Applicable Codes and Standards

I. SCOPE
1. The provisions of the California Mechanical Code shall apply to the installation, alterations, repairs and replacement of mechanical systems, including equipment, appliances, fixtures, fittings and/or appurtenances, including ventiliating, heating, cooling, air-conditioning and refrigeration systems, incinerators and other energy-related systems.

2. CMC Ch.11, 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.

3. Refrigerants are regulated under the provisions CFC Section 606 and CMC Chapter 11; refrigerant quantities are not regulated by CFC Chapter 50 or CBC Chapters 3 and 4.

4. Except as modified by the CMC, refrigeration systems shall comply with ASHRAE 15. In addition, ammonia refrigeration shall comply with IIAR 2.

II. CLASSIFICATION OF REFRIGERANTS/SYSTEMS

1. The refrigerant used shall be of a type listed in Table 1102.2 or in accordance with ASHRAE 34 where approved by AHJ.

2. Refrigerants shall be classified in accordance with Table 1102.2.

3. Refrigeration systems shall be classified as a High-Probability or Low-Probability System according to the degree of probability that a leakage of refrigerant could enter a normally occupied area.

4. When a refrigeration system is located in a refrigeration machinery room, the classification of the refrigeration system is not required.

III. LOCATION OF REFRIGERATION SYSTEMS

1. The concentration of refrigerant in a complete discharge of an independent circuit of high-probability systems shall not exceed the amounts shown in Table 1102.2, except as provided in Sec. 1104.3 and Sec. 1104.4. The volume of occupied space shall be in accordance with Sec. 1104.2.1 through Section 1104.2.3.

2. Refrigeration systems or portions thereof shall not be located within a required exit enclosure.

3. Refrigeration compressors >5 horsepower (3.7 kW) rating shall be located at least 10 feet from an exit opening in a Group A, B, E, F, I, R Div. 1, S Occupancy unless separated by a one-hour fire-resistive occupancy separation.

4. Refrigerant piping shall not be located within a required exit.
### IV. REFRIGERATION MACHINERY ROOMS

1. Refrigeration systems shall be provided with a refrigeration machinery room when any of the following conditions exist:
   - The quantity of refrigerant in a single system exceeds Table 1102.2 amounts.
   - Direct-fired and indirect-fired absorption equipment, except lithium bromide systems using water as the refrigerant.
   - An A1 system having an aggregate compressor horsepower of 100 (74.6 kW) or more.
   - The system contains other than a Group A1 refrigerant. (see exceptions)

See the following exceptions where a machinery room is not required:

- (1) Lithium bromide absorption systems using water as the refrigerant.
- (2) Ammonia-water absorption unit systems installed outdoors, provided that the quantity of refrigerant in a single system does not exceed Table 1102.2 amounts and the discharge is shielded and dispersed.
- (3) Systems containing less than 300 pounds (136.1 kg) of refrigerant R-123 and located in an approved exterior location.
- (4) Systems containing less than 35 pounds (15.9 kg) of refrigerant R-717 and located in an approved exterior location.

2. All components containing refrigerant shall be located either in a machinery room or outdoors.

3. When a refrigeration system is located outdoors more than 20 ft from building openings and is enclosed by a penthouse, lean-to, or other open structure, natural or mechanical ventilation shall be provided.

### V. REFRIGERATION MACHINERY ROOM CONSTRUCTION

1. Refrigeration machinery rooms shall be separated from other portions of the building per CBC Table 509.

2. Penetrations into machinery rooms shall be sealed to inhibit the passage of refrigerant vapor.

### VI. REFRIGERATION MACHINERY ROOM CONTENTS

1. Refrigeration machinery rooms shall house all refrigerant-containing portions of the system other than the piping and evaporators permitted by CMC Section 1104.4, discharge piping required by CMC Chapter 11, and cooling towers regulated by CMC Chapter 11, Part II and their essential piping.
2016 Refrigeration Machinery Rooms Equipment Reminder List

2. Open flames or devices having an exposed surface exceeding 800°F are prohibited in refrigeration machinery rooms.  CMC 1106.8

3. Combustion air or return air shall not be taken from or through a refrigeration machinery room unless ducted and sealed to prevent refrigerant leakage into the airstream or a refrigerant leak detector shall automatically shut down such equipment in the event of refrigerant leakage. CMC 1106.6

4. Equipment, piping, ducts, vents or similar devices which are not essential for the refrigeration process, maintenance of the equipment or for the illumination, ventilation or fire protection of the room shall not be placed in or pass through a refrigeration machinery room. CMC 1108.1

VII. REFRIGERATION MACHINERY ROOM ACCESS/EGRESS

1. Refrigeration machinery rooms shall be of such dimensions that all system parts are readily accessible with adequate space for maintenance and operations. CMC 1106.2

2. An unobstructed walking space at least 3 feet in width and 6 feet 8 inches in height shall be maintained throughout allowing free access to at least two sides of all moving machinery and approaching each stop valve. CMC 1106.2

3. Access to refrigeration machinery rooms shall be restricted to authorized personnel and posted with a permanent sign. CMC 1106.2

4. Refrigeration systems having more than 220 lbs of A1 or 30 lbs any other group refrigerant shall be accessible to the fire department at all times. CFC 606.5

5. Refrigeration machinery rooms larger than 1,000 sq. ft. shall have access to not less than 2 exits. CBC 1006.2.2.2

6. The exits shall be separated by a minimum distance equal to 1/2 the maximum horizontal dimension of the room. CBC 1006.2.2.2

7. When 2 exits are required, one such exit may be by a fixed ladder or alternating tread device. CBC 1006.2.2.2

8. All portions of machinery rooms must be within 150 ft. travel of an exit or exit access door and doors shall swing in direction of egress travel. CBC 1006.2.2.2

9. Doors shall be tight-fitting and self-closing. CBC 1006.2.2.2

VIII. REFRIGERANT VAPOR DETECTION AND ALARMS

1. Machinery rooms shall have approved refrigerant-vapor detectors. CFC 606.8

2. Refrigerant-vapor detectors or sampling tube shall be located in an area where refrigerant from a leak will concentrate and will activate visual and audible alarms inside the room and outside each entrance. CFC 606.8 & CMC 1106.4

3. The alarm shall have manual reset type and shall be located inside the refrigeration machinery room CMC 1106.4

4. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in the CMC for the refrigerant classification. CFC 606.8

5. Approved refrigerant-vapor detection and alarm systems shall utilize alarm signaling devices of at least 15 dba above the operating ambient noise level of the space installed and shall provide an approved, distinctive visual alarm. CMC 1106.4
6. Detectors and alarms shall be placed in approved locations.  
   CFC 606.8

7. The detector shall transmit to an approved location.  
   CFC 606.8

8. Refrigerant vapor-detectors shall activate fans providing  
   emergency purge ventilation.  
   CMC 1107.6

9. Detection and alarm systems shall be installed, maintained,  
   and tested in accordance with the CFC and with the  
   equipment manufacturer's specifications.  
   CMC 1108.4

IX. REFRIGERATION ROOM VENTILATION

1. Refrigeration machinery rooms shall be provided with a source  
   of outside air for ventilation and removal of rejected heat.  
   CMC 1107.1

2. Exhaust inlets or permanent openings shall be arranged to  
   provide ventilation throughout the entire machinery room.  
   CMC 1107.4

3. Fans providing machinery room temperature control or  
   automatic purge of refrigerant-vapor are allowed to be  
   automatically or manually controlled to provide intermittent  
   ventilation as conditions require.  
   CMC 1107.5

4. Emergency purge fans shall have a break-glass type or tamper  
   resistant covered on-only control switch immediately adjacent to  
   and outside each principal refrigeration machinery room exit.  
   CMC 1107.6

5. Two colored and labeled indicator lamps responding to the  
   differential pressure across the purge fan or current through the  
   fan motor shall be provided for each switch. One lamp shall  
   indicate flow; the other shall indicate no flow.  
   CMC 1107.6

6. Exhaust from mechanical ventilation systems shall comply with  
   CMC Section 502.2.  
   CMC 1107.7

7. Exports capable of discharges exceeding 25% of the LFL or  
   50% of the IDLH shall be provided with an approved treatment  
   system, except ammonia.  
   CFC 606.13

8. Emergency purge fans and their associated equipment provided  
   for the exhausting of other than Group A1 and Group B1  
   refrigerants shall meet the requirements of Class I, Division 1  
   hazardous locations.  
   CMC 1107.8

9. Makeup-air intakes to replace exhaust air shall provide air  
   directly from the outside of the building.  
   CMC 1107.9

10. Intakes shall be fitted with backdraft dampers or similar flow-  
    control means to prevent reverse flow.  
    CMC 1107.9

11. Distribution of makeup-air shall be arranged to provide thorough  
    mixing within the room to prevent short circuiting of makeup-air  
    directly to exhaust.  
    CMC 1107.9

12. Refrigeration machinery rooms shall be provided with dedicated  
    mechanical exhaust systems. The exhaust systems shall have  
    the capacity to provide emergency purge of escaping refrigerant  
    at a rate of 30 air changes per hour (ACH) for ammonia, or for  
    other refrigerants as determined in accordance with Equation  
    1107.2
X. EMERGENCY CONTROL

1. Regardless of the refrigerant group or the type of electrical installation provided, an emergency break-glass type off-only control switch shall be provided immediately adjacent and outside the principal machinery room exit.  

2. The emergency control switch shall provide off-only control of refrigerant compressors, pumps and normally closed automatic refrigerant valves located in the machinery room.

3. The emergency control switch shall be automatically shutoff where the refrigerant vapor concentration in the machinery room exceeds the vapor detector's upper detection limit or 25 percent of the LFL, whichever is lower.

4. Refrigeration machinery rooms are not required to be classified as a hazardous location for electrical equipment except as provided in Section 1107.8.

5. Where refrigerants of A2, A3, B2 and B3 are used, the machinery room shall conform to the Class I, Division 2 hazardous location requirement of the CEC.

6. Refrigeration systems containing more than 6.6 lbs of flammable, toxic or highly toxic refrigerant or ammonia shall be provided with an automatic crossover valve and automatic emergency stop.

XI. Control Valves

1. Systems containing more than 6.6 pounds of refrigerant shall have stop valves installed at the following locations:
   (1) The suction inlet of a compressor, compressor unit, or condensing unit.  
   (2) The discharge of a compressor unit, or condensing unit.  
   (3) At refrigerant outlet from a liquid receiver.

   Exceptions:
   (1) Systems that have a refrigerant pumpout function capable of storing the refrigerant charge, or are with the provisions for pumpout of the refrigerant.  
   (2) Self-contained systems.  [ASHRAE 15:9.12.4]

2. Systems containing more than 110 pounds of refrigerant shall have stop valves installed at the following locations:
   (1) The suction inlet of a compressor, compressor unit, or condensing unit.  
   (2) The discharge outlet of a compressor, compressor unit, or condensing unit.  
   (3) The inlet of a liquid receiver, except for self-contained systems or where the receiver is an integral part of the condenser or condensing unit.  
   (4) The outlet of a liquid receiver.  
   (5) The inlets and outlets of condensers where more than one condenser is used in parallel in the systems.

   Exception:  
   Systems that have a refrigerant pumpout function capable of storing the refrigerant charge, or are equipped with the provisions for pumpout of the refrigerant or self-contained systems.  [ASHRAE 15:9.12.5]

3. Stop valves shall be readily accessible from the refrigeration floor or platform.
## XII. EMERGENCY SIGNS AND LABELS

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<td>1. Stop valves shall be identified by tagging in accordance with the referenced standard for identification. (ASME A 13.1-2007)</td>
<td>CMC 1110.5</td>
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<td>2. A valve chart shall be mounted under glass at a location near the principal entrance to the machinery room.</td>
<td>CMC 1110.5</td>
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<td>3. Piping shall be identified with the type of refrigerant, function and pressure.</td>
<td>CMC 1109.10</td>
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<td>4. Refrigeration units or systems with over 220 lbs of group A1 or other group over 30 lbs shall be provided with approved emergency signs, charts and labels in accordance with NFPA 704. Hazard signs shall be in accordance with the CMC for the classification of refrigerants listed therein.</td>
<td>CFC 606.7</td>
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## XIII. PROTECTION OF PIPING AND EQUIPMENT

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<td>1. Refrigeration systems and portions thereof shall not be located in an elevator shaft, dumbwaiter shaft or a shaft containing moving objects nor in a location where they will be subject to mechanical damage.</td>
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<td>2. Air conditioning refrigerant circuit access ports located outdoors shall be protected from unauthorized access with locking-type tamper resistant caps or in a manner approved by the Authority Having Jurisdiction.</td>
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<td>3. Equipment subject to vehicular damage shall be protected in accordance with CFC Section 312.</td>
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## XIV. PRESSURE RELIEF DEVICES

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<td>1. Refrigeration systems shall be protected by a pressure relief device or other means to safely relieve pressure due to fire or abnormal conditions.</td>
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<td>2. Pressure relief devices, fusible plugs and purge systems discharging to the atmosphere from refrigeration systems containing flammable, toxic or highly toxic refrigerants or ammonia shall comply with CFC Sections 606.12.3 through 606.12.5.</td>
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**NOTE**

Compliance with all items on this list does not necessarily assure compliance with all provisions of the applicable codes and standards. This check list should be used only by persons with a comprehensive knowledge of the applicable codes and standards.

**APPLICABLE CODES AND STANDARDS**

- **2016 California Building Code - Part 2, Title 24, CCR**  

- **2016 California Mechanical Code - Part 4, Title 24, CCR**  
  (2015 Uniform Mechanical Code and 2016 California Amendments)

- **2016 California Fire Code - Part 9, Title 24, CCR**  
ASHRAE 15-2013 Safety Refrigeration Systems
ASHRAE 34-2013 Designation and Safety Classification of Refrigerants
ASME A13.1-2007 Scheme for the Identification of Piping Systems
IIAR2-2014 Mechanical Refrigeration, Equipment, Design, and Installation of Ammonia Systems

http://www.oshpd.ca.gov/FDD/Regulations/CANs/index.html
OSHPD Project Review Status
http://www.oshpd.ca.gov/FDD/project_status/index.asp
OSHPD Public Use Forms
http://www.oshpd.ca.gov/FDD/Forms/index.html