

This fact sheet explores the rules for the safe operation and maintenance of A2 and A3 flammable-refrigerant-based stationary air conditioning and refrigeration systems. The content is based on the *Flammable Refrigerants Safety Guide* (the guide) as published in July 2013. Separate fact sheets cover system design and system installation.

Operating flammable-refrigerant-based systems

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 on the safety aspects of the equipment
- Are sleeping or are incapacitated
- Might introduce an ignition source (e.g. a room heater) into an area that potentially contains leaked flammable refrigerant.

AS/NZS 1677.1 requires all A3 refrigerants to be odourised. But, not all flammable refrigerants may 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. 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 should use the audit tool provided in Section 13 of the 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, which 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/intended.

Fire service notification

The local fire service should be notified of any system that holds 5kg or more of a flammable refrigerant. A notification form, see Appendix C of the guide, should be sent to the appropriate fire service on installation.

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 systems shut-down procedure and the 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 guide.

After a fire

In the event of a fire, burnt fluorinated 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, consult Safety Data Sheets (SDS), which should be available at a site where flammable refrigerants are used.

Maintenance imperative

Regular service and maintenance is essential to the safe and reliable operation of a flammable-refrigerant-based refrigeration or air conditioning system. All detection systems require regular servicing and operator training to ensure correct operation into the future.

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 and use. See Section 2 of the guide.

An ARCTick licence is required for anyone to work with HCFC or HFC refrigerants.

Significant consequences may arise if you, as an owner operator, fail to properly address safety considerations. Further information can be found on all of these topics in the *Flammable Refrigerants Safety Guide*, available for free download from www.airah.org.au

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Maintaining flammable-refrigerant-based systems

Maintenance overview

Service and maintenance is covered in AS/NZS 1677.2 Section 5 on Testing, Inspection, Documentation and Marking, and Section 6 on Operation and Maintenance. If servicing a refrigeration system at 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 to 1000 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:

- 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

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. For these zones, procedural controls including isolation of all electrical equipment may be accepted in accordance with AS/NZS 60079.14, 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 2m in all directions, refer to AS/NZS 60079.10.1.

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 (e.g. outdoors). For a domestic fridge it would be a minimum of 2m, 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 explosive limit (LEL). 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.

Refrigerant recovery safety

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

Licensing

An ARCTick licence is required for anyone to work with HCFC or HFC refrigerants. Specific licensing requirements for A3 refrigerants apply in Queensland. See Section 2 of the guide.

Significant consequences may arise if you, as a service provider, fail to properly address safety considerations. Further information can be found on all of these topics in the *Flammable Refrigerants Safety Guide*, available for free download from www.airah.org.au