

**Carlsbad Fire Department  
Fire Prevention Bureau**

**Guideline for  
Refrigeration Systems**



Approved and Authorized By:

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# Guideline for Refrigeration Systems

## PURPOSE

The intent of this guideline is to clarify certain requirements for refrigeration systems regulated by Chapter 6 of the 2019 California Fire Code (CFC). Not all refrigeration system requirements will be identified in this guideline.

## SCOPE

This guideline is applicable to existing refrigeration systems and new systems where the amount of refrigerant in a single system exceeds 220 pounds of Group A1 or 30 pounds of any other Group. Existing systems will be regulated by the Code in effect at the time of construction or major upgrade, while new installations are regulated by the 2019 CFC. When an existing refrigeration system is upgraded or modified, the Fire Code Official will determine how the application of the two codes shall be applied.

## Definitions

Immediately Dangerous to Life and Health (IDLH) – a concentration of airborne contaminants normally expressed in parts per million (ppm) or milligrams per cubic meter, which represents the maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or irreversible health effects. This level is established by the National Institute of Occupational Safety and Health (NIOSH). If the 2019 California Mechanical Code (CMC) does not have adequate data for IDLH, the refrigerant manufacturer or the Fire Code Official shall make a determination.

Lower Flammability Limit (LFL) – the minimum concentration of vapor in air at which propagation of flame will occur in the presence of an ignition source. LFL is sometimes referred to as LEL (Lower Explosive Limit).

Permissible Exposure Limit (PEL) – the maximum permitted eight-hour time-weighted average concentration of an airborne contaminant.

## Classification

Refrigerants are classified into groups according to toxicity and flammability, example: ammonia is a Class B-2 while R-404A and R-507A are Class A-1.

Toxicity Classification based on the 2019 CMC shows Class A as refrigerants with a low degree of toxicity and Class B as refrigerants with higher toxicity.

Flammability Classification based on the 2019 CMC shows Class 1 indicates low flammability, Class 2 indicates moderate flammability, and Class 3 indicates high flammability.

## SUMBITTAL REQUIREMENTS

### 1. General Requirements

- A. Submit three (3) sets of legible, scaled plans with one (1) set of current and complete technical data sheets/manufacturer's specifications to Carlsbad Fire Prevention.
- B. A system shall be subject to review by both the building department and Carlsbad Fire Department (CFD). Installation, upgrade, retrofit, and modification plans of refrigeration systems shall be submitted for review to the CFD prior to installation.
- C. The plans shall include the scope of work, design details, specifications of the system, and demonstrate full compliance with applicable codes and industry standards/guidelines (such as IIAR, RETA, and ASHRAE).
- D. Plans need to specify if CFC or CMC designs are proposed, any combined use of these codes and/or standards are subject to approval by CFD.
  - 1) Access – Refrigeration systems shall be accessible to the fire department at all times as required by the fire code official. CFD recommends an approved Knox key box.
  - 2) Emergency Fire Control Box – Are no longer required by the CFC or the CMC. Existing refrigeration systems are expected to maintain and test their emergency fire control box. Removing or altering the emergency control box shall be approved by City of Carlsbad. The control box for existing ammonia refrigeration systems shall be in accordance with the Code in effect at the time of construction or major upgrade, and contain a compressor shut down switch, clear emergency instructions, and the refrigeration engineer's emergency 24 hr telephone contacts.
  - 3) Toxic or highly toxic refrigerants. Systems containing refrigerants which are toxic or highly toxic shall discharge vapor to atmosphere only through an approved treatment or flare system (2019 CFC 605.12.1). Some refrigerants, such as ammonia, are subject to additional state and/or federal programs when the total facility-wide quantity exceeds 500 pounds for CalARP or 10,000 pounds for Federal RMP.
  - 4) Ammonia refrigerant. Systems containing ammonia refrigerant shall discharge vapor to the atmosphere only through approved treatment, flaring, or diffusion systems (2019 CFC 606.12.4). If another method of safe emergency discharge is currently in use such as a sanitary drain system, the business owner shall be required to show CFD that this connection and use of the drain is acceptable by the local sanitation authority.
  - 5) Refrigeration Machinery Rooms – When required by 2019 CMC machinery rooms (sometimes referred to as compressor or engine rooms) shall conform to specific sections. Roof mounted systems and/or equipment not sufficiently enclosed to contain refrigerant vapors need not comply with this section.

- 6) The following is a summary of significant machinery room safety features:
- Vapor leak detectors to have blue visual strobes in/out of primary exits
  - Vapor leak detectors to have local audible horns in/out of primary exits
  - Normal ventilation
  - Emergency purge ventilation
  - Automatic shutdown device
  - Emergency shutdown device
  - Exit door 36" width, swing outward, panic hardware, illuminated sign
  - Automatic fire sprinklers and/or fire rated construction (see CBC Sec 508.2)
- 7) The following is a partial summary of refrigerated space/cold area safety features:
- Vapor leak detectors to have local audible horns in/out of primary exits
  - Vapor leak detectors to have local audible horns in/out of primary exits
  - Vapor tight design, no ventilation
- 8) The following is a partial summary of refrigeration system safety features:
- Compressor isolation stop valves
  - Liquid receiver vessel isolation stop valves
  - Liquid condensers isolation stop valves
  - Spring return ("dead man") valves at oil drain points
  - Flow direction and identification signs on piping
  - Emergency pressure control system (systems built after 2007)
  - Automatic crossover valves (systems built after 2007)
- 9) Detection and Alarm Systems: Alarm signaling devices shall sound at 15 dB above ambient noise. Alarms shall be activated in the space when the refrigerant vapor PEL is exceeded. Detection and alarm systems shall be powered and supervised as required for fire alarm systems in 2016 NFPA 72.
- 10) Testing of Equipment –Installation acceptance tests must be witnessed and approved by an CFD inspector.
- 11) Inspection: At the time of the final fire inspection, the owner/operator shall demonstrate that the leak detection, notification, automatic shut down, and Call-Out features are functioning as per the plan design.

## **2. Notification of Discharges**

The CFD shall be notified immediately upon discharge of refrigerant, whether automatic or manual. Refrigerant shall not be discharged except in an emergency. Releases or threatened releases must also be reported to the Cal OES at (800) 852-7550. 2019 CFC 605.14

### 3. Leak Detection and Alarms

This section's purpose is to provide additional direction in meeting the refrigerant alarm and detection requirements of the 2019 California Fire Code and the 2019 California Mechanical Code.

- Most Machinery Rooms require refrigerant alarm and detection systems.
- Some walk-in freezers and coolers require refrigerant alarm and detection systems if refrigerant quantities exceed 2019 CMC Table 11A amounts as indicated on the CFD Refrigerant Disclosure Form.
- Refrigerant alarm and detection systems shall provide supervisory trouble and supervisory detection signals to an off-premises central monitoring station. It is preferred that refrigerant alarm and detection systems be connected to a Security panel or local fire alarm /sprinkler monitoring system, or directly to a refrigeration engineer under contract to respond in 30 minutes.
- Refrigerant alarm and detection signals shall not activate fire alarm/sprinkler monitoring alarm devices. Only the blue-colored horn/strobes of the refrigerant alarm and detection system shall be activated by a refrigerant detection.
- CFD may require refrigeration trouble and/or detection signals as alarm signals (and dispatch first responders) if unusually hazardous conditions may result from a significant refrigerant leak.

**NOTE:** Please complete the attached refrigerant disclosure form and include it as part of the plan submittal package. The factors are different for each refrigerant type, for example the factor for R-22 is 5.5 lb/1000cuft while the factor for R-404A is 17 lb/1000cuft.

## REFRIGERANT DISCLOSURE FORM

Date: \_\_\_\_\_ Carlsbad Permit# (if applicable): \_\_\_\_\_

Business Name (Where system is located): \_\_\_\_\_

Complete Business Address: \_\_\_\_\_ Phone: ( ) \_\_\_\_\_

Refrigerant Contractor or Engineering Firm: \_\_\_\_\_ Phone: ( ) \_\_\_\_\_

**Instructions:**

- Column #1 Identify each refrigerant system included in this submittal.
- Column #2 List the chemical name of the refrigerant or the refrigerant number, CMC Factor.
- Column #3 Identify the refrigerant safety group. Refrigerant safety groups are defined in the California Mechanical Code (CMC).
- Column #4 Identify the total amount of refrigerant in each system (in pounds). If the amount in any single system is greater than 220 pounds of Group A1 refrigerants or 30 pounds of any other Group, submit a refrigeration plan to the CFD.
- Column #5 Does the refrigeration system have components located so that the leakage of refrigerant could enter a space occupied by any person? Example is a walk-in freezer or machine room. If yes, identify the volume of the smallest space occupied (in cubic feet). CMC Table 11
- Column #6 Calculate by using: column #4 divided by column #5 divided by 1000. If this value exceeds the CMC value for the specific refrigerant type, then submit a refrigeration plan, including a refrigerant alarm and detection system, to CFD. Provide a copy of this form to the City Building Department.
- Column #7 Does the quantity of refrigerant exceed the amount specified in CMC Table 11-1? If yes, contact the local building department and CFD for requirements.

**PROVIDE INFORMATION IN TABLE FORMAT**

<u>Identify Each System</u>	Refrigerant Chemical Name OR Refrigerant Number/ Factor from CMC	Safety Group	Quantity of Refrigerant (Pounds)	Volume of Smallest Occupied Space Open to System (Cubic Feet)	<u>Pounds of Refrigerant</u> per 1,000 Cubic Feet of Enclosed Space	Does Column #6 Quantity Exceed CMC Table 11A? (Y/N)