

# Orange County Fire Authority

1 Fire Authority Road, Irvine CA 92602

## RECOMMENDED CHECKLIST FOR NH3 REFRIGERATION – CFC Article 63

Facility Name:	Inspection Date:
Facility Address:	Inspector:
Facility Contact:	Phone #:

Version: 04/16/07

Article 63 (Refrigeration) of the 2001 California Fire Code (CFC) applies to refrigeration systems having more than 35 pounds of ammonia (Group B2, R-717 refrigerant) [CFC 6301]. Each ammonia system equipment item must comply with applicable recognized standards as evidenced by the listing and label of an approved agency (CMC, 302.1).

EMERGENCY RESPONSE/TRAINING/COMMUNICATION	
Y e s  <input type="checkbox"/>	N o . a) The necessary elements in 19 CCR, 2731 ? b) Employee evacuation or shelter-in-place? c) Fire? d) Ammonia release? e) Ammonia overpressure? <i>For example, in an overpressure situation potentially causing or causing a release, how will the facility mitigate the release by reducing the pressure in the ammonia system?</i> f) Procedures to prevent entry into a potentially flammable ammonia atmosphere? <i>Ammonia is flammable in the range of 12-26%.</i>
Y e s  <input type="checkbox"/>	N o . a) Methods for safe handling of ammonia? b) Procedures for coordination with Fire Department? c) Use of emergency response equipment and supplies? d) If site personnel are trained to provide ER? At what level? <input type="checkbox"/> Not trained to provide ER <input type="checkbox"/> Level C (w/ APR) <input type="checkbox"/> Level B (w/ SCBA)
Y e s  <input type="checkbox"/>	N o . Are training records available and is employee training adequate? Do employees have annual refreshers?
Y e s  <input type="checkbox"/>	N o . Does facility have portable ammonia monitor? If so, what type? _____ <i>Note that personnel cannot do an entry in APRs if they cannot determine whether atmosphere is IDLH or not. IDLH for ammonia is 300 ppm.</i>
Y e s  <input type="checkbox"/>	N o . Is there a communication system available between engine room operators and other facility personnel? <i>For example, are radios available for engine room operators to provide warning, evacuation or shelter-in-place notifications to other employees?</i>
Y e s  <input type="checkbox"/>	N o . Is emergency response equipment stored outside of engine room? <i>The engine room is a common source of releases and emergency response equipment, if stored in the engine room, may not be accessible during a release.</i>
Y e s  <input type="checkbox"/>	N o . Is the following minimum equipment installed, properly maintained and readily available for use (Title 8, CCR, Section 501)? a) At least 2 full face respiratory devices (e.g., 1 SCBA and 1 gas mask with spare canister); b) Pair of ammonia resistant gloves; c) Pair of protective boots; d) Ammonia resistant pants and jacket and/or slicker; e) A deluge shower and bubble fountain or other method of simultaneously washing both eyes with clean water (minimum water supply shall be 50 gallons); and f) First-aid kit.

<b>KNOX BOX (CFC, 6306)</b>	
Y e s  <input type="checkbox"/>	N 8 Does the facility have a KNOX box (CFC 6306)? Or 24 hr. security? Are the Emergency Response Plan, emergency contact information, site map, MSDSs and the piping and valve diagram available in the KNOX box, the Emergency Control Box and/or security office? Site map should include location of buildings/rooms, fire hydrants, fire department connections, OS&Y valve, rated firewalls, exits, doorways, roof vents, compressors, receivers, condensers, evaporators and hazardous material storage. The piping and valve diagram should indicate the location of compressors, receivers, condensers, evaporators, emergency control valves (including compressor and ventilation controls), King Valve, Emergency Control Box and pressure relief valves (PRVs).
<b>EMERGENCY CONTROL BOX AND DIFFUSION SYSTEM (CFC, 6307-6309)</b>	
Y e s  <input type="checkbox"/>	N 9 Does refrigeration system have an Emergency Control Box for handling overpressure situations (CFC, 6307 & 6318)? If so, does it have: <ul style="list-style-type: none"> <li>a) A control box, not more than 6 feet above grade, made of steel or stainless steel with a minimum of 16 gauge thickness and provided with a hinged cover and lock?</li> <li>b) Valve operational procedures— instructions for manual overpressure control of the system in an emergency with the valves adequately identified as to the sequential procedure to be followed?</li> <li>c) The name, address and emergency phone numbers to obtain emergency service?</li> <li>d) Instructions to notify the Fire Department by calling 911 in the event of an emergency?</li> <li>e) Proper identification—label on the outside cover reading, “FIRE DEPARTMENT—EMERGENCY CONTROL BOX” and “AMMONIA”?</li> <li>f) Adequate illumination for operating the Emergency Control Box.</li> </ul> <p><i>Note that for <u>new</u> construction ammonia systems, the Emergency Control Box must include a balance valve to reduce high side pressure to the low side (e.g., to low side vapor or the liquid of the low pressure receiver). However, the valve operational instructions should include that the balance valve should <u>only</u> be used if the release is on the high side. Moreover, the low side system must be designed for the same pressures as the high side (250 psig).</i></p> <p><i>For modifications at existing systems, the balance valve is recommended provided the low side is designed for the appropriate pressure.</i></p>
Y e s  <input type="checkbox"/>	N 1 Does the ammonia system(s) have a diffuser tank (CFC, 6309)? Tank capacity must be at least 1 gal. of fresh water per each lb. of ammonia. Tank must be not less than 1/8” (10 gauge) steel. Horizontal dimensions of the tank shall be equal to or less than one-half of the height. Tank must have a hinged cover or if enclosed, must have a vent hole at top. Pipe connections must be through the top of the tank; <u>the complete diffuser pipe (discharge pipe) inside the tank must be constructed of stainless steel.</u> The tank should be labeled “WATER” with clearly visible lettering. The tank must have an audible and visual alarm for low water level or an automatic fill device. The tank should be equipped with a 2½” NSH (National Standard Hose) fire department connection. Is fire hydrant accessible?
Y e s  <input type="checkbox"/>	N 1 Are PRVs plumbed to the diffuser tank (CFC, 6309)? The stainless steel discharge pipe from the PRVs must discharge ammonia vapor (i.e., ammonia vapor from the low and high side of the system) in the center of the tank near the bottom but not more than 30 feet below the surface of the water.
Y e s  <input type="checkbox"/>	N 2 Is the diffusion piping to the tank designed to prevent water from back flowing to the PRV(s)?
Y e s  <input type="checkbox"/>	N 3 Is a vent line sensor or diffuser tank pH monitor installed to detect ammonia released from a PRV(s)? The sensor or pH monitor, when activated at the trip point, should send a signal to the ammonia detection and alarm monitor or PLC. The vent line sensor can be located in the atmospheric vent of the diffuser tank to monitor the headspace for ammonia.
<b>REFRIGERATION MACHINERY ROOMS, ALARMS AND VENTILATION (CFC, 6310 &amp; 6311)</b>	
Y e s  <input type="checkbox"/>	N 4 Does the refrigeration system have a machinery room (engine room) when required (see CFC, 6310.1)? Engine room must be of such dimensions that all system parts are readily accessible, must have walking space at least 3 feet in width and 6 feet, 8 inches in height to at least 2 sides of all moving machinery and approaching each ammonia system stop valve.

Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>1</b>	Is the engine room sprinklered?
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>6</b>	Does access to engine room have a posted sign restricting entry to authorized personnel only (CFC, 6310.2)?
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>7</b>	Does the engine room exiting comply with the Building Code for special hazards (CFC, 6310.3)?
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>8</b>	Does engine room have approved ammonia-vapor detectors located in an area where the ammonia from a leak is likely to concentrate (CFC, 6310.4)? Are the detectors/sensors intrinsically safe or if not, can they be installed in an explosion-proof enclosure approved by the manufacturer or de-energized before 10% of the LEL?  At a minimum, the engine room detectors must activate visual (e.g., rotating or flashing strobes) and audible alarms at 25-50 ppm ammonia. Audible alarm must be at least 15dB above ambient noise (CFC, 6313.1). At least one rotating or flashing strobe and audible alarm (appropriate UL temperature rating) should be located inside the engine room/recirculator room and on the engine room/recirculator room outside wall.  A minimum of one detector for each engine room must be capable of detecting ammonia concentrations up to at least 10,000-20,000 ppm. The ammonia detection and alarm system monitor must be located in an area remote from the engine room and must provide continuous ammonia concentration readings for all ammonia detectors (not just the engine room detectors). A sign must be installed on the exterior of all engine room doors stating "A remote monitor located in ... provides continuous ammonia concentration levels [or alarm status conditions]." The sign background should be red with 1" high white letters.  In addition, a sampling port must be installed through the engine room wall in the same general area as the engine room ammonia sensor. The sampling port should have about a 1-1/4" inside diameter and be constructed of non-ferrous materials with an air-tight cap. The sampling port should have a sign that reads "Ammonia Engine Room Air Sample Port-- Keep Closed at All Times When Not in Use." The sign background should be red with 1" high white letters.
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>9</b>	Does engine room have sealed penetrations through walls to inhibit the passage of ammonia into other rooms (CFC, 6310.5)?
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>20</b>	Are open flames or devices having an exposed surface exceeding 800°F prohibited in engine room (CFC, 6310.7)?
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>21</b>	Is the engine room provided with a continuous source of outside air for ventilation & removal of rejected heat and are the exhaust inlets or openings located to provide ventilation throughout the entire engine room (CFC, 6311.1-.2)? Engine rooms must be provided with dedicated mechanical ventilation systems that continuously provide 0.5 cubic foot per minute of air flow per gross square foot of floor area. Engine room ventilation systems must also limit the temperature rise within the room to a maximum of 104°F (CMC, 1108.2)
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>22</b>	Are fans provided in the engine room for emergency purge ventilation (CFC, 6311.4)?
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	<b>23</b>	Do the emergency purge ventilation fans have a clearly identified break-glass switch providing on-only control immediately adjacent to and outside of the engine room means of egress (CFC, 6311.4)? Each fan must be controlled by its own switch (CMC, 1108.6).

Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>2</b>	Do the emergency purge ventilation fans respond automatically to ammonia detected in the engine room [at 50 percent of the IDLH or 150 ppm] (CFC, 6311.4)? The emergency purge control must be provided with a manual reset only.
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>2</b>	Are the central control switches for emergency purge ventilation fans the 3-position, automatic/on/off type and clearly labeled for both function and the specific fans controlled (CFC, 6311.5)? Two-colored and labeled indicator lamps responding to the differential pressure created by air flow must be provided for each switch; one lamp must indicate flow, the other must indicate no flow.
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>2</b>	Can the engine room ventilation fans be shut-off from outside the engine room, i.e., do the engine room continuous ventilation fans also have a central control on/off switch that is clearly labeled and within a key operated or locked glass-covered enclosure adjacent to and outside of the principal entrance to the engine room (CFC, 6311.5)? Necessary keys must be located in a single approved location. <i>The engine room is a common source of releases and it may not be possible to enter the engine room to shut-off the ventilation fans during a release. In some cases, e.g., when there are down-wind receptors, it may be advantageous to keep the engine room closed and the fans off to minimize the amount of ammonia released. Thus, CFC 6311.5 requires a remote engine room ventilation fan emergency control on/off switch.</i>
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>2</b>	Do all ventilation fans discharge at least 20 feet from a property line or opening into a building (CFC, 6311.6)?
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>2</b>	Do fans and associated equipment intended to operate the emergency purge of ammonia meet the requirements for a Class I, Division 1 hazardous location (CFC, 6311.7) ?
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>2</b>	Are make-up air intakes for the engine room installed to deliver air from outside of the building and fitted with backdraft dampers or approved flow-control means to prevent reverse flow (CFC, 6311.8)? <i>Distribution of makeup air should be arranged to provide thorough mixing within the machinery room to prevent short circuiting of the makeup air directly to the exhaust.</i>
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>3</b>	Are the engine room doors self-closing? Does the engine room have a roll-up door and is it relatively vapor tight? Is the roll-up door designed to close during an ammonia release?
<b>STORAGE AREA DETECTION AND ALARM SYSTEMS (CFC, 6312, 6313 &amp; 6317)</b>			
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>3</b>	Are refrigerated rooms and piping spaces equipped with ammonia-vapor detectors (spaced no more than approximately 30 feet from evaporators) and sealed from all other non-refrigerated portions of the building by vaportight construction and tightfitting, gasketed doors (CFC, 6312)?
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>3</b>	In other than the engine room, does the detection and alarm system utilizing listed fire alarm signaling devices, when activated at 50 percent of the IDLH (150 ppm) or 25 percent of the LFL, provide automatic shutdown stopping the flow of refrigerant to evaporators within cold rooms (e.g., use of solenoid valves, activated by the detection and alarm system, on high pressure liquid lines to evaporators) & stopping the flow of ammonia in all supply lines leaving the engine room (CFC, 6313.2.2)? At ammonia concentrations at or greater than 25 percent of the LFL, activation of the detection and alarm system shall automatically de-energize electrical power within space that does not meet Class I, Division 1, Group D electrical requirements. At least one visual alarm (rotating or flashing strobe) and audible alarm (appropriate UL temperature rating) should be located in each cold room & in dock area.
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>3</b>	Is the detection and alarm system remotely annunciated at an approved constantly attended location as required for fire alarm systems (CFC, 6313.4)?
Y e s  <input type="checkbox"/>	N o .  <input type="checkbox"/>	<b>3</b>	Is the detection and alarm system connected to a secondary source of power to automatically supply electrical power in the event of a loss of power from the primary source (CFC, 6317.2)? <i>Note: A UPS rated for 1½ hrs. may be used to satisfy this requirement (NEC, Section 700-12.a).</i>

<b>PERIMETER DETECTION AND ALARM SYSTEMS</b>		
Y e s <input type="checkbox"/>	N 3 5 .  <input type="checkbox"/>	Is perimeter detection necessary to detect an outdoor release (e.g., from a trailer mounted compressor unit or due to the proximity of receptors)?
<b>REFRIGERATION MACHINERY ROOM EQUIPMENT AND CONTROLS (CFC, 6314)</b>		
Y e s <input type="checkbox"/>	N 3 6 .  <input type="checkbox"/>	Is piping, equipment, ducts, vents or similar devices, not essential for the refrigeration process, maintenance, illumination or ventilation, prohibited from being located in or passing through the engine room (CFC, 6314.1)?
Y e s <input type="checkbox"/>	N 3 7 .  <input type="checkbox"/>	Can the compressor(s) be shut-down from outside the engine room, i.e., is a clearly labeled emergency control break-glass switch providing off-only control of electrically energized equipment (including compressors) and devices within the engine room provided immediately adjacent to and outside of the engine room means of egress and is the emergency shut-off automatically activated with the detection and alarm system when ammonia concentrations exceed 25 percent of the LFL (CFC, 6314.4)? <i>The engine room is a common source of releases and it may not be possible to enter the engine room to shut-off the compressors during a release. CFC, 6314.4 thus requires a remote compressor emergency shut-down switch.</i>
<b>REFRIGERANT CONTROL VALVES/PIPING AND VALVE DIAGRAM (CFC, 6315)</b>		
Y e s <input type="checkbox"/>	N 3 8 .  <input type="checkbox"/>	Are stop valves installed in the refrigeration system at the following locations: at the inlet and outlet of a compressor and condenser, at the liquid receiver outlet (King Valve) and at the inlet of a pressure receiver with a volume exceeding 3 cubic feet (CFC 6315.1)?
Y e s <input type="checkbox"/>	N 3 9 .  <input type="checkbox"/>	Are the stop valves accessible from the engine room floor or a level platform (CFC, 6315.3)?
Y e s <input type="checkbox"/>	N 4 0 .  <input type="checkbox"/>	Is there access (e.g., ladder) for exterior stop valves (e.g., for evaporators) located on the roof and for stop valves at the condensers (CFMC, 1126.0)?
Y e s <input type="checkbox"/>	N 4 1 .  <input type="checkbox"/>	Is a piping and valve diagram mounted under glass at an approved location near the principal entrance to the engine room (CFC, 6315.4 & 6315.5)?
Y e s <input type="checkbox"/>	N 4 2 .  <input type="checkbox"/>	Are all ammonia system valves identified by tagging and numbered consistent with the piping and valve diagram (CFC, 6315.4)?
<b>PIPING AND PIPING LABELING</b>		
Y e s <input type="checkbox"/>	N 4 3 .  <input type="checkbox"/>	Is ammonia system piping in accordance with standards? Piping should conform to ASME Standard B31.5, Refrigeration Piping & IIAR Standard 2. Piping should be carbon steel or stainless. Pipe > 2 in. shall be electric-resistance welded or seamless (CMC, 1110.3). <i>Galvanized and copper piping should not be used.</i> Pipe connections can be threaded if the pipe size is 1.25" or smaller. Pipe 1.5" or larger should be welded. Ammonia pipe welders should be certified in the pipe sizes and welding procedures required. Piping should be at least 7½ ft. above the floor. The distance between insulated lines should be at least 3 times the thickness of the insulation for screwed/welded fittings and 4 times for flange fittings. Piping must be securely fastened to a permanent support within 6 ft. following the first bend from the compressor and within 2 ft. of each subsequent bend or angle. Piping shall be supported at points not more than 15 feet apart (CMC, 1111.2)
Y e s <input type="checkbox"/>	N 4 4 .  <input type="checkbox"/>	Are all ammonia pipelines properly labeled, including: 1) a yellow label with the word "Ammonia", 2) the physical state (vapor or liquid), 3) the pressure level (high or low pressure) and 4) the direction of flow (IIAR, Bulletin No. 114 & ANSI A13.1)? Piping should be labeled at 30 foot intervals with a label in every room through which the piping extends; outdoor areas should also be labeled.

<b>PROTECTION FROM MECHANICAL DAMAGE (CFC, 6316)</b>	
Y e s  <input type="checkbox"/>	N 4 Is ammonia equipment subject to vehicular damage (e.g., outdoor receivers) protected by o 5 guard posts (CFC, 6316)? .  <input type="checkbox"/>
<b>TESTING OF EQUIPMENT AND RECORDS (CFC, 6320)</b>	
Y e s  <input type="checkbox"/>	N 4 Were/are the following emergency systems tested for safety and effectiveness upon o 6 completion or alteration and tested periodically in accordance with manufacturer's . instructions by a qualified person and as required by the Fire Department: diffusion system, valves and appurtenances necessary to the operation of the emergency control box, fans and associated equipment intended to operate emergency purge ventilation systems, and detection and alarm systems (CFC, 6320.1 & 6320.2)?
Y e s  <input type="checkbox"/>	N 4 Were refrigeration-containing parts of the high and low side of a system that was field o 7 erected or repaired tested (at 235 psig for ammonia) and proven to be tight after complete . installation and prior to operation (CMC, 1123.2-3)? <b>Exception:</b> compressors, condensers, evaporators, coded pressure vessels, safety devices, pressure gages, control mechanisms and systems that are factory tested. Oxygen, flammable or combustible gases shall not be used for leak testing. Test must incorporate a pressure-limiting or pressure-reducing device with a pressure-relief device and a gage on the outlet side.
Y e s  <input type="checkbox"/>	N 4 Was a dated test declaration, indicating a "Pass" result and signed by the installer, received o 8 for the field test (CMC, 1123.4)? The declaration should include the facility name, address, . identification of the system tested, name and number designation of the refrigerant and the test pressure.
Y e s  <input type="checkbox"/>	N 4 Will ammonia detection and alarm system sensors be calibrated in accordance with the o 9 frequency required by the manufacturer (CFC, 6320.2)? Calibration frequencies should be . stated in the facility's operating procedures.
Y e s  <input type="checkbox"/>	N 5 Are written records of required testing maintained on-site (CFC, 6320.3)? o 0 .  <input type="checkbox"/>
<b>NOTIFICATION OF DISCHARGES (CFC, 6321)</b>	
Y e s  <input type="checkbox"/>	N 5 Has the facility notified the Fire Department by dialing 911 immediately upon discharge of o 1 ammonia or is site management aware of this requirement (CFC, 6321)? .  <input type="checkbox"/>
<b>STORAGE, HANDLING AND USE (CFC, 6322)</b>	
Y e s  <input type="checkbox"/>	N 5 Is flammable and combustible material storage (e.g., compressor oil) prohibited in the engine o 2 room (CFC, 6322)? .  <input type="checkbox"/>
<b>RECORDS (CFC, 6324)</b>	
Y e s  <input type="checkbox"/>	N 5 Are records for the amount of ammonia purchased and removed maintained on-site? (CFC, o 3 6324)? .  <input type="checkbox"/>
<b>PRESSURE RELIEF VALVE (PRV) INSTALLATION AND MAINTENANCE</b>	
Y e s  <input type="checkbox"/>	N 5 Is each part of the refrigeration system that can be valved off and that contains one or more o 4 pressure vessels having internal diameters greater than 6 inches and containing liquid . refrigerant protected by a PRV (CMC, 1114.5)? Stop valves must not be located between a PRV and the portion of the system protected thereby (CMC, 1114.6).
Y e s  <input type="checkbox"/>	N 5 Are PRVs changed at least every 5 years? o 5 .  <input type="checkbox"/>

OTHER REQUIREMENTS			
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	5 6 .	Can ammonia system valves be controlled remotely? <i>Note: not necessarily a CFC requirement.</i>
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	5 7 .	Are ammonia system oil drain valves the spring type? <i>Note: not necessarily a CFC requirement. Spring type oil drain valves prevent the operator from walking away during the oil draining process and thus minimize the chance of an ammonia release occurring during this maintenance activity.</i>
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	5 8 .	Are floor drains located in the engine room? If so, are there measures in place to prevent an ammonia release to the sewer? <i>Note: not necessarily a CFC requirement.</i>
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	5 9 .	Are fire extinguishers properly located and serviced, including being located in the engine room (CFC 1002.1)? Rating should not be less than 40B-C.
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	6 0 .	Are exits properly marked, including exits for the engine room and cold rooms (CFC, 1207.6)?
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	6 1 .	Is every ammonia receiver and vessel properly identified with the contents and its size and does the facility have proper NFPA 704 placarding for all rooms/buildings containing more than 100 pounds of ammonia (CFC, 8001.7)? <i>Facility should use 3-1-0 for outdoor locations and 3-3-0 for indoor locations for ammonia.</i>
Y e s <input type="checkbox"/>	N o <input type="checkbox"/>	6 2 .	Does the facility have a windsock (s)? <i>Note: not necessarily a CFC requirement. However, a windsock should be visible from every outside location of the facility to assist employees in evacuating properly to an upwind area in a release incident.</i>

AMMONIA DETECTION AND ALARM SENSOR AND VENTILATION SETTINGS			
Room	Alarm/Equipment Control	Threshold	CFC Section
Engine/ Machinery Room	Alarm On	25-50 ppm	6310.4
	Alarm Company Notification	To be determined (TBD)	
	Ventilation Fan On	25-150 ppm	6311.4& 6311.6
	Ventilation Fan Off	150-4000 ppm <sup>1</sup>	6311.6
	Compressor/Pump Off	150-1000 ppm	6313.2.2
	De-energize electrical	up to 20,000 ppm	6314.4
Cold Rooms	Alarm On	25-50 ppm	6313.2.1
	Flow to Evaporators Off	150 ppm	6313.2.2
	Alarm Company Notification	TBD	
	De-energize electrical <sup>2</sup>	up to 20,000 ppm	6313.2.2

Alarms must be visual and audible. Audible alarm must be 15 dB above operating ambient noise.

<sup>1</sup>The maximum threshold of 4000 ppm is less than 25% of the LFL; this value is based on more conservative potential health impacts. This threshold may be set differently based on site-specific conditions. **An engineering analysis of plume dispersion demonstrating that 50% of the IDLH will not be exceeded at the property line may be required for approval of ventilation fan off settings** (CMC, 1108.7). Compressor/pump off ppm setting should be no higher than the ventilation fan off ppm setting.

<sup>2</sup>When space does not meet Class I, Division 1, Group D requirements.