

2007 Refrigeration Machinery Rooms Equipment Reminder List

Applicable Codes and Standards

CBC 2007, CMC 2007, CFC 2007
ASHRAE 34-2004, ANSI A13.1-96

I. SCOPE

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|---|---|
| 1. Mechanical appliances, equipment and systems shall be constructed, installed and maintained in accordance with the California Mechanical Code. | CBC 2801.1 |
| 2. Refrigeration systems, equipment and devices, including the replacement of parts, alterations and substitution of a different refrigerant, shall conform to the requirements of Chapter 11, CMC. | CMC 1101 |
| 3. Refrigerants are regulated under the provisions of CFC Section 606 and CMC Chapter 11; refrigerant quantities are not regulated by CFC Article 80 or CBC Chapter 3 & 4. | CFC 2701,
Exc. 5
CBC 307.1,
Exc. 9
CBC 414.1.2 |

CHK.

N/A

II. CLASSIFICATION OF REFRIGERANTS/SYSTEMS

- | | | | |
|--------------------------|--------------------------|---|-----------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. The refrigerant used shall be of a type listed in Table 11-1 or as classified by ANSI/ASHRAE Standard 34-2004 as approved. | CMC 1102 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Refrigerants shall be classified in accordance with ASHRAE 34-2004 for refrigeration designation and safety classification. | 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 1104 |

CHK.

N/A

III. LOCATION OF REFRIGERATION SYSTEMS

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|--------------------------|--------------------------|---|-------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Refrigeration systems or portions thereof shall not be located within a required exit enclosure. | CMC 1106.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Refrigeration compressors exceeding 5 horsepower rating shall be located at least 10 feet from an exit opening in a Group A; Group B; Group E; Group I; or Group R, Division 1 Occupancy unless separated by a one-hour fire-resistive occupancy separation. | CMC 1106.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Refrigerant piping shall not be located within a required exit. | CMC 1111.5 |

CHK.

N/A

IV. REFRIGERATION MACHINERY ROOMS

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|--------------------------|--------------------------|---|---------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 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- and indirect fired absorption equipment, except direct- and indirect-fired lithium bromide absorption systems using water as the refrigerant. | CMC 1107.1.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | A Group A1 system having an aggregate compressor horsepower of 100 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 |

2007 Refrigeration Machinery Rooms Equipment Reminder List

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.
- (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.
- (3) Systems containing less than 300 lbs (136.1 kg) of refrigerant R-123 and located in an approved exterior location.
- (4) Systems containing less than 35 lbs (16 kg) of refrigerant R-717 and located in an approved exterior location.

- | | | | |
|--------------------------|--------------------------|--|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 2. All components containing refrigerant shall be located either in a machinery room or outdoors. Note: This code edition may require an alternate means. | 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. Note: This code edition may require an alternate means. | ASHRAE 15, 8.11.5 |

CHK. N/A 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 508.2. | CBC 508.2.2 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Penetrations into machinery rooms shall be sealed to inhibit the passage of refrigerant vapor. | CMC 1107.5 |

CHK. N/A VI. REFRIGERATION MACHINERY ROOM CONTENTS

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|--------------------------|--------------------------|--|-------------------|
| <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 800F° are prohibited in refrigeration machinery rooms. | 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 |
| <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 |

CHK. N/A VII. REFRIGERATION MACHINERY ROOM ACCESS/EGRESS

- | | | | |
|--------------------------|--------------------------|--|-------------------|
| <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 |

2007 Refrigeration Machinery Rooms Equipment Reminder List

<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 an 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 the direction of egress travel regardless of occupant load.	CBC 1015.4
<input type="checkbox"/>	<input type="checkbox"/>	9. Doors shall be tight-fitting and self-closing.	CBC 1015.4
<u>CHK.</u>	<u>N/A</u>	VIII. REFRIGERANT VAPOR DETECTION AND ALARMS	
<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 detector shall transmit an alarm to an approved location.	CFC 606.8
<input type="checkbox"/>	<input type="checkbox"/>	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
<input type="checkbox"/>	<input type="checkbox"/>	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 1121.1
<input type="checkbox"/>	<input type="checkbox"/>	6. Detectors and alarms shall be placed in approved locations.	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 stop the flow of refrigeration in all supply lines leaving the refrigeration machinery room.	CMC 1121.1
<input type="checkbox"/>	<input type="checkbox"/>	9. When the LFL is 25% or greater, refrigerant vapor-detectors shall de-energize electrical power within the space.	CMC 1109.4
<input type="checkbox"/>	<input type="checkbox"/>	10. Detection and alarm systems shall be powered and supervised as required for fire alarm systems in California Fire Code.	CMC 1121.2
<input type="checkbox"/>	<input type="checkbox"/>	11. Detection and alarm systems for all refrigerants shall be annunciated at an approved location as required for fire alarm systems in accordance with the California Fire Code.	CMC 1121.3
<input type="checkbox"/>	<input type="checkbox"/>	12. Detection and alarm systems shall be installed and maintained in accordance with the California Fire Code.	CMC 1121.4
<u>CHK.</u>	<u>N/A</u>	IX. REFRIGERATION ROOM VENTILATION	
<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

2007 Refrigeration Machinery Rooms Equipment Reminder List

<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
<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 created by airflow 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 opening.	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
CHK.	N/A	X. EMERGENCY CONTROL	
<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 of electrically energized equipment and devices within the machinery room shall be provided immediately adjacent and outside each machinery room means of egress.	CMC 1109.4
		2. 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 nonpositive-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

2007 Refrigeration Machinery Rooms Equipment Reminder List

(4) Self-contained systems do not require a stop valve at the inlet of the receiver. **CMC 1112.1**

- | <u>CHK.</u> | <u>N/A</u> | XII. EMERGENCY SIGNS AND LABELS | |
|--------------------------|--------------------------|---|-------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Stop valves shall be identified in accordance with ASME A13.1-1996 by tagging. | CMC 1112.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. A valve chart shall be mounted under glass at an approved location near the principal entrance to the machinery room. | CMC 1112.4 |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Piping shall be identified in accordance with ASME A13.1-1996. | CMC 1111.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Piping shall be identified with the type of refrigerant, function and pressure. | CMC 1111.8 |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. 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 |

- | <u>CHK.</u> | <u>N/A</u> | XIII. PROTECTION OF PIPING AND EQUIPMENT | |
|--------------------------|--------------------------|---|-------------------|
| <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 | |
|--------------------------|--------------------------|--|-------------------|
| <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

2007 California Building Code – Part 2, Title 24, CCR
(2006 International Building Code and 2007 California Amendments)

2007 California Mechanical Code – Part 4, Title 24, CCR
(2006 Uniform Mechanical Code and 2007 California Amendments)

2007 California Fire Code – Part 9, Title 24, CCR
(2006 International Fire Code and 2007 California Amendments)

ASHRAE 34-2004 Designation and Safety Classification of Refrigerants
ANSI A13.1-96 Scheme for the Identification of Piping Systems