

## Understanding and Complying with the Gas Detection Specifications in the CSA and ASHRAE Safety Standards for Mechanical Refrigeration & Ammonia Systems

There are safety standards in place for the design, construction and operation of mechanical refrigeration/ammonia systems. The goal of these safety standards is to keep the refrigerant/ammonia contained within the equipment and in the event that a leak does happen, mitigate the impact on people.

Included in the safety standards are specific requirements for the use of gas detectors. The purpose of this document is to help you understand those requirements and to outline what CETCI, as a manufacturer of gas detection systems, suggests for a mechanical refrigeration/ammonia applications.

As a Canadian manufacturer, our suggestions comply primarily with the Mechanical Refrigeration Code published by the Canadian Standards Association (CSA). However, we also recognize the ASHRAE Safety Standard for Refrigeration Systems. The two Safety Standards are similar, with the biggest difference being the maximum alarm setpoint for ammonia – not exceeding 300ppm (CSA) vs 1,000ppm (ASHRAE).

*A Simplified Writing and Comparison of the Standards Specifying Gas Detector Requirements Only*

CSA B52-05 Code		ASHRAE Standard 15-2007
A gas detector shall be located in an area where a leak is most likely to concentrate. More than one gas detector may be required depending on the machinery room configuration or airflow patterns.		A gas detector shall be located in the machinery room in an area where a leak will concentrate.
The gas detector must activate an audible and visible alarm.		The gas detector must activate an audible and visual alarm inside the machinery room and outside each entrance to the machinery room.
The alarm device must be in a location that is frequented by people so corrective action can be initiated.		
The gas detector must activate the mechanical ventilation system.		The gas detector must activate the mechanical ventilation system.
The activation of the audible alarm and the mechanical ventilation system is to be triggered at the lowest practical detection level, not exceeding 300 ppm for Ammonia or the refrigerants corresponding TWA (which is 1,000 ppm, except R123 which is 50 ppm).		The activation of the audible and visual alarm and the mechanical ventilation system is to be triggered at a gas value not greater than the corresponding TLV-TWA of the particular refrigerant (which is 1,000 ppm, except R123 which is 50 ppm) and 1000 ppm for Ammonia.
		The type of alarm must be the manual reset type with the reset located inside the machinery room.

<p>Gas detectors must be tested to make sure they work properly. The test must be conducted at the specified refrigerant concentration as stated by the manufacturer and in accordance with their instructions. The test must trigger the audible and visual alarms and the mechanical ventilation system. The gas detector must be tested at least once a year. The test date and tester's name should be noted on a tag and affixed to the gas detector.</p>		<p>The gas detector must be periodically tested in accordance with the manufacturer's specifications and any requirements set out by the jurisdiction having authority.</p>
<p>If a machinery room does not comply with the Class T machinery room standards (see Clause 6.2 and 6.3), when ammonia is used and all refrigerant-containing parts, except piping and evaporators, are installed in that machinery room, that room will be considered a Class 1, Zone 2 hazardous location. An explosion proof gas detector will be required.</p>		<p>When refrigerants belonging to Groups A2, A3, B2 and B3 are used, the machinery room must conform to Class 1, Division 2 of the National Electrical Code. An explosion proof gas detector will be required.</p>
		<p>When refrigerants belonging to Groups A1 and B1 are used, the requirements of Class 1, Division 2 National Electrical Code do not apply.</p>
		<p>When ammonia is being used, the requirements of Class 1, Division 2 National Electrical Code do not apply as long as there is a gas detector that is set to alarm at 1000ppm.</p>
		<p>If there is combustion equipment installed in the machinery room with refrigerant containing equipment, a refrigerant detector must be configured to automatically shut down the combustion equipment if there is a refrigerant leak.</p>
<p>Immediately outside the machinery room door there must be a switch on a separate circuit to manually turn ON the mechanical ventilation system in an emergency.</p>		<p>Immediately outside the machinery room door there must be a control switch on a separate electrical circuit for the ventilation fans.</p>
<p>Immediately outside the machinery room door there must be a switch to manually turn OFF the equipment in an emergency.</p>		<p>Immediately outside the machinery room door there must be remote control of the mechanical equipment inside the room to shut down the equipment in an emergency.</p>
<p>Code Sections: 4.5.2 (c) (iii) System Application Rules 6.2.3 Refrigerant Vapour Detector 6.3 (h) and (i) Class T Machinery Rooms 6.4.1 Class T Machinery Rooms 6.4.2 Machinery Rooms 8.4.1 (d) Maintenance</p>		<p>Standards Sections: 8.11.2.1 and 8.11.6 (b) Refrigeration Machinery Room, General Requirements 8.12 (g) and (h) Machinery Room, Special Requirements 11.6.3 Periodic Tests Informative Appendix 1: I1 Alarm Levels and I3 Re-entry into Refrigerating Machinery Rooms</p>

*CET has taken reasonable efforts in interpreting the Safety Standards as outlined above with the intention to make the information easier to understand. CET does not assume responsibility for any errors, omissions or misinterpretation of said information. It is the responsibility of the user to ensure compliance as required in their jurisdiction.*

## CET's Gas Detection System Suggestions for Mechanical Refrigeration & Ammonia Systems

For a *refrigerant system*, a gas detector with a corresponding refrigerant sensor should be mounted 10 in to 18 in (25 cm to 43 cm) off the floor in an area where a refrigerant leak is most likely to concentrate.

For an *ammonia system*, a gas detector with an ammonia sensor should be mounted on or near the ceiling in an area where an ammonia leak is most likely to concentrate.

More than one gas detector may be required depending on the size of the room, airflow patterns and room configuration.

Outside the main machinery room door, should be mounted a Controller with a top mounted strobe and a manual shut off switch. The Controller will provide a visual confirmation of the gas readings inside the room. The top mounted strobe will activate should the gas detector go into alarm and the manual shut off switch can be configured to shut off mechanical equipment inside the room.

A remote display connected to a remote horn/strobe should be mounted outside each door that accesses the machinery room. The remote display will provide visual confirmation of the gas readings inside the room. The gas detector(s) inside the room should be configured to trigger an audible and visual alarm mounted inside the machinery room and outside each entrance door to the machinery room. The gas detector (or Controller) will be configured to alarm based on the following gas level setpoints:

Refrigerants					
Product Name	Gas Detectors			Controllers	
	ART *	LPT-A	LPT-B or LPT-M or ESH-A	FCS or QCC	DCC
<b>Low Alarm</b>	250 ppm	n/a	250 ppm	250 ppm	250 ppm
<b>Mid Alarm</b>	500 ppm	n/a	500 ppm	500 ppm	500 ppm
<b>High Alarm</b>	1000 ppm	500 ppm	1000 ppm	1000 ppm	1000 ppm
* Except R123 Refrigerant, which is set at L = 85 ppm, M = 95 ppm and H = 100 ppm					
Ammonia					
Product Name	Gas Detectors		Controllers		
	LPT-A	LPT-B or LPT-M or ESH-A	FCS or QCC	DCC	
<b>Low Alarm</b>	n/a	25 ppm	25 ppm	25 ppm	
<b>Mid Alarm</b>	n/a	35 ppm	35 ppm	n/a	
<b>High Alarm</b>	25	250 ppm	250 ppm	250 ppm	

Upon detection of gas on or above the setpoint, the gas detector will activate the mechanical ventilation system using its internal relay, or if connected to a Controller, BAS, DDC or similar control panel, the activation of the fans and/or shutdown of equipment will be triggered by that equipment.

For more information about CET's gas detection systems, applications, calibration and much more, please visit <https://www.critical-environment.com>.