



Dangerous Goods and Rail Safety

**A Technical Publication from
ALBERTA EDGE (ENVIRONMENTAL AND
DANGEROUS GOODS EMERGENCIES)**

Refrigerant Gases

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Alberta 

This material is meant as a guide to certain parts of the Transportation of Dangerous Goods Regulations and is not meant to be a substitute for them. It is the responsibility of handlers, offerers and transporters of dangerous goods to consult the Regulations for the exact requirements. Alberta EDGE (Environmental and Dangerous Goods Emergencies) of Alberta Transportation can provide accurate information regarding the Regulations 24 hours a day.

Alberta EDGE (Environmental and Dangerous Goods Emergencies)

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These telephone lines are recorded to assist in responding to the emergency (natural/manmade) and/or inquiry regarding dangerous goods and to ensure that the information is accurate. Direct any questions regarding the recording to the Regulatory Compliance Officer responding to your call or contact the Manager of Alberta EDGE at 780-427-8660. *Legal Authority: Dangerous Goods Transportation and Handling Act, Section 13(1).*

INTRODUCTION

Refrigerant gases are commercial gases that are used as heat exchange material. Most of the early refrigerants (such as sulfur dioxide (SO₂) and ammonia (NH₃)) were toxic, corrosive, or flammable, as well as highly devastating to the ozone layer. They have been replaced by chlorofluorocarbons, which were thought to be less environmentally harmful. Even these refrigerants have come under intense scrutiny as suspected ozone destroyers. Early refrigerants are no longer used in domestic refrigerators, though ammonia continues to be popular in large industrial applications.

The refrigeration industry has adopted a system of identifying refrigerant chemicals by assigning them "R" numbers. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) created the system to help identify these gases without having to deal with their proper chemical names. The proper shipping name must be used when preparing a dangerous goods shipping document. Shipping names, classes and UN numbers for some common refrigerant gases can be found in Appendix 1.

The Dangerous Goods and Rail Safety section of Alberta Transportation is responsible for administering the Transportation of Dangerous Goods (TDG) legislation for dangerous goods transport by road or rail in Alberta. Alberta EDGE can be reached 24/7 at (780) 422-9600 or toll free 1-800-272-9600, and is a valuable source of information on TDG Regulations.

This bulletin provides a general overview of the TDG Regulations and outlines procedures required to transport refrigerants.

EXEMPTIONS

Class 2, Gases, or Ammonia Solutions (Class 8) in Refrigerating Machines Exemption [Section 1.32]

You do not need a shipping document, safety marks, TDG training, a UN standardized container, an Emergency Response Assistance Plan, or to adhere to the spill reporting requirements if you are transporting less than 12 kg of UN2857, (REFRIGERATING MACHINES, and refrigerating machine components, containing Class 2.2, non-flammable, non-toxic gases or ammonia solutions) or less than 12 L UN2672, (AMMONIA SOLUTIONS),.

Refrigerating machines include air conditioning units and machines or other appliances designed for the specific purpose of keeping food or other items at a low temperature in an internal compartment.

150 kg Gross Mass Exemption (Section 1.15)

You do not need a shipping document, safety marks, TDG training, a UN standardized container, or to adhere to the TDG spill reporting guidelines if the dangerous goods being transported:

- are in one or more small container(s) built for transport
- have a gross mass of less than or equal to 150 kg, and
- are being transported by the user or purchaser of the dangerous goods.

This exemption cannot be used if you are transporting dangerous goods that:

- require an ERAP;
- require a control or emergency temperature;
- are Class 2.1, Flammable Gases, in a cylinder larger than 46 L;
- are Class 2.3, Toxic Gases;

500 kg Gross Mass Exemption [Section 1.16]

You do not need a full shipping document, most safety marks or a UN standardized container if the dangerous goods being transported are:

- in one or more small containers which are built for transport, and
- the gross mass of all dangerous goods on the vehicle is less than or equal to 500 kg
- each container has displayed on a side which will be visible during transport, the dangerous goods safety marks required by Part 4 of the TDG Regulations.
- accompanied by a document that is located in accordance with the requirements for location of a shipping document in sections 3.7 to 3.9 of Part 3, Documentation; and
- the document referred above includes the following information in the following order:
 - the primary class of the dangerous goods, following the word “Class” or “Classe”, and
 - the total number of dangerous goods containers, following the words “number of means of containment” or “nombre de contenants”.

For example,

Class 2.1, number of means of containment, 5

Class 2.2, number of means of containment, 10

Refrigerants cannot be transported using this exemption if they:

- require an ERAP;
- require a control or emergency temperature;
- are Class 2.1, Flammable Gases, in a cylinder with a capacity greater than 46 L;
- are Class 2.3, Toxic Gases;

DANGEROUS GOODS SHIPPING DOCUMENT (PART 3)

Dangerous goods must be accompanied by a shipping document during transport. It is the responsibility of the consignor (the person who has possession of the dangerous goods to prepare a shipping document when offering dangerous goods for transport [Section 3.1]. The document is similar to a standard bill of lading but must contain specific information needed to describe the dangerous goods [Section 3.5]. The carrier must not take possession of dangerous goods unless they have received a shipping document from the consignor. They may receive the shipping document in an electronic format, but a paper copy **MUST** accompany the load of refrigerants. The shipping document must accompany

the consignment throughout its journey [Section 3.2]. The consignor and each carrier that transported the refrigerants shall retain a copy of the shipping document for a period of two years [Section 3.11].

The following table describes the minimum required information, which must appear on a dangerous goods shipping document.

Shipping Document Information	When Required	Where in The Regulations
Date	Always	3.5(1)(b)
Name and address of consignor	Always	3.5(1)(a)
Description of goods in the following order		
a. UN number	Always	3.5(1)(c)(i)
b. Shipping name	Always	3.5(1)(c)(ii)
c. The technical name of the most dangerous substance related to the primary classification	If Provision 16 of Schedule 2 applies	3.5(1)(c)(ii)(A)
d. The words "Not Odorized"	For liquefied petroleum gas that has not been odorized	3.5(1)(c)(ii)(B)
e. Primary classification	Always	3.5(1)(c)(iii)
f. Subsidiary classifications	If Any	3.5(1)(c)(v)
g. Packing group	If Any	3.5(1)(c)(vi)
The words 'Toxic by inhalation' or 'toxic – inhalation hazard'	If Provision 23 of Schedule 2 applies	3.5(1)(c)(vii)
The quantity in the International System of Units (SI) for each shipping name ^{1,2}	Always	3.5(1)(d)
The number of containers ²	For dangerous goods in small containers requiring safety labels	3.5(1)(e)
The words "24-Hour Number" followed by a telephone number where the consignor can easily be reached ³	Always	3.5(1)(f)
Consignor's Certification ⁴	Always	3.6.1
Emergency Response Assistance Plan (ERAP) number and telephone number to activate it	If Required	3.6(1)
The control and emergency temperatures	For products in Classes 4.1 and 5.2	3.6(3)

1. If the dangerous goods fill less than 10% of the container, then the words "Residue – Last Contained", followed by the shipping name of the dangerous goods last contained can be used to describe the quantity [Section 3.5(4)].

2. **Multiple Deliveries:** If the quantity of dangerous goods or the number of small containers changes during transport, the carrier must show the change on the shipping document or on a document attached to the shipping document. [Section 3.5(5)].
3. The telephone number of someone who is not the consignor, but who can give technical information on the shipment, such as the Canadian Transport Emergency Centre (CANUTEC), may be used instead. To use CANUTEC's phone number, the consignor must receive permission, in writing, from CANUTEC. A consignor who uses the telephone number of an organization or agency other than CANUTEC must ensure that the organization or agency has current, accurate information on the dangerous goods the consignor offers for transport and, if the organization or agency is located outside Canada, the telephone number must include the country code and, if required, the city code [Section 3.5(2)].
4. Consignor's Certification: "I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations." [Section 3.6.1]

While a driver is accompanying a consignment of refrigerants, the shipping document must be in a pocket on the driver's door, or within the driver's reach. If a driver is not with the refrigerants, the shipping document must be in a location that is visible to anyone entering the cab of the vehicle through the driver's door [Section 3.7].

SAFETY MARKS (PART 4)

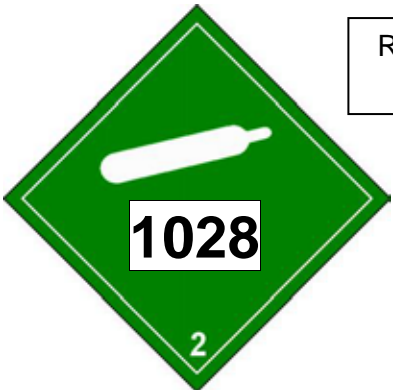
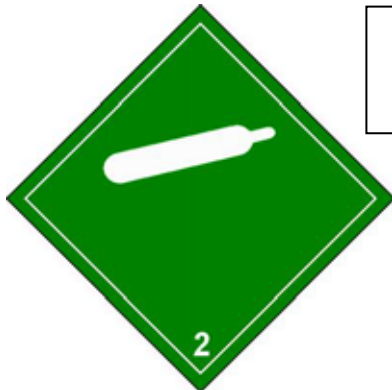
Safety marks are the labels, placards, UN numbers and package markings on a dangerous goods container described in Part 4 of the TDG Regulations. The consignor is responsible for displaying safety marks on all dangerous goods containers [Section 4.4]. The carrier is responsible for making sure that the safety marks remain displayed during transport. The carrier is also responsible for removing or changing the safety marks if the requirements for dangerous goods safety marks change during transport [Section 4.5]. Safety marks must be displayed on a large container BEFORE it is loaded with dangerous goods [Section 4.3]

Small Containers

A small container has a capacity of 450 L (or kg) or less. They must display the dangerous goods label(s), shipping name and UN number of the product [Sections 4.10 to 4.12]. The label must be least 100 mm with a line running 5 mm inside the edge on each side. If the container is too small or it has an irregular shape, the label can be reduced in size up to a dimension of 30 mm on each side [Section 4.7(2)]. The label may be displayed on a tag affixed to the container if it cannot be displayed on the container itself [Section 4.12]. If the label is displayed on a tag, the tag must also display the shipping name and UN number.



The UN number required for a dangerous goods label can be placed inside the label or next to the label as shown below [Section 4.8(1)]. If the UN number is inside the label the letters "UN" must be omitted.

Example of Safety Marks for a Small Container
In this case the product is REFRIGERANT GAS R12, Class 2.2

	 <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">UN1028 REFRIGERANT GAS R12</div>
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Class 2.2 label is green with a white cylinder symbol

Example of Safety Marks for a Product with a Subsidiary Class
In this case the product is , SULPHUR DIOXIDE, Class 2.3 (8)

	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">SULPHUR DIOXIDE</div>	
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Class 2.3 label is white with a skull and crossbones symbol.
Class 8 label is black with a corrosive symbol on its top half.

Large Containers

A large container has a capacity of over 450 L or kg. Placards representing the hazard class(es) of the dangerous goods being transported must be displayed on all four sides of a large container [Section 4.5(1)].

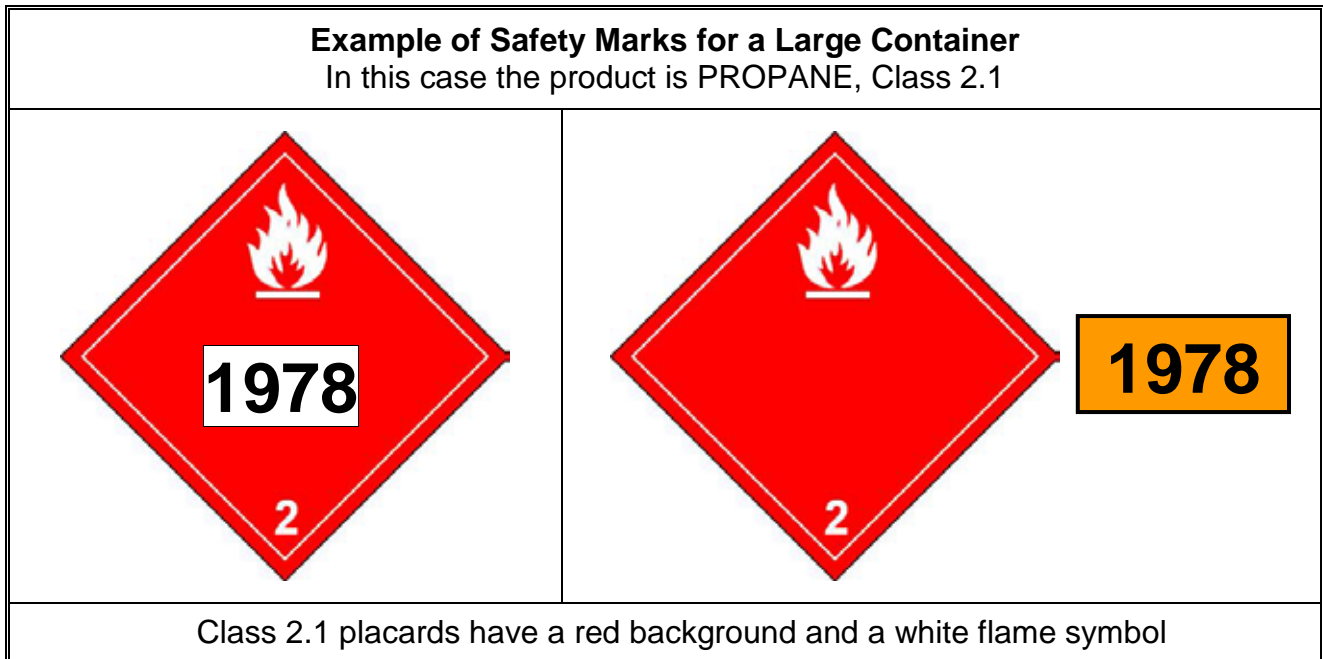
Each side of a placard must be at least 250 mm in length. Except for the DANGER placard, all placards must have a line running 12.5 mm inside the edge. If the large container has an irregular shape or its size is too small, the placard can be reduced in size but the dimensions must never be less than 100 mm on each side [Section 4.7(3)].

UN numbers must be displayed in accordance with Section 4.15(2) of the TDG Regulations if:

- the dangerous goods are in a quantity or concentration for which an Emergency Response Assistance Plan (ERAP) is required; or
- the dangerous goods are a liquid or a gas in direct contact with the large container

Placards can also be displayed on a frame permanently attached to the large container. If the leading end of a highway tank is obstructed by the tractor, the placard can be displayed on the front of the truck instead [Section 4.15(3)].

The UN number of the dangerous goods being transported is displayed inside the placard or on an orange panel next to the placard if required. The letters “UN” are always omitted [Section 4.8(2)].



DANGER Placard

A DANGER placard is used when small containers of dangerous goods with different classes are transported in the same larger container (such as a van). [Section 4.16]

A DANGER placard cannot be used for

- dangerous goods with a gross mass over 1000 Kg, in the same class and are from one consignor;
- dangerous goods that require an (ERAP);
- Class 2.3, Toxic Gases.

A DANGER placard cannot be used on a road or rail vehicle containing flammable gas that is to be transported by ship.

Placarding Exemption for Dangerous Goods Having a Gross Mass of 500kg or Less [Section 4.16.1]

You do not need to placard a load of refrigerants if:

- the gross mass of all dangerous goods being transported are less than 500 kg.
- the refrigerants do not require an ERAP
- there are no subsidiary classes or
- Class 2.1 flammable gases are not in a vehicle which will be transported by ship.

You cannot use this exemption for Class 2.3 (Toxic Gases).

TRAINING (PART 6)

Anyone who handles, offers for transport or transports dangerous goods must have a valid Transportation of Dangerous Goods Training Certificate or must be under the direct supervision of a trained person [Section 6.1].

An employer can issue a training certificate when they are confident that an employee possesses adequate TDG training. The training certificate may be in paper or electronic format. Self-employed people can issue training certificates for themselves. Information required on a TDG training certificate can be found in Section 6.3. The employer must keep a record of the training that the employee received and a copy of their training certificate [Section 6.6]. The training certificate must be immediately presented to an inspector who requests it (it must be carried by anyone transporting dangerous goods at all times) [Section 6.8].

RELEASE OR ANTICIPATED RELEASE REPORT REQUIREMENT (PART 8)

If a release or anticipated release of dangerous goods occurs, the person in possession of the dangerous goods at the time must make a verbal emergency report to the local authorities as soon as safely possible. For Class 2 dangerous goods (most refrigerants), a report is required if there is a release (or potential for release) of any quantity. For more information on reporting requirements, request Alberta EDGE's information bulletin entitled Emergency, Release or Anticipated Release Report Requirements.

A local authority is any organization, which may be responsible for emergency response at the location of the release or anticipated release. In Alberta, these include:

- the local police or RCMP, and
- Alberta EDGE

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The person making the verbal Emergency Report must also make a verbal Release or Anticipated Release Report as per Section 8.4 to the Canadian Transport Emergency Centre (CANUTEC) (1-888-226-8832 or 613-996-6666) if:

- a fatality occurred;
- there were any injuries caused by exposure to the dangerous goods which required medical treatment by a health care provider;
- an evacuation occurred or people sheltered in place;
- a loading or unloading facility, road, main rail line or main waterway was closed;
- the container became damaged enough to compromise its integrity; or
- the centre sill or stub sill of a tank car was broken or there is a crack in the metal equal to or greater than 15 cm (6 in.)

If a report is required to CANUTEC, the person must also report the incident to the consignor of the dangerous goods.

The information that must be included in the verbal Release or Anticipated Release Report is:

- the name and contact information of the person making the report;
- the date, time and location of the event;
- the mode of transport used (including a description of the container);
- the shipping name or UN number of the dangerous goods;
- the quantity of dangerous goods initially in the container;
- the quantity of dangerous goods released (if applicable);
- the type of incident leading to the event (for example: collision, roll-over, derailment, overflow, fire, explosion or load-shift);
- the name and geographic location of any road, main railway or main waterway that was closed (if applicable);
- the number of people evacuated or sheltered in place (if applicable); and
- the number of fatalities or injures (if applicable).

A report can also include other information not required by the regulations (for example, any cleanup arrangements, or involvement of other emergency response agencies like the police, fire department, Alberta Environment and Parks or the Alberta Energy Regulator).

After submitting a verbal Release or Anticipated Release report to CANUTEC, the person or employer of the person who made the report must submit a written 30-day follow-up report to the Dangerous Goods Directorate of Transport Canada [Section 8.8]. The 30-Day Follow-up Report must include the following information:

- names and contact information of the person submitting the report, the consignor, the carrier and the consignee;
- date, time and location of the event;
- the mode of transport;
- classification of the dangerous goods;
- quantity of dangerous goods in the container before the event occurred;
- the quantity of dangerous goods released (if applicable)
- a description of the container involved and a description of the failure or damage including how the event occurred;
- information about the conditions leading to the event;
- information on any fire or explosion (if applicable);
- the name and location of any facility that was closed, and the duration of the closure;
- the name and location of any road, main railway line or main waterway that was closed, and the duration of the closure
- number of deaths and injuries (if applicable);
- an estimate of the number of people evacuated, if any; and
- the ERAP reference number (if applicable);
- the date the initial verbal report was made; and
- an estimate of the financial loss as a result of the release/anticipated release and any associated, emergency response or remediation.

A 30 day report must be kept for two years after the day which it was made. The person who made the report must make the report available to an inspector within 15 days after receiving a written request from the inspector.

APPENDIX 1

Table 1: Refrigerant Group I

Shipping Name	Class	PIN	"R" #
TRICHLOROFLUOROMETHANE	NR	-----	R-11
DICHLORODIFLUOROMETHANE; or REFRIGERANT GAS R 12	2.2	UN1028	R-12
CHLORODIFLUOROBROMOMETHANE; or REFRIGERANT GAS R 12B1	2.2	UN1974	R-12B1
CHLOROTRIFLUOROMETHANE; or REFRIGERANT GAS R 13	2.2	UN1022	R-13
BROMOTRIFLUOROMETHANE; or REFRIGERANT GAS R 13B1	2.2	UN1009	R-13B1
REFRIGERANT GAS R 14; or TETRAFLUOROMETHANE	2.2	UN1982	R-14
DICHLOROFLUOROMETHANE; or REFRIGERANT GAS R 21	2.2	UN1029	R-21
CHLORODIFLUOROMETHANE; or REFRIGERANT GAS R 22	2.2	UN1018	R-22
REFRIGERANT GAS R 23; or TRIFLUOROMETHANE	2.2	UN1984	R-23
TRICHLOROTRIFLUOROETHANE	NR	-----	R-113
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE; or REFRIGERANT GAS R 114	2.2	UN1958	R-114
CHLOROPENTAFLUOROETHANE; or REFRIGERANT GAS R 115	2.2	UN1020	R-115
HEXAFLUOROETHANE; or REFRIGERANT GAS R 116	2.2	UN2193	R-116
1-CHLORO-2,2,2-TRIFLUOROETHANE; or REFRIGERANT GAS R 133a	2.2	UN1983	R-133A
OCTAFLUOROCYCLOBUTANE; or REFRIGERANT GAS RC 318	2.2	UN1976	RC-318
DICHLORODIFLUOROMETHANE AND DIFLUOROETHANE AZEOTROPIC MIXTURE <i>with approximately 74 percent dichlorodifluoromethane; or</i> REFRIGERANT GAS R 500	2.2	UN2602	R-500
CHLORODIFLUOROMETHANE AND CHLOROPENTAFLUOROETHANE MIXTURE <i>with fixed boiling point, with approximately 49 percent chlorodifluoromethane; or</i> REFRIGERANT GAS R 502	2.2	UN1973	R-502
CHLORODIFLUOROMETHANE AND TRIFLUOROMETHANE AZEOTROPIC MIXTURE <i>with approximately 60 per cent chlorotrifluoromethane; or</i> REFRIGERANT GAS R 503	2.2	UN2599	R-503
CARBON DIOXIDE	2.2	UN1013	R-744
HEXAFLUOROPROPYLENE; or REFRIGERANT GAS R 1216	2.2	UN1858	R-1216

New Refrigerants

Shipping Name	Class	PIN	"R" #
DICHLOROTRIFLUOROETHANE	NR	-----	SUVA 123
1-CHLORO-1,2,2,2-TETRAFLUOROETHANE; or REFRIGERANT GAS R 124	2.2	UN1021	SUVA 124
REFRIGERANT GAS R 134a; or 1,1,1,2-TETRAFLUOROETHANE	2.2	UN3159	SUVA 134A
LIQUEFIED GAS N.O.S. (CHLORODIFLUOROMETHANE, CHLOROTETRAFLUOROETHANE AND DIFLUOROETHANE)	2.2	UN3163	SUVA MP39 or MP66
LIQUEFIED GAS N.O.S. (PENTAFLUOROETHANE, CHLORODIFLUOROMETHANE AND PROPANE)	2.2	UN3163	SUVA HP80 or HP81
LIQUEFIED GAS N.O.S. (PENTAFLUOROETHANE, TRIFLUOROETHANE AND TETRAFLUOROETHANE)	2.2	UN3163	SUVA HP62
LIQUEFIED GAS N.O.S. (DIFLUOROMETHANE, PENTAFLUOROETHANE AND TETRAFLUOROETHANE)	2.2	UN3163	SUVA 9000
LIQUEFIED GAS N.O.S. (DIFLUOROMETHANE AND PENTAFLUOROETHANE)	2.2	UN3163	SUVA 9100

Group I refrigerants are the least hazardous because they are not flammable or toxic, but these materials vaporize rapidly when spilled and can pose a significant hazard of asphyxiation if they are spilled in an enclosed space.

Table 2: Refrigerant Group II

Shipping Name	Class	PIN	"R" #
AMMONIA, ANHYDROUS	2.3 (8)	UN1005	R-717
1,2-DICHLOROETHYLENE	3	UN1150	R- 1130
1,1-DICHLOROETHYLENE; or REFRIGERANT GAS R 1132a	2.1	UN1959	R-1132A
METHYL CHLORIDE; or REFRIGERANT GAS R 40	2.1	UN1063	R-40
SULPHUR DIOXIDE	2.3(8)	UN1079	R-764

Group II refrigerants are toxic and somewhat flammable.

Table 3: Refrigerant Group III

Shipping Name	Class	PIN	“R” #
BUTANE	2.1	UN1011	R-600
ETHANE	2.1	UN1035	R-170
PROPANE	2.1	UN1978	R-290
REFRIGERANT GAS R 143a; or 1,1,1-TRIFLUOROETHANE	2.1	UN2035	R-143A
1,1-DIFLUOROETHANE; or REFRIGERANT GAS R 152a	2.1	UN1030	R-152A
VINYL CHLORIDE, STABILIZED	2.1	UN1086	R-1140
REFRIGERATING MACHINES, containing <i>flammable, non-toxic liquified gas</i>	2.1	UN3358	-----

Group III refrigerants are highly flammable gases or liquefied gases under pressure.

Table 4: Refrigerant Group IV

Shipping Name	Class	PIN	“R” #
REFRIGERANT GAS, N.O.S.	2.2	UN1078	-----
REFRIGERATING MACHINES, <i>containing non-flammable, non-toxic, liquefied gas or ammonia solutions (UN2672)</i>	2.2	UN2857	-----

Group IV refrigerants are mixtures of more than one gas.