REVISION RECORD
FOR THE STATE OF CALIFORNIA
SUPPLEMENT

July 1, 2012

2010 Title 24, Part 5, California Plumbing Code

PLEASE NOTE: The date of this supplement is for identification purposes only. See the History Note Appendix.

It is suggested that the section number, as well as the page number be checked when inserting this material and removing the superseded material. In case of doubt, rely on the section numbers rather than the page numbers because the section numbers must run consecutively.

It is further suggested that the superseded material be retained with this revision record sheet so that the prior wording of any section can be easily ascertained. Please keep the removed pages with this revision page for future reference.

NOTE

Due to the fact that the application date for a building permit establishes the California Building Standards Code provisions that are effective at the local level, which apply to the plans, specifications, and construction for that permit, it is strongly recommended that the removed pages be retained for historical reference.

Part 5

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California Code of Regulations Title 24

California Agency Information Contact List

California Energy Commission
Energy Hotline.....(800) 772-3300
or (916) 654-5106
Building Efficiency Standards
Appliance Efficiency Standards
Compliance Manual/Forms

California State Lands Commission
Marine Oil Terminals.....(562) 499-6317

California State Library
Resources and Information.....(916) 654-0261
Government Publication Section.....(916) 654-0069

Corrections Standards Authority
Local Adult Jail Standards.....(916) 324-1914
Local Juvenile Facility Standards.....(916) 324-1914

Department of Consumer Affairs – Acupuncture Board
Office Standards .....(916) 445-3021

Department of Consumer Affairs – Board of Pharmacy
Pharmacy Standards .....(916) 574-7900

Department of Consumer Affairs – Bureau of Barbering and Cosmetology
Barber and Beauty Shop and
College Standards.....(916) 574-7570
(800) 952-5210

Department of Consumer Affairs – Bureau of Home Furnishings and Thermal Insulation
Insulation Testing Standards.....(916) 574-2041

Department of Consumer Affairs – Structural Pest Control Board
Structural Standards.....(800) 737-8188
(916) 561-8708

Department of Consumer Affairs – Veterinary Medical Board
Veterinary Hospital Standards .....(916) 263-2610

Department of Food and Agriculture
Meat & Poultry Packing Plant
Standards.....(916) 654-1447
Dairy Standards .....(916) 654-1447

Department of Public Health
Organized Camps Standards.....(916) 449-5661
Public Swimming Pools Standards.....(916) 449-5693
Asbestos Standards.....(510) 620-2874

Department of Housing and Community Development
Residential – Hotels, Motels,
Apartments, Single-Family Dwellings ...(916) 445-9471
Permanent Structures in Mobilehome
and Special Occupancy Parks.....(916) 445-9471
Factory-Built Housing, Manufactured
Housing and Commercial Modular .....(916) 445-3338
Mobile Homes – Permits & Inspections
Northern Region.....(916) 255-2501
Southern Region.....(951) 782-4420
Employee Housing Standards.....(916) 445-9471

Department of Water Resources
Gray Water Installations Standards .....(916) 651-9667

Division of the State Architect – Access Compliance
Access Compliance Standards.....(916) 445-8100

Division of the State Architect – Structural Safety
Public Schools Standards .....(916) 445-8100
Essential Services Building Standards ...(916) 445-8100
Community College Standards.....(916) 445-8100

Division of the State Architect – State Historical Building Safety Board
Alternative Building Standards .....(916) 445-8100

Office of Statewide Health Planning and Development
Hospital Standards.....(916) 440-8356
Skilled Nursing Facility Standards.....(916) 440-8356
Clinic Standards.....(916) 440-8356
Permits.....(916) 440-8356

Office of the State Fire Marshal
Code Development and Analysis .....(916) 445-8200
Fire Safety Standards.....(916) 445-8200
Fireplace Standards.....(916) 445-8200
Day Care Centers Standards.....(916) 445-8200
Exit Standards.....(916) 445-8200

Revised: February 24, 2010

UPC FOREWORD

Not Adopted by The State of California

The advantages of a uniform plumbing code adopted by various local jurisdictions has long been recognized. Disorder in the industry as a result of widely divergent plumbing practices and the use of many different, often conflicting, plumbing codes by local jurisdictions influenced the Western Plumbing Officials Association (now the International Association of Plumbing and Mechanical Officials [IAPMO]) to form a committee of plumbing inspectors, master and journeyman plumbers, and sanitary and mechanical engineers, assisted by public utility companies and the plumbing industry to create a basic plumbing document for general use. The product of this effort, the first edition of the *Uniform Plumbing Code*® (UPC®) was officially adopted by IAPMO in 1945. The widespread use of this code over the past five decades by jurisdictions throughout the United States and internationally is testament to its merit.

With the publication of the 2003 Edition of the *Uniform Plumbing Code*®, another significant milestone was reached. For the first time in the history of the United States, a plumbing code was developed through a true consensus process. The 2009 edition represents the most current approaches in the plumbing field and is the second edition developed under the ANSI consensus process. Contributions to the content of the code were made by every segment of the built industry, including such diverse interests as consumers, enforcing authorities, installers/maintainers, insurance, labor, manufacturers, research/standards/testing laboratories, special experts, and users.

The UPC is designed to provide consumers with safe and sanitary plumbing systems while, at the same time, allowing latitude for innovation and new technologies. The public at large is encouraged and invited to participate in IAPMO's open consensus code development process. This code is updated every three years. A code development timeline and other relevant information is available at IAPMO's website at www.iapmo.org.

The *Uniform Plumbing Code*® is dedicated to all those who, in working to achieve "the ultimate plumbing code," have unselfishly devoted their time, effort, and personal funds to create and maintain this, the finest plumbing code in existence today.

The 2009 *Uniform Plumbing Code*® is supported by the American Society of Sanitary Engineering (ASSE), the Mechanical Contractors Association of America (MCAA), the Plumbing-Heating-Cooling Contractors National Association (PHCC-NA), the United Association (UA), and the World Plumbing Council (WPC). The presence of these logos, while reflecting support, does not imply any ownership of the copyright to the UPC, which is held exclusively by IAPMO. Further, the logos of these associations indicates the support of IAPMO's open, consensus process being used to develop IAPMO's codes and standards.

The addresses of the organizations are as follows:
ASSE – 901 Canterbury Road, Suite A • Westlake, OH 44145-7201 • (440) 835-3040
MCAA – 1385 Piccard Drive • Rockville, MD 20850 • (301) 869-5800
PHCC-NA – PO Box 6808 • Falls Church, VA 22046 • (800) 533-7694
UA – Three Park Place • Annapolis, MD 21401 • (410) 269-2000
World Plumbing Council Secretariat – P.O. Box 810, Lafayette, IN 47902 USA

Code changes made to the original amalgamated code are marked in the margins as follows.

← An arrow denotes a deletion | A vertical line denotes a change

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HOW TO DISTINGUISH MODEL CODE LANGUAGE FROM CALIFORNIA AMENDMENTS

To distinguish between model code language and incorporated California amendments, including exclusive California standards, California amendments will appear in italics. Symbols indicate the status of code changes as follows:

[SFM] This symbol following a section leader identifies which state agency(s) have amended a section of model code. For a complete listing of state agencies, refer to the Application Sections within Chapter 1, Division I.

‖ This symbol indicates that a change has been made to a California amendment.

| This symbol indicates that a change has been made to IAPMO model language.

> This symbol indicates deletion of California language.

→ This symbol indicates IAPMO deletion of IAPMO language.

To learn more about the use of this code refer to pages xxiv and xxv. Training materials on the application and use of this code are available at the website of the California Building Standards Commission *http://www.bsc.ca.gov/default.htm*

administrative and enforcement authority, permits, fees, violations, inspections, and penalties.

1.8.4 Permits, Fees, Applications, and Inspections.

1.8.4.1 Permits. *A written construction permit shall be obtained from the enforcing agency prior to the erection, construction, reconstruction, installation, relocation, or alteration of any plumbing system.*

Exceptions:

1. *Work exempt from permits as specified in Chapter 1, Administration, Division II, Sections 103.1.2.1 and 103.1.2.2 of this code.*
2. *Changes, alterations, or repairs of a minor nature not affecting structural features, egress, sanitation, safety, or accessibility as determined by the enforcing agency.*

Exemptions from permit requirements shall not be deemed to grant authorization for any work to be done in any manner in violation of other provisions of law or this code.

1.8.4.2 Fees. *Subject to other provisions of law, the governing body of any city, county, or city and county may prescribe fees to defray the cost of enforcement of rules and regulations promulgated by the Department of Housing and Community Development. The amount of the fees shall not exceed the amount reasonably necessary to administer or process permits, certificates, forms, or other documents, or to defray the costs of enforcement. For additional information, see State Housing Law, Health and Safety Code, Division 13, Part 1.5, Section 17951 and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 1, Article 3, commencing with Section 6.*

1.8.4.3 Plan Review and Time Limitations. *Subject to other provisions of law, provisions related to plan checking, prohibition of excessive delays, and contracting with or employment of private parties to perform plan checking are set forth in the State Housing Law, Health and Safety Code Section 17960.1, and for employee housing, in Health and Safety Code Section 17021.*

1.8.4.3.1 Retention of Plans. *The building department of every city, county, or city and county shall maintain an official copy, microfilm, or electronic or other type of photographic copy of the plans of every building, during the life of the building, for which the department issued a building permit.*

Exceptions:

1. *Single or multiple dwellings not more than two stories and basement in height.*
2. *Garages and other structures appurtenant to buildings listed in Exception 1.*
3. *Farm or ranch buildings appurtenant to buildings listed in Exception 1.*
4. *Any one-story building where the span between bearing walls does not exceed 25 feet (7620 mm), except a steel frame or concrete building.*

All plans for common interest developments as defined in Section 1351 of the California Civil Code shall be retained. For additional information regarding plan retention and reproduction of plans by an enforcing agency, see Health and Safety Code Sections 19850 through 19852.

1.8.4.4 Inspections. *Construction or work for which a permit is required shall be subject to inspection by the building official and such construction or work shall remain accessible and exposed for inspection purposes until approved. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or other regulations of the Department of Housing and Community Development.*

1.8.5 Right of Entry for Enforcement.

1.8.5.1 General. *Subject to other provisions of law, officers and agents of the enforcing agency may enter and inspect public and private properties to secure compliance with the rules and regulations promulgated by the Department of Housing and Community Development. For limitations and additional information regarding enforcement, see the following:*

1. *For applications subject to State Housing Law as referenced in Section 1.8.3.2.1 of this code, refer to Health and Safety Code, Division 13, Part 1.5, commencing with Section 17910 and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 1, commencing with Section 1.*
2. *For applications subject to the Mobilehome Parks Act as referenced in Section 1.8.3.2.2 of this code, refer to Health and Safety Code, Division 13, Part 2.1, commencing with Section 18200 and California Code of Regulations, Title 25, Division 1, Chapter 2, commencing with Section 1000.*
3. *For applications subject to the Special Occupancy Parks Act as referenced in Section 1.8.3.2.3 of this code, refer to Health and Safety Code Division 13, Part 2.3, commencing with Section 18860 and California Code of Regulations, Title 25, Division 1, Chapter 2.2, commencing with Section 2000.*
4. *For applications subject to the Employee Housing Act as referenced in Section 1.8.3.2.4 of this code, refer to Health and Safety Code, Division 13, Part 1, commencing with Section 17000 and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 3, commencing with Section 600.*
5. *For applications subject to the Factory-Built Housing Law as referenced in Section 1.8.3.2.5 of this code, refer to Health and Safety Code, Division 13, Part 6, commencing with Section 19960 and California Code of Regulations, Title 25, Division 1, Chapter 3, Subchapter 1, commencing with Section 3000.*

1.8.6 Local Modification by Ordinance or Regulation.

1.8.6.1 General. *Subject to other provisions of law, a city, county or city and county may make changes to the provisions adopted by the Department of Housing and Community Development. If any city, county, or city and county does not amend, add, or repeal by local ordinances or regulations the provisions published in this code or other reg-*

ulations promulgated by the Department of Housing and Community Development, those provisions shall be applicable and shall become effective 180 days after publication by the California Building Standards Commission. Amendments, additions, and deletions to this code adopted by a city, county or city and county pursuant to California Health and Safety Code Sections 17958.5, 17958.7, and 18941.5, together with all applicable portions of this code, shall also become effective 180 days after publication of the California Building Standards Code by the California Building Standards Commission.

1.8.6.2 Findings, Filings, and Rejections of Local Modifications. *Prior to making any modifications or establishing more restrictive building standards, the governing body shall make express findings and filings, as required by California Health and Safety Code Section 17958.7, showing that such modifications are reasonably necessary due to local climatic, geological, or topographical conditions. No modification shall become effective or operative unless the following requirements are met:*

1. *The express findings shall be made available as a public record.*
2. *A copy of the modification and express finding, each document marked to cross-reference the other, shall be filed with the California Building Standards Commission for a city, county, or a city and county, and with the Department of Housing and Community Development for fire protection districts.*
3. *The California Building Standards Commission has not rejected the modification or change.*

Nothing in this section shall limit the authority of fire protection districts pursuant to California Health and Safety Code Section 13869.7(a).

1.8.7 Alternate Materials, Designs, Tests, and Methods of Construction.

1.8.7.1 General. *The provisions of this code as adopted by the Department of Housing and Community Development are not intended to prevent the use of any alternate material, appliance, installation, device, arrangement, design, or method of construction not specifically prescribed by this code. Consideration and approval of alternates shall comply with Section 1.8.7.2 for local building departments and Section 1.8.7.3 for the Department of Housing and Community Development.*

1.8.7.2 Local Building Departments. *The building department of any city, county, or city and county may approve alternates for use in the erection, construction, reconstruction, movement, enlargement, conversion, alteration, repair, removal, demolition, or arrangement of an apartment house, hotel, motel, lodging house, or dwelling or an accessory structure, except for the following:*

1. *Structures located in mobilehome parks as defined in California Health and Safety Code Section 18214.*
2. *Structures located in special occupancy parks as defined in California Health and Safety Code Section 18862.43.*
3. *Factory-built housing as defined in California Health and Safety Code Section 19971.*

1.8.7.2.1 Approval of Alternates. *The consideration and approval of alternates by a local building department shall comply with the following procedures and limitations:*

1. *The approval shall be granted on a case-by-case basis.*
2. *Evidence shall be submitted to substantiate claims that the proposed alternate, in performance, safety, and protection of life and health, conforms to, or is at least equivalent to, the standards contained in this code and other rules and regulations promulgated by the Department of Housing and Community Development.*
3. *The local building department may require tests performed by an approved testing agency at the expense of the owner or owner's agent as proof of compliance.*
4. *If the proposed alternate is related to accessibility in covered multifamily dwellings or facilities serving "COVERED MULTIFAMILY DWELLINGS" as defined in Chapter 11A of the CBC, the proposed alternate must also meet the threshold set for "EQUIVALENT FACILITATION" as defined in Chapter 11A of the CBC.*

For additional information regarding approval of alternates by a local building department pursuant to the State Housing Law, see California Health and Safety Code Section 17951(e) and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 1.

1.8.7.3 Department of Housing and Community Development. *The Department of Housing and Community Development may approve alternates for use in the erection, construction, reconstruction, movement, enlargement, conversion, alteration, repair, removal, or demolition of an apartment house, hotel, motel, lodging house, dwelling, or an accessory thereto. The consideration and approval of alternates shall comply with the following:*

1. *The department may require tests at the expense of the owner or owner's agent to substantiate compliance with the California Building Standards Code.*
2. *The approved alternate shall, for its intended purpose, be at least equivalent in performance and safety to the materials, designs, tests, or methods of construction prescribed by this code.*

1.8.8 Appeals Board.

1.8.8.1 General. *Every city, county, or city and county shall establish a process to hear and decide appeals of orders, decisions, and determinations made by the enforcing agency relative to the application and interpretation of this code and other regulations governing use, maintenance and change of occupancy. The governing body of any city, county, or city and county may establish a local appeals board and a housing appeals board to serve this purpose. Members of the appeals board(s) shall not be*

employees of the enforcing agency and shall be knowledgeable in the applicable building codes, regulations and ordinances as determined by the governing body of the city, county, or city and county.

Where no such appeals boards or agencies have been established, the governing body of the city, county, or city and county shall serve as the local appeals board or housing appeals board as specified in California Health and Safety Code Sections 17920.5 and 17920.6.

1.8.8.2 Definitions. *The following terms shall for the purposes of this section have the meaning shown.*

Housing Appeals Board. *The board or agency of a city, county or city and county which is authorized by the governing body of the city, county, or city and county to hear appeals regarding the requirements of the city, county, or city and county relating to the use, maintenance, and change of occupancy of buildings and structures, including requirements governing alteration, additions, repair, demolition, and moving. In any area in which there is no such board or agency, "housing appeals board" means the local appeals board having jurisdiction over the area.*

Local Appeals Board. *The board or agency of a city, county, or city and county which is authorized by the governing body of the city, county, or city and county to hear appeals regarding the building requirements of the city, county, or city and county. In any area in which there is no such board or agency, "local appeals board" means the governing body of the city, county, or city and county having jurisdiction over the area.*

1.8.8.3 Appeals. *Except as otherwise provided by law, any person, firm, or corporation adversely affected by a decision, order, or determination by a city, county, or city and county relating to the application of building standards published in the California Building Standards Code, or any other applicable rule or regulation adopted by the Department of Housing and Community Development, or any lawfully enacted ordinance by a city, county, or city and county, may appeal the issue for resolution to the local appeals board or housing appeals board as appropriate.*

The local appeals board shall hear appeals relating to new building construction and the housing appeals board shall hear appeals relating to existing buildings.

1.8.9 Unsafe Buildings or Structures.

1.8.9.1 Authority to Enforce. *Subject to other provisions of law, the administration, enforcement, actions, proceedings, abatement, violations, and penalties for unsafe buildings and structures are contained in the following statutes and regulations:*

1. *For applications subject to State Housing Law as referenced in Section 1.8.3.2.1 of this code, refer to Health and Safety Code, Division 13, Part 1.5, commencing with Section 17910 and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 1, commencing with Section 1.*
2. *For applications subject to the Mobilehome Parks Act as referenced in Section 1.8.3.2.2 of this code, refer to Health and Safety Code, Division 13, Part 2.1, commencing with Section 18200 and California Code of Regulations, Title 25, Division 1, Chapter 2, commencing with Section 1000.*
3. *For applications subject to the Special Occupancy Parks Act as referenced in Section 1.8.3.2.3 of this code, refer to Health and Safety Code, Division 13, Part 2.3, commencing with Section 18860 and California Code of Regulations, Title 25, Division 1, Chapter 2.2, commencing with Section 2000.*
4. *For applications subject to the Employee Housing Act as referenced in Section 1.8.3.2.4 of this code, refer to Health and Safety Code, Division 13, Part 1, commencing with Section 17000 and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 3, commencing with Section 600.*
5. *For applications subject to the Factory-Built Housing Law as referenced in Section 1.8.3.2.5 of this code, refer to Health and Safety Code, Division 13, Part 6, commencing with Section 19960 and California Code of Regulations, Title 25, Division 1, Chapter 3, Subchapter 1, commencing with Section 3000.*

1.8.9.2 Actions and Proceedings. *Subject to other provisions of law, punishments, penalties, and fines for violations of building standards are contained in the following statutes and regulations:*

1. *For applications subject to the State Housing Law as referenced in Section 1.8.3.2.1 of this code, refer to Health and Safety Code, Division 13, Part 1.5, commencing with Section 17910 and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 1, commencing with Section 1.*
2. *For applications subject to the Mobilehome Parks Act as referenced in Section 1.8.3.2.2 of this code, refer to Health and Safety Code, Division 13, Part 2.1, commencing with Section 18200 and California Code of Regulations, Title 25, Division 1, Chapter 2, commencing with Section 1000.*
3. *For applications subject to the Special Occupancy Parks Act as referenced in Section 1.8.3.2.3. of this code, refer to Health and Safety Code, Division 13, Part 2.3, commencing with Section 18860 and California Code of Regulations, Title 25, Division 1, Chapter 2.2, commencing with Section 2000.*
4. *For applications subject to the Employee Housing Act as referenced in Section 1.8.3.2.4 of this code, refer to Health and Safety Code, Division 13, Part 1, commencing with Section 17000 and California Code of Regulations, Title 25, Division 1, Chapter 1, Subchapter 3, commencing with Section 600.*
5. *For applications subject to the Factory-Built Housing Law as referenced in Section 1.8.3.2.5 of this code, refer to Health and Safety Code, Division 13, Part 6, commencing with Section 19960 and California Code of Regulations, Title 25, Division 1, Chapter 3, Subchapter 1, commencing with Section 3000.*

1.8.10 Other Building Regulations.

1.8.10.1 Existing Structures. *Notwithstanding other provisions of law, the replacement, retention, and extension of original materials and the use of original methods of*

construction for any existing building or accessory structure, or portions thereof, shall be permitted. For additional information, see California Health and Safety Code Sections 17912 and 17958.8.

1.8.10.2 Moved Structures. *Subject to the requirements of California Health and Safety Code Sections 17922.3 and 17958.9, local ordinances or regulations relating to a moved residential or accessory structure shall, after July 1, 1978, permit the retention of existing materials and methods of construction so long as the structure does not become or continue to be a substandard building.*

Note:

Authority Cited – *Health and Safety Code Sections 17040, 17050, 17920.9, 17921, 17921.3, 17921.6, 17921.10, 17922, 17922.6, 17922.12, 17927, 17928, 17959.6, 18300, 18552, 18554, 18620, 18630, 18640, 18670, 18690, 18691, 18865, 18871.3, 18871.4, 18873, 18873.1, 18873.2, 18873.3, 18873.4, 18873.5, 18938.3, 18944.11, and 19990; and Government Code Section 12955.1.*

References – *Health and Safety Code Sections 17000 through 17062.5, 17910 through 17995.5, 18200 through 18700, 18860 through 18874, and 19960 through 19997; and Government Code Sections 12955.1 and 12955.1.1.*

1.9.0 Division of the State Architect.

1.9.1 Division of the State Architect – Access Compliance. ***Note:*** *For applications listed in Section 1.9.1 of the California Building Code, regulated by the Division of the State Architect – Access Compliance see California Code of Regulations, Title 24, Part 2 (California Building Code), Chapter 1 (Division 1 California Administration) under authority cited by Government Code Section 4450 and in reference cited by Government Code Sections 4450 through 4461, 12955.1, and Health and Safety Code Sections 18949.1, 19952 through 19959.*

1.9.1.1 Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this Subsection 1.9.1 will be identified in the Matrix Adoption Tables under the acronym DSA AC.

1.9.2 Division of the State Architect – Structural Safety.

1.9.2.1 DSA-SS (Division of the State Architect – Structural Safety).

Application – *Public elementary and secondary schools, community college buildings, and state-owned or state-leased essential services buildings.*

Enforcing Agency – *(Division of the State Architect – Structural Safety) (DSA-SS).*

The Division of the State Architect has been delegated the responsibility and authority by the Department of General Services to review and approve the design and observe the construction of public elementary and secondary schools, community colleges, and state-owned or state-leased essential services buildings.

Authority Cited – *Education Code Section 17310 and 81142, and Health and Safety Code Section 16022.*

References –*Education Code Sections 17280 through 17317 and 81130 through 81147, and Health and Safety Code Sections 16000 through 16023.*

1.9.2.1.1 Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this Subsection 1.9.2 will be identified in the Matrix Adoption Tables under the acronym DSA SS.

1.9.2.2 DSA-SS/CC (Division of the State Architect – Structural Safety/Community Colleges).

Application – *Community Colleges.*

The Division of the State Architect has been delegated the authority by the Department of General Services to promulgate alternate building standards for application to community colleges, which a community college may elect to use in lieu of standards promulgated by DSA-SS in accordance with Section 1.9.2.1. Refer to Title 24, Part 2, Section 1.9.2.2.

Enforcing Agency – *Division of the State Architect – Structural Safety/Community Colleges (DSA-SS/CC).*

The Division of the State Architect has been delegated the authority by the Department of General Services to review and approve the design and oversee construction of community colleges electing to use the alternative building standards as provided in this section.

Authority Cited – *Education Code Section 81053.*

References – *Education Code Sections 81052, 81053, and 81130 through 81147.*

1.9.2.2.1 Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this Subsection 1.9.2.2 will be identified in the Matrix Adoption Tables under the acronym DSA SS/CC.

1.10.0 Office of Statewide Health Planning and Development.

1.10.1 OSHPD 1. *Specific scope of application of the agency responsible for enforcement, enforcement agency, specific authority to adopt and enforce such provisions of this code, unless otherwise stated.*

OSHPD 1

Application – *General acute-care hospitals and acute psychiatric hospitals, excluding distinct part units or distinct part freestanding buildings providing skilled nursing or intermediate-care services. For Structural Regulations: Skilled nursing facilities and/or intermediate-care facilities except those skilled nursing facilities and intermediate-care facilities of single story, Type V, wood or light steel-frame construction.*

Enforcing Agency – *Office of Statewide Health Planning and Development (OSHPD). The office shall enforce the Division of the State Architect access compliance regulations and the regulations of the Office of the State Fire Marshal for the above stated facility types.*

1.10.1.1 Applicable Administrative Standards.

1. *Title 24, Part 1, California Code of Regulations: Chapters 6 and 7.*
2. *Title 24, Part 2, California Code of Regulations: Sections 1.1.0 and 1.10.0, Chapter 1, Division I and Sections 101-117, Chapter 1, Division II.*

1.10.1.2 Applicable Building Standards. *California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 9, 10, and 11.*

Authority Cited *– Health and Safety Code Sections 127010, 127015, 1275, and 129850.*

References *– Health and Safety Code Sections 19958, 127010, 127015, 129680, 1275, and 129675 through 130070.*

1.10.1.3 Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this Subsection 1.10.1 will be identified in the Matrix Adoption Tables under the acronym OSHPD 1.

1.10.2 OSHPD 2. *Specific scope of application of the agency responsible for enforcement, enforcement agency, specific authority to adopt and enforce such provisions of this code, unless otherwise stated.*

OSHPD 2

Application *– Skilled nursing facilities and intermediate-care facilities, including distinct part skilled nursing and intermediate-care services on a general acute-care or acute psychiatric hospital license, provided either in a rate unit or a freestanding building. For Structural Regulations: Single-story, Type V skilled nursing facility and/or intermediate-care facilities utilizing wood or light steel-frame construction.*

Enforcing Agency *– Office of Statewide Health Planning and Development (OSHPD). The office shall also enforce the Division of the State Architect access compliance regulations and the regulations of the Office of the State Fire Marshal for the above stated facility type.*

1.10.2.1 Applicable Administrative Standards.

1. *Title 24, Part 1, California Code of Regulations: Chapter 7.*
2. *Title 24, Part 2, California Code of Regulations: Sections 1.1.0 and 1.10.0, Chapter 1, Division I and Sections 101-117, Chapter 1, Division II.*

1.10.2.2 Applicable Building Standards. *California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 9, 10, and 11.*

Authority Cited *– Health and Safety Code Sections 127010, 127015, 1275, and 129850.*

References *– Health and Safety Code Sections 127010, 127015, 1275, and 129680.*

1.10.2.3 Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this Subsection 1.10.2 will be identified in the Matrix Adoption Tables under the acronym OSHPD 2.

1.10.3 OSHPD 3. *Specific scope of application of the agency responsible for enforcement, enforcement agency, specific authority to adopt and enforce such provisions of this code, unless otherwise stated.*

OSHPD 3

Application *– Licensed clinics and any freestanding building under a hospital license where outpatient clinical services are provided.*

Enforcing Agency *– Local building department.*

1.10.3.1 Applicable Administrative Standards.

1. *Title 24, Part 1, California Code of Regulations: Chapter 7.*
2. *Title 24, Part 2, California Code of Regulations: Sections 1.1.0 and 1.10.0, Chapter 1, Division I and Sections 101-117, Chapter 1, Division II.*

1.10.3.2 Applicable Building Standards. *California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 9, 10, and 11.*

Authority Cited *– Health and Safety Code Sections 127010, 127015, and 1226.*

References *– Health and Safety Code Sections 127010, 127015, 129885, and 1226, Government Code Section 54350, and State Constitution Article 11, Section 7.*

1.10.3.3 Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this Subsection 1.10.3 will be identified in the Matrix Adoption Tables under the acronym OSHPD 3.

1.10.4 OSHPD 4. *Specific scope of application of the agency responsible for enforcement, enforcement agency, specific authority to adopt and enforce such provisions of this code, unless otherwise stated.*

OSHPD 4

Application *– Correctional Treatment Centers.*

Enforcing Agency *–Office of Statewide Health Planning and Development (OSHPD). The office shall also enforce the Division of the State Architect access compliance regulations and the regulations of the Office of the State Fire Marshal for the above stated facility types.*

1.10.4.1 Applicable Administrative Standards.

1. *Title 24, Part 1, California Code of Regulations: Chapter 7.*
2. *Title 24, Part 2, California Code of Regulations: Sections 1.1.0 and 1.10.0, Chapter 1, Division I and Sections 101-117, Chapter 1, Division II.*

1.10.4.2 Applicable Building Standards. *California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 9, 10 and 11.*

Authority Cited *– Health and Safety Code Sections 127010, 127015, and 129790.*

References *– Health and Safety Code Sections 127010, 127015, 1275, and 129675 through 130070.*

1.10.4.3. Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this Subsection 1.10.4 will be identified in the Matrix Adoption Tables under the acronym OSHPD 4.

1.11.0 Office of the State Fire Marshal.

1.11.1 SFM-Office of the State Fire Marshal. *Specific scope of application of the agency responsible for enforcement, the enforcement agency and the specific authority to adopt and enforce such provisions of this code, unless otherwise stated.*

Application:

Institutional, Educational, or any Similar Occupancy. *Any building or structure used or intended for use as an asylum,*

jail, mental hospital, hospital, sanitarium, home for the aged, children's nursery, children's home, school, or any similar occupancy of any capacity.

Authority Cited – *Health and Safety Code Section 13143.*
Reference – *Health and Safety Code Section 13143.*

Assembly or Similar Place of Assemblage. *Any theater, dance-hall, skating rink, auditorium, assembly hall, meeting hall, nightclub, fair building, or similar place of assemblage where 50 or more persons may gather together in a building, room or structure for the purpose of amusement, entertainment, instruction, deliberation, worship, drinking or dining, awaiting transportation, or education.*

Authority Cited – *Health and Safety Code Section 13143.*
Reference – *Health and Safety Code Section 13143.*

Small Family Day-Care Homes.

Authority Cited – *Health and Safety Code Sections 1597.45, 1597.54, 13143, and 17921.*

Reference – *Health and Safety Code Section 13143.*

Large Family Day-Care Homes.

Authority Cited – *Health and Safety Code Sections 1597.46, 1597.54, and 17921.*

Reference – *Health and Safety Code Section 13143.*

Residential Facilities and Residential Facilities for the Elderly.

Authority Cited – *Health and Safety Code Section 13133.*
Reference – *Health and Safety Code Section 13143.*

Any State Institution or Other State-Owned or State-Occupied Building.

Authority Cited – *Health and Safety Code Section 13108.*

Reference – *Health and Safety Code Section 13143.*

High-Rise Structures.

Authority Cited – *Health and Safety Code Section 13211.*

Reference – *Health and Safety Code Section 13143.*

Motion Picture Production Studios.

Authority Cited *– Health and Safety Code Section 13143.1.*

Reference – *Health and Safety Code Section 13143.*

Organized Camps.

Authority Cited *– Health and Safety Code Section 18897.3.*
Reference – *Health and Safety Code Section 13143.*

Residential.

All hotels, motels, lodging houses, apartment houses and dwellings, including congregate residences and buildings and structures accessory thereto. Multiple-story structures existing on January 1, 1975, let for human habitation, including and limited to, hotels, motels, apartment houses, less than 75 feet (22 860 mm) above the lowest floor level having building access, wherein rooms used for sleeping are let above the ground floor.

Authority Cited *– Health and Safety Code Sections 13143.2 and 17921.*

Reference – *Health and Safety Code Section 13143.*

Residential Care Facilities.

Certified family-care homes, out-of-home placement facilities, halfway houses, drug and/or alcohol rehabilitation facilities, and any building or structure used or intended for use as a home or institution for the housing of any person of any age when such person is referred to or placed within such home or institution for protective social care and supervision services by any governmental agency.

Authority Cited – *Health and Safety Code Section 13143.6.*
Reference – *Health and Safety Code Section 13143.*

Tents, Awnings, or Other Fabric Enclosures Used in Connection with Any Occupancy.

Authority Cited – *Health and Safety Code Section 13116.*

Reference – *Health and Safety Code Section 13143.*

Fire Alarm Devices, Equipment, and Systems in Connection with Any Occupancy.

Authority Cited – *Health and Safety Code Section 13114.*

Reference – *Health and Safety Code Section 13143.*

Hazardous Materials.

Authority Cited – *Health and Safety Code Section 13143.9.*

Reference – *Health and Safety Code Section 13143.*

Flammable and Combustible Liquids. Authority Cited – *Health and Safety Code Section 13143.6.*

Reference – *Health and Safety Code Section 13143.*

Public School Automatic Fire Detection, Alarm, and Sprinkler Systems.

Authority Cited *– Health and Safety Code Section 13143 and California Education Code Article 7.5, Sections 17074.50, 17074.52, and 17074.54.*

References *– Government Code Section 11152.5, Health and Safety Code Section 13143 and California Education Code Chapter 12.5, Leroy F. Greene School Facilities Act of 1998, Article 1.*

Wildland-Urban Interface Fire Area.

Authority Cited – *Health and Safety Code Sections 13143, 13108.5(a), and 18949.2(b) and (c); and Government Code Section 51189.*

References *– Health and Safety Code Sections 13143, Government Code Sections 51176, 51177, 51178, and 51179; and Public Resources Code Sections 4201 through 4204.*

and specifications shall be submitted to the enforcing agency having jurisdiction.

2. *All plans and specifications shall be prepared under the responsible charge of an architect or a civil or structural engineer authorized by law to develop construction plans and specifications, or by both such architect and engineer. Plans and specifications shall be prepared by an engineer duly qualified in that branch of engineering necessary to perform such services. Administration of the work of construction shall be under the charge of the responsible architect or engineer except that where plans and specifications involve alterations or repairs, such work of construction may be administered by an engineer duly qualified to perform such services and holding a valid certificate under Chapter 7 (commencing with Section 65700) of Division 3 of the Business and Professions Code for performance of services in that branch of engineering in which said plans, specifications and estimates and work of construction are applicable.*

   This section shall not be construed as preventing the design of fire-extinguishing systems by persons holding a C-16 license issued pursuant to Division 3, Chapter 9, Business and Professions Code. In such instances, however, the responsibility charge of this section shall prevail.

1.11.3.4 Existing High-Rise Buildings.

1. *Complete plans or specifications, or both, shall be prepared covering all work required by Section 3412 for existing high-rise buildings. Such plans or specifications shall be submitted to the enforcing agency having jurisdiction.*
2. *When new construction is required to conform with the provisions of these regulations, complete plans or specifications, or both, shall be prepared in accordance with the provisions of this subsection. As used in this section "new construction" is not intended to include repairs, replacements or minor alterations which do not disrupt or appreciably add to or affect the structural aspects of the building.*

1.11.3.5 Retention of Plans. *Refer to Building Standards Law, Health and Safety Code Sections 19850 and 19851, for permanent retention of plans.*

1.11.4 Fees.

1.11.4.1 Other Fees. *Pursuant to Health and Safety Code Section 13146.2, a city, county, or district which inspects a hotel, motel, lodging house, or apartment house may charge and collect a fee for the inspection from the owner of the structure in an amount, as determined by the city, county, or district, sufficient to pay its costs of that inspection.*

1.11.4.2 Large Family Day Care. *Pursuant to Health and Safety Code Section 1597.46, Large Family Day-Care Homes, the local government shall process any required permit as economically as possible, and fees charged for review shall not exceed the costs of the review and permit process.*

1.11.4.3 High-Rise. *Pursuant to Health and Safety Code Section 13217, High-Rise Structure Inspection: Fees and Costs, a local agency which inspects a high-rise structure pursuant to Health and Safety Code Section 13217 may charge and collect a fee for the inspection from the owner of the high-rise structure in an amount, as determined by the local agency, sufficient to pay its costs of that inspection.*

1.11.4.4 Fire Clearance Preinspection. *Pursuant to Health and Safety Code Section 13235, Fire Clearance Preinspection, Fee; upon receipt of a request from a prospective licensee of a community care facility, as defined in Section 1502, of a residential-care facility for the elderly, as defined in Section 1569.2, or of a child day-care facility, as defined in Section 1596.750, the local fire enforcing agency, as defined in Section 13244, or State Fire Marshal, whichever has primary jurisdiction, shall conduct a preinspection of the facility prior to the final fire clearance approval. At the time of the preinspection, the primary fire enforcing agency shall price consultation and interpretation of the fire safety regulations and shall notify the prospective licensee of the facility in writing of the specific fire safety regulations which shall be enforced in order to obtain fire clearance approval. A fee of not more than $50.00 may be charged for the preinspection of a facility with a capacity to serve 25 or fewer persons. A fee of not more than $100.00 may be charged for a preinspection of a facility with a capacity to serve 26 or more persons.*

1.11.4.5 Care Facilities. *The primary fire enforcing agency shall complete the final fire clearance inspection for a community care facility, residential-care facility for the elderly, or child day-care facility within 30 days of receipt of the request for the final inspection, or as of the date the prospective facility requests the final prelicensure inspection by the State Department of Social Services, whichever is later.*

Pursuant to Health and Safety Code Section 13235, a preinspection fee of not more than $50 may be charged for a facility with a capacity to serve 25 or less clients. A fee of not more than $100 may be charged for a preinspection of a facility with a capacity to serve 26 or more clients.

Pursuant to Health and Safety Code Section 13131.5, a reasonable final inspection fee, not to exceed the actual cost of inspection services necessary to complete a final inspection may be charged for occupancies classified as residential care facilities for the elderly (RCFE).

Pursuant to Health and Safety Code Section 1569.84, neither the State Fire Marshal nor any local public entity shall charge any fee for enforcing fire inspection regulations pursuant to state law or regulation or local ordinance, with respect to residential-care facilities for the elderly (RCFE) which service six or fewer persons.

1.11.4.6 Requests of the Office of the State Fire Marshal. *Whenever a local Authority Having Jurisdiction requests that the State Fire Marshal perform plan review and/or inspection services related to a building permit, the applicable fees for such shall be payable to the Office of the State Fire Marshal.*

1.11.5 Inspections. *Work performed subject to the provisions of this code shall comply with the inspection requirements of Title 24, Part 2, California Building Standards Code, Sections 109.1, 109.3, 109.3.4, 109.3.5, 109.3.6, 109.3.8, 109.3.9, 109.3.10, 109.5, and 109.6 as adopted by the Office of the State Fire Marshal.*

1.11.5.1 Existing Group I-1 or R occupancies. *Licensed 24-hour care in a Group I-1 or R occupancy in existence and originally classified under previously adopted state codes shall be reinspected under the appropriate previous code, provided there is no change in the use or character which would place the facility in a different occupancy group.*

1.11.6 Certificate of Occupancy. *A Certificate of Occupancy shall be issued as specified in Title 24, Part 2, California Building Code, Section 111.*

Exception: *Group R-3 and Group U Occupancies.*

1.11.7 Temporary Structures and Uses. *See Title 24, Part 2, California Building Code, Section 107.*

1.11.8 Service Utilities. *See Title 24, Part 2, California Building Code, Section 112.*

1.11.9 Stop Work Order. *See Title 24, Part 2, California Building Code, Section 115.*

1.11.10 Unsafe Buildings, Structures, and Equipment. *See Title 24, Part 2, California Building Code, Section 116.*

1.11.11. Adopting Agency Identification.

The provisions of this code applicable to buildings identified in this section will be identified in the Matrix Adoption Tables under the acronym SFM.

1.12.0 Reserved for the State Librarian.

1.13.0 Department of Water Resources (DWR).

1.13.1 Application – *Construction, installation, or alteration of graywater systems for subsurface irrigation and other safe uses.*

Enforcing Agency – *Local building department or the Department of Water Resources.*

Authority Cited – *Water Code Sections 14875 through 14877.3.*

References – *Water Code Sections 14875 through 14877.3.*

1.13.2 Application – *Installation, construction, alteration, or repair of recycled water systems for water closets, urinals, trap primers for floor drains, floor sinks and other allowed uses.*

Enforcing Agency *– State or local agency specified by the applicable provisions of law.*

Authority Cited *– Water Code Section 13557.*

References *– Water Code Section 13553.*

1.13.3 Adopting Agency Identification. *The provisions of this code applicable to buildings identified in this section will be identified in the Matrix Adoption Tables under the acronym DWR.*

1.14.0 Reserved for the State Lands Commission.

314.5 Piping, fixtures, appliances, and appurtenances shall be adequately supported in accordance with this code, the manufacturer's installation instructions, and as required by the Authority Having Jurisdiction.

314.6 Hanger rod sizes shall be no smaller than those shown in Table 3-1.

314.7 Gas piping shall be supported by metal straps or hooks at intervals not to exceed those shown in Table 12-3.

TABLE 3-1
HANGER ROD SIZES

PIPE AND TUBE SIZE		ROD SIZE	
(inches)	mm	(inches)	mm
½ – 4	15 – 100	⅜	9.5
5 – 8	125 – 200	½	12.7
10 – 12	250 – 300	⅝	15.9

315.0 Trenching, Excavation, and Backfill.

315.1 Trenches deeper than the footing of any building or structure and paralleling the same shall be not less than 45 degrees (0.79 rad) therefrom, or as approved per Section 301.0 of this code.

315.2 Tunneling and driving shall be permitted to be done in yards, courts, or driveways of any building site. Where sufficient depth is available to permit, tunnels shall be permitted to be used between open-cut trenches. Tunnels shall have a clear height of two (2) feet (610 mm) above the pipe and shall be limited in length to one-half (½) the depth of the trench, with a maximum length of eight (8) feet (2438 mm). When pipes are driven, the drive pipe shall be not less than one (1) size larger than the pipe to be laid.

315.3 Open Trenches. Excavations required to be made for the installation of a building drainage system or any part thereof, within the walls of a building, shall be open trench work and shall be kept open until the piping has been inspected, tested, and accepted.

315.4 Excavations shall be completely backfilled as soon after inspection as practicable. Adequate precaution shall be taken to ensure proper compactness of backfill around piping without damage to such piping. Trenches shall be backfilled in thin layers to twelve (12) inches (305 mm) above the top of the piping with clean earth, which shall not contain stones, boulders, cinderfill, frozen earth, construction debris, or other materials that would damage or break the piping or cause corrosive action. Mechanical devices such as bulldozers, graders, etc., shall be permitted to then be used to complete backfill to grade. Fill shall be properly compacted. Suitable precautions shall be taken to ensure permanent stability for pipe laid in filled or made ground.

316.0 Joints and Connections.

316.1 Types of Joints.

316.1.1 Threaded Joints. Threads on iron pipe size (IPS) pipe and fittings shall be standard taper pipe threads in accordance with standards listed in Table 14-1. Threads on tubing shall be approved types. Threads on plastic pipe shall be factory cut or molded. Threaded plastic pipe shall be Schedule 80 minimum wall thickness. Tubing threads shall conform to fine tubing thread standards. When a pipe joint material is used, it shall be applied only on male threads, and such materials shall be approved types, insoluble in water and nontoxic. Cleanout plugs and caps shall be lubricated with water-insoluble, nonhardening material or tape. Thread tape or thread lubricants and sealants specifically intended for use with plastics shall be used on plastic threads. Conventional pipe thread compounds, putty, linseed-oil-based products, and unknown lubricants and sealants shall not be used on plastic threads.

316.1.2 Wiped Joints. Joints in lead pipe or fittings or between lead pipe or fittings and brass or copper pipe, ferrules, solder nipples, or traps shall be full-wiped joints. Wiped joints shall have an exposed surface on each side of a joint not less than three-fourths (¾) inch (19.1 mm) and not less than as thick as the material being joined. Wall or floor flange lead-wiped joints shall be made by using a lead ring or flange placed behind the joint at the wall or floor. Joints between lead pipe and cast-iron, steel, or wrought iron shall be made by means of a caulking ferrule or soldering nipple.

316.1.3 Soldered Joints. Joints in copper tubing shall be made by the appropriate use of approved copper or copper alloy fittings. Surfaces to be joined by soldering shall be cleaned bright by manual or mechanical means.

The joints shall be properly fluxed with an approved-type flux and made up with approved solder. Solder and fluxes shall be manufactured to approved standards. Solders and fluxes with a lead content that exceeds two-tenths (0.2) of one (1) percent shall be prohibited in piping systems used to convey potable water.

316.1.4 Flared Joints. Flared joints for soft copper tubing shall be made with fittings meeting approved standards. The tubing shall be reamed to the full inside diameter, resized to round, and expanded with a proper flaring tool.

316.1.5 Flexible Compression Factory-Fabricated Joints. Where pipe is joined by means of flexible compression joints, such joints shall conform to approved standards and shall not be considered as slip joints.

316.1.6 Solvent Cement Plastic Pipe Joints. Plastic pipe and fittings designed to be joined by solvent cementing shall comply with applicable standards referenced in Table 14-1.

ABS pipe and fittings shall be cleaned and then joined with solvent cement(s).

CPVC pipe and fittings shall be cleaned and then joined with listed primer(s) and solvent cement(s).

Exceptions:

(1) Listed solvent cements that do not require the use of primer shall be permitted for use with CPVC pipe and fittings, manufactured in accordance with ASTM D2846, one-half (½) inch (15 mm) through two (2) inches (50 mm) in diameter.

(2) [HCD 1 & HCD 2] Low VOC One-Step Cement that does not require the use of primer shall be utilized with CPVC pipe and fittings, manufactured in accordance with ASTM D 2846, Standard for Chlorinated Poly Plastic Hot- and Cold-Water Distribution Systems, ½ inch through 2 inches in diameter.

PVC pipe and fittings shall be cleaned and joined with primer(s) and solvent cement(s).

A solvent cement transition joint between ABS and PVC building drain and building sewer shall be made using a listed transition solvent cement.

[HCD 1 & HCD 2] *Plastic pipe and fittings joined with solvent cement shall utilize Low VOC primer(s), if a primer is required, and Low VOC solvent cement(s) as defined in Section 214.*

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 1000˚F (538˚C) shall be used. Brazing on medical gas systems shall be performed by certified installers meeting the requirements of ASME *Boiler and Pressure Vessel Code*, Section IX, Welding and Brazing Qualifications, or AWS B2.2, *Standard for Brazing Procedure and Performance Qualifications*.

316.1.8 *[Not permitted for OSHPD 1, 2, 3 & 4]* Pressure-Lock-Type Connection. This is a mechanical connection that depends on an internal retention device to prevent pipe or tubing separation. Connection is made by inserting the pipe or tubing into the fitting to a prescribed depth.

316.1.9 *[Not permitted for OSHPD 1, 2, 3 & 4]* Pressed Fitting. This is a mechanical connection for joining copper tubing that uses a crimping tool to affix the O-ring seal copper or copper alloy fitting to the tubing. The tubing shall be inserted into the fitting, and the crimp shall be made using the tool recommended by the manufacturer.

316.1.10 Push-fit Fitting. A mechanical fitting where the connection is assembled by pushing the tube or pipe into the fitting and is sealed with an "O" ring.

316.1.11 Heat Fusion Weld Joints. This type of joint is used in some thermoplastic systems to connect pipe to fittings or pipe lengths directly to one another (butt-fusion). This method of joining pipe to fittings includes socket-fusion, electro-fusion, and saddle-fusion. This method of welding involves the application of heat and pressure to the components, allowing them to fuse together forming a bond between the pipe and fitting.

316.2 Special Joints.

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.

316.2.2 Unions. Approved unions shall be permitted to be used in drainage piping when accessibly located in the trap seal or between a fixture and its trap in the vent system, except underground or in wet vents, at any point in the water supply system, and in gas piping as permitted by Section 1211.3.2(4).

316.2.3 Plastic Pipe to Other Materials. When connecting plastic pipe to other types of piping, only approved types of fittings and adapters designed for the specific transition intended shall be used.

316.2.4 Dielectric Unions. [HCD 1 & HCD 2, OSHPD 1, 2, 3 & 4] *Dielectric unions shall be used at all points of connection where there is a dissimilarity of metals.*

316.3 Flanged Fixture Connections.

316.3.1 Fixture connections between drainage pipes and water closets, floor outlet service sinks and urinals shall be made by means of approved brass, hard lead, ABS, PVC, or iron flanges caulked, soldered, solvent cemented; rubber compression gaskets; or screwed to the drainage pipe. The connection shall be bolted with an approved gasket, washer, or setting compound between the fixture and the connection. The bottom of the flange shall be set on an approved firm base.

316.3.2 Closet bends or stubs shall be cut off so as to present a smooth surface even with the top of the closet ring before rough inspection is called.

316.3.3 Wall-mounted water closet fixtures shall be securely bolted to an approved carrier fitting. The connecting pipe between the carrier fitting and the fixture shall be an approved material and designed to accommodate an adequately sized gasket. Gasket material shall be neoprene, felt, or similar approved types.

316.4 Prohibited Joints and Connections.

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

316.4.2 No fitting or connection that offers abnormal obstruction to flow shall be used. The enlargement of a three (3) inch (80 mm) closet bend or stub to four (4) inches (100 mm) shall not be considered an obstruction.

317.0 Increasers and Reducers.

Where different sizes of pipes and fittings are to be connected, the proper size increasers or reducers or reducing fittings shall be used between the two sizes. Brass or cast-iron body cleanouts shall not be used as a reducer or adapter from cast-iron drainage pipe to iron pipe size (IPS) pipe.

318.0 Food-Handling Establishments.

Food or drink shall not be stored, prepared, or displayed beneath soil or drain pipes, unless those areas are protected

TABLE 4-2
[OSHPD 1, 2, 3 & 4][24] MINIMUM PLUMBING FACILITIES

SPACE	HANDWASHING FIXTURE	SCRUB SINKS	TOILETS	BATHTUBS OR SHOWERS	SERVICE SINKS[1]	CLINIC SINKS
Administration Lobby						
Public Toilet - Male	*1*[2]		*1*			
Public Toilet - Female	*1*[2]		*1*			
Airborne infection isolation room	*1*					
Airborne infection isolation toilet room	*1*[2]		*1*[5]	*1*[5]		
Cardiac Catheterization procedure room		*1*[4]				
Central Sterile Supply	*1*[15]					
Cesarean/Delivery Service Space						
Labor Rooms	*1*		*1*[9]	*1*[9]		
Recovery Room	*1*					*1*
Drug distribution station	*1*					
Cesarean operating room		*2*[10]				
Delivery room		*1*[10]				
Staff lounge toilet						
Staff Toilet - Male	*1*[2]		*1:1-15*			
Staff Toilet - Female	*1*[2]		*1:1-15*			
LDR or LDRP room	*1*		*1*	*1*		
Waiting area/room						
Public Toilet - Male	*1*[2]		*1*			
Public Toilet - Female	*1*[2]		*1*			
Clinical Laboratory Service Space[11]	*1*					
Dietetic Service Space					*1*	
Kitchen	*1*[2]					
Food serving area	*1*[2]					
Food Preparation	*1*[2]					
Dietary Staff Toilet - Male	*1*[2]		*1:1-15*			
Dietary Staff Toilet - Female	*1*[2]		*1:1-15*			
Emergency Service Treatment room	*1*					
Open plan	*1:4 cubicles*					
Observation units	*1:4 cubicles*					
Trauma/Cardiac, Emergency surgery, Cystoscopy, Cast Room or Special procedure room		*1*[4]				
Intensive Care Units[7]					*1*	*1*
Open plan	*1:3 beds*					
Patient rooms[28]	*1*					
Newborn Intensive Care Unit (NICU)	*1:4 bassinets*[17]				*1*	*1*
Control station	*1*					
Staff lounge						
Staff Toilet - Male	*1*[2]		*1:1-15*			
Staff Toilet - Female	*1*[2]		*1:1-15*			
Employee dressing rooms and lockers						
Staff Toilet - Male	*1*[2]		*1:1-15*			
Staff Toilet - Female	*1*[2]		*1:1-15*			
Exam and treatment rooms	*1*					
Housekeeping room[1]					*1*	
Laboratories	*1*[15]					
Laundry soiled linen, receiving, holding and sorting	*1*					

SPACE	HANDWASHING FIXTURE	SCRUB SINKS	TOILETS	BATHTUBS OR SHOWERS	SERVICE SINKS[1]	CLINIC SINKS
Medicine preparation room	*1*[19]					
Morgue and Autopsy	*1*					
Nourishment area	*1+ 1*[2]					
Nuclear Medicine room	*1*					
Mold room	*1*					
Patient room	*1*					
Patient toilet and bath facilities[13]	*1*[2]		*1:4 beds*	*1:12*[16]		
Multi-purpose rooms	*1*		*1*			
Central bathing facility			*1*			
Administration Center or Nurses' Stations[27]	*1*					
Newborn/well baby nursery	*1:6 bassinets*				*1*	
Gastrointestinal endoscopy procedure room	*1*					
Pediatric and Adolescent Unit toilet room	*1*[2,26]		*1*[26]			
Pharmacy	*1*[25]					
Staff Toilet - Male	*1*[2]		*1:1-15*			
Staff Toilet - Female	*1*[2]		*1:1-15*			
Compounding area for parenteral soultions	*1*					
Postanesthesia care units (PACU)	*1*					*1*
Protective environment room	*1*					
Protective environment toilet room	*1*[2]		*1*[5]	*1*[5]		
Psychiatric unit patient room	*1*		*1*			
Radiological/Imaging Services Space	*1*		*1*[29]			
Computerized tomography (CT)						
Ultrasound[8]			*1*[30]			
Angiography		*1*[4, 31]				
Fluoroscopy[8]			*1*[30]			
Staff Toilet[18] *- Male*	*1*[2]		*1:1-15*			
Staff Toilet[18] *- Female*	*1*[2]		*1:1-15*			
Rehabilitation Therapy Space						
Training toilet			*1*			
Physical therapy service space	*1*					
Occupational therapy service space	*1*					
Speech pathology	*1*					
Renal Dialysis Service Space	*1:4 stations*				*1*	*1*
Bloodborne Infection Isolation Room	*1*					
Nurses' station	*1*					
Medication dispensing	*1*					
Home training room	*1*					
Repair room	*1*				*1*	
Dialysis Patient toilet	*1*		*1*[23]			
Staff lounge						
Staff Toilet - Male	*1*[2]		*1:1-15*	*1 shower*		
Staff Toilet - Female	*1*[2]		*1:1-15*	*1 shower*		
Surgical Service Space		*2*[3]			*1*	
Staff clothing change areas						
Staff Toilet - Male	*1*[2]		*1:1-15*	*1 shower*		
Staff Toilet - Female	*1*[2]		*1:1-15*	*1 shower*		
Clean-up rooms	*1*					
Substerile area	*1*					

SPACE	HANDWASHING FIXTURE	SCRUB SINKS	TOILETS	BATHTUBS OR SHOWERS	SERVICE SINKS[1]	CLINIC SINKS
Anesthesia workroom	*1*					
Soiled workroom or soiled holding	*1*					*1*
Cancer treatment/infusion therapy treatment	*1:4 stations*					
Utility/Work Room						
Clean[21]	*1*					
Soiled[22]	*1*					*1[14]*
Patient beds [Skilled Nursing/Intermediate Care Facilities]	*1:8[32]*		*1:6*	*1:20*		
Patient toilet and bath facilities[13] [Correctional Treatment Center]	*1:8[2]*		*1:6*	*1:12*		
Airborne infection isolation anteroom[6] [Correctional Treatment Center]	*1[6]*		*1[6]*	*1[6]*		
Airborne infection isolation anteroom [Correctional Treatment Center]	*1*					
Protective environment room[6] [Correctional Treatment Center]	*1[6]*		*1[6]*	*1[6]*		
Protective environment anteroom [Correctional Treatment Center]	*1*					

1 Each department or nursing unit shall be served by a housekeeping room equipped with a service sink. Departments may share service closets provided the departmental services are compatible. A dedicated housekeeping room shall be provided for the following services: Surgical/Catherization, ICU, NICU, nursery, dietary, renal dialysis and outpatient surgery.

2 Conventional spouts and controls on hot-and cold-water supplies are acceptable. Aerators are not permitted. Non-aerating laminar flow devices are permitted. Nourishment areas shall have a handwashing fixture in or immediately accessible from the nourishment area.

3 A minimum of two scrub sinks shall be provided in a surgical unit containing one operating room. Four scrub sinks shall be provided in surgical units containing two operating rooms. One additional scrub sink shall be provided per each additional operating room.

4 The scrub sink is in addition to the required number for surgeries.

5 The following fixtures shall be provided in airborne infection or protective environment rooms of hospitals only:

a. Within an adjoining toilet room, a lavatory, a shower containing a seat or a space for a shower chair, and toilet equipped with bedpan flushing attachment with a vacuum breaker.

b. A handwashing fixture within a separate anteroom.

6 The following fixtures shall be provided in isolation rooms of correctional treatment centers only:

a. Within an adjoining toilet area, a handwashing fixture, a shower containing a seat or a space for a shower chair, and water closet equipped with bedpan flushing attachment with a vacuum breaker.

b. A handwashing fixture within a separate anteroom.

7 Includes burn center spaces, acute respiratory-care service spaces, and coronary-care service spaces.

8 A toilet room with handwashing fixture shall directly adjoin each procedure room.

9 One toilet with lavatory and one shower may serve two labor rooms.

10 One additional scrub sink per cesarean or delivery operating room.

11 Provide emergency eye-wash and shower.

12 Not used.

13 Fixtures serving individual patient rooms shall not be considered as meeting the required ratios for bedrooms not served by individual adjoining toilet or bathrooms.

14 The clinic sink may be deleted if all bedrooms in the nursing unit are provided with adjoining toilets with bedpan flushing devices.

15 Conventional controls on hot-and cold-water supplies are acceptable. The water discharge points shall be 5 inches (127 millimeters) above the fixture rim. Aerators are not permitted. Non-aerating laminar flow devices are permitted.

16 A minimum of one bathtub is required on each floor of an acute care or acute psychiatric hospital providing skilled nursing or intermediate care services.

17 In a multiple-bed room, every bed position shall be within 20 feet (6 meters) of a hands-free handwashing fixture. Where an individual room concept is used, a handwashing fixture shall be provided within each infant care room.

18 When three or more procedure rooms are provided.

19 If a separate medicine room is provided, the room shall be equipped with a sink in addition to the nurses' station handwashing fixture. Hot-water supplies are optional.

20 Not used.

21 Handwashing fixtures may be deleted if room is storage and holding only.

22 Handwashing fixtures may be deleted if room is temporary holding of soiled materials.

23 Toilet shall be equipped with a bedpan flushing attachment.

24 Optional services approved by the licensing agency shall comply with the applicable space requirements of OSHPD 1 and 2.

25 Shall be provided in each separate room where open medication is handled.

26 Conveniently accessible throughout the unit.

27 Includes rooms or areas within coronary and intensive-care units and postanethesia recovery rooms.

28 Modular toilet/sink combination units located within a privacy curtain may be used within each patient space or private room. The toilet fixture shall be completely contained within cabinetry when not in use.

29 In service spaces with procedure rooms that do not have dedicated patient toilets, provide a minimum of one patient toilet room with a seprate handwashing fixture within the service space.

30 Toilet room shall be accessible from the procedure room.
31 Scrub sink shall be located outside the staff entrance to the procedure room.
32 Lavatories shall be equipped with gooseneck spouts without aerators and may have conventional controls.

TABLE 4-3

TYPE OF BUILDING OR OCCUPANCY	WATER CLOSETS (FIXTURES PER PERSON)		URINALS (TROUGH URINAL TO INDIVIDUAL URINAL EQUIVALENCE)	LAVATORIES (FIXTURES PER PERSON)	BATHTUBS OR SHOWERS	DRINKING FOUNTAINS (FIXTURES PER PERSON)[3]
	MALE	FEMALE	MALE		FIXTURES PER PERSON)[7]	
Nonindustrial—office buildings, public buildings and similar establishments	1 1-15 2 16-35 3 36-55 4 56-80 5 81-110 6 111-150 1 additional for each additional 40 employees or fraction thereof	1 1-15 2 16-35 3 36-55 4 56-80 5 81-110 6 111-150	Length of trough urinal / Number of individual urinals 24" (610 mm) 1 36" (914 mm) 2 48" (1219 mm) 2 60" (1524 mm) 3	1 1-15 2 16-35 3 36-60 4 61-90 5 91-125 1 additional for each additional 4 employees or fraction thereof	1:10 persons per shift required to shower	—
Industrial–factories, warehouses, loft buildings and similar establishments	1 1-15 2 16-35 3 36-55 4 56-80 5 81-110 6 111-150 1 additional for each additional 40 employees or fraction thereof	1 1-15 2 16-35 3 36-55 4 56-80 5 81-110 6 111-150	24" (610 mm) 1 36" (914 mm) 2 48" (1219 mm) 2 60" (1524 mm) 3 72" (1829 mm) 4	1 to 100 employees 1 per 10 Over 100 employees 1 additional for each additional 15 employees or fraction thereof	1:10 persons per shift required to shower	—

1 The figures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction thereof.
2 Each water closet shall occupy a separate compartment which shall be equipped with a door, door latch and clothes hook. The door and the walls or partitions between fixtures shall be sufficient to assure privacy.
3 Drinking fountains shall not be located in toilet rooms.
4 Washing facilities shall be reasonably accessible to all employees.
5 Toilet facilities shall be accessible to the employees at all times. Where practicable, toilet facilities should be within 200 feet (61 m) of locations at which workers are regularly employed and should not be more than one floor-to-floor flight of stairs from working areas.
6 Urinals may be installed instead of water closets in toilet rooms to be used only by men provided that the number of water closets shall not be less than two thirds of the minimum number of toilet facilities specified. The length of trough urinals to the equivalent number of individual urinals shall be based on the above table.
7 When there are less than five employees, separate toilet rooms for each sex are not required provided toilet rooms can be locked from the inside and contain at least one water closet.
8 Twenty-four linear inches of wash sink or 18 inches of circular basin, when provided with water outlets for such space, shall be considered equivalent to one lavatory.
Exception: The requirements of Table 4-3 do not apply to mobile crews or to normally unattended work locations provided employees at these locations have immediately available transportation to nearby toilet facilities which meet the requirements of Table 4-3.

TABLE 4-4

TYPE OF BUILDING OR OCCUPANCY[2]	WATER CLOSETS (FIXTURES PER PERSON)	URINALS (FIXTURES PER MALE)	LAVATORIES (FIXTURES PER PERSON)	BATHTUBS OR SHOWERS (FIXTURES PER PERSON)	DRINKING FOUNTAINS (FIXTURES PER PERSON)
Day Use Public Beaches[1,2]	Male / Female 1 1-100 / 1 1-100 No sex designated 1 1-500 Minimum of 2	May be substituted for up to two-thirds of the water closets required			
Picnic Areas	Male / Female 1 1-50 / 1 1-50				
Overnight Use Public Beaches[2]	1 1-7.5 campsites[3] 1 1-7.5 campsites[3]	May be substituted for up to one-third of the water closets required[3]		1 1-12.5 campsites[4]	
Organized Camps	1 1-15[3]		1 1-15	1 1-156	Minimum 1 per camp

1 Toilets shall be located in accordance with actual use patterns on the beach. The reasonable intent of the toilet requirements is that it should apply on the basis of average daily use during periods of peak use. The health officer may determine how many days the population standard may be exceeded.
2 Laundry facilities are not required, but if they are provided, must be a minimum of two laundry trays or a washing machine.
3 Toilet facilities shall not be farther than 400 feet from any lot or campsite.
4 Showers are not required, but it provided, they shall be provided on the indicated ratio. Outdoor rinse-off showers may be cold water only.
5 Toilets shall be located within 300 feet from the living accommodations they serve.
6 Showers shall be provided in the living area or in a centrally located structure.
Exception: Intermittent short-term organized camps are not required to provide shower facilities, but it provided, they shall comply with this part.

Pages 67 - 68 of the 2010 California Plumbing Code have been deleted

506.4.2 Indirect-fired water heater that incorporate a single-wall heat exchanger shall meet all of the following requirements:

(1) Connected to a low-pressure hot water boiler limited to a maximum of thirty (30) psig by an approved safety or relief valve.

(2) Heater transfer medium is either potable water or contains fluids having a toxicity rating or Class of 1.

(3) Bear a label with the word "Caution," followed by the following statements:

(a) The heat-transfer medium must be water or other nontoxic fluid having a toxic rating or Class of 1 as listed in Clinical Toxicology of Commercial Products, 5th edition.

(b) The pressure of the heat-transfer medium must be limited to a maximum of thirty (30) psig (207 kPa) by an approved safety or relief valve.

Note: The word "Caution" and the statements in letters having an uppercase height of not less than 0.120 of an inch (3.0 mm). The vertical spacing between lines of type shall be not less than 0.046 of an inch (1.2 mm). Lowercase letters shall be compatible with the uppercase letter size specification.

507.0 Air for Combustion and Ventilation.

507.1 General.

507.1.1 Air for combustion, ventilation, and dilution of flue gases for gas utilization appliances installed in buildings shall be obtained by application of one (1) of the methods covered in Sections 507.2.1 through 507.7. Gas utilization appliances of other than natural draft and Category I vented appliances shall be provided with combustion, ventilation, and dilution air in accordance with the appliance manufacturer's instructions. Where infiltration does not provide the necessary air, outdoor air shall be introduced in accordance with methods covered in Sections 507.4 through 507.7. [NFPA 54:9.3.1.1]

Exceptions:

(1) This provision shall not apply to direct-vent appliances.

(2) Type 1 clothes dryers that are provided with make-up air in accordance with section NFPA 54:10.4.3.

507.1.1.1 Clothes Dryer. A device used to dry wet laundry by means of heat derived from the combustion of fuel gases. [NFPA 54:3.3.18]

507.1.1.2 Clothes Dryer, Type 1. Primarily used in family living environment. May or may not be coin-operated for public use. [NFPA 54:3.3.18.1]

507.1.1.3 Exhausting to the Outdoors. Type 1 and Type 2 clothes dryers shall be exhausted to the outside air. [NFPA 54:10.4.2]

507.1.1.4 Provisions for Make-Up Air. Make-up air shall be provided for Type 1 clothes dryers in accordance with the manufacturer's installation instructions. [NFPA 54:10.4.3.1]

507.1.2 Gas appliances of other than natural draft design and other than Category I vented appliances shall be provided with combustion, ventilation, and dilution air in accordance with the appliance manufacturer's instructions. [NFPA 54:9.3.1.2]

507.1.3 Where used, a draft hood or a barometric draft regulator shall be installed in the same room or enclosure as the appliance served so as to prevent any difference in pressure between the hood or regulator and the combustion air supply. [NFPA 54:9.3.1.4]

507.1.4 Makeup air requirements for the operation of exhaust fans, kitchen ventilation systems, clothes dryers, and fireplaces shall be considered in determining the adequacy of a space to provide combustion air requirements. [NFPA 54:9.3.1.5]

507.2 Indoor Combustion Air. The required volume of indoor air shall be determined in accordance with Sections 507.2.1 or 507.2.2 except that where the air infiltration rate is known to be less than 0.40 ACH, Section 507.2.2 shall be used. The total required volume shall be the sum of the required volume calculated for all appliances located within the space. Rooms communicating directly with the space in which the appliances are installed through openings not furnished with doors, and through combustion air openings sized and located in accordance with Section 507.3 are considered a part of the required volume. [NFPA 54:9.3.2]

507.2.1 Standard Method. The required volume shall be not less than fifty (50) cubic feet per 1,000 Btu/hour (4.8 m^3/kW). [NFPA 54:9.3.2.1]

507.2.2 Known Air Infiltration Rate Method. Where the air infiltration rate of a structure is known, the minimum required volume shall be determined as follows [NFPA 54:9.3.2.2]:

(1) For appliances having other than fan-assisted, combustion systems: calculate using Equation 5-1 but not less than thirty-five (35) cubic feet per 1,000 Btu/hour (3.4 m^3/kW). [NFPA 54:9.3.2.2(1)]

(2) For fan-assisted combustion system appliances, calculate using Equation 5-2 but not less than twenty-five (25) cubic feet per 1,000 Btu/hour (2.4 m^3/kW). [NFPA 54: 9.3.2.2(2)]

(3) For purposes of this calculation, an infiltration rate greater than 0.60 ACH shall not be used in the equations. [NFPA 54:9.3.2.2(3)]

Equation 5-1:

Required volume $_{other}$ > (21 ft^3 /ACH) x (I_{other}/1,000 Btu/h)

Equation 5-2:

Required volume $_{fan}$ > (15 ft^3 /ACH) x (I_{fan}/1,000 Btu/h)

Where:

I_{other} = All appliances other than fan-assisted input in Btu/hour

I_{fan} = Fan-assisted appliance input in Btu/hour

ACH = Air change per hour (Percent of volume of space exchanged per hour, expressed as a decimal)

507.3 Indoor Opening Size and Location. Openings used to connect indoor spaces shall be sized and located in accordance with the following [NFPA 54:9.3.2.3]:

(1) *Combining spaces on the same story.* Each opening shall have a free area of not less than one (1) square inch /1,000 Btu/h (2,200 mm^2/kW) of the total input rating of all gas utilization appliances in the space, but not less than one-hundred (100) square inches (0.06 m^2). One (1) opening shall commence within twelve (12) inches (300 mm) of the top, and one (1) opening shall commence within twelve (12) inches (300 mm) of the bottom of the enclosure [see Figure 5-7]. The dimension of air openings shall be not less than three (3) inches (80 mm). [NFPA 54:9.3.2.3(1)]

(2) *Combining spaces in different stories.* The volumes of spaces in different stories shall be considered as communicating spaces where such spaces are connected by one (1) or more openings in doors or floors having a total free area of not less than two (2) square inches/1,000 Btu/h (4,400 mm^2/kW) of total input rating of all gas utilization appliances. [NFPA 54:9.3.2.3(2)]

507.4 Outdoor Combustion Air. Outdoor combustion air shall be provided through opening(s) to the outdoors in accordance with methods Sections 507.4.1 or 507.4.2. The dimension of air openings shall be not less than three (3) inches (80 mm). [NFPA 54:9.3.3]

507.4.1 Two Permanent Openings Method. Two (2) permanent openings, one (1) commencing within twelve (12) inches (300 mm) of the top and one (1) commencing within twelve (12) inches (300 mm) of the bottom of the enclosure shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors as follows [NFPA 54:9.3.3.1]:

(1) Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a free area of not less than one (1) square inch/4000 Btu/h (550 mm^2/kW) of total input rating of all appliances in the enclosure. [See Figures 5-8 and 5-9.] [NFPA 54:9.3.3.1(1)]

(2) Where communicating with the outdoors through horizontal ducts, each opening shall have a free area of not less than one (1) square inch/2,000 Btu/h (1,100 mm^2/kW) of total input rating of all appliances in the enclosure. [See Figure 5-10] [NFPA 54:9.3.3.1(2)]

507.4.2 One Permanent Opening Method. One (1) permanent opening, commencing within twelve (12) inches (300 mm) of the top of the enclosure, shall be provided. The appliance shall have clearances of not less than one (1) inch (25 mm) from the sides and back and six (6) inches (160 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors [see Figure 5-11] and shall have a minimum free area of the following [NFPA 54:9.3.3.2]:

(1) One (1) square inch/3,000 Btu/h (700 mm^2/kW) of the total input rating of all appliances located in the enclosure, and [NFPA 54:9.3.3.2(1)]

(2) Not less than the sum of the areas of all vent connectors in the space. [NFPA 54:9.3.3.2(2)]

507.5 Combination Indoor and Outdoor Combustion Air. The use of a combination of indoor and outdoor combustion air shall be in accordance with Sections 507.5.1, 507.5.2 and 507.5.3 [see example calculation in NFPA 54 Annex J and this chapter – Part II] [NFPA 54:9.3.4].

507.5.1 Indoor Openings. Where used, openings connecting the interior spaces shall comply with Section 507.3. [NFPA 54:9.3.4(1)]

507.5.2 Outdoor openings shall be located in accordance with Sections 507.4.1 or 507.4.2. [NFPA 54:9.3.4(2)]

507.5.3 Outdoor Openings Size. The outdoor openings size shall be calculated in accordance with the following [NFPA 54:9.3.4(3)]:

(1) The ratio of interior spaces shall be the available volume of communicating spaces divided by the required volume.

(2) The outdoor size reduction factor shall be one (1) minus the ratio of interior spaces.

(3) The minimum size of outdoor openings shall be the full size of outdoor openings calculated in accordance with Sections 507.4.1 or 507.4.2, multiplied by the reduction factor. The dimension of air openings shall be not less than three (3) inches (80 mm). [NFPA 54:9.3.4(3)(c)]

507.6 Engineered Installations. Engineered combustion air installations shall provide an adequate supply of combustion, ventilation, and dilution air and shall be approved by the Authority Having Jurisdiction. [NFPA 54:9.3.5]

507.7 Mechanical Combustion Air Supply. Where combustion air is provided by a mechanical air supply system, the combustion air shall be supplied from outdoors at the minimum rate of 0.35 cubic feet/min per 1,000 Btu/h (0.034 m^3/min per kW) for appliances located within the space. [NFPA 54:9.3.6]

507.7.1 Where exhaust fans are installed, additional air shall be provided to replace the exhausted air. [NFPA 54:9.3.6.1]

507.7.2 Each of the appliances served shall be interlocked to the mechanical air supply system to prevent main burner operation where the mechanical air supply system is not in operation. [NFPA 54:9.3.6.2]

507.7.3 Where combustion air is provided by the building's mechanical ventilation system, the system shall provide the specified combustion air rate in addition to the required ventilation air. [NFPA 54:9.3.6.3]

507.8 Louvers, Grilles and Screens.

(A) Louvers and Grilles. The required size of openings for combustion, ventilation, and dilution air shall be based

shall be installed without alteration, exactly as furnished and specified by the appliance manufacturer. [NFPA 54:12.13.2]

If a draft hood is not supplied by the appliance manufacturer where one (1) is required, a draft hood shall be installed, be of a listed or approved type, and, in the absence of other instructions, be of the same size as the appliance flue collar. Where a draft hood is required with a conversion burner, it shall be of a listed or approved type. [NFPA 54: 12.13.2.1]

Where it is determined that a draft hood of special design is needed or preferable for a particular installation, the installation shall be in accordance with the recommendations of the appliance manufacturer and shall be approved by the Authority Having Jurisdiction. [NFPA 54:12.13.2.2]

510.12.3 Draft-Control Devices. Where a draft-control device is part of the gas utilization appliance or is supplied by the appliance manufacturer, it shall be installed in accordance with the manufacturer's instructions. In the absence of manufacturer's instructions, the device shall be attached to the flue collar of the appliance or as near to the appliance as practical. [NFPA 54:12.13.3]

510.12.4 Additional Devices. Gas utilization appliances (except incinerators) requiring controlled chimney draft shall be permitted to be equipped with a listed double-acting barometric draft regulator installed and adjusted in accordance with the manufacturer's instructions. [NFPA 54:12.13.4]

510.12.5 Location. Draft hoods and barometric draft regulators shall be installed in the same room or enclosure as the appliance in such a manner as to prevent any difference in pressure between the hood or regulator and the combustion air supply. [NFPA 54:12.13.5]

510.12.6 Positioning. Draft hoods and draft regulators shall be installed in the position for which they were designed with reference to the horizontal and vertical planes and shall be located so that the relief opening is not obstructed by any part of the appliance or adjacent construction. The appliance and its draft hood shall be located so that the relief opening is accessible for checking vent operation. [NFPA 54:12.13.6]

510.12.7 Clearance. A draft hood shall be located so that its relief opening is at least six (6) inches (150 mm) from any surface except that of the appliance it serves and the venting system to which the draft hood is connected. Where a greater or lesser clearance is indicated on the appliance label, the clearance shall not be less than that specified on the label. Such clearances shall not be reduced. [NFPA 54:12.13.7]

510.13 Manually Operated Dampers. A manually operated damper shall not be placed in any appliance vent connector. Fixed baffles shall not be classified as manually operated dampers. [NFPA 54:12.14]

510.14 Automatically Operated Vent Dampers. An automatically operated vent damper shall be of a listed type. [NFPA 54:12.15]

510.15 Obstructions. Devices that retard the flow of vent gases shall not be installed in a vent connector, chimney, or vent. The following shall not be considered as obstructions [NFPA 54:12.16]:

(1) Draft regulators and safety controls specifically listed for installation in venting systems and installed in accordance with the terms of their listing.

(2) Approved draft regulators and safety controls designed and installed in accordance with approved engineering methods.

(3) Listed heat reclaimers and automatically operated vent dampers installed in accordance with the terms of their listing.

(4) Vent dampers serving listed appliances installed in accordance with this chapter or other approved engineering methods.

(5) Approved economizers, heat reclaimers, and recuperators installed in venting systems of appliances not required to be equipped with draft hoods, provided the gas utilization appliance manufacturer's instructions cover the installation of such a device in the venting system and performance in accordance with Sections 510.3.1 and 510.3.2 is obtained.

511.0 Sizing of Category I Venting Systems.

511.1 These venting tables shall not be used where obstructions (see Section 510.15) are installed in the venting system. The installation of vents serving listed appliances with vent dampers shall be in accordance with the appliance manufacturer's instructions or in accordance with the following [NFPA 54:13.1.1]:

(1) The maximum capacity of the vent system shall be determined using the NAT Max column.

(2) The minimum capacity shall be determined as though the appliance were a fan-assisted appliance, using the FAN Min column to determine the minimum capacity of the vent system. Where the corresponding "FAN Min" is "NA" the vent configuration shall not be permitted and an alternative venting configuration shall be utilized.

511.1.1 Where the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the use of the smaller size shall be permitted provided that the installation complies with the following requirements [NFPA 54:13.1.2]:

(1) The total vent height (H) is at least ten (10) feet (3 m).

(2) Vents for appliance draft hood outlets or flue collars twelve (12) inches (300 mm) in diameter or smaller are not reduced more than one (1) table size.

(3) Vents for appliance draft hood outlets or flue collars exceeding twelve (12) inches (300 mm) in diameter are not reduced more than two (2) table sizes.

(4) The maximum capacity listed in the tables for a fan-assisted appliance is reduced by 10 percent (0.90 maximum table capacity).

(5) The draft hood outlet exceeds four (4) inches (100 mm) in diameter. Do not connect a three (3) inch (80 mm) diameter vent to a four (4) inch (100 mm) diameter draft hood outlet. This provision shall not apply to fan-assisted appliances.

511.1.2 Elbows. Single-appliance venting configurations with zero (0) lateral lengths in Tables 5-8, 5-9, and 5-12 shall have no elbows in the venting system. Single-appliance venting with lateral lengths, include allowance for two (2) 90 degree elbows. For each additional elbow up to and including 45 degrees, the maximum capacity listed in the venting tables shall be reduced by 5 percent. For each additional elbow exceeding 45 degrees up to and including 90 degrees, the maximum capacity listed in the venting tables shall be reduced by 10 percent. [NFPA 54:13.1.3]

Where multiple offsets occur in a vent, the total lateral length of all offsets combined shall not exceed that specified in Tables 5–8 through 5–12. [NFPA 54-09:13.1.3]

511.1.3 Zero (0) lateral (L) shall apply only to a straight vertical vent attached to a top outlet draft hood or flue collar. [NFPA 54:13.1.4]

511.1.4 Sea level input ratings shall be used when determining maximum capacity for high-altitude installation. Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation. [NFPA 54:13.1.5]

511.1.5 For appliances with more than one (1) input rate, the minimum vent capacity (FAN Min) determined from the tables shall be less than the lowest appliance input rating, and the maximum vent capacity (FAN Max/NAT Max) determined from the tables shall exceed the highest appliance rating input. [NFPA 54:13.1.6]

511.1.6 Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Tables 5-8 or 5-9 for Type B vents with the maximum capacity reduced by 20 percent (0.80 maximum capacity) and the minimum capacity as shown in Tables 5-8 or 5-9.

Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with Section 511.1.2. The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one (1) long radius 90 degree turn at the bottom of the liner. [NFPA 54:13.1.7]

511.1.7 Connection to Chimney Liners. Connections between chimney liners and listed double-wall connectors shall be made with listed adapters designed for such purposes. [NFPA 54:13.1.8]

511.1.8 Vertical Vent Upsizing 7 x Rule. Where the vertical vent has a larger diameter than the vent connector, the vertical vent diameter shall be used to determine the minimum vent capacity, and the connector diameter shall be used to determine the maximum vent capacity. The flow area of the vertical vent shall not exceed seven (7) times the flow area of the listed appliance categorized vent area, flue collar area, or draft hood outlet area unless designed in accordance with approved engineering methods. [NFPA 54:13.1.9]

511.1.9 Draft Hood Conversion Accessories. Draft hood conversion accessories for use with masonry chimneys venting listed Category I fan-assisted appliances shall be listed and installed in accordance with the listed accessory manufacturer's installation instructions. [NFPA 54:13.1.10]

511.1.10 Tables 5-8 through 5-11 shall be used for chimneys and vents not exposed to the outdoors below the roof line. A Type B vent or listed chimney lining system passing through an unused masonry chimney flue shall not be considered to be exposed to the outdoors. A Type B vent passing through an unventilated enclosure or chase insulated to a value of at least R8 shall not be considered to be exposed to the outdoors. Table 5-9 in combination with Table 5-12 shall be used for clay-tile-lined exterior masonry chimneys, provided the following are met [NFPA 54:13.1.11]:

(1) The vent connector is Type B double wall.

(2) The vent connector length is limited to one and one-half (1½) feet for each inch (18 mm/mm) of vent connector diameter.

(3) The appliance is draft-hood-equipped.

(4) The input rating is less than the maximum capacity given in Table 5-9.

(5) For a water heater, the outdoor design temperature shall be not less than 5°F (-15°C).

(6) For a space-heating appliance, the input rating exceeds the minimum capacity given by Table 5-12.

511.1.11 Corrugated vent connectors shall not be smaller than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter. [NFPA 54:13.1.12]

511.1.12 Vent connectors shall not be upsized more than two (2) sizes exceeding the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter. [NFPA 54:13.1.13]

511.1.13 In a single run of vent or vent connector, more than one (1) diameter and type shall be permitted to be used, provided that the sizes and types are permitted by the tables. [NFPA 54:13.1.14]

511.1.14 Interpolation shall be permitted in calculating capacities for vent dimensions that fall between table entries. (See Part II-Example G.1.3.) [NFPA 54:13.1.15]

511.1.15 Extrapolation beyond the table entries shall not be permitted. [NFPA 54:13.1.16]

511.1.16 For vent heights lower than six (6) feet and exceeding vent heights shown in the tables, engineering methods shall be used to calculate vent capacities. [NFPA 54:13.1.17]

511.2 Additional Requirements to Multiple Appliance Vent Table 5-14 through Table 5-22.

511.2.1 Obstructions and Vent Damper. These venting tables shall not be used where obstructions (see Section 510.15) are installed in the venting system. The installation of vents serving listed appliances with vent dampers shall be in accordance with the appliance manufacturer's instructions or in accordance with the following [NFPA 54:13.2.1]:

(1) The maximum capacity of the vent connector shall be determined using the NAT Max column.

(2) The maximum capacity of the vertical vent or chimney shall be determined using the FAN + NAT column when the second appliance is a fan-assisted appliance, or the NAT + NAT column when the second appliance is equipped with a draft hood.

(3) The minimum capacity shall be determined as if the appliance were a fan-assisted appliance.

(a) The minimum capacity of the vent connector shall be determined using the FAN Min column.

(b) The FAN + FAN column shall be used when the second appliance is a fan-assisted appliance, and the FAN + NAT column shall be used when the second appliance is equipped with a draft hood, to determine whether the vertical vent or chimney configuration is not permitted (NA). Where the vent configuration is NA, the vent configuration shall not be permitted and an alternative venting configuration shall be utilized.

511.2.2 The vent connector horizontal length shall be eighteen (18) inches/inch (18 mm/mm) of connector diameter as shown in Table 5-7. [NFPA 54:13.2.2]

511.2.3 The vent connector shall be routed to the vent utilizing the shortest possible route. Connectors with longer horizontal lengths than those listed in Table 5-7 are permitted under the following conditions [NFPA 54:13.2.3]:

(A) The maximum capacity (FAN Max or NAT Max) of the vent connector shall be reduced 10 percent for each additional multiple of the length listed in Table 5-7. For example, the length listed for a four (4) inch (100 mm) connector shall not exceed six (6) feet (1.8 m). With a connector length exceeding six (6) feet (1.8 m) but not exceeding twelve (12) feet (3.7 m), the maximum capacity must be reduced by 10 percent (0.90 maximum vent connector capacity). With a connector length exceeding twelve (12) feet (3.7 m) but not exceeding eighteen (18) feet (5.5 m), the maximum capacity must be reduced by 20 percent (0.80 maximum vent capacity) [NFPA 54:13.2.3(1)].

(B) For a connector serving a fan-assisted appliance, the minimum capacity (FAN Min) of the connector shall be determined by referring to the corresponding single appliance table. For Type B double-wall connectors, Table 5-8 shall be used. For single-wall connectors, Table 5-9 shall be used. The height (H) and lateral (L) shall be measured according to the procedures for a single appliance vent, as if the other appliances were not present. [NFPA 54:13.2.3(2)]

TABLE 5-7
VENT CONNECTOR MAXIMUM LENGTH
[NFPA 54:TABLE 13.2.2]

CONNECTOR DIAMETER MAXIMUM (in.)	CONNECTOR HORIZONTAL LENGTH (ft.)
3	4½
4	6
5	7½
6	9
7	10½
8	12
9	13½
10	15
12	18
14	21
16	24
18	27
20	30
22	33
24	36

For SI units, 1 in. = 25.4 mm; 1 ft. = 0.305 m.

511.2.4 Where the vent connectors are combined prior to entering the vertical portion of the common vent to form a common vent manifold, the size of the common vent manifold and the common vent shall be determined by applying a 10 percent reduction (.90 x maximum common vent capacity) to the Common Vent Capacity part of the common vent tables. The length of the common vent connector manifold (LM) shall not exceed eighteen (18) inches/inch (18 mm/mm) of common vent connector manifold diameter (D). (See Part II-Figure G.1(k).) [NFPA 54:13.2.4]

511.2.5 Vent Offset. Where the common vertical vent is offset, the maximum capacity of the common vent shall be reduced in accordance with Section 511.2.6, and the horizontal length of the common vent offset shall not exceed eighteen (18) inches/inch (18 mm/mm) of common vent diameter. Where multiple offsets occur in a common vent, the total horizontal length of offsets combined shall not exceed eighteen (18) inches/inch (18 mm/mm) of common vent diameter. [NFPA 54:13.2.5]

511.2.6 For each elbow up to and including 45 degrees in the common vent, the maximum common vent capacity listed in the venting tables shall be reduced by 5 percent. For each elbow exceeding 45 degrees up to and including 90 degrees, the maximum common vent capacity listed in the venting tables shall be reduced by 10 percent. [NFPA 54:13.2.6]

511.2.7 Common Vent Minimum Size. The cross-sectional area of the common vent shall be equal to or exceeding the cross-sectional area of the largest connector. [NFPA 54:13.2.8]

511.2.8 Tee and Wye Fittings. Tee and wye fittings connected to a common gas vent shall be considered as part of the common gas vent and constructed of materials consistent with that of the common gas vent. [NFPA 54-09:13.2.9]

511.2.9 At the point where tee or wye fittings connect to a common vent, the opening size of the fitting shall be equal to the size of the common vent. Such fittings shall not be prohibited from having reduced size openings at the point of connection of appliance vent connectors. [NFPA 54:13.2.10]

511.2.10 Sea level input ratings shall be used when determining maximum capacity for high-altitude installation. Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation. [NFPA 54:13.2.11]

511.2.11 The connector rise (R) for each appliance connector shall be measured from the draft hood outlet or flue collar to the centerline where the vent gas streams come together. [NFPA 54:13.2.12]

511.2.12 For multiple units of gas utilization appliances located on one (1) floor, available total height (H) shall be measured from the highest draft hood outlet or flue collar up to the level of the outlet of the common vent. [NFPA 54:13.2.13]

511.2.13 For multistory installations, available total height (H) for each segment of the system shall be the vertical distance between the highest draft hood outlet or flue collar entering that segment and the centerline of the next higher interconnection tee. (See Part II-Figure G.1(m).) [NFPA 54:13.2.14]

511.2.14 The size of the lowest connector and of the vertical vent leading to the lowest interconnection of a multistory system shall be in accordance with Tables 5-8 or 5-9 for available total height (H) up to the lowest interconnection. (See Part II-Figure G.1(n).) [NFPA 54:13.2.15]

511.2.15 Where used in multistory systems, vertical common vents shall be Type B double-wall and shall be installed with a listed vent cap. [NFPA 54:13.2.16]

511.2.16 Offsets in multistory common vent systems shall be limited to a single offset in each system, and systems with an offset shall comply with all of the following [NFPA 54:13.2.17]:

(1) The offset angle shall not exceed 45 degrees from vertical.

(2) The horizontal length of the offset shall not exceed eighteen (18) inches for each inch (18 mm/mm) of common vent diameter of the segment in which the offset is located.

(3) For the segment of the common vertical vent containing the offset, the common vent capacity listed in the common venting tables shall be reduced by 20 percent (0.80 x maximum common vent capacity).

(4) A multistory common vent shall not be reduced in size above the offset.

511.2.17 Where two (2) or more appliances are connected to a vertical vent or chimney, the flow area of the largest section of vertical vent or chimney shall not exceed seven (7) times the smallest listed appliance categorized vent areas, flue collar area, or draft hood outlet area unless designed in accordance with approved engineering methods. [NFPA 54:13.2.18]

511.2.18 For appliances with more than one (1) input rate, the minimum vent connector capacity (FAN Min) determined from the tables shall be less than the lowest appliance input rating, and the maximum vent connector capacity (FAN Max or NAT Max) determined from the table shall exceed the highest appliance input rating. [NFPA 54:13.2.19]

511.2.19 Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Tables 5-14 or 5-15 for Type B vents, with the maximum capacity reduced by 20 percent (0.80 maximum capacity) and the minimum capacity as shown in Tables 5-14 or 5-15. Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with Sections 511.2.5 and 511.2.6. The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one (1) long radius 90 degree turn at the bottom of the liner. [NFPA 54:13.2.20]

511.2.20 Tables 5-14 and 5-15 shall be used for chimneys and vents not exposed to the outdoors below the roof line. A Type B vent passing through an unventilated enclosure or chase insulated to a value of not less than R8 shall not be considered to be exposed to the outdoors. Table 5-19 through Table 5-22 shall be used for clay-tile-lined exterior masonry chimneys, provided all of the following conditions are met [NFPA 54:13.2.22]:

(1) Vent connector is Type B double-wall.

(2) One (1) appliance is draft-hood-equipped.

(3) The combined appliance input rating is less than the maximum capacity given by Table 5-19 (for NAT + NAT) or Table 5-21 (for FAN + NAT).

(4) The input rating of each space-heating appliance exceeds the minimum input rating given by Table 5-20 (for NAT + NAT) or Table 5-22 (for FAN + NAT).

(5) The vent connector sizing is in accordance with Table 5-16.

511.2.21 Vent connectors shall not be increased more than two (2) sizes exceeding the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter. Vent connectors for draft-hood-equipped appliances shall not be smaller than the draft hood outlet diameter. Where vent connector sizes determined from the tables for fan-assisted appliances are smaller than the flue collar diameter, the use of the smaller sizes shall be permitted provided that the installation complies with all of the following conditions [NFPA 54:13.2.24]:

(1) Vent connectors for fan-assisted appliance flue collars twelve (12) inches (300 mm) in diameter or

606.2 Use of Joints.

606.2.1 Copper Water Tube. Joints in copper tubing shall be made by the appropriate use of approved fittings properly soldered or brazed together as provided in Section 316.1.3 or 316.1.7 or by means of approved flared or compression fittings in Sections 606.1.1 or 316.1.5. Solder and soldering flux shall conform to the requirements of Section 316.1.3. Mechanically formed tee fittings shall be made by brazing only and shall conform to the requirements of Sections 316.1.7 and 606.1.3.

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

606.2.3 Slip Joints. In water piping, slip joints shall be permitted to be used only on the exposed fixture supply.

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 mm^2) overflow screened with copper screen having not less than fourteen (14) nor exceeding eighteen (18) openings per linear inch (25.4 mm).

608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves.

608.1 Inadequate Water Pressure. Whenever the water pressure in the main or other source of supply will not provide a residual water pressure of not less than fifteen (15) pounds per square inch (103 kPa), after allowing for friction and other pressure losses, a tank and a pump or other means that will provide said fifteen (15) pound (103 kPa) pressure shall be installed. Whenever fixtures and/or fixture fittings are installed that require residual pressure exceeding fifteen (15) pounds per square inch (103 kPa), that minimum residual pressure shall be provided.

608.2 Excessive Water Pressure. Where static water pressure in the water supply piping is exceeding 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. Pressure regulator(s) equal to or exceeding one and one-half (1½) 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. Pipe size determinations shall be based on 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 such 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.

608.3 Any water system provided with a check valve, backflow preventer, or any other normally closed device that prevents dissipation of building pressure back into the water main shall be provided with an approved, listed, and adequately sized expansion tank or other approved device having a similar function to control thermal expansion. Such expansion tank or other approved device shall be installed on the building side of the check valve, backflow preventer, or other device and shall be sized and installed in accordance with the manufacturer's recommendation.

Any water system containing storage water heating equipment shall be provided with an approved, listed, adequately sized combination pressure and temperature relief valve, except for listed nonstorage instantaneous heaters having an inside diameter of not more than three (3) inches (80 mm). Each such approved combination temperature and pressure relief valve shall be installed on the water-heating device in an approved location based on its listing requirements and the manufacturer's instructions. Each such combination temperature and pressure relief valve shall be provided with a drain as required in Section 608.5.

608.4 Each pressure relief valve shall be an approved automatic type with drain, and each such relief valve shall be set at a pressure of not more than one-hundred and fifty (150) pounds per square inch (1,034 kPa). No shutoff valve shall be installed between the relief valve and the system or in the drain line.

608.5 Relief valves located inside a building shall be provided with a drain, not smaller than the relief valve outlet, of galvanized steel, hard-drawn copper piping and fittings, CPVC or listed relief valve drain tube with fittings that will not reduce the internal bore of the pipe or tubing (straight lengths as opposed to coils) and shall extend from the valve to the outside of the building, with the end of the pipe not more than two (2) feet (610 mm) nor less than six (6) inches (152 mm) above ground or the flood level of the area receiving the discharge and pointing downward. Such drains shall be permitted to terminate at other approved locations. Relief valve drains shall not terminate in a building's crawl space. No part of such drain pipe shall be trapped or subject to freezing. The terminal end of the drain pipe shall not be threaded.

608.6 Any water-heating device connected to a separate storage tank and having valves between said heater and tank shall be provided with an approved water pressure relief valve.

608.7 Vacuum Relief Valves. Where a hot-water storage tank or an indirect water heater is located at an elevation above the fixture outlets in the hot-water system, a vacuum relief valve shall be installed on the storage tank or heater.

609.0 Installation, Testing, Unions, and Location.

609.1 Installation. Water piping shall be adequately supported in accordance with Section 314.0. Burred ends shall be reamed to the full bore of the pipe or tube. Changes in direction shall be made by the appropriate use of fittings, except that changes in direction in copper tubing may be made with bends, provided that such bends are made with bending equipment that does not deform or create a loss in the cross-sectional area of the tubing. Changes in direction are allowed with flexible pipe and tubing without fittings in accordance with the manufacturer's installation instructions. Provisions shall be made for expansion in hot-water piping. Piping, equipment, appurtenances, and devices shall be installed in a workmanlike manner in conformity with the provisions and intent of the code. Water service yard piping shall be not less than twelve (12) inches (305 mm) below the average local frost depth. The cover shall be not less than twelve (12) inches (305 mm) below finish grade.

609.2 Water pipes shall not be run or laid in the same trench as building sewer or drainage piping constructed of clay or materials that are not approved for use within a building unless both of the following conditions are met:

609.2.1 The bottom of the water pipe, at all points, shall be not less than twelve (12) inches (305 mm) above the top of the sewer or drain line.

609.2.2 The water pipe shall be placed on a solid shelf excavated at one (1) side of the common trench with a clear horizontal distance of not less than twelve (12) inches (305 mm) from the sewer or drain line.

Water pipes crossing sewer or drainage piping constructed of clay or materials that are not approved for use within a building shall be laid not less than twelve (12) inches (305 mm) above the sewer or drain pipe.

609.3 Water piping installed within a building and in or under a concrete floor slab resting on the ground shall be installed in accordance with the following requirements:

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.

609.3.2 Copper tubing shall be installed without joints where possible. Where joints are permitted, they shall be brazed, and fittings shall be wrought copper.

Note: For the purpose of this section, "within the building" shall mean within the fixed limits of the building foundation.

609.4 Testing. Upon completion of a section or of the entire hot and cold water supply system, it shall be tested and proved tight under a water pressure not less than the working pressure under which it is to be used. The water used for tests shall be obtained from a potable source of supply. Except for plastic piping, a fifty (50) lb./in.^{2} (345 kPa) air pressure shall be permitted to be substituted for the water test. In either method of test, the piping shall withstand the test without leaking for a period of not less than fifteen (15) minutes.

609.5 Unions. Unions shall be installed in the water supply piping not more than twelve (12) inches (305 mm) of regulating equipment, water heating, conditioning tanks, and similar equipment that requires service by removal or replacement in a manner that will facilitate its ready removal.

609.6 Location. Except as provided in Section 609.7, no building supply shall be located in any lot other than the lot that is the site of the building or structure served by such building supply.

609.7 Nothing contained in this code shall be construed to prohibit the use of all or part of an abutting lot to:

609.7.1 Provide access to connect a building supply to an available public water service when proper cause and legal easement not in violation of other requirements have been first established to the satisfaction of the Authority Having Jurisdiction.

609.7.2 Provide additional space for a building supply when proper cause, transfer of ownership, or change of boundary not in violation of other requirements have been first established to the satisfaction of the Authority Having Jurisdiction. The instrument recording such action shall constitute an agreement with the Authority Having Jurisdiction, which shall clearly state and show that the areas so joined or used shall be maintained as a unit during the time they are so used. Such an agreement shall be recorded in the office of the County Recorder as a part of the conditions of ownership of said properties, and shall be binding on heirs, successors, and assigns to such properties. A copy of the instrument recording such proceedings shall be filed with the Authority Having Jurisdiction.

609.8 Low-Pressure Cutoff Required on Booster Pumps for Water Distribution Systems. When a booster pump (excluding a fire pump) is connected to a water service or underground water pipe, a low-pressure cutoff switch on the inlet side of the pump shall be installed not more than five (5) feet (1,524 mm) of the inlet. The cutoff switch shall be set for not less than ten (10) psi (69 kPa). A pressure gauge shall be installed between the shutoff valve and the pump.

609.9 Disinfection of Potable Water System. New or repaired potable water systems shall be disinfected prior to use whenever required by the Authority Having Jurisdiction. ***[OSHPD 1, 2, 3 & 4]*** *Prior to utilization of newly constructed or altered potable water piping systems, all affected potable water piping shall be disinfected using procedures prescribed in California Plumbing Code Sections 609.9.1 through 609.9.4.* The method to be followed shall be that prescribed by the Health Authority or, in case no method is prescribed by it, the following:

that are connected to the appliance grounding conductor of the circuit supplying that appliance. [NFPA 54-09:7.13.1]

1211.15.2 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 six (6) AWG copper wire. [NFPA 54-09:7.13.2]

1211.15.3 Gas piping shall not be used as a grounding conductor or electrode. This does not preclude the bonding of metallic piping to a grounding system. [NFPA 54-09:7.13.3]

1211.15.4 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]

1211.16 Electrical Circuits. Electrical circuits shall not utilize gas piping or components as conductors. [NFPA 54:7.14]

Exception: Low-voltage (50V or less) control circuits, ignition circuits, and electronic flame detection device circuits shall be permitted to make use of piping or components as a part of an electric circuit.

1211.17 Electrical Connections.

(A) Electrical connections between wiring and electrically operated control devices in a piping system shall conform to the requirements of *California Electrical Code*.

(B) Any essential safety control depending on electric current as the operating medium shall be of a type that will shut off (fail safe) the flow of gas in the event of current failure. [NFPA 54:7.15.2]

1211.18 Earthquake-Actuated Gas Shutoff Valves. *Earthquake-actuated gas shutoff valves, certified by the State Architect as conforming to California Referenced Standards Code (CRSC), Standard 12-12-1, shall be provided for buildings when such installation is required by local ordinance. Earthquake-actuated gas shutoff valves which have not been certified by the State Architect shall be prohibited in buildings open to the public under mandatory installation by local ordinance.*

An earthquake-actuated gas shutoff valve is a valve for installation in a gas piping system and designed to automatically shut off the gas at the location of the valve in the event of a seismic disturbance.

1212.0 Appliance Connections to Building Piping.

1212.1 Connecting Gas Appliances. Gas utilization appliances shall be connected to the building piping in compliance with Sections 1212.5 and 1212.6 by one of the following [NFPA 54:9.6.1]:

(1) Rigid metallic pipe and fittings. [NFPA 54:9.6.1(1)]

(2) Semirigid metallic tubing and metallic fittings. Aluminum alloy tubing shall not be used in exterior locations. [NFPA 54:9.6.1(2)]

(3) Listed flexible gas connectors in compliance with CSA 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 appliance. [NFPA 54:9.6.1(3)]

(4) CSST where installed in accordance with the manufacturer's instructions. [NFPA 54:9.6.1(5)]

(5) Listed nonmetallic gas hose connectors in accordance with Section 1212.3. [NFPA 54:9.6.1(6)]

(6) Gas-fired food service (commercial cooking) appliances listed for use with casters or otherwise subject to movement for cleaning, and other large and heavy gas utilization appliances that can be moved, shall be connected in accordance with the connector manufacturer's installation instructions using a listed appliance connector complying with CSA Z21.69, *Standard for Connectors for Movable Gas Appliances*. The commercial cooking appliance connector installation shall be configured in accordance with the manufacturer's installation instructions. (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 Section 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, insulation, or are subject to repeated wettings by such liquids as water (except rain water), detergents, or sewage.[NFPA 54:9.6.1(7)]

1212.2 Suspended Low-Intensity Infrared Tube Heaters. Suspended low-intensity infrared tube heaters shall be connected to the building piping system with a connector listed for the application in accordance with CSA Z21.24/CGA 6.10*, Connectors for Gas Appliances*. [NFPA 54-09:9.6.1.3]

(A) The connector shall be installed in accordance with the tube heater installation instructions, and shall be in the same room as the appliance.

(B) Only one connector shall be used per appliance.

1212.3 Use of Nonmetallic Gas Hose Connectors. Listed nonmetallic gas hose connectors shall be used in accordance with the terms of their listing and as follows [NFPA 54:9.6.2]:

(A) Indoor. Indoor gas hose connectors shall be used only to connect laboratory, shop, and ironing equipment requiring mobility during operation. An equipment shutoff valve shall be installed where the connector is attached to the building piping. The connector shall be of minimum length and shall not exceed six (6) feet (1,829 mm). The connector shall not be concealed and shall not extend from one (1) room to another or pass through wall partitions, ceilings, or floors.

(B) Outdoor. Outdoor gas hose connectors are permitted to connect portable outdoor gas-fired appliances. An appliance shutoff valve, a listed quick-disconnect device, or a listed gas convenience outlet shall be installed where the connector is attached to the supply piping and in such a manner to prevent the accumulation of water or foreign matter. This connection shall be made only in the outdoor area where the appliance is to be used. The connector length shall not exceed fifteen (15) feet (4,572 mm).

1212.4 Connection of Portable and Mobile Industrial Gas Appliance.

(A) Where portable industrial gas utilization appliances, or appliances requiring mobility or subject to vibration, are connected to the building gas piping system by the use of a flexible hose, the hose shall be suitable and safe for the conditions under which it can be used. [NFPA 54:9.6.3.1]

(B) Where industrial gas utilization appliances requiring mobility are connected to the rigid piping by the use of swivel joints or couplings, the swivel joints or couplings shall be suitable for the service required, and only the minimum number required shall be installed. [NFPA 54:9.6.3.2]

(C) Where industrial gas utilization appliances subject to vibration are connected to the building piping system by the use of all-metal flexible connectors, the connectors shall be suitable for the service required. [NFPA 54:9.6.3.3]

(D) Where flexible connections are used, they shall be of the minimum practical length and shall not extend from one (1) room to another or pass through any walls, partitions, ceilings, or floors. Flexible connections shall not be used in any concealed location. They shall be protected against physical or thermal damage and shall be provided with gas shutoff valves in readily accessible locations in rigid piping upstream from the flexible connections. [NFPA 54:9.6.3.4]

1212.5 Appliance Shutoff Valves and Connections. Gas utilization appliance connected to a piping system shall have an accessible, approved manual shutoff valve with a nondisplaceable valve member, or a listed gas convenience outlet installed within six (6) feet (1.8 m) of the appliance it serves. Where a connector is used, the valve shall be installed upstream of the connector. A union or flanged connection shall be provided downstream from this valve to permit removal of controls. Shutoff valves serving decorative gas appliances shall be permitted to be installed in fireplaces if listed for such use. [NFPA 54:9.6.4]

1212.6 Quick-Disconnect Devices. Quick-disconnect devices used to connect appliances to the building piping shall be listed. Where they are installed indoors, an approved manual shutoff valve with a nondisplaceable valve member shall be installed upstream of the quick-disconnect device. [NFPA 54:9.6.5]

1212.7 Sediment Trap. Where a sediment trap is not incorporated as a part of the gas utilization appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical at the time of appliance installation. The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet, as illustrated in Figure 12-1, or other device recognized as an effective sediment trap. Illuminating appliances, ranges, clothes dryers, decorative vented appliances for installation in vented fireplaces, gas fireplaces, and outdoor grills shall not be required to be so equipped. [NFPA 54-09:9.6.7]

1212.8 Installation of Piping. Piping shall be installed in a manner not to interfere with inspection, maintenance, or servicing of the gas utilization equipment. [NFPA 54:9.6.8]

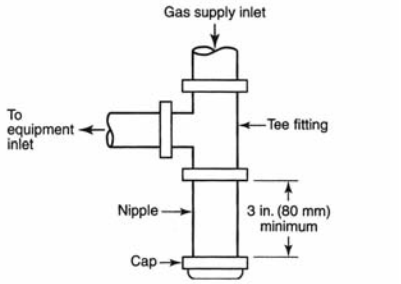

FIGURE 12-1 METHOD OF INSTALLING A TEE FITTING SEDIMENT TRAP.

1213.0 Liquefied Petroleum Gas Facilities and Piping.

Liquefied petroleum gas facilities shall comply with NFPA 58, *Liquefied Petroleum Gas Code*.

1214.0 Pressure Testing and Inspection.

1214.1 General.

1214.1.1 Prior to acceptance and initial operation, piping installations shall be inspected and pressure-tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of this code. [NFPA 54:8.1.1.1]

1214.1.2 Inspection shall consist of visual examination during or after manufacture, fabrication, assembly, or pressure tests, as appropriate. Supplementary types of non-destructive inspection techniques, such as magnetic-particle, radiographic, and ultrasonic, shall not be required unless specifically listed herein or in the engineering design. [NFPA 54:8.1.1.2]

1214.1.3 Where repairs or additions are made following the pressure test, the affected piping shall be tested. Minor repairs and additions are not required to be pressure-tested provided that the work is inspected and connections are tested with a noncorrosive leak-detecting fluid or other leak-detecting methods approved by the Authority Having Jurisdiction. [NFPA 54:8.1.1.3]

1214.1.4 Where new branches are installed from the point of delivery to new appliances, only the newly installed branches shall be required to be pressure-tested. Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or approved leak-detecting methods. [NFPA 54:8.1.1.4]

1214.1.5 A piping system shall be tested as a complete unit or in sections. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one (1) section of the piping system and test medium in an adjacent section, unless two (2) valves are installed in series with a valved "telltale" located between these valves. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve-closing mechanism, is designed to safely withstand the pressure. [NFPA 54:8.1.1.5]

TABLE 12-38
CORRUGATED STAINLESS STEEL TUBING (CSST) [NFPA 54-09: TABLE 6.3(j)]

											GAS:	UNDILUTED PROPANE		
											INLET PRESSURE:	5.0 psi		
											PRESSURE DROP:	3.5 psi		
											SPECIFIC GRAVITY:	1.50		
	TUBE SIZE (EHD)*													
FLOW DESIGNATION:	13	15	18	19	23	25	30	31	37	39	46	48	60	62
LENGTH (ft)	CAPACITY IN THOUSANDS OF BTU PER HOUR													
10	826	1,070	1,710	2,060	3,150	4,000	7,830	8,950	13,100	14,441	28,600	31,200	54,400	63,800
25	509	664	1,090	1,310	2,040	2,550	4,860	5,600	8,400	9,339	18,000	19,900	34,700	40,400
30	461	603	999	1,190	1,870	2,340	4,430	5,100	7,680	8,564	16,400	18,200	31,700	36,900
40	396	520	867	1,030	1,630	2,030	3,820	4,400	6,680	7,469	14,200	15,800	27,600	32,000
50	352	463	777	926	1,460	1,820	3,410	3,930	5,990	6,717	12,700	14,100	24,700	28,600
75	284	376	637	757	1,210	1,490	2,770	3,190	4,920	5,539	10,300	11,600	20,300	23,400
80	275	363	618	731	1,170	1,450	2,680	3,090	4,770	5,372	9,990	11,200	19,600	22,700
100	243	324	553	656	1,050	1,300	2,390	2,760	4,280	4,830	8,930	10,000	17,600	20,300
150	196	262	453	535	866	1,060	1,940	2,240	3,510	3,983	7,270	8,210	14,400	16,600
200	169	226	393	464	755	923	1,680	1,930	3,050	3,474	6,290	7,130	12,500	14,400
250	150	202	352	415	679	828	1,490	1,730	2,740	3,124	5,620	6,390	11,200	12,900
300	136	183	322	379	622	757	1,360	1,570	2,510	2,865	5,120	5,840	10,300	11,700
400	117	158	279	328	542	657	1,170	1,360	2,180	2,498	4,430	5,070	8,920	10,200
500	104	140	251	294	488	589	1,050	1,210	1,950	2,247	3,960	4,540	8,000	9,110

*EHD = Equivalent Hydraulic Diameter, which is a measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table does not include effect of pressure drop across the line regulator. Where regulator loss exceeds 1 psi, do not use this table. Consult with regulator manufacturer for pressure drops and capacity factors. Pressure drops across a regulator may vary with flow rate.

(2) CAUTION: Capacities shown in table may exceed maximum capacity for a selected regulator. Consult with regulator or tubing manufacturer for guidance.

(3) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger numbers of bends and/or fittings shall be increased by an equivalent length of tubing to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(4) All table entries are rounded to 3 significant digits.

TABLE 12-39
POLYETHYLENE PLASTIC PIPE [NFPA 54: TABLE 6.3(k)]

					GAS:	UNDILUTED PROPANE	
					INLET PRESSURE:	11.0 in. w.c.	
					PRESSURE DROP:	0.5 in. w.c.	
					SPECIFIC GRAVITY:	1.50	
INTENDED USE: PE SIZING BETWEEN INTEGRAL 2-STAGE REGULATOR AT TANK OR 2ND STAGE (LOW PRESSURE REGULATOR) AND BUILDING							
	PIPE SIZE (in.)						
NOMINAL OD:	½	¾	1	1¼	1½	2	
DESIGNATION:	SDR 9.33	SDR 11.0	SDR 11.00	SDR 10.00	SDR 11.00	SDR 11.00	
ACTUAL ID:	0.660	0.860	1.077	1.328	1.554	1.943	
LENGTH (ft)	THOUSANDS OF BTU PER HOUR						
10	340	680	1,230	2,130	3,210	5,770	
20	233	468	844	1,460	2,210	3,970	
30	187	375	677	1,170	1,770	3,180	
40	160	321	580	1,000	1,520	2,730	
50	142	285	514	890	1,340	2,420	
60	129	258	466	807	1,220	2,190	
70	119	237	428	742	1,120	2,010	
80	110	221	398	690	1,040	1,870	
90	103	207	374	648	978	1,760	
100	98	196	353	612	924	1,660	
125	87	173	313	542	819	1,470	
150	78	157	284	491	742	1,330	
175	72	145	261	452	683	1,230	
200	67	135	243	420	635	1,140	
250	60	119	215	373	563	1,010	
300	54	108	195	338	510	916	
350	50	99	179	311	469	843	
400	46	92	167	289	436	784	
450	43	87	157	271	409	736	
500	41	82	148	256	387	695	

Note: All table entries are rounded to 3 significant digits.

TABLE 12-40
POLYETHYLENE PLASTIC PIPE [NFPA 54-09: TABLE 6.3(I)]

			GAS:	UNDILUTED PROPANE		
			INLET PRESSURE:	2.0 psi		
			PRESSURE DROP:	1.0 psi		
			SPECIFIC GRAVITY:	1.50		
INTENDED USE: PE PIPE SIZING BETWEEN 2 PSI SERVICE AND LINE PRESSURE REGULATOR						
	PIPE SIZE (in.)					
NOMINAL OD:	½	¾	1	1¼	1½	2
DESIGNATION:	SDR 9.33	SDR 11.0	SDR 11.00	SDR 10.00	SDR 11.00	SDR 11.00
ACTUAL ID:	0.660	0.860	1.077	1.328	1.554	1.943
LENGTH (ft)	CAPACITY IN THOUSANDS OF BTU PER HOUR					
10	3,130	6,260	11,300	19,600	29,500	53,100
20	2,150	4,300	7,760	13,400	20,300	36,500
30	1,730	3,450	6,230	10,800	16,300	29,300
40	1,480	2,960	5,330	9,240	14,000	25,100
50	1,310	2,620	4,730	8,190	12,400	22,200
60	1,190	2,370	4,280	7,420	11,200	20,100
70	1,090	2,180	3,940	6,830	10,300	18,500
80	1,010	2,030	3,670	6,350	9,590	17,200
90	952	1,910	3,440	5,960	9,000	16,200
100	899	1,800	3,250	5,630	8,500	15,300
125	797	1,600	2,880	4,990	7,530	13,500
150	722	1,450	2,610	4,520	6,830	12,300
175	664	1,330	2,400	4,160	6,280	11,300
200	618	1,240	2,230	3,870	5,840	10,500
250	548	1,100	1,980	3,430	5,180	9,300
300	496	994	1,790	3,110	4,690	8,430
350	457	914	1,650	2,860	4,320	7,760
400	425	851	1,530	2,660	4,020	7,220
450	399	798	1,440	2,500	3,770	6,770
500	377	754	1,360	2,360	3,560	6,390
550	358	716	1,290	2,240	3,380	6,070
600	341	683	1,230	2,140	3,220	5,790
650	327	654	1,180	2,040	3,090	5,550
700	314	628	1,130	1,960	2,970	5,330
750	302	605	1,090	1,890	2,860	5,140
800	292	585	1,050	1,830	2,760	4,960
850	283	566	1,020	1,770	2,670	4,800
900	274	549	990	1,710	2,590	4,650
950	266	533	961	1,670	2,520	4,520
1,000	259	518	935	1,620	2,450	4,400
1,100	246	492	888	1,540	2,320	4,170
1,200	234	470	847	1,470	2,220	3,980
1,300	225	450	811	1,410	2,120	3,810
1,400	216	432	779	1,350	2,040	3,660
1,500	208	416	751	1,300	1,960	3,530
1,600	201	402	725	1,260	1,900	3,410
1,700	194	389	702	1,220	1,840	3,300
1,800	188	377	680	1,180	1,780	3,200
1,900	183	366	661	1,140	1,730	3,110
2,000	178	356	643	1,110	1,680	3,020

Note: All table entries are rounded to 3 significant digits.

TABLE 12-41
POLYETHYLENE PLASTIC TUBING [NFPA 54-09: TABLE 6.3(m)]

	GAS:	**UNDILUTED PROPANE**
	INLET PRESSURE:	**11.0 in. w.c.**
	PRESSURE DROP:	**0.5 in. w.c.**
	SPECIFIC GRAVITY:	**1.50**
INTENDED USE: PE TUBE SIZING BETWEEN INTEGRAL 2-STAGE REGULATOR AT TANK OR SECOND STAGE (LOW PRESSURE REGULATOR) AND BUILDING.		
	PLASTIC TUBING SIZE (CTS) (in.)	
NOMINAL OD:	½	1
DESIGNATION:	**SDR 7.00**	**SDR 11.00**
ACTUAL ID:	**0.445**	**0.927**
LENGTH (ft)	**THOUSANDS OF BTU PER HOUR**	
10	121	828
20	83	569
30	67	457
40	57	391
50	51	247
60	46	314
70	42	289
80	39	269
90	37	252
100	35	238
125	31	211
150	28	191
175	26	176
200	24	164
225	22	154
250	21	145
275	20	138
300	19	132
350	18	121
400	16	113
450	15	106
500	15	100

Note: All table entries are rounded to 3 significant digits.

they have not become contaminated for oxygen service and that they are free of obstructions or debris. [NFPA 99:5.1.10.5.3.9]

The interior surfaces of tube ends, fittings, and other components that were cleaned for oxygen service by the manufacturer, but become contaminated prior to being installed, shall be permitted to be recleaned on-site by the installer by thoroughly scrubbing the interior surfaces with a clean, hot water–alkaline solution, such as sodium carbonate or trisodium phosphate one (1) pound to three (3) gallons (450 g to 11 L) of potable water and thoroughly rinsing them with clean, hot potable water. [NFPA 99:5.1.10.5.3.10]

Other aqueous cleaning solutions shall be permitted to be used for on-site recleaning permitted in NFPA 99:5.1.10.5.3.10, provided that they are as recommended in CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service*, and are listed in CGA Pamphlet O2-DIR, *Directory of Cleaning Agents for Oxygen Service*. [NFPA 99:5.1.10.5.3.11]

Material that has become contaminated internally and is not clean for oxygen service shall not be installed. [NFPA 99:5.1.10.5.3.12]

Joints shall be brazed within eight (8) hours after the surfaces are cleaned for brazing. [NFPA 99:5.1.10.5.3.13]

1319.4 Flux shall only be used when brazing dissimilar metals such as copper and bronze or brass, using a silver (BAg series) brazing filler metal. [NFPA 99:5.1.10.5.4.1]

Surfaces shall be cleaned for brazing in accordance with Section 1319.3. [NFPA 99:5.1.10.5.4.2]

Flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. [NFPA 99:5.1.10.5.4.3]

The flux shall be applied and worked over the cleaned surfaces to be brazed using a stiff bristle brush to ensure complete coverage and wetting of the surfaces with flux. [NFPA 99:5.1.10.5.4.4]

Where possible, short sections of copper tube shall be brazed onto the noncopper component and the interior of the subassembly shall be cleaned of flux prior to installation in the piping system. [NFPA 99:5.1.10.5.4.5]

On joints DN20 (NPS ¾) (⅞ in. O.D.) size and smaller, flux-coated brazing rods shall be permitted to be used in lieu of applying flux to the surfaces being joined. [NFPA 99:5.1.10.5.4.6]

1319.5 Tube ends shall be inserted fully into the socket of the fitting. [NFPA 99:5.1.10.5.6.1]

Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. [NFPA 99:5.1.10.5.6.2]

After flux is liquefied, or where flux is not permitted to be used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. [NFPA 99:5.1.10.5.6.3]

Techniques for heating the joint; applying the brazing filler metal; and making horizontal, vertical, and large-diameter joints shall be as stated in sections on Applying Heat and Brazing and Horizontal and Vertical Joints in Chapter VII, Brazed Joints, in the CDA *Copper Tube Handbook*. [NFPA 99:5.1.10.5.6.4]

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 99:5.1.10.5.5.3]

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

In order to assure 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]

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 flux-coated 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 (Section 1327.10) and standing pressure test (Section 1327.11). [NFPA 99:5.1.10.5.7.4]

Brazed joints that are identified as defective under conditions of Section 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]

1320.0 Valves – Requirements, Locations, and Labeling.

1320.1 General Requirements. Shutoff valves accessible to other than authorized personnel shall be installed in valve boxes with frangible or removable windows large enough to permit manual operation of valves. [NFPA 99:5.1.4.2.1]

Shutoff valves for use in certain areas, such as psychiatric or pediatric, shall be permitted to be secured with the approval of the Authority Having Jurisdiction to prevent inappropriate access. [NFPA 99:5.1.4.2.2]

1320.1.1 Where valves are concealed in any enclosure, the door or entry to the enclosure shall be identified and color coded with the type of gas service installed, as described in Section 1323.0. Enclosures shall be of sufficient size to permit valve operation. Valve handles in the off position shall prevent closure of the access panel or door.

1320.2 In-line shutoff valves intended for use to isolate piping for maintenance or modification shall meet the following requirements:

(1) Be located in a restricted area.

(2) Be locked or latched open.

(3) Be identified in accordance with Section 1323.0 [NFPA 99:5.1.4.9.1]

1320.3 Shutoff valves provided for the connection of future piping shall meet the following requirements:

(1) Be locked in a restricted area.

(2) Be locked or latched closed.

(3) Be identified in accordance with Section 1323.0 [NFPA 99:5.1.4.10]

1320.3.1 Future connection valves shall be labeled as to gas content. [NFPA 99:5.1.4.10.1]

1320.3.2 Downstream piping shall be closed with a brazed cap with tubing allowance for cutting and rebrazing. [NFPA 99:5.1.4.10.2]

1320.3.3 A zone valve shall be located immediately outside each vital life-support, critical care, and anesthetizing location in each medical gas and/or vacuum line, and located so as to be readily accessible in an emergency. [NFPA 99:5.1.4.8.7]

1320.3.4 Gas-delivery columns, hose reels, ceiling tracks, control panels, pendants, booms, or other special installations shall be located downstream of the zone valve. [NFPA 99:5.1.4.8.7.1]

1320.3.5 Zone valves shall be so arranged that shutting off the supply of gas to any one (1) operating room or anesthetizing location will not affect the others. [NFPA 99:5.1.4.8.7.2]

1320.4 Source Valve. A shutoff valve shall be placed at the immediate connection of each source system to the distribution piping to permit the entire source, including all accessory devices (such as air dryers, final line regulators, etc.), to be isolated from the facility. [NFPA 99:5.1.4.4]

1320.4.1 The source valve shall be located in the immediate vicinity of the source equipment. [NFPA 99:5.1.4.4.1]

1320.4.2 The source valve shall be labeled in accordance with Section 1323.0, Source Valve for the (Source Name). [NFPA 99:5.1.4.4.2, 5.1.11.2.3]

1320.5 Main Valve. A shutoff valve shall be provided in the main supply line inside of the building, except where one or more of the following conditions exist:

(1) The source and source valve are located inside the building served.

(2) The source system is physically mounted to the wall of the building served and the pipeline enters the building in the immediate vicinity of the source valve. [NFPA 99:5.1.4.5]

1320.5.1 The main line valve shall be located to permit access by authorized personnel only (i.e., by locating above a ceiling or behind a locked access door). [NFPA 99:5.1.4.5.1]

1320.5.2 The main line valve shall be located on the facility side of the source valve and outside of the source room, enclosure, or where the main line first enters the building. [NFPA 99:5.1.4.5.2]

1320.5.3 The main line shall be labeled in accordance with Section 1323.0. [NFPA 99:5.1.4.5.3 and 5.1.11.2.4]

1320.6 Riser Valve. Each riser supplied from the main line shall be provided with a shutoff valve adjacent to the riser connection. Riser valves shall be permitted to be located above ceilings, but shall remain accessible and not be obstructed. [NFPA 99:5.1.4.6, 5.1.4.6.1]

1320.7 Zone Valve. 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]

CALIFORNIA PLUMBING CODE – MATRIX ADOPTION TABLE
APPENDIX F - FIREFIGHTER BREATHING AIR REPLENISHMENT SYSTEMS

Adopting Agency	BSC	SFM	HCD			DSA			OSHPD				CSA	DPH	AGR	DWR	CA
			1	2	1/AC	AC	SS	SS/CC	1	2	3	4					
Adopt Entire Chapter																	
Adopt Entire Chapter as amended (amended sections listed below)																	
Adopt only those sections that are listed below																	
Chapter/Section																	

APPPENDIX F
FIREFIGHTER BREATHING AIR REPLENISHMENT SYSTEMS

F 1.0 Scope.

This chapter covers minimum requirements for the installation of firefighter breathing air replenishment systems.

F 2.0 Definitions.

For purposes of this chapter, the following definitions shall apply:

High-Rise Building – A building where the floor of an occupiable story exceeds seventy-five (75) feet (23 m) above the lowest level of fire department vehicle access. [NFPA 5000: 3.3.65.10]

Interior Cylinder Fill Panels – Lockable interior panels that provide firefighters the ability to regulate breathing air pressure and refill SCBA cylinders.

Interior Cylinder Fill Stations and Enclosures – Free-standing fill containment stations that provide firefighters the ability to regulate breathing air pressure and refill SCBA cylinders.

Self-Contained Breathing Apparatus (SCBA) – An atmosphere-supplying respirator that supplies a respirable air atmosphere to the user from a breathing source that is independent of the ambient environment and designed to be carried by the user. For the purposes of this appendix, where this term is used without any qualifier, it indicates only open-circuit self-contained breathing apparatus or combination SCBA/SARs. For the purposes of this appendix, combination SCBA/SARs are encompassed by the terms self-contained breathing apparatus or SCBA. (See also NFPA 1981 3.3.2, Atmosphere-Supplying Respirator, 3.3.11, Combination SCBA/SAR, and 3.3.44, Supplied Air Respirator.) [NFPA 1981 3.3.40]

F 3.0 System Components.

Firefighter breathing air replenishment systems shall contain, as a minimum, the following components.

(A) Exterior Fire Department Connection Panel

(B) Interior Fire Department Air Fill Panel or Station

(C) Interconnected Piping Distribution System

(D) Pressure Monitoring Switch

F 4.0 Required Installations.

A firefighter air system shall be installed in the following buildings:

F 4.1 High-rise buildings.

F 4.2 Underground structures that are three (3) or more floors below grade with an area greater than twenty-thousand (20,000) square feet (1,858 m^2).

F 4.3 Large area structures with an area greater than two-hundred-thousand (200,000) square feet (18,581m^2) and where the travel distance from the building centerline to the closest exit is greater than five-hundred (500) feet (152 m), such as warehouses, manufacturing complexes, malls, or convention centers.

F 4.4 Underground transportation or pedestrian tunnels exceeding five-hundred (500) feet (152 m) in length.

F 5.0 Exterior Fire Department Connection Panel and Enclosure.

F 5.1 Purpose. The exterior fire department connection panel shall provide the fire department's mobile air operator access to the system and shall be compatible with the fire department's mobile air unit.

F 5.2 Number of Panels. Each building or structure shall have a minimum of two (2) panels.

F 5.3 Location. Each panel shall be attached to the building or on a remote monument at the exterior of the building with a minimum of six (6) foot (1.8 m) radius and 180-degree (3.14 rad) clear unobstructed access to the front of the panel. The panel shall be weather-resistant or secured inside of a weather-resistant enclosure. The panel shall be located on opposite sides of the building within fifty (50) feet (15 m) of an approved roadway or driveway, or other locations approved by the Authority Having Jurisdiction.

F 5.4 Construction. The fire department connection panel shall be installed in a metal cabinet constructed of minimum 18-gauge carbon steel or equivalent. The cabinet shall be provided with a coating or other means to protect the cabinet from corrosion.

F 5.5 Vehicle Protection. Where the panel is located in an area subject to vehicle traffic, impact protection shall be provided.

F 5.6 Enclosure Marking. The front of the enclosure shall be marked, "FIREFIGHTER AIR SYSTEM". The lettering shall be in a color that contrasts with the enclosure front and in letters that are a minimum of two (2) inches (51 mm) high with three-eighths (3/8) inch (9.5 mm) brush stroke.

F 5.7 Enclosure Components. The exterior fire department connection panel shall contain all of the necessary gauges, isolation valves, pressure-relief valves, pressure-regulating valves, check valves, tubing, fittings, supports, connectors, adapters, and other necessary components as required to allow the fire department's mobile air unit to connect and augment the system with a constant source of breathing air. Each fire department connection panel shall contain not less than two (2) inlet air connections.

F 5.8 Pressure-Relief Valve. Pressure-relief valves shall be installed downstream of the pressure regulator inlet. The relief valve shall meet the requirements of the CGA S-1.3 and

shall not be field adjustable. The relief valve shall have a set-to-open pressure not exceeding 1.1 times the design pressure of the system. Pressure-relief valve discharge shall terminate so that the exhaust air stream cannot impinge upon personnel in the area. Valves, plugs or caps shall not be installed in the discharge of a pressure-relief valve. Where discharge piping is used, the end shall not be threaded.

F 5.9 Security. The fire department connection panel enclosure shall be locked by an approved means.

F 6.0 Interior Cylinder Fill Panels.

F 6.1 Cabinet Requirements. Each cylinder fill panel shall be installed in a metal cabinet constructed of minimum 18-gauge carbon steel or equivalent. The depth of the cabinet shall not create an exit obstruction when installed in building stairwells. With the exception of the shutoff valve, pressure gauges, fill hoses, and ancillary components; no system components shall be visible and shall be contained behind a minimum 18-gauge interior panel.

F 6.2 Clearance and Access. The panel shall be located a minimum of thirty-six (36) inches (914 mm) but not more than sixty (60) inches (1,524 mm) above the finished floor or a stairway landing. Clear unobstructed access shall be provided to each panel.

F 6.3 Door. The door shall be arranged such that when the door is open, it does not reduce the required exit width or create an obstruction in the path of egress.

F 6.4 Cabinet Marking. The front of each cylinder fill panel shall be marked, "FIREFIGHTER AIR SYSTEM". The lettering shall be in a color that contrasts with the cabinet front and in letters that are a minimum of two (2) inches (51 mm) high with three-eighths (3/8) inch (9.5 mm) brush stroke.

F 6.5 Cabinet Components. The cabinet shall be of sufficient size to allow for the installation of the following components:

F 6.5.1 The cylinder fill panel shall contain all of the gauges, isolation valves, pressure-relief valves, pressure-regulating valves, check valves, tubing, fittings, supports, connectors, hoses, adapters, and other components to refill SCBA cylinders.

F 6.6 Cylinder Filling Hose. The design of the cabinet shall provide a means for storing the hose to prevent kinking. When the hose is coiled, the brackets shall be installed so that the hose bend radius is maintained at four (4) inches (102 mm) or greater. Fill hose connectors for connection to SCBA cylinders shall comply with the requirements of CGA V-1, number 346 or 347. No other SCBA cylinder fill connections shall be permitted.

F 6.7 Security. Each panel cover shall be maintained and locked by an approved means.

F 7.0 Interior Cylinder Fill Stations and Enclosures.

F 7.1 Location. The location of the closet or room for each air fill station shall be approved by the Authority Having Jurisdiction. When approved by the Authority Having Jurisdiction, the space shall be permitted to be utilized for other firefighting purposes. The door to each room enclosing the air filling station enclosure shall be readily accessible at all times. A minimum of six (6) foot (1.8 m) radius and 180-degree (3.14 rad) clear unobstructed access to the front of the air filling station shall be provided. The enclosure shall have emergency lighting installed in accordance with NFPA 70.

F 7.2 Security. Each air fill station shall be installed within a lockable enclosure, closet, or room by an approved means. Access to fill equipment and controls shall be restricted to authorized personnel by key or other means.

F 7.3 Components. The air fill station shall contain all of the gauges, isolation valves, pressure-relief valves, pressure-regulating valves, check valves, tubing, fittings, supports, connectors, hoses, adapters, and other components to refill SCBA cylinders.

F 7.4 Cylinder Filling Hose. Where hoses are used, the design of the cabinet shall provide a means for storing the hose to prevent kinking. When the hose is coiled, the brackets shall be installed so that the hose bend radius is maintained at four (4) inches (102 mm) or greater. Fill hose connectors for connection to SCBA cylinders shall comply with the requirements of CGA V-1, no. 346 or 347. For high-pressure SCBA cylinders forty-thousand, five-hundred (4,500) psi (31,026 kPa), no. 347 connectors shall be used. For low-pressure SCBA cylinder three-thousand (3,000) psi (20,684 kPa) and two-thousand, two-hundred (2,200 psi) (15,168 kPa), no. 346 connectors shall be used. No other SCBA cylinder fill connections shall be permitted.

F 7.5 Enclosure and Air Filling Station Marking. Each enclosure, closet, or room shall be marked, “FIREFIGHTERS AIR SYSTEM.” The lettering shall be in a color that contrasts with the cabinet front and in letters that are a minimum of two (2) inches (51 mm) high with three-eighths (3/8) inch (9.5 mm) brush stroke.

F 8.0 Materials.

All pressurized components shall be compatible for use with high-pressure breathing air equipment and self-contained breathing air apparatus. Pressurized breathing air components shall be rated for a minimum working pressure of five-thousand (5,000) psi (34,474 kPa).

F 8.1 Tubing. Tubing shall be stainless steel complying with ASTM A269, or other approved materials that are compatible with breathing air at the system pressure. Routing of tubing and bends shall be such as to protect the tubing from mechanical damage.

F 8.2 Fittings. Fittings shall be constructed of stainless steel complying with ASTM A479, or other approved materials that are compatible with breathing air at the system pressure.

F 8.3 Prohibited Materials. The use of nonmetallic materials, carbon steel, iron pipe, malleable iron, high-strength gray iron, or alloy steel shall be prohibited for breathing air pipe and tubing materials.

F 8.4 Pressure Monitoring Switch. An electric low- pressure monitoring switch shall be installed in the piping system to monitor the air pressure. The pressure switch shall transmit a supervisory signal to the central alarm monitoring station when the pressure of the breathing air system is less than eighty (80) percent of the system operating pressure. Activation of the pressure switch shall also activate an audible alarm and visual strobe located at the building annunciator panel. A weather-resistant sign shall be provided in conjunction with the audible alarm stating, "FIREFIGHTER AIR SYSTEM – LOW AIR PRESSURE ALARM." Where not part of a building annunciator panel, the lettering shall be in a contrasting color, and the letters shall be a minimum of two (2) inches (51 mm) high with three-eighths (3/8) inch (9.5 mm) brush stroke.

F 8.5 Isolation Valve. A system isolation valve shall be installed downstream of each air fill station and shall be located in the panel or within three (3) feet (914 mm) of the station. The isolation valve shall be marked with its function in letters that are a minimum of three-sixteenths (3/16) inches (4.8 mm) high with a one-sixteenth (1/16) inch (1.6 mm) brushstroke.

F 9.0 System Requirements.

F 9.1 Protection. All components of the Firefighter Breathing Air Replenishment System installed in a building or structure shall be protected by a minimum two (2) hour fire-resistive construction. All components shall be protected from physical damage.

F 9.2 Markings. Components shall be clearly identified by means of stainless steel or plastic labels or tags indicating their function. This shall include as a minimum all fire department connection panels, air fill stations, air storage system, gauges, valves, air connections, air outlets, enclosures, and doors.

F 9.3 Tubing Markings. Tubing shall be clearly marked, "FIREFIGHTERS AIR SYSTEM" and "HIGH PRESSURE BREATHING AIR" by means of signs or self-adhesive labels. Signs shall be one (1) inch (25.4 mm) high and shall be secured to the tubing. Signs shall be made of brass, stainless steel, or plastic and engraved with three-eighths (3/8) inch (9.5 mm) letters with one-sixteenth (1/16) inch (1.6 mm) stroke lettering. Signs or labels shall be placed at a minimum of twenty (20) foot intervals (6 m) and at each fitting, whether the tubing is concealed or in plain view. All tubing shall have a sign or label at any accessible point.

F 9.4 Support. Pipe and tubing shall be supported at the minimum intervals shown in Table 3-2 of this code. Pipe and tubing shall be supported in accordance with Section 314.0 of this code.

F 10.0 Design Criteria.

F 10.1 Fill Time. The system shall be designed to fill, at the most remote fill station or panel, a minimum of two (2) 66 standard cubic foot (1.87 m^3) compressed breathing air cylinder to a maximum pressure of four-thousand, five-hundred (4,500) psi (31,026 kPa) simultaneously in three (3) minutes or less. Where greater capacity is required, the Authority Having Jurisdiction shall specify the required system capacity.

F 10.2 Fill Panels or Stations Location. Cylinder fill panels or stations shall be installed in the interior of buildings as follows:

F 10.2.1 High-Rise Buildings. An interior cylinder fill panel or station shall be installed commencing on the third floor and every third floor thereafter above grade. For underground floors in buildings with more than five (5) underground floors, an interior cylinder fill panel or station shall be installed commencing on the third floor below grade and every three (3) floors below grade thereafter, except for the bottom-most floor.

F 10.2.2 Underground Structures. For underground floors in buildings with more than five (5) underground floors, an interior cylinder fill panel or station shall be installed commencing on the third floor below grade and every three (3) floors below grade thereafter, except for the bottom-most floor.

F 10.2.3 Installation Locations. The specific location or locations on each floor shall be approved by the Authority Having Jurisdiction.

F 11.0 System Assembly Requirements.

The system shall be an all-welded system except where the tubing joints are readily accessible and at the individual air fill panels or stations. When mechanical high-pressure tube fittings are used, they shall be approved for the type of materials to be joined and rated for the maximum pressure of the system.

F 11.1 Welding Requirements. Welding procedures shall meet ASME B31.1, Part 4 and Chapter V. Prior to and during the welding of sections of tubing, a continuous, regulated dry nitrogen or argon purge at three (3) psi (20.7 kPa) shall be maintained to eliminate contamination with products of the oxidation or welding flux. The purge shall commence a minimum of two (2) minutes prior to welding operations and continue until the welded joint is at ambient temperature.

F 11.2 Prevention of Contamination. The system components shall not be exposed to contaminants, including but not limited to, oils, solvents, dirt, and construction materials. When contamination of system components has occurred, the affected component shall not be installed in the system.

F 12.0 System Acceptance and Certification.

F 12.1 Static Pressure Testing. Following fabrication, assembly, and installation of the piping distribution system, exterior connection panel, and interior cylinder fill panels, the Authority Having Jurisdiction shall witness the pneumatic testing of the complete system at a minimum test pressure of seven-thousand, five-hundred (7,500) psi (51,711 kPa) using oil-free dry air, nitrogen, or argon. A minimum twenty-four (24) hour pneumatic test shall be performed. During this test, all fittings, joints, and system components shall be inspected for leaks. A solution compatible with the system component

materials shall be used on each joint and fitting. Any defects in the system or leaks detected shall be documented on an inspection report, repaired or replaced. As an alternate, a pressure-decay test in accordance with ASME B31.3 shall be permitted.

F 12.2 Low Pressure Switch Test. Upon successful completion of the twenty-four (24) hour static pressure test, the system's low-pressure monitoring switch shall be calibrated to not less than three-thousand (3,000) psi (20,684 kPa) descending, and tested to verify that the signal is annunciated at the building's main fire alarm panel and by means of an audible alarm and visual strobe located in a visible location.

F 12.3 Compatibility Check. Each air fill panel and station and each exterior fire department connection panel shall be tested for compatibility with the fire department's SCBA fill fittings.

F 12.4 Material Certifications. The pipe or tubing material certifications shall be provided to the Authority Having Jurisdiction.

F 12.5 Air Sampling. Before the system is placed into service, a minimum of two (2) samples shall be taken from separate air fill panels and submitted to an independent certified gas analysis laboratory to verify the system's cleanliness and that the air complies with the requirements for breathing air in accordance with NFPA 1989, Section 5.6. The written report of the analysis shall be submitted to the Authority Having Jurisdiction, documenting that the breathing air complies with this section.

F 12.5.1 During the period of air quality analysis, the air fill panel inlet shall be secured so that no air can be introduced into the system and each air fill panel shall be provided with a sign stating, "AIR QUALITY ANALYSIS IN PROGRESS, DO NOT FILL OR USE ANY AIR FROM THIS SYSTEM." This sign shall be a minimum of eight and one-half (8-1/2) inches (216 mm) by eleven (11) inches (279 mm) with minimum of one (1) inch (25.4 mm) lettering.

F 12.6 Annual Air Sampling. The breathing air within the system shall be sampled and certified annually and inspected in accordance with the procedure in Section F12.5.

F 12.7 Final Proof Test. The Authority Having Jurisdiction shall witness the filling of two (2) empty sixty-six (66) cubic foot (1.87 m^3) capacity SCBA cylinders in three (3) minutes or less, using compressed air supplied by fire department equipment connected to the exterior fire department connection panel. The SCBA cylinders shall be filled at the air fill panel or station farthest from the exterior fire department connection panel. Following this, a minimum of two (2) air samples shall then be taken from separate air filling stations and submitted to an independent certified gas analyst laboratory to verify the system's cleanliness and that the air meets the requirements of NFPA 1989. The written report shall be provided to the Authority Having Jurisdiction certifying that the air analysis complies with the above requirements.

– X –

– Y –

– Z –

HISTORY NOTE APPENDIX

California Plumbing Code
(Title 24, Part 5, California Code of Regulations)

For prior history, see the History Note Appendix to the California Plumbing Code, 2007 Triennial Edition effective January 1, 2008.

1. *(BSC 05/09, DSA-AC 03/09, DSA-SS 04/09, HCD 03/09, OSHPD 02/09, SFM 02/09) Adoption by reference of the 2009 Uniform Plumbing Code (UPC) with necessary state amendments and repeal of the 2006 edition of the UPC. Effective on January 1, 2011.*

2. *Erratum to correct errors and omissions.*

3. *(BSC EF 01/10, HCD EF 01/10, OSHPD EF 02/10, DSA-SS EF 01/10, AGR EF 01/10, DPH EF 01/10) Chapter 6, Table 6-4 footnotes 1, 2, 3, Sections 604.1, 604.1.2, 604.11, 604.11.1, 604.11.2, 604.13, 604.13.1, 604.13.2. Effective on January 1, 2011.*

4. *(HCD 03/10; OSHPD 06/10; DSA-SS 01/10) – Repeal and amend provisions of the 2010 California Plumbing Code, CCR Title 24, Part 5 for State regulated occupancies, effective on July 1, 2012.*

5. *Erratum to include Appendix F in the 2010 California Plumbing Code, inadvertently omitted from the first printing, and editorial corrections by IAPMO in Chapters 3, 5, 6, 12, and 13, published with the supplement identified in Item 4, above.*