

September 20, 2019

Richie Kaur  
California Air Resources Board  
1001 I Street  
PO Box 2815  
Sacramento, CA 95812  
(Submitted via email to [richie.kaur@arb.ca.gov](mailto:richie.kaur@arb.ca.gov))

Re: AHRI Letter Responding to CARB's Request for Additional Input and Clarifications  
Following the August 6, 2019 Public Meeting

---

Dear Ms. Kaur,

On August 6, AHRI submitted a letter to California Air Resources Board (CARB) regarding GWP levels and feedback from original equipment manufacturers (OEMs) of stationary commercial refrigeration equipment regarding CARB-proposed regulations. AHRI fielded responses to the questions CARB raised regarding the August 6 letter and provides additional input and clarification with this response.

AHRI is the trade association representing manufacturers of heating, cooling, water heating, and refrigeration equipment. More than 300 members strong, AHRI is an internationally recognized advocate for the industry, and develops standards for, and certifies the performance of many of the products manufactured by our members. In North America, the annual output of the HVACR and water heating industry is worth more than \$44 billion. In the United States alone, the HVACR and water heating industry supports 1.3 million jobs and \$256 billion in economic activity.

In this letter AHRI responds to questions pertaining to the following topics:

1. Definitions
2. Revised definition for new equipment
3. 150 GWP limit for new buildings vs. replacing equipment in existing facilities
4. Revised AHRI proposal table
5. 300 GWP limit for condensing units
6. 50 lb charge limit
7. Refrigerant service GWP limit
8. Exemptions

## 1. DEFINITIONS

As requested following the August 6 public meeting, AHRI has drafted changes to the definition for New Refrigeration Equipment and addressed new construction applications to distinguish where 150 GWP limits are feasible. AHRI also suggests that CARB use the EPA definitions for equipment types where possible. Those definitions, with minor edits, are shown below for CARB's consideration.

### New Refrigeration Equipment

1. Any refrigeration equipment system that is first installed using new or used components; or
  - a. Additions to existing equipment such that they increase nominal compressor capacity after the date at which this sub article becomes effective;
2. Any refrigeration equipment that is modified such that it is:
  - a. Modified to increase nominal compressor capacity after the date at which this sub article becomes effective; or
  - b. Replaced or cumulatively replaced after the date at which this sub article becomes effective, such that the capital cost of subsequent service, repair or replacement would exceed 50 percent of the capital cost of replacing the entire refrigeration system based on quoted system replacement cost.

### Refrigeration Greenfield Construction

1. Greenfield construction of Retail Food Refrigeration equipment (i.e., a completely new building); or
2. If all equipment is being replaced inside the shell of a building to convert it to contain Retail Food Refrigeration equipment.

### Retail Food Refrigeration

Retail Food Refrigeration, or commercial refrigeration, includes equipment designed to store and display chilled or frozen goods for commercial sale. This end-use includes the following categories of equipment: *stand-alone equipment*, *remote condensing units*, and *supermarket systems*.

### Self-contained Retail Food Refrigeration

Self-contained equipment includes refrigerators, freezers, and reach-in coolers (either open or with doors) where all refrigeration components are integrated and, for the smallest types, the refrigeration circuit is entirely brazed or welded. These systems are fully charged with refrigerant at the factory and typically require only an electricity supply to begin operation.

### Refrigerated Food Processing and Dispensing Equipment

Refrigerated Food Processing and Dispensing Equipment dispenses and often processes a variety of food and beverage products. For instance, some such equipment will process the product by combining ingredients, mixing and preparing it at the proper temperature, while others function mainly as a holding tank to deliver the product at the desired temperature or to deliver chilled ingredients for the processing, mixing and preparation.

Some may use a refrigerant in a heat pump, or utilize waste heat from the cooling system, to provide hot beverages. Some may also provide heating functions to melt or dislodge ice or for sanitation purposes.

This equipment can be self-contained or can be connected via piping to a dedicated condensing unit located elsewhere. Equipment within this end-use category include but are not limited to: chilled and frozen beverages (carbonated and uncarbonated, alcoholic and nonalcoholic); frozen custards, gelato, ice cream, Italian ice, sorbets and yogurts; milkshakes, “slushies” and smoothies, and whipped cream.

### Remote Condensing Units

Remote Condensing Units are composed of one (and sometimes two) compressor(s), one condenser, and one receiver assembled into a single unit, which is normally located external to the sales area. The condenser (and often other parts of the system) is located outside the space or area cooled by the evaporator, typically ejecting heat to the outdoor ambient environment. Remote condensing units are commonly installed in convenience stores, specialty shops (e.g., bakeries, butcher shops), restaurants, institutional cafeterias and commissaries, farms, small and medium cold storage facilities, food processing facilities, and other small and medium-size refrigeration facilities.

### Supermarket Systems

This equipment category includes multiplex or centralized systems, which operate with racks of compressors installed in a machinery room. Two main design classifications are used: Direct and Indirect Systems.

#### *1. Direct Systems*

In Direct Systems, the refrigerant circulates from the machinery room to the sales area, where it evaporates in display-case heat exchangers, and then returns in vapor phase to the suction headers of the compressor racks. Another direct supermarket design, often referred to as a distributed refrigeration system, uses an array of separate compressor racks located near the display cases rather than having a central compressor rack system.

#### *2. Indirect Systems*

Indirect supermarket designs include secondary loop systems and cascade refrigeration. Indirect systems use a “chiller” (not to be confused with the “chiller” end-use) or other refrigeration system to cool a secondary fluid that is then circulated throughout the store to the cases.

### Retrofit

Retrofit means to convert an appliance from one refrigerant to another refrigerant. Retrofitting includes the conversion of the appliance to achieve system compatibility with the new refrigerant and may include, but is not limited to, changes in lubricants, gaskets, filters, driers, valves, o-rings or appliance components. Retrofit does not apply to updates to existing equipment where the refrigerant is not changed.

## 2. REVISED DEFINITION FOR NEW EQUIPMENT

CARB requested comments on the definition for New Refrigeration Equipment. AHRI expressed concern with the proposed definition and its potential inclusion of servicing or replacement applications. AHRI provides the revisions shown above to address these concerns. AHRI requests that this definition be updated as shown to exclude the following situations which AHRI does not believe it was CARB's intent to include. Cases of retrofit, maintenance and replacement of equipment components cannot be done for all applications given the current equipment limitations and restrictions of safety codes and standards.

- Retrofit: Using new refrigerant as a result of replacing refrigerant with a non-delisted and lower GWP refrigerant.
- Servicing: Any time refrigerant is used to charge existing equipment.
- Maintenance: Replacing a component without increasing the nominal compressor capacity.
- Replacement: Partial or complete replacement (refurbishing to reduce carbon/energy footprint).

## 3. 150 GWP LIMIT FOR NEW BUILDINGS VS. REPLACING EQUIPMENT IN EXISTING FACILITIES

CARB requested feedback on the feasibility of low-GWP systems in existing stores for all system sizes above 50 pounds of charge, and whether equipment in *new buildings* can meet the 150 GWP limit by 2022. AHRI members support a 150 GWP limit for new buildings or Refrigeration Greenfield Construction except for the category of Remote Condensing Units as these pose significant technological difficulties in complying with 150 GWP limitations.

1. Provisions in the original letter stand for all replacement and new equipment applications.
2. AHRI proposes the following definition for Greenfield Construction in refrigeration and agrees to a 150 GWP limit for Greenfield Construction excluding Remote Condensing Units.

### REFRIGERATION GREENFIELD CONSTRUCTION

- a. Greenfield construction of Retail Food Refrigeration equipment (i.e., a completely new building); or
  - b. If all equipment is being replaced inside the shell of a building to convert it to contain Retail Food Refrigeration equipment.
3. AHRI proposes the following limits be set for Refrigeration Greenfield Construction:
    - a. Retail Food Refrigeration equipment greater than 50 lb: 150 GWP limit;
      - i. Exception: remote condensing units 50 - 300 lbs: 1500 GWP limit

These limits have been added to the proposal table as New Construction.

#### 4. REVISED AHRI PROPOSAL TABLE

Following the August 6 public meeting, CARB raised some pertinent questions regarding AHRI's original commercial refrigeration letter and asked for clarification on some of the proposed GWP limits and product classes. AHRI has revised this proposal to further clarify and address these questions.

Refrigeration Equipment Type	New / Retrofit	Charge Size	GWP Step 1 - 2021	GWP Step 2 - 2024
Supermarket	New Construction	>50 lb	150	150
Supermarket	Retrofit	>50 lb	1,500	
Supermarket	New Equipment	50-300 lb	1,500	150 <sup>[2]</sup>
Supermarket	New Equipment	> 300 lb	150	150
Remote condensing unit	Retrofit	>50 lb	1,500	
Remote condensing unit	New Construction	50 lb - 300 lb	1,500	300 <sup>[2]</sup>
Remote condensing unit	New Equipment	50 lb - 300 lb	1,500	300 <sup>[2]</sup>
Self-contained retail food refrigeration	New Construction	>50 lb	150	150
Food processing & dispensing equipment	New Construction	>50 lb	150	150
Food processing & dispensing equipment	Retrofit	>50 lb	1,500	
Food processing & dispensing equipment	New Equipment	50 lb - 300 lb	1,500	300 <sup>[2]</sup>
Food processing & dispensing equipment	New Equipment	>300 lb	150	150
Cold storage warehouses	Retrofit	>50 lb	1,500	
Cold storage warehouses	New Equipment	50 lb - 300 lb	1,500	300 <sup>[2]</sup>
Cold storage warehouses	New Equipment	>300 lb	150	150
Ice Machines <sup>[1]</sup>	New Equipment	>50 lb	2,200	300 <sup>[2]</sup>
Small refrigeration equipment - LT <sup>[4]</sup>	New Equipment	<50 lb	2,200	2,200
Small refrigeration equipment - MT <sup>[4]</sup>	New Equipment	<50 lb	1,500	1,500
<i>Industrial refrigeration<sup>[3]</sup></i>	New Equipment	>50 lb		
<i>Industrial refrigeration<sup>[3]</sup></i>	Retrofit	>50 lb		
<i>Large food processing plants<sup>[3]</sup></i>	New Equipment	>50 lb		
<i>Large food processing plants<sup>[3]</sup></i>	Retrofit	>50 lb		

<sup>[1]</sup> Flammable refrigerants cannot be used per ASHRAE 15 in hallways and egress areas, where ice machines are often located

<sup>[2]</sup> Date is contingent on the adoption of Safety Standards into California State Code

<sup>[3]</sup> AHRI did not receive enough input to comment on industrial applications to comment on these categories of equipment at this time.

<sup>[4]</sup> Ice machines are excluded from these limits

## 5. 300 GWP LIMIT FOR CONDENSING UNITS

AHRI proposes a 300 GWP limit for remote condensing units in 2024. There are no practical synthetic refrigerant options in the proper, medium pressure range for commercial refrigeration under 150 GWP, leaving only natural refrigerants to be used for remote condensing units. Blend refrigerants under 150 GWP have extremely high glide [ $>20^{\circ}\text{R}$ ] and consequently may have significant problems in application. Assuming typical options and average piping lengths to the associated loads, the charge size of remote condensing units ranges from 5 lb to 300 lb, thus no hydrocarbons or ammonia will be allowed foreseeably by safety standards in draft form today, leaving carbon dioxide as the only choice below 150 GWP.

Condensing units, regardless of refrigerant, are also held to strict new Department of Energy Walk-in Cooler & Freezer (WICF) regulations, thus preserving energy efficiency is of paramount importance. The energy-saving options required to make a remote condensing unit using CO<sub>2</sub> compliant with WICF regulations increase their cost significantly. Some options may include a larger condenser (gas cooler coils), additional cooling coils for desuperheating and intercooling, parallel compression, ejectors, and so on.

Moreover, because CO<sub>2</sub> has been used in supermarket-size racks and larger, the supply chain for all required components does not yet exist in the necessary size range. The exception to this size statement is small CO<sub>2</sub> bottle coolers for medium temperature only – also at an unsuitable size to fulfill all condensing unit supply chain needs.

A 300 GWP limit for remote condensing units allows A2L HFO-blend refrigerant R-454A and others to be used. R-454A refrigerant has glide on par with R-448A and R-449A, so manufacturers are accustomed to designing for it and do not anticipate significant issues. R-454A has a high discharge temperature, thus necessitating liquid injection; therefore, units may be more costly, but not greatly so. The operating characteristics of R-454A are likely to enable a straightforward path to DOE WICF compliance.

## 6. 50 LB CHARGE LIMIT

The AHRI Refrigeration Regulatory Committee drafted the proposal below for equipment below 50 lbs. of charge. Since EPA can approve additional refrigerants, this ensures that CARB can achieve its 2030 goals and align with the proposed service ban. The proposals have been added to the table as small refrigeration equipment, which covers all equipment in SNAP rules 20 and 21 under 50 lb charge.

- a. For medium temperature systems, less than 50 lbs. charged equipment, 1500 GWP limit can be met in 2022.
- b. For low temperature systems such as all hermetic, low temperature compressors, 2200 GWP limit could be met in 2022.
- c. Ice machines are excluded from these limits.

## 7. REFRIGERANT SERVICE GWP LIMIT

Based on AHRI's models, CARB cannot meet its emissions target by 2030 without addressing existing stationary refrigeration equipment. In seeking a way for CARB to meet this goal, while still supporting current business and stores within the state, AHRI proposes a Refrigerant Service GWP Limit as follows:

Servicing: Any time refrigerant is used to charge existing equipment:

- a. AHRI supports the continued use of recycled or reclaimed refrigerant in refrigeration systems with no GWP limitations;
- b. AHRI supports the inclusion of a refrigerant service GWP limit of 1500 GWP for MT and 2200 GWP for LT systems for the equipment types listed in the updated AHRI proposal table.

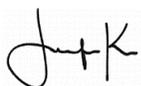
## 8. EXEMPTIONS

AHRI asks that CARB please consider including a clause within this regulation to account for necessary exceptions similar to Canada's essential purpose permit option in their Ozone-depleting Substances and Halocarbons Alternatives Regulations (ODSHAR). To prepare for the transition to low-GWP alternatives with such complex products as commercial refrigeration equipment, the clause is intended to allow a person to import, manufacture, use, or sell a substance or product designed to contain a substance if it will be used for an essential purpose and a permit is specifically issued. Environment and Climate Change Canada (ECCC) defines 'essential purpose' as a purpose requiring the use of a substance or a product containing or designed to contain a substance, when that use is necessary for the health and safety or the good functioning of society, encompassing its cultural and intellectual aspects, and when there are no technically or economically feasible alternatives to that use that are acceptable from the standpoint of the environment and of health.

The ODSHAR essential purpose exemption and definition clause can be reviewed at [Part 5 – s.66 \(1\) and \(2\)](#). The process is still being finalized by ECCC, but any specific questions can be sent to ECCC's Halocarbons Management Team at [ec.gestionhalocarbures-halocarbonsmanagement.ec@canada.ca](mailto:ec.gestionhalocarbures-halocarbonsmanagement.ec@canada.ca).

AHRI greatly appreciates the opportunity to provide these comments. We look forward to further engagement with CARB to provide any additional information or clarification of the above proposals. Should you have any questions regarding this submission, please contact Helen Walter-Terrinoni [hwalter-terrionni@ahrinet.org, (302) 598-4608] or Jennifer Kane [jkane@ahrinet.org, (703) 600-0304].

Respectfully,



Jennifer Kane  
Regulatory Engineer  
Direct: (703) 600-0304  
Email: [jkane@ahrinet.org](mailto:jkane@ahrinet.org)

Cc: Helen Walter-Terrinoni  
Lauren MacGowens