2022 Refrigeration Machinery Room Equipment Reminder List

Applicable Codes and Standards

CBC 2022, CMC 2022, CFC 2022
ASHRAE A13.1-2020, ASHRAE 15-2019, ASHRAE 34-2016, ASME A13.1-2020, IIAR2-2014, IIAR3-2017, IIAR4-2015, IIAR5- 2013, NFPA 704-2017

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 ventilating, heating, cooling, airconditioning and refrigeration systems, incinerators and other energy-related systems.	**CBC 101.4.2**
	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.	**CMC 1101.1**
	3. Refrigerants are regulated under the provisions CFC Section 608 and CMC Chapter 11; refrigerant quantities are not regulated by CFC Chapter 50 or CBC Chapters 3 and 4.	**CFC 5001.1, Exc. 6, CBC 307.1.1, Exc. 7 & CBC 414.1.2**
	4. Except as modified by the CMC, refrigeration systems shall comply with ASHRAE 15. In addition, ammonia refrigeration shall comply with IIAR 2, IIAR 3, IIAR 4, and IIAR 5.	**CMC 1102.1 & 1102.2**

II. CLASSIFICATION OF REFRIGERANTS/SYSTEMS

CHK.	N/A		
☐	☐	**1.** The refrigerant used shall be of a type listed in Table 1102.3 or in accordance with ASHRAE 34 where approved by AHJ.	**CMC 1102.3**
☐	☐	**2.** Refrigerants shall be classified in accordance with Table 1102.3.	**CMC 1103.1**
☐	☐	**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.	**CMC 1103.2**
☐	☐	**4.** Where all components containing refrigerant are located either outdoors or in a machinery room, the probability classification of the refrigeration system is not necessary.	**CMC 1103.2**

III. LOCATION OF REFRIGERATION SYSTEMS

CHK.	N/A		
☐	☐	**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 1102.3, 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.	**CMC 1104.2**
☐	☐	**2.** Refrigeration systems or portions thereof shall not be located within a required exit enclosure.	**CMC 1105.6**
☐	☐	**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.	**CMC 1105.6**
☐	☐	**4.** Refrigerant piping shall not be located within an enclosed public stairway, stair landing or means of egress.	**CMC 1109.4.1**

IV. REFRIGERATION MACHINERY ROOMS

CHK.	N/A		
		1. Refrigeration systems shall be provided with a refrigeration machinery room when any of the following conditions exist:	**CMC 1106.1**
☐	☐	The quantity of refrigerant in a single, independent refrigerant circuit of a system exceeds Table 1102.3 amounts.	**CMC 1106.1.1**
☐	☐	Direct-fired and indirect-fired absorption equipment, except lithium bromide systems using water as the refrigerant.	**CMC 1106.1.2**
☐	☐	An A1 system having an aggregate compressor horsepower of 100 (74.6 kW) or more.	**CMC 1106.1.3**
☐	☐	The system contains other than a Group A1 refrigerant. (see exceptions)	**CMC 1106.1.4**
		See the following exceptions where a machinery room is not required:	**CMC 1106.1.4**
☐	☐	(1) Lithium bromide absorption systems using water as the refrigerant.	**CMC 1106.1.4**
☐	☐	(2) Systems containing less than 300 pounds (136.1 kg) of refrigerant R-123 and located in an approved exterior location.	**CMC 1106.1.4**

CHK.	N/A	IV. REFRIGERATION MACHINERY ROOMS CONTINUED	
☐	☐	**2.** All components containing refrigerant shall be located either in a machinery room or outdoors.	**ASHRAE 15, 7.4, CMC 1106.1**
☐	☐	**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.	**ASHRAE 15, 8.11.5, CMC 1106.4**

CHK.	N/A	V. REFRIGERATION MACHINERY ROOM CONSTRUCTION	
☐	☐	**1.** Refrigeration machinery rooms shall be separated from other portions of the building per CBC Table 509.1.	**CBC 509.1**
☐	☐	**2.** All pipes piercing the interior walls, ceiling, or floor of such rooms shall be tightly sealed to the walls, ceiling, or floor through which they pass.	**CMC 1107.1.6**

CHK.	N/A	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.	**CMC 1106.1.4**
☐	☐	**2.** There shall be no flame-producing device or continuously operating hot surface over 800°F permanently installed in the room.	**CMC 1107.1.1**
☐	☐	**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 1106.5**
☐	☐	**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**

CHK.	N/A	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 1106.10**
☐	☐	**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 1106.10**
☐	☐	**3.** Access to refrigeration machinery rooms shall be restricted to authorized personnel and posted with a permanent sign.	**CMC 1106.10 & CMC 1106.11**
☐	☐	**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 608.6**
☐	☐	**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**
☐	☐	**10.** Exit and exit access doorways shall swing in the direction of egress travel and shall be equipped with panic hardware.	**CBC 1006.2.2.2**

CHK.	N/A	VIII. REFRIGERANT VAPOR DETECTION AND ALARMS	
☐	☐	**1.** Machinery rooms shall have approved refrigerant-vapor detectors.	**CFC 608.9**
☐	☐	**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 room and outside each entrance.	**CFC 608.9.1 & CMC 1106.2.2.1**
☐	☐	**3.** The alarm shall have manual reset type and shall be located inside the refrigeration machinery room	**CMC 1106.2.2.1**
☐	☐	**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 608.9.1 #1**
☐	☐	**5.** Detectors and alarms shall be placed in approved locations.	**CFC 608.9.1**
☐	☐	**6.** The detector shall transmit to an approved location.	**CFC 608.9.1**
☐	☐	**7.** Refrigerant vapor-detectors shall activate fans providing emergency ventilation.	**CMC 1106.2.2.1 & 1107.1.7.1**

VIII. REFRIGERANT VAPOR DETECTION AND ALARMS CONTINUED

CHK.	N/A		
☐	☐	**8.** Refrigerant detectors shall perform automatic self-testing, include one or more set points to activate responses and activate a response within not more than 30 seconds.	**CMC 1106.2.2.2**
☐	☐	**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

CHK.	N/A		
☐	☐	**1.** Ventilation or mechanical cooling systems shall be provided to maintain a temperature of not more than 104°F (40°C) in the refrigerant machinery room under design load and weather conditions.	**CMC 1106.8**
☐	☐	**2.** Ventilation 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 1107.1.10 & CFC 608.10.2**
☐	☐	**3.** Exhausts capable of discharges exceeding 25% of the LFL or 50% of the IDLH shall be provided with an approved treatment system, except ammonia.	**CFC 608.14**
☐	☐	**4.** The emergency ventilation for A1, A2, A3, B1, B2L, B2 and B3 refrigerants shall have the capacity to provide mechanical exhaust at a rate as determined in accordance with Equation 1106.2.5.1.	**CMC 1106.2.5.1**
☐	☐	**5.** Makeup-air intakes to replace exhaust air shall provide air directly from the outside of the building.	**CMC 1106.7**
☐	☐	**6.** Intakes shall be fitted with backdraft dampers or similar flow-control means to prevent reverse flow.	**CMC 1106.7**
☐	☐	**7.** 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 1106.7**
		8. Refrigeration machinery rooms shall be provided with dedicated mechanical exhaust systems in accordance with the following:	**CMC 1106.3**
☐	☐	(1) Operated, where occupied, to supply not less than 0.5 cfm/ft^2 of machinery room area or 20 cubic feet per minute per person.	
☐	☐	(2) Operable, where occupied at a volume required to not exceed the higher of a temperature rise of 18°F above inlet air temperature or a maximum temperature of 122°F.	

X. EMERGENCY CONTROL

CHK.	N/A		
☐	☐	**1.** Regardless of the refrigerant group or the type of electrical installation provided, an emergency break-glass type or covered off-only control switch shall be provided immediately adjacent and outside the principal machinery room exit.	**CMC 1108.3**
☐	☐	**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.	**CMC 1108.3**
☐	☐	**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.	**CMC 1108.3 & CMC 1107.1.7.2**
☐	☐	**4.** Refrigeration machinery rooms are not required to be classified as a hazardous location for electrical equipment except as provided in Section 1107.1.7 of Section 1107.1.8.	**CMC 1108.2**
☐	☐	**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.	**CFC 608.17**
☐	☐	**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.	**CFC 608.11**

XI. CONTROL VALVES

CHK.	N/A		
		1. Systems containing more than 6.6 pounds of refrigerant shall have stop valves installed at the following locations:	**CMC 1110.1**
☐	☐	(1) The suction inlet of a compressor, compressor unit, or condensing unit.	**CMC 1110.1**
☐	☐	(2) The discharge of a compressor unit, or condensing unit.	**CMC 1110.1**
☐	☐	(3) At refrigerant outlet from a liquid receiver.	**CMC 1110.1**
		Exceptions:	
		(1) Systems that have a refrigerant pumpout function capable of storing the refrigerant charge, or are equipped with the provisions for pumpout of the refrigerant.	**CMC 1110.1**
		(2) Self-contained systems. [ASHRAE 15:9.12.4]	**CMC 1110.1**

XI. CONTROL VALVES CONTINUED

CHK.	N/A		
		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.	**CMC 1110.2**
☐	☐	(2) The discharge outlet of a compressor, compressor unit, or condensing unit.	**CMC 1110.2**
☐	☐	(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.	**CMC 1110.2**
☐	☐	(4) The outlet of a liquid receiver.	**CMC 1110.2**
☐	☐	(5) The inlets and outlets of condensers where more than one condenser is used in parallel in the systems.	**CMC 1110.2**
		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]	**CMC 1110.2**
☐	☐	**3.** Stop valves shall be readily accessible from the refrigeration floor or platform.	**CMC 1110.4**

XII. EMERGENCY SIGNS AND LABELS

CHK.	N/A		
☐	☐	**1.** Stop valves shall be identified by tagging in accordance with the referenced standard for identification. (ASME A 13.1-2020)	**CMC 1110.5**
☐	☐	**2.** A valve chart shall be mounted under glass at a location near the principal entrance to the machinery room.	**CMC 1110.5**
☐	☐	**3.** Piping shall be identified with the type of refrigerant, function and pressure.	**CMC 1109.10**
☐	☐	**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.	**CFC 608.8**

XIII. PROTECTION OF PIPING AND EQUIPMENT

CHK.	N/A		
☐	☐	**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.	**CMC 1109.4.1**
☐	☐	**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.	**CMC 1105.11**
☐	☐	**3.** Soft annealed copper tubing conveying refrigerant shall be enclosed in iron or steel piping and fittings, or in conduit, molding, or raceway that will protect the tubing against mechanical injury from an exterior source.	**CMC 1109.7**

XIV. PRESSURE RELIEF DEVICES

CHK.	N/A		
☐	☐	**1.** Refrigeration systems shall be protected by a pressure relief device or other means to safely relieve pressure due to fire or abnormal conditions.	**CMC 1112.1**
☐	☐	**2.** Pressure relief devices, fusible plugs and purge systems for refrigeration systems containing flammable, toxic or highly toxic refrigerants or ammonia shall comply with CFC Sections 608.13.2 through 608.13.4.	**CFC 608.13**

NOTE

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

APPLICABLE CODES AND STANDARDS

2022 California Building Code - Part 2, Title 24, CCR
(2021 International Building Code and 2022 California Amendments)

2022 California Mechanical Code - Part 4, Title 24, CCR
(2021 Uniform Mechanical Code and 2022 California Amendments)

2022 California Fire Code - Part 9, Title 24, CCR
(2021 International Fire Code and 2022 California Amendments)

ASHRAE 15-2019 Safety Refrigeration Systems
ASHRAE 34-2016 Designation and Safety Classification of Refrigerants
ASME A13.1-2020 Scheme for the Identification of Piping Systems
IIAR2-2014 Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems

IIAR3-2017 Ammonia Refrigeration Valves
IIAR4-2015 Installation of Closed-Circuit Ammonia Refrigeration Systems

IIAR5-2013 Start-Up and Commissioning of Closed Circuit Ammonia Refrigeration Systems
NFPA 704-2017 Standard System for Identification of the Hazards of Materials for

OSHPD Policy Intent Notices and Code Application Notices.
https://hcai.ca.gov/construction-finance/codes-and-regulations/#PINs
https://hcai.ca.gov/construction-finance/codes-and-regulations/#CANs
OSHPD Project Review Status
https://hcai.ca.gov/construction-finance/resources/project-status-reports/
OSHPD Public Use Forms
https://hcai.ca.gov/construction-finance/resources/forms-applications-reminder-lists/#ProjectForms