

Filed November 2, 1965

Ind 45

11:00 am

STATE OF WISCONSIN )  
DEPARTMENT OF INDUSTRIAL COMMISSION ) SS.

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

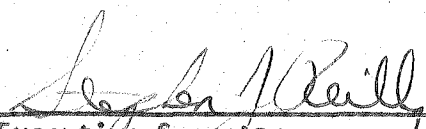
I, Stephen J. Reilly, Executive Secretary of the Industrial Commission of Wisconsin, and custodian of the official records of said Commission, do hereby certify that the attached changes to Section Ind 45 Mechanical Refrigeration codes were adopted by the Industrial Commission on October 29, 1965.

I further certify that said copy has been compared by me with the original on file in this Commission and that the same is a true copy thereof and of the whole of such original.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the department at the Capitol, in the City of Madison, this

1 day of November

A. D., 1965.

  
Executive Secretary

Pursuant to authority vested in the Industrial Commission of Wisconsin by Section 101.01-101.29 Wisconsin Statutes, and pursuant to Chapter 227, the Industrial Commission on October 29, 1965 voted to Amend rule Ind 45 as follows:  
Create Ind 45.02(35) to read as follows:

(35) PREMISES are the buildings and that part of the grounds of one property, where an installation would affect the safety of those buildings or adjacent property.

Renumber Definitions Ind 45.02 (35) through (47).

Amend Ind 45.03 to read as follows:

Occupancy classification. (1) Locations governed by this code are public buildings and places of employment.

(a) INSTITUTIONAL OCCUPANCY, as used in this code, shall apply to that portion of the premises in which persons are confined to receive medical, charitable, educational, or other care or treatment, or in which persons are held or detained by reason of public or civic duty, including among others, hospitals, asylums, sanitariums, police stations, jails, courthouses with cells, and similar occupancies.

(b) PUBLIC ASSEMBLY OCCUPANCY, as used in this code, shall apply to that portion of the premises in which persons congregate for civic, political, educational, religious, social, or recreational purposes; including among others, armories, assembly rooms, auditoriums, ballrooms, bath houses, bus terminals, broadcasting studios, churches, colleges, courthouses without cells, dance halls, department stores, exhibition halls, fraternity halls, libraries, lodge rooms, mortuary chapels, museums, passenger depots, schools, skating rinks, subway stations, theaters, and similar occupancies.

(c) RESIDENTIAL OCCUPANCY, as used in this code, shall apply to that portion of the premises in which sleeping accommodations are provided, including among others, club houses, convents, dormitories, hotels, lodging houses, multiple story apartments, residences, studios, tenements, and similar occupancies.

(d) COMMERCIAL OCCUPANCY, as used in this code, shall apply to that portion of the premises used for the transaction of business; for the rendering of professional services; for the supplying of food, drink or other bodily needs and comforts; for manufacturing purposes or for the performance of work or labor (except as included under subsection <sup>(2)</sup>~~(6)~~ - Industrial Occupancy) including among others, bake shops, fur storage, laboratories, loft buildings, markets, office buildings, professional buildings, restaurants, stores other than department stores, and similar occupancies.

(e) INDUSTRIAL OCCUPANCY, as used in this code, shall apply to an entire building or to that portion of the premises used for manufacturing, processing, or storage of materials or products, including among others, chemical, food, candy and ice cream factories, ice making plants, meat packing plants, refineries, perishable food warehouses and similar occupancies, provided the entire building is occupied by a single tenant.

(f) MIXED OCCUPANCY, as used in this code, shall apply to a building occupied or used for different purposes in different parts. When the occupancies are cut off from the rest of the building by tight partitions, floors, and ceilings and protected by self-closing doors, the requirements for each type of occupancy shall apply for its portion of the building or premises. For example, the cold storage spaces in retail frozen food lockers, hotels, and department stores in buildings occupied by a single tenant might be classified under INDUSTRIAL OCCUPANCY, whereas other portions of the building

would be classified under other occupancies. When the occupancies are not so separated, the occupancy carrying the more stringent requirements shall govern.

(2) ADJACENT LOCATIONS. Equipment installed in locations adjacent to areas outlined in section Ind 45.03(1), including outdoor installations, shall be governed by the applicable requirements of this Code.

Amend Ind 45.05(1)(a) to read as follows:

Refrigerant classification. (1) GENERAL. Refrigerants shall be classified as follows:

(a) Group 1.

Carbon dioxide (Refrigerant 744) . . . . .	CO <sub>2</sub>
Dichlorodifluoromethane (Refrigerant 12) . . . . .	CCl <sub>2</sub> F <sub>2</sub>
Dichlorodifluoromethane, 73.8% . . . . .	CCl <sub>2</sub> F <sub>2</sub>
and Ethylidene Fluoride, 26.2% (Refrigerant 500) . . . . .	CH <sub>2</sub> -CHF <sub>2</sub>
Dichloromethane (Methylene chloride) (Refrigerant 30) . . . . .	CH <sub>2</sub> Cl <sub>2</sub>
Dichloromonofluoromethane (Refrigerant 21) . . . . .	CHCl <sub>2</sub> F
Dichlorotetrafluoroethane (Refrigerant 114) . . . . .	C <sub>2</sub> Cl <sub>2</sub> F <sub>4</sub>
Monobromotrifluoromethane (Refrigerant 13B1) . . . . .	CBrF <sub>3</sub>
Monochlorodifluoromethane (Refrigerant 22) . . . . .	CHClF <sub>2</sub>
Monochlorodifluoromethane, 48.8% . . . . .	CHClF <sub>2</sub>
and Monochloropenta-fluoroethane, 51.2% (Refrigerant 502) . . . . .	CClF <sub>2</sub> CF <sub>3</sub>
Monochlorotrifluoromethane (Refrigerant 13) . . . . .	CClF <sub>3</sub>
Octafluorocyclobutane (Refrigerant C318) . . . . .	C <sub>4</sub> F <sub>8</sub>
Trichloromonofluoromethane (Refrigerant 11) . . . . .	CCl <sub>3</sub> F
Trichlorotrifluoroethane (Refrigerant 113) . . . . .	C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub>

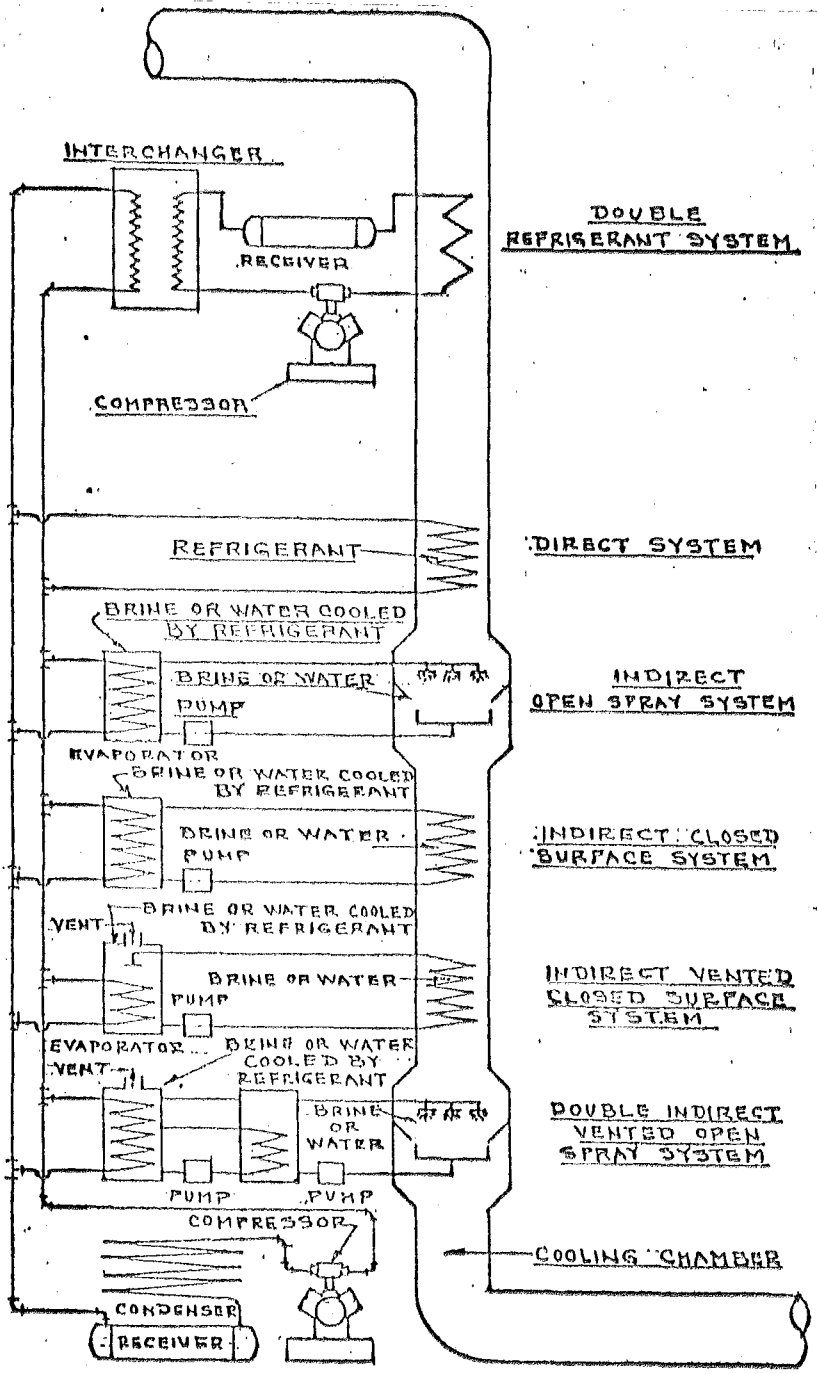


Figure 1

Amend Figure 1 as shown for Ind 45.05.

Amend Table 1 Ind 45.06 as shown:

TABLE 1. MAXIMUM PERMISSIBLE QUANTITIES OF GROUP 1 REFRIGERANTS FOR DIRECT SYSTEMS

Refrigerant Name and Number	Chemical Formula	Maximum quantity in lb. per 1000 cu. ft. of humanly occupied space
Carbon dioxide (Refrigerant 744)	CO <sub>2</sub>	11
Dichlorodifluoromethane (Refrigerant 12)	CCl <sub>2</sub> F <sub>2</sub>	31
Dichlorodifluoromethane, 73.8% and Ethylidene Fluoride, 26.2% (Refrigerant 500)	CCl <sub>2</sub> F <sub>2</sub> ) CH <sub>2</sub> -CHF <sub>2</sub> )	26
Dichloromethane (Methylene chloride) (Refrigerant 30)	CH <sub>2</sub> Cl <sub>2</sub>	6
Dichloromonofluoromethane (Refrigerant 21)	CHCl <sub>2</sub> F	13
Dichlorotetrafluoromethane (Refrigerant 114)	C <sub>2</sub> Cl <sub>2</sub> F <sub>4</sub>	44
Monobromotrifluoromethane (Refrigerant 13B1)	CBrF <sub>3</sub>	38
Monochlorodifluoromethane (Refrigerant 22)	CHClF <sub>2</sub>	22
Monochlorodifluoromethane, 48.8% and Monochloropentafluoroethane, 51.2% (Refrigerant 502)	CHClF <sub>2</sub> CClF <sub>2</sub> CF <sub>3</sub>	30
Monochlorotrifluoromethane (Refrigerant 13)	CClF <sub>3</sub>	27
Octafluorocyclobutane (Refrigerant C318)	C <sub>4</sub> F <sub>8</sub>	50
Trichloromonofluoromethane (Refrigerant 11)	CCl <sub>3</sub> F	35
Trichlorotrifluoroethane (Refrigerant 113)	C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub>	24

Amend Ind 45.062 (1)(a) to read as follows:

Direct systems in institutional occupancies shall be limited to unit systems each containing not more than 20 pounds of group I refrigerants, except in kitchens, laboratories, and mortuaries. (See Wisconsin Administrative Code subsection Ind 45.062(4)).

Amend the note following Ind 45.09 to read as follows:

NOTE: The Wisconsin Industrial Commission will recognize the provisions of American Standard Code for Pressure Piping (B31.5 - 1962) and American Standard Wrought-Steel Wrought-Iron Pipe (B 36.10 - 1959), Specifications for Seamless Copper Pipe, Standard Sizes, (ASTM B 42-62), American Standard Specifications for Seamless Copper Water Tube (ASTM B 88-62) (ASA H 23, 1-63), Standard Specifications for Seamless Copper Tubing, Bright Annealed (ASTM B 280-62), Specifications for Seamless Red Brass Pipe, Standard Sizes (ASTM B 43-62).

Amend 45.09(3)(a) to read as follows:

SPECIFIC MINIMUM REQUIREMENTS FOR REFRIGERANT PIPE AND TUBING. (a) No less than Schedule 80 wall thickness carbon steel or wrought iron pipe shall be used for Group II and Group III refrigerant liquid lines for sizes  $1\frac{1}{2}$  inches and smaller. No less than Schedule 40 wall thickness carbon steel or wrought iron pipe shall be used for Group I refrigerant liquid lines sizes 6 inches and smaller, Group II and Group III refrigerant liquid lines sizes 2 inches through 6 inches and Group I, Group II, and Group III refrigerant vapor lines 6 inches and smaller. Butt-welded carbon steel and butt-welded wrought iron pipe shall not be used for refrigerant liquid lines.

Cast iron pipe shall not be used for Group I, Group II, or Group III refrigerant lines.

Amend Ind 45.09 (4) to read as follows:

**JOINTS AND REFRIGERANT-CONTAINING PARTS IN AIR DUCTS.** Joints and all refrigerant-containing parts of a refrigerating system located in an air duct of an air conditioning system carrying conditioned air to and from a humanly occupied space shall be constructed to withstand, without leakage, a temperature of 1000 F.

Amend Ind 45.09(5)(b) to read as follows:

Systems containing 100 pounds or more of refrigerant. All systems containing 100 pounds or more of a refrigerant, other than systems utilizing nonpositive displacement compressors, shall have stop valves, in addition to those in Wisconsin Administrative Code subsection Ind 45.09(6)(a), on each inlet of each liquid receiver except that none shall be required on the inlet of a receiver in a condensing unit nor on the inlet of a receiver which is an integral part of a condenser.

Amend Ind 45.10(1)(c) to read as follows:

Aluminum, zinc, or magnesium shall not be used in contact with methyl chloride in a refrigerating system. Magnesium alloys shall not be used in contact with any halogenated refrigerant.

Amend Ind 45.10 (2) Introductory paragraph to read as follows:

**MINIMUM TEST PRESSURES.** Every refrigerant-containing part of every system, including pressure gauges and control mechanisms, shall be tested and proved tight by the manufacturer at not less than the minimum refrigerant leak field test pressure specified in Table 6 except limited charged systems. (See Wisconsin Administrative Code subsection Ind 45.10(3) and 45.14(1)(b).



Repeal and recreate Ind 45.10(4)(c) to read as follows:

On systems using nonpositive displacement compressors, the pressure-limiting device may be set at the pressure setting of the relief device, the refrigerant leak field test pressure actually applied or the design working pressure of the high side of the system, whichever is smallest, provided the pressure relief device is subject to low side pressure and there are no stop valves on the system as exempted by Ind 45.09(5) for nonpositive displacement compressors.

Create Ind 45.10(4)(d) to read as follows:

Pressure-limiting devices shall be connected, with no intervening stop valves, between the pressure-imposing element and any stop valve on the discharge side.

Amend Ind 45.10(8) to read as follows:

NAMEPLATE. Each separately sold condensing unit and each compressor or compressor unit sold for field assembly in a refrigerating system shall carry a nameplate marked with the manufacturer's name, nationally registered trademark or trade name, identification number, the test pressure applied by the manufacturer, and the refrigerant for which it is designed. The refrigerant shall be designated according to tables in Ind 45.20.

Amend table in Ind 45.13(5) to read as follows:

Kind of Refrigerant	Value of f
Ammonia (Refrigerant 717)	0.5
Refrigerants 12, 22 and 500	1.6
Refrigerants 502 and Refrigerants 13, 13B1, and 14 when on cascaded systems	2.5
All other refrigerants	1.0

Amend Table 6 in Ind 45.14 to read as follows:

TABLE 6. MINIMUM REFRIGERANT LEAK FIELD TEST PRESSURES

Refrigerant Name and Number*	Chemical Formula	Minimum field Refrigerant Leak Test Pressures, psig	
		High Side	Low Side
Ammonia (717)	NH <sub>3</sub>	300	150
Butane (600)	C <sub>4</sub> H <sub>10</sub>	95	50
Carbon dioxide (744)	CO <sub>2</sub>	1500	1000
Dichlorodifluoromethane (12)	CCl <sub>2</sub> F <sub>2</sub>	235	140
Dichlorodifluoromethane 73.8% ) (500)	CCl <sub>2</sub> F <sub>2</sub> )	285	150
Ethylidene fluoride 26.2% )	CH <sub>3</sub> CHF <sub>2</sub> )		
Dichloroethylene (1130)	C <sub>2</sub> H <sub>2</sub> Cl	30	30
Dichloromethane (Methylene chloride) (30)	CH <sub>2</sub> Cl <sub>2</sub>	30	30
Dichloromonofluoromethane (21)		70	40
Dichlorotetrafluoroethane (114)	C <sub>2</sub> Cl <sub>2</sub> F <sub>4</sub>	50	50
Ethane (170)	C <sub>2</sub> H <sub>6</sub>	1200	700
Ethyl chloride (160)	C <sub>2</sub> H <sub>5</sub> Cl	60	50
Ethylene (1150)	C <sub>2</sub> H <sub>4</sub>	1600	1200
Isobutane (601)	(CH <sub>3</sub> ) <sub>3</sub> CH	130	70
Methyl chloride (40)	CH <sub>3</sub> Cl	210	120
Methyl formate (611)	HCOOCH <sub>3</sub>	50	50
Monobromotrifluoromethane (13B1)	CF <sub>3</sub> Br	435	245
Monochlorodifluoromethane (22)	CHClF <sub>2</sub>	300	150

Refrigerant Name and Number*	Chemical Formula	High Side	Low Side
Monochlorodifluoromethane 48.8% and Monochloropentafluoroethane 51.2% (502)	CHClF <sub>2</sub>	300	150
Monochlorotrifluoromethane (13)	CClF <sub>3</sub>	685*	685*
Octafluorocyclobutane (C318)	C <sub>4</sub> F <sub>8</sub>	130	70
Propane (290)	C <sub>3</sub> H <sub>8</sub>	300	150
Sulphur dioxide (764)	SO <sub>2</sub>	170	85
Trichloromonofluoromethane (11)	CCl <sub>3</sub> F	20	20
Trichlorotrifluoroethane (113)	C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub>	20	20

\*Critical pressure is 561 psia at critical temp of 83.9 F (See Note (1) above).

Amend Ind 45.151(1)(b)

When the kind of refrigerant is changed as provided in Wis. Adm. Code subsection Ind 45.157 there shall be a new sign, of the same type as specified in Wis. Adm. Code subsection Ind 45.151 (1), indicating clearly that a substitution has been made, and stating the same information for the new refrigerant as was stated in the original.

Amend table in Ind 45.20 to read as follows:

DESIGNATION OF REFRIGERANTS

ASHRAE Standard Refrigerant Designation	Chemical Name	Chemical Formula
<b>Halocarbon Compounds</b>		
10	Carbontetrachloride	CCl <sub>4</sub>
11	Trichloromonofluoromethane	CCl <sub>3</sub> F

ASHRAE Standard Refrigerant Designation	Chemical Name	Chemical Formula
12	Dichlorodifluoromethane	$CCl_2F_2$
13	Monochlorotrifluoromethane	$CClF_3$
13B1	Monobromotrifluoromethane	$CB_1F_3$
14	Carbontetrafluoride	$CF_4$
20	Chloroform	$CHCl_3$
21	Dichloromonofluoromethane	$CHCl_2F$
22	Monochlorodifluoromethane	$CHClF_2$
23	Trifluoromethane	$CHF_3$
30	Methylene Chloride	$CH_2Cl_2$
31	Monochloromonofluoromethane	$CH_2ClF$
32	Methylene fluoride	$CH_2F_2$
40	Methyl chloride	$CH_3Cl$
41	Methyl fluoride	$CH_3F$
50	Methane	$CH_4$
110	Hexachloroethane	$CCl_3CCl_3$
111	Pentachloromonofluoroethane	$CCl_3CCl_2F$
112	Tetrachlorodifluoroethane	$CCl_2FCCl_2F$
112a	Tetrachlorodifluoroethane	$CCl_3CClF_2$
113	Trichlorotrifluoroethane	$CCl_2FCClF_2$
113a	Trichlorotrifluoroethane	$CCl_3CF_3$
114	Dichlorotetrafluoroethane	$CClF_2CClF_2$
114a	Dichlorotetrafluoroethane	$CCl_2FCF_3$
114B2	Dibromotetrafluoroethane	$CB_1F_2CB_1F_2$
115	Monochloropentafluoroethane	$CClF_2CF_3$
116	Hexafluoroethane	$CF_3CF_3$
120	Pentachloroethane	$CHCl_2CCl_3$

ASHRAE Standard Refrigerant Designation	Chemical Name	Chemical Formula
123	Dichlorotrifluoroethane	$\text{CHCl}_2\text{CF}_3$
124	Monochlorotetrafluoroethane	$\text{CHClFCF}_3$
124a	Monochlorotetrafluoroethane	$\text{CHF}_2\text{CClF}_2$
125	Pentafluoroethane	$\text{CHF}_2\text{CF}_3$
133a	Monochlorotrifluoroethane	$\text{CH}_2\text{ClCF}_3$
140a	Trichloroethane	$\text{CH}_3\text{CCl}_3$
142b	Monochlorodifluoroethane	$\text{CH}_3\text{CClF}_2$
143a	Trifluoroethane	$\text{CH}_3\text{CF}_3$
150a	Dichloroethane	$\text{CH}_3\text{CHCl}_2$
152a	Difluoroethane	$\text{CH}_3\text{CHF}_2$
160	Ethyl chloride	$\text{CH}_3\text{CH}_2\text{Cl}$
170	Ethane	$\text{CH}_3\text{CH}_3$
218	Octafluoropropane	$\text{CF}_3\text{CF}_2\text{CF}_3$
290	Propane	$\text{CH}_3\text{CH}_2\text{CH}_3$
<b>Cyclic Organic Compounds</b>		
C316	Dichlorohexafluorocyclobutane	$\text{C}_4\text{Cl}_2\text{F}_6$
C317	Monochloroheptafluorocyclobutane	$\text{C}_4\text{ClF}_7$
C318	Octafluorocyclobutane	$\text{C}_4\text{F}_8$
<b>Azeotropes</b>		
500	Refrigerants 12/152a 73.8/26.2 wt%	$\text{CCl}_2\text{F}_2/\text{CH}_3\text{CHF}_2$
501	Refrigerants 22/1273/25wt%	$\text{CHClF}_2/\text{CCl}_2\text{F}_2$
502	Refrigerants 22/115 48.8/51.2wt%	$\text{CHClF}_2/\text{CClF}_2\text{CF}_3$

ASHRAE Standard Refrigerant Designation	Chemical Name	Chemical Formula
<b>Miscellaneous Organic Compounds</b>		
<b>Hydrocarbons</b>		
50	Methane	$CH_4$
170	Ethane	$CH_2CH_3$
290	Propene	$CH_3CH_2CH_3$
600	Butane	$CH_3CH_2CH_2CH_3$
601	Isobutane	$CH(CH_3)_3$
(1150)	Ethylene	$CH_2=CH_2$
(1270)	Propylene	$CH_3CH=CH_2$
<b>Oxygen Compounds</b>		
610	Ethyl ether	$C_2H_5OC_2H_5$
611	Methyl formate	$HCOOCH_3$
<b>Sulphur Compounds</b>		
620		
<b>Nitrogen Compounds</b>		
630	Methyl amine	$CH_3NH_2$
631	Ethyl amine	$C_2H_5NH_2$
<b>Inorganic Compounds</b>		
717	Ammonia	$NH_3$
718	Water	$H_2O$
729	Air	
744	Carbon dioxide	$CO_2$
744a	Nitrous oxide	$N_2O$
764	Sulphur dioxide	$SO_2$

ASHRAE Standard Refrigerant Designation	Chemical Name	Chemical Formula
Unsaturated Organic Compounds		
112a	Dichlorodifluoroethylene	$CCl_2=CF_2$
1113	Monochlorotrifluoroethylene	$CClF=CF_2$
1114	Tetrafluoroethylene	$CF_2=CF_2$
1120	Trichloroethylene	$CHCl=CCl_2$
1130	Dichloroethylene	$CHCl=CHCl$
1132a	Vinylidene fluoride	$CH_2=CF_2$
1140	Vinyl chloride	$CH_2=CHCl$
1141	Vinyl fluoride	$CH_2=CHF$
1150	Ethylene	$CH_2=CH_2$
1270	Propylene	$CH_3CH=CH_2$

\*Carrier Corp. Document 2-D-127, p. 1.