



FLAMMABLE REFRIGERANTS – BE INFORMED, BE AWARE

Operating and maintaining flammable refrigerant-based systems

This fact sheet explores the rules for the safe operation and maintenance of A2L, A2 and A3 flammable refrigerant-based stationary air conditioning and refrigeration systems. Significant consequences may arise if you, as a service provider, fail to follow appropriate maintenance or decommissioning practices. The content is based on the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) *Flammable Refrigerants Safety Guide* – available from www.airah.org.au.

OPERATION

APPLICABLE STANDARDS

- AS/NZS 5149.4:2016 *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 4: Operation, maintenance and recovery*
- AS/NZS 60079 *Explosive atmospheres series*

MANAGING OCCUPANT RISKS

The charge limits for flammable refrigerants are restricted according to the level of risk they pose to those using the equipment or occupying the surrounding area. Risks increase when occupants:

- are unskilled or untrained in the safety aspects of the equipment.
- are sleeping or are incapacitated.
- might introduce an ignition source (such as a room heater) into an area that potentially contains leaked flammable refrigerant.

Flammable refrigerants may not have odourant added or the odourant may fade over time. If there is a leak, the flammable refrigerant may not be detected (smelt) by



people in the space. Pooled leaked refrigerant presents a flammability risk, and maximum refrigerant charge limits are applied to reduce the risks according to the application.

ASSURING COMPLIANCE

Safety risks are minimised by applying the correct design, installation and maintenance practices. Owners and operators can use the audit tool in section 13 of the *Flammable Refrigerants Safety Guide* to assess the compliance of any flammable refrigerant-based installation or service provider against the requirements outlined in the guide.

SOURCES OF IGNITION

There must be no potential sources of ignition in or near the equipment that could ignite any refrigerant that leaks from the system. Flammable materials should not be stored near or around a system containing flammable refrigerants.

VENTILATION

Any ventilation provided for the system must remain operable for the life of the system. Keep fans on and vents open as designed and intended.

FIRE SERVICE NOTIFICATION

Best practice sees the local fire service notified of any system that holds 5 kg or more of a flammable refrigerant. A notification form can be sent to the appropriate fire service on installation – see Appendix C of the *Flammable Refrigerants Safety Guide*. Notification should also be provided when the system is changed, decommissioned or removed.

GAS DETECTION

It is the workplace's obligation to ensure any gas detection equipment is working. Any level of flammable gas detection (including odour) should be taken as an indicator of dangerous conditions or situations that could quickly escalate to dangerous. Any alarm should be taken seriously and responded to.

EMERGENCY PLANNING

Alarm response – including the system shut-down procedure and occupant evacuation procedure – should be explicitly detailed in the site's emergency plan, the written document detailing how a workplace and its occupants deal with or manage an emergency – see section 7 of the *Flammable Refrigerants Safety Guide*.



AFTER A FIRE

In the event of a fire, burnt fluorinated A2L and A2 flammable refrigerants can release highly toxic gases, including hydrofluoric acid and carbonyl halides, resulting in high local concentrations during and immediately after a fire. Avoid any area where decomposition products may be present, and consult safety data sheets (SDSs), which should be available at a site where flammable refrigerants are used.

MAINTENANCE IMPERATIVE

For compliance with AS/NZS 5149.4:2016 to be claimed, the people operating the system must be competent and instructed in the correct system operation procedures. Each system must have an operation logbook and be the subject of preventive maintenance procedures specified in the system operating instructions.

TRAINING

Someone who oversees the day-to-day operations of a business should be aware of the safety risks involved with the operation of any equipment containing a flammable refrigerant installed on their premises. Service providers maintaining systems must also be trained in their correct handling/use. Training is available from Refrigerant License New Zealand. Responsible wholesalers restrict the sales of flammable refrigerants to only those persons who have evidence of Refrigerant License New Zealand certification.

MAINTENANCE

Service, maintenance and repair is covered in AS/NZS 5149.4:2016 section 5, with section 6 covering recovery, reuse and disposal. If servicing a refrigeration system at a commercial premises, technicians must prepare, maintain and implement an emergency plan dealing with the work they are undertaking.

MAINTENANCE RISK

The risk of fire or explosions is higher when systems are being worked on, compared to when they are operating normally. The potential for refrigerant release and for sources of ignition to be present is typically 100–1,000 times greater during service and repair activities than at any other time.

PRE-SERVICE SAFETY

Prior to any service, maintenance or repair of the system, the following assessment must be completed:

- Positively identify the refrigerant being worked with or treat it as an A3 refrigerant.
- Instruct all staff and others working in the local area about the nature of the work being carried out.
- Obtain a permit for hot work (if required).
- If working within restrictive spaces cannot be avoided, employ the correct safe working practices.
- Confirm that no ignition sources are present and no flammable materials are stored in the work area.
- Ensure that suitable fire extinguishing equipment (CO₂ or dry-powder type) is available.
- Section off the area around the workspace, and erect appropriate signage.
- Confirm that the working ventilation would safely disperse any released refrigerant to the outside.
- Ensure suitable flammable refrigerant gas detectors are present, operating and able to warn of a leak.
- Confirm all appropriate and necessary tools and personal protective equipment (PPE) are available.



TEMPORARY FLAMMABLE ZONES

Temporary flammable zones are areas where at least some emission of refrigerant is anticipated to occur during normal working procedures. These areas would be classified as zone 2 hazardous areas under AS/NZS 60079.10.1:2009. For these zones, procedural controls including isolation of all electrical equipment may be accepted in accordance with AS/NZS 60079.14:2017 rather than requiring all electrical equipment in the zone to be installed as suitable for a hazardous area. The distance from the potential leak point that should be considered as a temporary flammable zone is a minimum of 2 m in all directions – refer to AS/NZS 60079.10.1:2009. The actual dimensions of the temporary flammable zone should be determined, taking account of the charge in the system and whether it is located indoors or in a well ventilated area (outdoors). For a domestic fridge, it would be a minimum of 2 m – for larger systems, greater distances could be required.

SAFE SYSTEM ACCESS

Never break into a system containing refrigerant under pressure by cutting or breaking pipework. A number of aspects must be considered when gaining access to a system:

- It is preferable to remove the entire refrigerant charge in case of unexpected failures.
- When the refrigerant has been removed, flush the system with oxygen-free dry nitrogen (OFDN). Flushing with OFDN can eliminate the risk of flash fire by diluting residual refrigerant below the lower flammability limit

[LFL]. Depending on the charge size and purging method, this may need to be repeated several times.

- If brazing operations are to take place, OFDN must be purged through the system during the brazing process.
- Never use compressed air or oxygen for flushing, pressure testing or filling, due to the explosion possibility.

It is preferable to use cold-connection technologies instead of brazing when performing system repairs where there is a likelihood that residual flammable refrigerant is present.

A3 AND NON-SGG FLAMMABLE REFRIGERANT RECOVERY SAFETY

System charges greater than 150 g should be recovered. The machine and cylinder used for refrigerant recovery and storage must be suitable for flammable refrigerants.

CERTIFICATION

Since 1 January 2015, responsible wholesalers restrict the sales of refrigerant to only those persons who have evidence of certification (from Refrigerant License New Zealand) to safely handle that refrigerant. www.rlnz.org.nz

These fact sheets have been produced by the Climate Control Companies Association New Zealand [CCCANZ] supported by BRANZ and in association with the Australian Institute of Refrigeration, Air Conditioning and Heating [AIRAH]. They provide an overview of the key elements of safe operation for flammable refrigerant-based systems and an introduction to the pathways, plans and processes towards a new cooling environment. The fact sheets cover:

1. Introduction and overview
2. System design considerations
3. Installing systems with flammable refrigerants
4. Operating and maintaining flammable refrigerant-based systems [this fact sheet]

Designers/installers/service providers should access the AS/NZS 5149 *Refrigerating systems and heat pumps – Safety and environmental requirements* series in order to ascertain the precise requirements for an individual installation.