

Flammable refrigerant gases position paper

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This Position Paper was developed by the Heads of Workplace Safety Authorities (HWSA) and provides information on the obligations of work health and safety duty holders with respect to the use of flammable refrigerant gases at workplaces.

1. Scope

This paper concerns refrigerant gases classified as Division 2.1 flammable gases under the Australian Dangerous Goods Code or classified as Flammable Gas Category 1 using the Globally Harmonized System (GHS). It covers general work health and safety / occupational health and safety (WHS/OHS) duties, however, readers should check their legislative responsibilities at the state/territory and Commonwealth level in relation to working with refrigerants.

It includes information on:

- the use of flammable refrigerant gases in stationary and mobile (vehicle) workplace environments (including fixed or portable plant);
- how to manage the risk of fire and explosion from refrigeration and air-conditioning systems ¹containing flammable refrigerant gases and
- the storage and handling of flammable refrigerant gases.

This document does not address the transport of refrigerant gases. The application of WHS/OHS legislation in domestic environments is in scope only when work is being conducted; for example during installation or servicing of a domestic refrigeration system.

Whilst refrigerant gases may have one or more of a number of hazards (eg toxicity, irritant properties, flammability, environmental hazards) this paper focuses on the issue of flammability. The general duty of care provisions in the WHS/OHS legislation apply to all workplace hazards, including those not in the scope of this paper such as Flammable Gas Category 2 substances.

The term “**must**” is used where there is a WHS/OHS legislative duty. As this position paper applies broadly to various Australian jurisdictions, references to specific sections of the legislation are not provided and enquiries on this should be directed to the relevant regulator (Section 6).

2. Background

The use of flammable refrigerant gases, such as hydrocarbons, flammable hydrofluoroolefins (HFOs, eg R1234yf) and R32 has increased in recent years as organisations seek to minimise the use of ozone depleting gases and synthetic greenhouse gases with high global warming potential.

Ozone depleting substances and synthetic greenhouse gas refrigerant gases (fluorocarbons) are scheduled under the Commonwealth’s Ozone Protection and Synthetic Greenhouse Gas Management Act 1989. All practitioners installing or working on systems that are designed to contain a fluorocarbon refrigerant **must** hold an appropriate licence granted under the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995.

A licence under the Ozone Protection and Synthetic Greenhouse Gas Management

Regulations 1995 is not required for the use of HFOs. The use of refrigerant gases other than those in the scope of the Commonwealth legislation does not require a licence in most jurisdictions.

Queensland requires individuals or businesses to have a licence to handle hydrocarbon refrigerant gases, however there is not a mandatory national licence for working with flammable refrigerant gases. There is a voluntary national accreditation scheme available for key refrigerants not covered by a national licence, including hydrocarbons and HFO 1234yf (refer to the Australian Refrigeration Council item in Section 6 for more information).

3. Risks of flammable refrigerants

As the use of flammable refrigerants is increasing, there is a need to ensure duty holders have access to consistent information on how to manage WHS/OHS risks associated with these substances.

Some recent workplace fire incidents concerning flammable refrigerant gases have directly contributed to injuries, deaths and damage to property globally, including in Australia and New Zealand. Combustion products of some refrigerants and mixtures are toxic, for example halogenated refrigerants release hydrogen fluoride or carbonyl dichloride (phosgene) in a fire. It should be noted that lubricant/refrigerant mixtures may be flammable even if the refrigerant is non-flammable (SafeWork NSW, 2016) and that combustion products of non-flammable halogenated refrigerants are also toxic.

Some refrigerants are a blend of gases, and some blends (called zeotropic blends) change in composition if leaks occur (due to different boiling points), which can lead to unpredictable hazard properties.

The use of mercaptan or other odourants to add a warning property to hydrocarbon refrigerants is declining, however may be required in some jurisdictions. When an odourant is used, it may become ineffective over time, depending on the design of the equipment. People should be aware that flammable refrigerant leaks may be odourless.

The WHS/OHS legislation includes broad duties for risk management. The measures taken to manage risk should be proportionate and appropriate to the level of risk. The law uses the term “so far as reasonably practicable” to ensure the general duties are applied at a level proportionate to the risk.

4. Issues

a) Compatibility of refrigerant gases with the refrigeration system - Refrigerant gases **must** be compatible with the refrigeration system. This determination **must** be made by a competent person², who has experience in this matter and who may have undertaken

relevant formal training. **A competent person is one who has acquired through training, qualifications or experience the knowledge and skills to conduct the task safely.**

Converting a refrigerant system to use an alternative refrigerant **must** only be conducted in accordance with advice from the original equipment manufacturer or a competent person. A refrigerant should only be used in equipment that is designed or re-designed for its use.

Topping up using different refrigerant gas types presents a safety risk for the worker as well as to those people who use that plant after the work has been completed. Systems should only be topped up with the same refrigerant as is in the system.

b) Communication and provision of information - Refrigeration systems **must** be clearly labelled as to the refrigerant in use. Labelling may be supplemented by signage, placards and documentation. This is essential for the safety of refrigeration technicians as they may not have gas detection/identification equipment (however such equipment is strongly recommended).

There is a lack of information in relation to which workplaces use flammable refrigerants and the quantities used, placing reliance on duty holders to have effective communication systems (for example, systems to inform emergency services organisations).

c) Fire and explosion risks - There should be systems in place to reduce fire and explosion risks and manage potential hazardous atmospheres where flammable refrigerants are in use, appropriate to the risks.

d) Worker competency - All people with WHS/OHS duties in relation to flammable refrigerant gases **must** be competent to conduct that role safely. The required level of training, qualifications and/or experience to conduct a task will depend on the complexity of the task and the associated hazards. Duty holders should ensure that systems are in place to select workers, including contractors, with appropriate competencies, or to ensure appropriate training is provided to such workers.

e) Compliance concerns - Current levels of WHS/OHS compliance are inadequate in some cases, and this could lead to adverse outcomes such as fire, injuries or fatalities.

5. WHS/OHS Regulators' Position – Responsibilities of Duty Holders

5.1 Importers and manufacturers of flammable refrigerant gases

a) Importers and manufacturers of flammable refrigerant gases **must** classify the substance in accordance with the GHS³. For guidance, refer to the Safe Work Australia (SWA) publication *Guidance on the Classification of Hazardous Chemicals under the*

Work Health and Safety Regulations.

- b) Where a refrigerant gas is classified as a hazardous chemical (including a flammability hazard), the importer and manufacturer **must** prepare a compliant Safety Data Sheet (SDS) and label. Refer to the model SWA Codes of Practice Preparation of Safety Data Sheets for Hazardous Chemicals and Labelling of Workplace Hazardous Chemicals for detailed requirements.
- c) Importers and manufacturers of refrigerant gases may also classify the products in terms of flammability and toxicity using *AS/NZS ISO 817:2016 Refrigerants – Designation and safety classification*. This is not mandatory under WHS/OHS legislation; however these classifications can be considered additional information and included on the SDS and label.
- d) The importer and the manufacturer of a refrigerant gas that is a hazardous chemical **must** ensure that the product is correctly packed, which for flammable gases or gases under pressure, requires compliance with the Australian Dangerous Goods Code (ADG Code).

5.2 Designers of refrigeration systems

- a) Designers of refrigeration systems **must** eliminate risks associated with the system so far as is reasonably practicable. Where risks cannot be eliminated, they **must** be minimised as far as is reasonably practicable. This includes risks to people who install, maintain, construct, dispose of or use the system, and those in the vicinity of the system at a workplace.
- b) Designers of refrigeration systems should refer to the relevant Standards (see Section 6) for information on design measures to prevent the release of refrigerants and other controls.
- c) Designers of mobile, portable or stationary refrigeration systems that use or are compatible for use with flammable refrigerants **must** control any flammability hazards and risks and any other hazards or risks associated with the refrigerant. Designers should have relevant experience and training, including accredited courses run by registered training institutes or equivalent where available, for example:
- UEENEEJ177A – Design hydrocarbon refrigerated systems.
 - UEENEEM052A – Classify hazardous area – Gas atmospheres
 - UEENEJ174A – Apply safety awareness and legal requirements for hydrocarbon refrigerants
 - UNEENEEJ108A – Recover, pressure test, evacuate, charge and leak test refrigerants

Designers of complex refrigeration systems may hold relevant tertiary qualifications.

d) Flammable refrigerants may be odourised to aid in their detection. **Note:** Odourants may fade with time in some circumstances.

e) The refrigerant gas quantity (charge size) **must** be appropriate to the room or enclosure size and use. Refrigerant gases and gas blends, which contain one or more flammable refrigerants, **must** have a charge limit equal to the lowest charge limit applicable to any constituent. See AS/NZS 5149.1 for more information on charge limits.

f) Gas detection equipment should be installed to detect leaks from larger stationary direct systems (where a rupture or leak would cause refrigerant release to an occupied space), eg machinery rooms or cold rooms. It is also recommended that where practicable, stationary air conditioning equipment using flammable refrigerants should use a flammable gas detector alarm system for the air leaving the cooling coil. Gas detection equipment should also be considered for smaller systems where a flammable refrigerant release could result in a flammable atmosphere, such as where the room is small. Such gas detection systems can be interlocked to shut down the system in the event of a leak if this is appropriate for the system. More information is available in AS/NZS 5149.

g) Designers of refrigeration systems should provide the following information to people who use, store, construct or maintain the system at a workplace:

- Specify one or more refrigerants which are compatible with the system;
- Any areas classified as hazardous areas in terms of fire risk as far as practicable (including documentation as per AS/NZS 60079 where the application is in the scope of that standard); and
- Instructions on the safe use and maintenance of the system.

h) Refrigeration systems **must** include labelling or signage specifying the refrigerant used and any hazards associated with that refrigerant. Refer to jurisdictional legislation for specific labelling or signage requirements.

5.3 Manufacturers, importers and suppliers of refrigeration equipment for use in workplaces

a) Manufacturers, importers and suppliers of refrigeration equipment **must** eliminate risks associated with the system so far as is reasonably practicable. Where risks cannot be eliminated, they **must** be minimised as far as is reasonably practicable. This includes risks to people who install, maintain, dispose of or use the system, and those in the vicinity of the system at a workplace.

b) Manufacturers, importers and suppliers of refrigeration systems **must** provide adequate information to clients in relation to the refrigeration system, its potential hazards, and instructions for safe installation and use. Details of the type of information

to provide are available in AS/NZS 5149.2 (Section 5.4) and other applicable standards (eg the AS/NZS 60335 series covering vending machines, refrigerators, freezers, dryers, commercial refrigerating appliances, air conditioning and heat pumps).

c) Manufacturers, importers and suppliers of refrigeration systems for use in workplaces should have relevant experience and training, including completing relevant units of competency or equivalent, for example:

UEENEEJ174A – Apply safety awareness and legal requirements for hydrocarbon refrigerants

5.4 Suppliers of refrigerant gases for use in workplaces

a) Suppliers of refrigerant gases **must** eliminate risks associated with the intended use, storage and disposal of the substance, so far as reasonably practicable. Where risks cannot be eliminated, they **must** be reduced as far as is reasonably practicable. This includes risks to people who use the gas, maintain the refrigeration system, or dispose of the gas, and those in the vicinity of the refrigeration system or gas storage area at a workplace.

b) Suppliers **must** provide adequate information to clients in relation to the refrigerant gas, covering potential hazards and instructions for safe use.

c) Suppliers of hazardous chemicals **must** provide compliant SDS and ensure the supplied product is correctly packed and labelled.

5.5 Refrigeration technicians, engineers and businesses that install or maintain workplace refrigeration systems

a) The installer of a stationary or mobile workplace refrigeration system **must** eliminate risks associated with the system, so far as reasonably practicable. Where risks cannot be eliminated, they **must** be minimised as far as is reasonably practicable. This includes risks to people who install, maintain, dispose of or use the system, and those in the vicinity of the system at a workplace.

b) Businesses that install or maintain refrigeration systems **must** ensure the refrigerant is compatible with the system, and that this compatibility is documented. For example, the specifications for the system should document the compatible refrigerant/s.

c) Where an alternative refrigerant is being considered, the compatibility of this refrigerant with the system **must** be assessed and documented by a competent person prior to the substitution. A person changing a refrigerant to a more flammable refrigerant takes on a role similar to that of a designer of a refrigeration system. For example, for a fixed system a refrigeration engineer **must** assess the suitability of the system for use with the alternative refrigerant, and ensure compliance with relevant standards including AS/NZS 5149, and the AS/NZS 3000 and other electrical standards.

d) Where the system falls under the scope of AS/NZS 3000 (the “Wiring Rules”) generally and specifically Clause 7.7 “Hazardous Areas (Explosive Gas or Combustible Dusts)” and compliance with AS/NZS 3000 is mandatory via the applicable jurisdiction’s electrical regulations, the person in control of the installation **must** classify the hazardous areas in accordance with Clause 7.7 (which invokes the hazardous area standard AN/NZS 60079.10.1). As a guide, most large fixed systems using flammable refrigerants in most jurisdictions **must** comply with these requirements.

e) If plant such as registerable pressure vessels is involved, re-registration by the WHS/OHS regulator may be required.

f) The business operating the workplace or vehicle should also be consulted prior to a refrigerant substitution and should approve the substitution prior to it proceeding. In the absence of written confirmation from a competent person on the suitability of an alternative refrigerant, the alternative refrigerant **must** not be used.

g) Systems for leak detection and emergency management **must** be suited to the refrigerant and proportionate to the risks. Further information is provided in AS/NZS 5149.

h) Technicians **must** be provided with information and training on the hazards and safe use of the specific refrigerants they use or are likely to encounter in their work. The employer of a refrigeration technician has a duty to ensure the technician has been informed and trained so far as practicable to manage risks to health and safety.

i) Refrigeration technicians **must** be competent to manage any foreseeable hazard (including a flammability hazard) during installation or maintenance work. They should have relevant experience and training, and where flammable refrigerants are or may be used, this should include relevant units of competency or equivalent, for example:

- UEENEEJ174A – Apply safety awareness and legal requirements for hydrocarbon refrigerants
- UEENEEJ175A – Service and repair self-contained hydrocarbon air conditioning and refrigeration systems
- UEENEEJ176A – Install and commission hydrocarbon refrigeration systems, components and associated equipment
- UEENEEJ177A – Design hydrocarbon refrigerated systems (where applicable).

Installers of complex refrigeration systems may hold relevant tertiary qualifications.

There is a voluntary national accreditation scheme available to assist refrigeration technicians to upskill in relation to key refrigerants not covered by a national licence, including hydrocarbons and HFO 1234yf (refer to the Australian Refrigeration Council item in Section 6 for more information).

Guidance in relation to vehicle air-conditioning is available in the Department of the Environment, Water, Heritage and the Arts (DEWHA) Code of Practice Control of

refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air-conditioners. The current edition does not cover flammable refrigerants. [**Note:** Any person who handles refrigerant gases containing scheduled ozone depleting substances or synthetic greenhouse gases, or carries out work on refrigeration and air conditioning equipment containing these gases, **must** hold a national Refrigerant Handling Licence under the Ozone Protection and Synthetic Greenhouse Gas management Regulations 1995].

j) Businesses employing refrigeration technicians should develop safe work procedures for working with flammable refrigerants. For example, safe work procedures should include matters such as:

i. Confirming the type of refrigerant present.

ii. Do not top up a refrigeration system without first checking for and fixing any leaks.

iii. Only use electrical equipment that is rated for hazardous area use (eg flame-proof or intrinsically safe) near sources of flammable refrigerant (where there may be a leak or release). The hazardous area classification document (see also 5.5 d) developed in accordance with AS 60079.14 provides specific requirements, for example on the use of electrical equipment suitable for use in the hazardous area.

iv. Whenever a flammable refrigerant is placed in a vehicle air-conditioning system, affix a label in a prominent place in the engine bay to make it clear what refrigerant is used, and how much is used. It should incorporate a flammable gas (Division 2.1) class label or GHS pictogram. Refer also to the DEWHA Code of Practice *Control of refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air-conditioners*.

v. Information **must** be provided whenever a flammable refrigerant is used in a stationary system, including appropriate labelling and/or signage. Placards may be required depending on quantities. The system owner **must** be provided with the SDS for the substance and provision should be made for leak detection and emergency management on a risk basis.

vi. For jurisdictions using WHS legislation, it should be noted that Regulation 51 of the model WHS regulations requires a person conducting a business or undertaking at a workplace to manage risks to health and safety from a hazardous atmosphere at the workplace, where a hazardous atmosphere includes atmospheres with flammable gases at more than 5% lower explosive limit (LEL). Management of such atmospheres and associated risk control measures may be achieved by following recognised industry standards, such as AS/NZS 5149 and AS/NZS 60079.10 within their scope of application.

k) Businesses installing or maintaining refrigeration systems should consider the purchase of portable gas detection and identification systems. **Note:** these systems rely on regular maintenance and calibration and operator training and results may be

affected by environmental factors. Alternatively, portable gas detection and identification equipment may be hired, or safe work methods that minimise risks from all potential refrigerant hazards so far as is reasonably practicable may be developed and implemented.

l) Certification, inspection and maintenance records should be available for apparatus used in hazardous areas. These records should include the suitability of the equipment for hazardous areas, details of all inspection/maintenance and the details of the competent person who conducted the inspection/maintenance.

m) In Queensland, a licence is required for handling hydrocarbon refrigerant gases. Contact your regulator for more information.

5.6 People conducting a business or undertaking, employers and people with management or control of workplaces where flammable refrigerant gases are used in refrigeration or air-conditioning systems

a) The person conducting a business or undertaking (PCBU)⁴ involved in the storage or handling of hazardous chemicals **must** eliminate risks associated with this storage or handling so far as reasonably practicable.

Where risks cannot be eliminated, they **must** be minimised as far as is reasonably practicable. This includes risks to people who install, maintain, dispose of or use the system, and those in the vicinity of the system at a workplace. Minimising risks as far as is reasonably practicable means that more controls will be required for larger or higher risk refrigeration systems (eg commercial cool room) compared with small, low risk refrigeration systems (eg domestic type refrigerator).

b) PCBUs **must** ensure that only competent workers work on air-conditioners and other refrigeration systems, particularly those containing flammable refrigerants. Examples of suitable units of competency include:

- UEENEEJ174A – Apply safety awareness and legal requirements for hydrocarbon refrigerants
- UEENEEJ175A – Service and repair self-contained hydrocarbon air conditioning and refrigeration systems
- UEENEEJ176A – Install and commission hydrocarbon refrigeration systems, components and associated equipment
- UEENEEJ177A – Design hydrocarbon refrigerated systems.

[Note: Any person who handles prescribed refrigerant gases or carries out work on refrigeration and air conditioning equipment which may contain prescribed gases **must** hold a national Refrigerant Handling Licence under the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995.]

Tertiary qualifications may be appropriate for persons conducting complex work with air conditioning and refrigeration systems.

c) Workers **must** be provided with information and training on the hazards and safe use of the specific refrigerants to which they could be exposed.

d) Gas detection equipment should be installed to manage the risk of leaks from larger systems.

e) Before using flammable refrigerants as a substitute to re-gas a refrigeration system designed for less flammable refrigerants, the PCBU **must** obtain written advice from a competent person (preferably the system's designer, manufacturer or supplier) on the suitability of the specific refrigerant for the system and the safety controls or system modifications required.

f) The PCBU should have systems in place to ensure that if a system needs additional refrigerant, the same type as is in the system should be used, to avoid creating a refrigerant mixture with unknown hazards.

g) The PCBU should implement a preventative maintenance program for the refrigeration system in accordance with the manufacturer's instructions or to an equivalent standard, and should ensure maintenance and inspection records are kept.

h) The PCBU **must** use information from the designer of the refrigeration system to identify hazardous areas, and ensure safe systems of work (eg hot work permits) are in place for hazardous areas.

4 Including an employer or a person with management or control of a workplace

i) If using a flammable refrigerant in a mobile system, the system should be labelled in a prominent place such as the engine bay to make it clear what refrigerant is used, and how much is used (charge size). The label should incorporate a flammable gas (Division 2.1) class label or GHS pictogram.

j) Adequate information **must** be provided whenever a flammable refrigerant is used in a stationary system, including appropriate labelling and signage. Placarding may be required depending upon quantities. The PCBU **must** obtain the SDS for the refrigerant, include it in the hazardous chemicals register and make it available to workers who may be exposed to the substance; and provision **must** be made for emergency management.

k) The PCBU may require placards and manifests and in some jurisdictions may need to notify the regulator of the use of the refrigerant, depending on the hazard classification and quantity of the refrigerant.

l) The PCBU should check conditions of equipment warranties and insurance policies prior to using alternative refrigerants, including whether the use of an alternative refrigerant should be disclosed to the insurer.

5.7 People conducting a business or undertaking (including employers) for the recovery, reclamation or disposal of refrigerant gases

a) PCBUs involved in the recovery, reclamation or disposal of hazardous chemicals **must** eliminate risks associated with this work so far as reasonably practicable. Where risks cannot be eliminated, they must be minimised as far as is reasonably practicable. This includes risks to people who conduct the work or others in the vicinity of the work.

b) PCBUs **must** ensure that only competent workers handle flammable refrigerants. Depending on the nature of the work and the specific refrigerants, examples of suitable units of competency include:

- UEENEEJ174A – Apply safety awareness and legal requirements for hydrocarbon refrigerants
- UEENEEJ175A – Service and repair self-contained hydrocarbon air conditioning and refrigeration systems

[Note: Any person who handles prescribed refrigerant gases or carries out work on refrigeration and air conditioning equipment which may contain these gases **must** hold a national Refrigerant Handling Licence under the Ozone protection and Synthetic Greenhouse Gas Management Regulations 1995.]

c) Workers undertaking recovery, reclamation or disposal activities **must** be provided with information and training on the hazards and safe handling of the specific refrigerants they handle.

d) Businesses reclaiming or disposing of refrigerants

should use appropriate gas detection and identification systems. **Note:** these systems rely on regular maintenance and calibration and on operator training and results may be affected by environmental factors.

e) PCBUs involved in the recovery, reclamation or disposal of refrigerant gases should ensure there is a procedure in place to identify the refrigerant, and a safe disposal procedure appropriate to each type of refrigerant.

f) It is an offence to discharge ozone depleting substances and synthetic greenhouse gases to the atmosphere whether in a mixture with other gases or not.

g) It is good practice to recover all synthetic refrigerants, including those for which recovery is not mandatory, for example R1234yf.

h) PCBUs should have recovery units and cylinders suitably rated and labelled for refrigerants likely to be encountered.

i) PCBUs involved in recovery, reclamation or disposal of refrigerant gases should refer to relevant standards and guides for information on requirements under other legislation.

5.8 Storage of flammable refrigerant gases

Flammable gases should be stored in accordance with relevant standards, including AS/NZS 4332 Storage of gases in cylinders and for LPG, AS/NZS 1596 The storage and handling of LP gas.

5.9 People transporting flammable refrigerant gases

This position paper does not address transport of refrigerant gases, which is covered by jurisdictional Dangerous Goods (Transport) legislation in most states and territories. In most jurisdictions, the requirements of the Australian Dangerous Goods (ADG) Code apply to the transport of flammable refrigerant gases.

5.10 Disposal of Refrigerants

Businesses have an obligation to send scheduled refrigerants for disposal to the holder of a refrigeration trading authorisation or to the operator of a refrigerant destruction facility. This includes mixtures of flammable and scheduled gases. Refer to the Ozone protection and Synthetic Greenhouse Gas management Regulations 1995 for further information.

6. Further information

- Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH). (2013). *Flammable Refrigerants Safety Guide* (Scope: applies to stationary applications)
- Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH). (2007). *Refrigerant handling code of practice 2007: Part 2 – Systems other than self-contained low charge systems*
- Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH). (2013) *Discussion paper – Transition to low-emissions HVAC&R: Issues and solutions*
- Australian Institute of Refrigeration, Air Conditioning and Heating training courses: www.airah.org.au
- Australian Refrigeration Council (ARC) *Accreditation Scheme for Technicians*
- COAG National Licencing Steering Committee. (2013). *Decision Regulatory Impact Statement*
- Department of Education and Training (2016). Courses and training providers. <http://training.gov.au>
- Department of the Environment, Water, Heritage and the Arts. (2008). *Control of refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air-conditioners.*

- Department of Mines, Industry Regulation and Safety (WA) (2018). Safety Bulletin: Safety considerations when switching to flammable refrigerants
- Department of Mines and Petroleum (WA). (2012). Safety Bulletin: Safe use of flammable refrigerants
- Department of Natural Resources and Mines (Qld). (2013) Illegal hydrocarbon refrigerant usage
- Department of Natural Resources and Mines (Qld). (2015). Hydrocarbon Refrigerants
- Department of Sustainability, Environment, Water, Population and Communities. (2012). Safety Considerations When Using Flammable Refrigerants
- Department of the Environment. (2015). Analysis of work health and safety data for the use of synthetic greenhouse gases and substitutes in the refrigeration and air-conditioning industry
- New Zealand Fire Service. (2008). Inquiry into the explosion and fire at Icepack Coolstores, Tamahere, on 5 April 2008
- Safe Work Australia. (2018). Guidance on the Classification of Hazardous Chemicals under the Work Health and Safety Regulations.
- Safe Work Australia. (2015). Model Code of Practice for Labelling of Workplace Hazardous Chemicals
- Safe Work Australia. (2016). Model Code of Practice for Preparation of Safety Data Sheets for Hazardous Chemicals
- SafeWork NSW. (2016). Servicing of Refrigeration Systems
- SAI Global. AS/NZS 5149.1:2016 Refrigerating systems and heat pumps – Safety and environmental requirements. Definitions, classification and selection criteria. Available from <https://www.saiglobal.com/online>
- SAI Global. AS/NZS 5149.2:2016 Refrigerating systems and heat pumps – Safety and environmental requirements. Design, construction, testing, marking and documentation. Available from <https://www.saiglobal.com/online>
- SAI Global. AS/NZS 5149.3:2016 Refrigerating systems and heat pumps – Safety and environmental requirements. Installation site. Available from <https://www.saiglobal.com/online>
- SAI Global. AS/NZS 5149.4:2016 Refrigerating systems and heat pumps – Safety and environmental requirements. Operation, maintenance, repair and recovery. Available from <https://www.saiglobal.com/online>
- SAI Global. AS/NZS 1596:2014 The storage and handling of LP Gas. Available from <https://www.saiglobal.com/online>
- SAI Global. AS/NZS 60079.10.1:2009 Explosive atmospheres - Classification of areas - Explosive gas atmospheres
- SAI Global. AS/NZS 60079.14:2009 Explosive atmospheres – Electrical installations design, selection and erection. Available from <https://www.saiglobal.com/online>
- SAI Global. AS/NZS 60335 series – Household and similar electrical appliances. Available from <https://www.saiglobal.com/online>

- SAI Global. AS/NZS 4332:2004 *Storage of gases in cylinders*. Available from <https://www.saiglobal.com/online>
- SAI Global. AS/NZS ISO 817:2016 *Refrigerants – Designation and safety classification*. Available from <https://www.saiglobal.com/online>
- UNECE (2009). [The Globally harmonized system of classification and labelling of chemicals](#) (GHS)

Jurisdictional WHS/OHS regulators

- Australian Capital Territory: www.worksafe.act.gov.au
- Comcare: www.comcare.gov.au
- Northern Territory: www.worksafe.nt.gov.au
- New South Wales: www.safework.nsw.gov.au
- Queensland: www.worksafe.qld.gov.au ; www.dnrm.qld.gov.au
- South Australia: www.safework.sa.gov.au
- Tasmania: www.worksafe.tas.gov.au
- Victoria: www.worksafe.vic.gov.au
- Western Australia: www.dmirs.wa.gov.au

Footnotes

¹ The terms “refrigerant” and “refrigeration system” are used in a broad sense in this document and include air-conditioning applications.

² The term “competent person” is not used in Victorian OHS legislation; however the issue of competency, including relevant experience and training, is still pertinent.

³ GHS classification became mandatory in most Australian jurisdictions from 01 January 2017 and is accepted in all Australian jurisdictions – contact your regulator for GHS implementation details.

⁴ Including an employer or a person with management or control of a workplace.

<https://www.safework.nsw.gov.au/resource-library/hazardous-chemicals/flammable-refrigerant-gases-position-paper>

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