

2010 Refrigeration Machinery Rooms Equipment Reminder List

Applicable Codes and Standards

CBC 2010, CMC 2010, CFC 2010

ASHRAE 15-2007, ASHRAE 34-2007, ASME A13.1-2007, IAR2-1999

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. Refrigeration systems, equipment and devices, including the replacement of parts, alterations and substitution of a different refrigerant shall conform to the requirements of **CMC 1101.0**
3. Refrigerants are regulated under the provisions CFC Section 606 and CMC Chapter 11; refrigerant quantities are not regulated by CFC Chapter 27 or CBC Chapter 3 & 4. **CFC 2701, Exc. 5
CBC 307.1, Exc. 7
CBC 414.1.2
CMC 1102.0**
4. Except as modified by the CMC, refrigeration systems shall comply with ASHRAE 15. In addition, ammonia refrigeration shall comply with IAR 2.

CHK.

N/A

II. CLASSIFICATION OF REFRIGERANTS/SYSTEMS

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|--------------------------|--------------------------|---|-------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. The refrigerant used shall be of a type listed in Table 11-1 or as classified by ASHRAE 34-2007 as approved. | CMC 1102.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Refrigerants shall be classified in accordance with ASHRAE 34-2007 for refrigeration designation and safety | CMC 1103 |
| <input type="checkbox"/> | <input type="checkbox"/> | 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 1104 |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. When a refrigeration system is located in a refrigeration machinery room, the classification of the refrigeration system is not required. | CMC 1105.2 |

CHK.

N/A

III. LOCATION OF REFRIGERATION SYSTEMS

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|--------------------------|--------------------------|---|-------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. The refrigerant quantity of a high-probability system shall not exceed the amount of Table 11-1 based on the volume of the smallest, enclosed space which the system is located in, serves, or passes through. Not applicable to a refrigeration machinery room. | CMC 1105.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Refrigeration systems or portions thereof shall not be located within a required exit enclosure. | CMC 1106.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 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 1106.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Refrigerant piping shall not be located within a required exit. | CMC 1111.5 |

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<u>CHK.</u>	<u>N/A</u>	IV. REFRIGERATION MACHINERY ROOMS	
		1. Refrigeration systems shall be provided with a refrigeration machinery room when any of the following conditions exist:	CMC 1107.1
<input type="checkbox"/>	<input type="checkbox"/>	The quantity of refrigerant in a single system exceeds Table 11-1 amounts.	CMC 1107.1.1
<input type="checkbox"/>	<input type="checkbox"/>	Direct-fired and indirect-fired absorption equipment, except lithium bromide systems using water as the refrigerant.	CMC 1107.1.2
<input type="checkbox"/>	<input type="checkbox"/>	An A1 system having an aggregate compressor horsepower of 100 (74.6 kW) or more.	CMC 1107.1.3
<input type="checkbox"/>	<input type="checkbox"/>	The system contains other than a Group A1 refrigerant. (see exceptions)	CMC 1107.1.4
		See the following exceptions where a machinery room is not required:	CMC 1107.1.4
		(1) Lithium bromide absorption systems using water as the refrigerant.	CMC 1107.1.4
		(2) Ammonia-water absorption unit systems installed outdoors, provided that the quantity of refrigerant in a single system does not exceed Table 11-1 amounts and the discharge is shielded and dispersed.	CMC 1107.1.4
		(3) Systems containing less than 300 pounds (136.1 kg) of refrigerant R-123 and located in an approved exterior location.	CMC 1107.1.4
		(4) Systems containing less than 35 pounds (16 kg) of refrigerant R-717 and located in an approved exterior location.	CMC 1107.1.4
<input type="checkbox"/>	<input type="checkbox"/>	2. All components containing refrigerant shall be located either in a machinery room or outdoors.	ASHRAE 15, 7.4
<input type="checkbox"/>	<input type="checkbox"/>	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
<u>CHK.</u>	<u>N/A</u>	V. REFRIGERATION MACHINERY ROOM CONSTRUCTION	
<input type="checkbox"/>	<input type="checkbox"/>	1. When the room is an incidental accessory occupancy to the main occupancy it shall be separated per CBC Table	CBC 508.2.5
<input type="checkbox"/>	<input type="checkbox"/>	2. Penetrations into machinery rooms shall be sealed to inhibit the passage of refrigerant vapor.	CMC 1107.5
<u>CHK.</u>	<u>N/A</u>	VI. REFRIGERATION MACHINERY ROOM CONTENTS	
<input type="checkbox"/>	<input type="checkbox"/>	1. Refrigeration machinery rooms shall house all refrigerant-containing portions of the system other than the piping and evaporators permitted by CMC Section 1105.3, discharge piping required by CMC Chapter 11, and cooling towers regulated by CMC Chapter 11, Part II and their essential piping.	CMC 1107.1
<input type="checkbox"/>	<input type="checkbox"/>	2. Open flames or devices having an exposed surface exceeding 800°F are prohibited in refrigeration machinery	CMC 1107.7
<input type="checkbox"/>	<input type="checkbox"/>	3. Combustion air or return air shall not be taken from or through a refrigeration machinery room.	CMC 1107.6

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| <input type="checkbox"/> | <input type="checkbox"/> | 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 1109.1 |
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CHK.	N/A	VII. REFRIGERATION MACHINERY ROOM ACCESS/EGRESS	
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|--------------------------|--------------------------|--|-------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Refrigeration machinery rooms shall be of such dimensions that all system parts are readily accessible with adequate space for maintenance and operations. | CMC 1107.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 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 1107.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Access to refrigeration machinery rooms shall be restricted to authorized personnel and posted with a permanent sign. | CMC 1107.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Refrigeration systems having more than 220 lbs A1 or 30 lbs other group refrigerant shall be accessible to the fire department at all times. | CFC 606.5 |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Refrigeration machinery rooms larger than 1,000 sq. ft. shall have access to not less than 2 exits. | CBC 1015.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. The exits shall be separated by a minimum distance equal to 1/2 the maximum horizontal dimension of the room. | CBC 1015.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. When 2 exits are required, one such exit may be by a fixed ladder or alternating tread device. | CBC 1015.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 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 1015.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 9. Doors shall be tight-fitting and self-closing. | CBC 1015.4 |

CHK.	N/A	VIII. REFRIGERANT VAPOR DETECTION AND ALARMS	
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|--------------------------|--------------------------|--|---------------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Machinery rooms shall have approved refrigerant-vapor detectors. | CFC 606.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 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. | CFC 606.8
CMC 1107.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. 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 |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. 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 1121.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Detectors and alarms shall be placed in approved locations. | CFC 606.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. The detector shall transmit to an approved location. | CFC 606.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. Refrigerant vapor-detectors shall activate fans providing emergency purge ventilation. | CMC 1108.5 |
| <input type="checkbox"/> | <input type="checkbox"/> | 8. Refrigerant vapor-detectors shall activate the emergency shutoff of electrically energized equipment and devices within the refrigeration machinery room. | CMC 1109.4 |

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| <input type="checkbox"/> | <input type="checkbox"/> | 9. Detection and alarm systems shall be powered and supervised as required for fire alarm systems in California | CMC 1121.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 10. Detection and Alarm systems shall be annunciated for all refrigerants at an approved location as required for fire alarm systems in the California Fire Code. | CMC 1121.3 |
| <input type="checkbox"/> | <input type="checkbox"/> | 11. Detection and alarm systems shall be installed, maintained, and tested in accordance with the California Fire Code and with the equipment manufacturer's specifications. | CMC 1121.4 |

CHK.

N/A

IX. REFRIGERATION ROOM VENTILATION

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|--------------------------|--------------------------|---|---------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Refrigeration machinery rooms shall be provided with a continuous source of outside air for ventilation and removal of rejected heat. | CMC 1108.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Exhaust inlets or permanent openings shall be arranged to provide ventilation throughout the entire machinery room. | CMC 1108.3 |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Fans providing machinery room temperature control or automatic purge of refrigerant-vapor are allowed to be automatically controlled to provide intermittent ventilation as conditions require. | CMC 1108.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Emergency purge fans shall have a break-glass type on-only control switch immediately adjacent to and outside each refrigeration machinery room means of egress. | CMC 1108.5
CFC 606.9.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Mechanical ventilation systems shall have switches to control power to each fan. | CMC 1108.6 |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. Fan switches shall be key activated or within a locked glass-covered enclosure located adjacent to and outside of the principal entrance to the machinery room. | CMC 1108.6 |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. Switches controlling continuous ventilation fans shall be two-position on-off type. | CMC 1108.6 |
| <input type="checkbox"/> | <input type="checkbox"/> | 8. Switches controlling intermittent or emergency ventilation fans shall be three-position automatic-on-off type. | CMC 1108.6 |
| <input type="checkbox"/> | <input type="checkbox"/> | 9. 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 1108.6 |
| <input type="checkbox"/> | <input type="checkbox"/> | 10. Exhaust from mechanical ventilation systems shall discharge not less than 20 feet from a property line or a building | CMC 1108.7 |
| <input type="checkbox"/> | <input type="checkbox"/> | 11. Exhausts capable of discharges exceeding 25% of the LFL or 50% of the IDLH shall be provided with an approved treatment system. | CMC 1108.7 |
| <input type="checkbox"/> | <input type="checkbox"/> | 12. 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 1108.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 13. Makeup-air intakes to replace exhaust air shall provide air directly from the outside of the building. | CMC 1108.9 |
| <input type="checkbox"/> | <input type="checkbox"/> | 14. Intakes shall be fitted with backdraft dampers or similar flow-control means to prevent reverse flow. | CMC 1108.9 |
| <input type="checkbox"/> | <input type="checkbox"/> | 15. 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 1108.9 |

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| <input type="checkbox"/> | <input type="checkbox"/> | 16. Exhaust from ventilation systems serving flammable, toxic or highly toxic refrigerants capable of exceeding 25% of the LFL or 50% of the IDLH shall be equipped with an approved treatment system. | CFC 606.13 |
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<u>CHK.</u>	<u>N/A</u>	X. EMERGENCY CONTROL	
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|--------------------------|--------------------------|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> | 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 each machinery room means of egress. | CMC 1109.4
CFC 606.9 &
CFC 606.9.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. The emergency control switch shall shutoff electrically energized equipment and devices located within the machinery room. | CMC 1109.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Refrigeration machinery rooms are not required to be classified as a hazardous location for electrical equipment. | CMC 1109.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. 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 606.16 |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. 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 606.10 |

<u>CHK.</u>	<u>N/A</u>	XI. Control Valves	
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| | | 1. Stop valves shall be installed in refrigerant piping at the following locations: | CMC 1112.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | At inlet and outlet of a positive-displacement-type compressor, compressor unit or condensing unit. | CMC 1112.1.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | At refrigerant outlet from a liquid receiver. | CMC 1112.1.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | At the refrigerant inlet of a pressure vessel containing liquid refrigerant with a volume of greater than 3 cubic feet. | CMC 1112.1.3 |
| | | Exceptions: | |
| | | (1) Systems with non-positive-displacement compressors. | CMC 1112.1 |
| | | (2) Systems having a pump-out receiver for storage of the charge. | CMC 1112.1 |
| | | (3) Systems containing less than 110 lbs. of Group A1 refrigerant. | CMC 1112.1 |
| | | (4) Self-contained systems do not require a stop valve at the inlet of the receiver. | CMC 1112.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Stop valves shall be readily accessible from the refrigeration floor or platform. | CMC 1112.3 |

<u>CHK.</u>	<u>N/A</u>	XII. EMERGENCY SIGNS AND LABELS	
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| <input type="checkbox"/> | <input type="checkbox"/> | 1. Stop valves shall be identified by tagging in accordance with ASME A13.1-2007. | CMC 1112.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. A valve chart shall be mounted under glass at a location near the principal entrance to the machinery room. | CMC 1112.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Piping shall be identified with the type of refrigerant, function and pressure. | CMC 1111.8 |

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| <input type="checkbox"/> | <input type="checkbox"/> | 4. Refrigeration units or systems with over 220 lbs A1 or other over 30 lbs shall be provided with a 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 606.7 |
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<u>CHK.</u>	<u>N/A</u>	XIII. PROTECTION OF PIPING AND EQUIPMENT	
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|--------------------------|--------------------------|---|-------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 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 1106.5 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Equipment subject to vehicular damage shall be protected in accordance with CFC Section 312. | CFC 301 |

<u>CHK.</u>	<u>N/A</u>	XIV. PRESSURE RELIEF DEVICES	
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|--------------------------|--------------------------|--|-------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 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 1114.1 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Pressure relief devices, fusible plugs and purge systems for refrigeration systems containing >6.6 lbs of flammable, toxic or highly toxic refrigerants shall be provided with an approved discharge system as required by CFC 606.12.1, 606.12.2 and 606.12.3. | CFC 606.12 |

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

2010 California Building Code - Part 2, Title 24, CCR
(2009 International Building Code and 2010 California Amendments)

2010 California Mechanical Code - Part 4, Title 24, CCR
(2009 Uniform Mechanical Code and 2010 California Amendments)

2010 California Fire Code - Part 9, Title 24, CCR
(2009 International Fire Code and 2010 California Amendments)

ASHRAE 15-2007 Safety Refrigeration Systems
ASHRAE 34-2007 Designation and Safety Classification of Refrigerants
ASME A13.1-2007 Scheme for the Identification of Piping Systems
IAR2-1999 Mechanical Refrigeration, Equipment, Design, and Installation of Ammonia Systems

OSHPD Policy Intent Notices and Code Application Notices.
<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>