

# FLAMMABLES GET REAL

A move away from costly, high-GWP refrigerants, and growth in the popularity of naturals has increased the industry's exposure to flammable refrigerants. As Sean McGowan reports, it is timely then, that AIRAH has developed the Flammable Refrigerants Safety Guide.

Designed for all levels of and participants within the refrigeration and air conditioning industry, AIRAH's *Flammable Refrigerants Safety Guide* addresses the obvious hazards associated with working with flammable refrigerants. The *Flammable Refrigerants Safety Guide* is available free from [www.airah.org.au](http://www.airah.org.au)

Thought to be the first of its kind in Australia, the guide brings a myriad of safety and compliance requirements and standards together in one easily accessible document.

This is expected to be of great benefit to many in the industry – particularly smaller operators and technicians who have previously found it difficult to identify compliance requirements for new and existing systems.

"There was no one source of authority in the Australian market that industry could turn to," says AIRAH CEO, Phil Wilkinson, M.AIRAH. "The guide pulls all this together into one document so practitioners can be confident in what they can and cannot do."

The guide was created in response to a spike in interest in low-global-warming potential (GWP) refrigerants – many of which are flammable – following the introduction of an equivalent carbon price on synthetic greenhouse gases (SGG) with high (GWP) last year.


Up until then, the industry was predominantly using non-flammable refrigerants for residential and commercial applications.

The guide's development also follows feedback from industry that a safety guide was the next step after the 2011 release of AIRAH's Ammonia Refrigeration Code of Practice.


According to Vince Aherne, M.AIRAH, who authored the *Flammable Refrigerants Safety Guide* on behalf of AIRAH, awareness needed to be raised in industry. Technical service providers, as well as owners, operators and regulators, need to be aware of the risks associated with flammable refrigerants and how these risks should be managed.

SAFETY GUIDE FLAMMABLE REFRIGERANTS
FLAMMABLE REFRIGERANTS SAFETY GUIDE


**Enclosed vehicles include:**




Utility with an enclosed compartment




Utility with a cover over the tray



When the covers are down, the vehicle is deemed an enclosed vehicle




Utility with a canopy



Enclosed trailer

This self-assessment document is for the transport of gas cylinders up to a quantity of 250L of Division 2.1 Flammable gases in enclosed vehicles such as vans and wagons, and should be read in conjunction with the Section 12 of this guide.  
For quantities greater than 250L of Division 2.1 Flammable gases, the full requirements of the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG 7) apply and reference must be made to the ADG 7 for requirements.

**Traffic light assessment system for the transport of Class 2 dangerous goods in a "tool of trade" vehicle**

				<b>MANDATORY ACTION ITEM</b>
				CONSIDER
				SATISFACTORY

Transport of gas cylinders in a vehicle that is an enclosed vehicle			
Transport of gas cylinders in an enclosed vehicle	Yes	No	Action required
Is the vehicle that is to be used to transport the gas cylinder(s) an enclosed vehicle? That is to say the luggage area of the vehicle is not open to the elements (open air) and includes such vehicles as: • A van (with or without windows) • A panel van • A station wagon • A utility with a canopy over the tray or luggage/storage area • A utility with a tonneau cover over the tray • Other type of vehicle whereby the luggage/storage compartment is part of the inside of the vehicle.			If the answer to this question is YES, consider a vehicle with an open luggage/storage space such as a tray truck.  For vehicles with a canopy over the tray of the vehicle, install a vent that aids the circulation of air which will negate the build-up of any flammable gases in the storage area of the vehicle.
Is the water capacity of all gas cylinders transported, less than 250L?			If the answer to this question is NO, then the (relevant) conditions for a "Tool of Trade" vehicle do not apply.
Are the gas cylinders stored in a cabinet(s)?			
Is the cabinet sealed whereby any gas escape cannot enter the inside of the enclosed vehicle?			As an example, the seal around the door of the cabinet should be similar to a door on a household refrigerator. The cold air in the refrigerator is held in by the door seal.
Is there a pipe or tube in the cabinet, which is vented to the outside?			The pipe or tube allows any leaking gases to be discharged to outside atmosphere.
Are there appropriate markings on the door of the cabinet to indicate its contents?			

"The guide provides an effective roadmap to the use of flammable refrigerants," Aherne says.

"There are a range of regulations that come into play when designing with flammable refrigerants as well as when owning, operating and servicing such a system. These are laid out in the safety guide so users can better understand and fulfil their legal obligations."

This is particularly salient in light of major hydrocarbon accidents at Willow Grove, South Australia in 1999, and more recently in Tamahere, New Zealand, where a firefighter was killed and seven others injured, two critically.

Both systems would not have complied with the Flammable Refrigerants Safety Guide.

## RETROFIT NO-NO

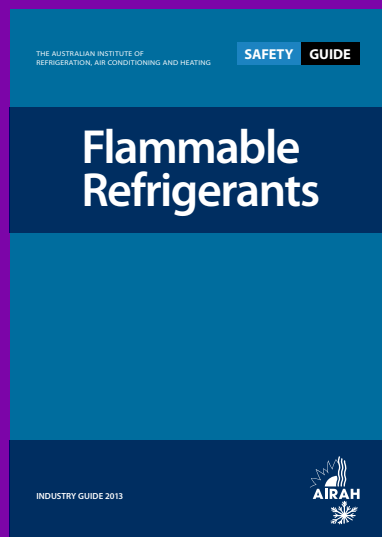
As chair of the ME006 Standards Committee for Refrigeration Safety and Environment, Heatcraft's Kevin Lee, M.AIRAH, was a logical choice to chair the development of the *Flammable Refrigerants Safety Guide*.

He says the two hydrocarbon accidents referred to in the guide, while vastly different in size, shared a number of the same issues that had simply not been addressed.

"Both sites were retrofits of old systems," Lee says. "And in the case of Café Grove (Willow Grove) the system was 10 years old."

Additionally, both systems had a history of leaks, and their charge limits had been exceeded. Sources of ignition also had not been addressed. In both cases their electrical systems were unsuitable.

# TAKING THE LONG ROAD



Like any of the other technical guides AIRAH has developed over the years, the development of the Flammable Refrigerants Safety Guide has only been made possible by the work of a dedicated team.

“The development of any guide is a long process involving extensive research and consultation, and consensus building,” says AIRAH CEO Phil Wilkinson, M.AIRAH

He says a couple of factors aided the process in the development of this guide – namely, Kevin Lee’s dedication to driving the project as chair of the task group; and the breadth of the 25 task group members who, all from relevant industry and regulatory backgrounds, brought their knowledge and experience to the project.

He also cites the work of AIRAH staff Heather White and Vince Aherne, M.AIRAH, for bringing the project together, and the many individuals who reviewed and commented on the document.

“AIRAH is in a unique position in our industry to develop these types of guides – and we have been doing it for many years,” says Wilkinson.

“The keys are our impartiality; open, inclusive transparent processes; and our ability to pull together the relevant expertise to ensure the best outcomes for industry and the community.”

Findings from both incidents revealed inadequate levels of training and showed that applicable standards and regulations had not been adhered to, including poor signage. Risk assessments had also not been carried out.

“These two sites were symptomatic of the ongoing promotion of hydrocarbons as ‘drop-in replacements’ suitable for retrofit,” says Lee.

He says this uncontrolled use of flammables should be of great concern for the Australian industry, and is in stark contrast to what is occurring in Europe.

“Flammable refrigerants such as R600-Butane and R290-Propane are now in widespread use and well controlled in Europe,” Lee says. “This usage is by original equipment manufacturers (OEMs) who design and build systems to meet the extra requirements necessary to be safe.”

He says retrofits or conversions are seldom undertaken in Europe.

“It is unfortunate that in Australia we do not have many OEMs left. The only local OEM that I am aware of using flammable refrigerants is Electrolux. They have converted all local manufacture of domestic refrigerators to R600.”

Lee says this lack of OEM-designed systems has resulted in the “drop-in” or retrofit market being the immediate market for hydrocarbons.

“Coupled with an Australian tradies’ attitude of, ‘She’ll be right mate’, this creates a very dangerous situation,” Lee warns.

“Propane can be put into an old R22 air conditioner and appear to give it a second life, the tradesman can appear as the hero because he has saved the homeowner a packet of money, and the air conditioner is working better than before.

“But what happens if the propane leaks into an area with an ignition source? Who is the hero then?”

One of the big messages out of the guide is that “dropping in” a flammable refrigerant to an existing

system designed for non-flammable refrigerant is unacceptable. The guide underlines this message by asserting that a full system conversion is required to use a flammable refrigerant in the place of a non-flammable alternative.

Furthermore, any such conversion must still comply with the applicable products standards called up by the State Electrical Regulations, and that whoever is converting the system take on the full responsibility of compliance.

“This has largely been glossed over in the industry,” Lee says.

This duty of care extends beyond compliance to include those matters addressed under state or territory Workplace Health and Safety Acts.

As the Flammable Refrigerants Safety Guide details, such legislation places general duties of care on those who are conducting or working in a business to minimise the risks to the health and safety of others. It applies to employers, employees, the self-employed, occupiers, designers, manufacturers, importers and suppliers.

Following some recent harmonisation around workplace health and safety legislation, where most states and territories (excluding Victoria and Western Australia) have adopted a national model, these requirements are now generally consistent across state borders.

Other regulations covered by the guide – as they apply to working with flammable refrigerants – include electrical safety regulations, system and product standards, codes of practice, ARCTick licensing, and regulations for hydrocarbon refrigerants that have been laid out in Queensland.

“Apart from those who specialise in ammonia systems, our general industry is not used to working with substances that have inherent risks,” says Lee. “The use of flammable refrigerants will mean that we must get used to conducting risk assessments as a regular part of our work.”

The guide devotes an entire section (Section 5) to risk assessment, controls and detection systems. Section 7 is devoted to emergency planning.

## SYSTEM DESIGN, CONVERSION AND MAINTENANCE

The *Flammable Refrigerants Safety Guide* goes into significant detail about both system design and conversion, including the various standards that come into play when designing and installing a system based on flammable refrigerants.

Topics covered include:

- Electrical appliance charge limitations
- Charge limits based on flammability classification
- Hazardous areas – explosive gas atmosphere
- Allowable charge of a flammable refrigerant
- Maximum charge limits based on occupancy classification
- Sources of ignition
- System jointing and construction standards
- Pressure equipment design registration and plan registration
- Protection against excess pressure
- Fire services notification.

It also outlines the necessary assessments for converting an existing system, designed for non-flammable refrigerant, to a flammable refrigerant. This includes the electrical standards, pressure standards, design standards and workplace health and safety regulations with which you need to comply.

Section 6 also specifies a sound approach to maintenance of systems using flammable refrigerants, including maintenance requirements as required under AS/NZS 1677.2.

Topics include pre-service safety, temporary flammable zones, refrigerant venting and recovery and topping up of systems.

## STORAGE AND HANDLING

Another important area covered in the *Flammable Refrigerants Safety Guide* is that of flammable refrigerant storage and handling.

This section was specifically written with small and medium enterprises (SMEs) in mind, and follows a number of incidents where flammable gas cylinders have exploded while being transported or stored on service vehicles.

According to Aherne, the guide is primarily aimed at SMEs because larger organisations are more likely to have their own resources to develop policies and technical practices that deal with these issues.

With this in mind, the guide also provides a series of checklists to simplify the rules and uses of flammable refrigerants for SMEs, including:

- A compliance checklist for the system owner or operator
- Several checklists for the system designer or installer
- Two assessment tools for transport of flammable gas cylinders in service vehicles.

"The guide also makes reference to a range of external resources that may be useful for the practitioner," says Aherne.

## TRAINING

Like any area that has seen rapid change in a short period of time, training tends to trail current practices. The industry is particularly concerned about training for flammable refrigerants use.

The *Flammable Refrigerants Safety Guide* goes some way to addressing these concerns by identifying the key competency areas of each level of staff working with flammable refrigerants.

The guide also defines the training requirements to be a "competent person" as follows:

**"Anyone working on refrigeration and air conditioning systems containing flammable refrigerant should be trained to include the following:**

- **Knowledge of legislation, regulation and standards relating to flammable refrigerants**
- **Detailed knowledge of and skill in handling flammable refrigerants, personal safety equipment, refrigerant leakage prevention, handling of cylinders, charging, leak detection, recovery and disposal**
- **Knowledge of the properties and hazards of flammable refrigerant gases."**

According to Lee, the rapid uptake of propane in display cabinets, and the pending use of R32 in mini-split systems, means the industry needs to quickly ramp up the training of service technicians.

Like others in the industry who are calling for training and licensing arrangements to be expanded to

include flammables such as hydrocarbons, Lee says the available course offerings are not yet adequate.

"Training courses for the servicing of small hydrocarbon systems have been developed and are offered by numerous TAFE colleges," he says. "But they currently do not adequately cover the application of R32 in mini-split systems and will need to be revised.

"The available course material also needs to be broadened to cover larger systems on flammable refrigerants."

Lee says that Australia should follow the lead of countries such as Germany, where licensing for refrigeration technicians covers all refrigerants, and requires that technicians receive regular training updates to maintain the licence.

In this respect, he says extending the ARctick licence to cover all refrigerants makes the most sense.

According to AIRAH's Wilkinson, training and awareness are key steps for any new technology or process. He urges industry members to seek a copy of the *Flammable Refrigerants Safety Guide*, available for free download from AIRAH's website.

"We urge those considering using flammable refrigerants to download the *Flammable Refrigerants Safety Guide* and make sure they are fully cognisant with the requirements," he says.

**More information:** To download a free copy of the *Flammable Refrigerants – Safety Guide*, visit [www.airah.org.au](http://www.airah.org.au), click on the "Resources" tab, and select "Technical Resources" from the drop-down menu. ▲