

**REVISION RECORD
FOR THE STATE OF CALIFORNIA
SUPPLEMENT**

July 1, 2021

2019 Title 24, Part 4, California Mechanical Code

General Information:

1. The date of this supplement is for identification purposes only. See the History Note Appendix on the backside or accompanying page.
2. This supplement is issued by the California Building Standards Commission in order to provide new and/or replacement pages containing recently adopted provisions for California Code of Regulations, Title 24, Part 4, the 2019 California Mechanical Code. Instructions are provided below.
3. Health and Safety Code Section 18938.5 establishes that only building standards in effect at the time of the application for a building permit may be applied to the project plans and construction. This rule applies to both adoptions of building standards for Title 24 by the California Building Standards Commission, and local adoptions and ordinances imposing building standards. The new building standards provided with the enclosed blue supplement pages must not be enforced before the effective date.
4. Not all code text on the enclosed blue supplement pages is a new building standard. New, amended, or repealed building standards are identified by margin symbols. An explanation of margin symbols is provided in the code before the Table of Contents.
5. You may wish to retain the superseded material with this revision record so that the prior wording of any section can be easily ascertained.

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PREFACE

This document is Part 4 of thirteen parts of the official triennial compilation and publication of the adoptions, amendments and repeal of administrative regulations to *California Code of Regulations, Title 24*, also referred to as the *California Building Standards Code*. Part 4 is known as the California Mechanical Code and incorporates, by adoption, the 2018 edition of the *Uniform Mechanical Code* of the International Association of Plumbing and Mechanical Officials with the California amendments.

The *California Building Standards Code* is published in its entirety every three years by order of the California legislature, with supplements published in intervening years. The California legislature delegated authority to various state agencies, boards, commissions and departments to create building regulations to implement the State's statutes. These building regulations or standards, have the same force of law, and take effect 180 days after their publication unless otherwise stipulated. The *California Building Standards Code* applies to occupancies in the State of California as annotated.

A city, county, or city and county may establish more restrictive building standards reasonably necessary because of local climatic, geological or topographical conditions. Findings of the local condition(s) and the adopted local building standard(s) must be filed with the California Building Standards Commission to become effective and may not be effective sooner than the effective date of this edition of the *California Building Standards Code*. Local building standards that were adopted and applicable to previous editions of the *California Building Standards Code* do not apply to this edition without appropriate adoption and the required filing.

Should you find publication (e.g., typographical) errors or inconsistencies in this code or wish to offer comments toward improving its format, please address your comments to:

California Building Standards Commission
2525 Natomas Park Drive, Suite 130
Sacramento, CA 95833-2936
Phone: (916) 263-0916
Web Page: www.dgs.ca.gov/bsc
Email: cbsc@dgs.ca.gov

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The 2019 *California Mechanical Code* (Code) was developed through the outstanding collaborative efforts of the Department of Housing and Community Development, Division of State Architect, Office of the State Fire Marshal, Office of Statewide Health Planning and Development, California Energy Commission, California Department of Public Health, California State Lands Commission, Board of State and Community Corrections, and the California Building Standards Commission (Commission).

This collaborative effort included the assistance of the Commission's Code Advisory Committees and many other volunteers who worked tirelessly to assist the Commission in the production of this Code.

Governor Edmund G. Brown Jr.

Members of the Building Standards Commission
Secretary Marybel Batjer – Chair
Steven Winkel – Vice-Chair

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For questions on California state agency amendments, please refer to the contact list on page iv.

California Code of Regulations Title 24

California Agency Information Contact List

The following state agencies may propose building standards for publication in Title 24. Request notice of such activity with each agency of interest. See Sections 1.2 through 1.14 of the California Building Code (Part 2 of Title 24) for more detailed information on the regulatory jurisdiction of each state agency.

Board of State and Community Corrections

www.bscc.ca.gov(916) 445-5073
Local Adult and Juvenile
Detention Facility Standards

California Building Standards Commission

www.dgs.ca.gov/bsc(916) 263-0916
State Buildings including UC and
CSU Buildings, Parking Lot and Walkway
Lighting, Green Building Standards
for Non-residential Buildings

California Energy Commission

www.energy.ca.gov**Energy Hotline** (800) 772-3300
Building Efficiency Standards
Appliance Efficiency Standards
Compliance Manual/Forms

California State Lands Commission

www.slc.ca.gov(562) 499-6312
Marine Oil Terminals Standards

California State Library

www.library.ca.gov(916) 323-9843

Department of Consumer Affairs:

Acupuncture Board

www.acupuncture.ca.gov(916) 515-5200
Office Standards

Board of Pharmacy

www.pharmacy.ca.gov(916) 518-3100
Pharmacy Standards

Bureau of Barbering and Cosmetology

www.barbercosmo.ca.gov(800) 952-5210
Barber and Beauty Shop,
and College Standards

Bureau of Household Goods and Services

www.bhgs.dca.ca.gov(916) 999-2041
Insulation Testing Standards

Structural Pest Control Board

www.pestboard.ca.gov(800) 737-8188
Structural Standards

Veterinary Medical Board

www.vmb.ca.gov(916) 515-5220
Veterinary Hospital Standards

Department of Food and Agriculture

www.cdffa.ca.gov(916) 900-5004
Meat & Poultry Packing Plant Standards

(916) 900-5008
Rendering & Collection Center Standards, Dairy Standards

Department of Housing and Community Development

www.hcd.ca.gov(800) 952-8356
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Single-Family Dwellings; and
Permanent Structures in Mobilehome &
Special Occupancy Parks

(916) 445-3338
Factory-Built Housing, Manufactured Housing &
Commercial Modular

Mobilehome - Permits & Inspections
Northern Region - (916) 255-2501
Southern Region - (951) 782-4420

(800) 952-8356
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Department of Public Health

www.dph.ca.gov(916) 449-5661
Organized Camps Standards
Public Swimming Pools Standards

Division of the State Architect

www.dgs.ca.gov/dsa(916) 445-8100

Access Compliance Fire and Life Safety Structural Safety

Public Schools Standards
Essential Services Building Standards
Community College Standards

State Historical Building Safety Board

www.dgs.ca.gov(916) 445-8100
Historical Rehabilitation, Preservation,
Restoration or Relocation Standards

Office of Statewide Health Planning and Development

www.oshpd.ca.gov(916) 440-8300
Hospital Standards
Skilled Nursing Facility Standards &
Clinic Standards

Office of the State Fire Marshal

www.osfm.fire.ca.gov(916) 568-3800
Code Development and Analysis
Fire Safety Standards

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**CALIFORNIA MECHANICAL CODE – MATRIX ADOPTION TABLE
CHAPTER 1 – ADMINISTRATION**

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the code user. See Chapter 1 for state agency authority and building applications.)

| Adopting Agency | BSC | BSC- CG | SFM | HCD | | | DSA | | | OSHPD | | | | | BSCC | DPH | AGR | DWR | CEC | CA | SL | SLC |
|---|-----|------------|-----|-----|---|------|-----|----|-------|-------|----|---|---|---|------|-----|-----|-----|-----|----|----|-----|
| | | | | 1 | 2 | 1-AC | AC | SS | SS/CC | 1 | 1R | 2 | 3 | 4 | | | | | | | | |
| Adopt Entire Chapter | | | | | | | | | | | | | | | | | | | | | | |
| Adopt Entire Chapter as amended (amended sections listed below) | | | | | | | | | | | | | | | | | | | | | | |
| Adopt only those sections that are listed below | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| Chapter/Section | | | | | | | | | | | | | | | | | | | | | | |
| 1.1.0 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.1 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.2 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.3 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.3.1 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.3.2 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.4 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.5 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.6 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.7 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.7.1 | X | | X | X | X | | | X | X | | | | | | | | | | | | | |
| 1.1.7.2 | X | | X | X | X | | | X | X | | | | | | | | | | | | | |
| 1.1.7.3 | X | | X | X | X | | | X | X | | | | | | | | | | | | | |
| 1.1.8 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.9 | X | | | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.9 Exceptions | | | | X | X | | | | | | | | | | | | | | | | | |
| 1.1.10 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.11 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.1.12 | X | | X | X | X | | | X | X | X | | X | X | X | | | | | | | | |
| 1.2.0 and 1.2.1.4 | X | | | | | | | | | | | | | | | | | | | | | |
| 1.2.2 | | X | | | | | | | | | | | | | | | | | | | | |
| 1.2.3 | X | | | | | | | | | | | | | | | | | | | | | |
| 1.8.0 – 1.8.10 and subsections | | | | X | X | | | | | | | | | | | | | | | | | |
| 1.9.0 | | | | | | | | X | X | | | | | | | | | | | | | |
| 1.9.1 | | | | | | | | X | | | | | | | | | | | | | | |
| 1.9.2 | | | | | | | | X | X | | | | | | | | | | | | | |
| 1.9.2.1 & 1.9.2.1.1 | | | | | | | | X | | | | | | | | | | | | | | |
| 1.9.2.2 & 1.9.2.2.1 | | | | | | | | | X | | | | | | | | | | | | | |
| 1.10.1 and subsections | | | | | | | | | | X | X | | | | | | | | | | | |
| 1.10.2 and subsections | | | | | | | | | | | | X | | | | | | | | | | |
| 1.10.3 and subsections | | | | | | | | | | | | | X | | | | | | | | | |
| 1.10.4 and subsections | | | | | | | | | | | | | | X | | | | | | | | |
| 1.10.5 and subsections | | | | | | | | | | | | | | | X | | | | | | | |
| 1.11.0 | | | X | | | | | | | | | | | | | | | | | | | |

CALIFORNIA MECHANICAL CODE – MATRIX ADOPTION TABLE
CHAPTER 1 – ADMINISTRATION (continued)

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the code user. See Chapter 1 for state agency authority and building applications.)

| Adopting Agency | BSC | BSC- CG | SFM | HCD | | | DSA | | | OSHDPD | | | | | BSCC | DPH | AGR | DWR | CEC | CA | SL | SLC |
|---|----------|------------|----------|----------|----------|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----|-----|-----|-----|----|----|-----|
| | | | | 1 | 2 | 1-AC | AC | SS | SS/CC | 1 | 1R | 2 | 3 | 4 | | | | | | | | |
| Adopt Entire Chapter | | | | | | | | | | | | | | | | | | | | | | |
| Adopt Entire Chapter as amended (amended sections listed below) | | | | | | | | | | | | | | | | | | | | | | |
| Adopt only those sections that are listed below | X | | X | X | X | | X | X | X | X | X | X | | | | | | | | | | |
| Chapter/Section | | | | | | | | | | | | | | | | | | | | | | |
| Division II – Administration | | | | | | | | | | | | | | | | | | | | | | |
| 101.0 – 104.1 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 104.2 (Items 1 – 5) | | | | X | X | | | | | | | | | | | | | | | | | |
| 104.3 – 107.0 | | | | | | | | | | X | X | X | X | | | | | | | | | |

This state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.0.

1.1.8 City, County, or City and County Amendments, Additions or Deletions. The provisions of this code do not limit the authority of city, county, or city and county governments to establish more restrictive and reasonably necessary differences to the provisions contained in this code pursuant to complying with Section 1.1.8.1. The effective date of amendments, additions, or deletions to this code by a city, county, or city and county filed pursuant to Section 1.1.8.1 shall be the date filed. However, in no case shall the amendments, additions, or deletions to this code be effective any sooner than the effective date of this code.

Local modifications shall comply with Health and Safety Code Section 18941.5 for Building Standards Law, Health and Safety Code Section 17958 for State Housing Law or Health and Safety Code Section 13869.7 for Fire Protection Districts.

1.1.8.1 Findings and Filings.

- (1) The city, county, or city and county shall make express findings for each amendment, addition, or deletion based upon climatic, topographical, or geological conditions.

Exception: Hazardous building ordinances and programs mitigating unreinforced masonry buildings.

- (2) The city, county, or city and county shall file the amendments, additions or deletions expressly marked and identified as to the applicable findings. Cities, counties, cities and counties, and fire departments shall file the amendments, additions, or deletions, and the findings with the California Building Standards Commission at 2525 Natomas Park Drive, Suite 130, Sacramento, CA 95833.
- (3) Findings prepared by fire protection districts shall be ratified by the local city, county, or city and county and filed with the California Department of Housing and Community Development, Division of Codes and Standards, P.O. Box 278180, Sacramento, CA 95827-8180 or 9342 Tech Center Drive, Suite 500, Sacramento, CA, 95826.

1.1.8.2 Locally Adopted Energy Standards – California Energy Code, Part 6. In addition to the provisions of Section 1.1.8.1 of this part, the provisions of this section apply to cities, counties, and cities and counties amending adopted energy standards affecting buildings and structures subject to the California Energy Code, Part 6.

Applicable provisions of Public Resources Code Section 25402.1 and applicable provisions of Chapter 10 of the California Administrative Code, Part 1 apply to local amendment of energy standards adopted by the California Energy Commission.

1.1.9 Effective Date of This Code. Only those standards approved by the California Building Standards Commission that are effective at the time an application for building permit is submitted shall apply to the plans and specifications for, and to the construction performed under, that permit. For

the effective dates of the provisions contained in this code, see the History Note page of this code.

Exceptions:

- (1) [HCD 1 & HCD 2] Retroactive permits issued in accordance with Health and Safety Code Section 17958.12.
- (2) [HCD 1 & HCD 2] Plans approved by the Department of Housing and Community Development or a Department-approved design approval agency for factory-built housing as defined by Health and Safety Code Section 19971. Approved plans, pursuant to the California Code of Regulations, Title 25, Division 1, Chapter 3, Subchapter 1, Article 3, Section 3048 remain valid for a period of 36 months from the date of plan approval.

1.1.10 Availability of Codes. At least one complete copy each of Titles 8, 19, 20, 24, and 25 with all revisions shall be maintained in the office of the building official responsible for the administration and enforcement of this code. Each state department concerned and each city, county, or city and county shall have an up-to-date copy of the code available for public inspection, see Health and Safety Code Section 18942(e)(1) and (2).

1.1.11 Format. This part fundamentally adopts the Uniform Mechanical Code by reference on a chapter-by-chapter basis. When a specific chapter of the Uniform Mechanical Code is not printed in the code and is marked “Reserved”, such chapter of the Uniform Mechanical Code is not adopted as a portion of this code. When a specific chapter of the Uniform Mechanical Code is marked “Not adopted by the State of California” but appears in the code, it may be available for adoption by local ordinance.

Note: Matrix Adoption Tables at the front of each chapter may aid the code user in determining which chapter or sections within a chapter are applicable to buildings under the authority of a specific state agency, but they are not to be considered regulatory.

1.1.12 Validity. If any chapter, section, subsection, sentence, clause, or phrase of this code is for any reason held to be unconstitutional, contrary to statute, exceeding the authority of the state as stipulated by statutes or otherwise inoperative, such decision shall not affect the validity of the remaining portion of this code.

1.2.0 Building Standards Commission.

1.2.1 BSC. 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.

(1) State Buildings for All Occupancies.

Application – State buildings (all occupancies), including buildings constructed by the Trustees of the California State University (CSU) and the Regents of the University of California (UC) where no state agency has the authority to adopt building standards applicable to such buildings.

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

Authority Cited – Health and Safety Code Section 18934.5.

Reference – Health and Safety Code, Division 13, Part 2.5, commencing with Section 18901.

(2) **University of California, California State Universities, and California Community Colleges.**

Application – Standards for lighting for parking lots and primary campus walkways at the University of California, California State Universities, and California Community Colleges.

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

Authority Cited – Government Code Section 14617.

Reference – Government Code Section 14617.

(3) **Existing State-Owned Buildings, including those owned by the University of California and by the California State University** – Building seismic retrofit standards including abating falling hazards of structural and nonstructural components and strengthening of building structures. See also Division of the State Architect.

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

Authority Cited – Government Code Section 16600.

References – Government Code Sections 16600 through 16604.

(4) **Unreinforced Masonry Bearing Wall Buildings.**

Application – Minimum seismic strengthening standards for buildings specified in the California Existing Building Code, except for buildings subject to building standards adopted pursuant to Part 1.5 (commencing with Section 17910).

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

Authority Cited – Health and Safety Code Section 18934.7.

References – Health and Safety Code Division 13, Part 2.5 commencing with Sections 18901.

1.2.1.1 State Building. For purposes of this code, a “state building” is a structure for which a state agency or state entity has authority to construct, alter, enlarge, replace, repair or demolish.

1.2.1.2 Enforcement. [CSU, UC, Judicial Council and California Department of Corrections Rehabilitation] state agencies or state entities authorized to construct state buildings may appoint a building official who is responsible to the agency for enforcement of the provisions of the California Building Standards Code.

Exception: State buildings regulated by other sections of this code remain the enforcement responsibility of the designated entities.

1.2.1.3 Enforcement, Reserved for DGS.

1.2.1.4 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 BSC.

1.2.2 BSC-CG. 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.

1. **Green Building Standards for Nonresidential Occupancies.**

Application – All occupancies where no other state agency has the authority to adopt green building standards applicable to those occupancies.

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

Authority Cited – Health and Safety Code Sections 18930.5, 18938 and 18940.5.

Reference – Health and Safety Code, Division 13, Part 2.5, commencing with Section 18901.

2. **Graywater Systems for Nonresidential Occupancies.**

Application – The construction, installation, and alteration of graywater systems for indoor and outdoor uses in nonresidential occupancies.

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

Authority Cited – Health & Safety Code Section 18941.8.

Reference – Health & Safety Code Section 18941.8.

1.2.3 Alternative Materials, Design, and Methods of Construction and Equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design, or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

1.2.3.1 Research Reports. Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from approved sources.

1.2.3.2 Tests. Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the building official shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the building official shall approve the testing procedures. Tests shall be performed by an approved agency. Reports of such tests shall be retained by the building official for the period required for retention of public records.

1.3.0 Reserved for Board of State and Community Corrections. ||

with Section 1, for the erection, construction, reconstruction, movement, enlargement, conversion, alteration, repair, removal, demolition, or arrangement of apartments, condominiums, hotels, motels, lodging houses, and dwellings, including accessory buildings, facilities, and uses thereto.

1.8.3.2.2 Mobilehome Parks Act. Refer to the Mobilehome Parks Act, California 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 for mobilehome park administrative and enforcement authority, permits, plans, fees, violations, inspections, and penalties both within and outside mobilehome parks.

Exception: Mobilehome parks where the Department of Housing and Community Development is the enforcing agency.

1.8.3.2.3 Special Occupancy Parks Act. Refer to the Special Occupancy Parks Act, California 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 for special occupancy park administrative and enforcement authority, permits, fees, violations, inspections, and penalties both within and outside of special occupancy parks.

Exception: Special occupancy parks where the Department of Housing and Community Development is the enforcing agency.

1.8.3.2.4 Employee Housing Act. Refer to the Employee Housing Act, California 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 for employee housing administrative and enforcement authority, permits, fees, violations, inspections, and penalties.

1.8.3.2.5 Factory-Built Housing Law. Refer to the Factory-Built Housing Law, California 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 for factory-built housing 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 mechanical system.

Exceptions:

- (1) Work exempt from permits as specified in Chapter 1, Administration, Division II, Section 104.2 Items (1) through (5) 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.
- (3) Retroactive permits issued in accordance with Health and Safety Code Section 17958.12.

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 4100 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 regulations 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 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 apartments, condominiums, hotels, motels, lodging houses, dwellings, or accessory structures, 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 2 of the California Building Code, the proposed alternate must also meet the threshold set for equivalent facilitation as defined in Chapter 2 of the California Building Code.

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 apartments, condominiums, hotels, motels, lodging houses, dwellings, or accessory structures thereto, and permanent buildings in mobilehome parks and special occupancy parks. 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 construction, 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 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. For enforcement related to accessory dwelling units, see Health and Safety Code Section 17980.12 operative until January 1, 2035.
- (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 in accordance with the provisions of this code and the California

Existing Building Code, as adopted by the Department of Housing and Community Development. For additional information, see California Health and Safety Code, Sections 17912, 17920.3, 17922 and 17958.8.

1.8.10.2 Moved Structures. Subject to the requirements of California Health and Safety Code Sections 17922, 17922.3 and 17958.9, local ordinances or regulations relating to a moved residential building or accessory structure thereto, shall permit the replacement, retention, and extension of original materials and the use of original methods of construction so long as the structure does not become or continue to be a substandard building.

1.9.0 Division of the State Architect.

1.9.1 Reserved for the Division of the State Architect – Access Compliance.

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 oversee 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 Sections 17310 and 81142, and Health & Safety Code Section 16022.

References – Education Code Sections 17280 through 17317 and 81130 through 81147, and Health & 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 1.9.2.1 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 and observe

the 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 and OSHPD 1R. 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 and OSHPD 1R

Application – [OSHPD 1] General acute-care hospital buildings. [OSHPD 1R] Non-conforming hospital SPC or freestanding buildings that have been removed from acute care service.

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 as indicated in the adoption matrix for Chapter 1, Division II.

1.10.1.2 Applicable Building Standards. California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 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, and OSHPD 1R.

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 facility buildings.

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 as indicated in the adoption matrix for Chapter 1, Division II.

1.10.2.2 Applicable Building Standards. California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 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 as indicated in the adoption matrix for Chapter 1, Division II.

1.10.3.2 Applicable Building Standards. California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 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 as indicated in the adoption matrix for Chapter 1, Division II.

1.10.4.2 Applicable Building Standards. California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 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.

1.10.5 OSHPD 5. Specific scope of application of the agency responsible for enforcement, enforcement agency and the specific authority to adopt and enforce such provisions of this code, unless otherwise stated.

OSHPD 5

Application – Acute psychiatric hospital buildings.

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.

1.10.5.1 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 and 1.10, Chapter 1, Division I, and as indicated in the adoption matrix for Chapter 1, Division II.

1.10.5.2 Applicable Building Standards. California Building Standards Code, Title 24, Parts 2, 3, 4, 5, 6, 9, 10 and 11.

Authority Cited – Health and Safety Code Sections 1275 and 129850.

References – Health and Safety Code Sections 129680, 1275 and 129675 through 130070.

1.10.5.3 Adopting Agency Identification. The provisions of this code applicable to buildings identified in this Subsection 1.10.5 will be identified in the Matrix Adoption Tables under the Acronym OSHPD 5.

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, dancehall, 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, 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.

CHAPTER 2

DEFINITIONS

201.0 General.

201.1 Applicability. For the purpose of this code, the following terms have the meanings indicated in this chapter.

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

202.0 Definition of Terms.

202.1 General. The definitions of terms are arranged alphabetically according to the first word of the term.

203.0

– A –

Absorption Unit. An absorption refrigeration system that has been factory-assembled and tested prior to its installation.

Accepted Engineering Practice. That which conforms to technical or scientific-based principles, test, or standards that are accepted by the engineering profession.

Access Panel. A closure device used to cover an opening into a duct, an enclosure, equipment, or an appurtenance. [NFPA 96:3.3.1]

Accessible. Where applied to a device, appliance, or equipment, “accessible” means having access thereto, but which first may require the removal of an access panel, door, or similar obstruction.

Accessible, Readily. Having a direct access without the necessity of removing a panel, door, or similar obstruction.

Accessory Dwelling Unit [HCD 1 & HCD 2]. *An attached or detached residential dwelling unit that provides complete independent living facilities for one or more persons and is located on a lot with a proposed or existing primary residence. Accessory dwelling units shall include permanent provisions for living, sleeping, eating, cooking, and sanitation on the same parcel as the single-family or multifamily dwelling is or will be situated. (See Government Code Section 65852.2.)*

Air, Class 1. Air with low contaminant concentration, low sensory-irritation intensity, and inoffensive odor. [ASHRAE 62.1:5.16.1]

Air, Class 2. Air with moderate contaminant concentration, mild sensory-irritation intensity, or mildly offensive odors. Class 2 air also includes air that is not necessarily harmful or objectionable, but that is inappropriate for transfer or recirculation to spaces used for different purposes. [ASHRAE 62.1:5.16.1]

Air, Class 3. Air with significant contaminant concentration, significant sensory-irritation intensity, or offensive odor. [ASHRAE 62.1:5.16.1]

Air, Class 4. Air with highly objectionable fumes or gases or with potentially dangerous particles, bioaerosols, or gases,

at concentrations high enough to be considered harmful. [ASHRAE 62.1:5.16.1]

Air, Combustion. See Combustion Air.

Air, Conditioned. Air that has been treated to achieve a desired level of temperature, humidity, or cleanliness.

Air, Dilution. Air that enters a draft hood or draft regulator and mixes with the flue gases. [NFPA 54:3.3.2.2]

Air, Exhaust. Air being removed from any space or piece of equipment and conveyed directly to the atmosphere by means of openings or ducts.

Air, Makeup. Air that is provided to replace air being exhausted.

Air, Outside. Air from outside the building intentionally conveyed by openings or ducts to rooms or to conditioning equipment.

Air, Relief. [OSHPD 1, 1R, 2, 3, 4 & 5] *Air being exhausted directly from a building or a return duct system which is not contaminated by odors or other contaminants and could otherwise be used as return air if not exhausted from the building.*

Air, Return. Air from the conditioned area that is returned to the conditioning equipment for reconditioning.

Air, Supply. Air being conveyed to a conditioned area through ducts or plenums from a heat exchanger of a heating, cooling, absorption, or evaporative cooling system.

Air Dispersion Systems. Materials intended for use in air handling systems in exposed locations operating under positive pressure.

Air-Handling Unit. A blower or fan used for the purpose of distributing supply air to a room, space, or area.

Air Intakes. An opening in a building’s envelope whose purpose is to allow outside air to be drawn into the structure to replace inside air that is removed by exhaust systems or to improve the quality of the inside air by providing a source of air having a lower concentration of odors, suspended particles, or heating content. [NFPA 96:3.3.2]

Air-Moving System. A system designed to provide heating, cooling, or ventilation in which one or more air-handling units are used to supply air to a common space or are drawing air from a common plenum or space.

Air Pollution Control Devices. Equipment and devices used for the purpose of cleaning air passing through them or by them in such a manner as to reduce or remove the impurities contained therein. [NFPA 96:3.3.3]

Anodeless Riser. An assembly of steel-cased plastic pipe used to make the transition between plastic piping installed underground and metallic piping installed aboveground. [NFPA 54:3.3.4]

Appliance. A device that utilizes an energy source to produce light, heat, power, refrigeration, air conditioning, or compressed fuel gas. This definition also shall include a vented decorative appliance.

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Appliance, Fan-Assisted Combustion. An appliance equipped with an integral mechanical means to either draw or force products of combustion through the combustion chamber or heat exchanger. [NFPA 54:3.3.5.4]

Appliance, Low-Heat. A fuel-burning appliance that produces a continuous flue gas temperature, at the point of entrance to the flue, of not more than 1000°F (538°C).

Appliance, Medium-Heat. A fuel-burning appliance that produces a continuous flue gas temperature, at the point of entrance to the flue, of more than 1000°F (538°C) and less than 2000°F (1093°C).

Appliance Categorized Vent Diameter/Area. The minimum vent diameter/area permissible for Category I appliances to maintain a nonpositive vent static pressure where tested in accordance with nationally recognized standards. [NFPA 54:3.3.6]

Appliance Flue Outlet. The opening or openings in a cooking device where vapors, combustion gases, or both leave the cooking device. [NFPA 96:3.3.4] There might or might not be ductwork attached to this opening.

Appliance Fuel Connector. An assembly of listed semi-rigid or flexible tubing and fittings to carry fuel between a fuel-piping outlet and a fuel-burning appliance.

Approved. Acceptable to the Authority Having Jurisdiction.

Exception: [HCD 1 & HCD 2] “Approved” means meeting the approval of the Enforcing Agency, except as otherwise provided by law, when used in connection with any system, material, type of construction, fixture or appliance as the result of investigations and tests conducted by the agency, or by reason of accepted principles or tests by national authorities, or technical, health, or scientific organizations or agencies.

Notes:

- (1) See Health and Safety Code Section 17920 for “Approved” as applied to residential construction and buildings or structures accessory thereto, as referenced in Sections 1.8.2.1.1 and 1.8.2.1.2.
- (2) See Health and Safety Code Section 17921.1 for “Approved” as applied to the use of hotplates in residential construction referenced in Sections 1.8.2.1.1 and 1.8.2.1.2.
- (3) See Health and Safety Code Section 19966 for “Approved” as applied to Factory-Built Housing as referenced in Sections 1.8.2.1.1 and 1.8.2.1.2.
- (4) See Health and Safety Code Section 18201 for “Approved” as applied to Mobilehome Parks as referenced in Section 1.8.2.1.3.
- (5) See Health and Safety Code Section 18862.1 for “Approved” as applied to Special Occupancy Parks as referenced in Section 1.8.2.1.3.

Approved Testing Agency. An organization primarily established for purposes of testing to approved standards and approved by the Authority Having Jurisdiction. [HCD 1 & HCD 2] “Approved Testing Agency” is any agency which is determined by the Enforcing Agency, except as otherwise provided by statute, to have adequate personnel and expertise to

carry out the testing of systems, materials, and various types of construction, fixtures or appliances.

Appurtenance. An accessory or a subordinate part that enables the primary device to perform or improve its intended function. [NFPA 96:3.3.5]

Assembly Building. A building or a portion of a building used for the gathering together of 50 or more persons for such purposes as deliberation, education, instruction, worship, entertainment, amusement, drinking, dining, or awaiting transportation. [HCD 1, HCD 2 and SFM] Refer to the California Building Code, Title 24, Part 2 for use and occupancy classification.

Authority Having Jurisdiction. The organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installations, or procedures. The Authority Having Jurisdiction shall be a federal, state, local, or other regional department or an individual such as a plumbing official, mechanical official, labor department official, health department official, building official, or others having statutory authority. In the absence of statutory authority, the Authority Having Jurisdiction may be some other responsible party. This definition shall include the Authority Having Jurisdiction’s duly authorized representative. [HCD 1, HCD 2, OSHPD 1, 1R, 2, 3 & 5 and SFM] || “Authority Having Jurisdiction” shall mean “Enforcing Agency” as defined in Section 207.0 of this code.

Automatic. That which provides a function without the necessity of human intervention.

Automatic Boiler. A boiler equipped with certain controls and limit devices.

Azeotrope. A refrigerant blend containing two or more refrigerants whose equilibrium vapor and liquid phase compositions are the same at a given pressure. At this pressure, the slope of the temperature vs. composition curve equals zero, which mathematically is expressed as $(dt/dx)_p = 0$, which, in turn, implies the occurrence of a maximum, minimum, or saddle point temperature. Azeotropic blends exhibit some segregation of components at other conditions. The extent of the segregation depends on the particular azeotrope and the application. [ASHRAE 34:3]

204.0

– B –

Baffle Plate. An object placed in or near an appliance to change the direction or retard the flow of air, air-fuel mixtures, or flue gases.

Boiler. A closed vessel used for heating water or liquid, or for generating steam or vapor by direct application of heat from combustible fuels or electricity.

Boiler, High-Pressure. A boiler for generating steam at gauge pressures in excess of 15 psi (103 kPa), or for heating water to a temperature in excess of 250°F (121°C) or at a gauge pressure in excess of 160 psi (gauge pressure of 1103 kPa). [NFPA 211:3.3.14.2]

Boiler Room. A room where boilers are installed.

Bonding Conductor or Jumper. A reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected. [NFPA 70:100(I)]

**CALIFORNIA MECHANICAL CODE – MATRIX ADOPTION TABLE
CHAPTER 3 – GENERAL REGULATIONS**

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the code user. See Chapter 1 for state agency authority and building applications.)

| Adopting Agency | BSC | BSC- CG | SFM | HCD | | | DSA | | | OSHDPD | | | | | BSCC | DPH | AGR | DWR | CEC | CA | SL | SLC |
|---|-----|------------|-----|-----|---|------|-----|----|-------|--------|----|---|---|---|------|-----|-----|-----|-----|----|----|-----|
| | | | | 1 | 2 | 1-AC | AC | SS | SS/CC | 1 | 1R | 2 | 3 | 4 | | | | | | | | |
| Adopt Entire Chapter | X | | | | | | | | | | | | | | | | | | | | | |
| Adopt Entire Chapter as amended (amended sections listed below) | | | X | X | X | | | X | X | X | X | X | X | X | | | | | | | | |
| Adopt only those sections that are listed below | | | | | | | | | | | | | | | | | | | | | | |
| Chapter/Section | | | | | | | | | | | | | | | | | | | | | | |
| 301.7 | | | | | | | | | | X | | | | | | | | | | | | |
| 303.2 | | | | | | | | | | † | † | † | † | † | † | | | | | | | |
| 303.7 | | | X | | | | X | X | | | | | | | | | | | | | | |
| 303.7.1 | | | | X | X | | | | | | | | | | | | | | | | | |
| 303.13 Exception | | | | X | X | | | | | | | | | | | | | | | | | |
| 306.2 | | | | | | | | | | X | | | | | | | | | | | | |
| 311.2 | | | | X | X | | | | | | | | | | | | | | | | | |
| 312.1 | | | | X | X | | X | X | | | | | | | | | | | | | | |
| 316.2 | | | | X | X | | | | | | | | | | | | | | | | | |
| 316.5 | | | | X | X | | | | | | | | | | | | | | | | | |
| 316.9 | | | | X | X | | | | | | | | | | | | | | | | | |
| 318.0 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 319.1 | | | | | | | | | | X | X | | | X | X | | | | | | | |
| 319.2 | | | | | | | | | | | X | | | X | | | | | | | | |
| 320.1 | | | | | | | | | | X | | | | X | | | | | | | | |
| 320.2 | | | | | | | | | | | X | | | X | | | | | | | | |
| 320.3 | | | | | | | | | | | | | X | | | | | | | | | |
| 320.4 | | | | | | | | | | X | | | | X | | | | | | | | |
| 320.4.4 | | | | | | | | | | X | | | | X | | | | | | | | |
| 320.5 | | | | | | | | | | X | X | X | | X | X | | | | | | | |
| 321.0 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 322.0 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 322.1 | | | | | | | | | | X | | X | X | X | | | | | | | | |
| 323.0 | | | | | | | | | | X | X | X | | X | X | | | | | | | |

This state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.0.

CHAPTER 3

GENERAL REGULATIONS

301.0 General.

301.1 Applicability. This chapter covers general requirements for heating, ventilating, air-conditioning, refrigeration, miscellaneous heat-producing, and energy-utilizing equipment or appliances. Such equipment or appliances shall comply with the requirements of this code.

301.2 Approval. Equipment or appliance shall be approved by the Authority Having Jurisdiction for safe use or comply with applicable nationally recognized standards as evidenced by the listing and label of an approved agency. A list of accepted standards is included in Chapter 17. Defective materials or parts shall be replaced in such a manner as not to invalidate an approval.

301.3 Design of Equipment. Installers shall furnish satisfactory evidence that the appliance is constructed in accordance with the requirements of this code. The permanently attached label of an approved agency shall be permitted to be accepted as such evidence.

301.4 Electrical Connections. For equipment regulated by this code:

- (1) Equipment requiring electrical connections of more than 50 volts shall have a positive means of disconnect adjacent to and in sight from the equipment served.

Exception: Other power disconnect means shall be acceptable where in accordance with *the California Electrical Code*.

- (2) A 120 volt receptacle shall be located within 25 feet (7620 mm) of the equipment for service and maintenance purposes. The receptacle outlet shall be on the supply side of the disconnect switch. The receptacle need not be located on the same level as the equipment.
- (3) Electrical wiring, controls, and connections to equipment and appliances regulated by this code shall be in accordance with *the California Electrical Code*.

301.5 Oil-Burning Appliances. The tank, piping, and valves for appliances burning oil shall be installed in accordance with the requirements of NFPA 31.

301.6 Personnel Protection. A metal guard shall be provided around exposed flywheels, fans, pulleys, belts, and moving machinery that are portions of a heating, ventilating, or refrigerating system.

301.7 OSHPD 1R [OSHPD 1R]. For OSHPD 1R, refer to Section 309 of California Existing Building Code for general requirements.

302.0 Materials – Standards and Alternates.

302.1 Minimum Standards. Listed pipe, pipe fittings, appliances, appurtenances, equipment, materials, and devices used in a mechanical system shall be listed (third-party certified) by a listing agency (accredited conformity assessment body) as complying with the approved applicable recognized standards referenced in this code, and shall be free from

defects. Unless otherwise provided for in this code, materials, appurtenances, or devices used or entering into the construction of mechanical systems, or parts thereof, shall be submitted to the Authority Having Jurisdiction for approval.

302.1.1 Marking. Each length of pipe and each pipe fitting, material, and device used in a mechanical system shall have cast, stamped, or indelibly marked on it any markings required by the applicable referenced standards and listing agency, and the manufacturer's mark or name, which shall readily identify the manufacturer to the end user of the product. Where required by the approved standard that applies, the product shall be marked with the weight and the quality of the product. Materials and devices used or entering into the construction of mechanical systems, or parts thereof, shall be marked and identified in a manner satisfactory to the Authority Having Jurisdiction. Such marking shall be done by the manufacturer. Field markings shall not be acceptable.

Exception: Markings shall not be required on nipples created from cutting and threading of approved pipe.

302.1.2 Standards. Standards listed or referred to in this chapter or other chapters cover materials that will conform to the requirements of this code, where used in accordance with the limitations imposed in this or other chapters thereof and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein shall be permitted to be used by special permission of the Authority Having Jurisdiction after the Authority Having Jurisdiction has been satisfied as to their adequacy. A list of mechanical standards that appear in specific sections of this code is referenced in Table 1701.1. Standards referenced in Table 1701.1 shall be applied as indicated in the applicable referenced section. A list of additional standards, publications, practices and guides that are not referenced in specific sections of this code appear in Table 1701.2. The documents indicated in Table 1701.2 shall be permitted in accordance with Section 302.2.

302.1.3 Existing Buildings. In existing buildings or premises in which mechanical installations are to be altered, repaired, or renovated, the Authority Having Jurisdiction has discretionary powers to permit deviation from the provisions of this code, provided that such proposal to deviate is first submitted for proper determination in order that health and safety requirements, as they pertain to mechanical systems, shall be observed.

302.2 Alternate Materials and Methods of Construction Equivalency. Nothing in this code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code. Techni-

GENERAL REGULATIONS

cal documentation shall be submitted to the Authority Having Jurisdiction to demonstrate equivalency. The Authority Having Jurisdiction shall have the authority to approve or disapprove the system, method, or device for the intended purpose.

However, the exercise of this discretionary approval by the Authority Having Jurisdiction shall have no effect beyond the jurisdictional boundaries of said Authority Having Jurisdiction. An alternate material or method of construction so approved shall not be considered as in accordance with the requirements, intent, or both of this code for a purpose other than that granted by the Authority Having Jurisdiction where the submitted data does not prove equivalency.

302.2.1 Testing. The Authority Having Jurisdiction shall have authority to require tests, as proof of equivalency.

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

302.2.1.2 Request by the Authority Having Jurisdiction. The Authority Having Jurisdiction shall have the authority to require tests to be made or repeated where there is reason to believe that a material or device no longer is in accordance with the requirements on which its approval was based.

302.3 Alternative Engineered Design. An alternative engineered design shall comply with the intent of the provisions of this code and shall provide an equivalent level of quality, strength, effectiveness, fire resistance, durability, and safety. Material, equipment, or components shall be designed and installed in accordance with the manufacturer's installation instructions.

302.3.1 Permit Application. The registered design professional shall indicate on the design documents that the mechanical system, or parts thereof, is an alternative engineered design so that it is noted on the construction permit application. The permit and permanent permit records shall indicate that an alternative engineered design was part of the approved installation.

302.3.2 Technical Data. The registered design professional shall submit sufficient technical data to substantiate the proposed alternative engineered design and to prove that the performance meets the intent of this code.

302.3.3 Design Documents. The registered design professional shall provide two complete sets of signed and sealed design documents for the alternative engineered design for submittal to the Authority Having Jurisdiction. The design documents shall include floor plans of the work. Where appropriate, the design documents shall indicate location, sizing, and loading of appurtenances, equipment, appliances, and devices.

302.3.4 Design Approval. An approval of an alternative engineered design shall be at the discretion of the

Authority Having Jurisdiction. The exercise of this discretionary approval by the Authority Having Jurisdiction shall have no effect beyond the jurisdictional boundaries of said Authority Having Jurisdiction. An alternative engineered design so approved shall not be considered as in accordance with the requirements, intent, or both of this code for a purpose other than that granted by the Authority Having Jurisdiction.

302.3.5 Design Review. The Authority Having Jurisdiction shall have the authority to require testing of the alternative engineered design in accordance with Section 302.2.1, including the authority to require an independent review of the design documents by a registered design professional selected by the Authority Having Jurisdiction and at the expense of the applicant.

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

303.0 Installation.

303.1 Listed Appliances. The installation of equipment and appliances regulated by this code shall be in accordance with the conditions of the listing, the manufacturer's installation instructions and this code. The manufacturer's installation and operating instructions shall be attached to the appliance. Clearances of listed equipment and appliances from combustible materials shall be as specified in the listing or on the rating plate.

303.2 Closet or Alcove Installations. [Not adopted for OSHPD 1, 1R, 2, 3, 4 & 5] Central heating furnaces and boilers installed in closets or alcoves shall be listed for such installation. Central heating furnaces not listed for closet or alcove installation shall be installed in a room or space having a volume not less than 12 times the total volume of the furnace. Central heating boilers not listed for closet or alcove installation shall be installed in a room or space having a volume 16 times the volume of the boiler.

Where the ceiling height of the room or space exceeds 8 feet (2438 mm), the volume shall be calculated on the basis of an 8 foot (2438 mm) height.

The installation clearances shall be in accordance with the appliance listing, shall not be reduced, and shall be installed in accordance with Section 904.1.

303.3 Unlisted Appliances. Except as otherwise permitted in this code, unlisted equipment and appliances shall be approved by the Authority Having Jurisdiction. Unlisted equipment and appliances shall be installed in accordance with the manufacturer's installation instructions and with clearances from combustible materials in accordance with Section 303.10 or Section 303.10.1.

303.4 Anchorage of Appliances. Appliances designed to be fixed in position shall be securely fastened in place in accordance with the manufacturer's installation instructions. Supports for appliances shall be designed and constructed to

sustain vertical and horizontal loads within the stress limitations specified in the building code.

303.5 Movement. Movement of appliances with casters shall be limited by a restraining device installed in accordance with the connector and appliance manufacturer's installation instructions.

303.6 Identification of Equipment. Where more than one heating, cooling, ventilating, or refrigerating system is installed on the roof of a building or within a building, it shall be permanently identified as to the area or space served by the equipment.

303.7 Liquefied Petroleum Gas Facilities. Containers, container valves regulating equipment, and appurtenances for the storage and supply of liquefied petroleum gas shall be installed in accordance with NFPA 58 and the California Fire Code.

303.7.1 Liquefied Petroleum Gas [LP-Gas] Appliances. [HCD 1 & HCD 2] *Liquefied petroleum gas-burning appliances shall not be installed in a pit, basement, or similar location where heavier-than-air gas might collect. Appliances so fueled shall not be installed in an above-grade under-floor space or basement unless such location is provided with an approved means for removal of unburned gas.*

303.8 Appliances on Roofs. Appliances on roofs shall be designed or enclosed so as to withstand climatic conditions in the area in which they are installed. Where enclosures are provided, each enclosure shall permit easy entry and movement, shall be of reasonable height, and shall have at least a 30 inch (762 mm) clearance between the entire service access panel(s) of the appliance and the wall of the enclosure. [NFPA 54:9.4.1.1]

303.8.1 Load Capacity. Roofs on which appliances are to be installed shall be capable of supporting the additional load or shall be reinforced to support the additional load. [NFPA 54:9.4.1.2]

303.8.2 Fasteners. Access locks, screws, and bolts shall be of corrosion-resistant material. [NFPA 54:9.4.1.3]

303.8.3 Installation of Appliances on Roofs. Appliances shall be installed in accordance with the manufacturer's installation instructions. [NFPA 54:9.4.2.1]

303.8.4 Clearance. Appliances shall be installed on a well-drained surface of the roof. At least 6 feet (1829 mm) of clearance shall be available between any part of the appliance and the edge of a roof or similar hazard, or rigidly fixed rails, guards, parapets, or other building structures at least 42 inches (1067 mm) in height shall be provided on the exposed side. [NFPA 54:9.4.2.2]

303.8.5 Electrical Power. All appliances requiring an external source of electrical power for its operation shall be provided with the following:

- (1) A readily accessible electrical disconnecting means within sight of the appliance that completely de-energizes the appliance.

- (2) A 120-V ac grounding-type receptacle outlet on the roof adjacent to the appliance on the supply side of the disconnect switch. [NFPA 54:9.4.2.3]

303.8.6 Platform or Walkway. Where water stands on the roof at the appliance or in the passageways to the appliance, or where the roof is of a design having a water seal, a suitable platform, walkway, or both shall be provided above the waterline. Such platform(s) or walkway(s) shall be located adjacent to the appliance and control panels so that the appliance can be safely serviced where water stands on the roof. [NFPA 54:9.4.2.4]

303.9 Avoiding Strain on Gas Piping. Appliances shall be supported and connected to the piping so as not to exert undue strain on the connections. [NFPA 54:9.1.17]

303.10 Clearances. Appliances and their vent connectors shall be installed with clearances from combustible material so their operation does not create a hazard to persons or property. Minimum clearances between combustible walls and the back and sides of various conventional types of appliances and their vent connectors are specified in Chapter 8 and Chapter 9. [NFPA 54:9.2.2] Where not provided in this code, listed and unlisted equipment or appliances shall be installed to maintain the required clearances for servicing and to combustible construction in accordance with the listing and the manufacturer's installation instructions.

303.10.1 Clearance Reduction. Reduce clearances to combustible construction for listed equipment and appliances shall comply with the listing and Table 303.10.1. Where permitted by the manufacturer, and not provided in this code, reduce clearances to combustible construction for unlisted equipment and appliances shall comply with Table 303.10.1.

303.10.1.1 Type I Hood Exhaust System. Reduce clearances for Type I exhaust systems shall be in accordance with Section 507.4.2 through Section 507.4.2.3. Clearances from the duct or the exhaust fan to the interior surface of enclosures of combustible construction shall be in accordance with Section 510.7.3 and clearances shall not be reduced.

303.10.1.2 Product Conveying Ducts. Reduce clearances to combustibles construction for product conveying ducts shall be in accordance with Section 506.10.3 through Section 506.11.6.3.

303.10.1.3 Solid-Fuel Burning Appliances. For solid-fuel burning appliances, the clearance, after reduction, shall not be less than 12 inches (305 mm) to combustible walls and not less than 18 inches (457 mm) to combustible ceilings. The clearance, after reduction, shall be permitted to be less than 12 inches (305 mm) to combustible walls and less than 18 inches (457 mm) to combustible ceilings where the solid-fuel burning appliances is listed for lesser clearance.

303.11 Installation in Commercial Garages. Appliances installed in enclosed, basement, and underground park- ←

GENERAL REGULATIONS

ing structures shall be installed in accordance with NFPA 88A. [NFPA 54:9.1.11.1]

» **303.11.1 Repair Garages.** Appliances installed in repair garages shall be installed in accordance with NFPA 30A. [NFPA 54:9.1.11.2]

» **303.12 Installation in Aircraft Hangars.** Heaters in aircraft hangars shall be installed in accordance with NFPA 409. [NFPA 54:9.1.12]

303.13 Pit Location. Where excavation is necessary to install an appliance, it shall extend to a depth of 6 inches (152 mm) below and 12 inches (305 mm) on all sides of the appliance, except on the service side, which shall have 30 inches (762 mm). Where the depth of the excavation for either the appliance or passageway exceeds 12 inches (305 mm), walls shall be lined with concrete or masonry 4 inches (102 mm) above the adjoining ground level.

Exception: [HCD 1 & HCD 2] Liquefied petroleum gas (LP-Gas) appliances as described in Section 303.7.1.

304.0 Accessibility for Service.

304.1 General. Appliances shall be located with respect to building construction and other equipment so as to permit access to the appliance. Sufficient clearance shall be maintained to permit cleaning of heating surfaces; the replacement of filters, blowers, motors, burners, controls, and vent connections; the lubrication of moving parts where necessary; the adjustment and cleaning of burners and pilots; and the proper functioning of explosion vents, where provided. For attic installation, the passageway and servicing area adjacent to the appliance shall be floored. [NFPA 54:9.2.1]

Unless otherwise specified, not less than 30 inches (762 mm) in depth, width, and height of working space shall be provided.

Exception: A platform shall not be required for unit heaters or room heaters.

304.2 Sloped Roof. Where equipment or appliances that require service are installed on a roof having a slope of 4 units vertical in 12 units horizontal (33 percent slope) or more, a level platform of not less than 30 inches by 30 inches (762 mm by 762 mm) shall be provided at the service side of the equipment or appliance.

» **304.3 Access to Appliances on Roofs.** Appliances located on roofs or other elevated locations shall be accessible. [NFPA 54:9.4.3.1]

304.3.1 Access. Buildings exceeding 15 feet (4572 mm) in height shall have an inside means of access to the roof unless other means acceptable to the Authority Having Jurisdiction are used. [NFPA 54:9.4.3.2]

304.3.1.1 Access Type. The inside means of access shall be a permanent, or foldaway inside stairway or ladder, terminating in an enclosure, scuttle, or trap door. Such scuttles or trap doors shall be not less than 22 inches by 24 inches (559 mm by 610 mm) in size, shall open easily and safely under all

conditions, especially snow; and shall be constructed so as to permit access from the roof side unless deliberately locked on the inside.

Not less than 6 feet (1829 mm) of clearance shall be between the access opening and the edge of the roof or similar hazard or rigidly fixed rails or guards not less than 42 inches (1067 mm) in height shall be provided on the exposed side. Where parapets or other building structures are utilized in lieu of guards or rails, they shall be not less than 42 inches (1067 mm) in height. [NFPA 54:9.4.3.3]

304.3.1.2 Permanent Ladders. Permanent ladders required by Section 304.3.1.1 shall be constructed in accordance with the following:

- (1) Side railings shall extend not less than 30 inches (762 mm) above the roof or parapet wall.
- (2) Landings shall not exceed 18 feet (5486 mm) apart measured from the finished grade.
- (3) Width shall be not less than 14 inches (356 mm) on center.
- (4) Rungs spacing shall not exceed 12 inches (305 mm) on center, and each rung shall be capable of supporting a 300 pound (136.1 kg) load.
- (5) Toe space shall be not less than 6 inches (152 mm).

304.3.2 Permanent Lighting. Permanent lighting shall be provided at the roof access. The switch for such lighting shall be located inside the building near the access means leading to the roof. [NFPA 54:9.4.3.4]

304.4 Appliances in Attics and Under-Floor Spaces.

An attic or under-floor space in which an appliance is installed shall be accessible through an opening and passageway not less than the largest component of the appliance, and not less than 22 inches by 30 inches (559 mm by 762 mm).

304.4.1 Length of Passageway. Where the height of the passageway is less than 6 feet (1829 mm), the distance from the passageway access to the appliance shall not exceed 20 feet (6096 mm) measured along the centerline of the passageway. [NFPA 54:9.5.1.1]

304.4.2 Width of Passageway. The passageway shall be unobstructed and shall have solid flooring not less than 24 inches (610 mm) wide from the entrance opening to the appliance. [NFPA 54:9.5.1.2]

304.4.3 Work Platform. A level working platform not less than 30 inches by 30 inches (762 mm by 762 mm) shall be provided in front of the service side of the appliance. [NFPA 54:9.5.2]

Exception: A working platform need not be provided where the furnace is capable of being serviced from the required access opening. The furnace service side shall not exceed 12 inches (305 mm) from the access opening.

304.4.4 Lighting and Convenience Outlet. A permanent 120V receptacle outlet and a lighting fixture shall be installed near the appliance. The switch controlling the lighting fixture shall be located at the entrance to the passageway. [NFPA 54:9.5.3]

305.0 Location.

305.1 Installation in Garages. Appliances in residential garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit shall be installed so that all burners and burner-ignition devices are located not less than 18 inches (457 mm) above the floor unless listed as flammable vapor ignition resistant. [NFPA 54:9.1.10.1]

305.1.1 Physical Damage. Appliances installed in garages, warehouses, or other areas subject to mechanical damage shall be guarded against such damage by being installed behind protective barriers or by being elevated or located out of the normal path of vehicles.

305.1.2 Access from the Outside. Where appliances are installed in a separate, enclosed space having access only from outside of the garage, such appliances shall be permitted to be installed at floor level, providing the required combustion air is taken from the exterior of the garage. [NFPA 54:9.1.10.3]

305.1.3 Cellulose Nitrate Plastic Storage. Heating equipment located in rooms where cellulose nitrate plastic is stored or processed shall be in accordance with the fire code.

305.2 Flood Hazard Areas. For buildings located in flood hazard areas, heating, ventilating, air-conditioning, refrigeration, miscellaneous heat-producing, and energy-utilizing equipment and appliances shall be elevated at or above the elevation in accordance with the building code for utilities and attendant equipment or the elevation of the lowest floor, whichever is higher.

Exception: Equipment and appliances shall be permitted to be located below the elevation in accordance with the building code for utilities and attendant equipment or the elevation of the lowest floor, whichever is higher, provided that the systems are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.

305.2.1 Coastal High Hazard Areas. Mechanical systems in buildings located in coastal high hazard areas shall be in accordance with the requirements of Section 305.2, and mechanical systems, pipes, and appurtenances shall not be mounted on or penetrate through walls that are intended to breakaway under flood loads in accordance with the building code.

305.2.2 Air Exhaust and Intake Openings. Outside air exhaust openings and air intake openings shall be located at or above the elevation required by the building code for utilities and attendant equipment or the elevation of the lowest floor, whichever is higher.

305.3 Elevator Shaft. Unless required for the functionality and safety of the elevator system, mechanical systems shall not be located in an elevator shaft.

305.4 Drainage Pan. Where a water heater is located in an attic, in or on an attic ceiling assembly, floor-ceiling assembly,

or floor-subfloor assembly where damage results from a leaking water heater, a watertight pan of corrosion-resistant materials shall be installed beneath the water heater with not less than $\frac{3}{4}$ of an inch (20 mm) diameter drain to an approved location. Such pan shall be not less than $1\frac{1}{2}$ inches (38 mm) in depth.

306.0 Automatic Control Devices.

306.1 General. Heating appliances shall be equipped with a listed device or devices that will shut off the fuel supply to the main burner or burners in the event of pilot or ignition failure. Liquefied petroleum gas-air-burning heating appliances shall be equipped with a listed automatic device or devices that will shut off the flow of gas to the pilot in the event of ignition failure.

Exception: The listed shutoff devices shall not be required on range or cooking tops, log lighters, lights, or other open-burner manually operated appliances, or listed appliances not requiring such devices and specific industrial appliances as approved by the Authority Having Jurisdiction.

Heating appliances whose manual fuel controls are not readily accessible from the main portion of the building being heated shall be equipped with remote controls.

Forced-air and gravity-type warm air furnaces shall be equipped with a listed air outlet temperature limit control that cannot be set for temperatures exceeding 250°F (121°C). Such controls shall be located in the bonnet or plenum, within 2 feet (610 mm) of the discharge side of the heating element of gravity furnaces or in accordance with the conditions of listing.

Electric duct heaters shall be equipped with an approved automatic reset air outlet temperature limit control that will limit the outlet air temperature to not exceed 200°F (93°C). The electric elements of the heater shall be equipped with fusible links or a manual reset temperature limit control that will prevent outlet air temperature in excess of 250°F (121°C).

306.2 Building Automation Systems. [OSHPD 1] *Building automation systems shall provide for localized control in the event of network failure. This capability shall be specified in the construction documentation.*

307.0 Labeling.

307.1 Fuel-Burning Appliances. Fuel-burning heating appliances shall bear a permanent and legible factory-applied nameplate on which shall appear:

- (1) The name or trademark of the manufacturer.
- (2) The approved fuel input rating of the appliance, expressed in Btu/h (kW).
- (3) The model number or equivalent.
- (4) The serial number.
- (5) Instructions for the lighting, operation, and shutdown of the appliance.

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- (6) The type of fuel approved for use with the appliance.
- (7) The symbol of an approved agency certifying compliance of the equipment with recognized standards.
- (8) Required clearances from combustible surfaces on which or adjacent to which it is permitted to be mounted.

307.2 Electric Heating Appliances. Electric heating appliances shall bear a permanent and legible factory-applied nameplate on which shall appear:

- (1) The name or trademark of the manufacturer.
- (2) The model number or equivalent.
- (3) The serial number.
- (4) The electrical rating in volts, amperes (or watts), and, for other than single phase, the number of phases.
- (5) The output rating in Btu/h (kW).
- (6) The electrical rating in volts, amperes, or watts of each field-replaceable electrical component.
- (7) The symbol of an approved agency certifying compliance of equipment with recognized standards.
- (8) Required clearances from combustible surfaces on which or adjacent to which it is permitted to be mounted.

An appliance shall be accompanied by clear and complete installation instructions, including required clearances from combustibles other than mounting or adjacent surfaces, and temperature rating of field-installed wiring connections exceeding 140°F (60°C).

307.3 Heat Pump and Electric Cooling Appliances. Heat pumps and electric cooling appliances shall bear a permanent and legible factory-applied nameplate on which shall appear:

- (1) The name or trademark of the manufacturer.
- (2) The model number or equivalent.
- (3) The serial number.
- (4) The amount and type of refrigerant.
- (5) The factory test pressures or pressures applied.
- (6) The electrical rating in volts, amperes, and, for other than single phase, the number of phases.
- (7) The output rating in Btu/h (kW).
- (8) The electrical rating in volts, amperes, or watts of each field replaceable electrical component.
- (9) The symbol of an approved agency certifying compliance of the equipment with recognized standards.
- (10) Required clearances from combustible surfaces on which or adjacent to which it is permitted to be mounted.

An appliance shall be accompanied by clear and complete installation instructions, including required clearances from combustible other than mounting or adjacent surfaces, and temperature rating of field-installed wiring connections exceeding 140°F (60°C).

307.4 Absorption Units. Absorption units shall bear a permanent and legible factory-applied nameplate on which shall appear:

- (1) The name or trademark of the manufacturer.
- (2) The model number or equivalent.

- (3) The serial number.
- (4) The amount and type of refrigerant.
- (5) Hourly rating in Btu/h (kW).
- (6) The type of fuel approved for use with the unit.
- (7) Cooling capacity Btu/h (kW).
- (8) Required clearances from combustible surfaces on which or adjacent to which it is permitted to be mounted.
- (9) The symbol of an approved agency certifying compliance of the equipment with recognized standards.

308.0 Improper Location.

308.1 General. Piping or equipment shall not be so located as to interfere with the normal use thereof or with the normal operation and use of windows, doors, or other required facilities.

309.0 Workmanship.

309.1 Engineering Practices. Design, construction, and workmanship shall comply with accepted engineering practices and shall be of such character as to secure the results sought to be obtained by this code.

309.2 Concealing Imperfections. It shall be unlawful to conceal cracks, holes, or other imperfections in materials by welding, brazing, or soldering, by using therein or thereon paint, wax, tar, solvent cement, other leak-sealing or repair agent.

309.3 Installation Practices. Mechanical systems shall be installed in a manner that is in accordance with this code, applicable standards, and the manufacturer's installation instructions.

310.0 Condensate Wastes and Control.

310.1 Condensate Disposal. Condensate from air washers, air-cooling coils, condensing appliances, and the overflow from evaporative coolers and similar water-supplied equipment or similar air-conditioning equipment shall be collected and discharged to an approved plumbing fixture or disposal area. Where discharged into the drainage system, equipment shall drain by means of an indirect waste pipe. The waste pipe shall have a slope of not less than $\frac{1}{8}$ inch per foot (10.4 mm/m) or 1 percent slope and shall be of approved corrosion-resistant material not smaller than the outlet size in accordance with Section 310.3 or Section 310.4 for air-cooling coils or condensing appliances, respectively. Condensate or wastewater shall not drain over a public way.

310.1.1 Condensate Pumps. Where approved by the Authority Having Jurisdiction, condensate pumps shall be installed in accordance with the manufacturer's installation instructions. Pump discharge shall rise vertically to a point where it is possible to connect to a gravity condensate drain and discharged to an approved disposal point. Each condensing unit shall be provided with a separate sump and interlocked with the equipment to prevent the equipment from operating during a failure. Separate pumps shall be permitted to connect to a single gravity indirect waste where equipped with check valves and approved by the Authority Having Jurisdiction.

315.1.1 Testing. Louvers that protect air intake or exhaust openings shall be tested in accordance with AMCA 550 for resistance to wind-driven rain.

315.1.2 Impact Resistance Test. Upon request by the Authority Having Jurisdiction, louvers protecting intake and exhaust ventilation ducts that are not fixed in the open position and located within 30 feet (9144 mm) of the grade shall be tested for impact resistance in accordance with AMCA 540.

316.0 Protection of Piping, Tubing, Materials, and Structures.

316.1 General. Piping or tubing passing under or through walls shall be protected from breakage. Piping passing through or under cinders or other corrosive materials shall be protected from external corrosion in an approved manner. Approved provisions shall be made for expansion of hot water piping. Voids around piping or tubing passing through concrete floors on the ground shall be sealed.

316.2 Installation. Piping or tubing shall be installed so that the piping, tubing, or connections will not be subject to undue strains or stresses, and provisions shall be made for expansion, contraction, and structural settlement. No piping or tubing, unless designed and listed for such use, shall be directly embedded in concrete or masonry. No structural member shall be seriously weakened or impaired by cutting, notching, or otherwise as defined in the *California Building Code or California Residential Code*.

316.3 Corrosion, Erosion, and Mechanical Damage. Piping or tubing subject to corrosion, erosion, or mechanical damage shall be protected in an approved manner.

316.4 Protectively Coated Pipe. Protectively coated pipe or tubing shall be inspected and tested, and a visible void, damage, or imperfection to the pipe coating shall be repaired in an approved manner.

316.5 Fire-Resistant Construction. Piping, tubing, and duct system penetrations of fire-resistance-rated walls, partitions, floors, floor/ceiling assemblies, roof/ceiling assemblies, or shaft enclosures shall be protected in accordance with the requirements of the *California Building Code or California Residential Code*.

316.6 Steel Nail Plates. Plastic piping or tubing, copper or copper alloy piping or tubing, and ducts penetrating framing members to within 1 inch (25.4 mm) of the exposed framing shall be protected by steel nail plates not less than No. 18 gauge (0.0478 inches) (1.2141 mm) in thickness. The steel nail plate shall extend along the framing member not less than 1½ inches (38 mm) beyond the outside diameter of the pipe or tubing.

Exception: See Section 1310.3.3.

316.7 Sleeves. Sleeves shall be provided to protect piping through concrete and masonry walls and concrete floors.

Exception: Sleeves shall not be required where openings are drilled or bored.

316.7.1 Building Loads. Piping or tubing through concrete or masonry walls shall not be subject to a load from building construction.

316.7.2 Exterior Walls. In exterior walls, annular space between sleeves and pipes or tubing shall be sealed and made watertight, as approved by the Authority Having Jurisdiction. A penetration through fire-resistive construction shall be in accordance with Section 316.5.

316.8 Firewalls. A pipe sleeve through a firewall shall have the space around the pipe or tubing completely sealed with an approved fire-resistive material in accordance with other codes.

316.9 Structural Members. A structural member weakened or impaired by cutting, notching, or otherwise shall be reinforced, repaired, or replaced so as to be left in a safe structural condition in accordance with the requirements of the *California Building Code or California Residential Code*.

316.10 Rodentproofing. Mechanical system shall be constructed in such a manner as to restrict rodents or vermin from entering a building by following the ductwork from the outside into the building.

316.11 Metal Collars. In or on buildings where openings have been made in walls, floors, or ceilings for the passage of ductwork or pipes, such openings shall be closed and protected by the installation of approved metal collars securely fastened to the adjoining structure.

317.0 Trenching, Excavation, and Backfill.

317.1 Trenches. Trenches deeper than the footings of a building or structure, and paralleling the same, shall be located not less than 45 degrees (0.79 rad) from the bottom exterior edge of the footing, or as approved in accordance with Section 302.0.

317.2 Tunneling and Driving. Tunneling and driving shall be permitted to be done in yards, courts, or driveways of a 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 2 feet (610 mm) above the pipe and shall be limited in length to one-half the depth of the trench, with a maximum length of 8 feet (2438 mm). Where pipes are driven, the drive pipe shall be not less than one size larger than the pipe to be laid.

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

317.4 Excavations. Excavations shall be completely backfilled as soon after inspection as practicable. Precaution shall be taken to ensure compactness of backfill around piping without damage to such piping. Trenches shall be backfilled in thin layers to 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 will 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. Precautions shall be taken to ensure permanent stability for pipe laid in filled or made ground.

318.0 Scope.

318.1 Applicability. This part is applicable to health facilities regulated by OSHPD (See Adoption Tables for application for specific sections).

Note: This section has no corresponding provisions in the UMC. For the scope and authority of each state agency, refer to Chapter 1.

318.2 Services/Systems and Utilities. Refer to Section 1224.4.1, 1225.2.1 and 1228.4.1.1 of the California Building Code.

319.0 Steam and Hot-Water Systems.

319.1 Requirements for Hospitals and Optional Services Provided in Correctional Treatment Centers. [OSHPD 1, 1R, 4 & 5]

319.1.1 Boilers shall have the capacity, based upon the rest ratings published by the Hydronics Institute or another acceptable national standard to supply the normal operating requirements of all connected systems and equipment.

319.1.2 A minimum of two boilers shall be provided. The arrangement of boilers shall be based on the capacity and capability of a boiler or boilers to operate all systems during periods of breakdown or maintenance of any one boiler.

319.1.3 Boiler systems providing space heating shall be designed to maintain a minimum temperature of 60°F (15.6°C) in general patient areas and the temperatures specified in Table 4-A for sensitive areas during periods of breakdown or maintenance of any one boiler.

319.1.4 Boiler feed pumps, condensate return pumps, fuel oil pumps, and heating circulating pumps shall be connected and installed to provide standby service in the event of pump failure. Installation of duplex pumps or provision of a spare pump will meet this requirement.

319.1.5 At least two sources of heat (e.g. two pieces of equipment) shall be provided for supplying essential services such as sterilizers, hot water for dishwashing, and domestic hot water for minimum patient service, such as handwashing and baths. Booster heaters for dishwashing providing 125°F to 180°F (52°C to 82°C) water may be counted as the second source of heat for that service.

319.2 Requirements for Skilled Nursing, Intermediate Care Facilities and Basic Services Provided in Correctional Treatment Centers. [OSHPD 2 & 4]

319.2.1 Boilers, if provided, shall accommodate Section 319.1.

319.2.2 Two or more interconnected water heaters are an acceptable means to provide two sources of heat for hot water (See Section 319.1.5).

320.0 Air Conditioning and Heating Systems.

320.1 Requirements for Hospitals and Optional Services Provided in Correctional Treatment Centers. [OSHPD 1, 1R, 4 & 5]

320.1.1 The systems shall be designed to provide the temperatures and relative humidity for sensitive areas or rooms shown in Table 4-A. When outdoor humidity and internal moisture sources are not sufficient to meet the requirements of sensitive areas or rooms in Table 4-A, humidification shall be provided by means of the health-care facility air-handling systems. Temperature shall be individually controlled for each operating and delivery room. Burn unit patient rooms that require humidifiers to comply with the requirements of sensitive areas or rooms in Table 4-A shall be provided with individual humidity control. All humidifiers shall use dry steam. Humidifiers shall be located within air handling systems or ductwork to avoid moisture accumulation in downstream components, including filters and insulation.

320.1.2 Heating systems shall be designed based on the "Heating DB 99.6%" column of the Climatic Design Data in ASHRAE Handbook-Fundamentals. The systems shall be thermostatically controlled with appropriate zoning to achieve the above conditions.

320.1.3 Cooling systems shall be designed based on the 0.4% columns of the four Annual Design Conditions titled Cooling, Evaporation, Dehumidification, and Enthalpy shown by the Climate Design Data in ASHRAE Handbook-Fundamentals. The systems shall be thermostatically controlled with appropriate zoning to achieve the above conditions.

320.2 Requirements for Skilled Nursing, Intermediate Care Facilities and Basic Services Provided in Correctional Treatment Centers. [OSHPD 2 & 4]

320.2.1 Systems shall accommodate the provisions of Sections 320.1.2 through 320.1.3.

320.2.2 Where air conditioning is provided, the system shall be thermostatically controlled in one or more zones.

320.3 Requirements for Outpatient Facilities and Licensed Clinics. [OSHPD 3]

320.3.1 The system shall be designed to provide the temperature and humidities for sensitive areas for rooms shown in Table 4-A.

320.4 Telephone and Technology Equipment Centers. ||

[OSHPD 1 & 4] Where telecommunications service entrance rooms, technology equipment centers, or technology distribution rooms are provided in accordance with Section 1224.5 of the California Building Code, the following requirements shall apply:

320.4.1 Power for HVAC systems serving the room(s) shall be supplied by the Equipment Branch pursuant to the California Electrical Code. Where redundant systems are provided, only one shall be required to be supplied by the Equipment Branch.

320.4.2 Mechanical equipment or fixtures that are not directly related to the support of the room shall not be installed in or pass through the room.

Exception: *Unrelated ductwork may be installed and shall be not less than 10 feet (3048 mm) above the finished floor.*

320.4.3 HVAC systems shall be provided to maintain environmental conditions recommended in ASHRAE's *Thermal Guidelines for Data Processing Environment* and the requirements of the specific equipment installed.

320.4.4 Technology equipment centers shall have redundant cooling systems each of sufficient capacity to provide required cooling during periods of breakdown or maintenance of either system. One system shall be non-hydronic and on essential power.

320.5 Psychiatric Services. [OSHPD 1, 1R, 2, 4 & 5] For projects associated with provision of psychiatric services in acute psychiatric hospitals, general acute-care hospitals, and special treatment program service units in skilled nursing facilities, psychiatric, seclusion, and holding-patient rooms shall be designed with security diffusers, grilles, and registers.

321.0 Essential Mechanical Provisions. [OSHPD 1, 1R, 2, 3 (Surgical Clinics only) 4 & 5] During periods of power outages essential electrical power shall be provided for the following equipment:

321.1 (Does not apply to OSHPD 3 surgical clinic.) All heating equipment and fans necessary to maintain a minimum temperature of 60°F (15.6°) in patient areas which are not specified in Section 322.0.

321.2 All heating equipment and fans necessary to maintain the minimum temperatures listed in Table 4-A for sensitive areas specified in Section 322.0.

321.3 Equipment necessary for humidification of the areas listed in Section 322.0.

321.4 All supply, return, and exhaust fans required to maintain the positive and negative air balances as required in Table 4-A.

321.5 All control components and control systems necessary for the normal operation of equipment required to have essential electrical power.

321.6 Alarms for airborne infection isolation rooms and protective environment rooms.

322.0 Sensitive Areas or Rooms. [OSHPD 1, 1R, 2, 3 (Surgical Clinics) 4 & 5] The following are sensitive areas or rooms:

- (1) Operating room, hybrid operation room
- (2) Cystoscopy
- (3) Cardiac catheterization lab
- (4) Trauma/cardiac room
- (5) Delivery room, cesarean operating room
- (6) Gastrointestinal endoscopy procedure room
- (7) Post-anesthesia care unit
- (8) Newborn nursery
- (9) Newborn intensive-care nursery unit
- (10) Intensive care
- (11) Burn unit

322.1 The following conditions shall be met for sensitive areas or rooms:

- (1) Thermostats and humidistats shall be either locally resettable and of the non-locking type or remotely resettable and of the locking type.
- (2) Systems shall be capable of maintaining the rooms within the temperature range in Table 4-A during normal operation. Lower or higher temperature shall be permitted when patients' comfort and/or medical conditions require those conditions.
- (3) The humidity ranges listed in Table 4-A are the minimum and maximum limits where control is specifically needed.
- (4) Types of intensive care service spaces are listed in the California Building Code.

323.0 Mechanical Equipment Schedules. [OSHPD 1, 1R, 2, 4 & 5] Mechanical equipment schedules in the construction documents shall clearly indicate which equipment will be powered by essential power or appropriate special seismic certifications.

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TABLE 303.10.1
REDUCTION OF CLEARANCES WITH SPECIFIED FORMS OF PROTECTION^{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
[NFPA 54: TABLE 10.2.3]

| TYPE OF PROTECTION APPLIED TO AND COVERING ALL SURFACES OF COMBUSTIBLE MATERIAL WITHIN THE DISTANCE SPECIFIED AS THE REQUIRED CLEARANCE WITH NO PROTECTION | WHERE THE REQUIRED CLEARANCE WITH NO PROTECTION FROM APPLIANCE, VENT CONNECTOR, OR SINGLE-WALL METAL PIPE IS: | | | | | | | | | |
|--|---|---------------------------|------------------|---------------------------|------------------|---------------------------|------------------|---------------------------|------------------|---------------------------|
| | 36 (INCHES) | | 18 (INCHES) | | 12 (INCHES) | | 9 (INCHES) | | 6 (INCHES) | |
| | ALLOWABLE CLEARANCES WITH SPECIFIED PROTECTION (INCHES) | | | | | | | | | |
| | USE COLUMN 1 FOR CLEARANCES ABOVE APPLIANCE OR HORIZONTAL CONNECTOR. USE COLUMN 2 FOR CLEARANCES FROM APPLIANCES, VERTICAL CONNECTOR, AND SINGLE-WALL METAL PIPE. | | | | | | | | | |
| | ABOVE (COLUMN 1) | SIDES AND REAR (COLUMN 2) | ABOVE (COLUMN 1) | SIDES AND REAR (COLUMN 2) | ABOVE (COLUMN 1) | SIDES AND REAR (COLUMN 2) | ABOVE (COLUMN 1) | SIDES AND REAR (COLUMN 2) | ABOVE (COLUMN 1) | SIDES AND REAR (COLUMN 2) |
| (1) 3½ inch thick masonry wall without ventilated air space | — | 24 | — | 12 | — | 9 | — | 6 | — | 5 |
| (2) ½ of an inch insulation board over 1 inch glass fiber or mineral wool batts | 24 | 18 | 12 | 9 | 9 | 6 | 6 | 5 | 4 | 3 |
| (3) 0.024 inch (nominal 24 gauge) sheet metal over 1 inch glass fiber or mineral wool batts reinforced with wire on rear face with ventilated air space | 18 | 12 | 9 | 6 | 6 | 4 | 5 | 3 | 3 | 3 |
| (4) 3½ inch thick masonry wall with ventilated air space | — | 12 | — | 6 | — | 6 | — | 6 | — | 6 |
| (5) 0.024 inch (nominal 24 gauge) sheet metal with ventilated air space | 18 | 12 | 9 | 6 | 6 | 4 | 5 | 3 | 3 | 2 |
| (6) ½ of an inch thick insulation board with ventilated air space | 18 | 12 | 9 | 6 | 6 | 4 | 5 | 3 | 3 | 3 |
| (7) 0.024 inch (nominal 24 gauge) sheet metal with ventilated air space over 0.024 inch (nominal 24 gauge) sheet metal with ventilated air space | 18 | 12 | 9 | 6 | 6 | 4 | 5 | 3 | 3 | 3 |
| (8) 1 inch glass fiber or mineral wool batts sandwiched between two sheets 0.024 inch (nominal 24 gauge) sheet metal with ventilated air space | 18 | 12 | 9 | 6 | 6 | 4 | 5 | 3 | 3 | 3 |

For SI units: 1 inch = 25.4 mm, °C = (°F-32)/1.8

Notes:

- ¹ Reduction of clearances from combustible materials shall not interfere with combustion air, draft hood clearance and relief, and accessibility of servicing.
- ² Clearances shall be measured from the outer surface of the combustible material to the nearest point on the surface of the appliance, disregarding an intervening protection applied to the combustible material.
- ³ Spacers and ties shall be of noncombustible material. No spacer or tie shall be used directly opposite the appliance or connector.
- ⁴ Where clearance reduction systems use a ventilated air space, a provision for air circulation shall be provided as described. [See Figure 303.10.1(2) and Figure 303.10.1(3)]
- ⁵ There shall be not less than 1 inch (25.4 mm) between clearance reduction systems and combustible walls and ceilings for reduction systems using a ventilated air space.
- ⁶ Where a wall protector is mounted on a single flat wall away from corners, it shall have not less than a 1 inch (25.4 mm) air gap. To provide air circulation, the bottom and top edges, or the side and top edges, or edges shall be left open.
- ⁷ Mineral wool batts (blanket or board) shall have a density of not less than 8 pounds per cubic foot (lb/ft³) (128 kg/m³) and a minimum melting point of 1500°F (816°C).
- ⁸ Insulation material used as part of a clearance reduction system shall have a thermal conductivity of 1 British thermal unit inch per hour square foot degree Fahrenheit [Btu•in/(h•ft²•°F)] [0.1W/(m•K)] or less.
- ⁹ There shall be not less than 1 inch (25.4 mm) between the appliance and the protector. In no case shall the clearance between the appliance and the combustible surface be reduced below that allowed in this table.
- ¹⁰ Clearances and thicknesses are minimum; larger clearances and thicknesses are acceptable.
- ¹¹ Listed single-wall connectors shall be installed in accordance with the terms of their listing and the manufacturer's installation instructions.

CALIFORNIA MECHANICAL CODE – MATRIX ADOPTION TABLE
CHAPTER 4 – VENTILATION AIR

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the code user. See Chapter 1 for state agency authority and building applications.)

| Adopting Agency | BSC | BSC- CG | SFM | HCD | | | DSA | | | OSHPD | | | | | BSCC | DPH | AGR | DWR | CEC | CA | SL | SLC |
|---|-----|------------|-----|-----|---|------|-----|----|-------|-------|----|---|---|---|------|-----|-----|-----|-----|----|----|-----|
| | | | | 1 | 2 | 1-AC | AC | SS | SS/CC | 1 | 1R | 2 | 3 | 4 | | | | | | | | |
| Adopt Entire Chapter | | | | | | | | | | | | | | | | | | | | | | |
| Adopt Entire Chapter as amended (amended sections listed below) | X | | X | X | X | | | X | X | | | | | | | | | | | | | |
| Adopt only those sections that are listed below | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| Chapter/Section | | | | | | | | | | | | | | | | | | | | | | |
| 401.0 | | | X | | | | | | | X | | X | X | X | | | | | | | | |
| 401.1 | | | | | | | | | | | X | X | X | X | X | | | | | | | |
| 401.2 with exception | | X | | | | | | X | X | | | | | | | | | | | | | |
| 401.2.1 | | X | | | | | | X | X | | | | | | | | | | | | | |
| 402.0 | | | | | | | | | | † | X | † | † | † | X | | | | | | | |
| 402.1 | X | | | | | | | X | X | X | X | X | X | X | X | | | | | | | |
| 402.1.3 | | | | | | | | | | | X | X | X | X | X | | | | | | | |
| 402.2 | | | | | | | | | | † | X | † | † | † | † | | | | | | | |
| 402.3 | | | | | | | | | | † | X | † | † | † | † | | | | | | | |
| 402.3 | | | | X | X | | | | | | | | | | | | | | | | | |
| 402.5 | | | | X | X | | | | | | | | | | | | | | | | | |
| 403.0 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 403.7.2.1 – 403.7.2.4 | | | X | X | X | | | | | | | | | | | | | | | | | |
| 405.0 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 407.0 and subsections | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 408.0 and subsections | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 409.0 and subsections | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 410.0 and subsections | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 411.0 and subsections | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 412.0 and subsections | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 413.0 and subsections | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 414.0 and subsections | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 415.0 and subsections | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 416.0 – 416.2 | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 416.3 | | | | | | | | | | | | | | | X | | | | | | | |
| 416.4 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 417.0 | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 418.0 and subsections | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| 419.0 and subsections | | | | | | | | | | X | | | | | | | | | | | | |
| Table 4-A | | | | | | | | | | X | X | X | X | X | X | | | | | | | |
| Table 4-B | | | | | | | | | | X | X | | X | X | | | | | | | | |
| Table 4-C | | | | | | | | | | | | X | | X | | | | | | | | |
| Table 402.1 | X | | | | | | | X | X | | | | | | | | | | | | | |
| Table 403.7 Note 11 & 12 | | | | X | X | | | | | | | | | | | | | | | | | |

This state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.0.

CHAPTER 4

VENTILATION AIR

401.0 General.

401.1 Applicability. This chapter contains requirements for ventilation air supply, exhaust, and makeup air requirements for occupiable spaces within a building. **[OSHPD 1, 1R, 2, 3, 4 & 5]** See Sections 404.0 through 418.0. **[SFM]** Air filters shall comply with all requirements of Part 12, Title 24, Chapter 12-71, SFM Standard 12-71-1.

401.2 Filters. [BSC-CG], [DSA-SS & DSA-SS/CC] In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air that provides at least a Minimum Efficiency Reporting Value (MERV) of 13. MERV 13 filters shall be installed prior to occupancy, and recommendations for maintenance with filters of the same value shall be included in the operation and maintenance manual in compliance with Chapter 5, Division 5.5. of the California Green Building Standards Code (CALGreen).

Exception: Existing mechanical equipment.

401.2.1 Labeling. Installed filters shall be clearly labeled by the manufacturer indicating the MERV rating.

> 402.0 Ventilation Air.

402.1 Occupiable Spaces. Occupiable spaces listed in Table 402.1 **[OSHPD 1, 1R, 2, 3, 4 & 5]** and Table 4-A shall be designed to have ventilation (outdoor) air for occupants in accordance with this chapter. *Ventilation air requirements for occupancies regulated by the California Energy Commission are found in the California Energy Code.*

402.1.1 Construction Documents. The outdoor air ventilation rate and air distribution assumptions made in the design of the ventilation system shall be clearly identified on the construction documents.

402.1.2 Dwelling. Requirements for ventilation air rate for single-family dwellings shall be in accordance with this chapter or ASHRAE 62.2.

402.1.3 Ventilation in Health Care Facilities. Mechanical ventilation for health care facilities shall be designed and installed in accordance with this code and ASHRAE 170 **[OSHPD 1, 1R, 2, 3, 4 & 5]-2013**, through Addendum ae. *Ventilation rates for areas not specified in Table 4-A shall have minimum ventilation and air change rates per ANSI/ASHRAE Standard 62.1. Where areas with prescribed ventilation rates in both Standards 62.1 and Table 4-A exist, the higher of the two air change rates shall be used. All supply-air, return air, and exhaust-air systems shall comply with ASHRAE 170. The text of ASHRAE 170 shall be modified as follows:*

- (1) ASHRAE 170. Section 6.1.2.1 -- Not adopted.
- (2) ASHRAE 170. Section 6.3.2 -- Not adopted.
- (3) ASHRAE 170. Table 6.4 -- Not adopted.
- (4) ASHRAE 170. Section 6.4-6.4.4 -- Not adopted.

(5) ASHRAE 170. Section 6.9 -- Not adopted.

(6) ASHRAE 170. Section 7.1a -- Modify as follows:
Replace reference to Table 7.1 with reference to Table 4-A.

(7) ASHRAE 170. Section 7.2.1a through e -- Not adopted.

(8) ASHRAE 170. Section 7.2.2 a through c, and e -- Not adopted.

(9) ASHRAE 170. Section 7.2.3 -- Not adopted.

(10) ASHRAE 170. Section 7.3.1 -- Modify as follows:
Replace reference to Table 7.1 with reference to Table 4-A.

(11) ASHRAE 170. Section 7.4.1 -- Modify as follows:
Delete the Exception that allows for high return grilles.

402.2 Natural Ventilation. [Not permitted for OSHPD 1, 2, 3, 4 & 5] Natural ventilation systems shall be designed in accordance with this section and shall include mechanical ventilation systems designed in accordance with Section 403.0, Section 404.0, or both.

Exceptions:

- (1) An engineered natural ventilation system where approved by the Authority Having Jurisdiction need not comply with Section 402.2.
- (2) A mechanical ventilation system is not required where:
 - (a) natural ventilation openings comply with the requirements of Section 402.2 and are permanently open or have controls that prevent the openings from being closed during periods of expected occupancy or
 - (b) the zone is not served by heating or cooling equipment. [ASHRAE 62.1:6.4]

402.2.1 Floor Area to Be Ventilated. Spaces, or portions of spaces, to be naturally ventilated shall be located within a distance based on the ceiling height, in accordance with Section 402.2.1.1, Section 402.2.1.2, or Section 402.2.1.3, from operable wall openings in accordance with Section 402.2.2. For spaces with ceilings which are not parallel to the floor, the ceiling height shall be determined in accordance with Section 402.2.1.4. [ASHRAE 62.1:6.4.1]

402.2.1.1 Single Side Opening. For spaces with operable openings on one side of the space, the distance from the operable openings shall be not more than $2H$, where H is the ceiling height. [ASHRAE 62.1:6.4.1.1]

402.2.1.2 Double Side Opening. For spaces with operable openings on two opposite sides of the space, the distance from the operable openings shall be not more than $5H$, where H is the ceiling height. [ASHRAE 62.1:6.4.1.2]

402.2.1.3 Corner Openings. For spaces with operable openings on two adjacent sides of a space, such as two sides of a corner, the distance from the operable openings shall be not more than $5H$ along a line drawn between the two openings that are farthest apart. Floor area outside that line shall comply with Section 402.2.1.1. [ASHRAE 62.1:6.4.1.3]

402.2.1.4 Ceiling Height. The ceiling height, H , to be used in Section 402.2.1.1 through Section 402.2.1.3 shall be the minimum ceiling height in the space.

Exception: For ceilings that are increasing in height as distance from the openings is increased, the ceiling height shall be determined as the average height of the ceiling within 20 feet (6096 mm) from the operable openings. [ASHRAE 62.1:6.4.1.4]

402.2.2 Location and Size of Openings. Spaces, or portions of spaces, to be naturally ventilated shall be permanently open to operable wall openings directly to the outdoors, the openable area of which is a minimum of 4 percent of the net occupiable floor area. Where openings are covered with louvers or otherwise obstructed, openable area shall be based on the net free unobstructed area through the opening. Where interior rooms, or portions of rooms, without direct openings to the outdoors are ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed and shall have a free area of not less than 8 percent of the area of the interior room nor less than 25 square feet (2.3 m²). [ASHRAE 62.1:6.4.2]

402.2.3 Control and Accessibility. The means to open required operable openings shall be readily accessible to building occupants where the space is occupied. Controls shall be designed to coordinate operation of the natural and mechanical ventilation systems. [ASHRAE 62.1:6.4.3]

402.3 Mechanical Ventilation. [Not permitted for OSHPD 1, 2, 3, 4 & 5] Where natural ventilation is not permitted by this section or the *California Building Standards Code*, mechanical ventilation systems shall be designed, constructed, and installed to provide a method of supply air and exhaust air. Mechanical ventilation systems shall include controls, manual or automatic, that enable the fan system to operate wherever the spaces served are occupied. The system shall be designed to maintain minimum outdoor airflow as required by Section 403.0 under any load conditions.

402.4 Outdoor Air Intake Protection. Required outdoor-air intakes shall be covered with a screen having not less than ¼ of an inch (6.4 mm) openings, and shall have not more than ½ of an inch (12.7 mm) openings.

402.4.1 Weather Protections. Outdoor air intakes that are part of the mechanical ventilation system shall be designed to manage rain entrainment, to prevent rain intrusion, and manage water from snow in accordance with ASHRAE 62.1.

402.5 Bathroom Exhaust Fans. [HCD 1 & HCD 2] Each bathroom shall be mechanically ventilated in accordance with Division 4.5 of the *California Green Building Standards Code (CALGreen)*.

403.0 Ventilation Rates. [Not permitted for OSHPD 1, 2, 3, 4 & 5 spaces listed in Table 4-A]

403.1 General. The design outdoor air intake flow rate for a ventilation system shall be determined in accordance with Section 403.2 through Section 403.9.4.

403.2 Zone Calculations. Ventilation zone parameters shall be determined in accordance with Section 403.2.1 through Section 403.2.3 for each ventilation zone served by the ventilation system. [ASHRAE 62.1:6.2.2]

403.2.1 Breathing Zone Outdoor Airflow. The outdoor airflow required in the breathing zone of the occupiable space or spaces in a ventilation zone, i.e., the breathing zone outdoor airflow (V_{bz}), shall be not less than the value determined in accordance with Equation 403.2.1.

$$V_{bz} = R_p \cdot P_z + R_a \cdot A_z \quad \text{(Equation 403.2.1)}$$

Where:

A_z = zone floor area: the net occupiable floor area of the ventilation zone, square feet (m²).

P_z = zone population: The number of people in the ventilation zone during typical usage.

R_p = outdoor airflow rate required per person as determined from Table 402.1.

R_a = outdoor airflow rate required per unit area as determined from Table 402.1. [ASHRAE 62.1:6.2.2.1]

403.2.2 Zone Air Distribution Effectiveness. The zone air distribution effectiveness (E_z) shall be not greater than the default value determined in accordance with Table 403.2.2. [ASHRAE 62.1:6.2.2.2]

403.2.3 Zone Outdoor Airflow. The zone outdoor airflow (V_{oz}), i.e., the outdoor airflow rate that shall be provided to the ventilation zone by the supply air distribution system, shall be determined in accordance with Equation 403.2.3. [ASHRAE 62.1:6.2.2.3]

$$V_{oz} = V_{bz} / E_z \quad \text{(Equation 403.2.3)}$$

403.3 Single-Zone Systems. For ventilation systems where one or more air handlers supply a mixture of outdoor air and recirculated air to only one ventilation zone, the outdoor air intake flow (V_{ot}) shall be determined in accordance with Equation 403.3. [ASHRAE 62.1:6.2.3]

$$V_{ot} = V_{oz} \quad \text{(Equation 403.3)}$$

407.4.1.4 No space above a ceiling may be utilized as an outside-air, relief-air, supply-air, exhaust-air, or return-air plenum.

Exception: Designs specifically approved by the enforcing agency.

407.4.1.5 Air from a patient room, exam room, treatment room shall not be transferred to another similar room without first having passed through air filters as required by Table 4-B or Table 4-C.

407.4.1.6 Supply outlets and return and exhaust air inlets shall be located to prevent short-circuiting.

407.4.1.7 Recirculating Room Units. For spaces where Table 4-A permits air to be recirculated by room units, the portion of the minimum total air changes per hour required for a space that is greater than the minimum outdoor air changes per hour required component may be provided by recirculating room HVAC units. Such recirculating room HVAC units shall:

- (1) not receive nonfiltered, nonconditioned outdoor air;
- (2) serve only a single space; and
- (3) provide filtration per Section 408.2 and Section 408.3 for airflow passing over any surface that is designed to condense water. This filter shall be located upstream of any such cold surface, so that all of the air passing over the cold surface is filtered.

407.5 Variable Air Volume.

407.5.1 Variable Air Volume Systems (VAV). Variable air volume systems subjecting the patient to a fluctuating air movement are not acceptable for airborne infection isolation rooms, protective environment rooms or those critically sensitive areas listed in Section 322.0. For non-sensitive areas, variable air volume systems meeting the following criteria can be considered:

407.5.1.1 The VAV system shall comply with code requirements for outside air, total air, and pressure relationship through the full range of operation from minimum to maximum.

407.5.1.2 The central return or exhaust fan shall be controlled to accomplish the variable air volume requirements of the individual rooms served by the fan as described in Section 407.5.1.3.

407.5.1.3 Variable air volume for return or exhaust air shall be accomplished by utilizing an automatic modulating damper in the return or exhaust air for each zone. The damper will modulate from full open to minimum position in conjunction with the supply air VAV terminal box.

408.0 Filters. [OSHPD 1, 1R, 2, 3, 4 & 5]

408.1 General. Filter efficiencies shall be certified by the manufacturer and shall be based on ASHRAE 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size when specifically set forth in these standards.

408.1.1 A filter gauge shall be installed across each filter bank serving central air systems. The gauge shall be red lined or a filter alarm light installed to signal when the recommended maximum static pressure drop has been reached.

408.1.2 Central air-handling systems are defined as any unit requiring duct work on the supply or inlet side that serve more than one room.

408.1.3 Filter banks shall be visually inspected for torn media and bypass in filter frames by means of a flashlight or equivalent, both with fans in operation and stopped. Tears in media and bypass in filter frames shall be eliminated in accordance with the manufacturer's directions and the requirements of the enforcing agency prior to commencing operation of the system.

408.1.4 Central air-handling systems shall be maintained in a reasonably clean condition during construction and shall be cleaned as necessary prior to replacement of temporary filter used during construction to ensure that clean air will be delivered to the occupied spaces.

408.1.5 Filter bank No. 1 shall be located upstream of the air-conditioning equipment. Filter bank No. 2 and filter bank No. 3 shall be located downstream of the supply fan and all cooling and humidification equipment with efficiencies as indicated in Table 4-B or Table 4-C.

Exception: Dry steam-type humidifiers for local room humidity control may be installed in the supply air duct downstream of the final filter bank where designs are specifically approved by the enforcing agency. Dry steam is that which is defined in the ASHRAE HVAC Systems and Equipment Handbook.

408.1.6 Filter bank No. 2 and filter bank No. 3 media shall be rigid or supported (noncollapsing type) and shall operate on the principles of impingement, straining, and diffusion.

408.2 Filters for Hospitals.

408.2.1 All air-ventilation systems shall comply with code requirements of this section and shall have filter bank efficiencies as listed in Table 4-B.

408.2.2 Noncentral recirculating air systems providing cooling to high heat producing equipment located in non-sensitive areas shall have a filter with minimum efficiency reporting value (MERV) of 6 based on ASHRAE 52.2.

408.2.3 Noncentral air systems serving any areas not listed in Table 4-B shall have a filter with minimum efficiency reporting value (MERV) of 6 based on ASHRAE 52.2.

408.2.4 Noncentral recirculating air handling systems, for example, through-the-wall units, fan coil units, and heat pumps may be utilized for single patient rooms of one or more beds. Filtration for these units shall have a filter with minimum efficiency reporting value (MERV) of 6, based on ASHRAE 52.2. The air ventilation system providing the minimum air changes of outdoor air shall comply with Table 4-B. These units may be used as recirculating units only. All outdoor air requirements shall be met by a separate central air handling systems.

408.3 Filters for Skilled Nursing Facilities, Intermediate Care Facilities, and Correctional Treatment Centers.

408.3.1 The air ventilation systems shall comply with code requirements of this section for skilled nursing facilities, intermediate care facilities and correctional treatment centers and shall have filter bank efficiencies as listed in Table 4-C.

408.3.2 Noncentral air systems serving single patient rooms of one or more beds shall comply with Table 4-C.

408.3.3 Noncentral recirculating air-handling systems, i.e. through the wall units, may be utilized for each patient room with one or more beds. Filtration for these units shall have a filter with minimum efficiency reporting value (MERV) of 6, based on ASHRAE 52.2. The air ventilation system providing the minimum air changes of outdoor air shall comply with Table 4-C. These units may be used as recirculating units only. All outdoor air requirements shall be met by a separate central air handling system.

408.3.4 Airborne infection isolation rooms, protective environment rooms, and sensitive areas in correctional treatment centers shall comply with Section 408.2.

408.4 Filters for Outpatient Facilities.

408.4.1 The air ventilation systems shall comply with code requirements of this section for outpatient facilities and shall have filter bank efficiencies as listed in Table 4-B.

408.4.2 Noncentral air systems serving individual rooms shall comply with Table 4-B.

409.0 Ducts. [OSHPD 1, 1R, 2, 3, 4 & 5]

409.1 Ducts which penetrate construction, intended for X-ray or other radiation protection, shall not impair the effectiveness of the protection.

409.2 Duct linings and their use shall meet the requirements of Chapter 6, California Mechanical Code.

409.3 Insulation of Ducts. Cold air ducts shall be insulated wherever necessary or to prevent condensation.

409.4 The anchorage and supporting structural elements for airducts shall be designed to withstand the lateral forces as required by the California Building Code, Title 24, Part 2.

410.0 Laboratory Ventilating Systems and Hoods. [OSHPD 1, 1R, 2, 3, 4 & 5]

410.1 Laboratory Ventilating Systems. Laboratory ventilating systems shall comply with NFPA 99, as required by Section 1224.4.6.4 of the California Building Code.

410.2 Exhaust Hoods and Safety Cabinets. Hoods and safety cabinets may be used for normal exhaust of a space provided minimum air change rates are maintained. If air change standards in Table 4-A do not provide sufficient air for proper operation of exhaust hoods and safety cabinets (when in use), supplementary makeup air (filtered and preheated) shall be provided around these units to maintain the required airflow direction and exhaust velocity. Makeup systems for hoods shall be arranged to minimize "short circuiting" of air and to avoid reduction in air velocity at the point of contaminant capture.

410.3 Laboratory Fume Hoods. Laboratory fume hoods shall meet the following standards:

410.3.1 General Standard. Average face velocity shall be at least 75 feet per minute (0.38 meters per second). Exhaust system shall be separate from the building exhaust system. Exhaust fan shall be located at the discharge end of the system. Exhaust duct system shall be of noncombustible corrosion-resistant material as required to meet the planned usage of the hood.

410.3.2 Special Standards for Use with Strong Oxidants. Fume hoods and their associated equipment in the air stream intended for use with perchloric acid and other strong oxidants shall be constructed of stainless steel or other material consistent with special exposures. Hoods and equipment shall be provided with a water wash and drain system to permit periodic flushing of duct and hood. When perchloric acid or other strong oxidants are only transferred from one container to another, standard laboratory fume hoods and the associated equipment may be used in lieu of stainless steel construction.

410.3.3 Special Standards for Use with Infectious or Radioactive Materials. Each hood shall have a minimum face velocity of 90 to 110 feet per minute (0.45 to 0.56 meters per second) with suitable pressure-independent air-modulating devices and alarms to alert staff of fan shutdown or loss of airflow. Each hood shall have filters with a 99.97 percent efficiency (based on the DOP test method) in the exhaust stream and be designed and equipped to permit the safe removal, disposal, and replacement of contaminated filters. Filters shall be as close to the hood as practical to minimize duct contamination. Fume hoods intended for use with radioactive isotopes shall be constructed of stainless steel or other material suitable for the particular exposure.

411.0 Kitchen and Dining Areas. [OSHPD 1, 2, 3, 4 & 5] ||

411.1 The air from dining areas may be used to ventilate the food preparation areas only after it has passed through a filter with at least an 80 percent average efficiency based on ASHRAE 52.2 or a minimum efficiency reporting value (MERV) of 13, based on ASHRAE 52.2.

Exception: For skilled nursing facilities, intermediate care facilities and correctional treatment centers, the air from dining area may be used to ventilate food preparation areas only after it has passed through a filter with a 50 percent average efficiency based on ASHRAE 52.2 or a minimum efficiency reporting value (MERV) of 10, based on ASHRAE 52.2.

412.0 Boiler, Mechanical, and Electrical Rooms. [OSHPD 1, 2, 3, 4 & 5] ||

412.1 Boiler, heater and electrical equipment rooms shall be provided with outdoor air so as to maintain combustion rates of equipment and temperatures in the rooms and in adjoining areas as rated in this chapter.

412.2 Floor surfaces in occupied spaces above such rooms should not exceed a temperature of 85°F (29.4°C), and suitable insulation may be required.

|| 413.0 Odorous Rooms. [OSHPD 1, 2, 3, 4 & 5]

413.1 Rooms in areas where excessive heat or moisture is generated, where objectional odors or dust are present, or where flammable or toxic gases may accumulate, which are used by health facility personnel or patients, shall be provided with exhaust ventilation to change the air a minimum of ten times per hour.

413.2 Kitchen, morgues and laundries located inside a hospital building or skilled nursing facility in which patients are accommodated, or treated, shall be ventilated with exhaust systems which will provide a minimum of ten air changes per hour and prevent odors from entering patient areas.

|| 414.0 Airborne Infection Isolation Rooms. [OSHPD 1, 2, 3, 4 & 5]

414.1 Exhaust Systems. A separate, dedicated exhaust system shall be provided for airborne infection isolation rooms. The dedicated system may serve more than one airborne infection isolation room, adjoining toilet room and anteroom. The exhaust ducts shall be identified by appropriate labeling with the words "Caution Airborne Infection Isolation Rooms Exhaust" or similar terminology. Such labeling shall be in a manner which is not readily removable and shall appear on the exhaust duct at intervals of not more than 20 feet (6096 mm) and at least once near each room and each story traversed by the exhaust system. Exhaust fans shall comply with Section 407.1.2. The discharge from exhaust fans shall be located above the roof and shall be located a minimum of 25 feet (7620 mm) from areas that may be occupied, doors, operable windows, outdoor air intakes, or other openings into the building. The exhaust fan discharge shall be labeled in a manner which readily identifies the precautions which should be observed. To ensure that the airborne contaminates do not reenter the building, one of the following shall be provided:

414.1.1 Exhaust discharge from fan shall extend at least 7 feet (2134 mm) above the roof and discharge vertically upward. Self-draining stacks or equivalent shall be used for rain protection. Rain caps which divert the exhaust toward the roof shall be prohibited.

414.1.2 Exhaust shall discharge above roof level and through an accessible HEPA filter. The HEPA filter shall be located upstream of the exhaust fan and have a minimum efficiency of 99.97 percent based on the DOP method in accordance with Mil-Std. 282 or a minimum efficiency reporting value (MERV) of 17, based on ASHRAE 52.2. Filter gage shall be installed across the filter. For maintenance of air balance relationship, see Section 407.3.2. The 25-foot (7620 mm) dimension required by Section 414.1 may be reduced when a 99.97 percent HEPA filter or a minimum efficiency reporting value (MERV) of 17, based on ASHRAE 52.2 is used and the reduced dimension is specifically approved by the enforcing agency.

414.2 Air Distribution. The supply outlets and exhaust inlets shall be located to provide airflow patterns that prevent stagnation of the air and eliminate short circuiting of the

supply to the exhaust, and minimize exposure of health care workers to airborne infectious particles. Supply-air outlets shall be located at or near the ceiling and at the end of the airborne infection isolation room which is opposite the head of the bed. Exhaust registers shall be located on the wall behind the patient's head, or as close to that wall as practical and shall be located not less than 3 inches (76 mm) nor more than 24 inches (610 mm) above the finished floor.

Exception: For correctional treatment centers, the location and design of the supply outlets an exhaust or return inlets shall not compromise the safety, security and protection of staff, inmates and property.

415.0 Protective Environment Rooms. [OSHPD 1, 2, 3, 4 & 5]

415.1 Air Distribution. The supply outlets and exhaust and return inlets shall be located to provide airflow patterns that prevent stagnation of the air and eliminate short circuiting of the supply to the exhaust or return. Supply air shall be delivered at or near the ceiling and near the patient's bed. All exhaust or return registers shall be located near the entrance to the protective environment room and not less than 3 inches (76 mm) nor more than 8 inches (203 mm) above the finished floor.

Exception: For correctional treatment centers, the location and design of the supply outlets and exhaust or return inlets shall not compromise the safety, security, and protection of staff, inmates and property.

416.0 Alarms – Airborne Infection Isolation Rooms and Protective Environment Rooms. [OSHPD 1, 2, 3, 4 & 5]

416.1 An alarm system which is based on static pressure control, volumetric control, or directional flow measurement shall be provided for each isolation room. The alarm system shall consist of a display monitor located on the corridor wall near the door to the room and a visual and audible alarm which annunciates at the room and at a nurses' station or other suitable location that will provide responsible surveillance. A time delay shall be provided to allow for routine openings of doors. The alarm shall annunciate when the supply, return, or exhaust fans are interrupted or when the minimum required pressure differential per ASHRAE 170 between the airborne infection isolation room and corridor or between the protective environment room and corridor is not being met during closed door conditions.

416.2 Other acceptable alarm systems will be allowed when designs are specifically approved by the enforcing agency.

416.3 [For OSHPD 4] For correctional treatment centers, the alarm system shall not create false alarms or security hazards.

416.4 Prior to acceptance of the rooms, the alarm system shall be tested and operated to demonstrate to the owner or designated representative that the installation and performance of the system conforms to design intent.

417.0 Testing and Balancing Airborne Infection Isolation Rooms and Protective Environment Rooms.

|| [OSHPD 1, 2, 3, 4 & 5] Prior to acceptance of the rooms, all mechanical systems shall be tested, balanced, and operated to demonstrate to the owner or designated representative that the installation and performance of the systems conform to design intent. All testing and balancing shall be performed by a qualified independent agency certified by the Associated Air Balance Council (AABC): the National Environmental Balancing Bureau (NEBB); or the Testing, Adjusting and Balancing Bureau (TABB).

418.0 Design Requirements for Ethylene Oxide (ETO) Sterilization Areas. [OSHPD 1, 1R, 2, 3, 4 & 5]

418.1 Air Changes. The ETO sterilization equipment room shall be provided with minimum air changes per hour per Table 4-A and be maintained at a negative air balance.

418.2 Exhaust Requirements.

418.2.1 All air from the ETO sterilizer equipment room shall be exhausted to the outside by a dedicated system or other approved method.

418.2.2 The exhaust fan for the dedicated system shall be located at the discharge point of the system and identified as ETO Equipment Room Exhaust.

418.2.3 Discharge Point. The discharge point shall be a minimum of 25 feet (7620 mm) away from any outside intake, operable window or personnel passage.

418.3 Ventilation Requirements.

418.3.1 Aeration Units. The aeration units shall be ventilated through a nonrecirculating dedicated ventilation exhaust system.

418.3.2 Capture Box. When the drain is not located in the ETO sterilizer equipment room, ventilation is required by a capture box.

418.3.3 Cylinder Change. When not located in the ETO sterilizer equipment room, exhaust during cylinder change is required by installing a hood that is part of a dedicated ventilation exhaust system, positioned no more than 1 foot (305 mm) above or behind the point where the change of cylinders takes place.

418.3.4 Sterilizer Relief Valve. The ventilation of sterilizer relief valve is required through a pipe connected to the outlet of the relief valve exhausted directly to the outdoors at a point high enough to be away from passers by, and not near any windows that open, nor near any air-conditioning or ventilation air intakes.

418.3.5 Ventilation of Sterilizer Door Area. The system shall be designed to capture the ETO when the door is opened following the completion of the sterilization process. A hood or canopy closed on each end should be installed over the sterilization door. A hood or canopy shall be connected to a dedicated exhaust ventilation system.

418.4 Gas Valves. Installation of gas line hand valves at the connection to the supply cylinders are required to minimize leakage during cylinder change.

418.5 Alarm Systems. An Audible and visual alarm system shall be installed to alert sterilizer operating personnel if the air flow falls below design cubic feet per minute (L/s).

419.0 Neonatal Intensive Care Units. [OSHPD 1]

419.1 Formula Preparation Area. Air shall be supplied over the formulation preparation area by group E, nonaspirating supply diffusers. Air shall be returned or exhausted by registers located not less than 3 inches (76 mm) nor more than 8 inches (203 mm) above the finished floor in the cleanup area.

419.2 Treatment Area/Room. Air shall be supplied over the treatment surface by group E, nonaspirating supply diffusers. Air shall be returned or exhausted by registers located not less than 3 inches (76 mm) nor more than 8 inches (203 mm) above the finished floor; adjacent to the treatment surface.

**TABLE 4-A
PRESSURE RELATIONSHIP AND VENTILATION REQUIREMENTS FOR GENERAL ACUTE CARE
HOSPITALS, SKILLED NURSING FACILITIES, INTERMEDIATE CARE FACILITIES, CORRECTIONAL
TREATMENT CENTERS, OUTPATIENT FACILITIES, AND LICENSED CLINICS**

| FUNCTION OR SPACE | PRESSURE RELATIONSHIP TO ADJACENT AREAS (f) (n) | MINIMUM OUTDOOR ACH | MINIMUM TOTAL ACH | ALL ROOM AIR EXHAUSTED DIRECTLY TO OUTDOORS (j) | AIR RECIRCULATED BY MEANS OF ROOM UNITS (a) | DESIGN RELATIVE HUMIDITY(k), % | DESIGN TEMPERATURE (l), °F/°C |
|---|---|---------------------|-------------------|---|---|--------------------------------|-------------------------------|
| Airborne infection isolation anteroom (u) | (e) | NR | 10 | Yes | No | NR | NR |
| Airborne infection isolation room (u) | Negative | 2 | 12 | Yes | No | max 60 | 70-75/21-24 |
| <i>Airborne infection isolation treatment/exam room</i> | <i>Negative</i> | <i>2</i> | <i>12</i> | <i>Yes</i> | <i>No</i> | <i>NR</i> | <i>NR</i> |
| <i>Angiography room</i> | <i>Positive</i> | <i>3</i> | <i>15</i> | <i>NR</i> | <i>NR</i> | <i>max 60</i> | <i>70-75/21-24</i> |
| Bathing room | Negative | NR | 10 | Yes | No | NR | 70-75/21-24 |
| Bathroom | Negative | NR | 10 | Yes | No | NR | 72-78/22-26 |
| Bedpan room | Negative | NR | 10 | Yes | No | NR | NR |
| <i>Blood bank/tissue storage</i> | <i>NR</i> | <i>2</i> | <i>6</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> |
| <i>Blood draw/phlebotomy</i> | <i>NR</i> | <i>2</i> | <i>6</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> |
| Bronchoscopy, sputum collection, and pentamidine administration (n) | Negative | 2 | 12 | Yes | No | NR | 68-73/20-23 |
| <i>Cardiac catheterization lab</i> | <i>Positive</i> | <i>3</i> | <i>15</i> | <i>NR</i> | <i>No</i> | <i>max 60</i> | <i>70-75/21-24</i> |
| Clean linen storage | Positive | NR | 2 | NR | NR | NR | 72-78/22-26 |
| Clean workroom (central medical and surgical supply space) | Positive | 2 | 4 | NR | No | max 60 | 72-78/22-26 |
| Clean workroom or clean holding (support) | Positive | 2 | 4 | NR | NR | NR | NR |
| Critical and intensive care | NR | 2 | 6 | NR | No | 30-60 | 70-75/21-24 |
| <i>CT Scan</i> | <i>NR</i> | <i>2</i> | <i>6</i> | <i>NR</i> | <i>NR</i> | <i>max 60</i> | <i>NR</i> |
| Darkroom (g) | Negative | 2 | 10 | Yes | No | NR | NR |
| Delivery room (caesarean) (m), (n), (o) | Positive | 4 | 20 | NR | No | 20-60 | 68-75/20-24 |
| Dialysis treatment area | NR | 2 | 6 | NR | NR | NR | 72-78/22-26 |
| Dialyzer reprocessing room | Negative | NR | 10 | Yes | No | NR | NR |
| Dietary storage | NR | NR | 2 | NR | No | NR | 72-78/22-26 |
| <i>Electroconvulsive therapy procedure room</i> | <i>P</i> | <i>3</i> | <i>15</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> |
| Emergency department exam/treatment room (p) | NR | 2 | 6 | NR | NR | max 60 | 70-75/21-24 |
| Endoscope cleaning | Negative | 2 | 10 | Yes | No | NR | NR |
| ER decontamination | Negative | 2 | 12 | Yes | No | NR | NR |
| ER waiting rooms | Negative | 2 | 12 | Yes (q) | NR | max 65 | 70-75/21-24 |
| Examination room | NR | 2 | 6 | NR | NR | max 60 | 70-75/21-24 |
| <i>Fast track room</i> | <i>NR</i> | <i>2</i> | <i>6</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> |
| <i>Fluoroscopy room</i> | <i>Negative</i> | <i>2</i> | <i>6</i> | <i>Yes</i> | <i>No</i> | <i>NR</i> | <i>NR</i> |
| Food preparation center (i) | NR | 2 | 10 | NR | No | NR | 72-78/22-26 |
| <i>Gamma camera</i> | <i>NR</i> | <i>2</i> | <i>6</i> | <i>NR</i> | <i>No</i> | <i>NR</i> | <i>NR</i> |
| Gastrointestinal endoscopy procedure room (x) | NR | 2 | 6 | NR | No | 20-60 | 68-73/20-23 |
| Hazardous material storage | Negative | 2 | 10 | Yes | No | NR | NR |
| Hydrotherapy | Negative | 2 | 6 | NR | NR | NR | 72-80/22-27 |
| <i>Infusion room</i> | <i>Positive</i> | <i>2</i> | <i>6</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> |
| Intermediate care (s) | NR | 2 | 6 | NR | NR | max 60 | 70-75/21-24 |
| <i>Interventional imaging procedure room</i> | <i>Positive</i> | <i>5</i> | <i>15</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> | <i>NR</i> |

VENTILATION AIR

TABLE 4-A (continued)
PRESSURE RELATIONSHIP AND VENTILATION REQUIREMENTS FOR GENERAL ACUTE CARE HOSPITALS, SKILLED NURSING FACILITIES, INTERMEDIATE CARE FACILITIES, CORRECTIONAL TREATMENT CENTERS, OUTPATIENT FACILITIES, AND LICENSED CLINICS

| FUNCTION OR SPACE | PRESSURE RELATIONSHIP TO ADJACENT AREAS (f) (n) | MINIMUM OUTDOOR ACH | MINIMUM TOTAL ACH | ALL ROOM AIR EXHAUSTED DIRECTLY TO OUTDOORS (j) | AIR RECIRCULATED BY MEANS OF ROOM UNITS (a) | DESIGN RELATIVE HUMIDITY(k), % | DESIGN TEMPERATURE (l), °F/°C |
|--|---|---------------------|-------------------|---|---|--------------------------------|-------------------------------|
| <i>IV Prep. room</i> | <i>Positive</i> | 2 | 6 | NR | NR | NR | NR |
| Janitor's closet, <i>housekeeping</i> | Negative | NR | 10 | Yes | No | NR | NR |
| Labor/delivery/recovery (LDR) (s) | NR | 2 | 6 | NR | NR | max 60 | 70-75/21-24 |
| Labor/delivery/recovery/postpartum (LDRP) (s) | NR | 2 | 6 | NR | NR | max 60 | 70-75/21-24 |
| Laboratory, bacteriology (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, biochemistry (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, cytology (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, general (v) | Negative | 2 | 6 | NR | NR | NR | 70-75/21-24 |
| Laboratory, glasswashing | Negative | 2 | 10 | Yes | NR | NR | NR |
| Laboratory, histology (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, infectious disease and virus | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, media transfer (v) | Positive | 2 | 4 | NR | NR | NR | 70-75/21-24 |
| Laboratory, microbiology (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, nuclear medicine (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, pathology (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, serology (v) | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| Laboratory, sterilizing | Negative | 2 | 10 | Yes | NR | NR | 70-75/21-24 |
| <i>Lactation</i> | NR | 2 | 6 | NR | NR | NR | NR |
| Laser eye room | Positive | 3 | 15 | NR | No | 20-60 | 70-75/21-24 |
| Laundry, general | Negative | 2 | 10 | Yes | No | NR | NR |
| Linen and trash chute room | Negative | NR | 10 | Yes | No | NR | NR |
| Medical/anesthesia gas storage (r) | Negative | NR | 8 | Yes | NR | NR | NR |
| Medication room | NR | 2 | 4 | NR | NR | max 60 | 70-75/21-24 |
| <i>Morgues and autopsy room (n)</i> | Negative | 2 | 12 | Yes | No | NR | 68-75/20-24 |
| <i>MRI room</i> | NR | 2 | 6 | NR | NR | NR | NR |
| <i>Negative-pressure x-ray room</i> | <i>Negative</i> | 2 | 12 | <i>Yes</i> | <i>No</i> | <i>max 60</i> | <i>72-78/22-26</i> |
| Newborn intensive care | Positive | 2 | 6 | NR | No | 30-60 | 72-78/22-26 |
| <i>Newborn intensive care formula room</i> | <i>P</i> | 2 | 10 | NR | <i>No</i> | NR | NR |
| Newborn/well baby nursery suite | NR | 2 | 6 | NR | No | 30-60 | 72-78/22-26 |
| Nonrefrigerated body-holding room (h) | Negative | NR | 10 | Yes | No | NR | 70-75/21-24 |
| Nourishment area or room | NR | NR | 2 | NR | NR | NR | NR |
| <i>Nuclear medicine (Gamma, PET, SPECT)</i> | <i>Negative</i> | 2 | 6 | <i>Yes</i> | <i>No</i> | NR | NR |
| Nuclear medicine hot lab | Negative | NR | 6 | Yes | No | NR | 70-75/21-24 |
| Nuclear medicine treatment room | Negative | 2 | 6 | Yes | NR | NR | 70-75/21-24 |
| <i>Nurse station (aa)</i> | <i>(aa)</i> | <i>(aa)</i> | 2 | <i>(aa)</i> | <i>(aa)</i> | <i>(aa)</i> | <i>(aa)</i> |
| <i>Observation</i> | NR | 2 | 6 | NR | NR | NR | 70-75/21-24 |
| Occupational therapy | NR | 2 | 6 | NR | NR | NR | 70-75/21-24 |
| Operating room, <i>hybrid operating room (m), (n), (o)</i> | Positive | 4 | 20 | NR | No | 20-60 | 68-75/20-24 |

TABLE 4-A (continued)
PRESSURE RELATIONSHIP AND VENTILATION REQUIREMENTS FOR GENERAL ACUTE CARE HOSPITALS, SKILLED NURSING FACILITIES, INTERMEDIATE CARE FACILITIES, CORRECTIONAL TREATMENT CENTERS, OUTPATIENT FACILITIES, AND LICENSED CLINICS

| FUNCTION OR SPACE | PRESSURE RELATIONSHIP TO ADJACENT AREAS (f) (n) | MINIMUM OUTDOOR ACH | MINIMUM TOTAL ACH | ALL ROOM AIR EXHAUSTED DIRECTLY TO OUTDOORS (j) | AIR RECIRCULATED BY MEANS OF ROOM UNITS (a) | DESIGN RELATIVE HUMIDITY(k), % | DESIGN TEMPERATURE (l), °F/°C |
|---|---|---------------------|-------------------|---|---|--------------------------------|-------------------------------|
| Operating/surgical cystoscopic room (m), (n), (o) | Positive | 4 | 20 | NR | No | 20-60 | 68-75/20-24 |
| Patient corridor | NR | NR | 2 | NR | NR | NR | NR |
| <i>Patient holding preparation</i> | NR | 2 | 6 | NR | No | NR | NR |
| Patient room | NR | 2 | 4 (y) | NR | NR | max 60 | 70-75/21-24 |
| <i>Pediatric play area</i> | NR | 2 | 6 | NR | NR | NR | NR |
| Pharmacy (b) | Positive | 2 | 4 | NR | NR | NR | NR |
| <i>Drug room</i> | NR | 2 | 4 | NR | NR | NR | NR |
| <i>HD ante room (b)</i> | Positive | NR | NR | NR | NR | < 60 | ≤68/≤20 |
| <i>HD buffer room (b)</i> | Negative | NR | 30 | Yes | No | < 60 | ≤68/≤20 |
| <i>HD segregated compounding area (ab)</i> | Negative | NR | 12 | Yes | NR | NR | NR |
| <i>HD storage (b)</i> | Negative | NR | 12 | Yes | NR | NR | NR |
| <i>Non-HD ante room (b)</i> | Positive | NR | 30 | NR | NR | < 60 | ≤68/≤20 |
| <i>Non-HD buffer room (b)</i> | Positive | NR | 30 | NR | No | < 60 | ≤68/≤20 |
| <i>Non-HD segregated compounding area</i> | NR | NR | NR | NR | NR | NR | NR |
| Physical therapy (nursing facility) | Negative | 2 | 6 | NR | NR | NR | 70-75/21-24 |
| Physical therapy (diagnostic and treatment) | Negative | 2 | 6 | NR | NR | max 65 | 72-80/22-27 |
| <i>Post-anesthesia care unit</i> | NR | 2 | 6 | Yes | No | 20-60 | 70-75/21-24 |
| <i>Pre-screening area</i> | Negative | 2 | 12 | Yes (q) | NR | NR | NR |
| Procedure room (o), (d) | Positive | 3 | 15 | NR | No | 20-60 | 70-75/21-24 |
| Protective environment anteroom (t) | (e) | NR | 10 | NR | No | NR | NR |
| Protective environment room (t) | Positive | 2 | 12 | NR | No | max 60 | 70-75/21-24 |
| Radiology waiting rooms | Negative | 2 | 12 | Yes (q), (w) | NR | max 60 | 70-75/21-24 |
| Recovery room | NR | 2 | 6 | NR | No | 20-60 | 70-75/21-24 |
| <i>Recreation/activity room</i> | NR | 2 | 6 | NR | NR | NR | NR |
| Resident gathering/activity/dining (nursing facility) | NR | 4 | 4 | NR | NR | NR | 70-75/21-24 |
| Resident room (nursing facility) | NR | 2 | 2 | NR | NR | NR | 70-75/21-24 |
| Resident unit corridor (nursing facility) | NR | NR | 4 | NR | NR | NR | NR |
| <i>Seclusion room</i> | NR | 2 | 6 | NR | NR | NR | NR |
| <i>Semi-restricted corridor</i> | NR | 2 | 4 | NR | NR | NR | NR |
| <i>Shower room</i> | Negative | NR | 10 | Yes | No | NR | NR |
| Soiled linen sorting and storage | Negative | NR | 10 | Yes | No | NR | NR |
| Soiled or decontamination room | Negative | 2 | 6 | Yes | No | NR | 72-78/22-26 |
| Soiled workroom or soiled holding, utility room | Negative | 2 | 10 | Yes | No | NR | NR |
| <i>Special purpose room (SNF & ICF only)</i> | NR | 2 | 6 | Yes | NR | NR | NR |
| <i>Speech therapy/audiology room</i> | NR | 2 | 6 | NR | NR | NR | NR |
| Sterile storage | Positive | 2 | 4 | NR | NR | max 60 | 72-78/22-26 |

TABLE 4-A (continued)
PRESSURE RELATIONSHIP AND VENTILATION REQUIREMENTS FOR GENERAL ACUTE CARE HOSPITALS, SKILLED NURSING FACILITIES, INTERMEDIATE CARE FACILITIES, CORRECTIONAL TREATMENT CENTERS, OUTPATIENT FACILITIES, AND LICENSED CLINICS

| FUNCTION OR SPACE | PRESSURE RELATIONSHIP TO ADJACENT AREAS (f) (n) | MINIMUM OUTDOOR ACH | MINIMUM TOTAL ACH | ALL ROOM AIR EXHAUSTED DIRECTLY TO OUTDOORS (j) | AIR RECIRCULATED BY MEANS OF ROOM UNITS (a) | DESIGN RELATIVE HUMIDITY(k), % | DESIGN TEMPERATURE (l), °F/°C |
|---|---|---------------------|-------------------|---|---|--------------------------------|-------------------------------|
| Sterilizer equipment room | Negative | NR | 10 | Yes | No | NR | NR |
| Substerile service area | NR | 2 | 6 | NR | No | NR | NR |
| Toilet room | Negative | NR | 10 | Yes | No | NR | NR |
| Trauma/cardiac room (crisis or shock) (c) | Positive | 3 | 15 | NR | No | 20-60 | 70-75/21-24 |
| Treatment room (surgery and critical care) (p) | NR | 2 | 6 | NR | NR | 20-60 | 70-75/21-24 |
| Treatment room (diagnostic and treatment) (x) | NR | 2 | 6 | NR | NR | max 60 | 70-75/21-24 |
| Triage | Negative | 2 | 12 | Yes (q) | NR | max 60 | 70-75/21-24 |
| Ultrasound room | NR | 2 | 6 | NR | NR | NR | NR |
| Unsterile supply | NR | 2 | 2 | NR | NR | NR | NR |
| Waiting area (nuclear medicine) | Negative | 2 | 12 | Yes | No | NR | NR |
| Waiting area primary care clinic | Negative | 2 | 10 | Yes(q) | NR | NR | NR |
| Warewashing | Negative | NR | 10 | Yes | No | NR | NR |
| Wound intensive care (burn unit) | NR | 2 | 6 | NR | No | 40-60 | 70-75/21-24 |
| X-ray (diagnostic and treatment) | NR | 2 | 6 | NR | NR | max 60 | 72-78/22-26 |
| X-ray (surgery/critical care and catheterization) | Positive | 3 | 15 | NR | No | max 60 | 70-75/21-24 |

Note: NR = No requirement

Notes for Table 4-A:

- a. Except where indicated by a “No” in this column, recirculating room HVAC units (with heating or cooling coils) are acceptable for providing that portion of the minimum total air changes per hour that is permitted by Section 407.4.1.7. Because of the cleaning difficulty and potential for buildup of contamination, recirculating room units shall not be used in areas marked “No.” Recirculating devices with HEPA filters shall be permitted in existing facilities as interim, supplemental environmental controls to meet requirements for the control of airborne infectious agents. The design of either portable or fixed systems should prevent stagnation and short circuiting of airflow. The design of such systems shall also allow for easy access for scheduled preventative maintenance and cleaning.
- b. *Additional air change, ISO class, continuous pressure monitoring and filtering requirements for compounding areas shall comply with California Board of Pharmacy regulations Title 16 §1735 & §1751, and USP <797> & <800>. Air supplied to the compounding buffer room and ante room must be introduced through 99.97% minimum HEPA filters located in the ceiling. At least 15 air changes per hour (ACPH) shall be provided to nonhazardous drug (non-HD) compounding buffer rooms through the ceiling. The HEPA filtered air from the PEC in the non-HD buffer room, when added to the HVAC-supplied HEPA-filtered air, shall increase the total HEPA-filtered ACPH to at least 30. If the PEC is used to meet the minimum total ACPH requirements, the PEC must not be turned off except for maintenance. All hazardous drug (HD) compounding areas and PECs shall be exhausted externally through 99.97% HEPA filtration.*
- c. The term *trauma room* as used herein is a first-aid room and/or emergency room used for general initial treatment of accident victims. The operating room within the trauma center that is routinely used for emergency surgery is considered to be an operating room by this standard.
- d. Pressure relationships need not be maintained when the room is unoccupied.
- e. See Section 7.2 of ASHRAE 170 and its subsections for pressure-relationship requirements.
- f. *For operating rooms, cardiac catheterization labs, angiography rooms, cystoscopy rooms, delivery rooms, cesarean operating rooms, newborn intensive care, and nurseries provide approximately 15% excess supply air to the room or a sufficient quantity of excess supply air to maintain an appropriate positive air balance based on the room tightness and number of doors. For all rooms not listed in this footnote or not listed in Section 322.0 requiring either a positive or negative air balance, provide approximately 10% differential cfm between supply and return/exhaust airflow but not less than 25 cfm differential shall be provided regardless of room size. Room function, size, and tightness may be considered when determining the differential airflow required. Where continuous directional control is not required, variations between supply cfm and return or exhaust cfm shall be minimized in accordance with Section 407.4.1.3.*
- g. All air need not be exhausted if darkroom equipment has a scavenging exhaust duct attached and meets ventilation standards regarding NIOSH, OSHA, and local employee exposure limits.^{2, 3}

- h. A nonrefrigerated body-holding room is applicable only to facilities that do not perform autopsies on-site and use the space for short periods while waiting for the body to be transferred.
- i. Minimum total air changes per hour (ach) shall be that required to provide proper makeup air to kitchen exhaust systems as specified in ANSI/ASHRAE Standard 154.⁴ In some cases, excess exfiltration or infiltration to or from exit corridors compromises the exit corridor restrictions of NFPA 90A,⁵ the pressure requirements of NFPA 96,⁶ or the maximum defined in the table. During operation, a reduction to the number of air changes to any extent required for odor control shall be permitted when the space is not in use. (See FGI [2010] in Informative Appendix B.)
- j. In some areas with potential contamination and/or odor problems, exhaust air shall be discharged directly to the outdoors and not recirculated to other areas. Individual circumstances may require special consideration for air exhausted to the outdoors. To satisfy exhaust needs, constant replacement air from the outdoors is necessary when the system is in operation.
- k. The RH ranges listed are the minimum and/or maximum allowable at any point within the design temperature range required for that space.
- l. Systems shall be capable of maintaining the rooms within the range during normal operation. Lower or higher temperature shall be permitted when patients' comfort and/or medical conditions require those conditions.
- m. National Institute for Occupational Safety and Health (NIOSH) criteria documents regarding occupational exposure to waste anesthetic gases and vapors, and control of occupational exposure to nitrous oxide⁷ indicate a need for both local exhaust (scavenging) systems and general ventilation of the areas in which the respective gases are utilized. Refer to NFPA 99 for other requirements.⁸
- n. If pressure-monitoring device alarms are installed, allowances shall be made to prevent nuisance alarms. Short-term excursions from required pressure relationships shall be allowed while doors are moving or temporarily open. Simple visual methods such as smoke trail, ball-in-tube, or flutterstrip shall be permitted for verification of airflow direction.
- o. Surgeons or surgical procedures may require room temperatures, ventilation rates, humidity ranges, and/or air distribution methods that exceed the minimum indicated ranges.
- p. Treatment rooms used for bronchoscopy shall be treated as bronchoscopy rooms. Treatment rooms used for procedures with nitrous oxide shall contain provisions for exhausting anesthetic waste gases.
- q. In a recirculating ventilation system, HEPA filters shall be permitted instead of exhausting the air from these spaces to the outdoors provided that the return air passes through the HEPA filters before it is introduced into any other spaces. The entire minimum total air changes per hour of recirculating airflow shall pass through HEPA filters. When these areas are open to larger, nonwaiting spaces, the exhaust air volume shall be calculated based on the seating area of the waiting area. (**Note:** The intent here is to not require the volume calculation to include a very large space [e.g., an atrium] just because a waiting area opens onto it.)
- r. See NFPA 99 for further requirements.⁸
- s. For intermediate care, labor/delivery/recovery rooms, and labor/delivery/recovery/postpartum rooms, four total ach shall be permitted when supplemental heating and/or cooling systems (radiant heating and cooling, baseboard heating, etc.) are used.
- t. The protective environment airflow design specifications protect the patient from common environmental airborne infectious microbes (i.e., Aspergillus spores). *The anteroom shall have negative air pressure in relation to the protective environment room. A door louver, transfer grille, or other acceptable means may be provided to allow for airflow from the protective environment room to the anteroom. The protective environment room shall have positive-pressure in relation to the anteroom and adjoining toilet room.* Recirculation HEPA filters shall be permitted to increase the equivalent room air exchanges; however, the outdoor air changes are still required. Constant-volume airflow is required for consistent ventilation for the protected environment. The pressure relationship to adjacent areas shall remain unchanged if the PE room is utilized as a normal patient room. Rooms with reversible airflow provisions for the purpose of switching between protective environment and AII functions shall not be permitted.
- u. The AII room described in this standard shall be used for isolating the airborne spread of infectious diseases, such as measles, varicella, or tuberculosis. *The airborne infection isolation room shall have negative pressure in relation to the anteroom, and the adjoining toilet room shall have negative pressure in relation to the airborne infection isolation room.* Supplemental recirculating devices using HEPA filters shall be permitted in the AII room to increase the equivalent room air exchanges; however, the minimum outdoor air changes of Table 4-A are still required. AII rooms that are retrofitted from standard patient rooms from which it is impractical to exhaust directly outdoors may be recirculated with air from the AII room, provided that air first passes through a HEPA filter. When the AII room is not utilized for airborne infection isolation, the pressure relationship to adjacent areas, when measured with the door closed, shall remain unchanged and the minimum total air change rate shall be 6 ach. Switching controls for reversible airflow provisions shall not be permitted. The anteroom shall have positive air pressure in relation to the airborne infection isolation room. A door louver, transfer grille, or other acceptable means may be provided to allow for airflow from the anteroom to the airborne infection isolation room.
- v. When required, appropriate hoods and exhaust devices for the removal of noxious gases or chemical vapors shall be provided in accordance with NFPA 99.⁸
- w. The requirement that all room air is exhausted directly to outdoors applies only to radiology waiting rooms programmed to hold patients who are waiting for chest x-rays for diagnosis of respiratory disease.
- x. If the planned space is designated in the organization's operational plan to be utilized for both bronchoscopy and gastrointestinal endoscopy, the design parameters for "bronchoscopy, sputum collection, and pentamidine administration" shall be used.
- y. For single-bed patient rooms using Group D diffusers, a minimum of six total ach shall be provided and calculated based on the volume from finished floor to 6 ft (1.83 m) above the floor.
- z. *This table is based on Table 7.1 in ASHRAE 170, "Ventilation of Healthcare Facilities", and is used with expressed written permission from ASHRAE.*
 - aa. *Nurse station pressure relationship and ventilation requirements shall match the area in which it is located.*
 - ab. *HD segregated compounding area shall have a differential pressure of -0.01 to -0.03 inches water column in relation to adjacent areas and a minimum of 12 air changes per hour.*

**TABLE 4-B
FILTER EFFICIENCIES FOR CENTRAL VENTILATION AND AIR-CONDITIONING SYSTEMS IN GENERAL ACUTE CARE HOSPITALS, ACUTE PSYCHIATRIC HOSPITALS, OUTPATIENT FACILITIES, AND LICENSED CLINICS¹**

| AREA DESIGNATION | MINIMUM NUMBER OF FILTER BANKS | FILTER EFFICIENCY % FILTER BANK (MINIMUM EFFICIENCY REPORTING VALUE MERV) ⁵ | | |
|--|--------------------------------|---|--------------------|---------------------|
| | | NO. 1 ¹ | NO. 2 ¹ | NO. 3 ¹ |
| | | <i>Orthopedic operating room, bone marrow transplant operating room, organ transplant operating room, NICU formula preparation room, NICU treatment area/room</i> | 3 | 30% |
| | | (8) | (14) | (17) |
| <i>Protective environment rooms</i> | 3 | 30% | 90% | 99.97% ⁴ |
| | | (8) | (14) | (17) |
| <i>Angiography; cardiac catheterization labs; operating rooms; interventional imaging procedure rooms; delivery rooms nurseries; patient care, treatment, cystoscopy, cesarean operating room, diagnostic, and related areas; airborne infection isolation rooms; areas providing direct patient service or clean supplies such as sterile and clean processes, and patient area corridors</i> | 2 | 30% | 90% | — |
| | | (8) | (14) | — |
| <i>Laboratories</i> | 2 | 30% | 80% | — |
| | | (8) | (13) | — |
| <i>Administrative, med staff support areas, bulk storage, soiled holding areas, food preparation areas, public cafeterias, and laundries</i> | 1 | 30% | — | — |
| | | (8) | — | — |
| <i>Psychiatric hospitals intended for the care and treatment of inpatients who do not require acute medical services</i> | 1 | 30% | — | — |
| | | (8) | — | — |

¹ Based on ASHRAE 52.2.

² Based on DOP test in accordance with MIL-STD-282 or based on ASHRAE 52.2.

³ HEPA filters at air outlet or other locations when approved by the Authority Having Jurisdiction.

⁴ HEPA filter located in the supply duct which serves the positive-pressure isolation room or rooms may serve more than one supply outlet and more than one positive-pressure isolation room. HEPA filter or a filter with minimum efficiency reporting value (MERV) of 17 installation shall be designed and equipped to permit safe removal, disposal and replacement of filters.

⁵ The numbers in parentheses represent MERV rating based on ASHRAE 52.2.

**TABLE 4-C
FILTER EFFICIENCIES FOR CENTRAL VENTILATION AND AIR-CONDITIONING SYSTEMS IN SKILLED NURSING FACILITIES AND INTERMEDIATE CARE FACILITIES AND CORRECTIONAL TREATMENT CENTERS¹**

| AREA DESIGNATION | MINIMUM NUMBER OF FILTER BANKS | FILTER EFFICIENCY % FILTER BANK (MINIMUM EFFICIENCY REPORTING VALUE MERV) ³ | |
|--|--------------------------------|---|--------------------|
| | | NO. 1 ¹ | NO. 2 ¹ |
| | | <i>All areas for inpatient care, treatment and/or diagnosis, and those areas providing direct service or cleaning supplies)</i> | 2 |
| | | (8) | (13) |
| <i>Administrative, bulk storage, soiled holding, laundries and food prep areas</i> | 1 | 30% ² | — |
| | | (8) | — |

¹ Based on ASHRAE 52.2.

² Filters are not required for evaporative coolers serving laundries and food preparation areas.

³ The numbers in parentheses represent MERV rating based on ASHRAE 52.2.

**CALIFORNIA MECHANICAL CODE – MATRIX ADOPTION TABLE
CHAPTER 5 – EXHAUST SYSTEMS**

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the code user. See Chapter 1 for state agency authority and building applications.)

| Adopting Agency | BSC | BSC- CG | SFM | HCD | | | DSA | | | OSHPD | | | | | BSCC | DPH | AGR | DWR | CEC | CA | SL | SLC |
|---|-----|------------|-----|-----|---|------|-----|----|-------|-------|----|---|---|---|------|-----|-----|-----|-----|----|----|-----|
| | | | | 1 | 2 | 1-AC | AC | SS | SS/CC | 1 | 1R | 2 | 3 | 4 | | | | | | | | |
| Adopt Entire Chapter | | | | X | X | | | | | | | | | X | | | | | | | | |
| Adopt Entire Chapter as amended (amended sections listed below) | X | | X | | | | | X | X | X | X | X | | X | X | | | | | | | |
| Adopt only those sections that are listed below | | X | | | | | | | | | | | | | | | | | | | X | |
| Chapter/Section | | | | | | | | | | | | | | | | | | | | | | |
| 504.1.1 | | | | | | | | | | X | X | X | | X | X | | | | | | | |
| 505.12 | | | | | | | | | | | | | | | | | | | | | X | |
| 505.12.1 | | | | | | | | | | | | | | | | | | | | | X | |
| 507.7 | | | | | | | | | | X | | X | X | X | X | | | | | | | |
| 508.5 | | | | | | | | | | X | X | X | | X | X | | | | | | | |
| 509.2.3 | | | X | | | | | | | | | | | | | | | | | | | |
| 509.2.3.4 | | | | | | | | | | | | | | | | X | | | | | | |
| 511.1.6 | | X | | | | | X | X | | | | | | | | | | | | | | |
| 512.2.5 | | | | | | | X | X | | | | | | | | | | | | | | |
| 513.2.2 | | | X | | | | X | X | | | | | | | | | | | | | | |
| 513.2.2 Exception 2 | | | | | | | X | X | | | | | | | | | | | | | | |
| 513.3.2 | | | X | | | | X | X | | | | | | | | | | | | | | |
| 513.11 | | | X | | | | X | X | | | | | | | | | | | | | | |
| 513.11.1 | | | X | | | | X | X | | | | | | | | | | | | | | |
| 516.2.7 Exception | | | X | | | | X | X | | | | | | | | | | | | | | |
| 516.2.9 | | | X | | | | X | X | | | | | | | | | | | | | | |

This state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.0.

507.7 Pharmaceutical Compounding Exhaust Discharge. [OSHPD 1, 2, 3, 4 & 5] Exhaust discharge from fans serving the compounding suite shall extend at least 7 feet (2134 mm) above the roof and discharge vertically upward. Self-draining stacks or equivalent shall be used for rain protection. Rain caps which divert the exhaust toward the roof shall be prohibited.

508.0 Type I Hoods.

508.1 Where Required. Type I hoods shall be installed at or above commercial-type deep-fat fryers, broilers, grills, hot-top ranges, ovens, barbecues, rotisseries, and similar equipment that emits comparable amounts of smoke or grease in a food-processing establishment. For the purpose of this section, a food-processing establishment shall include a building or portion thereof used for the processing of food, but shall not include a dwelling unit.

Exceptions:

- (1) Cooking appliance that is in accordance with UL 710B for reduced emissions where the grease discharge does not exceed 2.9 E-09 ounces per cubic inch (oz/in³) (5.0 E-06 kg/m³) where operated with a total airflow of 500 cubic feet per minute (cfm) (0.236 m³/s).
- (2) Recirculating systems listed in accordance with UL 710B and installed in accordance with Section 516.0.

508.2 Listed Type I Hood Assemblies. Listed hood assemblies shall be installed in accordance with the terms of their listing and the manufacturer's installation instructions. Listed hood assemblies shall be tested in accordance with UL 710. [NFPA 96:5.4]

508.2.1 Listed Ultraviolet Hoods. Listed ultraviolet hoods shall be installed and maintained in accordance with the terms of their listing and the manufacturer's installation instructions. Duct systems connected to ultraviolet hoods shall comply with Section 510.0. Ultraviolet hoods shall be tested and listed in accordance with UL 710 and UL 710C. [NFPA 96:5.5]

508.2.2 Construction of Listed Exhaust Hoods. Listed exhaust hoods with or without exhaust dampers shall be permitted to be constructed of materials required by the listing. [NFPA 96:5.1.6]

508.2.3 Assembly of Listed Exhaust Hoods. Listed exhaust hoods with or without exhaust dampers shall be permitted to be assembled in accordance with the listing requirements. [NFPA 96:5.1.7]

508.3 Construction of Type I Hoods. The hood or that portion of a primary collection means designed for collecting cooking vapors and residues constructed of steel shall be not less than 0.048 of an inch (1.219 mm) (No. 18 MSG), stainless steel not less than 0.036 of an inch (0.914 mm) (No. 20 MSG) in thickness, or other approved material of equivalent strength and fire and corrosion resistance. [NFPA 96:5.1.1]

Exception: Listed exhaust hoods.

- » **508.3.1 Grease Vapor.** Wall-mounted exhaust hood assemblies shall be tight fitting against the back wall as to not permit passage of grease vapor behind the hood, or between the back wall and the hood assembly. [NFPA 96:5.1.13]

508.3.2 Seams, Joints, and Penetrations. Seams, joints, and penetrations of the hood enclosure that direct and capture grease-laden vapors and exhaust gases shall have a liquid-tight continuous external weld to the hood's lower outermost perimeter. [NFPA 96:5.1.2]

Exceptions:

- (1) Seams, joints, and penetrations of the hood shall be permitted to be internally welded, provided that the weld is formed smooth or ground smooth, so as to not trap grease, and is cleanable. [NFPA 96:5.1.3]
- (2) Penetrations shall be permitted to be sealed by devices that are listed for such use and whose presence does not detract from the hood's or duct's structural integrity. [NFPA 96:5.1.5]

508.3.2.1 Sealed. Internal hood joints, seams, filter support frames, and appurtenances attached inside the hood shall be sealed or otherwise made gaskettight. [NFPA 96:5.1.4]

508.3.3 Eyebrow-Type Hoods. Eyebrow-type hoods over gas or electric ovens shall be permitted to have a duct constructed as required in Section 510.0 from the oven flue(s) connected to the hood canopy upstream of the exhaust plenum, as shown in Figure 508.3.3. [NFPA 96:5.1.8.1]

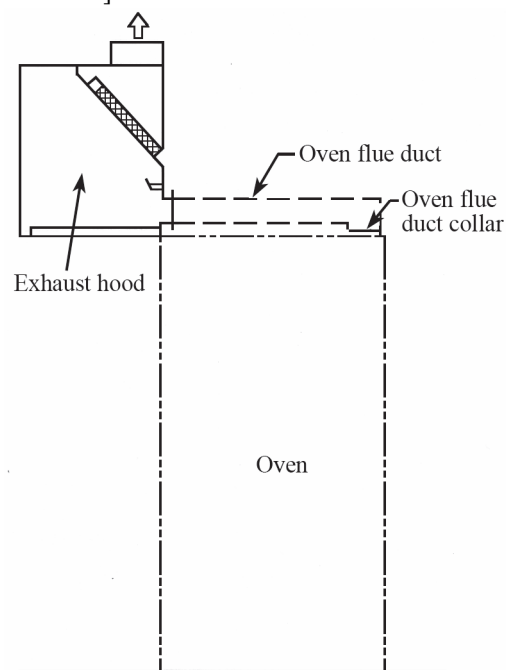


FIGURE 508.3.3
TYPICAL SECTION OF EYEBROW-TYPE HOOD
[NFPA 96: FIGURE 5.1.8.1]

508.3.3.1 Duct Connection. The duct connecting the oven flue(s) to the hood canopy shall be connected with a continuous weld or have a duct-to-duct connection. [See Figure 511.1.2(2) through Figure 511.1.2(4)] [NFPA 96:5.1.8.2]

508.3.4 Insulation. Insulation materials other than electrical insulation shall have a flame spread index of

not more than 25, where tested in accordance with ASTM E84 or UL 723. Adhesives or cements used in the installation of insulating materials shall be in accordance with this section where tested with the specific insulating material. [NFPA 96:5.1.9, 5.1.10]

» **508.3.5 Exhaust Hood Assemblies with Integrated Supply-Air Plenums.** The construction and size of exhaust hood assemblies with integrated supply air plenums shall be in accordance with the requirements of Section 508.1 through Section 508.5. [NFPA 96:5.3.1]

» **508.3.5.1 Outer Shell.** The construction of the outer shell or the inner exhaust shell shall be in accordance with Section 508.1 through Section 508.3.4. [NFPA 96:5.3.2]

» **508.3.5.2 Inner Shell.** Where the outer shell is welded, the inner shell shall be of greasetight construction. [NFPA 96:5.3.3]

» **508.3.5.3 Fire Dampers.** A fire-actuated damper shall be installed in the supply air plenum at each point where a supply air duct inlet or a supply air outlet penetrates the continuously welded shell of the assembly. [NFPA 96:5.3.4.1]

» **508.3.5.3.1 Listing.** The fire damper shall be listed for such use or be part of a listed exhaust hood with or without exhaust damper. [NFPA 96:5.3.4.2]

» **508.3.5.3.2 Actuating Temperature.** The actuation device shall have a temperature rating not to exceed 286°F (141°C). [NFPA 96:5.3.4.3]

» **508.3.5.3.3 Exemption.** Supply air plenums that discharge air from the face rather than from the bottom or into the exhaust hood and that are isolated from the exhaust hood by the continuously welded shell extending to the lower outermost perimeter of the entire hood assembly shall not require a fire-actuated damper. [NFPA 96:5.3.4.4]

» **508.4 Supports.** Hoods shall be secured in place [OSHPD 1, 1R, 2, 4 & 5] to resist the lateral loads given in the California Building Code, Title 24, Part 2 by noncombustible supports. The supports shall be capable of supporting the expected weight of the hood and plus 800 pounds (362.9 kg).

» **508.5 Hood Size.** Hoods shall be sized in accordance with the airflow capacity in accordance with Section 508.5.1.1 and installed to provide for the removal of heat, and capture and removal of grease-laden vapors in accordance with Section 511.2.2.

» **508.5.1 Canopy Size and Location.** For canopy type commercial cooking hoods, the inside edge thereof shall overhang or extend a horizontal distance of not less than 6 inches (152 mm) beyond the edge of the cooking surface on open sides, and the vertical distance between the lip of the hood and the cooking surface shall not exceed 4 feet (1219 mm).

Exception: Listed exhaust hoods are to be installed in accordance with the terms of their listings and the manufacturer’s installation instructions.

508.5.1.1 Capacity of Hoods. Canopy-type commercial cooking hoods shall exhaust through the hood with a quantity of air not less than determined by the application in accordance with Section 508.5.1.2 through Section 508.5.1.5. The exhaust quantity shall be the net exhaust from the hood determined in accordance with Equation 508.5.1.1. The duty level for the hood shall be the duty level of the appliance that has the highest (heaviest) duty level of appliances installed underneath the hood.

Exception: Listed exhaust hoods installed in accordance with the manufacturer’s installation instructions.

$$E_{NET} = E_{HOOD} - MA_{ID} \quad (\text{Equation 508.5.1.1})$$

Where:

E_{NET} = net hood exhaust

E_{HOOD} = total hood exhaust

MA_{ID} = makeup air, internal discharge

508.5.1.2 Extra-Heavy-Duty Cooking Appliances. The minimum net airflow for hoods used for solid fuel cooking appliances such as charcoal, briquette, and mesquite to provide the heat source for cooking shall be in accordance with Table 508.5.1.2.

TABLE 508.5.1.2
EXTRA-HEAVY-DUTY COOKING APPLIANCE AIRFLOW

| TYPE OF HOOD | AIRFLOW (cubic foot per minute per linear foot of hood) |
|---------------------------------|---|
| Backshelf/pass-over | Not permitted |
| Double island canopy (per side) | 550 |
| Eyebrow | Not permitted |
| Single island canopy | 700 |
| Wall-mounted canopy | 550 |

For SI units: 1 cubic foot per minute = 0.00047 m³/s, 1 foot = 304.8 mm

508.5.1.3 Heavy-Duty Cooking Appliances. The minimum net airflow for hoods used for cooking appliances such as gas under-fired broilers, gas chain (conveyor) broilers, electric and gas wok ranges, and electric and gas over-fired (upright) broilers shall be in accordance with Table 508.5.1.3.

TABLE 508.5.1.3
HEAVY-DUTY COOKING APPLIANCE AIRFLOW

| TYPE OF HOOD | AIRFLOW (cubic foot per minute per linear foot of hood) |
|---------------------------------|---|
| Backshelf/pass-over | 400 |
| Double island canopy (per side) | 400 |
| Eyebrow | Not permitted |
| Single island canopy | 600 |
| Wall-mounted canopy | 400 |

For SI units: 1 cubic foot per minute = 0.00047 m³/s, 1 foot = 304.8 mm

- (9) Duct inner liner shall be installed at not less than 1 inch (25.4 mm) on the collar and past the bead prior to the application of the tape and mechanical fastener. Where mastic is used instead of tape, the mastic shall be applied in accordance the mastic manufacturer’s instructions.
- (10) Duct outer vapor barriers shall be secured using two wraps of approved tape. A mechanical fastener shall be permitted to be used in place of, or in combination with, the tape.
- (11) Flexible air ducts shall not penetrate a fire-resistance-rated assembly or construction.
- (12) The temperature of the air to be conveyed in a flexible air duct shall not exceed 250°F (121°C).
- (13) Flexible Air ducts shall be sealed in accordance with Section 603.10.

603.6 Plastic Ducts. Plastic air ducts and fittings shall be permitted where installed underground and listed for such use.

603.7 Protection of Ducts. Ducts installed in locations where they are exposed to mechanical damage by vehicles or from other causes shall be protected by approved barriers.

603.8 Support of Ducts. Installers shall provide the manufacturer’s field fabrication and installation instructions.

Factory-made air ducts that are in accordance with UL 181 shall be supported in accordance with the manufacturer’s installation instructions. Other ducts shall comply with SMACNA HVAC Duct Construction Standards – Metal and Flexible.

603.9 Protection Against Flood Damage. In flood hazard areas, ducts shall be located above the elevation required by the building code for utilities and attendant equipment or the elevation of the lowest floor, whichever is higher, or shall be designed and constructed to prevent water from entering or accumulating within the ducts during floods up to such elevation. Where the ducts are located below that elevation, the ducts shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.

603.10 Joints and Seams of Ducts. Joints and seams for duct systems shall comply with SMACNA HVAC Duct Construction Standards – Metal and Flexible. Joints of duct systems shall be made substantially airtight by means of tapes, mastics, gasketing, or other means. Crimp joints for round ducts shall have a contact lap of not less than 1½ inches (38 mm) and shall be mechanically fastened by means of not less than three sheet-metal screws equally spaced around the joint, or an equivalent fastening method.

Joints and seams and reinforcements for factory-made air ducts and plenums shall comply with the conditions of prior approval in accordance with the installation instructions that shall accompany the product. Closure systems for sealing factory made air ducts and plenums shall be listed and labeled in accordance with UL 181A or UL 181B, and marked in accordance with Table 603.10.

**TABLE 603.10
CLOSURE MARKINGS**

| TYPE OF DUCTWORK | STANDARD | TYPE OF CLOSURE SYSTEM | MARKING |
|------------------------------------|----------|--------------------------|----------|
| Rigid Metallic or Rigid Fiberglass | UL 181A | Pressure Sensitive Tape | 181A-P |
| Rigid Metallic or Rigid Fiberglass | UL 181A | Mastic Tape | 181A-M |
| Rigid Metallic or Rigid Fiberglass | UL 181A | Heat Sensitive Tape | 181A-H |
| Flexible Air Ducts | UL 181B | Pressure Sensitive Tape* | 181B-FX* |
| Flexible Air Ducts | UL 181B | Mastic* | 181B-M* |

* Mechanical fasteners shall be used in conjunction with a listed pressure sensitive tape or mastic in accordance with UL181. Nonmetallic mechanical fasteners shall be listed and labeled in accordance with UL 181B and labeled “181B-C.”

603.10.1 Duct Leakage Tests. [Not adopted by HCD] Ductwork shall be leak-tested in accordance with the SMACNA HVAC Air Duct Leakage Test Manual. Representative sections totaling not less than 10 percent of the total installed duct area shall be tested. Where the tested 10 percent fail to comply with the requirements of this section, then 40 percent of the total installed duct area shall be tested. Where the tested 40 percent fail to comply with the requirements of this section, then 100 percent of the total installed duct area shall be tested. Sections shall be selected by the building owner or designated representative of the building owner. Positive pressure leakage testing shall be permitted for negative pressure ductwork. The permitted duct leakage shall be not more than the following:

$$L_{max} = C_L P^{0.65} \text{ (Equation 603.10.1)}$$

Where:

L_{max} = maximum permitted leakage, (ft³/min)/100 square feet [0.0001 (m³/s)/m²] duct surface area.

C_L = six, duct leakage class, (ft³/min)/100 square feet [0.0001 (m³/s)/m²] duct surface area at 1 inch water column (0.2 kPa).

P = test pressure, which shall be equal to the design duct pressure class rating, inch water column (kPa).

603.10.1.1 Duct Leakage Tests for Residential Buildings. [HCD 1 & HCD 2] See California Energy Code Section 150.0(m)(11) for low-rise residential; and Section 140.4(l) for duct leakage tests for other residential buildings.

603.11 Cross Contamination. Exhaust ducts and venting systems under positive pressure shall not extend into or pass through ducts or plenums.

603.12 Underground Installation. Ducts installed underground shall be approved for the installation and shall have a

slope of not less than 1/8 inch per foot (10.4 mm/m) back to the main riser. Ducts, plenums, and fittings shall be permitted to be constructed of concrete, clay, or ceramics where installed in the ground or in a concrete slab, provided the joints are sealed and duct is secured in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible. Metal ducts where installed in or under a concrete slab shall be encased in not less than 2 inches (51 mm) of concrete, secured in accordance with SMACNA HVAC Duct Construction Standards-Metal and Flexible.

603.13 Air Dispersion Systems. Where installed, air dispersion systems shall be completely in exposed locations in duct systems under positive pressure, and not pass through or penetrate fire-resistant-rated construction. Air dispersion systems shall be listed and labeled in accordance with UL 2518.

604.0 Insulation of Ducts.

604.1 General. Air ducts conveying air at temperatures exceeding 140°F (60°C) shall be insulated to maintain an insulation surface temperature of not more than 140°F (60°C). Factory-made air ducts and insulations intended for installation on the exterior of ducts shall be legibly printed with the name of the manufacturer, the thermal resistance (R) value at installed thickness, flame-spread index, and smoke developed index of the composite material. Internal duct liners and insulation shall be installed in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible. **[OSHPD 1, 1R, 2, 3, 4 & 5]** Cold air ducts shall be insulated wherever necessary or to prevent condensation.

Exceptions:

- (1) Factory-installed plenums, casings, or ductwork furnished as a part of HVAC equipment tested and rated in accordance with approved energy efficiency standards.
- (2) Ducts or plenums located in conditioned spaces where heat gain or heat loss will not increase energy use.
- (3) For runouts less than 10 feet (3048 mm) in length to air terminals or air outlets, the rated R-value of insulation need not exceed R-3.5.
- (4) Backs of air outlets and outlet plenums exposed to unconditioned or indirectly conditioned spaces with face areas exceeding 5 square feet (0.5 m²) need not exceed R-2; those 5 square feet (0.5 m²) or smaller need not be insulated.
- (5) Ducts and plenums used exclusively for evaporative cooling systems.

604.1.1 Within Ducts or Plenums. Materials installed within ducts and plenums for insulating, sound deadening, or other purposes shall have a mold, humidity, and erosion-resistant surface where tested in accordance with UL 181. Duct liners in systems operating with air velocities exceeding 2000 feet per minute (10.16 m/s) shall be fastened with both adhesive and mechanical fasteners, and exposed edges shall have approved treatment to withstand the operating velocity. Where the internal insulation is capable of being in contact with condensates or other liquids, the material shall be water-resistant.

604.1.2 Duct Coverings and Linings. Insulation applied to the surface of ducts, including duct coverings, linings, tapes, and adhesives, located in buildings shall have a flame-spread index not to exceed 25 and a smoke-developed index not to exceed 50, where tested in accordance with ASTM E84 or UL 723. The specimen preparation and mounting procedures of ASTM E2231 shall be used. Air duct coverings and linings shall not flame, glow, smolder, or smoke where tested in accordance with ASTM C411 at the temperature to which they are exposed in service. In no case shall the test temperature be less than 250°F (121°C). Coverings shall not penetrate a fire-resistance-rated assembly.

604.2 [OSHPD 1, 1R, 2, 3 (surgical clinics), 4 & 5] Thermal acoustical lining materials shall not be installed within ducts, terminal boxes, sound traps, and other in-duct systems serving areas such as operating, cesarean operating rooms, delivery rooms, post anesthesia care units, cystoscopy, cardiac catheterization labs, nurseries, intensive care units, newborn intensive care units, and airborne infection isolation rooms unless filters with 90 percent average efficiency based on ASHRAE Standard 52.2 or minimum efficiency rating value (MERV) of 14 are installed downstream of the duct lining.

604.3 [OSHPD 1, 1R, 2, 4 & 5] Thermal or acoustical lining materials shall not be installed within ducts which are downstream of the 99.97 percent high-efficiency particulate air (HEPA) filter or with minimum efficiency rating value (MERV) of 17 required in Section 408.2.1 for protective environment rooms.

605.0 Smoke Dampers, Fire Dampers, and Ceiling Dampers.

605.1 Smoke Dampers. Smoke dampers shall comply with UL 555S, and shall be installed in accordance with the manufacturer’s installation instructions where required by the California Building Code or California Residential Code.

605.2 Fire Dampers. Fire dampers shall comply with UL 555, and shall be installed in accordance with the manufacturer’s installation instructions where required by the building code. Fire dampers shall have been tested for closure under airflow conditions and shall be labeled for both maximum airflow permitted and direction of flow. Where more than one damper is installed at a point in a single air path, the entire airflow shall be assumed to be passing through the smallest damper area.

Ductwork shall be connected to damper sleeves or assemblies in accordance with the fire damper manufacturer’s installation instructions.

605.3 Ceiling Radiation Dampers. Ceiling radiation dampers shall comply with UL 555C, and shall be installed in accordance with the manufacturer’s installation instructions in the fire-resistive ceiling membrane of floor-ceiling and roof-ceiling assemblies where required by the building code. Fire dampers not meeting the temperature limitation of ceiling radiation dampers shall not be used as a substitute.

**CALIFORNIA MECHANICAL CODE – MATRIX ADOPTION TABLE
CHAPTER 10 – BOILERS AND PRESSURE VESSELS**

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the code user. See Chapter 1 for state agency authority and building applications.)

| Adopting Agency | BSC | BSC- CG | SFM | HCD | | | DSA | | | OSHPD | | | | | | BSCC | DPH | AGR | DWR | CEC | CA | SL | SLC |
|---|----------|------------|----------|----------|----------|------|-----|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----|-----|-----|-----|----|----|-----|
| | | | | 1 | 2 | 1-AC | AC | SS | SS/CC | 1 | 1R | 2 | 3 | 4 | 5 | | | | | | | | |
| Adopt Entire Chapter | X | | X | | | | | X | X | X | X | X | X | X | | X | | | | | | | |
| Adopt Entire Chapter as amended (amended sections listed below) | | | | X | X | | | | | | | | | | | | | | | | | | |
| Adopt only those sections that are listed below | | | | | | | | | | | | | | | | | | | | | | | |
| Chapter/Section | | | | | | | | | | | | | | | | | | | | | | | |
| 1001.2 | | | | X | X | | | | | | | | | | | | | | | | | | |
| 1001.2.1 | | | | | | | | | | X | X | X | X | X | X | | | | | | | | |

*This state agency does not adopt sections identified with the following symbol: †
The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.0.*

CHAPTER 10

BOILERS AND PRESSURE VESSELS

1001.0 General.

1001.1 Applicability. The requirements of this chapter shall apply to the construction, installation, operation, repair, and alteration of boilers and pressure vessels. Low-pressure boilers shall comply with this chapter and Section 904.0.

Exceptions:

- (1) Listed and approved potable water heaters with a nominal capacity not exceeding 120 gallons (454 L) and having a heat input not exceeding 200 000 British thermal units per hour (Btu/h) (58.6 kW) used for hot water supply at a pressure not exceeding 160 pounds-force per square inch (psi) (1103 kPa) and at temperatures not exceeding 210°F (99°C), in accordance with the plumbing code.
- (2) Pressure vessels used for unheated water supply, including those containing air that serves as a cushion and is compressed by the introduction of water and tanks connected to sprinkler systems.
- (3) Portable unfired pressure vessels and Interstate Commerce Commission (I.C.C.) containers.
- (4) Containers for liquefied petroleum gases, bulk oxygen, and medical gas that are regulated by the fire code.
- (5) Unfired pressure vessels in business, factory, hazardous, mercantile, residential, storage, and utility occupancies having a volume not exceeding 5 cubic feet (0.14 m³) and operating at pressures not exceeding 250 psi (1724 kPa).
- (6) Pressure vessels used in refrigeration systems shall comply with Chapter 11.
- (7) Pressure tanks used in conjunction with coaxial cables, telephone cables, power cables, and other similar humidity control systems.
- (8) A boiler or pressure vessel subject to regular inspection by federal inspectors or licensed by federal authorities.

1001.2 Boiler Rooms and Enclosures. Boiler rooms and enclosures shall comply with the *California Building Code*.

1001.2.1 [OSHPD 1, 1R, 2, 3, 4 & 5] *In no case shall boiler room volume or clearances be reduced below those required by the conditions of the boiler listing. The boiler and the boiler room ventilation system, including fans, controls, and damper motors shall be on essential power when required by Section 321.0. The ventilation system shall either operate continuously, or, if interlocked with the boiler(s) it shall not interfere with the proper boiler operation. Listed boilers shall be installed with clearances in accordance with the manufacturer's instructions.*

1001.3 Air for Combustion and Ventilation. Air for combustion and ventilation shall be provided in accordance with Chapter 7.

1001.4 Drainage. For heating or hot-water-supply boiler applications, the boiler room shall be equipped with a floor drain or other approved means for disposing of the accumulation of liquid wastes incident to cleaning, recharging, and

routine maintenance. No steam pipe shall be directly connected to a part of a plumbing or drainage system, nor shall a water having a temperature above 140°F (60°C) be discharged under pressure directly into a part of a drainage system. Pipes from boilers shall discharge by means of indirect waste piping as determined by the Authority Having Jurisdiction or the boiler manufacturer's instructions.

1001.5 Mounting. Equipment shall be set or mounted on a level base capable of supporting and distributing the weight contained thereon. Boilers, tanks, and equipment shall be securely anchored to the structure. Equipment requiring vibration isolation shall be installed as designed by a registered design professional and approved by the Authority Having Jurisdiction.

1001.5.1 Floors. Boilers shall be mounted on floors of noncombustible construction unless listed for mounting on combustible flooring.

1001.6 Chimneys or Vents. Boilers shall be connected to a chimney or vent, as provided for other fuel-burning equipment in Chapter 8 of this code.

1002.0 Standards.

1002.1 General. Pressure vessels shall be constructed and designed in accordance with the ASME Boiler & Pressure Vessel Code (BPVC) Section VIII. Boilers shall be constructed, designed, and installed in accordance with one of the following:

- (1) ASME BPVC Section I
- (2) ASME BPVC Section IV
- (3) NFPA 85

1002.2 Oil-Burning Boilers. Oil-burning boilers shall comply with Section 1002.2.1 and Section 1002.2.2.

1002.2.1 Listing & Labeling. Oil-burning boilers shall be listed and labeled in accordance with UL 726.

1002.2.2 Installation. Tanks, piping, and valves for oil-burning boilers shall be installed in accordance with NFPA 31.

1002.3 Electric Boilers. Electric boilers shall be listed and labeled in accordance with UL 834.

1002.4 Solid-Fuel-Fired Boilers. Solid-fuel-fired boilers shall comply with UL 2523 and shall be installed in accordance with the manufacturer's installation instructions.

1002.5 Dual Purpose Water Heater. Water heaters utilized for combined space- and water-heating applications shall be listed or labeled in accordance with the standards referenced in Table 1203.2, and shall be installed in accordance with the manufacturer's installation instructions.

1003.0 Detailed Requirements.

1003.1 Safety Requirements. The construction of boilers and pressure vessels and the installation thereof shall be in accordance with minimum requirements for safety from

structural and mechanical failure and excessive pressures as established by the Authority Having Jurisdiction in accordance with nationally recognized standards.

1003.2 Controls. Required electrical, mechanical, safety, and operating controls shall carry the approval of an approved testing agency or be accepted by the Authority Having Jurisdiction. Electrical controls shall be of such design and construction as to be suitable for installation in the environment in which they are located.

1003.2.1 Automatic Boilers. Automatic boilers shall be equipped with controls and limit devices in accordance with ASME CSD-1 or Table 1003.2.1.

The Authority Having Jurisdiction shall have the authority to approve solid-fuel-fired boilers that comply with the safety requirements for automatic gas fired boilers or oil fired boilers.

1003.3 Gauges. Steam boilers shall be provided with a pressure gauge and a water level glass. Water boilers shall be provided with a pressure gauge and a temperature gauge. Automatic boilers shall be equipped with the following gauges, as applicable:

- (1) Oil temperature
- (2) Oil suction pressure
- (3) High and low gas pressure
- (4) Stack temperature
- (5) Windbox pressure

1003.4 Stack Dampers. Stack dampers on boilers fired with oil or solid fuel shall not close off more than 80 percent of the stack area where closed, except on automatic boilers with prepurge, automatic draft control, and interlock. Operative dampers shall not be placed within a stack, flue, or vent of a gas-fired boiler, except on an automatic boiler with prepurge, automatic draft control, and interlock.

1003.5 Welding. Welding on pressure vessels shall be done by certified welders in accordance with nationally recognized standards.

1004.0 Expansion Tanks.

1004.1 General. An expansion tank shall be installed in a hot-water-heating system as a means for controlling increased pressure caused by thermal expansion. Expansion tanks shall be of the closed or open type and securely fastened to the structure. Tanks shall be rated for the pressure of the system. Supports shall be capable of carrying twice the weight of the tank filled with water without placing a strain on connecting piping.

Hot-water-heating systems incorporating hot water tanks or fluid relief columns shall be installed to prevent freezing under normal operating conditions.

1004.2 Open-Type Expansion Tanks. Open type expansion tanks shall be located not less than 3 feet (914 mm) above the highest point of the system. Such tanks shall be sized based on the capacity of the system. An overflow with a diameter of not less than one-half the size of the supply or not less than 1 inch (25 mm) in diameter shall be installed at the top of the tank. The overflow shall discharge through an air gap into the drainage system.

1004.3 Closed-Type Systems. Closed-type systems shall have an airtight tank or other approved air cushion that will be consistent with the volume and capacity of the system, and shall be designed for a hydrostatic test pressure of two and one-half times the allowable working pressure of the system. Expansion tanks for systems designed to operate at more than 30 pounds-force per square inch (psi) (207 kPa) shall comply with ASME BPVC Section VIII. Provisions shall be made for draining the tank without emptying the system.

1004.4 Minimum Capacity of Closed-Type Tank. The minimum capacity for a gravity-type hot water system expansion tank shall be in accordance with Table 1004.4(1). The minimum capacity for a forced-type hot water system expansion tank shall be in accordance with Table 1004.4(2), or Equation 1004.4. Equation 1004.4 shall not be used for diaphragm-type expansion tanks.

$$V_t = \frac{(0.00041t - 0.0466) V_s}{\left(\frac{P_a}{P_f} - \frac{P_a}{P_o}\right)} \quad \text{(Equation 1004.4)}$$

Where:

- V_t = Minimum volume of expansion tank, gallons
- V_s = Volume of system, not including expansion tank, gallons
- t = Average operating temperature, °F
- P_a = Atmospheric pressure, feet H₂O absolute
- P_f = Fill pressure, feet H₂O absolute
- P_o = Maximum operating pressure, feet H₂O absolute

For SI units: 1 gallon = 3.785 L, °C = (°F-32)/1.8, 1 foot of water = 2.99 kPa

**TABLE 1004.4(1)
EXPANSION TANK CAPACITIES FOR GRAVITY
HOT WATER SYSTEMS¹**

| INSTALLED EQUIVALENT DIRECT RADIATION ² (square feet) | TANK CAPACITY (gallons) |
|---|----------------------------|
| Up to 350 | 18 |
| Up to 450 | 21 |
| Up to 650 | 24 |
| Up to 900 | 30 |
| Up to 1100 | 35 |
| Up to 1400 | 40 |
| Up to 1600 | 2 to 30 |
| Up to 1800 | 2 to 30 |
| Up to 2000 | 2 to 35 |
| Up to 2400 | 2 to 40 |

For SI units: 1 gallon = 3.785 L, 1 square foot = 0.0929 m²

Notes:

- ¹ Based on a two-pipe system with an average operating water temperature of 170°F (77°C), using cast-iron column radiation with a heat emission rate of 150 British thermal units per square foot hour [Btu/(ft²•h)] (473 W/m²) equivalent direct radiation.
- ² For systems that exceed 2400 square feet (222.9 m²) of installed equivalent direct water radiation, the required capacity of the cushion tank shall be increased on the basis of 1 gallon (4 L) tank capacity per 33 square feet (3.1 m²) of additional equivalent direct radiation.

**CALIFORNIA MECHANICAL CODE – MATRIX ADOPTION TABLE
CHAPTER 11 – REFRIGERATION**

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the code user. See Chapter 1 for state agency authority and building applications.)

| Adopting Agency | BSC | BSC- CG | SFM | HCD | | | DSA | | | OSHPD | | | | | BSCC | DPH | AGR | DWR | CEC | CA | SL | SLC |
|---|-----|------------|-----|-----|---|------|-----|----|-------|-------|----|---|---|---|------|-----|-----|-----|-----|----|----|-----|
| | | | | 1 | 2 | 1-AC | AC | SS | SS/CC | 1 | 1R | 2 | 3 | 4 | | | | | | | | |
| Adopt Entire Chapter | X | | | X | X | | | | | | | | | | | X | | | | | | |
| Adopt Entire Chapter as amended (amended sections listed below) | | | X | | | | | X | X | X | X | X | X | X | | | | | | | | |
| Adopt only those sections that are listed below | | | | | | | | | | | | | | | | | | | | | | |
| Chapter/Section | | | | | | | | | | | | | | | | | | | | | | |
| 1104.3, <i>Exception</i> | | | | | | | | | | X | | | | X | | | | | | | | |
| 1108.4 | | | X | | | | | X | X | | | | | | | | | | | | | |
| Table 1104.1 | | | | | | | | | | X | X | X | X | X | X | | | | | | | |

This state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.0.

CHAPTER 11

REFRIGERATION

1101.0 General.

1101.1 Applicability. Part I governs the design, installation, and construction of refrigeration systems, equipment, refrigerant piping, pressure vessels, safety devices, replacement of parts, alterations, and substitution of different refrigerants. Part II governs the installation and construction of cooling towers.

1101.2 Equipment. Equipment for refrigerant recovery, recycling, or both shall comply with UL 1963.

Part I – Refrigeration Systems.

1102.0 Refrigeration Systems.

1102.1 General. Refrigeration systems using a refrigerant other than ammonia shall comply with this chapter and ASHRAE 15.

1102.2 Ammonia Refrigeration Systems. Refrigeration systems using ammonia as the refrigerant shall comply with IAR 2, IAR 3, IAR 4, and IAR 5 and shall not be required to comply with this chapter.

» **1102.3 Refrigerants.** The refrigerant used shall be of a type listed in Table 1102.3 or in accordance with ASHRAE 34 where approved by the Authority Having Jurisdiction.

Exception: Lithium bromide absorption systems using water as the refrigerant.

1103.0 Classification.

1103.1 Classification of Refrigerants. Refrigerants shall be classified in accordance with Table 1102.3 or in accordance with ASHRAE 34 where approved by the Authority Having Jurisdiction.

1103.1.1 Safety Group. Table 1102.3 classifies refrigerants by toxicity and flammability, and assigns safety groups using combinations of toxicity class and flammability class. For the purposes of this chapter, the refrigerant Groups A1, A2L, A2, A3, B1, B2L, B2, and B3 shall be considered to be individual and distinct safety groups. Each refrigerant is assigned into not more than one group.

1103.2 Classification of Refrigeration Systems. Refrigeration systems shall be classified according to the degree of probability that a leakage of refrigerant will enter an occupancy-classified area in accordance with Section 1103.2.1 and Section 1103.2.2. [ASHRAE 15:5.2]

1103.2.1 High-Probability System. Systems in which the basic design, or the location of components, is such that a leakage of refrigerant from a failed connection, seal, or component will enter the occupied space shall be classified as high-probability systems. A high-

probability system shall be a direct system or an indirect open spray system in which the refrigerant is capable of producing pressure that is more than the secondary coolant. [ASHRAE 15:5.2.1]

1103.2.2 Low-Probability System. Systems in which the basic design, or the location of the components, is such that a leakage of refrigerant from a failed connection, seal, or component is not capable of entering the occupied space shall be classified as low-probability systems. A low-probability system shall be an indirect closed system, double indirect system, or an indirect open spray system. In a low-probability indirect open spray system, the secondary coolant pressure remains more than the refrigerant pressure in operating and standby conditions. [ASHRAE 15:5.2.2]

1103.3 Higher Flammability Refrigerants. Group A3 and B3 refrigerants shall not be used except where approved by the Authority Having Jurisdiction.

Exceptions:

- (1) Laboratories with more than 100 square feet (9.29 m²) of space per person.
- (2) Industrial occupancies.
- (3) Listed portable-unit systems containing not more than 0.331 pounds (0.150 kg) of Group A3 refrigerant, provided that the equipment is installed in accordance with the listing and the manufacturer's installation instructions. [ASHRAE 15:7.5.3]

1104.0 Requirements for Refrigerant and Refrigeration System Use.

1104.1 System Selection. Refrigeration systems shall be limited in application in accordance with Table 1104.1, and the requirements of Section 1104.0.

1104.2 Refrigerant Concentration Limit. The concentration of refrigerant in a complete discharge of an independent circuit of high-probability systems shall not exceed the amounts shown in Table 1102.3, except as provided in Section 1104.3 and Section 1104.4. The volume of occupied space shall be determined in accordance with Section 1104.2.1 through Section 1104.2.3.

Exceptions:

- (1) Listed equipment containing not more than 6.6 pounds (2.99 kg) of refrigerant, regardless of the refrigerant safety classification, provided the equipment is installed in accordance with the listing and with the manufacturer's installation instructions.
- (2) Listed equipment for use in laboratories with more than 100 square feet (9.29 m²) of space per person, regardless of the refrigerant safety classification, provided that the equipment is installed in accordance with the listing and the manufacturer's installation instructions. [ASHRAE 15:7.2]

1104.2.1 Volume Calculations. The volume used to convert from refrigerant concentration limits to refrigerating system quantity limits for refrigerants in Section 1104.2 shall be based on the volume of space to which refrigerant disperses in the event of a refrigerant leak. [ASHRAE 15:7.3]

1104.2.2 Nonconnecting Spaces. Where a refrigerating system or part thereof is located in one or more enclosed occupied spaces that do not connect through permanent openings or HVAC ducts, the volume of the smallest occupied space shall be used to determine the refrigerant quantity limit in the system. Where different stories and floor levels connect through an open atrium or mezzanine arrangement, the volume to be used in calculating the refrigerant quantity limit shall be determined by multiplying the floor area of the lowest space by 8.2 feet (2499 mm). [ASHRAE 15:7.3.1]

1104.2.3 Ventilated Spaces. Where a refrigerating system or a part thereof is located within an air handler, in an air distribution duct system, or in an occupied space served by a mechanical ventilation system, the entire air distribution system shall be analyzed to determine the worst-case distribution of leaked refrigerant. The worst case or the smallest volume in which the leaked refrigerant disperses shall be used to determine the refrigerant quantity limit, subject to the criteria in accordance with Section 1104.2.3.1 through Section 1104.2.3.3. [ASHRAE 15:7.3.2]

1104.2.3.1 Closures. Closures in the air distribution system shall be considered. Where one or more spaces of several arranged in parallel are capable of being closed off from the source of the refrigerant leak, their volume(s) shall not be used in the calculation.

Exceptions: The following closure devices shall not be considered:

- (1) Smoke dampers, fire dampers, and combination smoke and fire dampers that close only in an emergency not associated with a refrigerant leak.
- (2) Dampers, such as variable-air-volume (VAV) boxes, that provide limited closure where airflow is not reduced below 10 percent of its maximum with the fan running. [ASHRAE 15:7.3.2.1]

1104.2.3.2 Plenums. The space above a suspended ceiling shall not be included in calculating the refrigerant quantity limit in the system unless such space is part of the air supply or return system. [ASHRAE 15:7.3.2.2]

1104.2.3.3 Supply and Return Ducts. The volume of the supply and return ducts and plenums shall be included where calculating the refrigerant quantity limit in the system. [ASHRAE 15:7.3.2.3]

1104.3 Institutional Occupancies. The RCL value required in Section 1104.2 shall be reduced by 50 percent for the areas of institutional occupancies. The total of Group A2, B2, A3, and B3 refrigerants shall not exceed 550 pounds (249.5 kg) in the occupied areas and machinery rooms of institutional occupancies.

Exception: The total of all Group A2L refrigerants shall not be limited in machinery rooms of institutional occupancies.

[OSHPD 1 & 4] Exception: For technology equipment centers not attached to a patient care area the amounts shown in Table 1102.2 may be calculated at 100 percent.

1104.4 Industrial Occupancies and Refrigerated Rooms. Section 1104.2 shall not apply in industrial occupancies and refrigerated rooms where in accordance with the following:

- (1) The space(s) containing the machinery is (are) separated from other occupancies by tight construction with tight-fitting doors.
- (2) Access is restricted to authorized personnel.
- (3) The floor area per occupant is not less than 100 square feet (9.29 m²).

Exception: The minimum floor area shall not apply where the space is provided with egress directly to the outdoors or into approved building exits.

- (4) Refrigerant detectors are installed with the sensing location and alarm level as required in refrigeration machinery rooms in accordance with Section 1106.2.2.2.
- (5) Open flames and surfaces exceeding 800°F (427°C) shall not be permitted where a Group A2, B2, A3, or B3 refrigerant, is used.
- (6) Electrical equipment that is in accordance with Class 1, Division 2, of the California Electrical Code where the quantity of a Group A2, B2, A3, or B3 refrigerant in an independent circuit is capable of exceeding 25 percent of the lower flammability limit (LFL) upon release to the space based on the volume determined in accordance with Section 1104.2.1 through Section 1104.2.3.
- (7) Refrigerant containing parts in systems exceeding 100 horsepower (74.6 kW) compressor drive power, except evaporators used for refrigeration or dehumidification, condensers used for heating, control and pressure-relief valves for either, and connecting piping, are located in a machinery room or outdoors. [ASHRAE 15:7.2.2]

1104.5 Flammable Refrigerants. The total of Group A2, B2, A3, and B3 refrigerants, other than Group A2L and B2L refrigerants shall not exceed 1100 pounds (498.9 kg) without approval by the Authority Having Jurisdiction. Institutional Occupancies shall comply with Section 1104.3.

1104.6 Applications for Human Comfort and for Non-industrial Occupancies. In nonindustrial occupancies, Group A2, A3, B1, B2, and B3 refrigerants shall not be used in high-probability systems for human comfort.

1104.7 Refrigerant Type and Purity. Refrigerants shall be of a type specified by the equipment manufacturer. Unless otherwise specified by the equipment manufacturer, refrigerants used in new equipment shall be of purity in accordance with AHRI 700.

1104.7.1 Recovered Refrigerants. Recovered refrigerants shall not be reused except in the system from which they were removed or as provided in Section 1104.7.2 or Section 1104.7.3. Where contamination is

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HISTORY NOTE APPENDIX

2019 CALIFORNIA MECHANICAL CODE

CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 4

HISTORY:

For prior code history, see the History Note Appendix to the California Mechanical Code, 2016 Triennial Edition, effective January 1, 2017.

1. *(BSC 03/18, HCD 01/18, DSA-SS 03/18, OSHPD 04/18, SFM 04/18) Adoption by reference of the 2018 Uniform Mechanical Code with necessary amendments to become the 2019 California Mechanical Code, and repeal of the 2015 edition of the Uniform Mechanical Code; effective on January 1, 2020.*
2. *Erratum to correct editorial errors in Matrix Adoption Tables and miscellaneous corrections throughout chapters 1, 3, and 17, effective January 1, 2020.*
3. *2019 Intervening Cycle Update (HCD 05/19, OSHPD 05/19) Adoption of amendments to the 2019 California Mechanical Code. Approved by the California Building Standards Commission on July 13, 2020, published on January 1, 2021, effective on July 1, 2021.*

