Safety in the HVAC&R Industry
A coalface perspective of market failure

FINDINGS AND RECOMMENDATIONS ON WORKPLACE HEALTH AND SAFETY ISSUES SURVEY
About AIRAH

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) is an industry-led organisation that represents the entire heating, ventilation, air conditioning and refrigeration (HVAC&R) value chain, from the tradesperson on site through to university-educated engineers, researchers and business leaders. This overarching perspective – and reach to more than 25,000 industry participants – positions AIRAH well to develop and promote a safe, sustainable, healthy and comfortable built environment for Australia’s future.

The 21st century imperatives of emissions reduction and energy productivity present our nation with significant change, challenges and opportunities. It is important that all stakeholders from the built environment and refrigeration sector come together to meet these challenges, because all of us have a part to play in achieving low emissions and in ensuring that technical challenges are met and risks are mitigated.

AIRAH is keen to work with all levels of government to improve the environmental performance and safety considerations of existing and new HVAC&R systems. We envisage a collaborative effort to get and keep positive action firmly on the agenda. AIRAH appreciates that it is important for all stakeholders to understand not only the vital role the HVAC&R industry has in the wider economy, but also the role the industry can play in helping Australia achieve its environmental aspirations, and international and national commitments.
Acknowledgements
AIRAH would like to recognise and thank the following organisations for their support in this project.

- Australian Industry Group (AiGroup)
- Master Plumbers and Mechanical Services Association of Australia (MPMSAA)
- Air Conditioning and Refrigeration Equipment Manufacturers Association (AREMA)
- Australian Refrigeration Council (ARC)
- Australian Refrigeration Mechanics Association (ARMA)
- Climate Control News (CCN)
- Refrigeration and Air Conditioning Contractors Association (RACCA)
- Refrigeration and Air Conditioning Trainers Alliance (RACTA)

Disclaimer
Information contained in this report may be copied or reproduced for study, research, information or educational purposes, subject to inclusion of an acknowledgment of the source.

The views and opinions expressed in this report are those of industry participants and do not necessarily reflect those of AIRAH.

While reasonable efforts have been made to ensure that the contents of this publication are factually correct, AIRAH does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this publication.

© AIRAH 2017
AIRAH Report
Safety in the HVAC&R Industry

A report on an independent and anonymous survey of technical service providers carried out to discover and review safety issues within the HVAC&R industries.

Table of Contents

Table of Contents ................................................................. 4
Executive Summary ............................................................. 6
1 Shining a light on HVAC&R safety ........................................ 9
 1.1 The key issues around HVAC&R regulation ....................... 9
 1.2 Background to AIRAH’s compliance focus ....................... 11
 1.3 Commonwealth Health and Safety investigation ............... 11
 1.4 Increasing safety incidents ............................................ 12
 1.5 National Model Work Health and Safety Laws .................. 12
 1.6 Reporting of WHS Issues .............................................. 13
 1.7 PRIME and Safety ...................................................... 13
2 The AIRAH HVAC&R Safety Survey .................................... 13
 2.1 Survey questions ....................................................... 14
 2.2 Who Responded? ....................................................... 14
 2.3 Where Were They Based? ............................................ 15
 2.4 Is There a Safety Problem? ......................................... 15
 2.5 The Headline Safety Issues .......................................... 17
 2.6 The Impacts – on Service Providers and on Others ........... 18
 2.7 Quality and Training – The Safety Issues ....................... 20
    2.7.1 What are the quality issues? .................................. 20
    2.7.2 What are the training and competency issues? ............ 22
    2.7.3 The suggested solutions – Quality and training .......... 22
 2.8 Access – The Safety Issues .......................................... 23
    2.8.1 What are the access issues? .................................. 23
    2.8.2 What is causing these issues? ............................... 25
    2.8.3 The suggested solutions - Access .......................... 25
 2.9 Refrigerants and other Working Fluids – The Safety Issues .. 26
    2.9.1 What are the issues? ........................................... 26
    2.9.2 The suggested solutions – Refrigerants and other working fluids ........................................... 27
 2.10 Electrical – The Safety Issues ....................................... 27
    2.10.1 What are the electrical issues? ............................. 27
    2.10.2 The suggested solutions - Electrical ........................ 28
 2.11 Other Safety Issues .................................................... 28
 2.12 Are the Safety Risks in HVAC&R Changing? ................... 29
 2.13 Observations ............................................................ 29
3 Next steps ............................................................................ 30
 3.1 AIRAH actions .......................................................... 30
 3.2 AIRAH advocacy ........................................................ 30
    3.2.1 National licensing and registration .......................... 30
3.2.2 Low GWP refrigerant safety .......................................................... 31
3.3 Partner to review and develop guides, codes and standards ...................... 31
  3.3.1 Minimum access for NCC ......................................................... 31
  3.3.2 WHS guide for the HVAC&R industry ...................................... 31
  3.3.3 RAC codes of practice ............................................................ 31
3.4 Engage with regulators to raise and promote awareness of issues .............. 32
  3.4.1 Awareness raising with regulators .......................................... 32
  3.4.2 WHS regulators position on flammable refrigerants ....................... 32
3.5 Train and raise awareness with HVAC&R industry .................................. 33
  3.5.1 Safety issues already addressed by AIRAH .............................. 33
  3.5.2 New refrigeration safety standards ............................................ 33
  3.5.3 Training on flammable refrigerants safety .................................. 33
3.6 Research ...................................................................................... 33
  3.6.1 Promote research ................................................................. 33
  3.6.2 Engage and collaborate with PRIME stakeholders on safety issues .... 34
4 An HVAC&R industry Safety Strategy .................................................... 34
  4.1.1 Industry safety strategy .......................................................... 34
  4.1.2 Creating a strategy – next steps ................................................ 34
  4.1.3 Actions to be included in the strategy ........................................ 34
Appendix 1 - Working with AIRAH .......................................................... 36
Appendix 2 - AIRAH achievements and credentials on HVAC&R safety & compliance .......... 37
Executive Summary

This project provides additional evidence and insights for AIRAH to progress its strategic advocacy theme of compliance.

Historically, the HVAC&R industry has not been considered a particularly “unsafe” industry. Although, due to the low visibility of the industry as a standalone entity, many of the safety incidents that do occur tend to be identified as construction, electrical, plumbing-related etc., rather than HVAC&R-related. A recent Commonwealth Workplace Health and Safety (WHS) report into safety within the refrigeration and air conditioning sector concluded that safety incidents were low, were most likely under-reported, and were more likely to increase due to contemporary technology changes.

AIRAH receive many comments and enquiries from its members and other industry stakeholders regarding safety issues within the HVAC&R industry and decided to run a national survey in collaboration with a range of industry associations. Reaching out to technical service providers on the topic of safety in the HVAC&R industry, the survey focussed on the refrigeration and air conditioning (RAC) sectors.

Safety issues were highlighted by industry respondents, but solutions were also suggested. These suggestions are summarised in the report, which concludes with a list of recommendations and a proposed “next step” to help address increasing concerns regarding the safety risks in the HVAC&R sector.

The results of this survey show there is a high level of concern about safety in the HVAC&R industry and AIRAH recommends an industry strategy to create a strong direction to improve safety standards and outcomes in this industry.
Key findings include:

• The four main areas of concern are quality and training, access to plant, working fluid hazards and electrical hazards.

• The increased safety risks and higher ongoing costs associated with poor access to HVAC&R plant and equipment are ‘designed in’ to systems from day one, from before construction even starts.

• There is a market failure at play in many scenarios.
  o Those who would have to pay for the additional capital cost to provide safe access during the construction are different to those who will actually pay for the increased ongoing costs caused by the inadequate access.

  o There is no market incentive for the builder to invest in access solutions that will save the owner or operator money in the longer term, and a cost transfer occurs.

• Increased costs in operation can include higher maintenance costs, higher energy costs and higher replacement costs.

• Technology transition to low-GWP refrigerants that is currently being driven by a national and global agreement to phase-down the production and use of HFC refrigerants is tending to increase the risks associated with working fluids (refrigerants and oils).
This survey and report have been produced to help the HVAC&R industry and WHS regulators understand safety issues in design, installation and service scenarios. The industry can now consider what the next steps should be to address these issues. AIRAH has a strong track record of supporting the industry and working with government to address critical issues and will lead a number of actions:

**Advocacy**

- Advocate for a Nationalised license scheme or harmonised state-based system for refrigeration and air conditioning trades and national registration for refrigeration and air conditioning engineers.
- Advise key government and industry stakeholders about the safety considerations of low global warming potential (GWP) refrigerants.

**Review and develop guides, codes and standards**

- Work with the Australian Building Codes board (ABCB) in the development of industry agreed guidelines for minimum access requirements.
- Develop and publish an AIRAH guide to the WHS Act and Regulations for the HVAC&R industry.
- Engage with the Department of the Environment and Energy and Energy (DoEE) and Safe Work Australia (SWA) to progress developing codes of practice and safety guidance for the refrigeration and air conditioning industry.

**Engage with regulators to raise and promote awareness of issues**

- Invite state and territory WHS regulators to participate in AIRAH conferences, division events, training and articles to address specific safety issues.
- Engage with WHS regulators on the national safety review on flammable refrigerants.

**Train and raise awareness with HVAC&R industry**

- Continue to raise awareness on safety issues already addressed by AIRAH.
- Raise industry awareness on new refrigeration safety standards.
- Produce online training on flammable refrigerants safety.

**Research**

- Collaborate with the higher education sector and/or WHS regulators to research specific parts of the supply chain/delivery process as it relates to safety

**Engage and collaborate with PRIME stakeholders on whole of industry safety issues**

**Develop an HVAC&R Industry Safety Strategy**

AIRAH recommends an industry strategy is required to create a clear vision and direction to improve safety in the HVAC&R industry. It should consider the breakdown of issues in the whole supply chain and how to prioritise actions. AIRAH recommends this strategy development is lead by the industry organisations whose member base is focused on the trade sector and relevant regulators.
1  Shining a light on HVAC&R safety

AIRAH receive many comments and enquiries from its members and other industry stakeholders regarding safety and compliance issues within the HVAC&R industry and has identified compliance as one of its strategic imperatives. Personal and community safety is the most critical of these areas and this survey and report shines a light on the issue to better understand the frequency and types of specific safety issues encountered. A clearer understanding of the issues helps AIRAH prioritise its activities and provide recommendations to relevant stakeholders.

AIRAH’s HVAC&R Nation magazine is published monthly and distributed to 15,000 HVAC&R tradespeople. The “Lighter Side” section highlights the problems seen in the industry. Many of the images in this report are taken from the Lighter Side

AIRAH’s trade publication – HVAC&R Nation

1.1  The key issues around HVAC&R regulation

(from AIRAH Policy and Advocacy Positions 2017-2020)

The HVAC&R industry operates under a wide range of legislation and regulatory requirements and regimes from all levels of government. The main areas of regulation encountered by our industry include:

- Building regulations – National Construction Code (NCC) requirements and various state based variations and differing building administration systems.
- Planning regulations – Including specific local requirements imposed through local government-based planning or development consent conditions.
- Local council regulations – Special local planning conditions, food services regulations, environmental noise enforcement.
- Environmental regulations – Ozone Protection and Synthetic Greenhouse Gas Management Act and associated regulations, environmental noise regulations, and air pollution regulations.
• Electrical regulations – AS/NZS 3000 wiring rules, electrical safety for refrigeration and heating appliances, hazardous area standards.

• Plumbing regulations – Including NCC Volume 3, AS 3500 series, backflow prevention trade waste regulations, and sewage.

• Gas regulations – Flammable fuel gas regulations, hydrocarbon refrigerants.

• Licensing regulations – For synthetic refrigerants handling through the Australian Refrigeration Council, for refrigeration and air conditioning contracting businesses through the state regulator, for hydrocarbon refrigerants through the state regulator.

• Occupational safety regulations – Model WHS Act and regulations in most states, or state based OH&S Act and regulations (Victoria and WA), safety in design, national occupational exposure standards, hazardous atmospheres, confined spaces, design registration, plant registration.

• Public Health regulations – State-based Legionnaires disease regulations, microbial control inspection testing and maintenance, indoor air quality.

• Fire Safety regulations – Essential services inspection testing and maintenance.

All of these regulations require a level of compliance. Issues in relation to non-compliance can arise at various points in the HVAC&R supply chain including:

• Product compliance – Products that do not comply with the regulated requirements, e.g. flexible duct R value, electrical cable rating, fire rating system FRL, MEPS efficiency.

• Specification compliance – Products or entire systems that are not designed or specified correctly and in accordance with the regulation, e.g. fire sprinklers in kitchen exhaust systems.

• Installation compliance – Products and systems that are not installed correctly and so fail to achieve the required compliance, e.g. fire damper installation.

• Operation and maintenance compliance – Products and systems that are not operated and maintained correctly to achieve the required compliance, e.g. cooling tower management.

Not all of these regulated requirements are well understood by the various stakeholders in the HVAC&R sector or in the client and procurement chain, particularly where regulations vary significantly from state to state, e.g. refrigeration and air conditioning contractor licensing, Legionnaires disease regulations. In many situations actual responsibilities are not clear to many duty holders.

Many regulations impose a self-certification scheme that is backed by a dispute driven reactive audit/investigation program. Compliance issues are often only inspected and examined after an incident has occurred and has been reported, or a dispute has arisen, leaving a lot of undiscovered non-compliance.

AIRAH’s focus on compliance is on the extent, causes, impacts and solutions for regulatory non-compliance within the HVAC&R sector.

AIRAH want to inform and work with all regulators to help bring a HVAC&R voice to the development of the environmental, energy, building, WHS, plumbing, electrical and health regulations that impact the HVAC&R industry.
1.2 Background to AIRAH’s compliance focus

There are several aspects to non-compliance including the type of issue, the sector in which it occurs, the nature of the issue, where it occurs in the supply chain and the frequency with which it is encountered.

- Compliance for buildings – Poor compliance with requirements of the NCC includes issues like system control sequences, errors with fire and smoke damper installation and smoke control systems not operating correctly.

- Compliance for refrigeration systems – Poor compliance with safety standards includes lack of pressure vessel registration, inadequate safety valves and pressure relief, no refrigerant detection, and poor quality of installation (poor pipe support, risks of trapped liquid, corrosion, liquid hammer, plantroom ventilation etc.), poor compliance with environmental standards includes excessive charge of refrigerant, insufficient leak testing and poor refrigerant management.

- Compliance with maintenance regulations – Poor compliance with state based maintenance regulations for essential services and cooling towers, including neglecting to inspect and maintain fire dampers, smoke control systems and cooling water systems in accordance with the required industry standards.

There is anecdotal and documentary evidence of a high level of “undiscovered” non-compliance issues within some sectors of the HVAC&R industry. In the property sector, compliance issues often come to light many years after the initial construction, during a fire safety audit or a due diligence pre-purchase inspection of a building.

Due to the multiplicity of state administrations involved, the self-certification approach at play and low levels of audit carried out, actual levels of regulatory non-compliance are difficult to quantify. There is significant work being undertaken by industry and regulators through the COAG Building Ministers Forum on building product compliance.

1.3 Commonwealth Health and Safety investigation

A recent 2015 Workplace Health and Safety (WHS) investigation into safety within the RAC industry was completed by David Caple & Associates Pty Ltd, titled as an Analysis of Work Health and Safety Data for the Use of Synthetic Greenhouse Gases and Substitutes in the Refrigeration and Air-Conditioning Industry.

This analysis concluded that safety incidents in the industry were most likely under-reported and going to increase due to the technology transition to low global warming potential (GWP) refrigerants.

“An evaluation of WHS incidents was undertaken in consultation with state based WHS regulators and Comcare. This indicated there have been very few WHS notifiable serious incidents for the RAC industry since 2012. However, the interview process revealed the industry still has many challenges with WHS incidents involving flammable gases. These include the knowledge and competency of designers of RAC systems to ensure safety integrity when using alternative gases and the variable level of knowledge and competency of technicians handling these gases. A focus on education and training in the safe use of alternative gases is required, including the use of flammable gases in systems that were not designed by the OEM for their use.

In reviewing WHS injury data, it was identified that musculoskeletal injuries and slips, trips, and falls, are the most frequently reported workers’ compensation claims. The risk from potential flammable gases in the RAC sector is not represented in the WHS claims, incidents or injury data. The insurance premium paid by the RAC sector for workers’ compensation reflects a low risk level comparable to light manufacturing industries. However, it is possible that this data is affected by under reporting of incidents in this industry.
There is a role for educators and the RAC industry to encourage a cultural change to improve the rate of reporting.”

The report identified 15 key safety and regulatory challenges for the RAC industry and included 34 recommendations for implementing safety solutions.

1.4 Increasing safety incidents

There have been several incidents recently where refrigeration technicians have been seriously injured and one incident of a fatality while performing service and maintenance work on refrigeration systems. AIRAH has been assisting state and commonwealth workplace health and safety agencies who have been investigating these issues.

As part of this work AIRAH undertook this industry survey to ask the question, Is the HVAC&R industry unsafe? What are the risks? And, how can they be mitigated?

1.5 National Model Work Health and Safety Laws

The national model Work Health and Safety (WHS) laws comprise a national model WHS Act, national model WHS regulations, and a suite of national model WHS codes of practice.

The stated objectives of harmonising WHS laws through a model framework are to protect the safety of workers, improve safety outcomes, reduce compliance costs for business, and improve efficiency for health and safety regulators.

Work health and safety laws commenced in New South Wales, Queensland, the Australian Capital Territory, the Commonwealth and the Northern Territory on 1 January 2012, and in South Australia and Tasmania on 1 January 2013.

The model laws were amended in 2016. As at 1 July 2016, no jurisdiction had adopted the 2016 amendments to the Act and Regulations.
The Western Australian Government remains committed to the principle of harmonisation and continues to take steps to progress the implementation of the model work health and safety laws.

The Victorian Government has confirmed that it will not be implementing the model WHS laws in their current form.

WHS laws and regulations require employers and people carrying out a business or undertaking (PCBU) to meet certain duties in regards to the safety of the workers and workplaces that they have control over.

- **Designers** have a duty to ensure that systems and plant are designed so that the safety risks for installers, operators and maintenance service providers are minimised as far as is reasonably practicable.
- **Installers** of systems and plant have similar duties.
- **Owners and operators** have a duty to ensure any foreseeable risks to workers or occupants are mitigated as far as is reasonably practicable.
- Providing unsafe access to HVAC&R systems and plant is illegal. However, the definition of what is “safe”, what is “unsafe” and what is “reasonably practicable” is not always clear.

### 1.6 Reporting of WHS Issues

It was identified during this project that WHS agencies have a reporting mechanism for WHS issues.

Contact details for the WHS agencies can be found on the SafeWork Australia website


### 1.7 PRIME and Safety

AIRAH has led the development of PRIME, an initiative developed by a coalition of stakeholders from within the Australian heating, ventilation, air conditioning, and refrigeration (HVAC&R) industry. The industry has been under pressure to help reduce the environmental impact of HVAC&R. Key stakeholders have taken a step back and spent some time evaluating exactly what needs to be done to develop low-emission solutions for the HVAC&R services.

PRIME stands for the five pathways to transition: Professionalism, Regulation, Information, Measurement, and Emission abatement. All of the industry-sourced solutions have been allocated into one of these five categories. Safety is a critical aspect of the PRIME vision, as the industry transitions to the use of low global-warming-potential refrigerants with new safety considerations.

**PRIME Vision - An Australian HVAC&R industry that is highly skilled and professional, safe, cost-effective and environmentally effective.**

### 2 The AIRAH HVAC&R Safety Survey

The survey was open for five weeks from Wednesday, July 20, 2016 and the following organisations supported AIRAH to raise awareness of the project to industry.

- Australian Industry Group (AIGroup)
- Master Plumbers and Mechanical Services Association of Australia (MPMSAA)
- Air Conditioning and Refrigeration Equipment Manufacturers Association (AREMA)
2.1 Survey questions

AIRAH has asked the following questions in the survey.

- Which sector of the HVAC&R industry do you work in?
- Do you have concerns about your safety in the HVAC&R industry?
- What is the biggest safety issue facing your sector?
- Where are you based?
- What safety issues do you encounter in your day to day work?
- What impact do these issues have on you?
- What impact do these issues have on others?
- What do you think these safety issues are caused by?
- What would you suggest is done to change or improve these safety issues?
- Do you think the safety of the HVAC&R industry is changing?
- What do you think is causing change in the safety considerations in the industry?
- What are the best ways to get the word out about improving safety?

2.2 Who Responded?

Hundreds of people reviewed the online survey and a total of 79 completed survey responses were received.

Respondents came from a variety of backgrounds and sectors, primarily technicians and contractors from commercial and industrial refrigeration and commercial and residential air conditioning.

The survey respondents included people who are:

- Licensed refrigeration and air conditioning technicians;
- Installation and commissioning contractors;
- Service and maintenance contractors;
- TAFE trainers and students;
- Manufacturers and suppliers;
- Facilities managers; and
- Compliance and WHS auditors.

The survey respondents included people who work in the following sectors:

- Commercial and industrial refrigeration;
• Residential and commercial air conditioning;
• Training and education;
• Supermarket and commercial refrigeration;
• Building management systems and controls; and
• Mining.

2.3 Where Were They Based?

Survey respondents came from all over the country, predominately from NSW but closely followed by Victoria, Queensland, and Western Australia. Industry participants from all other states and territories were represented in the results.

![Pie chart showing distribution of respondents by state or territory]

2.4 Is There a Safety Problem?

The survey asked the question –

Do you have concerns about your safety in the HVAC&R industry?

(Choices: Strong concerns, minor concerns. Not really, it’s pretty safe, it’s totally safe)

77 per cent of survey respondents indicated that they have safety concerns, with 44 per cent having strong concerns, while 22 per cent of respondents think the HVAC&R industry is relatively safe. Just 1 per cent of survey respondents believe the industry is totally safe.

77 per cent of participants have safety concerns about their workplaces
82 per cent of participants believe safety risks in HVAC&R industry are increasing.

Clearly, most survey participants have safety concerns in regards to the industry.
2.5 The Headline Safety Issues

When survey respondents shared what they thought were the “biggest safety issues facing the industry”, four main topic areas were identified, as follows:

Quality and training – 37 per cent of respondents highlighted issues to do with training, competency and quality as having the major safety impact. Issues raised included untrained people, people working beyond their competency level, as well as unscrupulous contractors cutting corners and costs to win work but providing unsafe solutions as a result.

Access – 29 per cent said access-related issues were the biggest cause of risk in their work day. Issues raised included working at heights, working in confined spaces and working alone. There were significant concerns with unsafe access routes and lack of space to safely carry out maintenance and service work. The overuse of vertical ladders (with harness wire) to access plant, as opposed to stairs, walkways and platforms, was also highlighted as an issue.

Working fluids – 21 per cent said that issues to do with refrigerants and oils, including flammability, toxicity and inappropriate retrofits were the main area of safety concern. Concerns about the long-term toxicity effects of refrigerants and oils, concerns about the widespread introduction of flammable refrigerants and concerns about the possibility of flammable A3 refrigerants being introduced into any
direct expansion (DX) refrigeration or air conditioning system without warnings, appropriate labelling or any safety considerations or modifications.

**Electricity** – 10 per cent of respondents said that working with the electrical side of the job was the most hazardous aspect of their work, including old legacy and unsafe distribution boards with outdated wiring and fuses and unmaintained safety systems. The ability to effectively electrically isolate existing HVAC&R plant and to lock-out tag-out is widely questioned.

![Substandard dangerous electrical work](image)

The remaining safety or risk categories highlighted included diverse and specialised issues such as exposure to a range of other chemicals and substances, encountering asbestos in older buildings, travelling by vehicle to various sites, manual muscular/skeletal injuries, hazards from working outdoors and on construction sites, inaction by owners on previously identified hazards, and irate and unhappy customers.

Throughout the survey responses, the prevailing industry and client attitude to risk was highlighted as an area that needs to be addressed. Complacency is no friend of safety. Each job should be complimented by a risk assessment process as most comprise unique circumstances.

The quality of safety plans and the effectiveness of relative approaches to safety management are always in the detail.

> “Lack of knowledge, vested interests, buck passing, poor change management by Government, lack of credible and unbiased information, poor training, poor training systems that fail to monitor training outcomes, misinformation, deceptive and misleading conduct by some suppliers and total lack of political leadership.”

### 2.6 The Impacts – on Service Providers and on Others

When asked what impact the various safety issues have on them, survey respondents answered as follows:
Inability to carry out my work in a safe manner, inability to complete works to customer satisfaction.

Increased risk of injury or liability, risks are taken to get to poorly located equipment, complex access arrangements leads to tiredness and mistakes.

Concerns regarding long-term health impacts of small cumulative exposures to refrigerants, oils and other chemicals.

Inability to correctly inspect or service plant, leading to downstream safety risks.

Stress and mental health impacts associated with the above issues.

Respondents generally believed that correctly addressing safety increased both the time needed and the overall costs of a job.

- Time – Continually addressing safety issues and maintaining safety as a focus takes a lot of time and effort.
- Cost – Costs are greater when safety is correctly addressed; costs due to access equipment, including PPE, and the additional human resources required to correct poorly designed/installed systems.

“As safety awareness has increased for many in the industry, the public appear to have little or no concern for safety when it affects the cost of a project. This is compounded by a few operators that are comfortable flouting safety issues.”

When asked what impact the various safety issues have on others, survey respondents responded as follows:

- Maintenance of plant and equipment that is located in unsafe areas or with unsafe access will either not be carried out at all or not be carried out adequately, resulting in possible downstream safety impacts including damage to equipment, loss of service and associated loss of productivity for the building or facility.

“The buildings we look after are worthless, if they can’t be maintained properly.”

- Additional costs to end users for out-of-hours work due to access limitations (e.g. indoor fan coils that cannot be accessed during office working hours).

“In the end of the day, it is the end user who is paying a large penalty to allow us to perform our works.”

“To do things safely, sometimes takes longer due to the planning and preparation required. This can be disruptive to businesses. The price to carry out works as safe as possible often means that clients give work to others who may be faster and cheaper.”

- Delays in completing works and resulting lack of service, or pressure to further cut corners (and increase safety risks) to get program back on track or to get a system back running as quickly as possible.

- Poorly located equipment generating trip or clash hazards for occupants, poorly fitted guarding on fans can cause injury to people in the vicinity of the plant.
If essential safety HVAC equipment fails during an emergency event (e.g. smoke control during a fire alarm), it could have a very serious detrimental impact on people being able to safely evacuate a building.

2.7 Quality and Training – The Safety Issues

2.7.1 What are the quality issues?

Poor planning and integration on the design side means that a construction and installation project will often fall behind schedule. This rush to complete construction projects puts costs and time pressure onto trades, who are often not given the resources required to complete a job to a safe standard. This leads to workers “taking risks due to time and money constraints” compromising their own safety, or taking short cuts which ultimately reduces the project safety outcomes, compromising the safety of others.

Restrictive pricing means the focus is on cost not quality, which drives the selection of poor quality equipment and acts to de-skill and de-professionalise the industry.

The reliance on paperwork and bureaucracy such as Safe Work Method Statements (SWMS) which, when generic, are often ignored or varied on site. There is an assumption or attitude amongst many that sites are safe once paperwork has been completed and “the required boxes have been ticked”.

NOTE: A Safe Work Method Statement (SWMS) is a document that outlines all of the high-risk work activities intended to be carried out at a workplace, the hazards that may arise from these activities, and the measures to be put in place to control those risks.

Operators that use unskilled labour and poor quality practices are cheaper and so are difficult to compete against in the open market. Customers do not fully understand the difference in quality and safety until after installation, when it is too late. The actions of these few operators tend to drag the market (or significant sections of it) down to their low level of quality and safety.
Coolroom condenser – lack of access and unsafe workspace

Equipment that cannot be accessed will never be maintained. This system will not deliver its designed performance due to air flow restrictions. A lose-lose for emissions reductions

Quality workmanship issues in a residential installation
2.7.2 What are the training and competency issues?

The current VET training system does not adequately cover training in the design and installation of systems using the refrigerants that are likely to be in most common use in the next 5–10 years. Training is lagging technology and practice, which is undesirable and has significant safety implications.

Certificate II qualified technicians have no training in energy efficiency or natural refrigerants.

Split system (Cert. II) installers are undertaking installation and maintenance work outside of their competencies. Peripheral trades such as electricians or plumbers are also completing work outside of their trade/competency. People working outside the scope of their qualifications and experience lead to poor project outcomes and increased safety risks for workers and others.

Builders are allowing (encouraging) unskilled trades to cut corners as a way to reduce construction costs.

There is a very low level of understanding of low-GWP technology and particularly natural refrigerant technology within the RAC trade.

Current training packages are not catering for the future of the trade and existing qualified technicians are not investing in, or are not able to, upskill.

Students and apprentices do not understand the full impacts of not following the correct safety procedures because employers/trainers are not up-to-date with contemporary refrigerants.

Generally, there is poor supervision and instruction of RAC trainees and apprentices.

A lack of worker understanding and training in the correct safety procedures and culture leads to complacency and laziness, with workers paying only lip service to SWMS. This is particularly true of inexperienced workers and in workers operating outside of their competency level.

2.7.3 The suggested solutions – Quality and training

Most respondents with a view had a preference for a reversal of the deregulation of the industry and a call for only allowing qualified technicians to perform RAC work.

National Licensing - Licence the RAC technician occupation, harmonised across all states and territories, to create a professional and independent trade. This single action will provide safety, energy productivity and emission reduction benefits to Australia – a win-win-win scenario.

System certification - Require certification and sign-off of all new and modified RAC systems on the final install – the same level of certification as is required for plumbing and electrical installations.

Client education - Clients, RAC system owners and operators, need to be provided with increased awareness and information about the impact that the “quality” of an RAC installation can have on its safety and lifetime performance levels.

Technical Information – Provide more information on new refrigerants and new safety procedures for installation and maintenance to industry participants, both technical service providers and operators.

Education and training – Create ‘learnings’ from past experiences and share it with industry, through short courses, seminars, multi-media presentations, information campaigns by government.
Funding and imperatives for training – Provide funding for more training, and force or incentivise employers to send workers to technical training and safety updates.

Standards – Develop better and clearer refrigeration safety standards that are regulated and enforced as minimum standards.

Risk management approach - Complacency due to repetitive activities can be challenged by completing risk assessment sheets for each individual job.

2.8 Access – The Safety Issues

2.8.1 What are the access issues?

Safe access to and about HVAC&R equipment is the primary issue in this category, causing ongoing safety issues when servicing and repairing systems. This includes accessing plant on roofs and in roof spaces (e.g. condensing units), in ceiling spaces (e.g. fan coil units) and in plantrooms and plant cupboards. Plant is often (commonly) installed in inaccessible positions increasing risks for the service person.

Safe access to and about HVAC&R equipment is the primary issue...

Working at heights presents fall hazards and appropriate safety solutions are often not provided, or the solutions that are provided are inadequate and not used correctly. This is predominately related to rooftop and high-wall installations but also mezzanine plantrooms in warehousing. Access is often compromised because “ladders are cheaper than steps”.

Inadequate access panels into ceiling spaces requiring dangerous ladder-based work. Lack of access to roof-mounted or high-wall plant requires scissors lift or scaffolding. Safety risks are imposed on service personnel for the working life of the installation, simply through poor design choices.
Inadequate Access panels into ceilings requiring dangerous ladder-based work ...

Working in confined spaces is a common issue, particularly in difficult to access poorly lit and unventilated plantrooms and plant enclosures.

Poor lighting in service areas is another access failing that can have serious safety implications for the HVAC&R technician. Safe access is not simply about physical attributes such as steps, harness points and rails, but also includes environmental parameters such as ambient noise levels, lighting levels, air quality parameters and ventilation levels.

Poor lighting in service areas

Working alone and working out of hours, particularly with large industrial refrigeration systems (i.e. large volume refrigerant systems located in an unoccupied facility).

Designers and owners do not fulfil their duties in relation to safe access to plant. Building regulations, through reference to the National Construction Code (NCC), require that access is provided to HVAC&R plant so that the building and its systems can continue to meet the required minimum performance against which the building was originally approved and certified. It is a requirement of WHS regulations (or OH&S regulations in some states) that the access that is provided for this purpose is “safe” for workers and occupants or is made safe.

In plain English, this means that access for HVAC&R maintenance must be provided as part of the NCC building certification process and the access provided must be safe because this access is a workplace-related space. Therefore, there is a legal imperative that HVAC&R plant has to be provided with safe access, which may not be well understood by all stakeholders in the building supply chain.

Designers and owners do not fulfil their duties in relation to safe access to plant.

Inadequate access is characterised as a market failure in the construction industry because the market rewards builders and developers that transfer construction costs to owners and operators through increased operating costs.

Inadequate access is characterised as a market failure in the construction industry...

Retrofitting energy efficiency improvements to existing systems is often not possible due to inadequate space for the additional components needed to improve a system’s energy productivity. This represents an ongoing energy and performance penalty imposed through poor access provisions in the original design.
2.8.2 What is causing these issues?

Poor planning and poor integration of HVAC&R plant and equipment into the overall building design process. Rooftop mounted equipment that is also located too close to the roof edge for example, or multiple rooftop units installed independently and without consideration of each other leading to erratic and hazardous electrical wiring and refrigerant piping distribution networks on the roof.

Poor planning and poor integration of HVAC&R plant and equipment into the overall building design process

Designers and owners who do not understand or who choose to disregard their duties in relation to safe access to plant.

“Customers see safe access as a cost, not a responsibility”.

2.8.3 The suggested solutions - Access

Existing WHS and NCC-regulated requirements for access should be better communicated and enforced. If these rules are consistently not enforced, they will be (and are being) ignored by the market. Industry awareness of the minimum rules need to be increased, provide more monitoring and independent audit, and give agencies a mandate and the required regulatory powers to enforce the existing requirements.

Designers and installers need to consider and allow for future access in their designs. This is a requirement of legislation but is not enforced in any way, and so is ultimately ignored by industry and certifiers.

I have had a number of discussions with facilities managers or building owners and, after explaining that they have safety issues which they are ultimately responsible for, and attempting to work with them to resolve the issues, I find they see it as a money grab. The most common comment is ‘it has been like that for years and if you don’t want to do the work we will find someone who will (and who won’t raise the safety concerns)’. Increase the stringency of rules for access to roof-mounted HVAC&R equipment, ban vertical ladders and require stairs and walkways instead.
Provide/require **remote monitoring solutions** such as automated KPI monitoring and fault detection of plant that reduces the necessity or frequency of physical inspection. Reducing the need for access or reducing the frequency will also reduce the potential for risk.

Service personnel should bring **Personal Protective equipment (PPE) to every site** and every job. That is the harsh safety reality of contemporary RAC work.

Pre-construction ‘**Access**’ reviews for buildings and facilities should be integrated into project management programs, to detect access issues early in the design/construction process.

Access provisions in a building or facility could be “**Rated** for safety/suitability” in the same way as energy (NABERS) and sustainability (Green Star) is currently rated. Create an access rating system and encourage the Property Council of Australia to adopt the system in its building grading matrix. This would help the market to correctly value access provisions in a facility.

The market needs better and clearer requirements about access responsibilities and **education of owners** about their duties.

### 2.9 Refrigerants and other Working Fluids – The Safety Issues

#### 2.9.1 What are the issues?

**Exposure** to potentially harmful substances; refrigerants, oils and other chemicals (e.g. oxy-acetylene torches).

**Lack of understanding** of refrigerants; toxicity, flammability, and the pressure they work under.

**Poor risk management** associated with the application of low-GWP refrigerants, including new synthetic refrigerants and existing natural refrigerants.

**Toxicity** – although not classified as toxic by safety standards, flammable A2 synthetic refrigerants may present an increased toxicity threat than previous A1 refrigerants, due to toxic products of combustion/decomposition that are created when they do burn. Burnt out compressors, leaks in ductwork with heater banks decomposing refrigerant are suggested as potential exposure pathways.

**Flammability** – of low-GWP refrigerants is a major concern and, in particular, the dangerous practice of dropping A3 hydrocarbon refrigerants into systems designed for A1 synthetic non-flammable refrigerants (i.e. changing the refrigerant safety classification without making the required system safety changes). Training and competency for new and existing service providers must be addressed.

> “At present, we see a significant number of split system installers performing service maintenance and breakdowns to equipment they are not licensed to do. With the introduction of R32 and hydrocarbons, it’s only a matter of time before someone gets hurt.”

The flammability and toxicity of **refrigerant/oil mixtures** are generally unknown, and are not being investigated.

**System provenance** – with the increasing prevalence of drop in replacement refrigerants being used in existing systems, without labelling or warnings, most service technicians do not now always know, for certain, what type of refrigerant is in an existing system.
Flammability and toxicity of refrigerant/oil mixtures are not being investigated

2.9.2 The suggested solutions – Refrigerants and other working fluids

Training and licensing in Australia needs to be linked together and updated to reflect contemporary RAC technologies practices. This should include the introduction of skills maintenance requirements for licence renewals.

Mandating licensing is the only way to professionalise the industry and ensure high standards of safety. Licensing should cover all refrigerants and all systems.

“How can a non-professional trade be expected to turn over a new leaf when it is being infiltrated by other tradespeople giving it a bad name, creating unsafe environments, and completed jobs not up to standard? What motivation does this offer young apprentices if they are not educated about new technology and are unaware of the transition taking place in the industry they are about to enter, and those senior to them have no interest in acquiring necessary new skills? Australia is the land of rules and regulations, so this industry is a very peculiar case indeed in that it appears to have been completely left to its own devices with commercial interests dictating what direction the industry heads in.”

Training on the design, installation and maintenance of flammable A2L, A2 and A3 refrigerants should be delivered free of charge or at low-cost to existing refrigeration mechanics who did not cover these refrigerants, and the associated protocols, in their original training.

Service personnel must treat every system as if it contains A3 flammable refrigerant until they positively identify the refrigerant type. Assumption leads to significant safety risks, adopt the precautionary principle at all times.

Instances where systems have been converted to A3 refrigerants should be investigated and the responsible contractors should be prosecuted if conversions are unsafe.

2.10 Electrical – The Safety Issues

2.10.1 What are the electrical issues?

Old electrical installations, outdated wiring and boards, compromised safety systems and fuses, hot work (working on live equipment), and opening non-compliant boards and electrical supplies.

Systems that cannot be safely isolated, not having isolators, having disabled isolators, or lack of labelling of a dual supply.

Failure to “lock-out tag-out” electrical supply to systems that can be safely isolated.

Outdated wiring and boards, compromised safety systems and fuses
2.10.2 The suggested solutions - Electrical

The following solutions were identified by respondents:

- **Training and licensing** – should cover the basics and safe electrical practices during installation and service.
- **Trade demarcation** – should clearly define the minimum standards and required competencies and the role of each individual trade; electrical, plumbing, refrigeration.
- **System inspection and certification** – introducing an “individual” certification requirement for all RAC work and associated electrical supplies.

2.11 Other Safety Issues

Although not as large or as prevalent as the headline safety issues, survey respondents did throw up several additional safety risks:

- **Chemicals** – In addition to refrigerants and oils, refrigeration and air conditioning trades also need to work with a range of other chemicals and substances.
- **Asbestos** – Is still encountered in older buildings from time to time, and not all buildings have an accurate asbestos register.
- **Travel** – Travelling by vehicle to various sites is itself not a risk-free activity including loading and unloading.
- **Muscular/skeletal** - Manual lifting, bending, crawling, stretching, and associated back and muscle issues, trips and falls, and eye injuries.
• **Fire safety** - Lack of inspection, testing and maintenance of fire and smoke control safety systems.
• **Environmental hazards** - Working outdoors, working in construction sites, heat stress, UV exposure etc.
• **Complacency** - Owners and operators of sites and facility not acting on hazards that have been identified previously.
• **HVAC&R Rage** - Irate and unhappy customers, people wanting to shoot the messenger.

### 2.12 Are the Safety Risks in HVAC&R Changing?

82 per cent of respondents to this question believe that the safety risks in HVAC&R are changing, and are changing for the worse. The significant majority view is that the industry is becoming less safe and higher risk.

18 per cent believe that the industry is safer, or at least no less safe, than it has been in the past.

Survey respondents note that different technical approaches with different risk/safety profiles and different solutions will be adopted in different sectors.

> “Reduced margins and unrealistic project programs are creating an environment where the cutting of corners and lowering of standards is common place. The ever-widening skills gap is further feeding this lowering of standards”.

### 2.13 Observations

In compiling and analysing these survey results the following observations are made.

The increased safety risks and higher ongoing costs associated with poor access to HVAC&R plant and equipment are “designed in” to systems from day one, from before construction even starts.

...market failure at play in many scenarios...

There is a market failure at play in many scenarios, in that those who would have to pay for the additional capital cost to provide safe access during the construction are different to those who will actually pay for the increased ongoing costs caused by the inadequate access. Therefore, there is no market incentive for the builder to invest in access solutions that will save the owner or operator money in the longer term, and a cost transfer occurs.
The increased safety risks and higher ongoing costs associated with poor access to HVAC&R plant and equipment are ‘designed in’ to systems from day one, from before construction even starts.

These increased costs in operation can include higher maintenance costs, higher energy costs and higher replacement costs.

The legal requirements for the provision of access to HVAC&R plant come from two distinct areas:

- Building regulations – requiring access to be provided sufficient to ensure that a building/system can continue to meet the regulated requirement.
- WHS/OH&S legislation – requiring access pathways to be safe. HVAC&R plant and equipment is a workplace for the refrigeration technician as is the access pathway to that plant.

The technology transition to low-GWP refrigerants, which is currently being driven by a national and global agreement to phase-down the production and use of HFC refrigerants, will tend to increase the risks associated with working fluids (refrigerants and oils) in the HVAC&R industry.

**Technology transition to low-GWP refrigerants ... is tending to increase the risks associated with working fluids (refrigerants and oils) ...**

3 **Next steps**

This survey and report have been produced to help AIRAH, government, and the HVAC&R industry understand safety issues and consider what the next steps should be to address the issues. AIRAH has a strong track record of supporting the industry and working with government to address critical issues and will lead a number of actions as outlined below. AIRAH recommend an industry strategy is also required.

3.1 **AIRAH actions**

AIRAH will undertake the following actions to help to make the industry safer and provide a positive feedback loop based on skills and safety. These actions will also help to professionalise the industry and make it attractive to new entrants, providing the respect that will attract and retain high calibre participants.

3.2 **AIRAH advocacy**

3.2.1 **National licensing and registration**

Advocate for a national licensing for refrigeration and air conditioning trades and national registration for refrigeration and air conditioning engineers.
AIRAH recognises and advocates for the need for a national licensing for refrigeration and air conditioning trades and national registration for refrigeration and air conditioning engineers, both based on skills and competency and both requiring skills maintenance and continued professional development as part of the renewal requirements. AIRAH has raised this issue through its Pre-Budget Submission 2017. See AIRAH Policy and Advocacy Positions 2017-2020

3.2.2 Low GWP refrigerant safety
Advise key government and industry stakeholders about safety considerations of low global warming potential (GWP) refrigerants.

AIRAH will raise awareness of the safety issues of the use of low GWP refrigerants with building regulators and stakeholders. It will also advocate for appropriate regulation within construction and maintenance legislative frameworks to recognise and mitigate the new risks.

AIRAH is a respected partner of government policymakers and regulators and industry stakeholders. It has a long history of providing impartial evidence based expert advice.

3.3 Partner to review and develop guides, codes and standards

3.3.1 Minimum access for NCC
Collaborate with the Australian Building Codes Board to develop industry guidelines.

AIRAH will work with the Australian Building Codes board (ABCB) in the development industry agreed guidelines for minimum access to be provided and the lifecycle implications of various access-related design and installation decisions.

AIRAH is a member of the Australian Building Codes Board (ABCB) Building Code Committee (BCC). The BCC the peak building technical advisory body provide advice to the ABCB Board to deliver its work program by providing a national forum for regulatory authorities and industry to consider technical matters relevant to building regulation reform.

AIRAH has a close working relationship with the ABCB through partnering on awareness raising initiatives, training, industry input to code reviews and evidence based technical advice.

3.3.2 WHS guide for the HVAC&R industry
AIRAH will develop and publish an AIRAH guide to the WHS Act and Regulations for the HVAC&R industry.

The implications of the WHS Act and Regulations are not well understood by many members of the HVAC&R supply chain. AIRAH will work with the WHS regulators and industry specialists to develop clear guidance what the industry’s legal responsibilities are and how to comply with their intent.

3.3.3 RAC codes of practice
Develop codes of practice and safety guidance for the refrigeration and air conditioning industry

AIRAH will engage with the Department of the Environment and Energy and Energy (DoEE) and Safe Work Australia (SWA) to progress developing codes of practice and safety guidance for the refrigeration and air conditioning industry.
AIRAH has identified a review of existing codes of practice and a range of new codes of practice and safety guidance is needed to aid the transition to low emission refrigerants. AIRAH will work with DoEE and SWA to seek support to develop these guides with input from industry stakeholders.

3.4 Engage with regulators to raise and promote awareness of issues

3.4.1 Awareness raising with regulators

*Invite state and territory WHS regulators to participate* in AIRAH conferences, division events, training and articles to address specific safety issues.

AIRAHs strategic policy and advocacy themes include compliance and the refrigerant transition. AIRAH has also led the industry PRIME initiative, which identifies a broad range of issues relating to safety aspects of transitioning to low global warming potential refrigerants.

AIRAH will continue to provide leadership in these areas through close cooperation with the relevant regulators to ensure clear information and awareness is provided to the HVAC&R industry through its communication and education channels. These include Ecolibrium, HVAC&R Nation, update emails, national conferences and training programs.

![AIRAH’s HVAC&R Nation is one of the main industry communication and awareness raising avenues](image)

3.4.2 WHS regulators position on flammable refrigerants

AIRAH will engage with WorkSafe WA who are leading a project to coordinate and develop a position paper on flammable refrigerants with its state and territory counterparts. The focus of this work is specifically looking at the safety issues of working with flammable refrigerants and the corresponding duties of a range of stakeholders, arising out of WHS laws and regulations.

AIRAHs strategic policy and advocacy themes include compliance and the refrigerant transition. AIRAH has also led the industry PRIME initiative, which identifies a broad range of issues relating to safety aspects of transitioning to low global warming potential refrigerants.
3.5  Train and raise awareness with HVAC&R industry

3.5.1  Safety issues already addressed by AIRAH
Refer Appendix 2 - AIRAH achievements and credentials on HVAC&R safety compliance

3.5.2  New refrigeration safety standards
AIRAH will collaborate with Standards Australia to develop and deliver training on new refrigeration safety standards to industry. AIRAH has a strong strategic relationship with Standards Australia and works closely to address industry needs for revision of existing standards and new standards. The revised refrigeration safety standards (AS/NZS 5149 parts 1-4) have recently been updated and published following a six year review process. AIRAH and Standards Australia will provide updates, awareness raising and training to industry on this critical standard.

3.5.3  Training on flammable refrigerants safety
Seek funding to create free online training on the AIRAH Flammable Refrigerant Safety Guide.

AIRAH convened and led a working group to develop the Flammable Refrigerant Safety Guide for the HVAC&R industry. This was complemented with two sold-out national seminar series to the trade in partnership with the Department of the Environment and Energy. AIRAH will seek support to evolve this training to an online format. This will provide access to those in remote and regional areas.

3.6  Research

3.6.1  Promote research
Collaborate with the higher education sector and/or WHS regulators to research specific parts of the supply chain/delivery process as it relates to safety, (e.g. design, installation, handover, operation and maintenance).

AIRAHs strategic policy and advocacy themes include innovation and research. AIRAH will identify and support relevant researchers to conduct further work in this field to provide further evidence and other opportunities to address the market failures in the construction industry supply chains.
3.6.2 Engage and collaborate with PRIME stakeholders on safety issues

Engage with PRIME stakeholders on projects relevant to safety.

PRIME is an initiative developed by a coalition of stakeholders from within the Australian heating, ventilation, air conditioning, and refrigeration (HVAC&R) industry. The industry has been under pressure to help reduce the environmental impact of HVAC&R. Key stakeholders have taken a step back and spent some time evaluating exactly what needs to be done to develop low-emission solutions for the essential HVAC&R services we all depend upon.

PRIME stands for the five pathways to transition: Professionalism, Regulation, Information, Measurement, and Emission abatement. All of the industry-sourced solutions have been allocated into one of these five categories. [www.primehvacr.com.au](http://www.primehvacr.com.au)

4 An HVAC&R industry Safety Strategy

4.1.1 Industry safety strategy

From the findings of the survey, AIRAH recommends an industry strategy is required to create a clear vision and direction to improve safety in the HVAC&R industry. It should consider the breakdown of issues in the whole supply chain and how to prioritise actions. This report recommends many varied activities such as awareness raising, harmonising of existing licensing and registration regulations, CPD development, stakeholder communications, and increased policing etc. AIRAH recommends this strategy development is lead by the industry organisations whose member base is focused on the trade sector and relevant regulators.

4.1.2 Creating a strategy – next steps

The next steps to creating a strategy include:

- A more **formal and full industry survey** to research deeper into the issues with supporting evidence, and solutions identified in this report.
- Engage with state/territory building administrations and WHS/OH&S, electrical and gas regulators to access safety data and explore _coordinated harmonised strategies_ to identified safety issues.
- A **combined industry/government workshop** is hosted with the aim of develop an overarching safety strategy and a plan of specific safety actions for the whole supply chain – including designers, installers, equipment owners, facility managers and maintenance service providers.

4.1.3 Actions to be included in the strategy

The following actions are recommended for inclusion in a whole of industry strategy:

- Development and delivery of a digital solution that includes **just-in-time online learning** and SWMS development capability.
- Industry collaboration with WHS regulators to coordinate and enable a drive to **a culture of reporting WHS issues**. This will build an evidence base of the issues and provide a feedback mechanism to identify the supply chain market failures (e.g. design, installation, procurement etc.).
- **National licensing of RAC trade** – Licence the RAC technician occupation, harmonised across all states and territories, to create a professional and independent trade. This single action will
provide safety, energy productivity and emission reduction benefits to Australia, a win-win-win scenario.

- **System certification for RAC** – Require certification and sign-off of all new and modified RAC systems on the final install, the same level of certification as is required for plumbing and electrical installations.

- **Information for owners relating construction legal obligations and quality to lifecycle costs** – Clients, RAC system owners and operators, need to be provided with increased awareness and information about the impact that the “quality” of an RAC installation can have on its safety and life-time performance levels. They need to understand that it is their **legal responsibility and duty** to make the workplace safe, which includes access to and around HVAC&R plant.

- **Training** – Delivered to refrigeration technicians with skills gaps. Provide more information on new refrigerants and new safety procedures for installation and maintenance through short courses, seminars, multi-media presentations, information campaigns by government, create learnings from past experiences and share it with industry.

- **Risk assessment sheet/process for every job** (culture change) – Complacency due to repetitive activities can be challenged by completing risk assessment sheets for each individual job.

- **Design review step** – To address access issues designers and installers need to consider and allow for future access in their designs. This is a requirement of legislation and should be addressed by a mandatory pre-construction review step to assess access arrangements. “Access” reviews for buildings and facilities should be integrated into project management program, to detect access issues early in the design/construction process.

- **Remote monitoring and fault detection** – Remote and automated KPI monitoring and fault detection that reduces the necessity or frequency of physical inspection. Reducing the need for access or reducing the frequency will reduce the potential for risk.

- **Trades people** need to be empowered to require that either the job is made safe or they can **refuse to undertake the work** until the risks are mitigated.

- **Increase stringency of access standards** – to HVAC&R plant.
Appendix 1 - Working with AIRAH

AIRAH has a strong history of working with government and industry stakeholders to create a safer sustainable built environment.

AIRAH is recognised as the pre-eminent source of heating, ventilation, air conditioning and refrigeration (HVAC&R) industry training information. AIRAH has developed a range of technical manuals and delivered a range of training and accreditation courses relevant to the trade and engineering design sector. AIRAH frequently engages with the whole supply chain through industry trade nights, conferences and forums, industry training and accreditation programs, and industry exhibitions. AIRAH is recognised within the industry as a trustworthy source of technical information. AIRAH regularly collaborates with government and non-government organisations (e.g. Australian Building Codes Board, Standards Australia) to deliver information seminars, conferences and industry-based training to the HVAC&R industry.

AIRAH will be able to access the relevant audience through its own membership base, through its collaboration partners, and through its alignment with the following industry and government organisations:

- Air Conditioning and Refrigeration Mechanics Association (ARMA)
- Air Conditioning and Mechanical Contractors Association (AMCA)
- Air Conditioning and Refrigeration Equipment Manufacturers Association (AREMA)
- Australian Fire and Emergency Service Authorities Council (AFAC)
- Australian Refrigeration Association (ARA)
- Australian Refrigeration Council (ARC)
- Chartered Institute of Building Services Engineers (CIBSE)
- Consumer Electronics Suppliers Association (CESA)
- Department of the Environment and Energy
- Facilities Management Association (FMA)
- Property Council of Australia (PCA)
- Refrigerants Australia (RA)
- Refrigeration and Air Conditioning Contractors Association (RACCA)
- Refrigerated Warehouse and Transport Association (RWTA)
- Standards Australia
- State licensing bodies – e.g. Victorian Building Authority
- End user associations – e.g. the Australian Grocers Association
Appendix 2 - AIRAH achievements and credentials on HVAC&R safety & compliance

• AIRAH conducts seminars and training on NCC referenced standards such as AS/NZS 1668 series and AS/NZS 3666 series, as well as important maintenance standards such as AS 1851. These important Australian Standards underpin many HVAC&R regulations including mechanical and natural ventilation, HVAC hygiene and fire and smoke control.

• AIRAH have facilitated the development of several safety-based codes of practice documents including the Victorian Ammonia Code of Practice, The Refrigerant Handling Code of Practice (parts 1 and 2) and the Flammable Refrigerants Safety Guide.

• AIRAH have developed and published a free Technical Bulletin on Kitchen Exhaust Fire safety, a topic that is regularly the subject of non-compliance and one that has serious safety implications.

• AIRAH have collaborated with SafeWork NSW to develop of a safety alert in relation to servicing refrigerant systems.

• AIRAH have collaborated with WorkSafe Victoria to develop of a safety alert in relation to flammable refrigerants.

• AIRAH have collaborated with SafeWork NSW to develop a skills workshop in relation to welding practices.

• AIRAH highlights safety and compliance issues in our industry and publish skills workshops to address safety issues through its publications Ecolibirum and HVAC&R Nation.

End of Report