



**Gas Detection & Emergency Alarm Systems**

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**Common Code References**  
**Refrigerant Monitoring Systems**

<p>IBC 908.6          Refrigerant Detector</p>	<p>Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values for the refrigerant classification indicated in the International Mechanical Code. Detectors and alarms shall be placed in approved locations.</p> <p><b>Exception:</b> Detectors are not required in ammonia system machinery rooms equipped with a vapor detector in accordance with the International Mechanical Code.</p> <p><b>Comment:</b> By reference from above the refrigerant detector shall comply with the requirements of IMC 2003.</p>
<p>IMC 2003: 1104.2          Machinery room</p>	<p>Except as provided in Sections 1104.2.1 and 1104.2.2, all components containing the refrigerant shall be located either outdoors or in a machinery room where the quantity of refrigerant in an independent circuit of a system exceeds the amounts shown in Table 1103.1. For refrigerant blends not listed in Table 1103.1, the same requirement shall apply when the amount for any blend component exceeds that indicated in Table 1103.1 for that component. This requirement shall also apply when the combined amount of the blend components exceeds a limit of 69,100 parts per million (ppm) by volume. Machinery rooms required by this section shall be constructed and maintained in accordance with Section 1105 for Group A1 and B1 refrigerants and in accordance with Sections 1105 and 1106 for Group A2, B2, A3 and B3 refrigerants.</p> <p>Exceptions:</p> <ol style="list-style-type: none"> <li>1. Machinery rooms are not required for listed equipment and appliances containing not more than 6.6 pounds (3 kg) of refrigerant, regardless of the refrigerant's safety classification, where installed in accordance with the equipment's or appliance's listing and the equipment or appliance manufacturer's installation instructions.</li> <li>2. Piping in conformance with Section 1107 is allowed in other locations to connect components installed in a machinery room with those installed outdoors.</li> </ol>
<p>IMC 2003: 1105.3          Refrigerant Detectors</p>	<p>Refrigerant detectors in mechanical rooms shall be provided as required by the International Fire Code.</p> <p><b>Comment:</b> A refrigerant detector is required by code. By reference from above the refrigerant detector will comply with the requirements of the IFC 2003.</p>

<p>IMC 2003: 1105.5 Fuel-burning appliances</p> <p><b>NFPA 1 Chapter 53 Section 53.10.3 has the same requirements</b></p>	<p>Open flames that use combustion air from the machinery room shall not be installed in a machinery room.</p> <p>Exceptions:</p> <ol style="list-style-type: none"> <li>1. Matches, lighters, halide leak detectors and similar devices.</li> <li>2. Where the refrigerant is carbon dioxide or water.</li> <li>3. Fuel-burning appliances shall not be prohibited in the same machinery room with refrigerant-containing equipment or appliances where combustion air is ducted from outside the machinery room and sealed in such a manner as to prevent any refrigerant leakage from entering the combustion chamber, or where a refrigerant vapor detector is employed to automatically shut off the combustion process in the event of refrigerant leakage.</li> </ol> <p><b>Comment:</b> Fuel burning appliances are allowed in the machinery room if the refrigerant detector automatically shut off the combustion process.</p>
<p>IMC 2003: 1105.6 Ventilation</p>	<p>Machinery rooms shall be mechanically ventilated to the outdoors. Mechanical ventilation shall be capable of exhausting the minimum quantity of air both at normal operating and emergency conditions. Multiple fans or multi-speed fans shall be allowed in order to produce the emergency ventilation rate and to obtain a reduced airflow for normal ventilation.</p>
<p>IMC 2003: 1105.6.4 Quantity—emergency conditions</p> <p><b>NFPA 1 Chapter 53 Section 53.10.4 has the same requirements</b></p>	<p>Upon actuation of the refrigerant detector required in Section 1105.3, the mechanical ventilation system shall exhaust air from the machinery room in the following quantity:</p>
<p>IFC 2003: 606.8 Refrigerant Detector</p> <p><b>NFPA 1 Chapter 53 Section 53.11.2 has the same requirements</b></p>	<p>Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector or a sampling tube that draws air to the detector shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in the International Mechanical Code for the refrigerant classification. Detectors and alarms shall be placed in approved locations.</p> <p><b>Exception:</b> Detectors are not required for ammonia systems where the machinery room complies with Section 1106.3 of the International Mechanical Code.</p> <p>CFC Refrigerant R-11 1,000 PPM TLV-TWA  CFC Refrigerant R-12 1,000PPM TLV-TWA  CFC Refrigerant R-22 1,000 PPM TLV-TWA  CFC Refrigerant R-123 30 PPM TLV-TWA  CFC Refrigerant R-134a 1,000 PPM TLV-TWA  CFC Refrigerant R-404 35 PPM TLV-TWA**  CFC Refrigerant R-502 1,000 PPM TLV-TWA</p>

	<p>These concentration levels can be found in MMC 2000, Table 1103.1. The TLV for CFC Refrigerant R-404 is from the product MSDS on the ASHRAE website.</p>
<p>IMC 2003: 1101.6 General</p>	<p>Refrigerant Systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15. Ammonia refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15 and IIAR 2.</p> <p><b>Comment:</b> By reference ASHRAE 15 is applicable.</p>
<p>ASHRAE 15, 2001: 8.11.2.1</p>	<p>Each refrigerating machinery rooms shall contain a detector, located in an area where refrigerant from a leak will concentrate, that actuates an alarm and mechanical ventilation in accordance with at a value not greater than the corresponding TLV-TWA (or toxicity measure consistent therewith). The alarm shall annunciate visual and audible alarms inside the refrigerant machinery rooms and outside each entrance to the refrigerant machinery rooms. The alarms required by this section shall be of the manual reset type with the reset located inside the refrigerant machinery rooms.</p> <p><b>Comment:</b> ASHRAE 15 basically duplicates the requirements of the IFC 2003 but adds the requirement for audible and visual outside each room entrance.</p>
<p>NFPA 1 Chapter 53 Section 53.11.4 Monitoring and Annunciation</p>	<p>Refrigerant vapor detection and alarm systems shall be remotely annunciated at an approved constantly attended location as required for fire alarm systems in accordance with NFPA 72, National Fire Alarm Code.</p>
<p>NFPA 1 Chapter 53 Section 53.11.3 Power and Supervision.</p>	<p>Refrigerant vapor detection and alarm systems shall be powered and supervised as required for fire alarm systems in accordance with NFPA 72, National Fire Alarm Code.</p>
<p>IFC 2003: 606.6.6.1 Periodic Testing</p> <p><b>NFPA 1 Chapter 53 Section 53.11.5 has the same requirements</b></p>	<p>The following emergency devices or systems shall be periodically tested in accordance with the manufacturer's instructions and as required by the code official.</p> <ol style="list-style-type: none"> <li>1. Treatment and flaring system.</li> <li>2. Valves and appurtenances necessary to the operation of emergency refrigeration control boxes.</li> <li>3. Fans and associated equipment intended to operate emergency ventilation systems.</li> <li>4. Detection and alarm systems.</li> </ol> <p><b>Comment:</b> The detection system requires proper maintenance and periodic performance verification.</p> <p>Manufacturers generally recommend that refrigerant leak detectors be calibrated a minimum of semi-annually and that the system functionality be verified annually.</p> <p>This requirement is also found in MMC 2003: Section 1109</p>