

- (1) Flared and compression-type connections, including connections to station outlets and inlets, alarm devices, and other components.
- (2) Other straight-threaded connections, including unions.
- (3) The use of pipe-crimping tools to permanently stop the flow. [NFPA 99:5.1.10.8]

1316.64.1 Threaded joints in medical gas and vacuum distribution piping shall meet the following requirements:

- (1) Be limited to connections to pressure/ vacuum indicators, alarm devices, and source equipment.
- (2) Be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpose*.
- (3) Be made up with polytetrafluoroethylene (such as Teflon™) tape or other thread sealant recommended for oxygen service, with the sealant applied to the male threads only. [NFPA 99 ~~5.1.10.5.8, 5.1.10.5.9 and 5.1.10.4~~]

1316.75 New or replacement shutoff valves shall be as follows:

- (1) Quarter turn, full ported ball type.
- (2) Brass or bronze construction.
- (3) Have extensions for brazing.
- (4) Have a handle indicating open or closed.
- (5) Consist of three pieces permitting in-line serviceability. [NFPA 99 5.1.4.3]

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1316.86 Soldered joints in copper Level 3 vacuum and Level 3 gas-powered systems piping shall be made in accordance with ASTM B 828, *Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings*, using a lead-free solder filler metal containing not more than 0.2 percent lead by volume. [NFPA ~~5.1.10.2.1, 5.1.10.4, and~~ 99:5.3.10.5]

1318.1 Piping shall be protected against freezing, corrosion, and physical damage. [NFPA 99:5.1.10.10.2]

Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be protected. [NFPA 99:5.1.10.10.2.1]

Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit. [NFPA ~~99:5.1.10.6.2~~ 5.1.10.10.2.2]

1318.2 Piping risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.

Piping shall not be installed in kitchens, elevator shafts, elevator machine rooms, areas with open flames, electrical service equipment ~~over~~ exceeding 600 volts, and areas prohibited under NFPA 70, National Electrical Code, except for the following locations:

- (1) Room locations for medical air compressor supply systems and medical-surgical vacuum pump supply systems.
- (2) Room locations for secondary distribution circuit panels and breakers having a maximum voltage rating of 600 volts.

Medical gas piping shall be permitted to be installed in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping ~~is limited to~~ shall not exceed 130°F (54°C) ~~maximum~~.

Medical gas piping shall not be located where subject to contact with oil, including a possible flooding area in the case of a major oil leak. [NFPA 99:5.1.10.10.3]

1318.3 Buried piping outside of buildings shall be installed below the local level of frost penetration. [NFPA 99:5.1.10.10.5.1]

1318.4 The installation procedure for underground piping shall protect the piping from physical damage while being backfilled. [NFPA 99:5.1.10.10.5.2]

If underground piping is protected by a conduit, cover, or other enclosure, the following requirements shall be met [NFPA 99:5.1.10.10.5.3]:

- (1) Access shall be provided at the joints for visual inspection and leak testing.
- (2) The conduit, cover, or enclosure shall be self-draining and not retain groundwater in prolonged contact with the pipe.

Buried piping that will be subject to surface loads shall be buried at a depth that will protect the piping and its enclosure from excessive stresses. [NFPA 99:5.1.10.10.5.4]

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The minimum backfilled cover above the top of the pipe or its enclosure for buried piping outside of buildings shall be 36 inches (900 mm), except that the minimum cover shall be permitted to be reduced to 18 inches (450 mm) where physical damage is otherwise prevented. [NFPA 99:5.1.10.10.5.5]

Trenches shall be excavated so that the pipe enclosure has firm, substantially continuous bearing on the bottom of the trench. [NFPA 99:5.1.10.10.5.6]

Backfill shall be clean and compacted so as to protect and uniformly support the pipe enclosure. [NFPA 99:5.1.10.10.5.7]

A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. [NFPA 99:5.1.10.10.5.8]

A continuous warning means shall also be provided above the pipeline at approximately one-half (1/2) the depth of bury. [NFPA 99:5.1.10.10.5.9]

Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of groundwater into the building. [NFPA 99 5.1.10.6.5:5.1.10.10.5.10]

1318.5 Hose and flexible connectors, both metallic and nonmetallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure, with a gauge pressure of 6,895 kPa (1,000 psi). [NFPA 99 5.1.10.6.7 99:5.1.10.10.7.1 –5.1.10.10.7.2]

1318.6 Where a positive-pressure medical gas piping distribution system, originally used or constructed for the use at one (1) pressure and for one (1) gas, is converted for operation at another pressure or for another gas, ~~all~~ the provisions of NFPA 5.1.10 shall apply as if the system were new. [NFPA 99:5.1.10.10.10.1]

A vacuum system shall not be permitted to be converted for use as a gas system. [NFPA 99 5.1.10.6.10:5.1.10.10.10.2]

1318.7 Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be protected. [NFPA 99:5.1.10.10.2.1]

1318.8 Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports - Selection and Application*. [NFPA 99:5.1.10.10.4.1]

Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports - Materials, Design, and Manufacture*. [NFPA 99:5.1.10.10.4.2]

Hangers for copper tube shall have a copper finish and be sized for copper tube. [NFPA 99:5.1.10.10.4.3]

In potentially damp locations, copper tube hangers or supports that are in contact with the tube shall be plastic-coated or otherwise be insulated from the tube. [NFPA 99:5.1.10.10.4.4]

Maximum support spacing shall be in accordance with Table 13-7. [NFPA Table 5.1.10.6.4.5 99:Table 5.1.10.10.4.5]

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1318.9 Where required, medical gas and vacuum piping shall be seismically restrained against earthquakes in accordance with the applicable building code. [NFPA 99 ~~5.1.10.6.4.6~~:5.1.10.10.4.6] Seismic considerations shall conform to the requirements of this code and the Authority Having Jurisdiction.

1318.10 Two (2) or more medical gas-piping systems shall not be interconnected for testing or any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system. [NFPA 99 ~~4-3.1.2.10(d)~~:5.1.10.10.8.1 – 5.1.10.10.8.2]

1318.11 Piping shall be labeled by stenciling or adhesive markers that identify the patient medical gas, the support gas, or vacuum system, and include:

- (1) The name of the gas/vacuum system or the chemical symbol per NFPA 99 Table 5.1.11.
- (2) The gas or vacuum system color code per NFPA 99 Table 5.1.11.
- (3) Where positive-pressure gas piping systems operate at pressures other than the standard gauge pressure in NFPA 99 Table 5.1.11, the pipe labeling shall include the operating pressure in addition to the name of the gas. [NFPA 99:5.1.11.1.1]

1319.6 When being brazed, joints shall be continuously purged with oil-free, dry nitrogen NF to prevent the formation of copper oxide on the inside surfaces of the joint. [NFPA 99:5.1.10.5.5.1]

The source of the purge gas shall be monitored, and the installer shall be audibly alerted when the source content is low. [NFPA 99:5.1.10.5.5.2]

The purge gas flow rate shall be controlled by the use of a pressure regulator and flow meter or combination thereof. [NFPA 99 ~~5.1.10.5.5.4~~:5.1.10.5.5.3]

Pressure regulators alone shall not be used to control purge gas flow rates. [NFPA 99:5.1.10.5.5.4]

In order to ensure that all ambient air has been removed from the pipeline prior to brazing, an oxygen analyzer shall be used to verify the effectiveness of the purge. The oxygen analyzer shall read below 1 percent oxygen concentration before brazing is to begin. [NFPA 99:5.1.10.5.5.5]

During and after installation, openings in the piping system shall be kept sealed to maintain a nitrogen atmosphere within the piping to prevent debris or other contaminants from entering the system. [NFPA 99:5.1.10.5.5.6]

While a joint is being brazed, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. [NFPA 99:5.1.10.5.5.7]

The flow of purge gas shall be maintained until the joint is cool to the touch. [NFPA 99:5.1.10.5.5.8]

After the joint has cooled, the purge discharge opening shall be sealed to prevent contamination of the inside of the tube and maintain the nitrogen atmosphere within the piping system. [NFPA 99:5.1.10.5.5.9]

The final connection of new piping to an existing, in-use pipeline shall be permitted to be made without the use of a nitrogen purge. [NFPA 99:5.1.10.5.5.10]

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After a final connection in a positive-pressure medical gas pipeline is made without a nitrogen purge, an outlet in the immediate downstream zone of the affected portions of both the new and existing in-use piping shall be tested in accordance with NFPA 99:5.1.12.3.9, Final Tie-In Test. [NFPA 99:5.1.10.5.5.11]

When using the autogenous orbital welding process, joints shall be continuously purged inside and outside with inert gas(es) in accordance with the qualified welding procedure. [NFPA 99:5.1.10.5.5.12]

1319.7 After brazing, the outside of all joints shall be cleaned by washing with water and a wire brush to remove any residue and permit clear visual inspection of the joint. [NFPA 99:5.1.10.5.7.1]

Where flux has been used, the wash water shall be hot. [NFPA 99:5.1.10.5.7.2]

Each brazed joint shall be visually inspected after cleaning the outside surfaces. [NFPA 99:5.1.10.5.7.3]

Joints exhibiting the following conditions shall not be permitted:

- (1) Flux or flux residue (when flux or fluxcoated BAg series rods are used with dissimilar metals).
- (2) Base metal melting or erosion.
- (3) Unmelted filler metal.
- (4) Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube.
- (5) Cracks in the tube or component.
- (6) Cracks in the brazed filler metal.
- (7) Failure of the joint to hold the test pressure under the installer-performed initial pressure test (~~1329.10-1327.10~~) and standing pressure test (~~Section-1329.11~~ 1327.11). [NFPA 99:5.1.10.5.7.4]

Brazed joints that are identified as defective under conditions 1319.7(2) or (5) shall be replaced. [NFPA 99:5.1.10.5.7.5]

Brazed joints that are identified as defective under Sections 1319.7(1), (3), (4), (6), or (7) shall be permitted to be repaired, except that no joint shall be reheated more than once before being replaced. [NFPA 99:5.1.10.5.7.6]

1320.7 Zone Valve. All station outlets/inlets shall be supplied through a zone valve as follows:

- (1) The zone valve shall be placed such that a wall intervenes between the valve and outlets/inlets that it controls.
- (2) The zone valve shall serve only outlets/inlets located on that same story. [NFPA 99:5.1.4.8]

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1323.1 Piping shall be labeled by stenciling or adhesive markers that identify the medical gas, support gas, or vacuum system and include:

- (1) The name of the gas/vacuum system or the chemical symbol per NFPA 99 Table 5.1.11.
- (2) The gas or vacuum system color code per NFPA 99 Table 5.1.11.
- (3) Where positive-pressure gas piping systems operate at pressures other than the standard gauge in NFPA 99 Table 5.1.11, the pipe labeling shall include the operating pressure in addition to the name of the gas. [NFPA 99:5.1.11.1]

Pipe labels shall be located as follows:

- (1) At intervals of not more than 20 ft (6,100 mm).
- (2) ~~At least~~ Not less than once in or above every room.
- (3) On both sides of walls or partitions penetrated by the piping.
- (4) ~~At least~~ Not less than once in every story height traversed /by risers. [NFPA 99:5.1.11.1.2]

1323.4 The shutoff valves described in Sections 1320.4, 1320.5, and 1320.6 shall be labeled to reflect the rooms that are controlled by such valves. Labeling shall be kept current from initial construction through acceptance. Valves shall be labeled in substance as follows:

In-line shutoff valves shall be labeled in substance as follows:

**CAUTION
(NAME OF MEDICAL GAS) VALVE
DO NOT CLOSE EXCEPT IN EMERGENCY
THIS VALVE CONTROLS SUPPLY TO...**

Source valves shall be labeled in substance as follows:

**SOURCE VALVE
FOR THE (SOURCE NAME).**

Main line valves shall be labeled in substance as follows:

**MAIN LINE VALVE FOR THE
(GAS/VACUUM NAME) SERVING THE (NAME OF BUILDING).**

Riser valve(s) shall be labeled in substance as follows:

**RISER FOR THE (GAS/VACUUM NAME)
SERVING (NAME OF THE AREA/BUILDING
SERVED BY THE PARTICULAR RISER).**

Service valve(s) shall be labeled in substance as follows:

**SERVICE VALVE FOR THE
(GAS/VACUUM NAME) SERVING
(NAME OF THE AREA/BUILDING
SERVED BY THE PARTICULAR VALVE).**

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[NFPA 99-5.1.11.2:5.1.11.2.6]

1324.0 Alarms. All master, area, and local alarm systems used for medical gas and vacuum systems shall include the following: [NFPA 99:5.1.9.1]

- (1) Separate visual indicators for each condition monitored, except as permitted for local alarms that are displayed on master alarm panels.
- (2) Visual indicators that remain in alarm until the situation that has caused the alarm is resolved.
- (3) A cancelable audible indication of each alarm condition that produces a sound with a minimum level of 80 dBA at 3 feet (920 mm).
- (4) A means to visually identify a lamp or LED failure.
- (5) Visual and audible indication that the wiring to an alarm initiating device is disconnected.
- (6) Labeling of each indicator, indicating the condition monitored.
- (7) Labeling of each alarm panel for its area of surveillance.
- (8) Re-initiation of the audible signal if another alarm condition occurs while the audible alarm is silenced.
- (9) Power for master and area alarms from the life safety branch of the emergency electrical system as described in Chapter 4, Electrical Systems.
- (10) Power for local alarms, dew point sensors, and carbon monoxide sensors permitted to be from the same essential electrical branch as is used to power the air compressor system.
- (11) Wiring from switches or sensors that is supervised or protected as required by Section 517.30(C)(3) of NFPA 70, National Electrical Code, for emergency system circuits.
- (12) Assurance by the responsible authority of the facility that the labeling of alarms, where room numbers or designations are used, is accurate and up-to-date.
- (13) Provisions for automatic restart after a power loss of 10 seconds (e.g., during generator startup) without giving false signals or requiring manual reset. [~~NFPA 99 5.1.9.1(1), (3), (4), (5), (6), (7)~~]

1326.2 The medical–surgical vacuum pumps shall exhaust in a manner and location that will minimize the hazards of noise and contamination to the facility and its environment.

The exhaust shall be located as follows:

- (1) Outdoors.
- (2) At least 10 feet (3,050 mm) from any door, window, air intake, or other openings in buildings.
- (3) At a level different from air intakes.

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- (4) Where prevailing winds, adjacent buildings, topography, or other influences that would not divert the exhaust into occupied areas or prevent dispersion of the exhaust.

The end of the exhaust shall be turned down and screened or otherwise be protected against the entry of vermin, debris, or precipitation by screening fabricated or composed of a noncorroding material.

The exhaust shall be piped of materials approved for medical–surgical vacuum piping under Section 1316.3 1 (Vacuum tubes).

The exhaust shall be free of dips and loops that might trap condensate or oil. Where such low points are unavoidable, a drip leg and valved drain shall be installed. [NFPA 99 5.1.3.6.7.1 - .5]

1326.4 Piping between vacuum pumps, discharges, receivers, and the vacuum main line valve shall be in accordance with Section 1316.4 3 except that stainless, galvanized, or black steel pipe shall be permitted to be used either black or galvanized. [NFPA 99:5.1.3.6.1.2(5)]

1327.2 ~~All~~ Systems that are breached and components that are subject to additions, renovations, or replacement (e.g., new gas sources: bulk, manifolds, compressors, dryers, alarms) shall be inspected and appropriately tested. [NFPA 99:5.1.12.1.3]

1327.2.1 Systems shall be deemed breached at the point of pipeline intrusion by physical separation or by system component removal, replacement, or addition. Breached portions of the systems subject to inspection and testing shall be confined to only the specific altered zone and components in the immediate zone or area that is located upstream for vacuum systems and downstream for pressure gases at the point or area of intrusion. [NFPA 99:5.1.12.1.4, 5.1.12.1.5]

1327.3 Advance Notice. It shall be the duty of the person doing the work authorized by the permit to notify the Authority Having Jurisdiction, orally or in writing, that said work is ready for inspection. ~~Such notification shall be given not less than twenty-four (24) hours before the work is to be inspected.~~

1327.8 Cross-Connection Test – Piped Gas Systems. It shall be determined that no cross connections exist between the various medical gas and vacuum piping systems. [NFPA 99:5.1.12.2.4]

~~All~~ Piping systems shall be reduced to atmospheric pressure. [NFPA 99:5.1.12.2.4.1]

Sources of test gas shall be disconnected from all piping systems except for the one (1) system being tested. [NFPA 99:5.1.12.2.4.2]

The system under test shall be charged with oil-free, dry nitrogen NF to a gauge pressure of fifty 50 psi (345 kPa). [NFPA 99:5.1.12.2.4.3]

After the installation of the individual faceplates with appropriate adapters matching outlet/inlet labels, each individual outlet/inlet in each installed medical gas and vacuum piping

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system shall be checked to determine that the test gas is being dispensed only from the piping system being tested. [NFPA 99:5.1.12.2.4.4]

1327.8.3 ~~All~~ Medical-surgical vacuum systems shall be in operation so that these vacuum systems are tested at the same time the medical gas systems are tested. The proper labeling and identification of system outlets/inlets shall be confirmed during these tests. [NFPA 99:5.1.12.2.4.6]

1327.9.1 After the piping system is filled with test gas, the supply valve and all outlets shall be closed and the source of test gas disconnected. Tests shall be conducted after the final installation of station outlet valve bodies, face plates, and other distribution system components (e.g., pressure alarm devices, pressure indicators, line pressure-relief valves, manufactured assemblies, hose, etc.). [NFPA 99:5.1.12.2.6.1]

The source valve shall be closed during this test. [NFPA99:5.1.12.2.6.2]

The piping systems shall be subjected to a twenty four (24)-hour standing pressure test using oil-free, dry nitrogen NF. [NFPA 99:5.1.12.2.6.3]

Test pressures shall be 20 percent above the normal system operating line pressure. [NFPA 99:5.1.12.2.6.4]

Leaks, if any, shall be located, repaired (if permitted), or replaced (if required), and retested. [NFPA 99-~~5.1.12.2.6.4~~-5.1.12.2.6.6]

At the conclusion of the tests, there shall be no change in the test pressure other than that attributed to changes of ambient temperature. [NFPA 99:5.1.12.2.6.5]

TABLE 13-7 Maximum Pipe Support Spacing

<editor's note: table remains unchanged>

[NFPA 99-~~5.1.10.6.4.1~~:5.1.10.10.4.5]

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CHAPTER 14 MANDATORY-REFERENCED STANDARDS

TABLE 14-1

Standards for Materials, Equipment, Joints and Connections

Where more than one standard has been listed for the same material or method, the relevant portions of all such standards shall apply.

Standard Number	Standard Title	Application
AHAM DW-1-2004 <u>2005*</u>	Household Electric Dishwashers	Appliances
AHAM DW 2PR 92	Plumbing Requirements for Household Dishwashers	Appliances
AHAM FWD-1-92-2005	Food Waste Disposers	Appliances
<u>APSP 1-2003*</u>	<u>Public Swimming Pools</u>	<u>Swimming Pools and Spas</u>
AHAM FWD 2PR 89	Household Food Waste Disposer Units	Appliances
ANSI A13.1 96 (R03)	Scheme for the Identification of Piping Systems	Piping
ANSI A21.10 2003	Ductile Iron and Gray Iron Fittings, 3 in. through 48 in. (75 mm through 1,200 mm), for Water and Other Liquids (same as AWWA C110)	Piping, Ferrous
ANSI A21.11 2000	Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings (same as AWWA C111)	Piping, Ferrous
ANSI A21.51 2002	Ductile Iron Pipe, Centrifugally Cast, for Water (same as AWWA C151)	Piping, Ferrous
ANSI A21.53 2000	Ductile Iron Compact fittings, 3 in. through 24 in. (76 mm through 610 mm) and 54 in. through 64 in. (1400 mm through 1600 mm), for Water Service (same as AWWA C153)	Piping, Ferrous
ANSI A118.10 99	Load, Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations	Fixtures
ANSI A137.1 88	Ceramic Tile	Miscellaneous
ANSI B2.1 90	Pipe Threads (Except Dryseal) (replaced by ASME B1.20.1 98)	Joints
ANSI/CSA LC 3 2000	Appliance Stands and Drain Pans	Miscellaneous
ANSI A117.1 2003	Accessible and Usable Building and Facilities	Miscellaneous
ANSI Z4.1 95	Sanitation in Places of Employment (Table 4-1 Note 6)	Miscellaneous
ANSI Z21.5.1a 2003	Gas Clothes Dryers Type 1 Clothes Dryers	Fuel Gas
ANSI Z21.5.2a 2003	Gas Clothes Dryers Type 2 Clothes Dryers	Fuel Gas
ANSI Z21.10.1 2004	Gas Water Heaters—Volume I—Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less (22kW)	Appliances
ANSI Z21.10.3 2004	Gas Water Heaters—Volume III—Storage, with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters	Appliances
ANSI Z21.12b 94	Draft Hoods	Appliances
ANSI Z21.13 2004	Gas-Fired Low-Pressure Steam and Hot-Water Boilers	Appliances

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Standard Number	Standard Title	Application
ANSI Z21.15-97	Manually Operated Gas Valves for Appliances, Appliance Connector, Valves, and Hose End Valves	Valves
ANSI Z21.22-2000	Relief Valves for Hot Water Supply Systems	Valves
ANSI Z21.24-2001	Connectors for Gas Appliances	Appliances
ANSI Z21.41-2003 CSA 6.9-2003	Quick Disconnect Devices for Use with Gas Fuel Appliances	Joints
ANSI Z21.47b-2003	Gas Fired Central Furnaces	Fuel Gas
ANSI Z21.56-2001 CSA 4.7-2001	Gas Fired Pool Heaters	Swimming Pools and Spas
ANSI Z21.69a-2003 CSA 6.16-2003	Connectors for Movable Gas Appliances	Appliances
ANSI Z21.80-2003 CSA 6.22-M2003	Line Pressure Regulators	Fuel Gas
ANSI Z21.81-98 CSA 6.25-M98	Cylinder Connection Devices	Fuel Gas
ANSI Z21.86-2004 CSA 2.32-2004	Vented Gas Fired Space Heating Appliances	Appliances
ANSI Z34.1-93	Certification – Third Party Certification Programs for Products Processes, and Services	Certification
ANSI Z83.11-2002	Gas Food Service Equipment	Fuel Gas
ANSI Z124.1-95	Plastic Bathtub Units	Fixtures
ANSI Z124.2-95	Plastic Shower Units	Fixtures
ANSI Z124.3-95	Plastic Lavatories	Fixtures
ANSI Z124.4-96	Plastic Water Closet Bowls and Tanks	Fixtures
ANSI Z124.5-97	Plastic Toilet (Water Closet) Seats	Fixtures
ANSI Z124.6-97	Plastic Sinks	Fixtures
ANSI Z124.7-97	Prefabricated Plastic Spa Shells	Fixtures
ANSI Z124.8-90	Plastic Bathtub Liners	Fixtures
IAPMO / ANSI Z124.9-2004	Plastic Urinal Fixtures (Note 1)	Fixtures
ANSI Z223.1-2002	National Fuel Gas Code (same as NFPA 54)	Fuel Gas
ISEA Z358.1-2004	Emergency Eyewash and Shower Equipment	Miscellaneous
ARI 1010-2002	Drinking Fountains and Self-Contained, Mechanically Refrigerated Drinking Water Coolers	Appliances
ASCE 25-99-2006	Earthquake Actuated Automatic Gas Shutoff Devices	Fuel Gas
ASHRAE 90.1-2004*	Energy Standard for Buildings Except Low-Rise Residential Buildings	Miscellaneous
ASME A13.1-2007*	Scheme for the Identification of Piping Systems	Piping
ASME A112.1.2-2004	Air Gaps in Plumbing Systems (for Plumbing Fixtures and Water-Connected Receptors)	Fittings
ASME A112.1.3-2000 (R2005)*	Air Gap Fittings for Use with Plumbing Fixtures, Appliances, and Appurtenances	Fixtures-Fittings

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Standard Number	Standard Title	Application
ASME A112.3.1-1993	<u>Performance Standard and Installation Procedures for Stainless Steel Drainage Systems for Sanitary, Storm, and Chemical Applications, Above and Below Ground (Note 1)</u>	Piping, Ferrous
ASME A112.3.4-2000 (R2004)*	Macerating Toilet System and Related Components	Fixtures
ASME A112.4.1-1993 (R2002)	Water Heater Relief Valve Drain Tubes	Appliances
ASME A112.4.2-2003	Water Closet Personal Hygiene Devices	Fixtures
ASME A112.4.3-1999 (R2004)	Plastic Fittings for Connecting Water Closets to the Sanitary Drainage Systems	Piping <u>Fittings</u>
ASME A112.4.7-2002*	Point of Use and Branch Water Submetering Systems	Miscellaneous
<u>ASME A112.4.14-2004</u>	<u>Manually Operated Quarter Turn Shutoff Valves for Use in Plumbing Systems</u> <u>Valves</u>	<u>Valves, Metallic ball</u>
ASME A112.6.1M-1997 (R2002)	Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use	Fixtures
ASME A112.6.2-2000 (R2004)	Framing-Affixed Supports for Off-the-Floor <u>Water Closets with Concealed Tanks</u> Plumbing Fixtures	Fixtures
ASME A112.6.3-2001 (R2007)	Floor and Trench Drains	DWV Components
ASME A112.6.4-2003	Roof, Deck, and Balcony Drains	DWV Components
ASME A112.6.7-2001 (R2007)	Enameled and Epoxy Coated Cast Iron and PVC Plastic Sanitary Floor Sinks	Fixtures
<u>ASME A112.6.9-2005*</u>	<u>Siphonic Roof Drains</u>	<u>DWV Components</u>
ASME A112.14.1-2003	Backwater Valves	Valves
ASME A112.14.3-2000 (R2004)*	Grease Interceptors	Fixtures
ASME A112.14.4-2001 (R2007)*	Grease Removal Devices	Fixtures
<u>ASME A112.14.6-2006*</u>	<u>FOG (Fats, Oils, Greases) Disposal Systems</u>	<u>Fixtures</u>
ASME A112.18.1-2005 / CSA B125.1-2005	Plumbing Supply Fittings	Fixtures <u>Fittings</u>
ASME A112.18.2-2005 / CSA B125.2-2005	Plumbing Waste Fittings	Fittings
ASME A112.18.3-2003* 20032*	<u>Performance Requirements for Backflow Protection Devices and Systems in Plumbing</u> Fixtures-Fittings	Kitchen, Lavatory, <u>Shampoo Bowls</u> , and Shower Fittings with <u>Flexible Hose</u>
ASME A112.18.6-2003	Flexible Water Connectors	Piping
ASME A112.18.7-1999(R2004)	Deck Mounted Bath / Shower Transfer Valves with Integral Backflow Protection	Valves
ASME A112.19.1M-1994(R2004)	Enameled Cast-Iron Plumbing Fixtures (Supplement 1-1998)	Fixtures
ASME A112.19.2M-	Vitreous China Plumbing Fixtures and Hydraulic Fixtures Requirements for Water	Fixtures

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Standard Number	Standard Title	Application
2003*	Closets and Urinals	
ASME A112.19.3- M-04 2000(R2004)*	Stainless Steel Plumbing Fixtures (Designed for Residential Use)	Fixtures
ASME A112.19.4M-1994(R2004)*	Porcelain-Enameled Formed Steel Plumbing Fixtures (Supplement 1-1998)	Fixtures
ASME A112.19.5-992005	Trim for Water-Closet Bowls, Tanks, and Urinals	Fixtures
ASME A112.19.7M-952006*	Whirlpool Hydromassage Bathtub Appliances	Fixtures
ASME A112.19.8M-87(R96)-2007*	Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, <u>and Hot Tubs;</u> and Whirlpool Bathtub Appliances	Swimming Pools and Spas
ASME A112.19.9M-1991 (R2002)*	Non-Vitreous Ceramic Plumbing Fixtures	Fixtures
ASME A112.19.10-2003*	Dual Flush Devices for Water Closets	Fixtures
ASME A112.19.12-2006*	Wall Mounted, and Pedestal Mounted, Adjustable, Elevating, Tilting and Pivoting Lavatory, and Sink, and Shampoo Bowl Carrier Systems <u>and Drainage Waste Systems</u>	Fixtures
ASME A112.19.13-20021 (R2007)*	Electrohydraulic Water Closets	Fixtures
ASME A112.19.14-20046*	Six-Liter Water Closets Equipped with a Dual Flushing <u>Flushing</u> Device	Fixtures
ASME A112.19.15-20045*	Bathtub/Whirlpool Bathtubs with Pressure Sealed Doors	Fixtures
ASME A112.19.19-2006	<u>Vitreous China Nonwater Urinals</u>	<u>Fixtures</u>
ASME A112.20.1-2004	Qualification of Installers of High Purity <u>Piping</u> Systems	Swimming Pools & Spas <u>Certification</u>
ASME A112.20.2-2004	Qualification of Installers of Firestop Systems and Devices for Piping Systems	Certification
ASME A112.21.3M-1985 (R042007)*	Hydrants for Utility and Maintenance Use (Note 1)	Valves
ASME A112.36.2M-1991 (R2002)*	Cleanouts (Note 1)	DWV Components
ASME B1.20.1-1983 (R042006)*	Pipe Threads, General Purpose, Inch	Joints
ASME B1.20.3-76 (R2003)*	Dryseal Pipe Threads, Inch	Joints
ASME B16.1-982005	Cast Gray Iron Pipe Flanges and Flanged Fittings; (Classes 25, 125, 250), and 800	Piping, Ferrous
ASME B16.3-982006*	Malleable-Iron Threaded Fittings <u>Classes 150 and 300</u>	Piping, Ferrous
ASME B16.4-1998 (R2006)	Gray Iron Threaded Fittings <u>Classes 125 and 250</u> (Includes Revision Services)	Piping, Ferrous
ASME B16.5-2003	Pipe Flanges and Flanged Fittings; <u>NPS ½ through NPS 24 Metric/Inch</u>	<u>Joints</u> <u>Fittings</u>

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Standard Number	Standard Title	Application
ASME B16.12-1998 (R2006)*	<u>Cast-Iron Threaded Drainage Fittings (Note 1)</u>	Piping, Ferrous Fittings
ASME B16.15-85 (R04) 2006	Cast Copper Alloy Bronze Threaded Fittings; Classes 125 and 250	Piping, Copper Alloy Fittings
ASME B16.18-2001 (2005)	Cast Copper Alloy Solder Joint Pressure Fittings (Note 1)	Piping, Copper Alloy Fittings
<u>ASME B16.20-1998</u> (R2004)*	<u>Metallic Gaskets For Pipe Flanges: Ring Joint Spiral Wound And Jacketed</u>	<u>Joints</u>
ASME B16.21-922005*	Nonmetallic Flat Gaskets for Pipe Flanges	Joints
ASME B16.22-2001 (R2005)*	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings Alloy	Piping, Copper Alloy Fittings
ASME B16.23-2002 (R2006)*	Cast Copper Alloy Solder Joint Drainage Fittings – DWV	Piping, Copper Alloy Fittings
ASME B16.24-20046*	Cast Copper Alloy Pipe Flanges and Flanged Fittings; <u>Classes 150, 300, 400, 600, 900, 1,500 and 2,500</u>	Piping, Copper Alloy Fittings
ASME B16.26-882006*	Cast Copper Alloy Fittings for Flared Copper Tubes	Piping, Copper Alloy Fittings
ASME B16.29-20047*	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV Alloy (Note 1)	Piping, Copper Alloy Fittings
ASME B16.33-2002 (R2007)*	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psig (<u>Sizes NPS 1/2 - NPS 24</u>)	Valves
ASME B16.34-962004*	Valves – Flanged, Threaded, and Welding End	Valves
ASME B16.39-1998 (R2006)*	Pipe Unions , Malleable Iron Threaded <u>Pipe Unions (Classes 150, 250 and 300)</u> (Includes Revision Services)	Piping, Ferrous Fittings
ASME B16.40-2002*	Manually Operated Thermoplastic Gas Shutoff and Valves in Gas Distribution Systems	Fuel Gas Valves
ASME B16.047-962006	Large Diameter Steel Flanges; <u>NPS 26 through NPS 60 Metric/Inch Standard</u>	Piping, Ferrous Fittings
ASME B16.50-2001*	Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings	Piping, Copper Alloy Fittings
ASME B31.1-20047	Power Piping	Piping
ASME B36.10M-2004*	Welded and Seamless Wrought Steel Pipe	Piping, Ferrous
ASME B36.19M-85(R94)2004*	Stainless Steel <u>Pipe</u>	Piping, Ferrous
ASME Section IV	Rules for Construction of Heating Boilers	Miscellaneous
ASME Section VIII	Rules for Construction of Pressure Vessels	Miscellaneous
ASME Section IX	Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators Qualifications	Certification
ASSE 1001-20028*	Atmospheric-Type Vacuum Breakers	Backflow Protection
ASSE 1002-1999	Anti-Siphon Fill Valves (Ballcocks) for Gravity Water Closet Flush Tank	Backflow Protection
ASSE 1003-2001*	Water Pressure Reducing Valves	Valves
ASSE 1004-1990	Backflow Prevention Requirements for Commercial Dishwashing Machines	Backflow Protection

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ASSE 1005-99	Water Heater Drain Valves	Valves
ASSE 1006-1986	Residential Use Dishwashers	Appliances
ASSE 1007-1986	Home Laundry Equipment	Appliances
ASSE 1008-86	Household Food Waste Disposer Units	Appliances
ASSE 1008-2006*	<u>Plumbing Aspects of Residential Food Waste Disposer Units</u>	<u>Appliances</u>
ASSE 1009-1990	Commercial Food Waste Grinder Units	Appliances
ASSE 1010-2004*	Water Hammer Arresters	Piping <u>Miscellaneous, Water Supply Component</u>
ASSE 1011-2004*	Hose-Connection Vacuum Breakers	Backflow Protection
ASSE 1012-2002*	Backflow Preventer with Intermediate Atmospheric Vent	Backflow Protection
ASSE 1013-2005*	Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers	Backflow Protection
ASSE 1014-2005*	<u>Backflow Prevention Devices for Hand-Held Showers</u>	Fixtures <u>Backflow Protection</u>
ASSE 1015-2005*	Double-Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies	Backflow Protection
ASSE 1016-2005*	<u>Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations</u>	Valves
ASSE 1017-2003*	Temperature Actuated Mixing Valves for Hot Water Distribution Systems	Valves
ASSE 1018-2001*	Trap Seal Primer Valves, Potable Water Supplied	Valves
ASSE 1019-2004*	Vacuum Breaker Wall Hydrant, Freeze-Resistant Automatic Draining Type	Backflow Protection
ASSE 1020-2004*	Pressure Vacuum Breaker Assembly	Backflow Protection
ASSE 1021-2001	Drains Air Gaps for Domestic Dishwasher Applications	Backflow Protection
ASSE 1022-2003*	Backflow Preventer for Beverage Dispensing Equipment	Backflow Protection
ASSE 1023-1979	Hot Water Dispensers, Household Storage Type, Electrical	Appliances
ASSE 1024-20034*	Dual Check Valve Backflow Preventers	Backflow Prevention
ASSE 1025-78	Diverters for Plumbing Faucets with Hose Spray, Anti-Siphon Type, Residential Applications	Valves
ASSE 1032-2004	Dual Check Valve Type Backflow Preventers for Carbonated Beverage Dispensers – Post Mix Types	Backflow Protection
ASSE 1035-2002*	Laboratory Faucet Backflow Preventer	Backflow Protection
ASSE 1037-1990	Pressurized Flushing Devices (Flushometers) for Plumbing Fixtures	Backflow Protection
ASSE 1044-2001*	Trap Seal Primer Devices-Drainage Types and Electronic Design Types	DWV Components
ASSE 1047-2005*	Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies	Backflow Protection
ASSE 1048-2005*	Double Check Detector Fire Protection Backflow Prevention Assemblies	Backflow Protection
ASSE 1052-2004*	Hose Connection Backflow Preventers	Backflow Protection
ASSE 1055-1997	Chemical Dispensing Systems	Backflow Protection
ASSE 1056-2001*	Spill Resistant Vacuum Breakers	Backflow Protection

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ASSE 1060-2006*	<u>Outdoor Enclosures for Backflow Prevention Assemblies</u>	<u>Miscellaneous</u>
ASSE 1061-2006*	<u>Removable and Non-Removable Push-Fit Fittings</u>	<u>Fittings</u>
ASSE 1062- 97 2006*	Temperature Actuated Flow Reduction (TAFR) Valves for Individual Fixture Fittings	Valves
ASSE 1066-1997	Individual Pressure Balancing In-Line Valves for Individual Fixture Fittings (Note 9 6)	Valves
ASSE 1069-2005*	Automatic Temperature Control Mixing Valves	Valves
ASSE 1070-2004*	Water Temperature Limiting Devices	Valves
ASSE Series 5000-2004*	Professional Qualification Standard for Backflow Prevention Assembly ies Testers, Repairers, and Surveyors	Backflow Protection <u>Certification</u>
ASSE 6000-2004 6 *	<u>Professional Qualifications Standard for Medical Gas Systems-Installers, Inspectors, and Verifiers, Maintenance Personnel and Instructors</u>	Certification
ASTM A 47-1999 (R2004)	Ferritic Malleable Iron Castings	Piping, Ferrous
ASTM A 48-2003	Gray Iron Castings	Piping, Ferrous
ASTM A 53-2007 4a	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless	Piping, Ferrous
ASTM A 74-2006 4a	Cast-Iron Soil Pipe and Fittings (Note 1)	Piping, Ferrous
ASTM A 126-2004	Gray Iron Castings for Valves, Flanges, and Pipe Fittings	Piping, Ferrous
ASTM A 197M-2000 (R2006)	Cupola Malleable Iron (Metric)	Piping, Ferrous
ASTM A 269-2004 7a	Seamless and Welded Austenitic Stainless Steel Tubing for General Service	Piping, Ferrous
ASTM A 312-2004 4b7	Seamless, <u>Welded</u> and Heavy Cold Worked Welded -Austenitic Stainless Steel Pipes	Piping, Ferrous
ASTM A 377-2003	Ductile-Iron Pressure Pipe	Piping, Ferrous
ASTM A 479-2005 6a	Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels	Piping, Ferrous
ASTM A 518-1999(R2003)	Corrosion-Resistant High-Silicon Iron Castings	Piping, Ferrous
ASTM A 536-1984(R2004)	Ductile Iron Casting	Piping, Ferrous
ASTM A 653M-2004 4a7	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process	Piping, Ferrous
ASTM A 733-2003	Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples	Piping, Ferrous
ASTM A 861-2004	High-Silicon Iron Pipe and Fittings (Note 1)	Piping, Ferrous
ASTM A 888-2004 7a	Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain Waste and Vent Piping Applications	Piping, Ferrous
ASTM B 29-2003	Refined Lead	Joints
ASTM B 32-2004	Solder Metal (Note 4 2)	Joints
ASTM B 42-2002 ^{e1}	Seamless Copper Pipe, Standard Sizes	Piping, Copper Alloy
ASTM B 43-1998(R2004)	Seamless Red Brass Pipe, Standard Sizes	Piping, Copper Alloy
ASTM B 75-2002	Seamless Copper Tube	Piping, Copper Alloy

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ASTM B 88-2003	Seamless Copper Water Tube	Piping, Copper Alloy
ASTM B 135-2002	Seamless Brass Tube (Metric)	Piping, Copper Alloy
ASTM B 152-2000 6a	Copper Sheet, Strip, Plate, and Rolled Bar	Miscellaneous
<u>ASTM B 187-2006</u>	<u>Copper Bar, Bus Bar, Rod and Shapes</u>	<u>Miscellaneous</u>
ASTM B 251-2002 ^{e1}	General Requirements for Wrought Seamless Copper Copper-Alloy Tube	Piping, Copper Alloy
ASTM B 280-2003	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service	Piping, Copper Alloy
ASTM B 302-2002 7	Threadless Copper Pipe, Standard Sizes	Piping, Copper Alloy
ASTM B 306-2002	Copper Drainage Tube (DWV)	Piping, Copper Alloy
ASTM B 370-2003	Copper Sheet and Strip for Building Construction	Miscellaneous
ASTM B 447-2002 7	Welded Copper Tube	Piping, Copper Alloy
ASTM B 584-2004 6a	Copper Alloy Sand Casting for General Applications (Note 5 <u>3</u>)	Piping, Copper Alloy
ASTM B 587- 2006 97 ^{e1} (R03)	Welded Brass Tube	Piping, Copper Alloy
ASTM B 687- 1999 (<u>R2005</u>) ^{e1}	Brass, Copper, and Chromium-Plated Pipe Nipples	Piping, Copper Alloy
ASTM B 813-2000 ^{e1}	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube	Joints
ASTM B 819-2000 (<u>R2006</u>)	Seamless Copper Tube for Medical Gas Systems	Piping, Copper Alloy
ASTM B 828-2002	Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings	Joints
ASTM C 14-2007 3	<u>Nonreinforced</u> Concrete Sewer, Storm Drain, and Culvert Pipe	Piping, Non-Metallic
ASTM C 296-2000 (<u>R2004</u>) ^{e1}	Asbestos-Cement Pressure Pipe	Piping, Non-Metallic
ASTM C 412-2003	Concrete Drain Tile	Piping, Non-Metallic
ASTM C 425-2004	Compression Joints for Vitrified Clay Pipe and Fittings	Joints
ASTM C 428- 97 (R02) ^{e1} 2005 (<u>R2006</u>)	Asbestos-Cement Nonpressure Sewer Pipe (Note 6 <u>4</u> and 7 <u>5</u>)	Piping, Non-Metallic
ASTM C 443-2005 a	Joints for Circular Concrete Pipe Sewer and Manholes <u>Culvert Pipe</u> , Using Rubber Gaskets	Joints
ASTM C 478-2003 a 7	Precast Reinforced Concrete Manhole Sections	Miscellaneous
ASTM C 564-2003a	Rubber Gaskets for Cast-Iron Soil Pipe and Fittings	Joints
ASTM C 700-2002 7a	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated	Piping, Non-Metallic
ASTM C 1053-2000 (<u>R2005</u>)	Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications (Note 1)	Piping, Non-Metallic
ASTM C 1173-2004 6	Flexible Transition Couplings for Underground Piping Systems	Joints
ASTM C 1277-2004 6	Shielded Couplings Joining Hubless Cast-Iron Soil Pipe and Fittings	Piping, Ferrous <u>Joints</u>
ASTM C 1440-2003 7	Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste, and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems	Piping, Plastic <u>Joints</u>

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ASTM C 1460-2004	Shielded Transition Couplings for Use with Dissimilar DWV Pipe and Fittings Above Ground	Piping, Plastic <u>Joints</u>
ASTM C 1461-2002 7	Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste, and Vent (DMV); Sewer; Sanitary; and Storm Plumbing Systems for Above and Below Ground <u>Use</u>	Piping, Plastic <u>Joints</u>
ASTM C 1540-2004	Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings	Joints
ASTM D 1527-1999 ^{et} (R2005)	Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, <u>Schedule</u> 40 and 80	Piping, Plastic
ASTM D 1784-2003 7	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds	Piping, Plastic <u>Miscellaneous</u>
ASTM D 1785-2004 a6*	Poly(Vinyl Chloride) (PVC) Plastic Pipe, <u>Schedule</u> , 40, 80, and 120	Piping, Plastic
ASTM D 1869-1995 (R 00 2005) ^{et}	Rubber O-rings for Asbestos-Cement Pipe	Joints
ASTM D 2104-2003 *	Polyethylene (PE) Plastic Pipe, <u>Schedule</u> 40	Piping, Plastic
ASTM D 2235-2004 *	Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings	Joints
ASTM D 2239-2003 *	Polyethylene (PE) Plastic Pipe, (SDR-PR) Based on Controlled Inside Diameter	Piping, Plastic
ASTM D 2241-2005 *4b	Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)	Piping, Plastic
ASTM D 2282-99^{et}	Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)	Piping, Plastic
ASTM D 2321-2000 5*	Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications	Piping, Plastic
ASTM D 2447-2003 *	Polyethylene (PE) Plastic Pipe, <u>Schedules</u> , 40 and 80 (Based on Controlled Outside Diameter)	Piping, Plastic
ASTM D 2464- 99 ^{et} 2006 *	Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, <u>Schedule</u> , 80 (Note 1)	Piping, Plastic <u>Fittings</u>
ASTM D 2466-2002 6*	Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, <u>Schedule</u> , 40 (Note 1)	Piping, Plastic <u>Fittings</u>
ASTM D 2467-2004 ^{et} 6*	Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, <u>Schedule</u> , 80 (Note 1)	Piping, Plastic <u>Fittings</u>
ASTM D 2513- 2004 a7b*	Thermoplastic Gas Pressure Pipe Tubing and Fittings (Note 1)	Piping, Plastic
ASTM D 2517-2000 ^{et} 6*	Reinforced Epoxy Resin Gas Pressure Pipe and Fittings	Piping, Plastic
ASTM D 2564-2004 ^{et} *	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems	Joints
ASTM D 2609-2002 *	Plastic Insert Fittings For Polyethylene (PE) Plastic Pipe (Note 1)	Piping, Plastic <u>Joints</u>
ASTM D 2657-2003 7*	Practice for Heating Fusion Joining of Polyolefin Pipe Fittings (Note 1)	Joints
ASTM D 2661-2002 6*	Acrylonitrile-Butadiene-Styrene (ABS) <u>Schedule</u> , 40 Plastic Drain, Waste, and Vent Pipe and Fittings (Note 1)	Piping, Plastic
ASTM D 2665-2004 a8*	Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings (Note 1)	Piping, Plastic
ASTM D 2672-1996a (R2003) *	Joints for IPS PVC Pipe Using Solvent Cement	Joints
ASTM D 2680-2001 *	Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite	Piping, Plastic

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	Sewer Piping	
<u>ASTM D 2683-2003*</u>	<u>Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing</u>	<u>Fittings</u>
ASTM D 2729-2003*	Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings (Note 1)	Piping, Plastic
ASTM D 2737-2003*	Polyethylene (PE) Plastic Tubing	Piping, Plastic
ASTM D 2751- 96a <u>2005*</u>	Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings (Note 1)	Piping, Plastic
<u>ASTM D 2774-2004^{e1}*</u>	<u>Underground Installation of Thermoplastic Pressure Piping</u>	<u>Piping, Plastic</u>
ASTM D 2846- 99^{et} <u>2006*</u>	Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems	Piping, Plastic
ASTM D 2855- <u>1996(R2002)*</u>	Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings	Joints
ASTM D 2996-2001 <u>(R2007)^{e1}*</u>	Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe	Piping, Plastic
ASTM D 3034-2004 a <u>6*</u>	Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings	Piping, Plastic
ASTM D 3035-2003 a <u>6*</u>	Polyethylene (PE) Plastic Pipe (DR-PR) (Based on Controlled Outside Diameter)	Piping, Plastic
ASTM D 3122- <u>1995 (R2002)*</u>	Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings	Joints
ASTM D 3138-2004*	Solvent Cements for Transition Joints, Acrylonitrile-Butadiene- Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Non-Pressure Piping Components	Joints
ASTM D 3139- <u>1998 (R2005)*</u>	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals	Joints
ASTM D 3212- <u>1996a (R2003)^{e1}*</u>	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals	Joints
<u>ASTM D 3261-2003*</u>	<u>Butt Heat Fusion Polyethylene (PE) Plastic Fitting for Polyethylene (PE) Plastic Pipe and Tubing</u>	<u>Fittings</u>
ASTM D 3311- <u>2002^{et}6a*</u>	Drain, Waste, and Vent (DWV) Plastic Fittings Patterns (Note 1)	Piping, Plastic <u>Miscellaneous</u>
ASTM D 3965-2004 <u>5*</u>	Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings	Piping, Plastic <u>Miscellaneous</u>
ASTM D 4068-2001*	Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane	Fixtures
ASTM D 4101-2004 a <u>7*</u>	Propylene Plastic Injection and Extrusion Materials	Miscellaneous
ASTM D 4551- <u>1996 (R2001)*</u>	Poly(Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane	Fixtures
ASTM D 6104- <u>1997 (R2003)</u>	Determining the Performance of Oil/Water Separators Subjected to Surface Run-Off	Fixtures
ASTM E 84-2004 <u>7b</u>	Surface Burning Characteristics of Building Materials	Miscellaneous
ASTM E 119-2000 <u>7a</u>	Fire Tests of Building Construction and Materials	Miscellaneous
ASTM E 814- <u>20062</u>	Fire Tests of Through-Penetration Fire Stops	Miscellaneous
ASTM F 402- 93(R99) <u>2005*</u>	Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings	Joints

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ASTM F 405- 97 <u>2005</u> *	Corrugated Polyethylene (PE) Tubing <u>Pipe</u> and Fittings	Piping, Plastic
ASTM F 409-2002*	Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings (Note 1)	Piping, Plastic
ASTM F 437- 99 <u>2006</u> *	Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule- 80	Piping, Plastic Fittings
ASTM F 438-2004*	Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule- 40	Piping, Plastic Fittings
ASTM F 439-2002 [†] <u>6</u> *	Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule- 80	Piping, Plastic Fittings
ASTM F 441-2002*	Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules- 40 and 80	Piping, Plastic
ASTM F 442- <u>1999 (R2005)</u> *	Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)	Piping, Plastic
<u>ASTM F 446-1985(R2004)</u> ^{e1}	<u>Grab Bars and Accessories Installed in the Bathing Area</u>	<u>Miscellaneous</u>
ASTM F 480-2002 <u>6b</u> *	Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR) Schedule 40 and Schedule 80	Piping, Plastic
ASTM F 493-2004*	Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings	Joints
ASTM F 628-2004 <u>6</u> ^{e1} *	Acrylonitrile-Butadiene-Styrene (ABS) Schedule- 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core, (Note 1)	Piping, Plastic
ASTM F 656-2002*	Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings	Joints
ASTM F 667- 97 <u>2006</u> *	Large Diameter Corrugated Polyethylene Tubing <u>Pipe</u> and Fittings	Piping, Plastic
ASTM F 714-2003- <u>6a</u> *	Polyethylene (PE) Plastic Pipe (SDR-PR) (Based on Outside Diameter)	Piping, Plastic
ASTM F 789-2003	Type PS 46 and Type PS 115 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings (Note 1)	Piping, Plastic
ASTM F 794-2003*	Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter	Piping, Plastic
ASTM F 810-2004 <u>7</u> *	Smoothwall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields	Piping, Plastic
ASTM F 876-2004 <u>a-6</u> *	Crosslinked Polyethylene (PEX) Tubing	Piping, Plastic
ASTM F 877-2002 <u>a-5</u> ^{e1} *	Crosslinked Polyethylene (PEX) Plastic Hot-and Cold-Water Distribution Systems	Piping, Plastic
ASTM F 891-2004- <u>7</u> *	Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core	Piping, Plastic
ASTM F 894- 98a <u>2007</u> *	Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe	Piping, Plastic
ASTM F 949-2003- <u>6a</u> *	Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings	Piping, Plastic
<u>ASTM F 1055-1998(R2006)</u> *	<u>Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing</u>	<u>Fittings</u>
ASTM F 1216-2003- <u>7b</u> *	Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube	Piping, Plastic
ASTM F 1281-2003- <u>7</u> *	Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe	Piping, Plastic
ASTM F 1282-2003- <u>6</u> *	Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe	Piping, Plastic

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ASTM F 1335-2004*	<u>Pressure-Rated Composite Pipe and Fittings for Elevated Temperature Service</u>	<u>Piping, Plastic</u>
ASTM F 1336-2007*	<u>Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings</u>	<u>Fittings</u>
ASTM F 1412-2001 ^{e1} *	Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems	Piping, Plastic
ASTM F 1476-2004 ⁷ *	<u>Performance of Gasketed Mechanical Couplings for Use in Piping Application</u>	Joints
ASTM F 1488-2003*	<u>Coextruded Composite Pipe</u>	<u>Piping, Plastic</u>
ASTM F 1499-2001*	<u>Coextruded Composite Drain, Waste, and Vent Pipe (DWV)</u>	<u>Piping, Plastic</u>
ASTM F 1673-2004*	Ployvinylidene Fluoride (PVDF) Corrosive Waste Drainage Systems	Piping, Plastic
ASTM F 1743-1996(R2003)*	Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)	Piping, Plastic
ASTM F 1807-2004 ⁷ ^a ^{e1} *	Metal Insert Fittings with <u>Utilizing</u> Copper Crimp Ring for SDR 9 Cross-linked Polyethylene (PEX) Tubing	Piping, Plastic <u>Joints</u>
ASTM F 1866-98 <u>2007</u> *	Poly(Vinyl Chloride) (PVC) <u>Plastic Schedule 40</u> Drainage and DWV Fabricated Fittings, Schedule 40	Piping, Plastic <u>Fittings</u>
ASTM F 1924-2004 ^{e4} - <u>5</u> *	Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing	Piping, Plastic <u>Fittings</u>
ASTM F 1948- 99a ^{e4} - <u>2005</u> *	Metallic Mechanical Fittings for Use on Outside Diameter Controlled Thermoplastic Gas Distribution Pipe and Tubing	Piping, Plastic <u>Fittings</u>
ASTM F 1960-2003 ⁷ <u>a</u> *	Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) Tubing	Piping, Plastic <u>Fittings</u>
ASTM F 1961-2002a*	Metal Mechanical Cold Flare Compression Fittings with Disc Springs for Cross-Linked Polyethylene (PEX) Tubing	Piping, Plastic <u>Fittings</u>
ASTM F 1970-2004 ⁵ *	Special Engineered Fittings or Appurtenances <u>or Valves</u> for Use in Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) Systems	Piping, Plastic <u>Miscellaneous</u>
ASTM F 1973-2002 ⁵ *	Factory Assembled Anodeless Riser and Transition Fitting in Polyethylene (PE) <u>and Polyimide 11 (PA11)</u> Fuel Gas Distribution Systems	Piping, Plastic - <u>Fuel Gas</u>
ASTM F 1974-2004*	Metal Insert Fittings for Polyethylene/Aluminum /Polyethylene and Crosslinked Polyethylene / Aluminum / Crosslinked Polyethylene Composite Pressure Pipe	Piping, Plastic <u>Joints</u>
ASTM F 1986-2001 (R2006)*	<u>Multilayer Pipe Type 2, Compression Fittings, and Compression Joints for Hot and Cold Drinking-Water Systems</u>	<u>Fittings</u>
ASTM F 2080-2004 ⁵	Cold-Expansion Fittings With Metal Compression Sleeves for Cross-Linked Polyethylene (PEX) Pipe	Piping, Plastic <u>Fittings</u>
ASTM F 2098-2004 ⁴ ^{e1}	Stainless Steel Clamps for Securing SDR9 Cross-Linked Polyethylene (PEX) Tubing to Metal Insert Fittings	Joints
ASTM F 2159-2003 ⁵	Plastic Insert Fittings Utilizing a Copper Ring for SDR9 Cross-Linked Polyethylene (PEX) Tubing	Joints
ASTM F 2165-2002*	Flexible Pre-Insulated Piping	Piping, Plastic
ASTM F 2262-2004 ⁵ *	Cross-linked Polyethylene/Aluminum/Cross-Linked Polyethylene Tubing OD Controlled SDR9	Piping, Plastic
ASTM F2434-2004 ⁵	Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-Linked/Polyethylene (PEX) Tubing and SDR9 Cross-Linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing	Piping, Plastic <u>Joints</u>
ASTM F 2509-2006	<u>Field-Assembled Anodeless Riser Kits for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing</u>	<u>Fuel Gas</u>

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Standard Number	Standard Title	Application
AWS A5.8-2004*	<u>Specifications for Filler Metals for Brazing and Braze Welding</u>	Joints
AWS B2.2-1991	Brazing Procedure and Performance Qualification	Certification
<u>AWS B2.4-2006*</u>	<u>Welding Procedure and Performance Qualification for Thermoplastics</u>	<u>Joints, Certification</u>
AWW A C110-2003*	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids (same as ANSI A21.10-98)	<u>Piping, Ferrous Fittings</u>
AWW A C111-2000-7*	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings (same as ANSI A21.11-00)	Piping, Ferrous
AWW A C151-2002*	Ductile-Iron Pipe, Centrifugally Cast, for Water (same as ANSI A21.51-91)	Piping, Ferrous
AWW A C153-2000-6*	Ductile-Iron Compact Fittings, 3 in. through 24 in. (76 mm through 610 mm) and 54 in. through 64 in. (1400 mm through 1600 mm), for Water Service (same as ANSI A21-53-00)	<u>Piping, Ferrous Fittings</u>
AWW A C203-2002*	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enameled and Tape – Hot Applied	<u>Piping Miscellaneous</u>
AWW A C213-2001*	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines	<u>Piping, Ferrous Miscellaneous</u>
AWW A C215-2004*	Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines	<u>Piping, Ferrous Miscellaneous</u>
AWWA C400-2003*	Asbestos-Cement Distribution -Pressure Pipe, 4 in. through 16 in. (100 mm through 400 mm) for Water Distribution Systems and Transmission	Piping, Non-Metallic
AWW A C500-2002*	<u>Metal-Seated Service Gate Valves for Water and Sewerage Systems Valves-Supply Service</u>	Valves
AWW A C504-2000-6*	Rubber-Seated Butterfly Valves	Valves
AWW A C507-99-2005*	Ball Valves, 6 in. through 48 in. (150 mm through 1,200 mm)	Valves
AWW A C510-1997*	Double Check Valve Backflow-Prevention Assembly	Backflow Protection
AWW A C511-1997*	Reduced-Pressure Principle Backflow-Prevention Assembly	Backflow Protection
AWW A C606-2004-6*	Grooved- and Shouldered- Type Joints	Joints
AWW A C900-97-2007*	<u>Polyvinyl Poly (Vinyl Chloride) (PVC) Pressure Pipe, and Fabricated Fittings 4 in. through 12 in. (100 mm through 300 mm),</u> for Water Distribution	Piping, Plastic
AWW A C901-2002*	Polyethylene (PE) Pressure Pipe and Tubing, ½ in. (13 mm) through 3 in. (76 mm), for Water Service	Piping, Plastic
<u>AWWA C904-2006*</u>	<u>Cross-Linked Polyethylene (PEX) Pressure Pipe, 1/2 in. (12 nun) through 3 in. (76 mm), for Water Service</u>	<u>Piping, Plastic</u>
AWW A C907-94-2004*	<u>Injection-Molded Poly (Vinyl Polyvinyl Chloride) (PVC) Pressure Fittings for Water – 4 in. Through 8-12 in. (100 mm through 2300 mm)</u>	<u>Piping, Plastic Fittings</u>
CGA V-1 2005	Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connection	Valves
CGA S-1.3-2005	Pressure Relief Device Standards-Part 3-Stationary Storage Containers for Compressed Gases	Fuel Gas
CISPI 301-2004a5	Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications (Note 1)	Piping, Ferrous
CISPI 310-2004	Couplings for Use in Connection with Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications	Joints
CSA No. 3-1992	U.S. Requirements for Excess Flow Valves	Valves

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CSA A257-2003	Concrete Pipe and Manhole Sections	Piping
CSA B45.0-2002	<u>General Requirements for Plumbing Fixtures</u>	Fixtures
CSA B45.1-2002	Ceramic Plumbing Fixtures	Fixtures
CSA B45.2-2002	Enameled Cast-Iron Plumbing Fixtures	Fixtures
CSA B45.3-2002	Porcelain-Enameled Steel Plumbing Fixtures	Fixtures
CSA B45.4-2002	Stainless Steel Plumbing Fixtures	Fixtures
CSA B45.5-2002	Plastic Plumbing Fixtures	Fixtures
CSA B45.9-2002	Macerating Systems and Related Components	DWV Components
CSA B45.10-2001 (R2006)	Hydromassage Bathtubs	Fixtures
CSA B45.11-2004	Glass Lavatories	Fixtures
CSA B64-2004 7	Backflow Preventers and Vacuum Breakers	Backflow Protection
CSA B64.1.1-2004 7	<u>Atmospheric Vacuum Breaker, Atmospheric Type (AVB)</u>	Backflow Protection
CSA B64.1.2-2004 7	<u>Pressure Vacuum Breaker, Pressure Type (PVB)</u>	Backflow Protection
CSA B64.2-2004 7	<u>Hose Connection Vacuum Breaker, Hose Connection Type (HCVB)</u>	Backflow Protection
CSA B64.2.1.1-2001 (R2006)	Vacuum Breaker, Hose Connection Vacuum Breaker, Hose Connection Dual Check Type with Automatic Drainage Feature (HCDVB)	Backflow Protection
CSA B64.4-2004 7	Backflow Preventers, Reduced Pressure Principle <u>Backflow Preventers, Type (RP)</u>	Backflow Protection
CSA B64.4.1-2001 (R2006)	Backflow Preventers, Reduced Pressure Principle <u>Backflow Preventers, Type for Fire System (RPF)</u>	Backflow Protection
CSA B64.5-2001 (R2006)	Backflow, Preventers, Double Check Valve Type (DVCA) <u>Backflow Preventers</u>	Backflow Protection
CSA B64.5.1-2001 (R2006)	Backflow Preventers, Double Check Valve <u>Backflow Preventers, Type for Fire Systems (DVCAF)</u>	Backflow Protection
CSA B64.7-2001	Vacuum Preventers, Laboratory Faucet <u>Vacuum Breakers, Type (LFVB)</u>	Backflow Protection
CSA B79-2005	<u>Floor Drains, Area Drains, Shower Drains, and Cleanouts for Residential Construction</u>	<u>DWV Components</u>
CSA B125.3-2004 5	Plumbing Fittings	Valves
CSA B128.1- 2006/B128.2-2006	<u>Design and Installation of Non-Potable Water Systems/Maintenance and Field Testing of Non-Potable Water Systems (Note 1)</u>	<u>Miscellaneous</u>
CSA B137.1-2002 5	Polyethylene (PE) Pipe, Tubing, and Fittings for Cold Water Pressure Services	Piping, Plastic
CSA B137.5-2002 5	Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications	Piping, Plastic
CSA B137.9-2002 5	Polyethylene/Aluminum/Polyethylene Composite Pressure-Pipe Systems	Piping, Plastic
CSA B137.10-2002 5	Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene Composite Pressure-Pipe Systems	Piping, Plastic
CSA B181.3-2002 6	Polyolefin Laboratory Drainage Systems	Piping/Plastic
CSA B242-80(R04) 2005	Groove and Shoulder Type Mechanical Pipe Couplings	Fittings
CSA B272-93 (R00)	Prefabricated Self Sealing Roof Vent Flashing	Fittings

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Standard Number	Standard Title	Application
CSA B356-2000 (R2005)	Water Pressure Reducing Valves for Domestic Water Supply Systems	Valves
CSA G401-2004 7	Corrugated Steel Pipe Products	Fittings Miscellaneous
CSA LC1-2005	Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST) (same as CSA 6.26)	Fuel Gas
CSA LC3-2000*	Appliance Stands and Drain Pans	Miscellaneous
CSA LC4-2007	Press-Connect Copper and Copper Alloy Fittings for Use in Fuel Gas Distribution Systems (same as CSA 6.32)	Fuel Gas
CSA Z21.5.1-2006*	Gas Clothes Dryers -Volume 1- Type 1 Clothes Dryers (same as CSA 7.1)	Fuel Gas
CSA Z21.5.2a-2006*	Gas Clothes Dryers -Volume 2- Type 2 Clothes Dryers (same as CSA 7.2)	Fuel Gas
CSA Z21.10.1b-2006*	Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less (same as CSA 4.1)	Appliances
CSA Z21.10.3a-2007*	Gas Water Heaters - Volume III- Storage, with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous (same as CSA 4.3)	Appliances
CSA Z21.12b-1994* (R2000)	Draft Hoods	Appliances
CSA Z21.13b-2007*	Gas-Fired Low-Pressure Steam and Hot-Water Boilers	Appliances
CSA Z21.15b-2006*	Manually Operated Gas Valves for Appliances, Appliance Connector, Valves, and Hose End Valves (same as CSA 9.1)	Valves
CSA Z21.22b-2001 (R2003)*	Relief Valves for Hot Water Supply Systems (same as CSA 4.4)	Valves
CSA Z21.24-2006*	Connectors for Gas Appliances (same as CSA 6.10)	Appliances
CSA Z21.40.1a-1997 (R2002)*	Quick Connect Devices for Use With Gas Fuel (same as CSA 2.91)	Joints
CSA Z21.41a-2005*	Quick-Disconnect Devices for Use with Gas Fuel Appliances (same as CSA 6.9)	Joints
CSA Z21.47a-2007*	Gas-Fired Central Furnaces (same as CSA 2.3)	Fuel Gas
CSA Z21.56-2006*	Gas-Fired Pool Heaters (same as CSA 4.7)	Swimming Pools and Spas
CSA Z21.69b-2006*	Connectors for Movable Gas Appliances (same as CSA 6.16)	Appliances
CSA Z21.80a-2005*	Line Pressure Regulators (same as CSA 6.22)	Fuel Gas
CSA Z21.81a-2007	Cylinder Connection Devices (same as CSA 6.25)	Fuel Gas
CSA Z21.86b-2007*	Vented Gas-Fired Space-Heating Appliances (same as CSA 2.32)	Appliances
CSA Z83.11-2006*	Gas Food Service Equipment (same as CSA 1.8)	Fuel Gas
CSA Z317.1-1999 (R2002)*	Special Requirements for Plumbing Installations in Health Care Facilities.	Miscellaneous
FCI 74-1-1991	Spring Loaded Lift Disc Check Valve	Valves
IAPMO IGC 154-2006a	Tub/Shower Enclosures with Factory-Installed Fittings, Shower Panel, Shower Door, and Threshold Assemblies	Fixtures
IAPMO IGC 157-2007	Ball Valves	Valves

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<u>IAPMO IGC 172-2005</u>	<u>Glass Lavatories and Sinks</u>	<u>Fixtures</u>
<u>IAPMO IGC 193-2006</u>	<u>Safety Plates and Plate Straps</u>	<u>Miscellaneous</u>
<u>IAPMO IGC 194-2004a</u>	<u>Copper Alloy or Aluminum Alloy Sinks and Lavatories</u>	<u>Fixtures</u>
<u>IAPMO IGC 217-2007</u>	<u>Metallic Bathtubs, Shower Pans, and Whirlpool Bathtubs</u>	<u>Fixtures</u>
<u>IAPMO IGC 226-2006a</u>	<u>Drinking Water Fountains With or Without Chiller or Heater</u>	<u>Fixtures</u>
<u>IAPMO PS 1-2004</u>	<u>Prefabricated Septic Tanks</u>	<u>DWV Components</u>
<u>IAPMO PS 4-2004</u>	<u>Drains for Prefabricated and Precast Showers</u>	<u>Fixtures</u>
<u>IAPMO PS 14-2002</u>	<u>Flexible Metallic Field Fabricated Water Connections</u>	<u>Piping</u>
<u>IAPMO PS 16-2004</u>	<u>Subdrains for Built Up Shower Pans</u>	<u>Fixtures</u>
<u>IAPMO PS 23-20046a</u>	<u>Dishwasher Drain Air Gaps</u>	<u>Backflow Protection</u>
<u>IAPMO PS 25-2002</u>	<u>Metallic Fittings for Joining Polyethylene Pipe for Water Service and Yard Piping</u>	<u>Joints</u>
<u>IAPMO PS 33-2004-7a</u>	<u>Flexible PVC Hose for Pools, Hot Tubs, Spas and Jetted Bathtub</u>	<u>Piping, Plastic Miscellaneous</u>
<u>IAPMO PS 34-2003</u>	<u>Encasement Sleeve for Potable Water Pipe and Tubing</u>	<u>Piping</u>
<u>IAPMO PS 36-1990</u>	<u>Lead-Free Sealing Compounds for Threaded Joints</u>	<u>Joints</u>
<u>IAPMO PS 37-1990</u>	<u>Black Plastic PVC or PE Pressure-Sensitive Corrosion Preventive Tape</u>	<u>Piping Miscellaneous</u>
<u>IAPMO PS 40-2001</u>	<u>Anodeless Transition Riser for Use with PVC Gas Yard Piping</u>	<u>Fuel Gas</u>
<u>IAPMO PS 42-1996</u>	<u>Pipe Alignment and Secondary Support Systems</u>	<u>Piping Miscellaneous</u>
<u>IAPMO PS 43-942007</u>	<u>Cushioned Bathtubs and Whirlpool Bathtub Appliances</u>	<u>Fixtures</u>
<u>IAPMO PS 46-20046a</u>	<u>Non-Integral Tile Flange Kits <u>Field-Fabricated Tiling Kits</u></u>	<u>Miscellaneous</u>
<u>IAPMO PS 50-20035</u>	<u>Flush Valves with Dual Flush Devices For Water Closets <u>or Water Closet Tank with an Integral Flush Valve with a Dual Flush Device</u></u>	<u>Fixtures</u>
<u>IAPMO PS 51-1998</u>	<u>Plastic and Metallic Expansions Joints</u>	<u>Joints</u>
<u>IAPMO PS 52-2004b6</u>	<u>Sumps and Sewage Ejector Tanks <u>with or without a Pump</u></u>	<u>DWV Components</u>
<u>IAPMO PS 53-1992</u>	<u>Grooved Mechanical Pipe Couplings and Grooved End Fittings</u>	<u>Joints</u>
<u>IAPMO PS 54-2003a6</u>	<u>Metallic and Plastic Utility Boxes</u>	<u>Miscellaneous</u>
<u>IAPMO PS 55-1992</u>	<u>Bathwaste Strainer Drains</u>	<u>Fixtures</u>
<u>IAPMO PS 57-2002</u>	<u>PVC Hydraulically Actuated Diaphragm Type Water Control Valves</u>	<u>Valves</u>
<u>IAPMO PS 59-1992</u>	<u>Septic Effluent and Waste Water Diverter Valves</u>	<u>DWV Components</u>
<u>IAPMO PS 60-1996</u>	<u>Sewage Holding Tank Containing Sewage Ejector Pump for Direct-Mounted Water Closet</u>	<u>DWV Components</u>
<u>IAPMO PS 61-922006a</u>	<u>Fabricated Stainless Steel Security <u>Water Closets or Urinals</u></u>	<u>Fixtures</u>
<u>IAPMO PS 63-2004a5</u>	<u>Plastic Leaching Chambers</u>	<u>DWV Components</u>
<u>IAPMO PS 64-982007</u>	<u>Pipe Flashings</u>	<u>Piping Miscellaneous</u>
<u>IAPMO PS 65-20052</u>	<u>Air Gap <u>Airgap</u> Units for Water Conditioning Equipment Installation</u>	<u>Backflow Protection</u>
<u>IAPMO PS 66-2000</u>	<u>Dielectric Waterway Fittings</u>	<u>Piping</u>

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		<u>Fittings</u>
IAPMO PS 67- 1993	Early-Closure Replacement Flappers or Early-Closure Replacement Flapper With Mechanical Assemblies	Fixtures
IAPMO PS 69-2003 a6	Plastic Bathwaste and Overflow Assemblies <u>with Tub Filler Spout</u>	Piping, Plastic
IAPMO PS 72-2003 7	Valves with Atmospheric Vacuum Breakers	Valves
IAPMO PS 73-1993	Dental Vacuum Pumps	Miscellaneous
IAPMO PS 76-1995	Ballcock or Flushometer Valve Tailpiece Trap Primers and Trap Primer Receptors/Adapters	DWV Components
IAPMO PS 79- 20035	Multiport Electronic Trap Primer	DWV Components
IAPMO PS 80-2003 b7	Grease Interceptors and Clarifiers	DWV Components
IAPMO PS 81-2000 6	Precast Concrete Seepage Pit Liners and Covers	DWV Components
IAPMO PS 82-1995	Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Fittings	Piping, Plastic <u>Fittings</u>
IAPMO PS 85-1995	Tools for Mechanically Formed Tee Connections in Copper Tubing	Piping <u>Miscellaneous</u>
IAPMO PS 86-1995	Rainwater Diverter Valve for Non-Roofed Area Slabs	DWV Components
IAPMO PS87-1995	Diverter and Shutoff Valves for Pool/Spas	Valves
IAPMO PS 88-2002	Pre-Pressurized Potable Water Tanks	Miscellaneous
IAPMO PS 89-1995	Soaking and Hydrotherapy (Whirlpool) Bathtubs with Hydraulic Seatlift	Fixtures
IAPMO PS 90-2003 6	Elastomeric Test Caps/Cleanout Caps	DWV Components
IAPMO PS 91- 95 2005a	Plastic Stabilizers for Use with Plastic Closet Bends	Piping, Plastic
IAPMO PS 92-2003	Heat Exchangers	Miscellaneous
IAPMO PS 93-2004a	Water Closet Seats with Spray, Water Closet Seats with Spray and other Devices with Spray for Water Closet <u>for Water Closets Supplied with Hot and Cold Water</u>	Fixtures
IAPMO PS 94-2001a	P-Trap, Supply Stop, and Riser Insulated Protector	Miscellaneous
IAPMO PS 95-2001	Drain, Waste, and Vent Hangers and Plastic Pipe Support Hooks <u>Piping</u>	Piping <u>Fixtures</u>
IAPMO PS 96-2002	Passive Direct Solar Water Heaters	Miscellaneous
IAPMO PS 97-2001	Mechanical Cast Iron Closet Flanges	Piping Ferrous
IAPMO PS 98-1996	Prefabricated Fiberglass Church Baptisteries	Fixtures
IAPMO PS 99-2004 7	Terrazzo Marble, Concrete, and Granite, and Slate Plumbing Fixtures	Fixtures
IAPMO PS 100-1996	Porous Filter Protector for Subdrain Weep Holes	DWV Components
IAPMO PS 101-1997	Suction Relief Valves	Valves
IAPMO PS 102-2004a	Pedestal Lavatory Trap	DWV Components
IAPMO PS 104-1997	Pressure Relief Connection for Dispensing Equipment	Valves
IAPMO PS 105-1997	Polyethylene Distribution Boxes	DWV Components
IAPMO PS 106- 98 2006	Prefabricated, Tileable Shower Receptors	Fixtures
IAPMO PS 107-1998	Aramid-Reinforced Rubber Hose for Use in Non-Potable Water Radiant Heating and Snow Melting	Piping, Plastic

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IAPMO PS – 108- 1998	Restaurant Fire Suppression Systems	Appliances
IAPMO PS 110- 99 <u>2006a</u>	PVC Cold Water Compression Fittings	Fittings
IAPMO PS 111- 1999	PVC Cold Water Gripper Fittings	Fittings
IAPMO PS 112- 1999	PVC Plastic Valves for Cold Water Distribution Systems Outside a Building and CPVC Plastic Valves for Hot and Cold Water Distribution Systems	Valves
IAPMO PS 113- 1999 ^{e1}	Hydraulically Powered Household Food Waster Grinders-Disposers	Appliances
IAPMO PS 114- 1999 ^{e1}	Remote, Floor Box Industrial Water Supply, Air Supply, Drainage	Miscellaneous
IAPMO PS 115- 2002 <u>7</u>	Hot Water <u>On-Demand</u> or Automatic Activated Hot Water Pumping Systems	Miscellaneous
IAPMO PS 116- 1999	Hot Water Circulating Devices Which Do Not Use a Pump	Miscellaneous
IAPMO PS 117- 2004 <u>a6</u>	Press-Type or Plain End Rubber Gasketed with Nail Connector Fittings for Copper and Copper Alloy Fittings with Press-Type or Nail-Type Connections For Installation on Copper Tubing	Fittings
IAPMO PS 119- 2006	Water Energized Sump Pump	Miscellaneous
<u>IAPMO Z124.1.2-2005*</u>	<u>Plastic Bathtub and Shower Units</u>	<u>Fixtures</u>
<u>IAPMO Z124.3-2005*</u>	<u>Plastic Lavatories</u>	<u>Fixtures</u>
<u>IAPMO Z124.4-2006*</u>	<u>Plastic Water Closet Bowls and Tanks</u>	<u>Fixtures</u>
<u>IAPMO Z124.5-2006*</u>	<u>Plastic Toilet (Water Closet) Seats</u>	<u>Fixtures</u>
<u>IAPMO Z124.6-2006*</u>	<u>Plastic Sinks</u>	<u>Fixtures</u>
<u>IAPMO Z124.7-1997*</u>	<u>Prefabricated Plastic Spa Shells</u>	<u>Fixtures</u>
<u>IAPMO Z124.8-1990*</u>	<u>Plastic Bathtub Liners</u>	<u>Fixtures</u>
<u>IAPMO Z124.9-2004*</u>	<u>Plastic Urinal Fixtures (Note 1)</u>	<u>Fixtures 401.1</u>
<u>IAPMO Z1000-2007</u>	<u>Prefabricated Septic Tanks</u>	<u>DWV Components</u>
<u>IAPMO Z1001-2007</u>	<u>Prefabricated Gravity Grease Interceptors</u>	<u>Fixtures</u>
<u>ICC A117.1-2003*</u>	<u>Accessible and Usable Buildings and Facilities</u>	<u>Miscellaneous</u>
<u>ISEA Z358.1-2004*</u>	<u>Emergency Eyewash and Shower Equipment</u>	<u>Miscellaneous</u>
IAPMO PS 118-2000	FOG (Fats, Oils, Greases) Disposal Systems	DWV Components
IAS 1-91	U.S. Requirements for Indirect Water Heaters for use with External Heat Source	Miscellaneous
IAS LC 1b-2001 CSA 6.26 M99	Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST) Fuel Gas	Fuel Gas
ISO Guide 65- 1996	General Requirements for Bodies Operating Product Certification Systems	Certification
MSS SP-25- 1998 <u>*</u>	Standard Marking System for Valves, Fittings, Flanges, and Unions	Piping <u>Miscellaneous</u>
MSS SP-42- 2004 <u>*</u>	Class 150 Corrosion-Resistant Gate-, Globe, Angle, and Check Valves with Flanged and Butt Weld Ends	Piping, Ferrous
MSS SP-44- 96 <u>2006*</u>	Steel Pipeline Flanges	Piping, Ferrous <u>Fittings</u>
MSS SP-58- 2002 <u>*</u>	Pipe Hangers and Supports – Materials, Design, and Manufacture	Piping <u>Miscellaneous</u>

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MSS SP-67-2002a*	Butterfly Valves	Valves
MSS SP-69-2002 3 *	Pipe Hangers Hangers and Supports – Selection and Application	Piping <u>Miscellaneous</u>
MSS SP-70- 98 2006*	Gray Cast -Iron Gate Valves, Flanged and Threaded Ends	Valves
MSS SP-71- 97 2005*	Gray-Cast -Iron Swing Check Valves, Flanged and Threaded Ends	Valves
MSS SP-72-1999	Ball Valves with Flanged or Butt-Welding Ends for General Service	Valves
MSS SP-73-2003	Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings	Joints
MSS SP-78- 98 2005a*	Gray Cast -Iron Plug Valves, Flanged and Threaded Ends	Valves
MSS SP-80-2003*	Bronze Gate- _ Globe, Angle, and Check Valves	Valves
MSS SP-83-2004 6 *	Class 300 Steel Pipe Unions Socket-Welding and Threaded	Piping, Ferrous <u>Joints</u>
MSS SP-89- 98 2003*	Pipe Hangers and Supports – Fabrication and Installation Practices	Piping <u>Miscellaneous</u>
MSS SP-104-2003*	Wrought Copper Solder Joint Pressure Fittings	Piping, Copper Alloy <u>Fittings</u>
MSS SP-106-2003*	Cast Copper Alloy Flanges and Flanged Fittings, Class 125, 150 and 300	Piping, Copper Alloy <u>Fittings</u>
MSS SP-109-1997 (R2006)*	Welded Fabricated Copper Solder Joint Pressure Fittings	Piping, Copper Alloy <u>Fittings</u>
MSS SP-123-1998 (R2006)*	Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube	Piping, Copper Alloy <u>Joints</u>
NFPA 13R-2002 7 *	Installation of Sprinklers Systems in Residential Occupancies up to and Including Four Stories in Height	Miscellaneous
NFPA 13D-2002 7 *	Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes	Miscellaneous
NFPA 31-2004 6 *	Installation of Oil-Burning Equipment	Miscellaneous
NFPA 54- 2002 / <u>Z223.1-2006</u> *	National Fuel Gas Code (same as ANSI Z223.1)	Fuel Gas
NFPA 58-2004*	Storage and Handling of Liquefied Petroleum Gases <u>Code</u>	Fuel Gas
NFPA 85-2004-7*	Boiler and Combustion Systems Hazards Code	Appliances
NFPA 99-2002 5 *	Health Care Facilities	Piping
NFPA 99C-2002 5 *	Gas and Vacuum Systems	Piping
NFPA 130-2003 7 *	Fixed Guideway Transit and Passenger Rail Systems	Miscellaneous
NFPA 211-2003 6 *	Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances	Miscellaneous
NFPA 502-2004-8*	Road Tunnels, Bridges, and Other Limited Access Highways	Miscellaneous
NFPA 1989-2003 8 *	Breathing Air Quality for Fire and Emergency Services Respiration ory <u>Protection</u>	Miscellaneous
<u>NSF 2-2007</u>	<u>Food Equipment Appliances</u>	<u>Appliances</u>
NSF 3-2003 7 *	Commercial Spray Type Dishwashing and Glasswashing Machines <u>Warewashing Equipment</u>	Appliances
NSF 4-2007e	<u>Commercial Cooking, Rethermalization, and Powered Hot Food Holding and Transport Equipment</u>	<u>Appliances</u>

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NSF 5-2005	Water Heaters, Hot Water Supply Boilers, and Heat Recovery Equipment	Appliances
NSF 12-2003 e 7*	Automatic Ice Making Equipment	Appliances
NSF 14-2004 ¹ 7*	Plastic Piping <u>System</u> Components and Related Materials	Piping, Plastic
NSF 18-2004-7*	Manual Food and Beverage Dispensing Equipment	Appliances
NSF 24-88 (R96)	Plumbing System Components for Manufactured Homes and Recreational Vehicles	Miscellaneous
NSF 29-2003 7 7*	<u>Detergent and Chemical Feeders for Commercial Spray-Type Dishwashing Machines</u>	Appliances
NSF40-2000 5 5*	Residential Wastewater Treatment Systems	DWV Components
NSF 41- 99 2005*	Non-Liquid Saturated Treatment Systems	DWV Components
NSF 42-2002 7 e*	Drinking Water Treatments Units-Aesthetic Effects	Appliances
NSF 44-2004-7*	Residential Cation Exchange Water Softeners	Appliances
NSF 46-2004-7*	Evaluation of Components and Devices Used in Wastewater Treatment Systems	DWV Components
NSF 53-2004-7a*	Drinking Water Treatment Units-Health Effects	Appliances
NSF 55-2007	<u>Ultraviolet Microbiological Water Treatment Systems</u>	<u>Appliances</u>
NSF 58-2004-7*	Reverse-Osmosis Drinking Water Treatment Systems	Appliances
NSF 61-2004-7a*	Drinking Water System Components - Health Effects	Miscellaneous
NSF 62-2004-7*	<u>Drinking</u> Water Distillation Systems	Appliances
NSF 169-2007	<u>Special Purpose Food Equipment and Devices</u>	<u>Appliances</u>
NSPI 1-2003	<u>Public Swimming Pools</u>	<u>Swimming Pools and Spas</u>
PDI G-101 85 2007	Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data	DWV Components <u>Fixtures</u>
PDI-WH 201- 92 2006	Water Hammer Arresters	<u>Piping</u> <u>Miscellaneous, Water Supply</u> <u>Component</u>
PSA1 Z4.1-1986 (R2005)*	<u>Sanitation In Places of Employment – Minimum Requirements</u>	<u>Miscellaneous</u>
SAE J 512-1997	Automotive Tube Fittings	Fittings
SAE J1670- 93 2005	Type F Clamps for Plumbing Applications	Joints
SAMA LF 6a	Medical Care Facility Brassware	Miscellaneous
TCNA A118.10-2005*	<u>Load, Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations</u>	<u>Fixtures</u>
TCNA A137.1-1988*	Ceramic Tile (surfaces)	<u>Miscellaneous</u>
UL 70-2001	<u>Septic Tanks, Bituminous Coated Metal</u>	<u>DWV Components</u>
UL 80-2004-7*	Steel Inside Tanks for Oil- Burner Fuel	Miscellaneous
UL 103-2001*	Factory-Built Chimneys for Residential Type and Building Heating Appliances (with revisions through June 30, 2006)	Miscellaneous
UL 125- 97 2007	Valves for Anhydrous Ammonia and LP-Gas (Other than Safety Relief <u>with</u> <u>revisions through September 17, 2001</u>)	Valves

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Standard Number	Standard Title	Application
UL 132- 97 2007*	Safety Relief Valves for Anhydrous Ammonia and LP-Gas (<u>with revisions through November 15, 2002</u>)	Valves
UL 144-1999*	LP-Gas Regulators (<u>with revisions through January 18, 002</u>)	Valves
UL 174-2004*	Household Electric Storage Tank Water Heaters (<u>with revisions through May 19, 2006</u>)	Appliances
UL 252-2003*	Compressed Gas Regulations	Valves
UL 263-2003*	Fire Tests of Building Construction and Materials	Miscellaneous
UL 296-2003*	Oil Burners (<u>with revisions through February 24, 2006</u>)	Appliances
UL 343-1997	Pumps for Oil-Burning Appliances (<u>with revisions through May 4, 2006</u>)	Pumps
UL 352- 97 2006	Constant- Level Oil Valves	Valves
UL 378- 93 2006	Draft Equipment	Miscellaneous
UL 399-1993*	Drinking-Water Coolers (<u>with revisions through March 3, 2006</u>)	Appliances
UL404-2005	Gauges, Indicating Pressure for Compressed Gas Service	Fuel Gas
UL429-1999	Electrically Operated Valves	Valves
UL 430-2004*	Waste Disposers (<u>with revisions through May 9, 2006</u>)	Appliances
UL 441-1996*	Gas Vents (<u>with revisions through August 9, 2006</u>)	Miscellaneous Fuel Gas
UL 443- 95 2006	Steel Auxiliary Tanks for Oil-Burner Fuel	Miscellaneous
UL 499- 97 2005*	Electric Heating Appliances (<u>with revisions through March 31, 2006</u>)	Appliances
UL 536-1997*	Flexible Metallic Hose	Fuel Gas
UL 563-1995*	Ice Makers (<u>with revisions through February 27, 2006</u>)	Appliances
UL 565-1998	Liquid-Level Gauges and Indicators for Anhydrous Ammonia and LP-Gas	Miscellaneous
UL 569-1995*	Pigtails and Flexible Hose Connectors for LP-Gas (<u>with revisions through January 31, 2001</u>)	Fuel Gas
UL 723-2004-7*	Standard-Test for Surface Burning Characteristics of Building Materials (<u>with revisions through May 27, 2005</u>)	Miscellaneous
UL 726-1995	Oil -Fired Boiler Assemblies (<u>with revisions through March 8, 2006</u>)	Appliances
UL 732-1995*	Oil-Fired Storage Tank Water Heaters (<u>with revisions through February 3, 2005</u>)	Appliances
UL 749-1997*	Household Dishwashers (<u>with revisions through March 31, 2003</u>)	Appliances
UL 778-2002*	Motor-Operated Water Pumps (<u>with revisions through February 1, 2006</u>)	Pumps
UL 834-2004*	Heating, Water Supply, and Power Boilers –Electric (<u>with revisions through March 30, 2006</u>)	Appliances
UL 921- 96 2006*	Commercial Electric Dishwashers	Appliances
UL 959-2001*	Factory Built, Medium Heat Appliance Factory Built Chimneys (<u>with revisions through September 29, 2006</u>)	Miscellaneous Appliances
UL 1081-1997	Swimming Pool Pumps, Filters, and Chlorinators	Swimming Pools and Spas
UL 1206-2003*	Electric Commercial Clothes Washing Equipment (<u>with revisions through May 19, 2006</u>)	Appliances
UL 1261-2001*	Electric Water Heaters for Pools and Tubs	Appliances

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Standard Number	Standard Title	Application
<u>UL 1331-2005</u>	<u>Station Inlets and Outlets</u>	<u>Miscellaneous</u>
UL 1453-2004*	Electric Booster and Commercial Storage Tank Water Heater	Appliances
<u>UL 1469-2006</u>	<u>Strength of Body and Hydraulic Pressure Loss Testing of Backflow Special Check Valves</u>	<u>Valves</u>
<u>UL 1479-2003</u>	<u>Fire Tests of Through-Penetration Firestops</u>	<u>Miscellaneous</u>
<u>UL 1951-1994*</u>	<u>Electric Plumbing Accessories (with revisions through October 22, 2003)</u>	<u>Miscellaneous</u>
<u>UL 2157-1997</u>	<u>Electric Clothes Washing Machines and Extractors</u>	<u>Appliances</u>
<u>WQA S-300-94-2000</u>	Point-of-Use Low Pressure Reverse Osmosis Drinking Water Systems	Appliances

Notes: *ANSI Approved

- 1 Although this standard is referenced in Table 14-1, some of the pipe, tubing, fittings, valves, or fixtures included in the standard are not acceptable for the use under the provisions of the Uniform Plumbing Code.
- 2 See Section 316.1.3 for restriction.
- 3 Alloy C85200 for cleanout plugs.
- 4 Limited to domestic sewage.
- 5 Type II only.
- 6 ASSE 1066 is not intended to limit the maximum outlet temperature at point of use.
- 7 See Section 315.0 for trenching, excavation, and backfilling requirements when installing building drains and sewers. Engineers may wish to consult ASTM D 2321 when preparing plans and specifications for sewer mains or specific projects.

TABLE 14-1 INDEX
Standards for Materials, Equipment,
Joints, and Connections

Piping

ANSI A13.1-96(R03)	223
ASME A112.4.3-99 (R04)	225
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<editor's note: Remainder of index remains unchanged.>

CHAPTER 16
GRAY WATER SYSTEMS

<EDITOR'S NOTE: DELETE CHAPTER 16 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING.>

ALTERNATE WATER SOURCES FOR NONPOTABLE APPLICATIONS

1601.0 General.

1601.1 Scope. The provisions of this chapter shall apply to the construction, alteration, and repair of alternate water source systems for nonpotable applications.

1601.1.2 Allowable Use of Alternate Water. Where approved by the Authority Having Jurisdiction, alternate water sources (reclaimed (recycled) water, rainwater, gray water and onsite treated nonpotable water) shall be permitted to be used in lieu of potable water for the applications identified in this chapter.

1601.2 System Design. Alternate water source systems complying with this chapter shall be designed by a person registered or licensed to perform plumbing design work. All components, piping and fittings used in any alternate water source system shall be listed. Systems subject to Title 30 of the Texas Administrative Code shall be designed and installed as required by the Texas Commission on Environmental Quality.

Exceptions:

- (1) A person registered or licensed to perform plumbing design work is not required to design rainwater catchment systems used for irrigation with a maximum storage capacity of 360 gallons (1,363 L).
- (2) A person registered or licensed to perform plumbing design work is not required to design rainwater catchment systems for single family dwellings where all outlets, piping and system components are located on the exterior of the building.
- (3) A person registered or licensed to perform plumbing design work is not required to design gray water systems having a maximum discharge capacity of 250 gallons (946 L) per day for single family and multi-family dwellings.
- (4) A person registered or licensed to perform plumbing design work is not required to design a listed on-site treated nonpotable water system for single family dwellings having a maximum discharge capacity of 250 gallons (946 L) per day.

1601.3 Permit.

It shall be unlawful for any person to construct, install, or alter, or cause to be constructed, installed, or altered any alternate water source system in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

Exceptions:

- (1) A permit is not required for exterior rainwater catchment systems located at grade level

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used for outdoor irrigation.

- (2) A plumbing permit is not required for rainwater catchment systems for single family dwellings where all outlets, piping and system components are located on the exterior of the building. This does not exempt the need for permits if required for electrical connections, tank supports, or enclosures.

1601.4 Component Identification. System components shall be properly identified as to the manufacturer.

1601.5 Maintenance and Inspection. Alternate water source systems and components shall be inspected and maintained in accordance with Sections 1601.5.1 and 1601.5.3

1601.5.1 Frequency. Alternate water source systems and components shall be inspected and maintained in accordance with Table 16-1 unless more frequent inspection and maintenance is required by the manufacturer.

1601.5.2 Maintenance log. A maintenance log for gray water, rainwater and on-site reclaimed (recycled) water systems required to have a permit in 1601.3 shall be maintained by property owner and be available for inspection. The property owner or designated appointee shall ensure that a record of testing, inspection and maintenance as required by Table 16-1 is maintained in the log. The log will indicate the frequency of inspection and maintenance for each system.

1601.5.3 Maintenance Responsibility. The required maintenance and inspection of alternate water source systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction.

Table 16-1	
Minimum Alternate Water Source Testing, Inspection and Maintenance Frequency	
Description	Minimum Frequency
<u>Inspect and clean filters and screens, and replace (if necessary).</u>	<u>Every 3 months</u>
<u>Inspect and verify that disinfection, filters and water quality treatment devices and systems are operational and maintaining minimum water quality requirements as determined by the Authority Having Jurisdiction.</u>	<u>In accordance with manufacturer’s instructions, and the Authority Having Jurisdiction</u>
<u>Inspect and clear debris from rainwater gutters, downspouts, and roof washers</u>	<u>Every 6 months</u>
<u>Inspect and clear debris from roof or other above ground rainwater collection surfaces</u>	<u>Every 6 months</u>
<u>Remove tree branches and vegetation overhanging roof or other above-ground rainwater collection surfaces</u>	<u>As needed</u>
<u>Inspect pumps and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect valves and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect pressure tanks and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>

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<u>Clear debris from and inspect storage tanks, locking devices, and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect caution labels and marking</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect and maintain mulch basins for gray water irrigation systems</u>	<u>As needed to maintain mulch depth and prevent ponding and runoff</u>
<u>Cross-connection inspection and test¹</u>	<u>After initial installation and every 12 months thereafter</u>

¹ The cross-connection test shall be performed in the presence of the Authority Having Jurisdiction in accordance with the requirements of this Chapter.

1601.6 Operation and Maintenance Manual. An operation and maintenance manual for gray water, rainwater and on-site treated water systems required to have a permit in 1601.3 shall be supplied to the building owner by the system designer. The operating and maintenance manual shall include the following:

- A. Detailed diagram of the entire system and the location of all system components,
- B. Instructions on operating and maintaining the system,
- C. Details on maintaining the required water quality as determined by the Authority Having Jurisdiction,
- D. Details on deactivating the system for maintenance, repair or other purposes,
- E. Applicable testing, inspection and maintenance frequencies as required by Table 16-1, and
- F. A method of contacting the manufacturer(s).

1601.7 Minimum Water Quality Requirements. The minimum water quality for alternate water source systems shall meet the applicable water quality requirements for the intended application as determined by the public health Authority Having Jurisdiction.

Exceptions:

- (1) Water treatment is not required for rainwater catchment systems used for above ground irrigation.
- (2) Water treatment is not required for gray water used for subsurface irrigation.
- (3) Water treatment is not required for rainwater catchment systems used for subsurface or drip irrigation.

1601.8 Material Compatibility. In addition to the requirements of this chapter, alternate water source systems shall be constructed of materials that are compatible with the type of pipe and fitting materials, water treatment, and water conditions in the system.

1601.9 System Controls. The system design shall provide user controls, such as valves, switches, timers, alarms, and other controllers as appropriate for the system.

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1601.9.1 Controls for pumps, valves, and other devices that contain mercury that come in contact with alternate water source water supply shall not be permitted.

1602.0 Reserved.

1603.0 Gray Water Systems.

1603.1 General. The provisions of this section shall apply to the construction, alteration, and repair of gray water systems.

1603.2 Gray Water System.

1603.2.1 Discharge. Gray water shall be permitted to be diverted away from a sewer or private sewage disposal system and discharge to a subsurface irrigation or subsoil irrigation system. The gray water shall be permitted to discharge to a mulch basin for single family and multi-family dwellings. Gray water shall not be used to irrigate root crops or food crops intended for human consumption that come in contact with soil.

1603.2.2 Surge Capacity. All gray water systems shall be designed to have the capacity to accommodate peak flow rates and distribute the total amount of estimated gray water on a daily basis to an subsurface irrigation field, subsoil irrigation field or mulch basin without surfacing, ponding or runoff. A surge tank is required for all systems that are unable to accommodate peak flow rates and distribute the total amount of gray water by gravity drainage. The water discharge for gray water systems shall be determined in accordance with Section 1603.9.1 or 1603.9.2 of this code.

1603.2.3 Diversion. The point of diversion of gray water to the sanitary drainage system shall occur downstream of fixture traps and vent connections through an approved gray water diverter valve. The gray water diverter shall be installed in an accessible location and clearly indicate the direction of flow.

1603.2.4 Backwater Valves. Gray water drains subject to backflow shall be provided with a backwater valve so located as to be accessible for inspection and maintenance.

1603.3 Connections to Potable and Reclaimed (Recycled) Water Systems. Gray water systems shall have no direct connection to any potable water supply or reclaimed (recycled) water systems. Potable or reclaimed (recycled) water is permitted to be used as makeup water for a non-pressurized storage tank provided the connection is protected by an airgap complying with the plumbing code.

1603.4 Location. No gray water system or part thereof shall be located on any lot other than the lot that is the site of the building or structure that discharges the gray water, nor shall any gray water system or part thereof be located at any point having less than the minimum distances indicated in Table 16-2.

Table 16-2
Location of Gray Water System

<u>Minimum Horizontal Distance in Clear Required From:</u>	<u>Surge Tank</u>		<u>Subsurface and Subsoil Irrigation Field and Mulch Bed</u>	
	<u>Feet (ft)</u>	<u>Meter (m)</u>	<u>Feet (ft)</u>	<u>Meters</u>
<u>Building structures¹</u>	<u>5^{2,9}</u>	<u>1.5²</u>	<u>2^{3,8}</u>	<u>0.6³</u>
<u>Property line adjoining private property</u>	<u>5</u>	<u>1.5</u>	<u>5⁸</u>	<u>1.5</u>
<u>Water supply wells⁴</u>	<u>50</u>	<u>15.2</u>	<u>100</u>	<u>30.5</u>
<u>Streams and lakes⁴</u>	<u>50</u>	<u>15.2</u>	<u>50⁵</u>	<u>15.2⁵</u>
<u>Sewage pits or cesspools</u>	<u>5</u>	<u>1.5</u>	<u>5</u>	<u>1.5</u>
<u>Sewage disposal field</u>	<u>5</u>	<u>1.5</u>	<u>4⁶</u>	<u>1.2⁶</u>
<u>Septic tank</u>	<u>0</u>	<u>0</u>	<u>5</u>	<u>1.5</u>
<u>On-site domestic water service line</u>	<u>5</u>	<u>1.5</u>	<u>5</u>	<u>1.5</u>
<u>Pressurized public water main</u>	<u>10</u>	<u>3.0</u>	<u>10</u>	<u>3.0⁷</u>

Note: When irrigation/disposal fields are installed in sloping ground, the minimum horizontal distance between any part of the distribution system and the ground surface shall be fifteen (15) feet (4,572 mm).

¹ Including porches and steps, whether covered or uncovered, breezeways, roofed porte cocheres, roofed patios, carports, covered walks, covered driveways, and similar structures or appurtenances.

² The distance shall be permitted to be reduced to zero (0) feet for above ground tanks when first approved by the Authority Having Jurisdiction.

³ Assumes a 45 degree (0.79 rad) angle from foundation.

⁴ Where special hazards are involved, the distance required shall be increased as directed by the Authority Having Jurisdiction.

⁵ These minimum clear horizontal distances shall also apply between the irrigation/disposal field and the ocean mean higher high tide line.

⁶ Plus two (2) feet (610 mm) for each additional foot of depth in excess of one (1) foot (305 mm) below the bottom of the drain line.

⁷ For parallel construction/for crossings, approval by the Authority Having Jurisdiction shall be required.

⁸ The distance shall be permitted to be reduced to (1.5) feet (458 mm) for drip and mulch basin irrigation systems.

⁹ The distance shall be permitted to be reduced to (0) zero feet (0 mm) for surge tanks of 75 gallons (284 L) or less.

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1603.5 Plot Plan Submission. No permit for any gray water system shall be issued until a plot plan with appropriate data satisfactory to the Authority Having Jurisdiction has been submitted and approved.

1603.6 Prohibited Location. When there is insufficient lot area or inappropriate soil conditions for adequate absorption to prevent the ponding, surfacing or runoff of the gray water, as determined by the Authority Having Jurisdiction, no gray water system shall be permitted. A gray water system is not permitted on any property in a geologically sensitive area as determined by the Authority Having Jurisdiction.

1603.7 (Reserved)

1603.8 Drawings and Specifications. The Authority Having Jurisdiction may require any or all of the following information to be included with or in the plot plan before a permit is issued for a gray water system, or at any time during the construction thereof:

- A. Plot plan drawn to scale and completely dimensioned, showing lot lines and structures, direction and approximate slope of surface, location of all present or proposed retaining walls, drainage channels, water supply lines, wells, paved areas and structures on the plot, number of bedrooms and plumbing fixtures in each structure, location of private sewage disposal system and expansion area or building sewer connecting to the public sewer, and location of the proposed gray water system.
- B. Details of construction necessary to ensure compliance with the requirements of this chapter, together with a full description of the complete installation, including installation methods, construction, and materials as required by the Authority Having Jurisdiction.
- C. Details for all holding tanks shall include all dimensions, structural calculations, bracings, and such other pertinent data as may be required.
- D. A log of soil formations and groundwater level as determined by test holes dug in proximity to any proposed irrigation area, together with a statement of water absorption characteristics of the soil at the proposed site as determined by approved percolation tests.
- E. Distance between the plot and any surface waters such as lakes, ponds, rivers or streams, and the slope between the plot and the surface water, if in close proximity.

Exception: The Authority Having Jurisdiction may allow the use of Table 16-2 in lieu of percolation tests.

1603.9 Procedure for Estimating Gray Water Discharge. All gray water systems shall be designed to distribute the total amount of estimated gray water on a daily basis. The water discharge for gray water systems shall be determined in accordance with Section 1603.9.1 or 1603.9.2 of this code.

1603.9.1 Single Family Dwellings and Multi-Family Dwellings. The gray water discharge for single family and multi-family dwellings shall be calculated by water use records, calculations of local daily per person interior water use, or the following procedure:

1. The number of occupants of each dwelling unit shall be calculated as follows:

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accordance with the plumbing code.

(H) Surge tanks shall be installed on dry, level, and well-compacted soil. The tank shall be installed on a foundation or platform that is constructed to accommodate all loads in accordance with the building code.

(I) Surge tanks shall be anchored to prevent against overturning when above ground and to resist buoyancy forces when installed below ground.

1603.10.2 Gray Water Pipe and Fitting Materials. All above-ground and underground building drainage and vent pipe and fittings for gray water systems shall comply with the requirements for above-ground and underground sanitary building drainage and vent pipe and fittings in the plumbing code. These materials shall extend a minimum of two (2) feet (610 mm) outside the building.

1603.10.3 Subsoil Irrigation Field Materials. Subsoil irrigation field piping shall be constructed of perforated high-density polyethylene pipe, perforated ABS pipe, perforated PVC pipe, or other approved materials, provided that sufficient openings are available for distribution of the gray water into the trench area. Material, construction, and perforation of the pipe shall be in compliance with the appropriate absorption field drainage piping standards and shall be approved by the Authority Having Jurisdiction.

1603.10.4 Subsurface Irrigation Field and Mulch Basin Supply Line Materials. Materials for gray water piping outside the building shall be polyethylene or PVC. Drip feeder lines shall be PVC or polyethylene tubing.

1603.10.5 Valves - All valves shall be accessible.

1603.10.6 Trap - Gray water piping discharging into the surge tank or having a direct connection to the sanitary drain or sewer piping shall be downstream of an approved water seal type trap(s). If no such trap(s) exists, an approved vented running trap shall be installed upstream of the connection to protect the building from any possible waste or sewer gases.

1603.10.7 Backwater Valve. A backwater valve shall be installed on all gray water drain connections to the sanitary drain or sewer.

1603.11 Subsurface Irrigation System Zones. Irrigation or disposal fields shall be permitted to have one or more valved zones. Each zone must be of adequate size to receive the gray water anticipated in that zone.

1603.11.1 Required Area of Subsurface Irrigation Fields, Subsoil Irrigation Fields and Mulch Basins. The minimum effective irrigation area of subsurface irrigation fields, subsoil irrigation fields and mulch basins shall be determined by Table 16-3 for the type of soil found in the excavation, based upon a calculation of estimated gray water discharge pursuant to Section 1603.9 of this chapter. For a subsoil irrigation field, the area shall be equal to the aggregate length of the perforated pipe sections within the valved zone multiplied by the width of the proposed subsoil irrigation field.

1603.11.2 Determination of Maximum Absorption Capacity. The irrigation field and mulch basin size shall be based on the maximum absorption capacity of the soil and determined using Table 16-3. For soils not listed in Table 16-3, the maximum absorption capacity for the proposed site may be determined by percolation tests or other method acceptable to the Authority Having Jurisdiction. A gray water system shall not be permitted,

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where the percolation test shows the absorption capacity of the soil is unable to accommodate the maximum discharge of the proposed gray water irrigation system.

Table 16-3 Design of Six Typical Soils		
<u>Type of Soil</u>	<u>Minimum square feet of irrigation area per 100 gallons of estimated gray water discharge per day</u>	<u>Maximum absorption capacity in gallons per square foot of irrigation/leaching area for a 24-hour period</u>
<u>Coarse sand or gravel</u>	<u>20</u>	<u>5.0</u>
<u>Fine sand</u>	<u>25</u>	<u>4.0</u>
<u>Sandy loam</u>	<u>40</u>	<u>2.5</u>
<u>Sandy clay</u>	<u>60</u>	<u>1.7</u>
<u>Clay with considerable sand or gravel</u>	<u>90</u>	<u>1.1</u>
<u>Clay with small amounts of sand or gravel</u>	<u>120</u>	<u>0.8</u>

Table 16-3 Design of Six Typical Soils (Metric)		
<u>Type of Soil</u>	<u>Minimum square meters of irrigation/leaching area per liter of estimated gray water discharge per day</u>	<u>Maximum absorption capacity in liters per square meter of irrigation/leaching area for a 24-hour period</u>
<u>Coarse sand or gravel</u>	<u>0.005</u>	<u>203.7</u>
<u>Fine sand</u>	<u>0.006</u>	<u>162.9</u>
<u>Sandy loam</u>	<u>0.010</u>	<u>101.8</u>
<u>Sandy clay</u>	<u>0.015</u>	<u>69.2</u>
<u>Clay with considerable sand or gravel</u>	<u>0.022</u>	<u>44.8</u>
<u>Clay with small amounts of sand or gravel</u>	<u>0.030</u>	<u>32.6</u>

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1603.11.3 Groundwater Level. No excavation for an irrigation field, disposal field or mulch basin shall extend within three (3) vertical feet (0.9 m) of the highest known seasonal groundwater level, nor to a depth where gray water contaminates the groundwater or surface water. The applicant shall supply evidence of groundwater depth to the satisfaction of the Authority Having Jurisdiction.

1603.12 Subsurface and Subsoil Irrigation Field, and Mulch Basin Design and Construction. Subsurface and subsoil irrigation field, and mulch basin design and construction shall comply with Sections 1603.12.1 through 1603.12.3. Where a gray water irrigation system design is predicated on soil tests, the subsurface or subsoil irrigation field or mulch basin shall be installed at the same location and depth as the tested area.

1603.12.1 Subsurface Irrigation Field. A subsurface irrigation field shall comply with Sections 1603.12.1.1 through 1603.12.1.7.

1603.12.1.1 Minimum Depth. All supply piping, including drip feeders, shall be a minimum two (2) inches (229 mm) below finished grade and covered with mulch or soil.

1603.12.1.2 Filter. A minimum 140 mesh (115 micron) filter with a capacity of 25 gallons (94.6 L) per minute or equivalent shall be installed. Where a filter backwash is installed, the backwash and flush discharge shall discharge into the building sewer or private sewage disposal system. Filter backwash and flush water shall not be used for any purpose.

1603.12.1.3 Emitter Size. Emitters shall be installed in accordance with the manufacturer’s installation instructions. Emitters shall have a minimum flow path of 1,200 microns and shall have a coefficient of manufacturing variation (C_v) of no more than 7 percent. Irrigation system design shall be such that emitter flow variation shall not exceed 10 percent.

1603.12.1.4 Number of Emitters. The minimum number of emitters and the maximum discharge of each emitter in an irrigation field shall comply with Table 16-4.

<u>Table 16-4</u>		
<u>Subsurface Irrigation Design Criteria for Six Typical Soils²</u>		
<u>Type of Soil</u>	<u>Maximum Emitter Discharge</u>	<u>Minimum Number of Emitters per gallon of estimated gray water discharged per day¹</u>
	<u>gal/day</u>	<u>gal/day</u>
<u>Sand</u>	<u>1.8</u>	<u>0.6</u>
<u>Sandy loam</u>	<u>1.4</u>	<u>0.7</u>
<u>Loam</u>	<u>1.2</u>	<u>0.9</u>
<u>Clay loam</u>	<u>0.9</u>	<u>1.1</u>
<u>Silty clay</u>	<u>0.6</u>	<u>1.6</u>
<u>Clay</u>	<u>0.5</u>	<u>2.0</u>

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¹The estimated gray water discharge per day shall be determined in accordance with Section 1603.9.

²For SI units, 1 gal = 3.8 L

1603.12.1.5 Controls. The system design shall provide user controls, such as valves, switches, timers and other controllers, as appropriate, to rotate the distribution of gray water between irrigation zones.

1603.12.1.6 Maximum Pressure. Where pressure at the discharge side of the pump exceeds 20 psi (138 kPa), a pressure-reducing valve able to maintain downstream pressure no greater than 20 psi (138 kPa) shall be installed downstream from the pump and before any emission device.

1603.12.2 Mulch Basin. A mulch basin shall comply with Sections 1603.12.2.1 through 1603.12.2.4 of this code.

1603.12.2.1 Single Family and Multi-Family Dwellings. The gray water discharge to a mulch basin is limited to single family and multi-family dwellings.

1603.12.2.2 Size. Mulch basins shall be of sufficient size to accommodate peak flow rates and distribute the total amount of estimated gray water on a daily basis without surfacing, ponding, or runoff. Mulch basins shall have a minimum depth of ten (10) inches (254 mm) below finished grade. The mulch basin size shall be based on the maximum absorption capacity of the soil, which is determined by Table 16-3.

1603.12.2.3 Minimum Depth. All gray water supply piping, including drip feeders shall be a minimum two (2) inches (229 mm) below finished grade and covered with mulch.

1603.12.2.4 Maintenance. The mulch Basin shall be maintained periodically to retain the required depth and area, and to replenish the required mulch cover.

1603.12.3 Subsoil Irrigation Field. Subsoil irrigation fields shall comply with Sections 1603.12.3.1 through 1603.12.3.3 of this code.

1603.12.3.1 Minimum Pipe Size. Subsoil irrigation field distribution piping shall be a minimum of three (3) inch (80 mm) diameter.

1603.12.3.2 Filter Material and Backfill. Filter material, clean stone, gravel, slag, or similar material acceptable to the Authority Having Jurisdiction, varying in size from three-quarter (3/4) inch (20 mm) to two and one-half (2-1/2) inch (65 mm) shall be placed in the trench to the depth and grade complying with Table 16-4. The perforated section of subsoil irrigation field distribution piping shall be laid on the filter material in an approved manner. The perforated section shall then be covered with filter material to the minimum depth in accordance with Table 16-4. The filter material shall then be covered with porous material to prevent closure of voids with earth backfill. No earth backfill shall be placed over the filter material cover until after inspection and acceptance.

Exception: Leaching chambers when installed according to manufacturer's recommendations.

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1603.12.3.3 Subsoil Irrigation Field Construction. Subsoil irrigation fields shall be constructed in accordance with Table 16-5. Where necessary on sloping ground to prevent excessive line slopes, irrigation lines shall be stepped. The lines between each horizontal leaching section shall be made with approved watertight joints and installed on natural or unfilled ground.

Exception: Leaching chambers when installed according to manufacturer's recommendations.

Table 16-5		
Subsoil Irrigation Field Construction		
Description	Minimum	Maximum
<u>Number of drain lines per valved zone</u>	<u>1</u>	<u>-</u>
<u>Length of each perforated line</u>	<u>-</u>	<u>100 ft. (30,840 mm)</u>
<u>Bottom width of trench</u>	<u>12 in. (305 mm)</u>	<u>18 in. (457 mm)</u>
<u>Spacing of lines, center to center</u>	<u>4 ft. (1219 mm)</u>	<u>-</u>
<u>Depth of earth cover of lines</u>	<u>10 in. (254 mm)</u>	<u>-</u>
<u>Depth of filter material cover of lines</u>	<u>2 in. (51 mm)</u>	<u>-</u>
<u>Depth of filter material beneath lines</u>	<u>3 in. (76 mm)</u>	<u>-</u>
<u>Grade of perforated lines level</u>	<u>level</u>	<u>3 in./100 ft. (2 mm/m)</u>

1603.13 Gray Water System Color and Marking Information. Pressurized gray water distribution systems shall be identified as containing nonpotable water in accordance with this code.

1603.14 Reserved.

1603.15 Special Provisions.

- (A) Other collection and distribution systems may be approved by the local Authority Having Jurisdiction, as allowed by Section 301.2 of this code.
- (B) Nothing contained in this chapter shall be construed to prevent the Authority Having Jurisdiction from requiring compliance with higher requirements than those contained herein, where such higher requirements are essential to maintain a safe and sanitary condition.

1603.16 Testing. All building drains and vents for gray water systems shall be tested in accordance with this code. Surge tanks shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed, and the tank shall remain watertight. A flow test shall be performed through the system to the point of gray water discharge. All lines and components shall be watertight up to the point of the irrigation perforated and drip lines.

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1603.17 Maintenance. Gray water systems and components shall be maintained in accordance with Table 16-1.

1604.0 Reclaimed (Recycled) Water Systems.

1604.1 General. The provisions of this section shall apply to the installation, construction, alteration, and repair of reclaimed (recycled) water systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, above ground and subsurface irrigation, industrial or commercial cooling or air conditioning and other uses approved by the Authority Having Jurisdiction.

1604.2 Permit. It shall be unlawful for any person to construct, install, alter, or cause to be constructed, installed, or altered any reclaimed (recycled) water system within a building or on a premises without first obtaining a permit to do such work from the Authority Having Jurisdiction.

1604.2.1 Plumbing Plan Submission. No permit for any reclaimed (recycled) water system shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.

1604.3 System Changes. No changes or connections shall be made to either the reclaimed (recycled) water system or the potable water system within any site containing a reclaimed (recycled) water system without approval by the Authority Having Jurisdiction.

1604.4 Connections to Potable or Reclaimed (Recycled) Water Systems. Reclaimed (Recycled) water systems shall have no connection to any potable water supply or alternate water source system. Potable water is permitted to be used as makeup water for a reclaimed (recycled) water storage tank provided the water supply inlet is protected by an airgap or reduced-pressure principle backflow preventer complying with the plumbing code.

1604.5 Reserved.

1604.6 Initial Cross-Connection Test. Before the building may be occupied, an individual recognized by the Authority Having Jurisdiction to perform backflow prevention testing shall perform the initial cross-connection test in accordance with Section 1604.13.2 of this code in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction. The test shall be ruled successful by the Authority Having Jurisdiction before final approval is granted.

1604.7 Reserved

1604.8 Reclaimed (Recycled) Water System Materials. Reclaimed (Recycled) water supply and distribution system materials shall comply with the requirements of the plumbing code for potable water supply and distribution systems, unless otherwise provided for in this section.

1604.9 Reclaimed (Recycled) Water System Color and Marking Information. Reclaimed (Recycled) water systems shall have a colored background in accordance with the plumbing code. Reclaimed (Recycled) water systems shall be marked with the words "CAUTION: NONPOTABLE RECLAIMED (RECYCLED) WATER, DO NOT DRINK." in lettering in accordance with the plumbing code.

1604.10 Valves. All valves, except fixture supply control valves, shall be equipped with a locking feature.

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1604.11 Installation.

(A) Hose bibbs shall not be allowed on reclaimed (recycled) water piping systems located in areas accessible to the public. Access to reclaimed (recycled) water at points in the system accessible to the public shall be through a quick-disconnect device that differs from those installed on the potable water system. Hose bibbs supplying reclaimed (recycled) water shall be marked with the words “CAUTION: NONPOTABLE RECLAIMED WATER, DO NOT DRINK” along with the following symbol:



(B) The reclaimed (recycled) water system and the potable water system within the building shall be provided with the required appurtenances (valves, air/vacuum relief valves, etc.) to allow for deactivation or drainage as required for cross connection test in Section 1604.13.2 of this code.

(C) Reclaimed (Recycled) water pipes shall be permitted to be run or laid in the same trench as potable water pipes with a twelve (12) inch (305 mm) minimum vertical and horizontal separation when both pipe materials are approved for use within a building. When piping materials do not meet this requirement the minimum horizontal separation shall be increased to sixty (60) inches (1,524 mm). The potable water piping shall be installed at an elevation above the reclaimed (recycled) water piping. Reclaimed water pipes laid in the same trench or crossing building sewer or drainage piping shall be installed in compliance with the plumbing code for potable water piping.

1604.12 Signs. Rooms and water closet tanks in buildings using reclaimed (recycled) water shall comply with Sections 1604.12.1 through 1604.12.3 of this code.

1604.12.1 Commercial, Industrial, and Institutional Restroom Signs. A sign shall be installed in all restrooms in commercial, industrial, and institutional occupancies using reclaimed (recycled) water for water closets and/or urinals. Each sign shall contain one half (1/2) inch (12.7 mm) letters of a highly visible color on a contrasting background. The location of the sign(s) shall be such that the sign(s) shall be visible to all users. The location of the signs shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES RECLAIMED (RECYCLED) WATER TO FLUSH TOILETS AND URINALS.

1604.12.2 Room Signs. Each room containing reclaimed (recycled) water equipment shall have a sign posted with the following wording in one (1) inch (25.4 mm) letters on a purple background:

CAUTION: NONPOTABLE RECLAIMED (RECYCLED) WATER, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE:

CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM.

1604.13 Inspection and Testing. Reclaimed (recycled) water systems shall be inspected and tested in accordance with Sections 1604.13.1 through 1604.13.3 of this code.

1604.13.1 Supply System Inspection and Test. Reclaimed (recycled) water systems shall be inspected and tested as outlined in the plumbing code for testing of potable water piping.

1604.13.2 Annual Cross-Connection Inspection and Testing. An initial and subsequent annual inspection and test shall be performed on both the potable and reclaimed (recycled) water systems. The potable and reclaimed (recycled) water system shall be isolated from each other and independently inspected and tested to ensure there is no cross connection in accordance with Sections 1604.13.2.1 through 1604.13.2.4 of this code.

1604.13.2.1 Visual System Inspection. Prior to commencing the cross-connection testing, a dual system inspection shall be conducted by the Authority Having Jurisdiction and other authorities having jurisdiction.

- (a) Meter locations of the reclaimed (recycled) water and potable water lines shall be checked to verify that no modifications were made and that no cross connections are visible.**
- (b) All pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.**
- (c) All valves shall be checked to ensure that valve lock are in place and intact. All valve control door signs shall be checked to verify that no signs have been removed.**

1604.13.2.2 Cross-Connection Test. The following procedure shall be followed by the applicant, who must be a licensed plumber with endorsement as a Water Supply Protection Specialist, in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction to determine whether a cross connection occurred.

- (a) The potable water system shall be activated and pressurized. The reclaimed (recycled) water system shall be shut down and completely drained.**
- (b) The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the reclaimed (recycled) water system is empty. The minimum period the reclaimed (recycled) water system is to remain depressurized shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and reclaimed (recycled) water distribution systems, but in no case shall that period be less than one (1) hour.**
- (c) The drain on the reclaimed (recycled) water system shall be checked for flow during the test and all fixtures, potable and reclaimed (recycled), shall be tested and inspected for flow. Flow from any reclaimed (recycled) water system outlet shall indicate a cross connection. No flow from a potable water outlet would indicate that it may be connected to the reclaimed (recycled) water system.**

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- (d) The potable water system shall then be completely drained.
- (e) The reclaimed (recycled) water system shall then be activated and pressurized.
- (f) The reclaimed (recycled) water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the potable water system is empty. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis, but in no case shall that period be less than one (1) hour.
- (g) All fixtures, potable and reclaimed (recycled), shall be tested and inspected for flow. Flow from any potable water system outlet shall indicate a cross-connection. No flow from a reclaimed (recycled) water outlet would indicate that it may be connected to the potable water system.
- (h) The drain on the potable water system shall be checked for flow during the test and at the end of the test.
- (i) If there is no flow detected in any of the fixtures which would have indicated a cross connection, the potable water system shall be repressurized.

1604.13.2.3 Discovery of Cross-Connection. In the event that a cross-connection is discovered, the following procedure, in the presence of the Authority Having Jurisdiction, shall be activated immediately:

- (a) Reclaimed (recycled) water piping to the building shall be shut down at the meter, and the reclaimed (recycled) water riser shall be drained.
- (b) Potable water piping to the building shall be shut down at the meter.
- (c) The cross-connection shall be uncovered and disconnected.
- (d) The building shall be retested following procedures listed in subsections 1604.13.2.1 and 1604.13.2.2 of this code.
- (e) The potable water system shall be chlorinated with fifty (50) ppm chlorine for twenty-four (24) hours.
- (f) The potable water system shall be flushed after twenty-four (24) hours and a standard bacteriological test shall be performed. If test results are acceptable, the potable water system may be recharged.

1604.13.2.4 Annual Inspection. An annual inspection of the reclaimed (recycled) water system, following the procedures listed in subsection 1604.13.2.1 of this code shall be required. Annual cross-connection testing, following the procedures listed in subsection 1604.13.2.2 of this code shall be required by the Authority Having Jurisdiction, unless site conditions do not require it. In no event shall the test occur less often than once in four (4) years.

Alternate testing requirements may be allowed by the Authority Having Jurisdiction.

1604.14 Sizing. Reclaimed (recycled) water piping shall be sized in accordance with the plumbing code for sizing potable water piping.

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1605.0 On-Site Treated Nonpotable Water Systems.

1605.1 General. The provisions of this section shall apply to the installation, construction, alteration, and repair of on-site treated nonpotable water systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, above and below ground irrigation, and other uses approved by the Authority Having Jurisdiction.

1605.2 Plumbing Plan Submission. No permit for any on-site treated nonpotable water system shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.

1605.3 System Changes. No changes or connections shall be made to either the on-site treated nonpotable water system or the potable water system within any site containing an on-site treated nonpotable water system without approval by the Authority Having Jurisdiction.

1605.4 Connections to Potable or Reclaimed (recycled) Water Systems. Onsite treated nonpotable water systems shall have no connection to any potable water supply or reclaimed (recycled) water source system. Potable or reclaimed (recycled) water is permitted to be used as makeup water for a non-pressurized storage tank provided the makeup water supply is protected by an airgap complying with the plumbing code.

1605.5 Initial Cross-Connection Test. Before the building may be occupied, an individual certified for backflow prevention testing shall perform the initial cross-connection test in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction. The test shall be ruled successful by the Authority Having Jurisdiction before final approval is granted.

1605.6 Reserved

1605.7 On-Site Treated Nonpotable Water System Materials. On-site treated nonpotable water supply and distribution system materials shall comply with the requirements of the plumbing code for potable water supply and distribution systems, unless otherwise provided for in this section.

1605.8 On-Site Treated Nonpotable Water Devices and Systems. Devices or equipment used to treat on-site treated nonpotable water in order to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and approved for the intended application.

1605.9 On-Site Treated Nonpotable Water System Color and Marking Information. On-site treated water systems shall have a colored background in accordance with the plumbing code. On-site treated water systems shall be marked with the words “CAUTION: ON-SITE TREATED NONPOTABLE WATER, DO NOT DRINK” in lettering in accordance with the plumbing code.

1605.10 Valves. All valves, except fixture supply control valves, shall be equipped with a locking feature.

1605.11 Design and Installation. The design and installation of on-site treated nonpotable systems shall comply with Sections 1605.11.1 through 1605.11.5 of this code.

1605.11.1 Listing Terms and Installation Instructions. On-site treated nonpotable water systems shall be installed in accordance with the terms of its listing and the manufacturer’s installation instructions.

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1605.11.2 Minimum Water Quality. The minimum water quality for on-site treated nonpotable water systems shall meet the applicable water quality requirements for the intended applications as determined by the Texas Commission on Environmental Quality.

1605.11.3 Deactivation and Drainage. The on-site treated nonpotable water system and the potable water system within the building shall be provided with the required appurtenances (valves, air/vacuum relief valves, etc.) to allow for deactivation or drainage as required for cross connection test in Section 1605.13.2 of this code.

1605.11.4 Near Underground Potable Water Pipe. On-site treated nonpotable water pipes shall be permitted to be run or laid in the same trench as potable water pipes with a twelve (12) inch (305 mm) minimum vertical and horizontal separation when both pipe materials are approved for use within a building. When piping materials do not meet this requirement the minimum separation shall be increased to sixty (60) inches (1,524 mm). The potable water piping shall be installed at an elevation above the on-site treated nonpotable water piping.

1605.11.5 Required Filters. A filter permitting the passage of particulates no larger than one-hundred (100) microns shall be provided for on-site treated nonpotable water supplied to water closets, urinals, trap primers, and drip irrigation system.

1605.12 Signs. Signs in buildings using on-site treated nonpotable water shall comply with Sections 1605.12.1 and 1605.12.2 of this code.

1605.12.1 Commercial, Industrial, and Institutional Restroom Signs. A sign shall be installed in all restrooms in commercial, industrial, and institutional occupancies using on-site treated water for water closets and/or urinals. Each sign shall contain one half (1/2) inch (12.7 mm) letters of a highly visible color on a contrasting background. The location of the sign(s) shall be such that the sign(s) shall be visible to all users. The location of the signs shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES ON-SITE TREATED NONPOTABLE WATER TO FLUSH TOILETS AND URINALS.

1605.12.2 Room Signs. Each room containing on-site treated water equipment shall have a sign posted with the following wording in one (1) inch (25.4 mm) letters on a purple background:

CAUTION ON-SITE TREATED NONPOTABLE WATER, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM.

This sign shall be posted in a location that is visible to anyone working on or near on-site treated nonpotable water equipment.

1605.13 Inspection and Testing. On-site treated nonpotable water systems shall be inspected and tested in accordance with Sections 1605.13.1 through 1605.13.3 of this code.

1605.13.1 Supply System Inspection and Test. On-site treated nonpotable water systems shall be inspected and tested as outlined in this code for testing of potable water piping.

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1605.13.2 Annual Cross-Connection Inspection and Testing. An initial and subsequent annual inspection and test shall be performed on both the potable and on-site treated nonpotable water systems. The potable and on-site treated nonpotable water system shall be isolated from each other and independently inspected and tested to ensure there is no cross connection in accordance with Sections 1605.13.2.1 through 1605.13.2.4 of this code.

1605.13.2.1 Visual System Inspection. Prior to commencing the cross-connection testing, a dual system inspection shall be conducted by the Authority Having Jurisdiction and other authorities having jurisdiction.

- (a) All pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.
- (b) All valves shall be checked to ensure that valve lock seals are still in place and intact. All valve control door signs shall be checked to verify that no signs have been removed.

1605.13.2.2 Cross-Connection Test. The following procedure shall be followed by the applicant in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction to determine whether a cross connection occurred.

- (a) The potable water system shall be activated and pressurized. The on-site treated nonpotable water system shall be shut down and completely drained.
- (b) The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the on-site treated nonpotable water system is empty. The minimum period the on-site treated nonpotable water system is to remain depressurized shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and on-site treated water distribution systems, but in no case shall that period be less than one (1) hour.
- (c) All fixtures, potable and on-site treated, shall be tested and inspected for flow. Flow from any on-site treated water system outlet shall indicate a cross connection. No flow from a potable water outlet would indicate that it may be connected to the on-site treated water system.
- (d) The drain on the on-site treated nonpotable water system shall be checked for flow during the test and at the end of the test
- (e) The potable water system shall then be completely drained.
- (f) The on-site treated nonpotable water system shall then be activated and pressurized.
- (g) The on-site treated nonpotable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the potable water system is empty. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis, but in no case shall that period be less than one (1) hour.
- (h) All fixtures, potable and on-site treated nonpotable, shall be tested and inspected for flow. Flow from any potable water system outlet shall indicate a

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cross-connection. No flow from an on-site treated water outlet would indicate that it may be connected to the potable water system.

- (i) The drain on the potable water system shall be checked for flow during the test and at the end of the test.
- (j) If there is no flow detected in any of the fixtures which would have indicated a cross connection, the potable water system shall be repressurized.

1605.13.2.3 Discovery of Cross-Connection. In the event that a cross-connection is discovered, the following procedure, in the presence of the Authority Having Jurisdiction, shall be activated immediately:

- (a) On-site treated nonpotable water piping to the building shall be shut down at the meter and the on-site treated water riser shall be drained.
- (b) Potable water piping to the building shall be shut down at the meter.
- (c) The cross-connection shall be uncovered and disconnected.
- (d) The building shall be retested following procedures listed in subsections 1605.13.2.1 and 1605.13.2.2 of this code.
- (e) The potable water system shall be chlorinated with fifty (50) ppm chlorine for twenty-four (24) hours.
- (f) The potable water system shall be flushed after twenty-four (24) hours, and a standard bacteriological test shall be performed. If test results are acceptable, the potable water system may be recharged.

1605.13.2.4 Annual Inspection. An annual inspection of the on-site treated nonpotable water system, following the procedures listed in subsection 1605.13.2.1 of this code shall be required. Annual cross-connection testing, following the procedures listed in subsection 1605.13.2.2 of this code shall be required by the Authority Having Jurisdiction, unless site conditions do not require it. In no event shall the test occur less often than once in four (4) years.

Alternate testing requirements may be allowed by the Authority Having Jurisdiction.

1605.14 Sizing. Unless otherwise provided for in this supplement, on-site treated nonpotable water piping shall be sized in accordance with the plumbing code for sizing potable water piping.

1606.0 Non Potable Rainwater Catchment Systems.

1606.1 General. The provisions of this section shall apply to the installation, construction, alteration, and repair of rainwater catchments systems intended to supply uses such as water closets, urinals, and trap primers for floor drains and floor sinks, irrigation, industrial processes, water features, and other uses approved by the Authority Having Jurisdiction.

Note: Additional design criteria can be found in the ARCSA/ASPE Rainwater Catchment Design and Installation Standard.

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1606.2 Plumbing Plan Submission. No permit for any rainwater catchment system requiring a permit shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved. No changes or connections shall be made to either the rainfall catchment or the potable water system within any site containing a rainfall catchment water system without approval by the Authority Having Jurisdiction.

1606.3 System Changes. No changes or connections shall be made to either the rainwater catchment system or the potable water system within any site containing a rainwater catchment system requiring a permit without approval by the Authority Having Jurisdiction.

1606.4 Connections to Potable or Reclaimed (Recycled) Water Systems. Rainwater catchment systems shall have no direct connection to any potable water supply or alternate water source system. Potable or reclaimed (recycled) water is permitted to be used as makeup water for a rainwater catchment system provided the potable or reclaimed (recycled) water supply connection is protected by an airgap or reduced-pressure principle backflow preventer complying with this code.

1606.5 Initial Cross-Connection Test. Where any portion of a rainwater catchment system is installed within a building, a cross-connection test is required in accordance with Section 1606.12.2 of this code. Before the building may be occupied or the system is activated, the installer shall perform the initial cross-connection test in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction. The test shall be ruled successful by the Authority Having Jurisdiction before final approval is granted.

1606.6 Sizing. Rainfall catchment system distribution piping for indoor applications shall be sized as outlined in this code for sizing potable water piping. The design and size of rainwater drains, gutters, conductors, and leaders shall comply with the plumbing code.

1606.7 Reserved

1606.8 Rainfall Catchment System Materials. Rainfall catchment system materials shall comply with Sections 1606.8.1 and 1606.8.4 of this code.

1606.8.1 Water Supply and Distribution Materials. Rainwater catchment water supply and distribution materials shall comply with the requirements of this code for potable water supply and distribution systems, unless otherwise provided for in this section.

1606.8.2 Rainwater Catchment System Drainage Materials. All materials used in rainwater catchment drainage systems, including gutters, downspouts, conductors, and leaders shall comply with the requirements of the plumbing code for storm drainage.

1606.8.3 Storage Tanks. Rainwater storage tanks shall comply with Section 1606.10.6 of this code.

1606.8.4 Collections Surfaces. The collection surface shall be constructed of a hard, impervious material.

1606.9 Rainwater Catchment Water System Color and Marking Information. Rainwater catchment systems shall have a colored background in accordance with this code. Rainwater catchment systems shall be marked with the words “CAUTION: NONPOTABLE RAINWATER WATER, DO NOT DRINK” in lettering in accordance with this code.

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1606.10 Design and Installation.

1606.10.1 Outside Hose Bibbs. Outside hose bibbs shall be allowed on rainwater piping systems. Hose bibbs supplying rainwater shall be marked with the words “CAUTION: NONPOTABLE WATER, DO NOT DRINK” along with the following symbol:



1606.10.2 Deactivation and Drainage for Cross Connection Test. The rainwater catchment system and the potable water system within the building shall be provided with the required appurtenances (valves, air/vacuum relief valves, etc.) to allow for deactivation or drainage as required for cross connection test in Section 1606.13.2 of this code.

1606.10.3 Collection Surfaces. Rainwater shall only be collected from roof surfaces. Rainwater catchment system shall not collect rainwater from:

- a. Vehicular parking surfaces;
- b. Surface water runoff; or
- c. Bodies of standing water.

1606.10.3.1 Prohibited Discharges. Overflows and bleed-off pipes from roof-mounted equipment and appliances shall not discharge onto roof surfaces that are intended to collect rainwater.

1606.10.4 Minimum Water Quality. No treatment is required for rainwater used for irrigation.

1606.10.5 Reserved.

1606.10.6 Rainwater Storage Tanks. Rainwater storage tanks shall be constructed and installed in accordance with Sections 1606.10.6.1 through 1606.10.6.7 of this code.

1606.10.6.1 Construction. Rainwater storage shall be constructed of solid, durable materials not subject to excessive corrosion or decay and shall be watertight. Storage tanks shall be approved by the Authority Having Jurisdiction, provided such tanks comply with approved applicable standards.

1606.10.6.2 Location. Rainwater storage tanks shall be permitted to be installed above or below grade.

1606.10.6.3 Above Grade. Above grade storage tanks shall be of an opaque material, approved for above-ground use in direct sunlight or shall be shielded from direct sunlight. Tanks shall be installed in an accessible location to allow for inspection and cleaning. The tank shall be installed on a foundation or platform that is constructed to accommodate all loads in accordance with the building code.

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1606.10.6.4 Below Grade. Rainwater storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. All holding tank covers shall be capable of supporting an earth load of not less than three hundred (300) pounds per square foot (1464.6 kg/m²) when the tank is designed for underground installation. Below grade rainwater tanks installed underground shall be provided with manholes. The manhole opening shall be located a minimum of 4 inches above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank.

1606.10.6.5 Drainage and Overflow. All rainwater storage tanks shall be provided with a means of draining and cleaning. The overflow drain shall not be equipped with a shutoff valve. The overflow outlet shall discharge as required for storm drainage systems. Where discharging to the storm drainage system, the overflow drain shall be protected from backflow of the storm drainage system by a backwater valve or other approved method.

1606.10.6.5.1 Overflow Outlet Size. The overflow outlet shall be sized to accommodate the flow of the rainwater entering the tank and not less than the aggregate cross-sectional area of all inflow pipes.

1606.10.6.6 Opening and Access Protection.

1606.10.6.6.1 Animals and Insects. All rainwater tank openings shall be protected to prevent the entrance of insects, birds or rodents into the tank.

1606.10.6.6.2 Human Access. Rainwater tank access openings exceeding 12 inches (305 mm) in diameter shall be secured to prevent tampering and unintended entry by either a lockable device or other approved method.

1606.10.6.7 Marking. Rainwater tanks shall be permanently marked with the capacity and the language: "NONPOTABLE RAINWATER." Where openings are provided to allow a person to enter the tank, the opening shall be marked with the following language: "DANGER- CONFINED SPACE"

1606.10.7 Pumps. All pumps serving rainwater catchment systems shall be listed. All pumps supplying water to water closets, urinals, trap primers shall be capable of delivering a minimum (15) pounds per square inch (103.4 kPa) residual pressure at the highest and most remote outlet served. Where the water pressure in rainwater supply system within the building exceeds (80) pounds per square inch (552 kPa), a pressure reducing valve reducing the pressure to (80) pounds per square inch (552 kPa) or less to all water outlets in the building shall be installed in accordance with this code.

1606.10.8 Roof Drains. Primary and secondary roof drains, conductors, leaders, and gutters shall be designed and installed as required by this code.

1606.10.9 Water Quality Devices and Equipment. Devices and equipment used to treat rainwater to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and approved for the intended application.

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1606.10.10 Freeze Protection. All tanks and piping installed in locations subject to freezing shall be provided with an adequate means of freeze protection.

1606.10.11 Debris Removal. The rainwater catchment conveyance system shall be equipped with a debris excluder or other approved means to prevent the accumulation of leaves, needles, other debris and sediment from entering the storage tank. All devices or methods used to remove debris or sediment shall be accessible.

1606.10.12 Required Filters. A filter permitting the passage of particulates no larger than one-hundred (100) microns shall be provided for rainwater supplied to water closets, urinals, trap primers, and drip irrigation system.

1606.10.13 Roof Gutters. Gutters shall maintain a minimum slope and be sized in accordance with this code.

1606.11 Signs. Signs in buildings using rainwater water shall comply with Sections 1606.11.1 and 1606.11.2 of this code.

1606.11.1 Commercial, Industrial and Institutional Restroom Signs. A sign shall be installed in all restrooms in commercial, industrial, and institutional occupancies using nonpotable rainwater for water closets and/or urinals. Each sign shall contain one half (1/2) inch (12.7 mm) letters of a highly visible color on a contrasting background. The location of the sign(s) shall be such that the sign(s) shall be visible to all users. The number and location of the signs shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES RAINWATER TO FLUSH TOILETS AND URINALS.

1606.11.2 Equipment Room Signs. Each equipment room containing nonpotable rainwater equipment shall have a sign posted with the following wording in one (1) inch (25.4 mm) letters on an ORANGE background:

CAUTION NONPOTABLE RAINWATER, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM.

This sign shall be posted in a location that is visible to anyone working on or near rainwater water equipment.

1606.12 Inspection and Testing. Rainwater catchment systems shall be inspected and tested in accordance with Sections 1606.12.1 through 1606.12.3 of this code.

1606.12.1 Supply System Inspection and Test. Rainwater catchment systems shall be inspected and tested in accordance with the applicable provisions of this code for testing of potable water and storm drainage systems.

1606.12.2 Annual Cross-Connection Inspection and Testing. An initial and subsequent annual inspection and test required by Section 1606.5 of this code shall be performed on both the potable and rainfall catchment water systems. The potable and rainfall catchment water system shall be isolated from each other and independently inspected and tested to

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ensure there is no cross connection in accordance with Sections 1606.12.2.1 through 1606.12.2.4 of this code.

1606.12.2.1 Visual System Inspection. Prior to commencing the cross-connection testing, a dual system inspection shall be conducted by the Authority Having Jurisdiction and other authorities having jurisdiction.

All pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.

1606.12.2.2 Cross-Connection Test. The following procedure shall be followed by the applicant in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction to determine whether a cross connection occurred.

- (a) The potable water system shall be activated and pressurized. The rainfall catchment water system shall be shut down and completely drained.
- (b) The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the rainfall catchment water system is empty. The minimum period the rainfall catchment water system is to remain depressurized shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and rainfall catchment water distribution systems, but in no case shall that period be less than one (1) hour.
- (c) All fixtures, potable and rainwater, shall be tested and inspected for flow. Flow from any rainfall catchment water system outlet shall indicate a cross connection. No flow from a potable water outlet would indicate that it may be connected to the rainwater water system.
- (d) The drain on the rainfall catchment water system shall be checked for flow during the test and at the end of the period.
- (e) The potable water system shall then be completely drained.
- (f) The rainfall catchment water system shall then be activated and pressurized.
- (g) The rainfall catchment water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the potable water system is empty. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis, but in no case shall that period be less than one (1) hour.
- (h) All fixtures, potable and rainfall catchment, shall be tested and inspected for flow. Flow from any potable water system outlet shall indicate a cross-connection. No flow from a rainfall catchment water outlet would indicate that it may be connected to the potable water system.
- (i) The drain on the potable water system shall be checked for flow during the test and at the end of the period.
- (j) If there is no flow detected in any of the fixtures which would have indicated a cross connection, the potable water system shall be repressurized.

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1606.12.2.3 Discovery of Cross-Connection. In the event that a cross-connection is discovered, the following procedure, in the presence of the Authority Having Jurisdiction, shall be activated immediately:

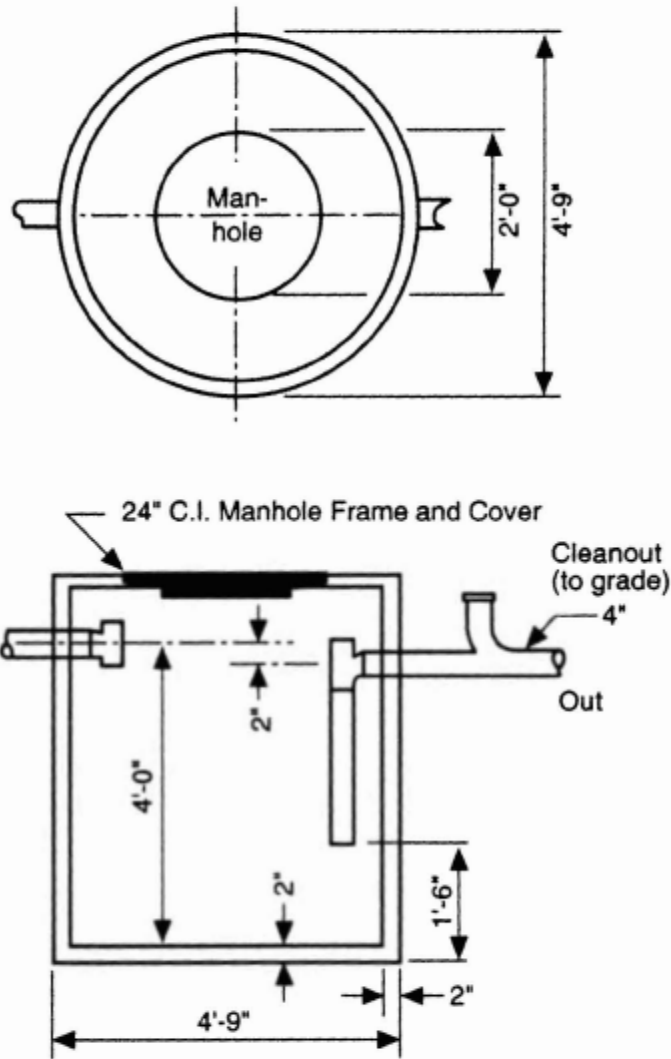
- (a) rainfall catchment water piping to the building shall be shut down at the meter, and the rainwater water riser shall be drained.
- (b) Potable water piping to the building shall be shut down at the meter.
- (c) The cross-connection shall be uncovered and disconnected.
- (d) The building shall be retested following procedures listed in subsections 1606.12.2.1 and 1606.12.2.2 of this code.
- (e) The potable water system shall be chlorinated with fifty (50) ppm chlorine for twenty-four (24) hours.
- (f) The potable water system shall be flushed after twenty-four (24) hours, and a standard bacteriological test shall be performed. If test results are acceptable, the potable water system may be recharged.

1606.12.2.4 Annual Inspection. An annual inspection of the rainfall catchment water system, following the procedures listed in section 1606.12.2.1 of this code shall be required. Annual cross-connection testing, following the procedures listed in section 1606.12.2.2 of this code shall be required by the Authority Having Jurisdiction, unless site conditions do not require it. In no event shall the test occur less often than once in four (4) years.

Alternate testing requirements may be allowed by the Authority Having Jurisdiction.

APPENDIX H
DRAWINGS FOR INTERCEPTORS

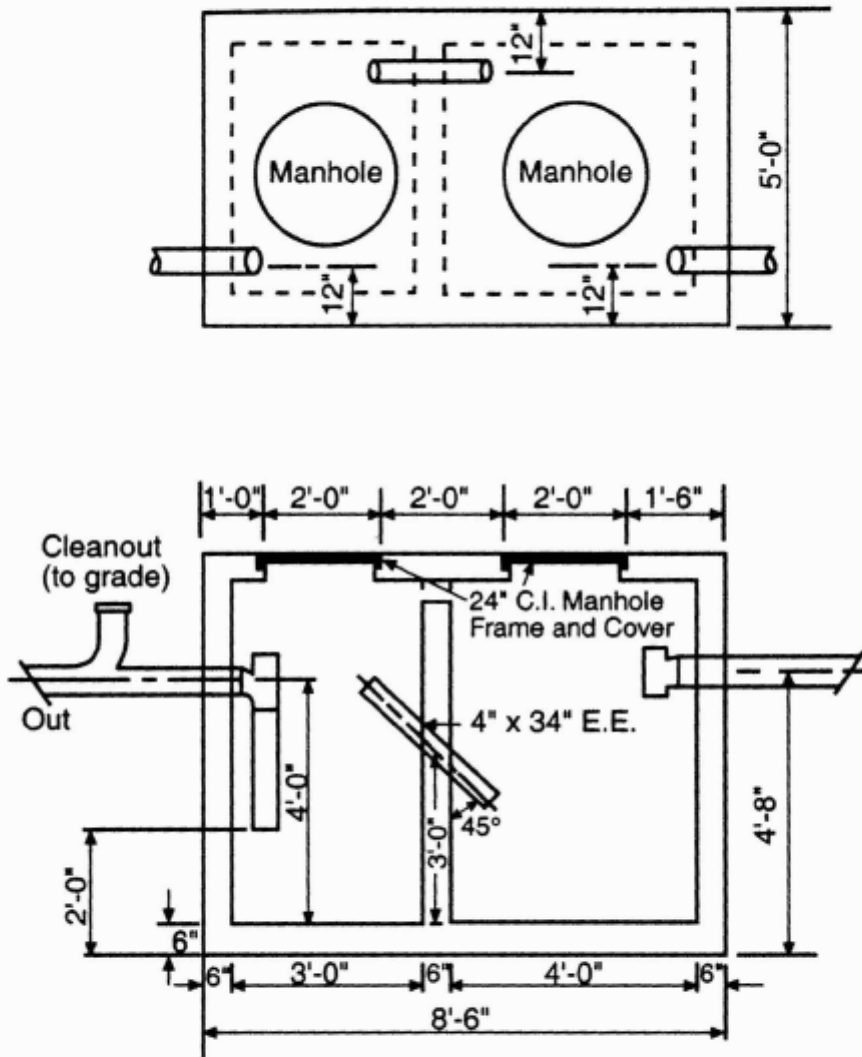
Figure No. L.T. 1



Based on Usage of Precast Unit
Lint Interceptor Washateria Operation for 5 to 10 Machines

Drawing LT-1

Figure No. L.T. 2

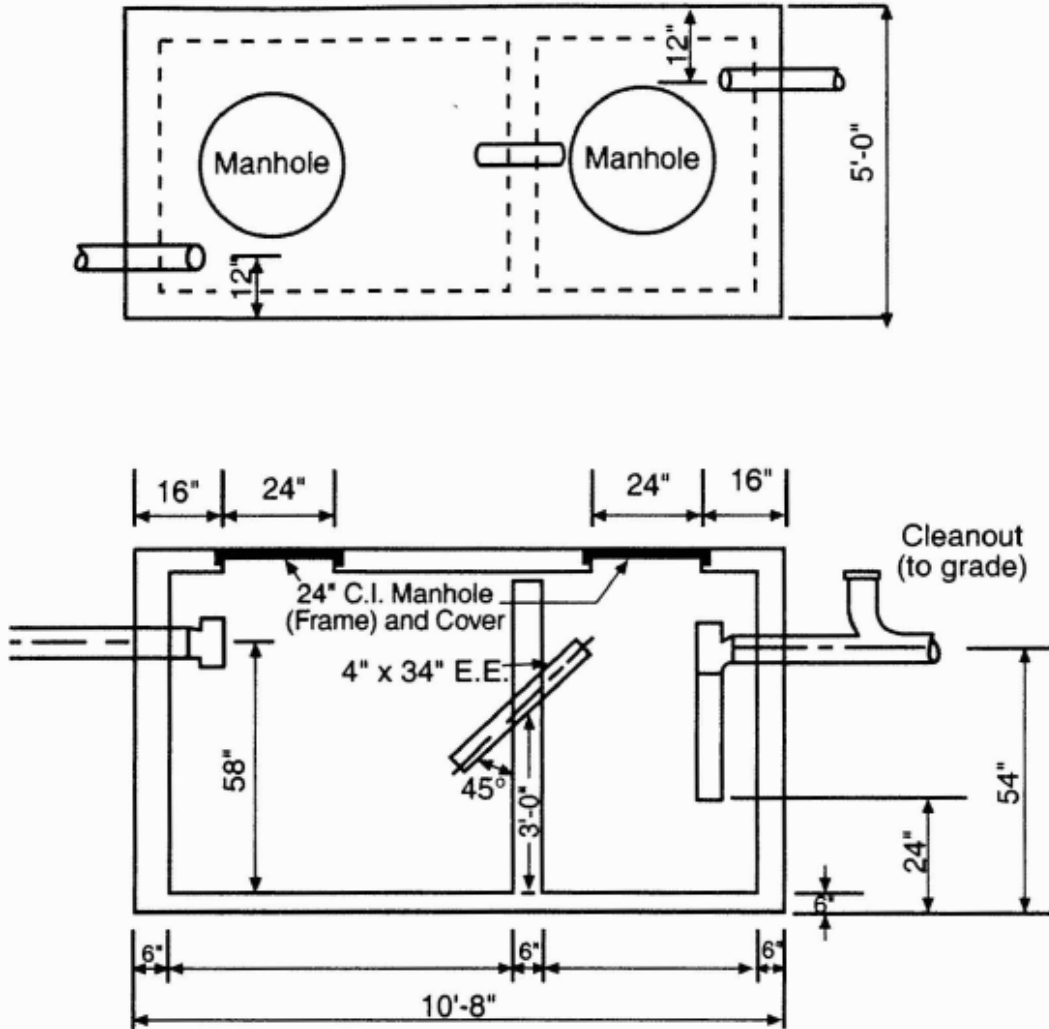


Based on Usage of Precast Unit

Lint Interceptor Washateria Operation for 11 to 20 Machines

Drawing LT-2

Figure No. L.T. 3



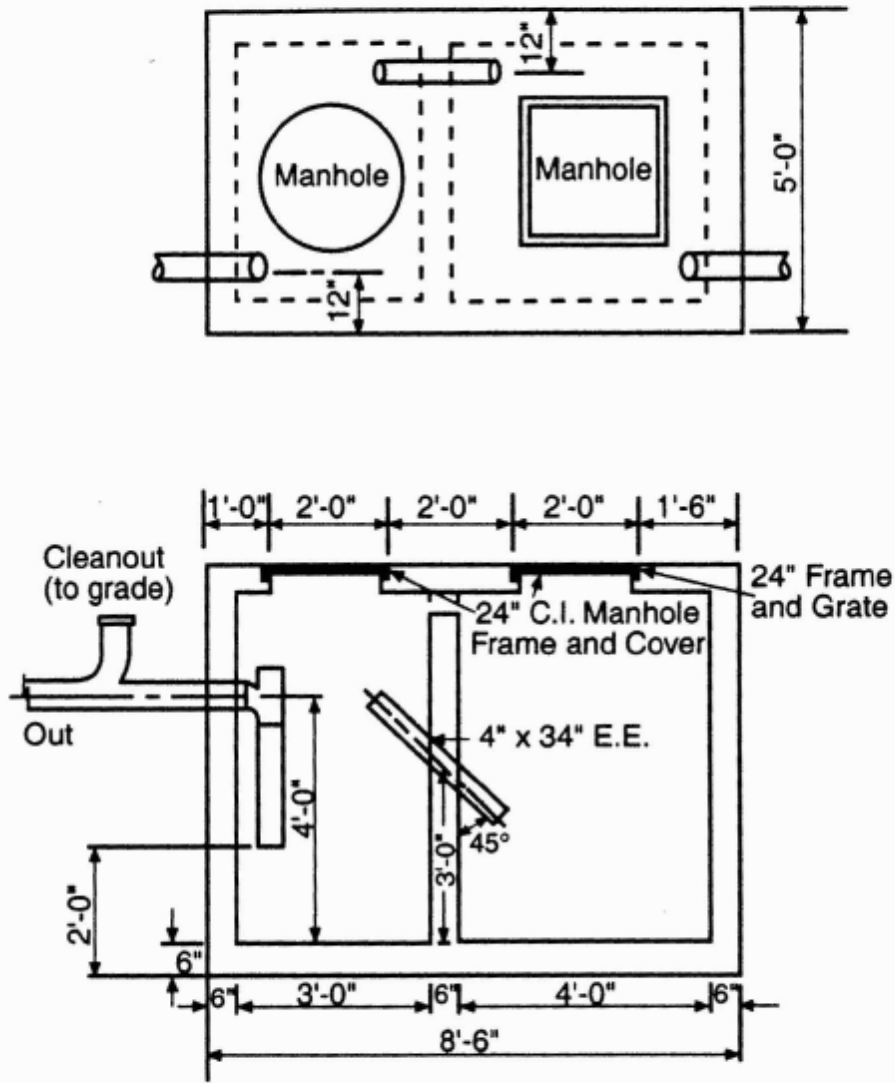
Based on Usage of Precast Unit

Lint Interceptor Washateria Operation for 21 to 30 Machines

Larger establishments and commercial-type laundries require an approved design by the project professional engineer.

Drawing LT-3

Figure No. M.T 1



Based on Usage of Precast Unit
Mud and Grease Interceptor for Wash Rack

Drawing MT-1

APPENDIX R
POTABLE RAINWATER CATCHMENT SYSTEMS

R 101.0 General.

R 101.1 Scope. The provisions of this chapter shall apply to the installation, construction, alteration, and repair of potable rainwater catchment systems.

R 101.2 System Design. Potable rainwater catchment systems complying with this chapter shall be designed by a person registered or licensed to perform plumbing design work.

R 101.3 Permit. It shall be unlawful for any person to construct, install, or alter, or cause to be constructed, installed, or altered any potable rainwater catchment systems in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

R 101.3.1 Plumbing Plan Submission. No permit for any rainwater catchment system requiring a permit shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved. No changes or connections shall be made to either the rainfall catchment or the potable water system within any site containing a rainfall catchment water system without approval by the Authority Having Jurisdiction.

R 101.3.2 System Changes. No changes or connections shall be made to either the rainwater catchment system or the potable water system within any site containing a rainwater catchment system requiring a permit without approval by the Authority Having Jurisdiction.

R 101.4 Product and Material Approval.

R 101.4.1 Component Identification. System components shall be properly identified as to the manufacturer.

R 101.4.2 Plumbing Materials and Systems. All pipe, pipe fittings, traps, fixtures, material, and devices used in a potable rainwater system shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and shall conform to approved applicable recognized standards referenced in this supplement and the plumbing code, and shall be free from defects. Unless otherwise provided for in this supplement, all materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof, shall be submitted to the Authority Having Jurisdiction for approval. [UPC 301.1.1]

R 101.5 Maintenance and Inspection. Potable rainwater catchment systems and components shall be inspected and maintained in accordance with Sections R 101.5.1 and R 101.5.3

R 101.5.1 Frequency. Potable rainwater catchment systems and components shall be inspected and maintained in accordance with Table R101.5.1 unless more frequent inspection and maintenance is required by the manufacturer.

R 101.5.2 Maintenance Log. A maintenance log for potable rainwater catchment systems shall be maintained by the property owner and be available for inspection. The property owner or designated appointee shall ensure that a record of testing, inspection and

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maintenance as required by Table R101.5.1 is maintained in the log. The log will indicate the frequency of inspection and maintenance for each system. A record of the required water quality tests shall be retained for a minimum of 2 years.

R 101.5.3 Maintenance Responsibility. The required maintenance and inspection of potable rainwater catchment systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction.

<u>Table R 101.5.1</u> <u>Minimum Potable Rainwater Catchment System</u> <u>Testing, Inspection, and Maintenance Frequency</u>	
<u>Description</u>	<u>Minimum Frequency</u>
<u>Inspect and clean filters and screens, and replace (if necessary).</u>	<u>Every 3 months</u>
<u>Inspect and verify that disinfection, filters, and water quality treatment devices and systems are operational. Perform any water quality tests as required by the Authority Having Jurisdiction.</u>	<u>In accordance with manufacturer’s instructions and the Authority Having Jurisdiction</u>
<u>Perform a water quality test for E. Coli, Total Coliform, and Heterotrophic bacteria. For a system where 25 different persons consume water from the system over a 60 day period a water quality test for cryptosporidium shall also be performed.</u>	<u>After initial installation and every 12 months thereafter or as directed by the Authority Having Jurisdiction</u>
<u>Inspect and clear debris from rainwater gutters, downspouts, and roof washers</u>	<u>Every 6 months</u>
<u>Inspect and clear debris from roof or other above ground rainwater collection surface</u>	<u>Every 6 months</u>
<u>Remove tree branches and vegetation overhanging roof or other above-ground rainwater collection surface</u>	<u>As needed</u>
<u>Inspect pumps and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect valves and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect pressure tanks and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Clear debris from and inspect storage tanks, locking devices, and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect caution labels and marking</u>	<u>After initial installation and every 12 months thereafter</u>

R 101.6 Operation and Maintenance Manual. An operation and maintenance manual for potable rainwater catchment systems shall be supplied to the building owner by the system designer. The operating and maintenance manual shall include the following:

- A. Detailed diagram of the entire system and the location of all system components,

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- B. Instructions on operating and maintaining the system,
- C. Details on maintaining the required water quality as determined by the Authority Having Jurisdiction,
- D. Details on deactivating the system for maintenance, repair or other purposes,
- E. Applicable testing, inspection and maintenance frequencies as required by Table R101.5.1, and
- F. A method of contacting the manufacturer(s).

R 101.7 Minimum Water Quality Requirements. The minimum water quality for all potable rainwater catchment systems shall meet the applicable water quality requirements as determined by the Texas Commission on Environmental Quality.

R 101.8 Material Compatibility. In addition to the requirements of this chapter, potable rainwater catchment systems shall be constructed of materials that are compatible with the type of pipe and fitting materials and water conditions in the system.

R 101.9 System Controls. The system design shall provide user controls, such as valves, switches, timers, alarms and other controllers as appropriate for the system.

R 101.9.1 Controls for pumps, valves and other devices that contain mercury that come in contact with the water supply shall not be permitted.

R 102.0 Connection.

R 102.1 General. No water piping supplied by a potable rainwater catchment system shall be connected to any other source of supply without the approval of the Authority Having Jurisdiction, Health Department or other department having jurisdiction. [UPC: 602.4]

R 102.2 Connections to Public or Private Potable Water Systems. Potable rainwater catchment systems shall have no direct connection to any public or private potable water supply or alternate water source system. Potable water from a public or private potable water system is permitted to be used as makeup water to the rainwater storage tank provided the public or private potable water supply connection is protected by an airgap or reduced-pressure principle backflow preventer complying with the plumbing code.

R 102.3 Backflow Prevention. The potable rainwater catchment system shall be protected against backflow in accordance with this code.

R 103.0 Potable Rainfall Catchment System Materials.

R 103.1 Collections Surfaces. The collection surface for potable applications shall be constructed of a hard, impervious material. Roof coatings, paints and liners shall comply with NSF Protocol P151.

R 103.1.1 Prohibited. Roof paints and coatings with lead, chromium or zinc shall not be permitted. Wood and copper roofing material and lead flashing shall not be permitted.

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R 103.2 Rainwater Catchment System Drainage Materials. All materials used in rainwater catchment drainage systems, including gutters, downspouts, conductors, and leaders shall comply with the requirements of this code for storm drainage.

R 103.3 Storage Tanks. Rainwater storage shall be constructed of solid, durable materials not subject to excessive corrosion or decay and shall be watertight. Storage tanks shall be approved by the Authority Having Jurisdiction for potable water applications, provided such tanks comply with approved applicable standards.

R 103.4 Water Supply and Distribution Materials. Potable rainwater supply and distribution materials shall comply with the requirements of this code for potable water supply and distribution systems.

R 104.0 Design and Installation.

R 104.1 Collection Surfaces. Rainwater shall only be collected from roof or other cleanable above-ground surfaces specifically designed for rainwater catchment. Rainwater catchment systems shall not collect rainwater from:

- a. Vehicular parking surfaces;
- b. Surface water runoff; or
- c. Bodies of standing water.

R 104.1.1 Prohibited Discharges. Overflows, condensate, and bleed-off pipes from roof-mounted equipment and appliances shall not discharge onto roof surfaces that are intended to collect rainwater.

R 104.2 Minimum Water Quality. The minimum water quality for harvested rainwater shall meet the applicable water quality requirements for the intended applications as determined by the public health Authority Having Jurisdiction, Health Department, or other department having jurisdiction.

R 104.2.1 Filtration Devices. Filters shall comply with NSF 53 and shall be installed in accordance with manufacturer's instructions.

R 104.2.2 Disinfection Devices. Chlorination, ozone and ultra-violet, and other approved disinfection methods shall be permitted. The disinfection devices and systems shall be installed in accordance with the manufacturer's installation instructions and the conditions of listing. Disinfection devices and systems shall be located downstream of the storage tank.

R 104.3 Overhanging Tree Branches and Vegetation. Tree branches and vegetation shall not be located over the roof or other above-ground rainwater collection surface. Where existing tree branch and vegetation growth extends over the rainwater collection surface, it shall be removed as required in Section R 101.5 of this code.

R 104.4 Rainwater Storage Tanks. Rainwater storage tanks shall be installed in accordance with Sections R 104.4.1 through R 104.4.4 of this code.

R 104.4.1 Location. Rainwater storage tanks shall be permitted to be installed above or below grade.

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R 104.4.1.1 Above Grade. Above grade storage tanks shall be of an opaque material, approved for above-ground use in direct sunlight or shall be shielded from direct sunlight. Tanks shall be installed in an accessible location to allow for inspection and cleaning. The tank shall be installed on a foundation or platform that is constructed to accommodate all loads in accordance with the Building Code.

R 104.4.1.2 Below Grade. Rainwater storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. All holding tank covers shall be capable of supporting an earth load of not less than three hundred (300) pounds per square foot (1464.6 kg/m²) when the tank is designed for underground installation. Below grade rainwater tanks installed underground shall be provided with manholes. The manhole opening shall be located a minimum of 4 inches above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank.

R 104.4.2 Drainage and Overflow. All rainwater storage tanks shall be provided with a means of draining and cleaning. The overflow drain shall not be equipped with a shutoff valve. The overflow outlet shall discharge as required by the plumbing code for storm drainage systems. Where discharging to the storm drainage system, the overflow drain shall be protected from backflow of the storm drainage system by a backwater valve or other approved method.

R 104.4.2.1 Overflow Outlet Size. The overflow outlet shall be sized to accommodate the flow of the rainwater entering the tank and not less than the aggregate cross-sectional area of all inflow pipes.

R 104.4.3 Opening and Access Protection.

R 104.4.3.1 Animals and Insects. All rainwater tank openings shall be protected to prevent the entrance of insects, birds, or rodents into the tank.

R 104.4.3.2 Human Access. Rainwater tank access openings exceeding 12 inches (305 mm) in diameter shall be secured to prevent tampering and unintended entry by either a lockable device or other approved method.

R 104.4.3.3 Exposure to Sunlight. Rainwater tank openings shall not be exposed to direct sunlight.

R 104.4.4 Inlets. A device or arrangement of fittings shall be installed at the inlet of the tank to prevent rainwater from disturbing sediment as it enters the tank.

R 104.4.5 Primary Tank Outlets. The primary tank outlet shall be located a minimum of 4 inches above the bottom of the tank or shall be provided with floating inlet to draw water from the cistern just below the water surface.

R 104.5 Pumps. All pumps serving rainwater catchment systems shall be listed for potable water use. All pumps supplying water shall be capable of delivering a minimum (15) pounds per square inch (103.4 kPa) residual pressure at the highest and most remote outlet served. Where the water pressure in rainwater supply system within the building exceeds (80) pounds per square inch

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(552 kPa), a pressure reducing valve reducing the pressure to (80) pounds per square inch (552 kPa) or less to all water outlets in the building shall be installed in accordance with this code.

R 104.6 Roof Drains. Primary and secondary roof drains, conductors, leaders, overflows, and gutters shall be designed and installed as required by this code.

R 104.7 Water Quality Devices and Equipment. Devices and equipment used to treat rainwater to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and approved for the intended application.

R 104.8 Freeze Protection. All tanks and piping installed in locations subject to freezing shall be provided with an adequate means of freeze protection.

R 104.9 Roof Washer or Pre-Filtration System. All collected rainwater shall pass through a roof washer or pre-filtration system before the water enters the rainwater storage tank. Roof washer systems shall comply with Sections R 104.9.1 through R 104.9.4 of this code:

R 104.9.1 Size. The roof washer shall be sized to direct a sufficient volume of rainwater containing debris that has accumulated on the collection surface away from the storage tank.

Note: The ARCSA/ASPE Rainwater Catchment Design and Installation Standard contains additional guidance on acceptable methods of sizing roof washers.

R 104.9.2 Debris Screen. The inlet to the roof washer shall be provided with a debris screen or other approved means that protects the roof washer from the intrusion of debris and vermin. Where the debris screen is installed, the debris screen shall be corrosion resistant and shall have openings no larger than 0.5 inches and no smaller than 0.25 inches nominal

R 104.9.3 Drain Discharge. Water drained from the roof washer or pre-filter shall be diverted away from the storage tank and discharged to a disposal area that does not cause property damage or erosion. Roof washer drainage shall not drain over a public way.

R 104.9.4 Automatic Drain. Roof washing systems shall be provided with an automatic means of self draining between rain events.

R 104.9.5 Roof washing debris drain. A method shall be provided in the roof washing system for removal of collected debris.

R 104.10 Filtration and Disinfection Systems. Filtration and Disinfection systems shall be located after the water storage tank. Where a chlorination system is installed, it shall be installed upstream of filtration systems. Where ultra-violet disinfection system is installed, a maximum 5 micron filter shall be installed upstream of the disinfection system.

B 104.10.1 Chemical Removal. After system filtration and disinfection, the system shall provide activated carbon filtration to remove chemicals.

R 104.11 Roof Gutters. Gutters shall maintain a minimum slope and be sized in with this code.

R 104.12 Drains, Conductors and Leaders. The design and size of rainwater drains, conductors, and leaders shall comply with this code.

R 104.13 Size of Potable Water Piping. Potable rainwater system distribution piping shall be sized in accordance with this code for sizing potable water piping.

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R 105.0 Cleaning.

R 105.1 General. The interior surfaces of tanks and equipment shall be cleaned before they are put into service.