

# PUBLIC REVIEW DRAFT

## AUSTRALIA AND NEW ZEALAND REFRIGERANT HANDLING CODE OF PRACTICE

### Part 1 — Self-contained low charge systems

This draft is open for industry/public review from Friday, July 26 until 5pm Monday August 19, 2024. Comments are invited on the technical content, wording and general arrangement of the draft Code of Practice.

Where you consider that specific content is too simplistic, too complex or incorrect please suggest an alternative. Please provide supporting reasons and suggested alternative wording for each comment. Where appropriate, changes will be incorporated before the Code is published. If the draft is acceptable without change, an acknowledgment to this effect would be appreciated.

The draft is available in Word and PDF formats. Comments must be submitted in the following suggested format indicating relevant clause numbers, comments and proposed solutions for each comment.

<b>Clause (number and page)</b>	<b>Comment</b>	<b>Proposed solution</b>
e.g. II Scope page 2	e.g. Scope is too narrow – increase to cover refrigerant charge of 3kg or less	e.g. Expand the scope of this part to include appliances that contain up to 3 kg refrigerant

If you know of other persons or organisations that may wish to comment on this draft, please advise them of its availability.

Further copies of the draft are available for download from [airah.org.au/rhcop2024](http://airah.org.au/rhcop2024)

All comments should be submitted to [technical@airah.org.au](mailto:technical@airah.org.au) before:

**5pm Monday, August 19, 2024**

**AUSTRALIA AND NEW ZEALAND REFRIGERANT HANDLING CODE OF PRACTICE 2024****PART 1 — SELF-CONTAINED LOW CHARGE SYSTEMS****I Public/industry review draft – Introduction**

AIRAH, the Australian Refrigeration Council (ARC) and the Department of Climate Change, Energy, the Environment and Water (DCCEEW), are collaborating to revise and update the RHCop. This draft revision of the **RHCop Part 1 — Self-contained low charge systems** has been prepared to release to industry for public comment.

The contents of the draft have been updated from the 2007 version in terms of changes to the standards and regulations the industry must currently work with.

- Design, manufacture and maintenance, requirements and recommendations have been updated based on the applicable AS/NZS standards and industry guidelines.
- Procedures have been outlined for (on-site) evacuation, charging, inspection and repair.
- More focus and clarity is provided around leak inspection, leak detection and leak testing.
- Sections on refrigerant recovery, recycling, reclamation, handling and storage and Appendices A, B and C are identical in both parts.

**II Scope**

This code applies to all appliances that contain a scheduled refrigerant charge of 2kg or less and do not require any work to be done on the refrigeration system at the time of installation. Examples of such appliances include water-cooled packaged air conditioners and heat pumps, heat pump clothes dryers and water heaters, room air conditioners, refrigerators, freezers and ice makers.

This code does not apply to appliances which contain a refrigerant charge of more than 2kg, or appliances that require work to be done on the refrigeration system at the time of installation. Those systems are covered by part 2 of this code, the *Australia and New Zealand refrigerant handling code of practice Part 2 – Systems other than self-contained low charge systems*.

This code specifies requirements that are mandatory for compliance with the code to be claimed, and also includes best practice recommendations. Environmental benefits and cost savings from reduced refrigerant losses can be expected from the application of this code.

This code has been developed with the intention of reducing emissions of scheduled refrigerants (listed in Appendix B) into the atmosphere. Systems that do not use a scheduled refrigerant (or do not use a refrigerant blend containing a fluorocarbon) are not covered by this code. This includes systems using hydrofluoroolefins, hydrocarbons, ammonia and carbon dioxide as refrigerant.

The application of these systems include a range of hazards and safety risks and all are covered by the same refrigeration safety standards: AS/NZS 5149 parts 1 to 4. Refrigerant management and containment is important for all refrigerants. For flammable refrigerants refer also to the [AIRAH Flammable Refrigerants Safety Guide](#) and the Heads of Workplace Safety Authorities (HWSA) *Flammable Refrigerant Gases Position Paper*.

**III Acknowledgments**

This Code of Practice was originally developed by the Association of Fluorocarbon Consumers and Manufacturers (AFCAM) with assistance from the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH), Standards Australia, the Institute of Refrigeration Heating and Air Conditioning Engineers of New Zealand (IRHACE) and other institutions. This edition was facilitated by AIRAH, the Australian Refrigeration Council (ARC) and the Department of Climate Change, Energy, the Environment and Water (DCCEEW), with assistance from a review committee, and was subject to public review prior to publication.

AIRAH, the ARC and DCCEEW wishes to acknowledge and thank all contributors to the previous editions of this document. AIRAH, the ARC and DCCEEW further wish to acknowledge and thank the following Industry Advisory Body (IAB) members and AIRAH members for their contributions to the 2024 edition of this document:

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Steve Smith – Superior Training Centre and National Refrigeration and Air Conditioning Training Alliance  
Dale Imlach – Victorian Automotive Chamber of Commerce  
Rodney Cumming – Australian Refrigeration Council  
Vincent Aherne – AIRAH

## IV How to read this code

Text containing the term **‘must’** underlined in bold font indicates compliance is mandatory under the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 or other regulations as noted.

Sections containing the terms **‘should’** or **‘recommended’** are **not** mandatory but are recommended as best practice.

Other sections are explanatory notes for informative purposes only.

Definitions for the terms used and a list of all referenced documents are provided in the Appendices.

### **Note for Australian users:**

The use of fluorocarbon refrigerants in Australia is governed by the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* and the *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995*. Any provisions contained in the Australian regulations take precedence over provisions in this code. The provisions in this code, however, take precedence over any original equipment manufacturer instructions (except where specified otherwise herein).

### **Note for New Zealand users:**

In New Zealand, ozone depleting substances, hydrofluorocarbons, and perfluorocarbons are subject to controls under the *Ozone Layer Protection Act 1996* and the *Climate Change Response Act 2002*. This Code does not have mandatory legislative status in New Zealand.

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**AUSTRALIA AND NEW ZEALAND REFRIGERANT HANDLING CODE OF PRACTICE**

***Part 1 — Self-contained low charge systems***

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# 1. General

## 1.1. Personnel

### 1.1.1. Australian licencing

In Australia, any person whose business is or includes the manufacturing, installation, servicing, modifying, or dismantling of any refrigeration and/or air conditioning equipment which:

- a) Contains
- b) Is designed to use, or
- c) Is manufactured using

any scheduled refrigerant, **must** ensure that they and/or any of their employees who handle **scheduled** refrigerant are appropriately licensed under the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995.

For further details on the Australian licensing system, see [www.dcceew.gov.au](http://www.dcceew.gov.au) or [www.arctick.org](http://www.arctick.org).

### 1.1.2. New Zealand certification

In New Zealand, any person whose business is or includes the manufacturing, installation, servicing, modifying, or dismantling of any refrigeration and/or air conditioning equipment which:

- a) Contains
- b) Is designed to use, or
- c) Is manufactured using

any scheduled refrigerant, **must** ensure that they and/or any of their employees who handle scheduled refrigerant possess a refrigerant filler and handler training and certification

In New Zealand, it is a legal requirement for any person who fills gas containers with gases under pressure to be trained and hold a current, approved filler compliance certificate. This applies to all gases under pressure, including air. The Refrigerant License Trust Board operates under the name Refrigerant License New Zealand (RLNZ) and provides refrigerant filler and handler training and certification for HVAC&R practitioners in New Zealand. For more details see <http://www.irhace.org.nz>.

### 1.1.3. Standard of work

Any person whose business is or includes the manufacturing, installation, servicing, modifying, or dismantling of any refrigeration and/or air conditioning equipment which:

- a) Contains
- b) Is designed to use, or
- c) Is manufactured using

any scheduled refrigerant, **must** ensure that they and/or any of their employees who handle scheduled refrigerant are provided with a copy of this code and work to the standards set out herein.

## 1.2. Refrigerant

### 1.2.1. Refrigerant venting

**Scheduled** refrigerant **must not** be willingly released to the atmosphere by any person by any means where the release is avoidable, including:

- a) Venting refrigerant directly or indirectly to atmosphere,

- b) Charging refrigerant into equipment with known or suspected leaks.
- c) Using refrigerant to flush refrigerant pipework clean internally
- d) Using refrigerant as the pressure medium during leak tightness testing
- e) Using refrigerant to clean heat exchanger fins or coils.

### 1.2.2. Refrigerant classification

All refrigerants **must** be classified according to AS/NZS ISO 817 (See Appendix C).

### 1.2.3. Flammable refrigerant

Under AS/NZS ISO 817 flammable refrigerants are assigned to one of three flammability classes: 2L, 2 or 3 (See Appendix C). Flammable refrigerants include A2L, A2, A3 and B2L refrigerants.

Manufacturers and suppliers **must** include additional safety information in the installation and service manuals for equipment using a flammable refrigerant.

Technicians **must** follow these instructions.

For more information on the duties associated with flammable refrigerants refer to the AIRAH *Flammable Refrigerants Safety Guide* and the Heads of Workplace Safety Authorities (HWSA) *Flammable Refrigerant Gases Position Paper*.

## 2. Design considerations

This section deals with the design considerations of new air conditioning and refrigeration systems and components and alterations to existing systems. It also identifies possible sources of inadvertent loss of refrigerants to the atmosphere.

### 2.1. Design of mass-manufactured systems

All systems **must** be designed so that they are able to be:

- a) Manufactured
- b) Installed
- c) Operated
- d) Maintained, and
- e) Decommissioned

without the avoidable loss of refrigerant as described in Clause 1.2.1.

The system design **must** comply with Clauses 2.2 to 2.10 of this code.

Where the designer can provide evidence that a system has been designed to an equivalent or better standard than is set out in this section, and complies with this clause, the design may be considered exempt from Clauses 2.3 to 2.10 inclusive.

### 2.2. Compliance Standards

Good system design is necessary for the prevention of refrigerant leakage.

All systems **must** be designed in accordance with the applicable Australian and New Zealand standards. These standards set minimum compliance requirements to ensure all potential hazards are eliminated or reduced to an acceptable level.

The applicable compliance standards include product standards such as:

AS/NZS 60335.1 – Household and Similar Electrical Appliances – Safety – General requirements

AS/NZS 60335.2.11 – Particular requirements for tumble dryers

AS/NZS 60335.2.24 – Particular requirements for refrigerating appliances, ice cream appliances and ice makers

AS/NZS 60335.2.34 – Particular requirements for motor compressors

AS/NZS 60335.2.40 – Particular requirements for electrical heat pumps, air conditioners and dehumidifiers

AS/NZS 60335.2.75 – Particular requirements for commercial dispensing appliances and vending machines

AS/NZS 60335.2.89 – Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor

Appliances complying with these standards are all deemed to be in conformity with AS/NZS 5149.2 except for electrical heat pumps, air conditioners and dehumidifiers where AS/NZS 60335.2.40 requires appliances to also conform to the mechanical strength requirements of AS/NZS 5149.2.

## 2.3. Working fluids

### 2.3.1. Refrigerant charge

Systems **should** be designed to minimise the amount of refrigerant required. Design parameters that affect refrigerant charge include:

- a) System architecture,
- b) Selection of refrigerant type,
- c) Diameters and lengths of pipes,
- d) Sizing of receivers, and
- e) The technology of the expansion device and of the heat exchangers employed.

The designer **should** always aim to maximise the specific refrigerant charge, i.e. the ratio of design refrigerant charge mass to system design cooling capacity (kg/kW).

### 2.3.2. Maximum refrigerant charge – standards

The maximum refrigerant charge limits of design standards **must** be complied with.

Refrigerant charge limitation (RCL) is the maximum amount of refrigerant allowed in a product or system to reduce the risks of toxicity, asphyxiation and flammability hazards.

AS/NZS 60335 standards contain charge limitations for particular products. Refrigerant charges are restricted according to the level of risk posed by the appliance application.

Practical limits, used for simple calculations, are based on the RCL or historically established charge limitations.

Note: Alternative provisions such as system valving, ventilation, detection and alarm can be used in accordance with the design standards to modify the RCL allowed in some circumstances.

### 2.3.3. Lubricants

All lubricants used **must** be compatible with the refrigerant and equipment as indicated by the refrigerant/equipment manufacturer's specifications.

## 2.4. Compressors

Leaks associated with compressors in self-contained low charge systems can generally be attributed to the internal connecting pipework. Proper initial installation, combined with a correct ongoing maintenance program, should minimise, if not eliminate, these problems.

Due to the small amount of refrigerant in self-contained low charge systems, these sealed systems are not generally provided with service valves.



### 2.4.1. Process tubes in compressors

Where compressors are fitted with a process tube, a length greater than 100mm **must** be provided to the compressor for the purpose of evacuating and charging the system with refrigerant and the subsequent sealing and the later use (if ever required for servicing) of a temporary clamp-on piercing type valve assembly.

### 2.4.2. Vibration isolation

The compressor **must** be mounted to avoid leaks caused by vibration.

Eliminating vibration in the suction and delivery refrigerant pipelines connected to the compressor will also minimise the potential for leaks.

## 2.5. Refrigerant condensers and evaporators

### 2.5.1. Corrosion

All systems **must** be designed with materials selected to minimise the risk of corrosion.

### 2.5.2. Erosion

The system **must** be designed to avoid excessive fluid velocity through the heat exchangers, which can cause vibration and erosion failures.

## 2.6. Refrigerant pipelines and fittings

### 2.6.1. General

All pipelines **must** be designed so that the number of joints is kept to the practical minimum.

### 2.6.2. Pipes

Welding, brazing or another permanent hermetic sealing method are **recommended** for joining refrigerant pipes wherever practicable, since they offer increased resistance to pressure, temperature, and vibration stresses.

### 2.6.3. Joining

All joints **must** be hermetically sealed and not flanged.

Where compression/crimped fittings have been used, they **must** be installed following the manufacturer's preparation and fitting instructions.

### 2.6.4. Vibration

Pipelines **must** be designed to minimise breakage due to vibration.

## 2.7. Valves

### 2.7.1. General

Due to the size of self-contained low charge systems, service valves are not normally included in the design.

### 2.7.2. Tap valves

Tube piercing or line tap valves and other similar devices **must** be used only to gain service access to the system in order to remove refrigerant.

They **must** be removed before the completion of service. The system design **must** not require these valves to be left on the system after the completion of service.

### 2.7.3. Schrader valves

The use of Schrader valves **should** be kept to the practical minimum.

Where fitted to the system, Schrader valves **must** be sealed with a cap when not in use to prevent loss of refrigerant.

The specification **should** include a requirement for all valves to be capped. The valve cap **should** be attached to the valve to prevent its loss.

## 2.8. Pressure relief

Pressure relief arrangements in self-contained low charge systems **must** be designed in accordance with the applicable appliance standard, AS/NZS 5149.2 or AS/NZS 1200, which specifies the type and size of pressure relieving device permitted for different system types.

## 2.9. Refrigerant pump down capability

Due to the size of self-contained low charge systems, liquid receivers used for pump down are not normally included in the design.

For these applications, one of the following two options **must** be undertaken:

1. Valves fitted to the system to allow the connection of a pump down unit for the removal of refrigerant prior to service or repair operations, or
2. A process tube can be used for this purpose with the addition of a temporary clamp-on piercing type valve.

# 3. Manufacture and assembly

## 3.1. Personnel

All supervisory personnel involved in the manufacturing process **must** be conversant with refrigerant technology and familiar with all aspects of the manufacturing process.

## 3.2. Complete systems

Complete systems **must** be supplied clean, dry, leak tightness tested, evacuated, pressurised, sealed and labelled with the refrigerant type before delivery.

If the system is pressurised with a substance other than the specified refrigerant, this substance **must** be identified on the system label.

## 3.3. Strength/tightness testing

All manufactured systems and components **must** be factory tested for leak tightness in accordance with the applicable manufacturing standard or **must** be pressure tested to the required pressure level in accordance with AS/NZS 5149.2 or AS 4041.

All refrigerant-containing parts, units or systems **must** be tested and proved tight by the manufacturer at not less than the design pressure for which they are rated.

## 3.4. Evacuation

All systems **should** be evacuated to less than 1,000 microns/133Pa absolute pressure before charging with refrigerant.

## 3.5. Charging of refrigerant

All charging **must** be carried out in accordance AS/NZS 5149.4, with the exception that manufacturers are not required to charge solely into the low side of the system.

All systems **must** be evacuated prior to charging with refrigerant.

## 3.6. Installation, operation and maintenance instructions

The manufacturer or installer **must** supply an adequate number of instruction manuals and also provide safety instructions.

### 3.6.1. Instructions

Installation, operation and maintenance instructions **must** be provided with each new appliance, detailing the correct methods and recommended procedures for installation, operation, and maintenance that:

- a) Prevent the deliberate emission of refrigerants, and
- b) Minimise the potential for accidental emission of refrigerants.

### 3.6.2. Standards

Installation, operation and maintenance instructions **must** be provided in accordance with the applicable compliance standard or be in accordance with AS/NZS 5142.2.

Instructions **should** encourage the owner to pass on operation and maintenance procedures for the appliance to the purchaser if the system is sold.

## 4. Installation procedures

### 4.1. System installation

The systems covered by this code are self-contained products that are manufactured and sold as completed units. As no work on the refrigeration system is required on site, installation is normally the responsibility of the purchaser, who **should** follow the manufacturer's installation instructions.

### 4.2. System commissioning

The manufacturer's instructions for commissioning **should** be followed. Manufacturer's instructions **must** not specify a practice that will result in the avoidable emission of refrigerant.

### 4.3. System documentation

Appliances that are manufactured, assembled and tested prior to being delivered to site **must** be provided with installation, operation and maintenance instructions in accordance with Section 3.

Manufacturer's instructions **must** not specify a practice that will result in the avoidable emission of refrigerant.

## 5. Labelling

### 5.1. Identification plate

A clearly readable identification plate **must** be located on the appliance. The identification plate **must** contain at least the following data:

- a) The name or identification of the supplier or manufacturer,
- b) The model, serial number, or reference number,
- c) The year of manufacture,

NOTE The year of manufacture can be part of the serial number, and all information can be part of the identification plate of the equipment and can be coded.

- d) the number designation of the refrigerant in accordance with AS/NZS ISO 817,
- e) the refrigerant charge,
- f) the maximum allowable pressure, high- and low-pressure sides,

- g) when flammable refrigerants are used, the flame symbol (ISO 7010 W021).

## 5.2. Change of refrigerant or lubricant

Whenever the type of refrigerant and/or lubricant in a system is changed, the technician **must** clearly label the system with:

- a) The number designation of the new replacement refrigerant in accordance with AS/NZS ISO 817,
- b) The refrigerant charge,
- c) The maximum allowable pressure, high- and low-pressure sides,
- d) When flammable refrigerants are used, the flame symbol,
- e) Name of service technician, licence number (Australia only) and service organisation,
- f) Date of change,
- g) Whether any ultraviolet dye has been added.

Whenever the type of lubricant in a system is changed (other than when it has been pre-charged into a replacement compressor by its manufacturer), the service technician **must** also clearly label the system with:

- h) The lubricant type.

## 6. Evacuation procedures

This section refers to evacuation in the field only, following repair or recommissioning, not evacuation during the manufacturing process. Evacuation is the final step before recharging a system with refrigerant and is critical for the removal of air and moisture from the system. It also serves as a final verification of system tightness.

### 6.1. General

Systems **must** be evacuated prior to system recharging, any time the refrigerant is removed from the system, i.e. for repair or replacement.

### 6.2. Manufacturer's evacuation instructions

Manufacturer's evacuation instructions **must** not specify a practice that will result in the avoidable emission of refrigerant.

Instructions **must** be followed if the system manufacturer has supplied instructions for evacuation.

If the manufacturer's instructions are followed, the evacuation procedure is exempt from the requirements of this section.

The relevant parts of this section of this code **must** be complied with if there are any evacuation procedures not covered by the manufacturer's instructions.

Evacuation of all other systems, or systems where manufacturer's instructions are not supplied, **must** comply with this section of this code in its entirety.

### 6.3. Equipment

Evacuation **should** be carried out with dedicated evacuation hoses (large diameter/as short as practical) and vacuum gauges and not service manifolds/gauges.

Depth of vacuums **must** be measured using accurate measuring equipment selected for the specific application, i.e. a dedicated vacuum gauge, not a standard manifold pressure gauge.

## 6.4. Procedures

Before beginning the evacuation process the system **must** be completely depressurised, ensuring that air is not introduced into the pipework.

Procedures **must** be planned so breaking the vacuum with refrigerant does not introduce contaminants into the system.

If the system manufacturer has not supplied instructions with the system for evacuation, the system **must** be evacuated to below 1,000 microns/133Pa.

Note:- Evacuating a wet system in ambient temperatures below 0°C will take a lot longer for the system dehydration to be achieved. Where possible, warm the equipment up. Any wet system that has a vacuum pulled below 4,500 microns will cause any internal moisture to change to solid ice.

After the system has been evacuated, the vacuum pump **must** be isolated from the system to check if the system vacuum pressure rises. As a guide, with constant ambient conditions, the vacuum **should not** rise more than 50 microns (6.7Pa absolute) in one hour. A greater rate of rise may indicate a leak or the presence of moisture, and the system **must** be leak tightness tested and repaired.

## 7. Refrigerant charging procedure

This section refers to charging in the field only, following repair or recommissioning, not charging during the manufacturing process. Charging to a known weight is the most accurate method of achieving the correct charge – use this when possible.

### 7.1. General

All refrigerant containing pipework and components **must** be evacuated prior to refrigerant charging.

### 7.2. Charging procedure

The maximum permissible system refrigerant charge limits for any appliance **must** not be exceeded, see Clause 2.3.

All charging **must** be carried out in accordance with AS/NZS 5149.4, Section C.2 Handling.

Hoses, fittings and procedures used during charging **must** be those which minimise the loss of refrigerant.

### 7.3. Verified hose connections

The pipework connecting a cylinder to a self-contained low charge system **must** be leak-tested before the cylinder valve is fully opened. This can be done by partially opening and then closing the cylinder valve to pressurise the connecting pipework and testing for a leak.

### 7.4. Refrigerant weight

Refrigerant **must** be weighed in to the system.

Refrigerant transferred **must** be accurately measured into the system with due reference to temperature in accordance with AS 4211.3.

### 7.5. Charging precautions

Charging lines **should** be as short as possible and have suitable fittings to minimise losses during disconnection at the end of the transfer.

Care **should** be taken to avoid refrigerant liquid being trapped between closed valves, as high pressures may develop.

Refrigerant cylinders **must not** be connected to a system at a higher pressure, or to a hydraulic leg, where the pressure is sufficient to cause a back flow of refrigerant into the cylinder.

Refrigerant cylinders **must not** be connected to systems or other cylinders at a high temperature for similar reasons.

Back flow of refrigerant can cause cylinders to be contaminated or overfilled, resulting in the subsequent danger from the development of a pressure high enough to burst the cylinder.

## 7.6. Flammable refrigerant

The refrigerating system **must** be earthed prior to charging with flammable refrigerant.

Extreme care **must** be taken not to overfill the refrigerating system.

# 8. Maintenance, repair and decommissioning

Technicians have the opportunity to reduce leakage when servicing or maintaining systems. Conversely, poor service and maintenance will increase the risk of leakage occurring.

## 8.1. General

Only competent technicians **must** work on refrigeration and air conditioning systems containing a scheduled refrigerant and, where applicable, hold a relevant national licence.

Systems containing a non-scheduled refrigerant **must** only be worked on by competent and appropriately trained technicians and, where applicable, they **must** hold a relevant state or territory licence.

Scheduled refrigerant **must** not be wilfully discharged to atmosphere under any circumstances. All scheduled refrigerants **must** be recovered and either recycled, reclaimed, or held for destruction in an approved manner.

If the technician doubts the integrity of the system, it **must not** be recharged until appropriate repairs and leak testing have been undertaken.

Having located a leak, the refrigerant **must** be recovered to a separate cylinder, if isolation is impractical, after which the repair can be undertaken.

The recovery cylinder **must** be suitable for the refrigerant being removed.

Technicians **must** ensure manufacturers' specifications are always complied with, especially when changing refrigerants and lubricants.

## 8.2. Refrigerant type

A technician **should** be aware of the possibility that the system may have been incorrectly charged or incorrectly labelled.

Before working on an unfamiliar system, the technician **must** first establish the type of refrigerant contained in the system by checking the pressure/temperature relationship or by using a refrigerant analyser or other methods, to verify that the labelling is correct.

Any refrigerant that cannot be identified **must not** be vented from the system.

If identification of the refrigerant is not possible it **must** be treated as a flammable refrigerant.

## 8.3. Flammable refrigerants

When working on air conditioners containing flammable refrigerant, instructions conforming to the requirements of AS/NZS 60335.2.40: Annex DD **must** be followed.

Manufacturers and suppliers **must** include additional safety information in the operation and maintenance manuals for equipment using a flammable refrigerant. Technicians must follow these instructions.

Tools and equipment **must** be rated for use with the appropriate flammability grade (2, 2L or 3).

For flammable refrigerants, if a leak is suspected, all sources of ignition and naked flames **must** be removed/extinguished.

Before beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. Any mechanical ventilation utilised **should** be suitable for use in a potentially hazardous environment. No electrical devices, leads or ignition sources in the vicinity **should** be energised, unless rated for hazardous environments.

Refer to the AIRAH *Flammable Refrigerants Safety Guide*.

## 8.4. Maintenance

### 8.4.1. Inspection

The owner of the unit is responsible for its use and care. All systems **should** be regularly inspected for issues.

### 8.4.2. Preventative maintenance

Preventive maintenance **must** be carried out in accordance with the manufacturer's instruction manual.

### 8.4.3. Faults

A malfunctioning unit **should** be attended to by a competent service technician as soon as the condition occurs to ensure that any leakage of refrigerant is minimised.

'Topping-up' a system's refrigerant charge **must not** be done until all leaks have been repaired.

## 8.5. In-service leakage inspection

Including in-service leak inspections as part of a preventative maintenance program allows the technician to find and fix small leaks before they lead to complete loss of refrigerant charge.

The in-service leak inspection is carried out with the refrigerant in place and the appliance operating as normal.

'Inspected for leakage' means the equipment or system is examined primarily for leakage using direct or indirect measuring methods, focusing on those parts of the equipment or system most likely to leak.

The technician **should** check, and repair as necessary, all potential leak sites.

### 8.5.1. Visual inspection

The technician **should** complete a visual inspection of the operating system including:

- a) Identifying any visible oil or dust stains on joints, components or insulation,
- b) Identifying any movement or stresses due to vibration or thermal expansion,
- c) Identifying any signs of corrosion, thermal stress, wear or metal to metal contact points,
- d) Identifying any unusual level of noise or vibration from the appliance.

### 8.5.2. Diagnostic analysis

The technician **should** assess the system/refrigerant operating temperatures and pressures and compare against the manufacturer's data and operation instructions to determine whether the refrigerant charge is low.

### 8.5.3. Leak inspection

Various methods may be used for leak inspection, e.g. electronic leak detectors, ultrasonic leak detectors, proprietary leak detection spray, or ultraviolet fluorescent additives. Electronic leak detectors **must** be specific to the refrigerant type.

Where a leak is detected, all refrigerant **must** be removed from the appliance, and the leak repaired.

Where a leak is suspected but not detected all refrigerant **must** be removed, and the appliance **must** be leak tightness tested.

### 8.5.4. Common leakage points

The following areas **must** be individually assessed with a leak detector:

- a) Joints – flare joints, mechanical joints and flanges, brazed joints, catalyst cured joints
- b) Valves – Schrader valves, service valves, manual valves, pressure relief valves/devices, expansion valves, line tap valves
- c) Evaporator and condensers – corroded areas, return bends, valves and joints
- d) Seals – shaft seals (open compressor), compressor gaskets, seals on replaceable driers and filters, seals on gauge points, seals on caps
- e) Other – capillary tubes, control bellows, O rings and pressure switches.

Access valves **must** have their caps refitted.

## 8.6. Repairs

Replacement of components or changes to the refrigerating system **must** be ordered and carried out by a competent person.

System components **should** be replaced with parts that are more leak resistant or have a reduced number of potential leak sources.

An equivalent replacement 'O' ring seal **must** be used each time an 'O' ring connection is remade.

### 8.6.1. Repair procedure

Repairs on refrigerant containing components **must** be carried out in the following order, where applicable:

1. Recovery of refrigerant, emptying and evacuation
2. Disconnecting and safeguarding of the components to be repaired
3. Cleaning and purging (e.g. with oxygen-free nitrogen, OFN)
4. Carrying out the repair
5. Testing and checking of the repair (pressure test, leakage test, functional test)
6. Evacuating and recharging with refrigerant.

Following any repair, all safety, control and measurement devices as well as alarm systems **must** be checked to verify operation.

### 8.6.2. Breaking into systems

Where not in the open, the area **must** be adequately ventilated before breaking into the system or conducting any hot work.

Systems **must** be evacuated and purged with OFN prior to any hot work.

Under no circumstances **must** the system be broken into, by means of cutting or breaking pipework, if it contains any refrigerant or any other gas under pressure.



### 8.6.3. Brazing and de-brazing

Where repair work requires brazing or de-brazing or any hot work, all refrigerant **must** be recovered from the system.

OFN **must** then be purged through the system both before and during the brazing process.

### 8.6.4. Oil removal

The compressor crankcase **must** be brought to atmospheric pressure before oil is removed.

Refrigerant content of the oil **must** be minimised using procedures such as evacuation, or the use of crankcase heaters, since the refrigerant vapours are soluble in compressor lubricating oils.

### 8.6.5. Tube piercing/line tap valves

Tube piercing/line tap valves or equivalent devices **must** only be used to gain temporary access to the system. They **must** be removed prior to the completion of service.

Where a tube piercing or line tap valve has been used and the remaining length of process tube is still 100mm or greater, the tube **must** be crimped off, the process fitting removed, and the end of the pipe sealed.

Where a tube piercing or line tap valve has been used and the remaining length of process tube is less than 100mm, a new process pipe of equal length to that originally fitted to the system **must** be fitted and sealed.

### 8.6.6. Testing

If work has been done on the refrigeration circuit, the systems **must** be leak tested after service and any identified leaks **must** be repaired. Refrigerant **must** not be put into the system for the purpose of leak testing.

A system **must** not be recharged until appropriate repairs and leak testing have been undertaken.

## 8.7. Cleaning and flushing

This procedure covers cleaning and flushing a contaminated system after a hermetic or semi-hermetic compressor failure or motor burnout.

Where possible, self-contained low charge systems **should** be taken to a workshop with appropriate facilities for cleaning and reinstating. When the system is empty and at atmospheric pressure, the faulty component parts **should** be removed and the system capped off.

### 8.7.1. Refrigerant recovery

Contaminated refrigerant **must** be fully recovered.

The cylinder **must not** be over-filled, as per AS 2030.5.

Contaminated refrigerant **must not** be recovered in the same cylinder as clean/reusable refrigerant.

Flammable refrigerants **must** be recovered into appropriately labelled cylinders.

### 8.7.2. Cleaning with solvents

Refrigerant **must not** be used for flushing components.

WHS/OHS safety standards **must** be observed when handling solvents. Relevant Safety Data Sheets **must** be obtained and made available to the technician handling solvents.

The cleaning solvent **should** be pumped throughout the system until only clean solvent emerges. After ensuring the system has been thoroughly cleaned, caution **should** be taken to ensure no solvent residue remains in the system after purging.

All spent solvents **must** be disposed of in accordance with Australian state and territory hazardous substance disposal regulations or New Zealand Hazardous Substances (Health and Safety Reform Revocations) Regulations 2017, as applicable.

Each Australian state and territory has its own laws and policies, and relevant permits, licences and/or registrations that cover transporting, storing, treating and disposing of hazardous waste.

### 8.7.3. Cleaning with filter dryers

If it has been established after testing the refrigerant and oil for acidity that the system has only been locally contaminated by the burnout, moisture, or mechanical failure, and does not require the cleaning procedure outlined in Clause 8.7.2, then cleaning of the system by using purpose selected suction and liquid line filter dryers is an acceptable alternative.

When using this method all filters fitted **must** be capable of being replaced with a minimal loss of refrigerant to the atmosphere.

### 8.7.4. Reassembly and test

When cleaning is complete, the major component parts **should** be reassembled in the system with the replacement compressor.

It is highly **recommended** that a suction line filter/dryer (a burnout dryer) be fitted.

The system **must** be pressurised and strength and leak tested before evacuation and recharging.

### 8.7.5. Evacuation

The system **must** then be evacuated before charging with refrigerant. Refer to Section 6.

A new dryer **should** be fitted while there is zero gauge pressure in the system. If triple evacuation is used, this **should** be done between the second and third stages. If deep evacuation is used, it is done at the beginning of the process.

The system can then be recharged with refrigerant.

## 8.8. Recharge

The system **must not** be recharged before the system has been fully leak tested, all identified leaks repaired and the system has been evacuated in accordance with Section 6.

Refrigerant used to recharge a system **must** meet the specification for new refrigerant set out by ARI 700.

Because most lubricants are very hygroscopic and will absorb moisture from the air, they **should** not be exposed to atmosphere for any longer than is necessary.

The system **should** be recharged to the refrigerant quantity shown on the identification plate.

## 8.9. Decommissioning

### 8.9.1. Refrigerant

All scheduled refrigerant **must** be recovered from all parts of the system at the time of decommissioning.

Recovered refrigerant **must** be reclaimed or disposed of in accordance with Section 11.

### 8.9.2. Equipment labelling

The equipment **must** be labelled stating that it has been decommissioned and emptied of refrigerant.

The label **must** be dated and signed.

## 9. Advice to equipment users

### 9.1. Owner's responsibilities

The owner of a refrigerating appliance is responsible for its use and care.

A malfunctioning unit **should** be attended to by a competent service technician as soon as the condition occurs to ensure that any leakage of refrigerant is minimised.

All refrigerants **must** be recovered and either recycled, reclaimed, or held for destruction in an approved manner.

The appliance **must not** be recharged before the system has been fully leak tightness tested and all identified leaks repaired.

Scheduled refrigerant **must** never be knowingly vented or leaked from a refrigerating system.

### 9.2. Leaking systems

Owners and operators of refrigeration appliances are advised that licenced service technicians are required by legislation to observe this code of practice and not to 'top up' systems known to be leaking or to service equipment unless it can be returned into service in a leak free condition.

Some modification to appliances may be necessary to achieve the aim of the code of practice to minimise loss of refrigerant.

### 9.3. Maintenance

It is in the interest of the operator to properly maintain the system by following the operating and maintenance instructions from the manufacturer.

It is recommended that a routine maintenance agreement for the appliance be undertaken with a competent service technician, and that the necessary repairs and adjustments proposed by the service technician are implemented.

All users **should** monitor the operation of their installation and call the service technician immediately if any abnormal condition is found. Apart from the likelihood of minimising loss of refrigerants to the atmosphere this may also save the cost of an expensive repair or replacement.

## 10. Change of refrigerant/lubricant procedure

The Ozone Protection and Synthetic Greenhouse Gas Management Regulations prohibit RAC equipment being retrofitted with a refrigerant that has a higher global warming potential (GWP) than the refrigerant the equipment was originally designed to use, unless the original design refrigerant is an ozone-depleting hydrochlorofluorocarbon (HCFC).

### 10.1. Procedures

The procedures specified in AS/NZS 5149.4 *Change of refrigerant type* and recommended by the system manufacturer or their distributor **must** be followed when a refrigerant change is to be carried out.

### 10.2. Manufacturer's advice

Changing a refrigerant and/or lubricant **must** only be carried out based on written advice from the equipment and/or component manufacturer.

If the equipment and/or component manufacturer cannot be contacted and written advice from them is not available, written advice from a suitably qualified refrigeration or air conditioning engineer **must** be obtained prior to the retrofit.

### 10.3. Flammable refrigerants

Where a different classification of refrigerant is being considered (e.g. changing from A1 to A2, A2L, or A3), a system conversion process is required. Refer to the AIRAH *Flammable Refrigerants Safety Guide* for more details.

### 10.4. Safety classification

The system **must not** be changed to a replacement refrigerant with a more hazardous AS/NZS 817 Safety Group Classification (see Appendix C) unless:

1. The system has been re-engineered by a competent refrigeration or air conditioning engineer, and
2. The required changes to the system have been carried out and documented, in accordance with AS/NZS 5149.4, and
3. Any introduced flammability concerns have been addressed in accordance with AS/NZS 60079.0.

### 10.5. Compatibility

The replacement refrigerant **must** be compatible with all parts of the system.

Correct lubricants **must** be used with the replacement refrigerant (check with the refrigerant and compressor supplier if in doubt).

A new filter dryer appropriate for the replacement refrigerant **must** be fitted.

### 10.6. Labelling and documentation

Refrigerating systems modified on site **must** be labelled, in accordance with Clause 5.2.

When a system refrigerant has been changed, the system's labelling, colour coding (if applicable) and nameplates **must** be changed to permanently identify the replacement refrigerant now contained in the system.

System operation and maintenance documentation **must** be updated.

# 11. Refrigerant recovery, recycling, reclamation and disposal

## 11.1. General

⚠ Warning: Non-condensable gases mixed with refrigerant can be extremely hazardous, increasing the pressure above normal vapour pressure. They can cause a cylinder to burst during filling or warming.

Flammable refrigerants **must** be recovered using equipment rated for use with the appropriate flammability grade (2, 2L or 3). Recovery units and vacuum pumps **must** conform with relevant standards. Refrigerant cylinders used **must** be designed for the refrigerant in use.

In Australia, recovery and disposal of refrigerant at the end of its useful life using recovery and/or recycling equipment is mandatory.

In New Zealand, it is an offence under the *Ozone Layer Protection Act 1996* to wilfully release an ozone-depleting substance. It is also illegal to release synthetic greenhouse gases (SGG) into the atmosphere under the *Climate Change Response Act (CCRA) 2022*.

Refrigerant cylinders will often be used as temporary receivers for all or part of the refrigerant charge. Hazards can arise in the use of refrigerant cylinders in this way and the requirements of this section **must** be complied with.

In New Zealand, any person refilling a cylinder must hold a current Refrigerant Fillers Certificate relevant to the refrigerant involved.

To avoid mixing refrigerants that can be recycled or reused, and to ensure that no recovery cylinder is over-filled, it is necessary to either use dedicated recovery equipment for each refrigerant or to ensure that only cylinders marked with the correct filling ratio are used, and that this filling ratio is not exceeded for the refrigerant being reclaimed.

## 11.2. Refrigerant recovery

In Australia, at the end of its useful life, all scheduled refrigerant **must** be recovered and recycled or disposed of, in accordance with this section.

Refrigerant **must not** be recovered into a flexible bag.

The entire refrigerant charge (vapour and liquid) **must** be recovered when a system is emptied.

### 11.2.1. Recovery equipment

Portable equipment is available for recovery of refrigerant in the field.

Refrigerant recovery equipment and/or recycle equipment **must** conform to ISO 11650 or AHRI 740. Refrigerant recovery units **must** be appropriate for the refrigerant being recovered.

Hoses, fittings and procedures used during recovery **must** be those which minimise the loss of refrigerant.

Recovery equipment **must** be used in accordance with the manufacturer's instructions.

See Appendix A for further information if the presence of flammable refrigerant is suspected.

### 11.2.2. Flammable refrigerant equipment

Tools and equipment **must** be rated for use with the appropriate flammability grade (2, 2L or 3).

A2L, A2 and A3 refrigerants are generally not compatible with the following traditional servicing tools used to work with A1 refrigerants, due to the flammable nature of the refrigerant:

- a) Vacuum pumps
- b) Recovery units

c) Refrigerant cylinders.

New or existing servicing tools **must** be assessed individually to ensure:

1. They conform with relevant international/Australian/New Zealand Standards.
2. The manufacturer's manual/specification states that it is designed for use with A2/A2L/A3 flammable refrigerants.
3. All electrical components fitted to the device (including switches, pressure controls and motors) are sealed in a flameproof enclosure (i.e. are suitable for use in a flammable environment).

### 11.2.3. Recovery cylinders

Cylinders **must** conform with AS 4484, AS 2030.1 and AS/NZS 1200.

Refrigerant **must not** be recovered into an out-of-date recovery cylinder, i.e. if its test date is over:

- a) 5 years old – in New Zealand, or
- b) 10 years old – in Australia.

Note: Refrigerant/oil mixtures have a lower density than refrigerant alone. For this reason the carrying capacity of refrigerant cylinders will be reduced for refrigerant/oil mixtures compared to pure refrigerants.

The designed maximum safe working pressure of a refrigerant cylinder determined in accordance with AS 2030.5 **must not** be exceeded in any filling operation, no matter how temporary.

Note: Particular care should be taken when recovering modern high-pressure refrigerants because their ambient pressures can be much higher than previous generation refrigerants.

Cylinders **must** only be used within the application for which they are designed. The recovery cylinder **must** be appropriate for the refrigerant being recovered. A2/A2L refrigerant **must** be recovered into A2/A2L specific cylinders with correct design pressure ratings.

The permission of the owner of the cylinder **must** be obtained in advance if a refrigerant cylinder belonging to a third party (for example, a refrigerant manufacturer, wholesaler or hirer) is to be used as a temporary receiver. Where granted, the cylinder owner **must** be given the opportunity to carry out an internal inspection for corrosion and contamination immediately after such use, and the refrigerant cylinder **must** be labelled indicating such use.

Valves and non-return valves on refrigerant cylinders **must not** be tampered with without the permission of the owner.

### 11.2.4. Contaminated refrigerant

Cross contamination of refrigerants and lubricants **must** not occur within the equipment if the refrigerant is to be recycled or reused.

If contaminated refrigerant is decanted into a recovery cylinder, corrosion and contamination may occur.

If a cylinder is filled with contaminated refrigerant, an internal examination followed by cleaning **should** be carried out before it is reused.

Refrigerant suspected to be contaminated **must** be either disposed of or tested if it is to be re-used. If necessary, it may be recycled or reprocessed to ensure it complies with the provisions of ARI 700.

## 11.3. Refrigerant recycling and reclamation

### 11.3.1. Refrigerant recycling

If recovered refrigerant is to be recycled or reprocessed, mixing different types of refrigerants may render large quantities of refrigerant unusable, as separation may be impossible.

Refrigerant recycling involves a few fairly simple cleaning processes that remove certain contaminants, such as moisture and particulates.

Recycling can be carried out on site using portable equipment. Some refrigerant recovery units include recycling stages.

Recycled refrigerant can be reused in the original system or, if reclaimed, can be used in another system.

The re-use of recovered refrigerant that has not been reclaimed (cleaned) can be detrimental to a refrigeration system. Recovered refrigerant can contain moisture, oils, acidity, particulates and non-condensable gasses. Re-using this refrigerant may cause corrosion to copper and aluminium components, shortening the life of heat transfer coils and compressors.

Refrigerant recycling equipment **must** conform to ISO 11650 or AHRI 740.

Contaminated recycled refrigerant **must** be reclaimed before re-use. Using recovered refrigerant that has not been reclaimed may void equipment warranty and seriously damage the system.

### 11.3.2. Refrigerant reclamation

Refrigerant reclamation **must** only be carried out at a specialist facility that reprocesses the refrigerant to a specification equivalent to the original refrigerant state.

Reclaimed refrigerant **must** be treated and processed so that it conforms to the AHRI 700 standard.

After reclamation, the refrigerant can be reused in any system designed for that refrigerant.

## 11.4. Disposal

### 11.4.1. Disposal of refrigerants

Unusable or unrequired scheduled refrigerant **must not** be discharged to the atmosphere and **must** be returned to a refrigerant supplier or collection agent for disposal.

In Australia, reclaimed refrigerant can be returned to the supplier for destruction or disposal. See [refrigerantreclaim.com.au](http://refrigerantreclaim.com.au) for more information.

In New Zealand all refrigerant importers are required to accept refrigerant back under product stewardship requirements. Locations that accept returned refrigerant in New Zealand include A Gas NZ Ltd, Patton NZ Ltd and RefSpecs NZ Ltd. For additional locations that accept returned refrigerant in New Zealand, visit [coolsafe.org.nz](http://coolsafe.org.nz)

### Appliance disposal

Scheduled refrigerant **must** be recovered from all refrigeration systems before their disposal.

All domestic and commercial refrigerator and freezer cabinets **must** have any locks removed or rendered inoperative upon removal from service. Doors, drawers and/or lids **must** be removed or otherwise rendered safe and inaccessible where refrigerators and freezer cabinets are stored or removed from service and left in any public place or any other place where children could have access.

## 11.5. Disposable refrigerant containers (New Zealand only)

The importation and use of fluorocarbon refrigerant in disposable refrigerant containers is prohibited by law in Australia. The following requirements apply to New Zealand only:

1. Any residual refrigerant in a disposable container **must** be recovered
2. A disposable container **must not** be refilled or used as a temporary receiver during service
3. A disposable container **must not** be repaired or modified in any way
4. Empty disposable containers **must** be disposed of at a recycling centre.

## 12. Handling and storage of refrigerants

### 12.1. Chemical hazards

Under Australian WHS/OHS regulations, and New Zealand Health and Safety at Work Act (HSWA) regulations, hazardous chemicals including refrigerants are classified according to the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS).

The GHS is designed to provide information for the safe storage, handling and use of a hazardous chemical, independent of the refrigerant classifications of AS/NZS ISO 817.

A refrigerant is required to have a Safety Data Sheet (SDS) developed and supplied by the manufacturer or importer that describes the hazard classification/s. The SDS provides the chemical hazard information of a product as a basis for safely managing the associated use, storage, and handling risks.

System owners **must** ensure SDS are readily available and service personnel **must** make reference to the SDS when handling refrigerants.

### 12.2. Flammability hazards

For flammable refrigerants, technicians **must** take the relevant safety measures for the correct transport, storage, and handling of a flammable gas.

This includes ensuring that the gas is not exposed to open flames or other ignition sources. Toxic substances like hydrogen fluoride and carbon dioxide are created when all fluorinated refrigerants are burnt. Asphyxiation and freeze burns are also a risk.

### 12.3. Handling and storage losses

Losses of refrigerant to the atmosphere can occur during the handling and storage of refrigerant cylinders. Service technicians have a duty of care to avoid such losses.

Where a scheduled refrigerant is to be transferred to a charging station, refrigerant vapour vented to atmosphere **must** be minimised.

### 12.4. Cylinder filling

In New Zealand, it is a legal requirement that any person who fills gas containers with gases under pressure **must** be trained and hold a current, approved filler compliance certificate. This applies to all gases under pressure, including air.

All refillable gas cylinders approved for filling in New Zealand are required to be stamped with a record number, normally done at the time of manufacture. The record number is in the form of LAB xxxx, or in the case of special cylinders, LAB xxxx SP. The inspection interval for refrigerant cylinders in New Zealand is every 5 years from date of manufacture.

The maximum gross weight **must not** be exceeded when filling refrigerant cylinders. The cylinder **must not** be used if the maximum gross weight is not marked on the cylinder.

The maximum gross weight is a function of the internal volume of the cylinder, refrigerant composition and oil content and temperature. The cylinder supplier should determine the maximum gross weight in accordance with AS 2030.5.

Refilling a cylinder **must** only be undertaken with the permission of the cylinder owner.

Refrigerant **must not** be vented to the atmosphere from the receiving cylinder.

The receiving cylinder may be cooled in an operating refrigerator or freezer.

Warming of the discharging cylinder under controlled conditions to increase the rate of discharge of refrigerant during transfer is permissible.



Refrigerant cylinders **must not** be directly heated by flame, radiant heat or uncontrolled direct contact heat. Heating of cylinders using indirect forms of heating, e.g. controlled temperature air flow, **must** only be conducted where the control system is designed to be fail safe.

## 12.5. Refrigerant transfer between cylinders

The provisions of clause 12.4 also apply to refrigerant transfer between cylinders.

Where refrigerant is to be transferred from one cylinder to another, a pressure or height difference **must** be established between the cylinders. This may be achieved by means of a pump or temperature differential.

Refrigerant cylinders **should not** be manifolded together if there is a possibility of temperature differences between the cylinders, since this will result in refrigerant transfer and the danger of overfilling the cold cylinder.

Where cylinders are manifolded together:

1. Care **should** be taken to ensure all the cylinders are at the same height to avoid gravity transfer between cylinders.
2. It is **highly recommended** that single direction flow or check valves be installed at each cylinder.

## 12.6. Cylinder storage

### 12.6.1. Hazards

There are numerous hazards associated with the storage of refrigerant. These include asphyxiation in confined spaces due to leakage from refrigerant cylinders, and fire, which may overheat and explode refrigerant cylinders or decompose refrigerant into toxic substances.

Technicians **should** make reference to refrigerant manufacturer's Safety Data Sheets when handling refrigerant cylinders.

### 12.6.2. Storage

Refrigerant **must** be stored securely with appropriate signage (to provide ready identification by emergency teams).

There are limits on the amount that can be stored and reference **must** be made to current local legislation.

Refer to the AIRAH *Flammable Refrigerants Safety Guide* for additional information on refrigerant storage.

### 12.6.3. Handling

The refrigerant cylinder and its valve **must** be handled carefully to avoid mechanical damage.

When a refrigerant cylinder is not in use its valve **must** be closed, the valve outlet sealing cap put in place and the valve protected.

Cylinders **must** be leak tested every 3 months. Refrigerant leak detectors can be used for this purpose.

The contents of a leaking cylinder **must** be transferred to a recovery cylinder immediately a leak is detected. The leaking cylinder **must** be returned to the supplier.

## 12.7. Refrigerant transport

### 12.7.1. Australia

In Australia, the Australian Code for the Transport of Dangerous Goods by Road and Rail (The ADG Code) provides detailed technical specifications and recommendations applicable to the transport

of dangerous goods by road and rail. The ADG Code covers the requirements for classification, packaging, marking and labelling of substances and articles that meet the United Nations classification criteria for dangerous goods. The ADG Code adopts the structure, format, definitions and concepts of the United Nations Recommendations on the Transport of Dangerous Goods Model Regulations while retaining Australian-specific provisions.

### **12.7.2. New Zealand**

In New Zealand, the regulations for transporting dangerous goods on land are outlined in the Land Transport Rule: Dangerous Goods 2005. This rule, also based on the UN Dangerous Goods Model Regulations, covers various aspects related to dangerous goods, including packaging, identification, documentation, segregation of incompatible goods, transport procedures, and the responsibilities of those involved in transporting dangerous goods. New Zealand Standard NZS 5433 provides detailed technical information to meet the requirements of the Land Transport Rule.

### **12.7.3. Flammable refrigerants**

For transportation purposes, flammable refrigerants are classified as a Dangerous Goods Class 2.1 flammable gas under the Australian Dangerous Goods Code and therefore require additional handling and storage safeguards compared to class 2.2 non-flammable gases (see also Appendix C). Cylinders for transport should be marked with the ADG Flammable Gas 2.1 Class Label (red diamond). Note that WHS regulations allow GHS pictograms to be substituted by the correct ADG class labels (for the same hazard).

Refer to the AIRAH *Flammable Refrigerants Safety Guide* for additional details on transporting refrigerants and a self-assessment tool for vehicle storage.

## Appendix A Recovery of fluorocarbons mixed with other refrigerants

Over the past few years, a number of different refrigerants and refrigerant mixtures have been used as replacements for HFCs, HCFCs and CFCs. In some cases, A3 hydrocarbons and hydrocarbon mixtures have been used for this purpose. Hydrocarbons or other refrigerants have also been used (illegally) to 'top up' fluorocarbon refrigerant in some refrigeration or air conditioning systems.

In many instances the equipment in question has not been labelled to indicate that an A3 refrigerant has been used and, as the operating pressures of these replacements are usually similar to those of the original refrigerant, identification in the field is extremely difficult.

If the presence of a flammable refrigerant is suspected in a system, proper care **should** be taken to recover it. Only properly trained personnel using equipment designed to recover these types of mixtures **should** perform this task.

Refrigerant mixtures containing a scheduled refrigerant **must not** be vented to the atmosphere and **must** be reclaimed.

## Appendix B Scheduled Refrigerants

A long-term replacement refrigerant **should** have a zero Ozone Depletion Potential (ODP) and low GWP.

The ODP and GWP figures listed below are from the Montreal Protocol, Annex A-E, Assessment Report 4. New Zealand regulations require the use the ODP and GWP values proscribed under the Montreal Protocol, Annex A-E, Assessment Report 5, with consequent different values to those listed.

The ODP and GWP figures listed below for refrigerant blends **must not** be used for the purposes of reporting on the import, export and manufacture of bulk Ozone Depleting Substances and Synthetic Greenhouse Gases, or imports of pre-charged equipment under Part VII of the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*. For further information on these reporting requirements, please contact the Ozone Protection and Synthetic Greenhouse Gas Team in the Australian Department of Climate Change, Energy, the Environment and Water or the Ministry for the Environment in New Zealand.

This table does not include all refrigerants that are currently in use in Australia and New Zealand. For refrigerant blends not listed on the Montreal Protocol, Annex A-E, Assessment Report 4, refer to ODP and GWP figures published by The International Panel for Climate Change (IPCC) Assessment Report (AR5).

### Scheduled Refrigerants – ODP and GWP (Australia only)

R No	Name	Chemical Formula or % Mass Mixture	ODP	GWP 100 yrs.	Safety Class
<b>CFCs and CFC blends</b>					
R11	Trichlorofluoromethane	C. <sub>l</sub> <sub>3</sub> .F	1.00	4,750	A1
R12	Dichlorodifluoromethane	C.Cl <sub>2</sub> .F <sub>2</sub>	1.00	10,900	A1
R113	Trichlorotrifluoroethane	C.Cl <sub>2</sub> .F.C.Cl.F <sub>2</sub>	0.80	6,130	A1
R114	Dichlorotetrafluoroethane	C.Cl.F <sub>2</sub> .C.Cl.F <sub>2</sub>	1.00	10,000	A1
R500	CFC Blend	CFC-12 (74%) HFC-152a (26%)	0.738	8,700	A1
R502	CFC Blend	CFC-115 (51%) HCFC-22 (49%)	0.334	4,500	A1
<b>HCFCs and HCFC blends</b>					
R22	Chlorodifluoromethane	C.H.Cl.F <sub>2</sub>	0.055	1,810	A1
R123	Dichlorotrifluoroethane	C.H.Cl <sub>2</sub> .C.F <sub>3</sub>	0.020	77	A1
R124	Chlorotetrafluoroethane	CH.F.Cl.C.F <sub>3</sub>	0.022	609	A1
R401A	HCFC Blend	HCFC-22 (53%) HCFC-124 (34%) HFC-152a (13%)	0.03663	1,100	A1/A1
R401B	HCFC Blend	HCFC-22 (61%) HFC-124 (28%) HFC-152a (11%)	0.03971	1,200	A1/A1
R401C	HCFC Blend	HCFC-22 (33%) HFC-124 (52%) HFC-152a (15%)	0.025	900	A1/A1

R No	Name	Chemical Formula or % Mass Mixture	ODP	GWP 100 yrs.	Safety Class
R402A	HCFC Blend	HCFC-22 (38%) HFC-125 (60%) HC-290 (Propane) (2%)	0.0209	2,700	A1/A1
R402B	HCFC Blend	HCFC-22 (60%) HFC-125 (38%) HC-290 (Propane) (2%)	0.033	2,300	A1/A1
R403A	HCFC Blend	HCFC-22 (75%) HFC-218 (20%) HC-290 (Propane) (5%)	0.04125	3,000	A1/A1
R403B	HCFC Blend	HCFC-22 (56%) HFC-218 (39%) HC-290 (Propane) (5%)	0.0308	4,300	A1/A1
R405A	HCFC Blend	HCFC-22 (45%) HFC-142b (5.5%) HFC-152a (7%) HFC-318 (42.5%)	0.018	5,200	A1/A1
R406A	HCFC Blend	HCFC-22 (55%) CFC-142b (41%) HC-600a (Isobutane) (4%)	0.0569	1,900	A1/A1
R408A	HCFC Blend	HCFC-22 (47%) HFC-125 (7%) HFC-143a (46%)	0.02585	3,000	A1/A1
R409A	HCFC Blend	HCFC-22 (60%) HCFC-124 (25%) HCFC-142b (15%)	0.04825	1,500	A1/A1
R409B	HCFC Blend	HCFC-22 (65%) HCFC-124 (25%) HCFC-142b (10%)	0.04775	1,500	A1/A1
R411A	HCFC Blend	HCFC-22 (87.5%) HCFC-152a (11%) HCFC-1270 (1.5%)	0.048125	1,500	A1/A2
R411B	HCFC Blend	HCFC-22 (94%) HCFC-152a (3%) HCFC-1270 (3%)	0.0517	1,600	A1/A2
R412A	HCFC Blend	HCFC-22 (70%) HCFC-142b (25%) HFC-218 (5%)	0.05475	2,200	A1/A2
R416A	HCFC Blend	HCFC-124 (39.5%) HCFC-134a (59%) HFC-600 (1.5%)	0.00869	1,000	A1/A1
R509A	HCFC Blend	HCFC-22 (44%) HFC-218 (56%)	0.0242	5,600	A1

R No	Name	Chemical Formula or % Mass Mixture	ODP	GWP 100 yrs.	Safety Class
<b>HFCs and HFC blends</b>					
R32	Difluoromethane	HFC-32	0.0	675	A2L
R125	Pentafluoroethane	CHF <sub>2</sub> CH <sub>3</sub>	0.0	3,500	A1
R134a	Tetrafluoroethane	C.F <sub>3</sub> .C.H <sub>2</sub> .F	0.0	1,430	A1
R143a	Trifluoroethane	C.F <sub>3</sub> .C.H <sub>3</sub>	0.0	4,470	A2
R152A	1,1-difluoroethane	CH <sub>3</sub> CHF <sub>2</sub>	0.0	124	A2
R404A	HFC Blend	HFC-125 (44%) HFC-134a (4%) HFC-143a (52%)	0.0	3,922	A1/A1
R407A	HFC Blend	HFC-32 (20%) HFC-125 (40%) HFC-134a (40%)	0.0	2,107	A1/A1
R407B	HFC Blend	HFC-32 (10%) HFC-125 (70%) HFC-134a (20%)	0.0	2,804	A1/A1
R407C	HFC Blend	HFC-32 (23%) HFC-125 (25%) HFC-134a (52%)	0.0	1,774	A1/A1
R407F	HFC Blend	HFC-32 (30%) HFC-125 (30%) HFC-134a (40%)	0.0	2,107	A1
R410A	HFC Blend	HFC-32 (50%) HFC-125 (50%)	0.0	2,088	A1/A1
R417A	HFC and HC Blend	HFC-125 (46.6%) HFC-134a (50%) HC-600a (3.4%)	0.0	2,346	A1
R422A	HFC and HC Blend	HFC-125 (85.1%) HFC-134a (11.5%) HC-600a (3.4%)	0.0	3,143	A1
R422D	HFC and HC Blend	HFC-125 (65.1%) HFC-134a (31.5%) HC-600a (3.4%)	0.0	2,729	A1
R423A	HFC Blend	HFC-134a (52.5%) HFC-227ea (47.5%)	0.0	2,280	A1
R424A	HFC and HC Blend	HFC-125 (50.5%) HFC-134a (47.0%) HC-600a (0.9%) HC-600 (1%) HC-601a (0.6%)	0.0	2,440	A1
R427A	HFC Blend	HFC-32 (15%) HFC-125 (25%) HFC-143a (10%) HFC-134a (50%)	0.0	2,138	A1
R428A	HFC and HC Blend	HFC-125 (77.5%) HFC-143a (20%) HC-290 (0.6%) HC-600a (1.9%)	0.0	3,607	A1

R No	Name	Chemical Formula or % Mass Mixture	ODP	GWP 100 yrs.	Safety Class
R434A	HFC Blend	HFC-125 (63.2%) HFC-143a (18%) HFC-134a (16%) HC-600a (2.6%)	0.0	3,245	A1
R437A	HFC and HC Blend	HFC-125 (19.5%) HFC-134a (78.5%) HC-600 (1.4%) HC-601 (0.6%)	0.0	1,805	A1
R438A	HFC and HC Blend	HFC-32 (8.5%) HFC-125 (45%) HFC-134a (44.2%) HC-600 (1.7%) HC-601a (0.6%)	0.0	2,264	A1
R442A	HFC Blend	HFC-32 (31%) HFC-125 (31%) HFC-134a (30%) HFC-152a (3%) HFC-227ea (5%)	0.0	1,888	A1
R448A	HFC and HFO Blend	HFC-32 (26%) HFC-125 (26%) HFC-134a (21%) HFO-1234yf (20%) HFO-1234ze (7%)	0.0	1,386	A1
R449A	HFC and HFO Blend	HFC-32 (24.3%) HFC-125 (24.7%) HFC-134a (25.7%) HFO-1234yf (25.3%)	0.0	1,396	A1
R450A	HFC and HFO Blend	HFC-134a (42%) HFO-1234yf (58%)	0.0	601	A1
R452A	HFC and HFO Blend	HFC-32 (11%) HFC-125 (59%) HFO-1234yf (30%)	0.0	2,139	A1
R452B	HFC and HFO Blend	HFC-32 (67%) HFC-125 (7%) HFO-1234yf (26%)	0.0	697	A2L
R454B	HFC and HFO Blend	HFC-32 (68.9%) HFO-1234yf (31.1%)	0.0	465	A2L
R454C	HFC and HFO Blend	HFC-32 (21.5%) HFO-1234yf (78.5%)	0.0	146	A2L
R466A	HFC and Trifluoroiodomethane Blend	HFC-32 (49%) HFC-125 (11.5%) R113 (39.5%)	0.0	733	A1
R507A	HFC Blend	HFC-125 (50%) HFC-143a (50%)	0.0	3,985	A1/A1
R508A	HFC and PFC Blend	HFC-23 (39%) R116 (61%)	0.0	13,214	A1
R513A	HFC and HFO Blend	HFC-134a (44%) HFO-1234yf (56%)	0.0	630	A1

## Appendix C Safety Classifications

### C.1 Safety Classification of Refrigerants

Refrigerants are classified into safety groups according to the criteria of AS/NZS ISO 817.

The safety classifications consist of two alphanumeric characters (e.g. A2 or B1). The capital letter indicates the toxicity and the numeral denotes the flammability.

### C.2 Toxicity classification

Refrigerants are assigned to one of two classes, A or B, based on the following exposure:

- **Class A (lower chronic toxicity)** signifies refrigerants that have an occupational exposure limit of 400ppm or greater,
- **Class B (higher chronic toxicity)** signifies refrigerants that have an occupational exposure limit of less than 400ppm.

### C.3 Flammability classification

Refrigerants are assigned to one of four classes based on flammability: 1, 2L, 2 or 3.

#### Class 1 (no flame propagation)

Single compound refrigerants or refrigerant blends that do not exhibit flame propagation when tested in air at 60°C and 101.3kPa.

Examples: R22, R134a, R404A, R410A, R744.

#### Class 2L (lower flammability)

Single compound refrigerants or refrigerant blends that meet all of the following conditions:

- Exhibit flame propagation when tested at 60°C and 101.3kPa,
- Have a low flammability limit (LFL) > 3.5% by volume if the refrigerant has no LFL at 23°C and 101.3kPa,
- Have a heat of combustion < 19,000kJ/kg, and
- Have a maximum burning velocity of <10cm/s when tested at 23°C and 101.3kPa.

Examples: R32, R1234yf, R1234ze, R717.

#### Class 2 (flammable)

Single compound refrigerants or refrigerant blends that meet all of the following conditions:

- Exhibit flame propagation when tested at 60°C and 101.3kPa,
- Have an LFL > 3.5% by volume if the refrigerant has no LFL at 23°C and 101.3kPa, and
- Have a heat of combustion < 19,000kJ/kg

Example: R415B.

#### Class 3 (higher flammability)

Single compound refrigerants or refrigerant blends that meet the following conditions:

- Exhibit flame propagation when tested at 60°C and 101.3kPa, and
- Have an LFL < 3.5% by volume if the refrigerant has no LFL at 23°C and 101.3kPa; or have a heat of combustion that is > 19,000kJ/kg.

Examples: R290, R600, R601, R1270.



## C.4 Safety classification of refrigerant blends

Blends whose flammability and/or toxicity characteristic may change as the composition changes during fractionation are assigned a dual safety group classification, with the two classifications separated by a slash (/).

Each of the two classifications has been determined according to the same criteria as a single component refrigerant. The first classification listed is the classification of the 'as formulated' composition of the blend. The second classification is the classification of the blend composition of the 'worst case fractionation'.

For flammability, 'worst case of fractionation' is defined as the composition during fractionation that results in the highest concentration of the flammable component(s) in the vapour or liquid phase.

For toxicity, 'worst case of fractionation' is defined as the composition during fractionation that results in the highest concentration(s) in the vapour or liquid phase for which the Threshold Limit Value – Time Weighted Average (TLV-TWA) is less than 400ppm. The TLV-TWA for a specified blend composition has been calculated from the TLV-TWA of the individual components.

## C.5 ADG Code classification

The Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code), available online at [www.ntc.gov.au](http://www.ntc.gov.au), provides detailed technical specifications and recommendations applicable to the transport of dangerous goods in Australia by road and rail including refrigerants.

The ADG Code covers the requirements for classification, packaging, marking and labelling of substances and articles that meet the United Nations classification criteria for dangerous goods.

ADG Class 2 substances are assigned to one of three divisions based on the primary hazard of the gas during transport. These divisions are designated:

- Division 2.1 Flammable gases,
- Division 2.2 Non-flammable, non-toxic gases, and
- Division 2.3 Toxic gases.

### Division 2.1 Flammable gases

Division 2.1 Flammable gases are gases that at 20°C and a standard pressure of 101.3kPa:

- i. Are ignitable when in a mixture of 13% or less by volume with air, or
- ii. Have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Flammability should be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156: 1996). Where insufficient data are available to use these methods, tests by a comparable method recognised by the competent authority may be used.

Examples: R32, R143A, R600, R1270.

### Division 2.2 Non-flammable, non-toxic gases

Division 2.2 Non-flammable, non-toxic gases are gases that:

- i. Are asphyxiant – gases that dilute or replace the oxygen normally in the atmosphere, or
- ii. Are oxidising – gases that may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does, or
- iii. Do not come under the other divisions.

Examples: R22, R134a, R404A, R407A, R410A, R744 (carbon dioxide).

## Division 2.3 Toxic gases

Division 2.3 Toxic gases are gases that:

- i. Are known to be so toxic or corrosive to humans as to pose a hazard to health; or
- ii. Are presumed to be toxic or corrosive to humans because they have an  $LC_{50}$  value equal to or less than  $5,000\text{ml/m}^3$  (ppm).

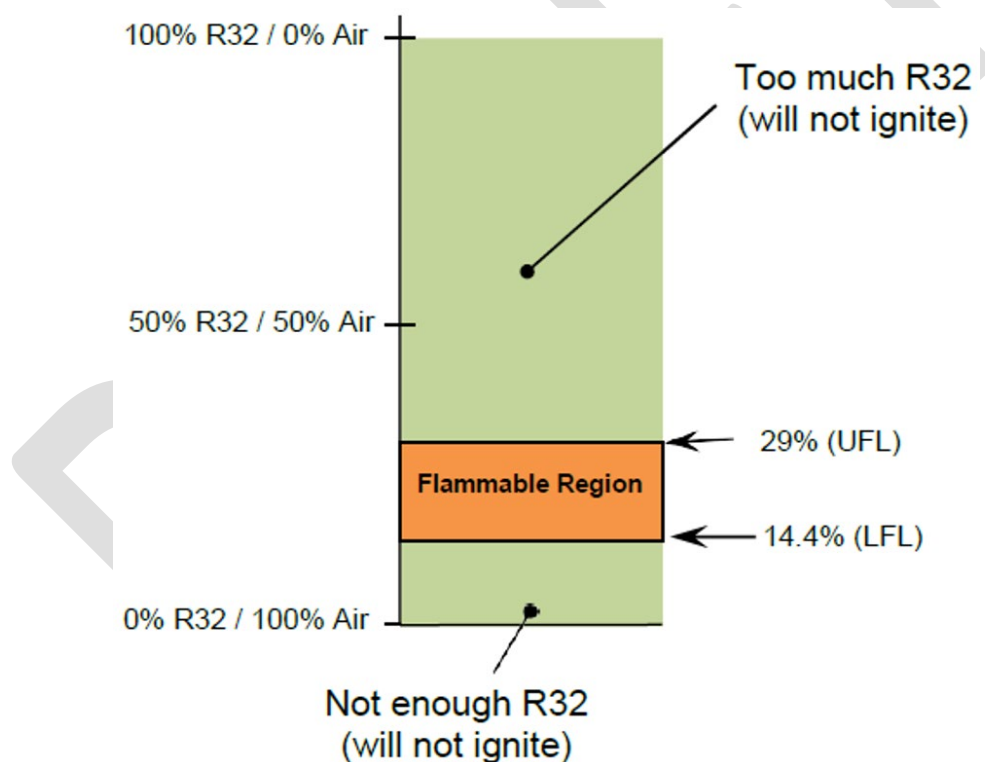
Example: R717 (ammonia).

## C.6 Lower Flammability Limit (LFL)

Class 2L, 2 and 3 flammable refrigerants are flammable when mixed with air (oxygen) at a percentage range specific to each refrigerant.

The Lower Flammability Limit (LFL) is the minimum concentration of the refrigerant that can propagate a flame through a homogeneous mixture of the refrigerant and air under the specified test conditions at  $23^\circ\text{C}$  and  $101.3\text{kPa}$ . That is, the mixture capable of producing a flame.

For example, R32 is flammable when mixed with air (or oxygen) at a certain percentage and ignited. The quantity of R32 vapour required to make the mixture flammable sits within a narrow band of 14.4% to 29% per the diagram below. The LFL of 14.4% for R32 is equivalent to  $307\text{g/m}^3$ .



**R32 Lower Flammability Limit**

Referring to the figure above, if there is less than 14.4% of R32 in the air then there is insufficient fuel (the R32) for combustion. If there is more than 29% then there is insufficient oxygen for combustion. When the mixture is within these concentrations it is said to be in its 'flammable region'.

The bottom of this region is called the 'Lower Flammability Limit' (LFL) and minimum design standards attempt to ensure that the LFL of the refrigerant cannot be reached if there is a leak. Note that these % values may also be expressed in  $\text{kg/m}^3$  or  $\text{g/m}^3$ .

## Appendix D Definitions and acronyms

### D.1 Definitions

For the purpose of this code the following definitions apply:

**Blend**

A combination of two or more refrigerants in a defined ratio that forms a refrigerant with specified thermodynamic properties.

**Compatible**

Components that can be operated together without degrading the overall performance of the system.

**Competent**

A technician who has acquired, through training, qualifications, experience or a combination of these, the knowledge and skill, and where relevant the applicable licence, enabling the person to safely perform the assigned work

**Contaminated refrigerant**

A refrigerant containing oil, acid, non-condensable substances and/or moisture and/or other foreign substances. This could include mixed refrigerants (cocktails) that are not a manufactured product.

**Cylinder**

A portable storage vessel designed for the safe storage and handling of refrigerant under pressure.

**Decommissioning**

The process whereby a system is deliberately rendered inoperable.

**Destruction**

A process whereby a refrigerant is permanently transformed or decomposed into other substances.

**Disposable container, disposable refrigerant container**

A non-refillable cylinder.

**Flammable refrigerant**

A refrigerant with a flammability classification of Class 2L, Class 2 or Class 3 in accordance with AS/NZS ISO 817.

**Fluorocarbon**

A hydrocarbon in which some or all of the hydrogen atoms have been replaced by fluorine.

**Global warming potential (GWP)**

The atmospheric warming impact of a refrigerant compared with an equal mass of carbon dioxide over a specified period of time (usually 100 years).

**Heat pump**

A piece of equipment capable of using ambient heat or waste heat from air, water or ground sources to provide heat or cooling and is based on the interconnection of one or more components forming a closed cooling circuit in which a refrigerant circulates to extract and release heat.

**Major components and sub-assemblies**

Equipment including compressors, air/water cooled condensers, liquid receivers, chilled water heat exchangers, evaporators and air/water cooled condensing units.

**Must**

When used for a provision, indicates that the provision is mandatory for compliance with this code.

**Ozone depletion potential (ODP)**

The capacity of a refrigerant to destroy stratospheric ozone. ODP is stated relative to the ODP of CFC-11, which is taken as having an ODP of 1.

**Plant**

A combination of one or more refrigerating systems at a single site.

**Reclaim**

To reprocess used refrigerant to new product specification by means which may include distillation. Chemical analysis of the refrigerant is required to determine that appropriate product specifications have been met. This term usually implies the use of processes or procedures available only at a specialised reclaim or manufacturing facility.

**Recover, recovery**

To remove refrigerant in any condition from a system and store it in an external cylinder, without necessarily testing or processing it in any way.

**Refrigerant**

The medium used for heat transfer in a refrigerating system, which absorbs heat on evaporating at a low temperature and a low pressure and rejects heat on condensing at a higher temperature and higher pressure. The term ‘gas’ should be avoided when referring to refrigerants. Unless specified otherwise, ‘refrigerant’ in this code refers to fluorocarbon scheduled refrigerant only.

**Refrigerating system**

An assembly of piping, vessels, and other components in a closed circuit in which a refrigerant is circulated for the purpose of transferring heat.

**Retrofit**

To replace the original refrigerant (and components, lubricant, etc. as required) in a system with an alternative.

**Returned refrigerant**

Refrigerant recovered from a system and returned to the supplier or equivalent for reclaim or destruction.

**Scheduled refrigerant**

A fluorocarbon refrigerant with an Ozone Depletion Potential and/or a Global Warming Potential as listed under Schedule 1 of the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*, (see Appendix B). Fluorocarbon refrigerants are synthetic chemicals consisting of or containing fluorocarbon, which include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFC).

**Self-contained low charge systems**

Appliances that contain a fluorocarbon refrigerant charge of 2kg or less, and do not require any work to be done on the refrigeration system at the time of installation.

**Should, recommended**

Indicate provisions that are not mandatory for compliance with this code but which are desirable as good and best practice.

**Split systems**

Systems that require interconnecting pipe work and electrical connections between the separate evaporator unit and the condensing unit. Note that split systems fall outside the scope of this code.

Refer instead to the Australia and New Zealand refrigerant handling code of practice Part 2 – *Systems other than self-contained low charge systems*.

For definitions of other components, refer to AS/NZS 5149.1, Section 3: Terms and definitions.

## D.2 Acronyms and initialisms

Acronyms and abbreviations for standards and organisations and relevant websites

Acronym / abbreviation	Standard / organisation	Website
AIRAH	Australian Institute of Refrigeration Air Conditioning and Heating	<a href="http://www.airah.org.au">www.airah.org.au</a>
ANSI	American National Standards Institute	<a href="http://www.ansi.org">www.ansi.org</a>
ARC	Australian Refrigeration Council	<a href="http://www.arctick.org">www.arctick.org</a>
AHRI	The Air-Conditioning, Heating, and Refrigeration Institute (American)	<a href="http://www.ahrinet.org">www.ahrinet.org</a>
AS	Australian Standard	<a href="http://www.standards.org.au">www.standards.org.au</a>
DCCEEW	Department of Climate Change, Energy, Environment and Water	<a href="http://www.dcceew.gov.au">www.dcceew.gov.au</a>
IRHACE	Institute of Refrigeration, Heating and Air Conditioning Engineers New Zealand	<a href="http://www.irhace.org.nz">www.irhace.org.nz</a>
NZCCO	New Zealand Climate Change Office	<a href="http://www.mfe.govt.nz">www.mfe.govt.nz</a>
NZS	New Zealand Standard	<a href="http://www.standards.co.nz">www.standards.co.nz</a>
RRA	Refrigerant Reclaim Australia	<a href="http://www.refrigerantreclaim.com.au">www.refrigerantreclaim.com.au</a>
SAE	Society of Automotive Engineers (American)	<a href="http://www.sae.org">www.sae.org</a>

The acronyms and initialisms used in this code have the following meaning:

**AIRAH** Australian Institute of Refrigeration  
Air Conditioning and Heating

**ARC** Australian Refrigeration Council

**DCCEEW** Department of Climate Change,  
Energy, the Environment and Water

**GHG** Greenhouse gas

**GWP** Global Warming Potential

**ODP** Ozone Depletion Potential

**OHS** Occupational Health and Safety

**OPSGGM Act** Ozone Protection and  
Synthetic Greenhouse Gas Management Act  
1989, including amendments

**RHL** Refrigerant handling licence

**SDS** Safety data sheets

**SGG** Synthetic greenhouse gas

**WHS** Work Health and Safety

## Appendix E Referenced documents and resources

### E.1 Referenced documents

Standards in place at the time of publication of this code **must** be complied with but it is best practice to comply with the latest edition of the document.

The standards and other documents listed are revised and updated from time to time. Best practice is to always refer to and apply the latest current versions and any amendments.

The documents referenced in this code are listed in this Appendix.

#### Regulatory documents

Australian Act	Ozone Protection and Synthetic Greenhouse Gas Management Act 1989
Australian Regulations	Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995
Code of Practice	Australia and New Zealand Refrigerant Handling Code of Practice Part 2 – Systems other than self-contained low charge systems
New Zealand Act	Ozone Layer Protection Act 1996
New Zealand Act	Climate Change Response (Zero Carbon) Amendment Act 2019
NZ Regulations	Health and Safety in employment (pressure equipment, cranes, and passenger ropeways) Regulations 1999
Code of Practice	NZ Approved Code of Practice – Pressure Equipment (excluding Boilers). Guide to gas cylinders – Worksafe NZ
ADG Code	Australian Code for the Transport of Dangerous Goods by Road and Rail
NZ Dangerous Goods	Land Transport Rule: Dangerous Goods 2005
HWSA	Heads of Workplace Safety Authorities: Flammable Refrigerant Gases Position Paper.

#### Australian, New Zealand and international standards

AS/NZS ISO 817	Refrigerants – Designation and safety classification
AS/NZS 1200	Pressure Equipment
AS 2030.1	Gas cylinders. Part 1: General requirements
AS 2030.5	Gas cylinders. Part 5: Filling, inspection and testing of refillable cylinders
AS 4211.3	Gas recovery on combined recovery and recycling equipment. Part 3: Fluorocarbon refrigerants from commercial/domestic refrigeration and air conditioning systems
AS 4484	Gas cylinders for industrial, scientific, medical and refrigerant use – Labelling and colour coding.
AS/NZS 5149	Refrigerating systems and heat pumps – Safety and environmental requirements
	AS/NZS 5149.1 (incorporating Amd 1 and Amd 2) – Part 1: Definitions, classification and selection criteria (ISO 5149-1:2014, MOD)
	AS/NZS 5149.2 – Part 2: Design, construction, testing, marking and documentation (ISO 5149-2:2014, MOD)
	AS/NZS 5149.4 – Part 4: Operation, maintenance, repair and recovery (ISO 5149-4:2014, MOD)

AS/NZS IEC 60079.0	Explosive atmospheres, Part 0: Equipment — General requirements
AS/NZS 60335.1	Household and Similar Electrical Appliances – Safety – General requirements
AS/NZS 60335.2.11	– Particular requirements for tumble dryers
AS/NZS 60335.2.24	– Particular requirements for refrigerating appliances, ice cream appliances and ice makers
AS/NZS 60335.2.34	– Particular requirements for motor compressors
AS/NZS 60335.2.40	– Particular requirements for electrical heat pumps, air conditioners and dehumidifiers (IEC 60335-2-40 Ed 7)
AS/NZS 60335.2.75	– Particular requirements for commercial dispensing appliances and vending machines
AS/NZS 60335.2.89	– Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor
NZS 5433	Transport of dangerous goods on land
ISO 11650	Performance of refrigerant recovery and/or recycling equipment

### **AIRAH documents**

AIRAH FRSG	Flammable Refrigerants Safety Guide (including update 1 2018)
AIRAH DA19	HVAC&R Maintenance

### **Other documents**

ANSI/AHRI 580	Non-Condensable Gas Purge Equipment for Use with Low Pressure Centrifugal Liquid Chillers
AHRI 700	Specification for Refrigerants
AHRI 740	Performance Rating of Refrigerant Recovery Equipment and Recovery/ Recycling Equipment