HVAC&R NEWS

AIRAH | INDUSTRY JOURNAL

OCTOBER–NOVEMBER 2025 | ISSUE 166

The living machine

How HVAC systems mimic the human body

High and dry

The importance of vapour barriers in refrigeration

Skills workshop

Air filter maintenance

AIRAH

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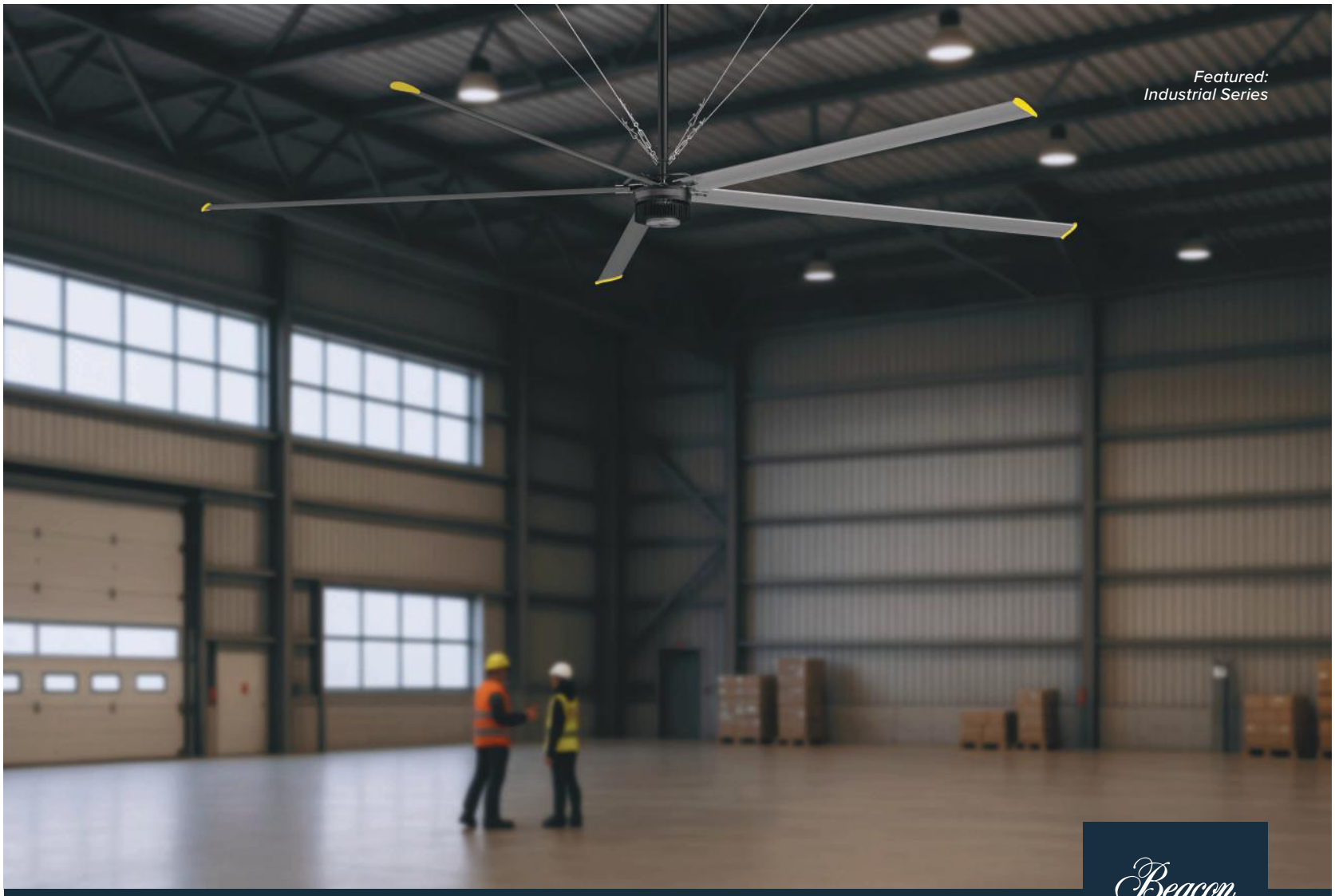

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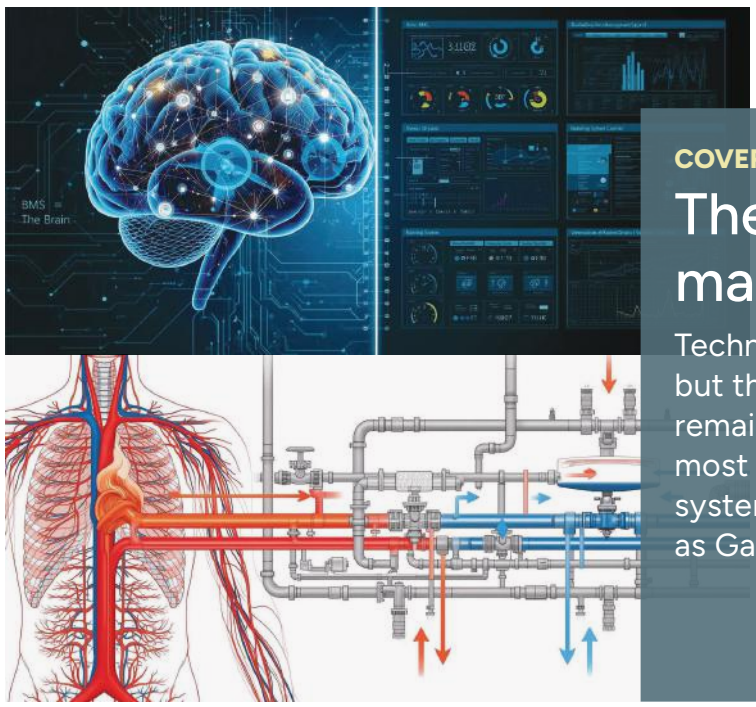
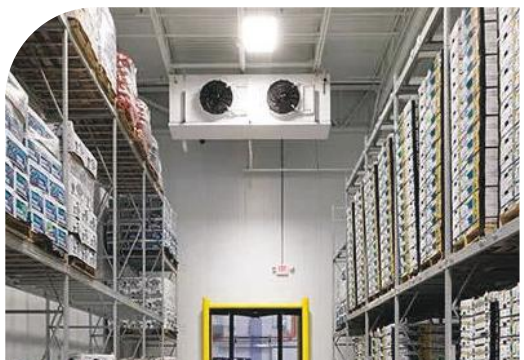


COVER FEATURE

The living machine / 24

Technology gets smarter, but the human body remains arguably the most advanced HVAC system on the planet, as Gary Raman explains.



EXCLUSIVE TO THIS ISSUE

The importance of vapour barriers in refrigeration / 19

Bob Jackson, M.AIRAH, explains how and why HVAC&R professionals should hermetically seal the outer skin of cold rooms to create a vapour barrier.

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Regular articles

AIRAH

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Address
National Office
James Harrison Centre
3/1 Elizabeth Street,
Melbourne VIC 3000

Contact
03 8623 3000
airah@airah.org.au
hvacrnews.com.au

Magazine team

Editor
Nick Johns-Wickberg
nick.johnsw@airah.org.au

Contributing writers
Laura Timberlake
Louise Belfield
Mark Vender

Advertising sales
John McGrath
john.mcgrath@airah.org.au
Tel: 0419 556 108

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Food for thought

How can we keep our brains active when AI thinks for us?

The other day, I was driving a few friends to a woodworking class on the other side of the city – and using Google Maps to navigate – when one of them mentioned Alzheimer's disease. They had recently heard about a study that tracked mortality from Alzheimer's against people's professions, focusing on people who worked in transport: taxi drivers, ambulance drivers, bus drivers, and aircraft pilots.

The study found that taxi and ambulance drivers were four to six times less likely to die from Alzheimer's than the population average. In contrast, bus drivers and pilots were more likely than average to die from Alzheimer's.

The authors' hypothesis is that jobs that stimulate the brain through regular navigational and spatial computations – like driving a taxi or an ambulance – provide protection from degenerative brain disease, whereas repetitive jobs that require minimal mental adjustment can do the opposite.

During the drive, this led to a conversation about how AI is affecting our minds. If a life of modern comfort and excess is bad for our bodies, then it stands to reason that an over-reliance on AI is bad for our brains.

AI can write our emails for us, and it can read the responses when they come. It can distil decades of scientific research into a few easily digestible sentences at the top of a Google search. It can create songs, videos, and even magazine covers – yes, including this issue of *HVAC&R News*.

But as impressive as AI is, there's often something unsatisfying about what it creates. Just because it knows everything doesn't mean AI truly understands anything. If you've ever found yourself drifting off while reading an AI-written article or noticing weird details on an AI image – this magazine's cover included – you'll know what I'm talking about.

It seems to me that HVAC&R work strikes the perfect balance between humanity and technology. While systems get smarter and tools become more advanced, there's still such a strong problem-solving element to this work that only the human mind can truly master. I can't imagine a better exercise for the brain.

Our cover story for this issue fits the theme of humanity versus technology as Gary Raman draws parallels between HVAC systems and the human body. We also have a fantastic feature by Bob Jackson on the importance of vapour barriers in cold rooms, an interview with Ree McCaig on training and diversity in HVAC&R, a position statement from AIRAH on the importance of minimum skills requirements, and a breakdown of what the government's 2035 emissions target means for our industry. Our skills workshop offers technicians guidance on air filter maintenance.

I hope these stories provide some food for thought in our increasingly technological world.

Nick Johns-Wickberg
EDITOR
nick.johnsw@airah.org.au

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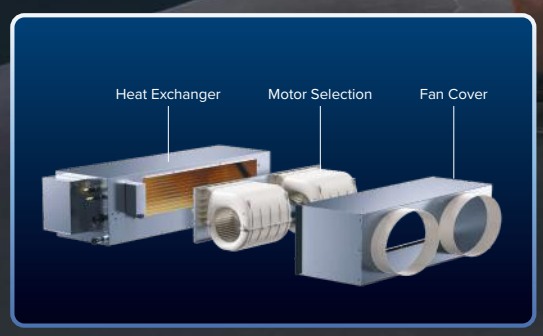
Built-in Condensate Pump

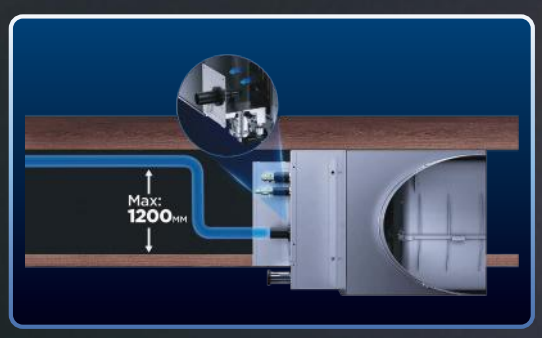
Wifi Smart Control

200 Pa High Static Pressure

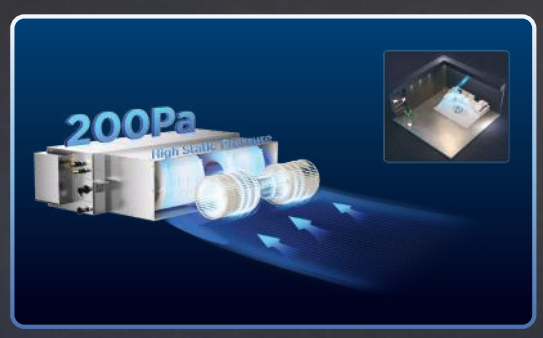
Self-cleaning Function



Split Design | Easy Installation



Built-in Condensate Pump



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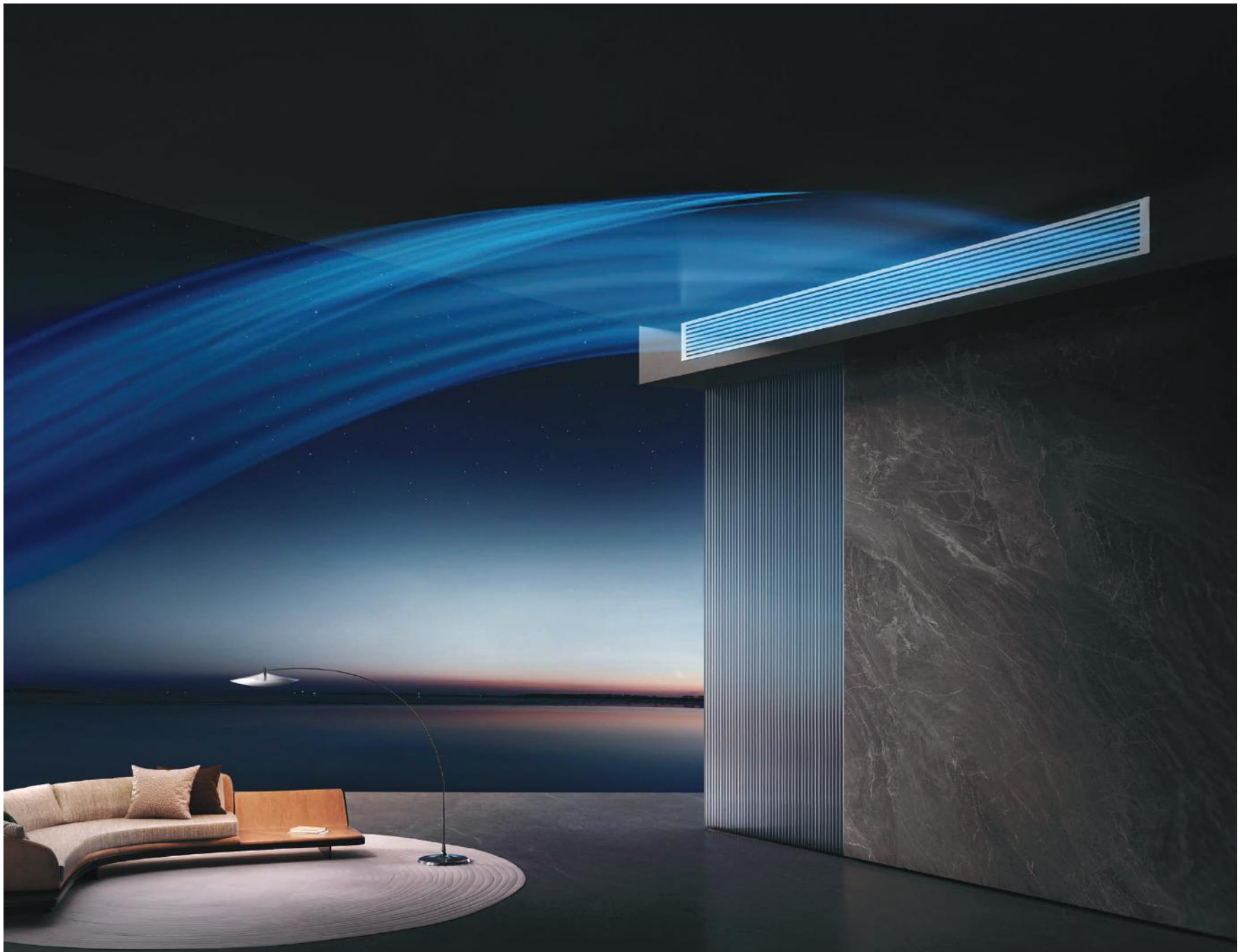

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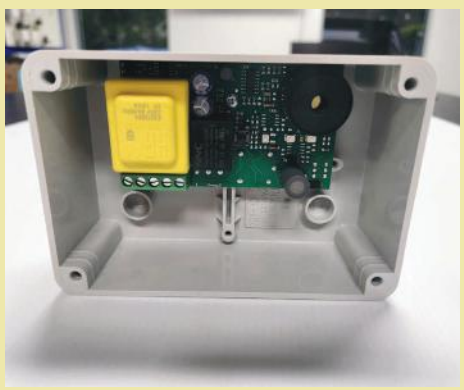
New ducted offering

Fujitsu General has launched its large capacity R32 High Static Ducted series, completing the company's R32 ducted family for the Australian market. The new range spans capacities from 18kW to 22.4kW. It uses R32 refrigerant, which Fujitsu says improves energy efficiency and lowers environmental impacts compared to earlier R410A models.

According to Fujitsu, the new models record improvements in key metrics, including total cooling seasonal performance factor (TCSPF) and heating seasonal performance factor (HSPF) across the 65, 72, and 90 systems, making it appropriate for both homeowners and businesses.

The R32 High Static Ducted series is available now through Fujitsu General's authorised dealer network across Australia, and the 65 model is offered in both single-phase and three-phase variants.

fujitsugeneral.com.au



Making (gas) sense

Duct-mounted refrigeration gas sensor Gas-sense has been released to the Australian market.

The company says that, unlike conventional wall-mounted sensors, Gas-sense has a probe directly installed within the ductwork, allowing for real-time detection of refrigerant leaks where airflow carries potential contaminants. This, the company says, ensures faster response times, more accurate readings, and enhanced safety across commercial and industrial environments.

The product can detect flammable refrigerant gases and HFC gases to provide an early warning before leaks pose a safety risk.

gassense.au

Evaporative wizardry

Australian air conditioning manufacturer Seeley International has announced the launch of its next-generation Climate Wizard: the CW-X & XR Series.

According to Seeley, the indirect/direct evaporative cooling system is purpose-built for high-performance cooling in large-scale environments, featuring a low-profile stainless-steel design appropriate for industrial, recreational, and commercial facilities.

Modular installation supports single-lift deployment for both rooftop and ground-level placement, with minimal roof penetrations and a single-point service connection. An integrated chassis enables beam-to-beam mounting, which Seeley says eliminates the need for additional structural supports. The CW-X/XR Series also offers an optional built-in walkway, transforming it into a fully self-contained module.

Each unit comes equipped with a Schneider PLC Controller as standard, enabling local and BMS integration. It also supports redundancy and includes a fault register.

seeleyinternational.com

Cooling evolution

Temperzone has released the Evolve IMD-Y standard compact profile range and the Evolve IMDL-Y low-profile range of chilled water fan coil units in Australia.

According to Temperzone, both series have the following features:

- High static fans with EC direct drive fan motors
- PTC elements and SSR element control relays in all electric heat units
- Hydrophilic coated coil fins
- ALC interface controller in each fan coil
- Rigid moulded PVC drain trays in Evolve IMDL-Y units
- Galvanised steel drain tray in Evolve IMD-Y units
- Full compliance with AS/NZS standards.

The following optional accessories are available for the two series:

- Evolve IMDL-Y low profile unit filter options, flat panel (EU2/G2)
- Soon to be released, filter box options for Evolve IMD-Y standard profile units with EU2/G2 flat panel filter or EU4/G4 with pleated 50mm filter
- Flexible hoses
- Spring mounting kits
- Evolve IMDL-Y low profile unit supply air multi-spigot plenums.

temperzone.com

Heavy-duty VRF

Mitsubishi Heavy Industries Air-Conditioners Australia (MHIAA) has announced the launch of the KXZ3 series VRF system, which it says is the first large-capacity commercial variable refrigerant flow (VRF) system in Australia to adopt R32 refrigerant.

The company says the KXZ3 allows modular combinations of up to three outdoor units for a total capacity of 100.5kW, with extended piping lengths of up to 160m and maximum vertical separation of 30m.

According to MHIAA, the KXZ3 also includes an R32 scroll compressor, slim heat exchanger with 7.0mm copper piping, optimised airflow design, and VTCC+ control system for greater efficiency in partial load conditions, as well as optional safety accessories including refrigerant leak detectors, alarms, shut-off valves, and ventilation systems.

mhiaa.com.au

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Long Pipe Lengths
The Mr Slim outdoor units feature power inverter technology with superior turndown capacity and long piping lengths up to 100m for PUZ-ZM200/250YKA-A. For installations with a pipe length of 50m or less, it is possible to use 7/8” soft-drawn copper pipe for Mr Slim outdoor units PUZ-ZM200/250YKA-A. These two models do not require additional refrigerant charge when the installed pipe length is 50m or less and helps reduce installation cost and time.

For more information on our products please visit **mitsubishielectric.com.au** or call 1300 280 625

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Tassie trades survey

Tasmania's Consumer, Building and Occupational Services (CBOS) is running a survey seeking industry insight into the risks faced by HVAC&R trades and how regulatory oversight could help mitigate these risks.

Currently, Tasmania does not have a licensing framework for air conditioning and refrigeration work – and many believe one is required. CBOS indicated that it is open to exploring the idea and has committed to forming a working group.

"We encourage those in the industry to respond to the survey," says AIRAH Advocacy and Policy Manager Mark Vender.

The survey is available until October 31.

cbos.tas.gov.au

Award for MHIAA

Mitsubishi Heavy Industries Air-Conditioners Australia (MHIAA) has been awarded the Canstar Blue Most Satisfied Customers Award in 2025, achieving five-star ratings in six of seven categories – including overall satisfaction, value for money, performance, features and functionality, quietness, and design.

"This award is a great honour and reflects our team's commitment to quality, performance, and innovation," says MHIAA Managing Director Mr Akihiro Nakajima.

mhiaa.com.au

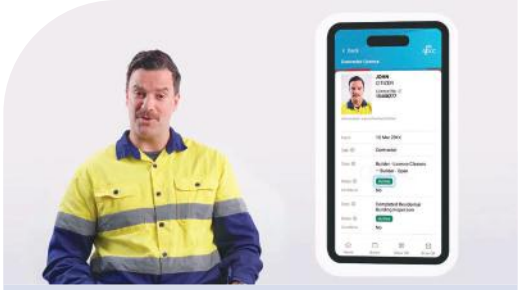
GENERAL

Name change for Fujitsu

From January 1, 2026, Fujitsu General will operate under the trading name General Inc.

The change comes after the company became a member of the Paloma Rheem HD Group through a public tender offer in August. General says its new brand symbol will be "gradually and smoothly" introduced in 2026 as it releases new products and offerings.

fujitsugeneral.com.au



Queensland goes digital

The Queensland Building and Construction Commission (QBCC) has announced that it will start introducing digital licences, developed in partnership with the Queensland government as part of Queensland's Digital Licence app.

The rollout is being conducted across three tranches between September and November 2025. Mechanical services licences, including air conditioning and refrigeration, are expected to be available in late 2025. More information, including licence types in each rollout phase, is available on the QBCC website.

The webpage explains that a digital licence carries the same legal status as the physical licence card, which licensees will still receive. While digital licences are optional and physical licences will continue, the QBCC is encouraging licensees to explore the benefits of going digital.

qbcc.qld.gov.au

More apprentices gaining CO_2 cred

A further 20 fourth-year apprentices have gained nationally recognised accreditation in CO_2 Safety and CO_2 System Repair and Service (UEERA0006 and UEERA0066) through the Kirby Apprentice Fund.

Participants undertook the training program at the Beijer Ref Academy, delivered by SCM REF AU, certified by Superior Training Centre and supported by product and controls training from Appion, Supercool Group, Danfoss and Copeland.

This is the second iteration of the scholarship program for the year, with 40 HVAC&R apprentices now having gained accreditation in 2025. The partners involved in the program are:

- Kirby HVACR
- ARBS Education and Research Foundation
- The Australian Refrigeration Council (ARC)
- Woolworths
- Supercool Group
- Danfoss
- Copeland.

kirbyhvacr.com.au

FeroTech's sweet partnership

Sydney-based BMS and electrical services company FeroTech Controls and Electrical has partnered with Honeywell.

As part of the collaboration, which began in August this year, FeroTech has become a system integrator of Honeywell products. FeroTech says the partnership will allow the company to integrate Honeywell technologies into their work, creating customised solutions for clients.

"This is a major milestone for FeroTech, with Honeywell being such a recognisable brand in the industry," says FeroTech Director Peter Hill, Affil.AIRAH.

"This partnership will allow us to offer a wider range of integration options and system flexibility for our clients, all the while reducing energy and operating costs."

ferotech.com.au

Worrying climate forecast

The Australian Climate Service has released the National Climate Risk Assessment, a first-of-its-kind report categorising and assessing Australia's climate risks.

The report collates a diverse set of data and knowledge to forecast what Australia could look like in coming decades under three climate change scenarios: average increases of 1.5°C, 2°C, and 3°C. It makes predictions with five levels of confidence – ranging from very low to very high – depending on the strength of evidence and the level of agreement among experts.

The report makes specific findings and recommendations about risks to the built environment sector, including supply chain breakdowns and reduced energy security.

acs.gov.au

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Free standards for ARC licence holders

The Australian Refrigeration Council (ARC) has announced new funding to provide free access to curated standards for RAC technicians and businesses.

The initiative will provide Refrigerant Handling Licence (RHL) and Refrigerant Trading Authorisation (RTA) holders with free and easy access to essential industry standards.

Permit holders will now be able to view the curated set of RAC standards on the Standards Australia mobile app, using a sponsored voucher code that can be obtained via the ARC website.

Vital standards

The standards in question offer comprehensive guidance across the full lifecycle of RAC systems, covering specification, design, installation, servicing, and end-of-life decommissioning.

Referenced in Section 135 of the *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 (Cth)*, these standards form part of the compliance framework for licensed technicians under the terms of their licence.

"This initiative is about equipping the industry with the tools they need to uphold safety, environmental responsibility, and regulatory compliance," says ARC CEO Glenn Evans.

"Making these standards easily accessible is a step forward in strengthening industry capability and professionalism."

What's included

The voucher code offers free access to the RAC technician's set, which includes the following standards:

AS/NZS 5149.1:2016
Refrigerating systems and heat pumps – Safety and environmental requirements, Part 1: Definitions, classification and selection criteria (ISO 5149-1:2014, MOD)

AS/NZS ISO 817:2016
Refrigerants – Designation and safety classification

AS/NZS 5149.4:2016
Refrigerating systems and heat pumps – Safety and environmental requirements, Part 4: Operation, maintenance, repair and recovery (ISO 5149-4:2014, MOD)

AS/NZS 5149.3:2016
Refrigerating systems and heat pumps – Safety and environmental requirements, Part 3: Installation site (ISO 5149-3:2014, MOD)

AS/NZS 5149.2:2016
Refrigerating systems and heat pumps – Safety and environmental requirements, Part 2: Design, construction, testing, marking and documentation (ISO 5149-2:2014, MOD)

Gain free access

Permit holders can obtain a free voucher code via the ARC website by scanning the QR code and filling in the form. This voucher code can then be redeemed through the Standards Australia Store for mobile-only access.

Please note: Voucher codes are limited each month and are available on a first-come, first-served basis.

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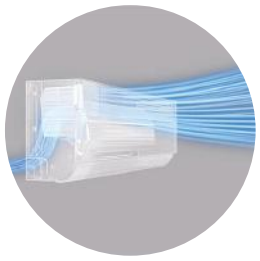

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*The test conducted at Intertek Testing Services Shenzhen Ltd., in 30.0m³/h air flow with DEHS Aerosol, report No. 230504050GZU-001. **The data is tested by Midea Laboratory, and based on the maximal fresh air volume 60m³/h with the room size of 20 square metres and 3 metres high. The product is equipped with 30m³/h fresh air as standard, while the maximum air flow can reach to 60m³/h if the hole is enlarged and the chamber is expanded in A/C installation. ***Self-cleaning mode reduces coil-trapped bacteria by 99.9% after 2 cleaning cycles, tested by UL Solutions (No. A802784). Visit http://verify.ul.com for further details.

Workforce plan highlights skills shortage

Powering Skills Organisation (PSO) has published new research showing what needs to be done for Australia to reach its net zero goals.

PSO released the 2025 edition of its annual *Workforce Plan* in September. According to the plan, Australia needs to train 42,000 new tradespeople by 2030 to meet the country's energy transition needs. This would mean creating 22,000 more "energy apprentice" positions than are currently available across the country.

There are many occupations and apprenticeships that fall under the federal government's New Energy Apprenticeships Program. Among these are air conditioning and refrigeration technicians, mechanical services technicians and mechanical services plumbers, for which a range of refrigeration and air conditioning training courses are eligible. Those who undertake these training courses are considered energy apprentices.

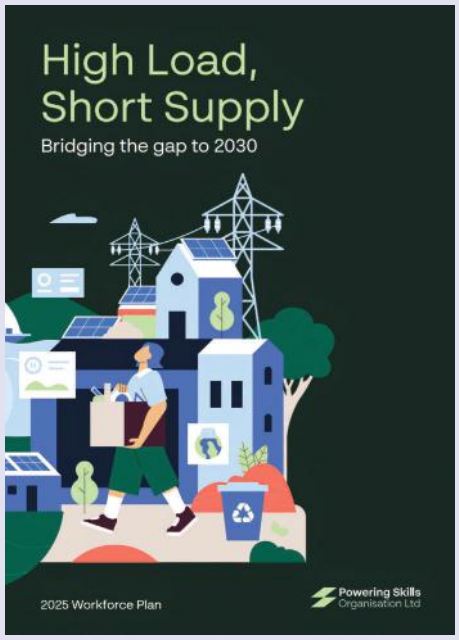
Multi-pronged apprentice challenge

The report finds that Australia needs to boost energy apprentice numbers by around 40% in the next five years to meet its net zero goals. According to PSO, this presents a significant challenge for several reasons.

The first is that apprenticeships are often seen as a second-choice pathway, with research showing that 78% of students plan to attend university and only 10% consider an apprenticeship. Despite this, demand for apprenticeships in many fields continues to outpace businesses' and training institutions' capacity to take on new learners.

Another issue is that up to three-quarters of employers offering energy apprenticeships are in the "micro", "small", or "medium" category, and they take on apprentices with little to no financial gain. Third- and fourth-year apprentices are commonly "poached" by larger companies, further reducing the incentive for smaller businesses to invest the time and effort into trainees.

Finally, many training institutions are struggling, with 79% reporting to PSO that they need more teachers, with low pay discouraging potential educators from taking on these positions. For 77% of training institutions, a lack of infrastructure is causing problems, including long wait times and delays in commencements.



Read the full report

You can read the full report by scanning the QR code. To find the full list of actions, enter "170" into the page search function within the report.

The path forward

To help resolve these challenges, PSO has outlined 31 actions that need to be taken – 15 of which are already being implemented, with a further 16 proposed.

Among the proposed actions are:

- Research projects to understand the benefits of undertaking apprenticeships, remove barriers to entry, reduce wait times, and find ways to improve support for mature-aged apprentices
- Policy and advocacy projects to clarify the role of post-trade training for energy workers
- Workforce projects to develop bodies and educational resources that would improve training, strengthen connections between training providers and industry, and better connect apprentices to potential employers.

Actions already being implemented include:

- Workforce projects to increase First Nations participation in energy apprenticeships
- Mapping state and territory licensing and regulations
- Consolidation of competency development units
- Reviewing why enrolments are low in some courses
- Creating a VET workforce blueprint.

HVAC&R SKILLS WORKSHOP

Air filter maintenance

MODULE 166

WHAT'S IT ABOUT?

This skills workshop provides an overview of the operation and maintenance requirements for air filters and associated systems.

WHO'S IT FOR?

Relevant for technicians involved in installing and maintaining air filters in HVAC systems.

This skills workshop, taken from AIRAH's *DA15 – Air filters and cleaning devices*, introduces technicians to best practice when conducting maintenance on air filters in HVAC systems. It outlines different maintenance approaches, offers guidance on testing, and provides instructions for safely removing, disposing of, and replacing air filters.

Maintenance

The maintenance imperative

It is essential that filtration systems are maintained throughout their service life. Filter manufacturers supply maintenance instructions, and these should be readily accessible to service personnel.

Most filter maintenance centres around changing out the filters or removing and cleaning or regenerating filter or air cleaning units.

For many HVAC&R applications "system maintenance" is crucial for ensuring the energy-efficient operation of the system fans. For example, cleaning or replacing the filters in an air conditioning system reduces system resistance and reduces fan energy use.

WHS requirements place a duty of care on the building occupier or a person conducting a business undertaking (PCBU) to maintain all equipment that influences the indoor environment quality of the building. The IEQ impacts occupants and visitors including maintenance staff and the public.

Access for maintenance

For a filter to be maintained there must be adequate access provided to service personnel for inspection and filter replacement. Where adequate access is not provided, then filter maintenance will most likely not be carried out. The provision of safe access for maintenance is a fundamental WHS requirement.

Preventative maintenance

Maintenance requirements vary with the type of filter, the type of installation and the system application. Preventative routine maintenance extends the life and the performance of the system. Maintenance routines comprise checking and periodically replacing filters.

Predictive maintenance

Predictive maintenance goes one step further and is generally applied to critical systems where failure is costly or unacceptable. Predictive maintenance includes continuously or periodically monitoring the system key performance indicators such as flow, temperature, pressure, current draw and vibration, and using that data to predict future failure or reduction in performance. Filter problems are detected and resolved early, prior to any critical failures.

Filter maintenance

Filter performance depends on proper selection, installation, operation, testing, and maintenance.

The scheduled maintenance program should include procedures for installation, removal, and disposal of the filter media. Proper maintenance, including monitoring of filter efficiency and system integrity, is critical to ensuring HVAC systems operate as intended.

It is important that filters are clean. A dirty filter may be more effective at filtering than a clean one, but only at the cost of increased energy consumption, reduced airflow, and potential shortening of equipment life. Indoor relative humidity at the filter should be kept below 60% to minimise microbial growth.

Filter resistance and pressure drop

Filter efficiency increases as particulate material is trapped because the captured particles help trap additional particles. However, there comes a point where the particulate build-up causes an excessive resistance/pressure drop across the filter, which the system fan cannot handle. The filter should be changed out before this point because the restricted airflow can reduce comfort, increase energy consumption, and damage equipment by overworking the fan and shortening operating life.

Scheduling maintenance

It is common that filters are changed out (replaced) according to fixed periodic time schedule. As a result they are often changed either too early or too late, and rarely optimally.

Optimising filter life-cycle involves monitoring of the filter's performance. The ideal is to not change filters too often, causing high replacement costs, but also not so infrequently as to is impede system airflow or reduce IAQ.

An air filter should be changed when the filter creates an excessive pressure drop. Manufacturers publish final resistances, which are the maximum point a filter may be operated to without expected mechanical failure.

In practice, actual change-out pressure drops may be significantly less than this and will vary from system to system. For an optimum solution the filter should be changed out when the resistance causes an increase in energy use that will exceed the cost of the new filter, see Figure 1.

Note: See *Scheduled maintenance* for a summary of AIRAH *DA19* recommendations for scheduled filter maintenance.

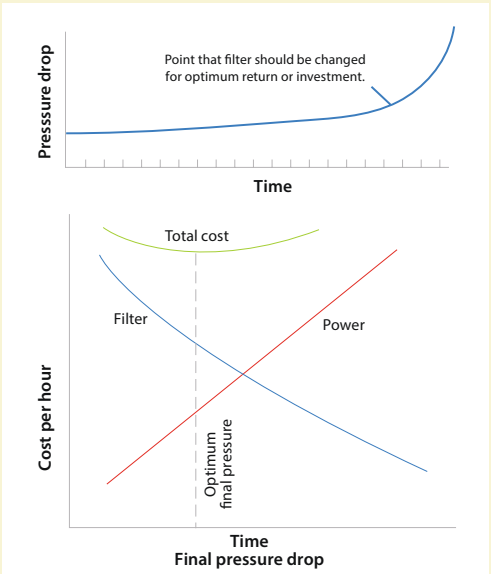


Figure 1: Optimising filter change-out time.

Condition-based maintenance

Periodic visual inspections combined with monitoring the pressure drop across the filter with a mechanical or digital manometer is a simple solution to inform filter maintenance schedules.

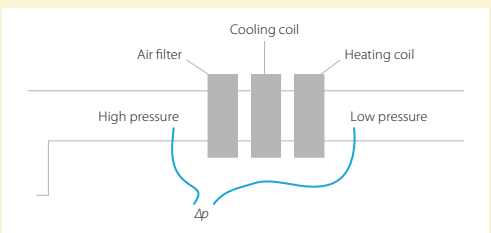


Figure 2: Filter (and coil) pressure differential monitoring.

Filter (and coil) pressure differential monitoring is applied across the filter/coil bank, see Figure 2. When a pre-set maximum pressure differential is reached an alarm is initiated to change the filter or clean the coils.

Different types and depths of filter, different filter configurations, and rate of pressure increase etc., are all dynamic factors that should all be taken into consideration when setting filter pressure drops for monitoring systems.

Recommended final pressure drops for AS 1324.1 rated air filters are listed in Table 1.

AS 1324 Filter rating	Recommended final pressure drop (Pa)
G1 to G4	150
F5 to F7	200
F8 to F9	300

Table 1: Absolute final pressure drops for AS 1324.1 rated air filters

These "final" pressure drop values are absolute values (designed to prevent complete blocking of the filter) not optimised for change-out based on filter costs, energy consumption and labour costs. Pressure drop trends across filter bank can also be monitored to indicate when a change-out is required or to detect and diagnose a leak or other system fault, see Figure 3.

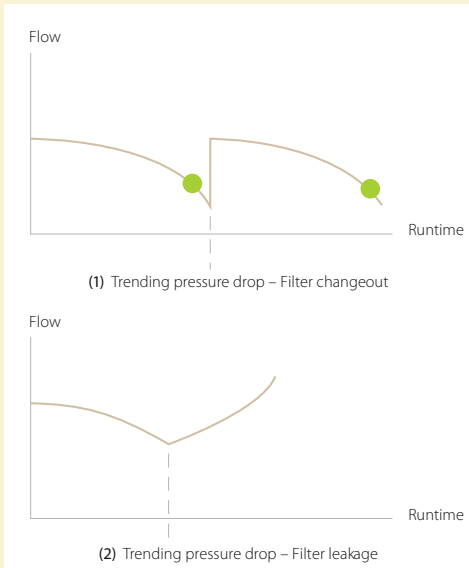


Figure 3: Trending pressure differential across filter bank.

Filters should be visually inspected or monitored for microbial growth periodically. When microbial growth is found it is a good idea to remove selected filter elements and send them to a laboratory for testing.

Filter change-out

Only adequately trained personnel should perform filter maintenance.

Ideally filter change-outs should occur when the facility is unoccupied. If this is not possible it is critical to turn off the supply fans to prevent debris from entering the ductwork downstream of the filters. HVAC systems should be locked out/tagged out while conducting maintenance to prevent contaminants from being entrained into the moving airstream.

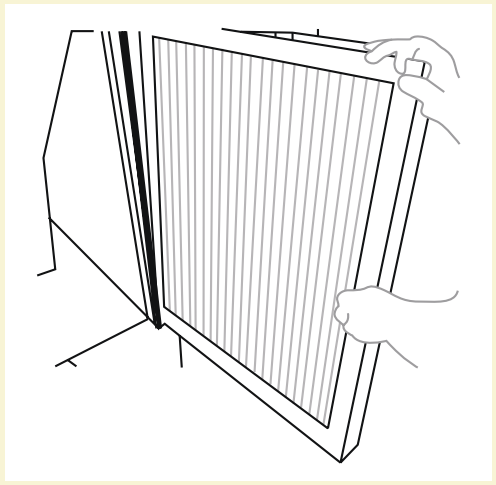


Figure 4: Changing out a panel filter.

When changing the filter, make sure that the replacement filter is of the correct size and compatible with the housing, see Figure 4. When removing a used filter, avoid dropping contaminants in the ductwork.

Persons performing maintenance and filter replacement on any ventilation system that is likely to be contaminated with hazardous contaminants should wear appropriate personal protective equipment (PPE) such as respirators, gloves, etc. Old filters should be placed in sealed plastic bags upon removal.

Filter installations should be thoroughly checked each time they are changed to be sure that gaskets are tight. Periodic checks between change-outs will ensure that there are no tears in the media or breaches in the frame, and that they are functioning properly. Not checking the proper installation and function of the air filters will decrease the life of the other system components, increase maintenance costs and potentially lead to the dispersion of unhealthy air contaminants throughout the building.

Filter disposal

Have a plastic bag handy and turn off the unit before commencing.

Carefully remove the used air filter/media from the unit. Place it gently into the bag without shaking to prevent it from releasing particles into the air. Tie or tape the bag shut. Dispose the bagged air filter in an approved site. Appropriate PPE should be worn.

Filter replacement

Filters should be transported and stored in their original packaging, to protect them from contamination.

They should not be unwrapped until immediately prior to installation, at which point each filter should be visually checked for any handling or transport damage. Damaged filters should not be used.

The entire filter area should be cleaned and washed down while fans are off.

Ongoing inspection

Regular checks using a particle-counting instrument is an effective means of evaluating filters in-operation to be certain they are performing as they should, verify they have no tears or holes, and confirm that seals and support framing are airtight.

Recording maintenance

To facilitate ongoing filter maintenance, labels should be placed on the filter housing units with operational information such as the:

- Number and type of filters
- Date last changed
- Initial and final pressure drop.

Filter monitoring technology

To determine the level of filter loading and filter resistance, various sensor technologies can be used, to monitor either pressure differential or airflow:

- Magnehelic gauge, which measures and illustrates the pressure difference before and after the filter. The gauge usually has two inlet ports that are each connected to the pressure points being monitored.
- Differential-pressure sensors, which measure the deflection of a diaphragm work best when the pressure drop across a filter is high. The devices typically lack the sensitivity required for very small pressure differences.
- Pressure switches can be used to indicate when a certain predefined pressure value is exceeded.
- Microthermal differential-pressure sensors permit a small amount of airflow, which is measured to determine pressure difference. These sensors are particularly suitable for filters with low differential pressures. They cannot be used when safety-critical sterilisation is achieved with air-cleaning systems.
- Flow sensors, which measure airflow, can be used. They are usually placed behind the filters, in the clean zone.

By logging data over time, trends can be assessed and an estimated date for filter change-out determined, see Figure 3.
The relationship between airflow and pressure drop and the resistance of the filter is illustrated in Figure 5.

The most accurate filter monitoring is achieved when both pressure drop and flow are measured to determine changes across a filter in relation to airflow.

Other methods in use for monitoring filters include:

- Optical systems, through which the discoloration (due to dust build-up) of a filter is measured
- Dust-load sensors, which measure dust concentration in the filter based on the triboelectric effect.

These are more expensive and rarely used in HVAC applications.

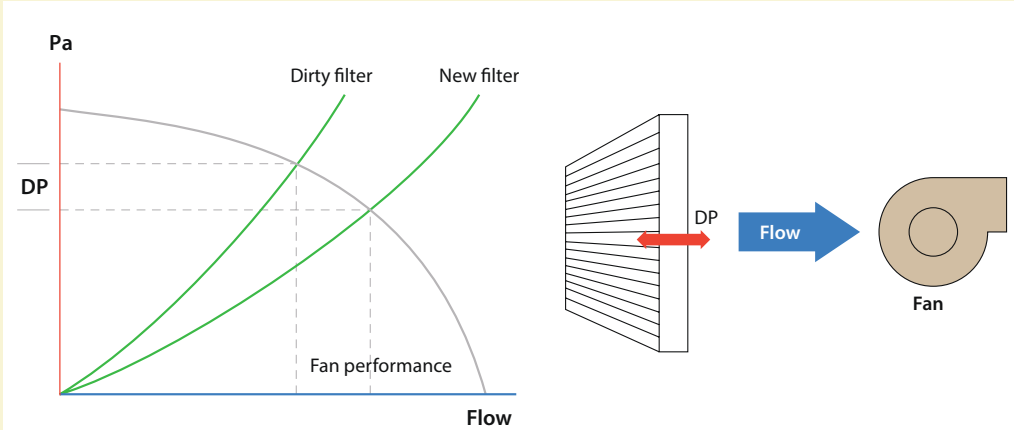


Figure 5: Monitoring filter resistance.

On-site testing

Besides visual inspection of filter installations, common on-site in-situ tests include:

- Recording of manometer readings
- Measurement of face velocity upstream of the air filter using an anemometer
- Use of portable particle counters (a pair may be used to determine in-situ fractional efficiency)
- Filter integrity testing of HEPA/ULPA filter installations, see 6.9
- Dust sampling for laboratory analysis

Scheduled maintenance

Mandatory and preventative maintenance routines are generally carried out to a scheduled frequency.

The frequency required for a particular filter will vary by application, i.e., duty, location, and quality of environment etc.

It is important that filters are checked in accordance with the manufacturer's schedule and the recommendations from AIRAH.

It is often necessary to install a stand-by unit so that the regular maintenance can be carried out without losing use of the system.

Recommendations

Poor installation and maintenance of air filters can lead to expensive coil and duct cleaning as well as high resistance to airflow, higher system pressure drops and consequently higher fan energy usage.

The contractor should ensure that frames have adequate strength for their design filter pressure (particularly relevant with large filter banks or those with cardboard frames). A dirty filter condition can be simulated by covering part of the media with an impervious material such as plastic sheeting. This technique can also help verify fan performance, system integrity, pressure alarms and manometers. It is also essential that media is as specified and is installed so air passes through it in the designed direction.

Manufacturers specify maximum pressure drops for their filters that are based on the laboratory performance testing of the filter.

Designers often use other (lower) maximum pressure drops and maximum design resistances.

The maximum design resistance should never be exceeded regardless of any maximum pressure drops recommended by manufacturers. Allowing systems to operate at higher than design resistances will reduce system performance and efficacy.

It should be noted that where a maximum fan power is required by the NCC the design resistance of the filter (bank) may be less than that which the filter manufacturer would otherwise recommend.

Clean out the filter area after each filter service. This is the time when dirt is most likely to be left in the chamber on the clean side of the filter.

Refer to the manufacturer's instructions.

This month's skills workshop is taken from AIRAH's *DA15 – Air filters and cleaning devices.*

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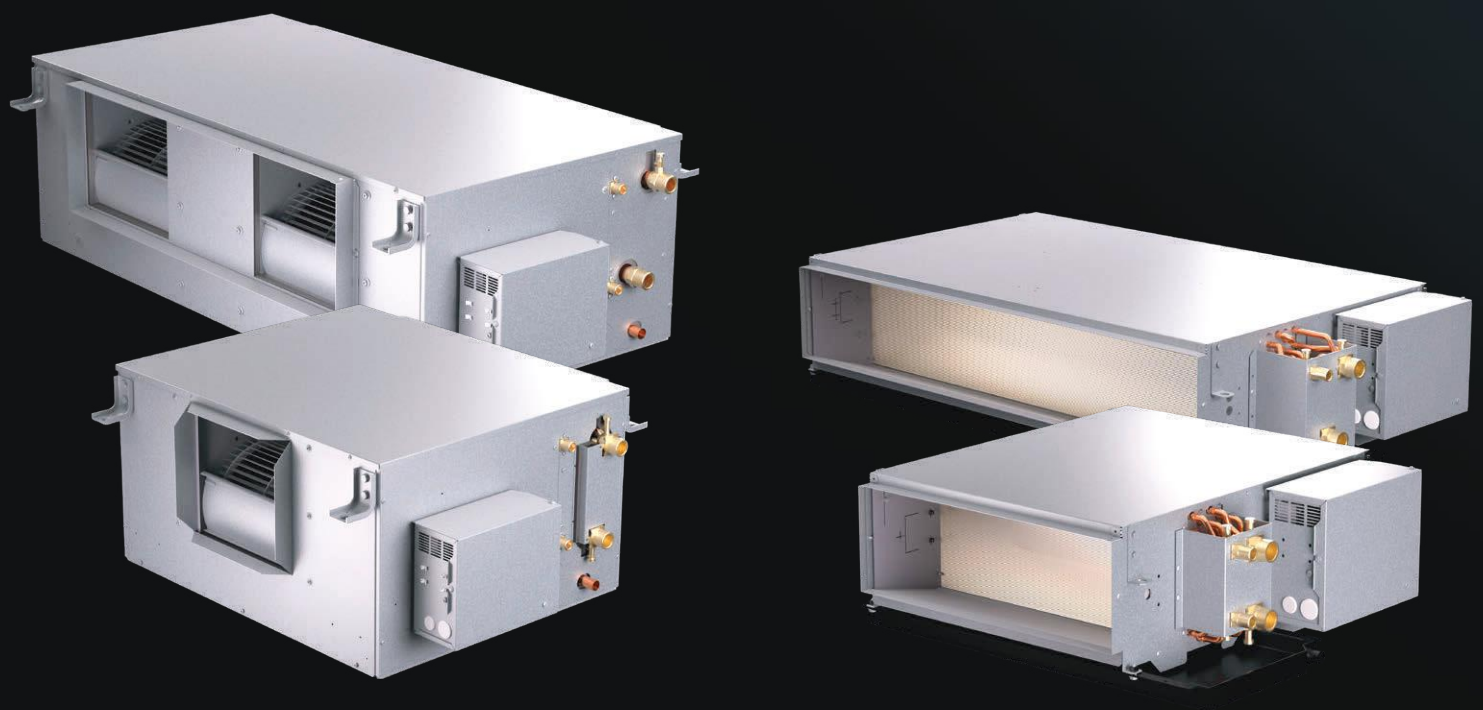

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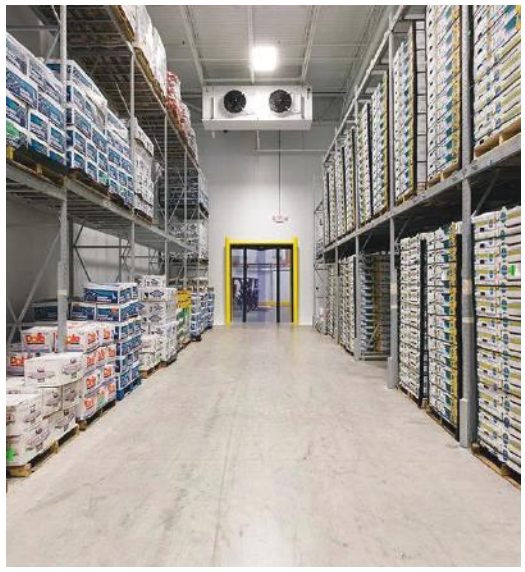
The importance of **vapour barriers** in refrigeration



Bob Jackson, M.AIRAH, explains the importance of hermetically sealing the outer skin of cold rooms to create a vapour barrier.

You learn a lot working in your field. Many of those things only come with experience, not from a textbook.

Since 1964, the importance of vapour barriers in refrigeration has been drummed into me by various professionals, including my extremely knowledgeable mentor, Keith Greenhalgh. However, I believe many people working in our industry today haven't had the training or experience to properly understand why vapour barriers are so important in cool rooms and freezer rooms.

I've written this article to share some of my experience on the issue.

Under (vapour) pressure

When we design a cold room, we always tell the builder to seal the outer skin, but we don't tell them why it is so important. This article aims to do that, focusing on how vapour pressure can cause moisture ingress.

Let's consider the conditions in my hometown, Cairns. The vapour pressure at design conditions for Cairns (32.8°C dry bulb and 26.8°C wet bulb) is 23.5mm of mercury (Hg). This can be seen in the psychrometric chart.

The vapour pressure at the outside of the inner skin is 2.8mm of Hg. This means the vapour pressure difference between the two points is 20.7mm of Hg.

One mm of Hg equals 133.322 pascals (Pa), so the difference between the two points is 2,760Pa. If the outside skin is not hermetically sealed with a proper vapour barrier, the pressure difference between the two points will cause moist air to pass through the outer skin and into the insulation.

The above figures are for a medium temperature cold room. The vapour pressure difference is significantly larger for a freezer room.

How to create a vapour barrier

Hermetically sealing a cool room stops vapour ingress from degrading the insulation over time, as well as preventing moisture from collecting below the cool room itself.

So, how do we create this vapour barrier?

Our approach to hermetically sealing refrigerated spaces has evolved over the years. Until the late 1950s, cold rooms were built on site using cork insulation. The cork was coated with pitch to achieve a vapour barrier.

In the early 1960s, Australia became one of the first countries to use insulated sandwich panels, a development that revolutionised how we build cold rooms. The best way to hermetically seal a cold room or freezer room that uses sandwich panels is as follows.

Smaller cold rooms

In smaller cold rooms, the first step is to place a bead of butyl mastic along each internal surface of the external aluminium angles before they are riveted to all of the external corners. This includes all floor, ceiling and wall corners.

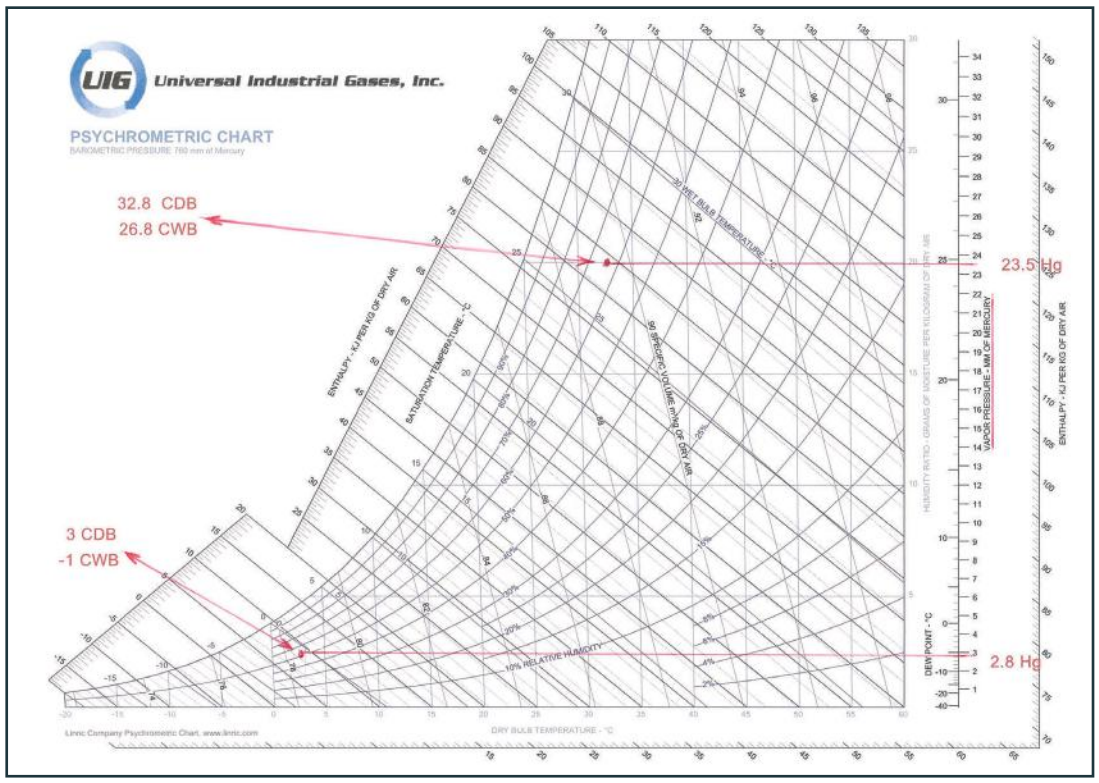
It's also necessary to run a bead of mastic along one edge of the external slip joints on all floor, ceiling and wall panels before marrying them into one another. Panel manufacturers have provisions in the slip joint to accept this bead of mastic.

Once the cold room is constructed, door and service door inserts are installed. Take care to also seal around the outer edge of the door inserts.

Larger cold rooms

In larger rooms, the same process applies, but the vapour barrier under the floor is dealt with a little differently.

1. First, fix the external aluminium floor angle to the structural concrete floor
2. Run a generous bead of mastic along the horizontal face of the aluminium floor angle
3. To create a vapour barrier, lay a strip of polyethylene film (such as Visqueen) approximately 300–400mm wide along the angle, pushing it into the bead of mastic. Laying the film under where the wall panels are being positioned allows work to be carried out without damaging the film that will eventually be installed in this area. It is imperative that the sealing integrity of the film is not compromised
4. Lay a bead of mastic along the inside vertical face of the floor angle and assemble the room as previously described



5. Once the room is fully constructed, lay out the film on the total internal floor area. Lay a generous bead of mastic along the previously installed film under the wall panels. If you need several strips of film for a large room, simply overlap the sheets at each joint and maintain the integrity of the vapour barrier by laying a generous bead of mastic between each overlapping sheet
6. Place the floor insulation inside the room on top of the film.

Notes on rivets

There are rivets designed specifically for cold room construction. Unlike normal pop rivets, these are designed for the whole rivet to expand along their whole length, meaning they expand into the hole and create airtight conditions.

These are are also known as “blind” rivets, meaning the expansion mandrel remains inside the rivet. These rivets also play an important role in maintaining the integrity of the vapour barrier. With standard rivets, there is no guarantee that the mandrel will remain in the rivet, so you could end up with an open hole through the centre of the rivet.

Don’t forget the slab

Sealing the sandwich panels isn’t the only step we need to take. A key but often overlooked aspect of sealing cold rooms is the concrete slab on which they’re built.

When a cold room is built on a suspended slab, sensible heat will flow from the slab over a period until it can reach a point where the temperature of the slab may fall below the dew point temperature of the air in the space below the concrete slab. Moisture forms on the underside of the slab, which can cause a real problem if there is tenancy below.

The solution is to install heating between the underside of the cold room and the top side of the concrete slab. This ensures that the temperature of the concrete slab remains above the dew point temperature of the space below.

There are multiple ways to heat the slab, with electric heaters being the most common. The wattage required differs between cold rooms and freezer rooms, and it’s best to install a spare heater as redundancy in case the original fails.

The downside of installing electric heating is the energy penalty, although this can be reduced by installing thicker insulation. It is advisable to install a pocket for a temperature sensor between the underside of the floor insulation and the top side of the structural slab so the heaters can be thermostatically controlled. The temperature of the slab here only needs to be above freezing (0°C).

To avoid the need for heating, some freezer complexes are built on a raised slab with an air gap between the underside of the concrete slab and the ground below. Another solution for freezers is to install slotted irrigation pipes at 900mm centres underneath the slab. The pipes need to be installed with a fall on them so that the ambient air will pass through them by natural convection. If natural convection doesn’t work, small fans can be installed to force air through the pipes. This method is called sub-floor ventilation.

Real-world examples

Below are five real-world examples of how hermetically sealing cold rooms can be hugely beneficial down the track.

Standing the test of time

When my apprenticeship employer (K. M. Greenhalgh) started building cold rooms in 1964, the edges of every panel were hermetically sealed with marine varnish. This meant that if the vapour barrier of the room was compromised in any way, the panels did not become waterlogged, as they each had their own vapour barrier. We installed our first cold room at Silkwood Butchery in 1964 – it’s still in service more than 60 years later.

Lesson learnt

Many years ago, we installed a cold room in a temporary location until the customer’s new premises were ready for occupancy. We decided not to seal it with mastic, as it would have been very messy when we were dismantling and reinstalling the cold room in the new location. We thought it wouldn't cause problems, but we were soon proven wrong! In just two months, the panels became quite waterlogged.

Cyclone-proof

After Cyclone Yasi, we got called to a job where an old Greenhalgh cold room had been smashed to pieces. That room had been in service for over 40 years. I retrieved a piece of the insulation and found it to be still in pristine condition, all thanks to a proper vapour barrier.

A great investment

In 2018, one of our customers purchased a hotel in Mareeba and called me to install a new main bar cold room. The original cold room was installed in 1970 by K. M. Greenhalgh, and the customer thought that after 48 years, the cold room would be completely waterlogged. We took samples of the cold room panels, and again they were in pristine condition; all the owner had to do was install modern glass door inserts and make some cosmetic adjustments, but not having to buy a new cold room saved him tens of thousands of dollars.

Added complications

In 2007, we built a new large freezer complex in Cairns. We hermetically sealed the exposed insulation on every edge of every panel, ensuring the insulation will be still dry decades down the track. Fortunately, we were dealing with a customer who could see the benefits of spending the extra money.

However, this project highlights a difficulty in maintaining the integrity of the vapour barrier on the outside skin of large complexes over many years. In a large freezer complex, the temperature could be -25°C on the inside skin of the panel and 35°C on the outside skin. The difference in temperature between the two skins causes the panels to move and damage the integrity of the vapour barrier, like you might see in a large bimetal strip. In large installations like this one, making “conduction cuts” in the panels can minimise this movement and extend the freezer room’s lifespan.

Protecting against frost heave

For most cold rooms built on a concrete slab placed directly on the ground, sub-floor heating isn’t necessary. However, a freezer room bigger than approximately 6x6m built directly on the ground needs this sub-floor heating to prevent what is known as “frost heave”.

Frost heave occurs when the ground below the freezer falls below 0°C. The water in the ground turns to ice, expands, and “heaves” the building up with it. As you can imagine, frost heave can have disastrous structural consequences.

Conclusion

The above examples show why vapour barriers are so important. This principle doesn’t just apply to refrigerated cold rooms; vapour barriers are also important in applications such as air handling units, air conditioning ductwork and insulation on cold pipes.

We’ve all seen what goes wrong when vapour barriers aren’t installed properly. When they are, it makes a world of different to both HVAC&R technicians and their clients.

Acknowledgements

The author thanks to the following people for reviewing this article:

- **Sonia Holzheimer, M.AIRAH**, Principal Mechanical Engineer at Sequal Consulting Group
- The late **Graeme Standfield, F.AIRAH** – an extremely competent mechanical engineer whom I knew for many years
- **Glenn Davies**, Manager at Actrol.

About the author

Bob Jackson, M.AIRAH, began his HVAC&R career as an apprentice at K. M. Greenhalgh in November 1962. Over his decades working in the trade in Cairns, he and his son have trained more than 100 apprentices with a focus on innovation and cutting-edge practices.

Learn more

For more information about cold rooms and how to improve energy efficiency, refer to *DA12: Energy Efficiency in Cold Rooms*.

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AIRAH opposes plan to lower the bar for our trade

The most recent report from the Productivity Commission has included a recommendation to lower entry requirements for refrigeration and air conditioning technicians in NSW – a move which AIRAH has opposed.

Mark Vender
ADVOCACY & POLICY MANAGER
mark.vender@airah.org.au

In August, the Commonwealth Productivity Commission issued interim reports that explored how to boost Australia's flagging productivity across five reform areas. The reports contained many recommendations, including the lowering of state-specific entry requirements for refrigeration and air conditioning technicians, as well as other trades such as hairdressers, painters and decorators.

AIRAH has provided feedback to the Productivity Commission strongly opposing the recommendation for refrigeration and air conditioning technicians.

But before looking at the specific issue, it's worth understanding the context.

The 'productivity' story so far

Productivity is an issue that feeds into other broad problems such as the housing crisis and the cost-of-living crisis. It is interesting and powerful in that it is apolitical – where topics such as the tax system and climate change still divide parts of our country, no one is really against making things more productive. And yet, it's not always easy to pinpoint what being more "productive" means or why we would want it.

To answer these broader questions, over the past year the Commonwealth Productivity Commission has conducted an inquiry to identify priority reforms that will deliver meaningful and measurable change.

Late in 2024, the commission asked for productivity pitches across five reform areas, including "building a skilled and adaptable workforce", which covered licensing.

Based on these pitches, a short-list of policy ideas was developed at the start of 2025, and the Productivity Commission sought feedback through a questionnaire in May and June. This feedback was incorporated into longer interim reports that were released in August, again with a call for comments. AIRAH has been engaging with this process by collecting member feedback and making submissions to the Productivity Commission.

The recommendation to lower entry requirements for refrigeration and air conditioning trades in NSW appeared in the most recent interim report.

The licensing context – why change NSW?

Australia's licensing landscape for refrigeration and air conditioning technicians is a patchwork. No two jurisdictions are the same, and to complicate matters, the occupational licensing at state and territory level is overlaid with our national ARCtick licensing system that focuses on refrigerants, with the goal of protecting the environment.

NSW differs from other jurisdictions in that the regulator requires a Certificate III level qualification in refrigeration and air conditioning. In other parts of the country, trades such as electricians and plumbers can install split system air conditioners up to 18kW, provided they have the relevant local licenses and an ARCtick restricted licence.

The fact that NSW has established this minimum requirement is seen as a positive by the HVAC&R industry. In fact, in conversations with regulators in other jurisdictions, AIRAH often refers to the NSW framework – particularly the latest version proposed under the incoming Building Bill – as the model to strive towards.

In the interim report, the Productivity Commission asserted that in jurisdictions like Queensland where other trades such as plumbers and electricians are doing refrigeration and air conditioning work, "no evidence of poorer quality or riskier work" has been provided.

According to the Productivity Commission, analysis undertaken for a previous inquiry found that the frequency of serious workers' compensation claims per million hours worked in NSW (8.3) is comparable to Queensland (8.8) and higher than Victoria (5.2). From this they inferred that the additional licensing requirements in NSW do not markedly improve worker safety.

AIRAH's response

AIRAH has responded to the interim report indicating that lowering the minimum entry requirements for air conditioning and refrigeration technicians would create risks to consumers, workers, and the environment.

In particular, we refute the suggestion that there is no evidence of poorer quality outcomes when associated trades perform refrigeration and air conditioning work. In the absence of hard data from regulators on the quality of installations done by differently qualified trades – data that AIRAH would, incidentally, welcome – the on-the-ground feedback is that the introduction of Certificate II workers has weakened the HVAC&R sector, and the outcome has actually been to create a less skilled workforce.

A similar response to the recommendation came from other industry bodies, including AMCA and the ARC.

The final report to the government will be delivered in December.

Read AIRAH's submission

To read AIRAH's full submission to the Productivity Commission, scan the QR code.

The living machine

The human body is arguably the most advanced HVAC system on the planet, as Gary Raman explains.

Walk into a high-rise building on a hot afternoon and you'll feel it instantly, the rush of cool conditioned air wrapping around you. It seems effortless, but behind the walls, a complex network of machines is working nonstop.

Now pause and think of your own body. Every second, your lungs draw in air, your heart pumps tirelessly, your skin sheds heat, and your brain keeps everything in balance. In many ways, your body is the most advanced HVAC system ever designed.

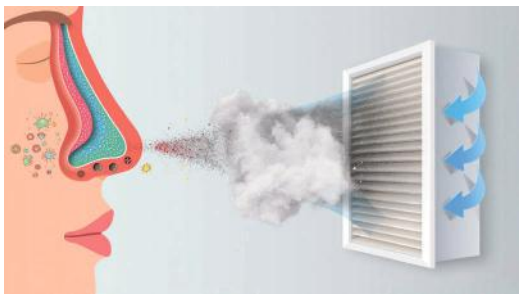
What if we imagined a building as a living being? Its pipes and ducts as arteries, its pumps as a heart, its cables as nerves. Suddenly, the mechanical and the biological don't seem so far apart. Let's walk through the body's processes, and at each step see how HVAC systems imitate them.

Step 1: Breathing in – the nose and air intake

When you breathe, air first passes through your nose. Tiny hairs and mucus filter dust and allergens. Blood vessels warm cold air or cool hot air, and moisture adjusts the humidity before the air reaches your lungs.

Buildings copy this with **louvers and dampers** that pull in outside air. Filters then capture dust and pollutants, while pre-conditioning equipment adjusts temperature and humidity. Where a machine needs separate units for each function, your nose handles it all automatically.

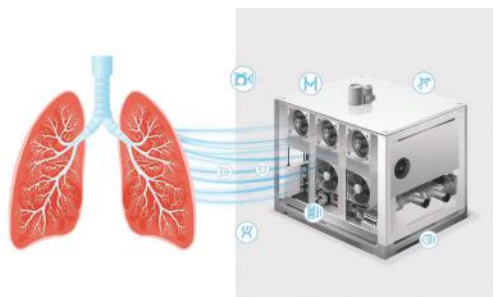
Step 2: Filtering impurities – the nose's defences and HVAC filters



If particles slip past your nose, your immune system responds by sneezing, coughing, or trapping them deeper in the airways. The body constantly defends against harmful intruders.

HVAC systems mimic this through **coarse and fine filters**. These block dust, pollen, and contaminants before air circulates through a building. But unlike your self-cleaning nose, filters must be replaced or cleaned regularly to keep working.

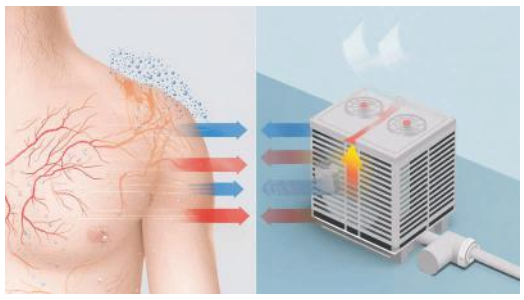
Step 3: Oxygen exchange – the lungs and air handling units



Inside your lungs, air travels to tiny sacs called alveoli, where oxygen enters your blood and carbon dioxide leaves. Muscles like the diaphragm act as fans, drawing air in and pushing it out.

In buildings, this role is played by the **air handling unit (AHU)**. Fans pull air across heating or cooling coils, adjust humidity, and distribute conditioned air through ducts. Just as alveoli transform raw air into usable oxygen, AHUs transform raw air into breathable comfort air.

Step 4: Cooling the body – skin, sweat, and the chiller-cooling tower cycle



When you overheat, your skin and sweat glands kick in. Blood vessels widen near the surface, sweat evaporates, and heat escapes into the air. This keeps your internal temperature stable.

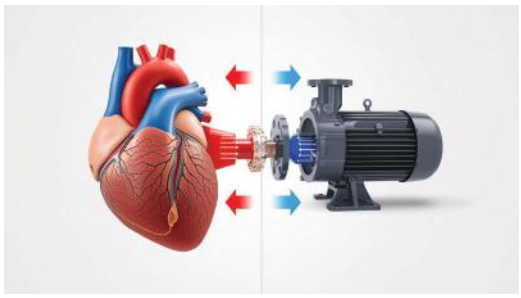
Buildings do the same with **chillers and cooling towers**. The chiller removes heat from water, which cools the air indoors. The cooling tower then expels that unwanted heat outside, just as sweat evaporates from your skin. Without this constant cycle, both humans and buildings would quickly overheat.

Step 5: Producing heat – metabolism and boilers

Even at rest, your metabolism burns calories to produce heat. The liver, brain, and muscles radiate warmth. The hypothalamus is the thermostat that keeps this process balanced.

Buildings generate heat using **boilers or heating coils**. Fuelled by gas or electricity, they warm incoming air/water during winter. Where a boiler can be switched on or off, your metabolism never stops, it adjusts continuously to your needs.

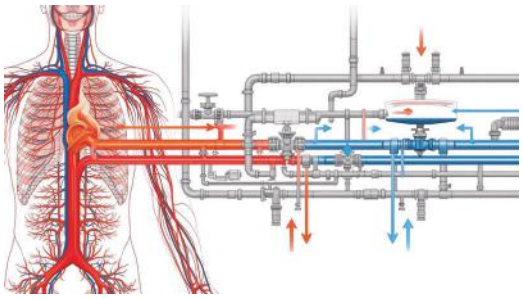
Step 6: Circulation – the heart and HVAC pumps



Your heart beats nonstop, sending oxygen-rich blood through arteries to nourish every cell. Valves keep blood moving in the right direction, and pressure adapts instantly to activity or rest.

HVAC systems rely on **pumps and fans** to move hot or chilled water through pipes and air through ducts. Check valves prevent backflow, just like the heart's valves. Both depend on steady, unbroken circulation; a blockage can be dangerous for the body and disastrous for a building.

Step 7: Transport network – blood vessels, ductwork, and pipework



The human body relies on an intricate branching system of blood vessels. Arteries deliver oxygen-rich blood, capillaries reach even the smallest tissues, and veins return blood to the heart.

Buildings mirror this with both **ductwork and pipework**.

- Ductwork distributes conditioned air to every space and brings it back for reconditioning.
- Pipework carries chilled water, hot water, and refrigerant throughout the building. Just as blood pressure must be maintained for the body to function, pressure integrity in pipes is critical.

Together, ducts and pipes form the circulatory network of a building. Keeping them sealed, insulated, and balanced ensures the system runs efficiently.

Step 8: Local adjustments – reflexes and dampers

When you exercise, bloodflow shifts instantly to your muscles. Arterioles dilate or contract, while reflexes adjust heart rate and breathing without conscious effort.

Buildings use **dampers and variable air volume (VAV) boxes** to do the same. They fine-tune airflow zone by zone. Too hot in one room? The damper adjusts. Where the body responds instantly, buildings depend on sensors and programming.

Step 9: Water balance – kidneys and humidifiers

Your kidneys are constantly balancing hydration. When water is low, they conserve it by concentrating urine; when fluid is high, they release more. Sweat glands also act as moisture regulators, cooling the body while expelling water.

HVAC systems copy this with **humidifiers and dehumidifiers**, which keep air at comfortable moisture levels. Just as dehydration or excess fluid can harm your body, overly dry or damp air can harm both people and buildings.

Step 10: Pressure buffers – the bladder and expansion tanks

The bladder stores urine until it is ready to be released, maintaining balance in the body. Similarly, blood vessels can expand slightly to absorb sudden surges in pressure, protecting delicate tissues from damage.

In HVAC systems, **expansion tanks** perform this stabilising role. As water heats up, it expands, which increases system pressure. An expansion tank provides a cushion of air or a flexible diaphragm that absorbs the extra volume, keeping pressure within safe operating limits. This prevents unnecessary stress on the system and ensures reliable, long-term operation.

Step 11: Master controller – the brain and BMS

Your brain, led by the hypothalamus, is constantly monitoring and adjusting. It predicts, anticipates, and balances temperature, hydration, and energy needs in real time.

Buildings use a **building management system (BMS)** to integrate all components including chillers, boilers, pumps, fans, and sensors. But while a BMS follows programmed rules, the human brain is creative, adaptive, and capable of learning from experience.

About the author

Gary (Guru) Raman, Affil.AIRAH is a senior HVAC engineer at Climax Air with 15+ years' industry experience. As a chartered engineer, he undertakes preliminary and detailed design, coordination, and value engineering across the defence, commercial, refurbishment and education sectors. Driven by sustainability, collaboration and innovation, Gary also volunteers with Scouts NSW and the Art of Living Foundation.

Lessons from our own bodies

Looking at a high-rise building as a living body is more than an analogy. It's a reminder that the smartest machines we've built still fall short of biology's genius. Your body heals itself, adapts instantly, and runs for decades with minimal downtime. No HVAC system can yet claim that.

Nevertheless, there are lessons we can take from this. Just as the human body relies on rest and repair to sustain itself, buildings thrive when their systems are cared for. Predictive maintenance – spotting problems before they happen – is like the body recognising early warning signs of illness. When combined with regular servicing, timely filter changes, and careful energy monitoring, HVAC systems can last far longer, run more efficiently, and save enormous costs over their lifetime.

Perhaps the most powerful lesson is adaptability. Our bodies adjust instantly to temperature, hydration, and stress without conscious thought. Buildings can move closer to this biological efficiency by adopting AI-driven controls that fine-tune operations in real time, reducing energy waste while keeping people comfortable. Add to that the integration of renewable energy sources such as solar, wind, or geothermal energy and you have a system that not only adapts, but also sustains itself in cleaner, greener ways.

The long-term result is simple but profound; just as the body extends its own life through balance and renewal, buildings too can increase their life expectancy through proper measures. With predictive maintenance, smart energy use, AI adaptability, and renewable power, our high-rise buildings can operate for decades with greater reliability and lower impact.

The next frontier in engineering may be buildings that are not just smart, but "alive" – capable of self-repair, adaptive control, and waste-free operation.

Q&A with **Ree McCaig**

HVAC&R News speaks with Ree (Maria) McCaig – owner of McCaig Air Conditioning in Bendigo – about the challenges of running a business, the rewards of training apprentices, and strategies for attracting more women to HVAC&R.

"We will give anyone an opportunity if they are willing to learn, as we believe if you invest in them, they will add value to your business."

Ree McCaig

HVAC&R News: How did you get into a career in HVAC&R?

Ree McCaig: I was employed at the National Australia Bank (NAB) for almost 15 years and had returned on a part-time basis after the birth of my first child, Connor. In 2002, the bank was restructuring and offering those who could not be redeployed packages. Chris, my area manager, wasn't quite ready to retire and wanted to purchase a business (not necessarily HVAC) for the last few years of his working life.

My husband's family owned McCaig Air Conditioning and were looking to sell and retire. Chris came to my husband Cam and me with a proposition to enter into a partnership and purchase the business together. In 2002 (while pregnant with my second child, Alessia), we purchased the business from Cam's parents who started it out of the back of a car in 1961. Chris stayed for about five years and eventually retired.

What are your day-to-day responsibilities as the owner of an HVAC&R business? What do you love about the job, and what are the major challenges?

I suppose you can say I'm the office manager, doing everything from wages, staffing, monthly claims and OH&S, while also serving as a psychologist, friend and anything administratively. For the most part I enjoy it; our staff are fabulous and really are like family. The challenging parts are the ever-changing "red tape" that comes with any business. There is so much paperwork, which can be quite time consuming and, I believe, over the top.

Has it been difficult to attract apprentices to the trade in recent times? What approaches do you take to unearth the next generation of talent?

Over the years it hasn't been too difficult to attract apprentices, but since COVID it has become somewhat more challenging. We use a group training organisation to help recruit apprentices, and more recently we've used social media.

Over the years we have had a mix of young people straight out of school and mature-age apprentices. Currently most of our apprentices are mature-age and two of those are women. Two are also onto their second apprenticeship with us! Dual tradespeople are an asset to any business, and we definitely encourage anyone wanting to complete a second one with us.

We will give anyone an opportunity if they are willing to learn, as we believe if you invest in them, they will add value to your business. Apprentices are the next generation of workers and no matter how "tech savvy" the world becomes, tradespeople will always be required.

Do you think being in a regional area makes it harder to attract and retain apprentices?

I don't believe being in a regional area makes it any more difficult to obtain apprentices, although we have had several move to the city for more money and experience. This is something we have never not entertained; our door is always open for them to return. Interestingly enough, a lot have returned over the years after they are qualified.

Do you think women often face barriers in entering the HVAC&R industry and reaching leadership positions? What can be done to remove some of these barriers?

While there are probably cultural and physiological barriers for some women in the industry, we haven't really experienced that in our business. Maybe this is due to myself and Cam making sure we create a great environment to work in, where everyone is treated the same if they are willing to put in the hard work.

I truly believe your business is only as good as your staff. We can't be everywhere and our staff are the face of our business, whether it be in person, on a job site or on the end of the phone.

What strategies has the business used to attract more female applicants to jobs like technicians and service managers?

The best strategies to attract women are word of mouth and encouraging a safe and happy workplace. Besides myself, we currently have seven female workers: two refrigeration mechanic apprentices, two service manager assistants, one fully qualified mechanical plumber – who has come into the office after having a baby as our project manager assistant/social media guru – one accounts officer and a warehouse assistant. The best thing about these women is they have all added value to our business in one way or another.

Emma Mills, Mel Blackmore, Pam Leech and Ree McCaig from the McCaig Air Conditioning team.

How Australia's 2035 emissions target will affect HVAC&R

The federal government has released its 2035 emissions target, which it says is "ambitious, achievable, and in Australia's national interests".

Nick Johns-Wickberg
nick.johnsw@airah.org.au

In September, Prime Minister Anthony Albanese announced that Australia would aim to reduce greenhouse gas emissions by 62–70% from 2005 levels by 2035. Albanese presented the updated target at the United Nations General Assembly in New York.

According to the most recent data, Australia has reduced its emissions by 29% on 2005 levels. Previous projections suggested that we would achieve a 51% reduction by 2035; this announcement represents a significant increase compared to that projected figure.

The announcement came just days after the release of the National Climate Risk Assessment, a first-of-its-kind report that paints a grim picture of what Australia's future will look like should we fail to minimise the severity of climate change.

AIRAH CEO Sami Zheng, Affil.AIRAH, says the announcement represents a step in the right direction on the path towards net zero.

"AIRAH welcomes the government's target of reducing the nation's greenhouse gas emissions by 62–70% from 2005 levels," Zheng says. "This is an important milestone in our country's necessary journey to net zero.

"While we would like to see more ambitious measures in some areas, especially in refrigerant transition, AIRAH acknowledges that the plan announced this week represents an achievable goal. It's important to have a target – now it's about the journey."

"We would encourage the government to formulate a holistic plan for refrigerants. This will give the HVAC&R industry time to prepare for future changes and will further incentivise investment in sustainable technology."

AIRAH CEO Sami Zheng, Affil.AIRAH

Built environment plan

The 2035 target is underpinned by six sector plans. The plan that is most relevant to the HVAC&R industry is the Built Environment Sector Plan.

One of the plan's goals is fast-tracking electrification within the built environment. It highlights that one of the major sources of Scope 1 emissions – direct greenhouse gas emissions from buildings – is fossil fuel gas. In homes, 57% of gas use is for space heating, while 36% is for water heating.

The plan identifies Scope 2 emissions – indirect emissions including those that come from offsite power generation – as the biggest contributor to the built environment's greenhouse gas emissions. The built environment is currently responsible for 48% of the country's Scope 2 emissions, a total of 73Mt CO_2e per year.

It identifies improving energy efficiency within buildings as the most effective way to reduce Scope 2 emissions.

The plan also touches on Scope 3 emissions, otherwise known as embodied carbon. It estimates that the built environment currently contributes 37–64Mt CO_2e of Scope 3 emissions per year in the construction process, including material extraction, transportation, manufacturing, construction, use, replacement, demolition and end of life.

"AIRAH supports initiatives to decarbonise the built environment, including the electrification of commercial, industrial and residential HVAC systems," Zheng says. "Phasing out gas heating is a no-brainer; it reduces Scope 1 emissions from fossil fuel while increasing energy efficiency and improving overall performance."

Business as usual on refrigerants?

The built environment plan makes specific reference to greenhouse gas emissions from hydrofluorocarbons (HFCs) within air conditioning and refrigeration systems, which it says account for 32% of the built environment's Scope 1 emissions. It also notes that Australia is phasing down its use of HFCs by 2036.

However, the plan references phase-down targets Australia committed to when it ratified the Kigali Amendment to the Montreal Protocol in 2016, with no further targets mentioned. And there is no mention of some of the issues with the current approach that industry stakeholders, including AIRAH,

highlighted during consultations with the Climate Change Authority.

"The environmental impacts of HVAC&R systems often get lost in high-level policy conversations, so it is encouraging to see HFCs mentioned in the Built Environment Sector Plan," Zheng says.

"But the measures don't extend beyond what the Kigali Amendment set in place nearly a decade ago. More importantly, they don't address the HFCs that Australia imports in pre-charged equipment, which is now larger than what we import in bulk.

"More broadly, HFCs are just one part of a changing refrigerant landscape. Our sector is looking for leadership from government on where we should be heading, not just until 2036 but beyond.

"We would encourage the government to formulate a holistic plan for refrigerants. This will give the HVAC&R industry time to prepare for future changes and will further incentivise investment in sustainable technology."

Finally, although the plan mentions the importance of maintaining HVAC&R systems, there are no specific measures that would support this.

"If we want to reduce Scope 1 emissions, better maintenance regimes and refrigerant tracking are no-regrets actions that would make a big difference," says Zheng.

Expanding built environment programs

The plan identifies four major built environment programs that will be expanded to help Australia reach its decarbonisation goals. Those programs are:

The Commercial Building Disclosure (CBD) program

The federal government will invest around $10 million to expand the existing CBD program, which currently requires office buildings over a certain threshold to disclose NABERS ratings. The program will consider most commercial building types by 2035.

The National Australian Built Environment Rating System (NABERS)

The government will invest around $10 million to expand NABERS to prepare the commercial buildings sector for expansion of the CBD program by developing new tools and providing discounted NABERS ratings. According to the plan, the development and refinement of NABERS tools will also enable NABERS and its partners to deliver useful products for industry in areas such as energy flexibility and embodied carbon.

Greenhouse and Energy Minimum Standards (GEMS)

The government will invest around $16 million to modernise the GEMS Act, ensuring it is fit for purpose now and into the future. According to the plan, this will reduce emissions and deliver real bill savings by regulating a greater range of more efficient products and equipment across residential, commercial and industrial sectors.

The Nationwide House Energy Rating Scheme (NatHERS)

The government will invest around $33 million to continue and scale up the rollout of NatHERS ratings for existing homes. According to the plan, this will provide ratings and upgrade information for more households across Australia to better inform decisions on how to cut energy bills, reduce emissions and improve resilience and comfort in housing.

Read the full report

You can access the full suite of reports and information accompanying the announcement of the 2035 emissions target on the DCEEWW website by scanning the QR code.

The most relevant information for the HVAC&R section can be found at the same link under the Built Environment Sector Plan.

Vote for the winner!

Choose your favourite entry at:
hvacrnews.com.au/the-lighter-side

Have you come across something scary, ugly or just plain funny?
Send your hi-res (>500KB) photos to Nick Johns-Wickberg at nick.johnsw@airah.org.au

1. Edge of your seat stuff

"This has been there 15 years, but by the looks of it, won't be there much longer!" says Ben, who came across this terrifying HVAC disaster waiting to happen. We're calling it – a light breeze might be all it takes to send this plummeting down onto whatever lies below.

STEVE SAYS

Ignoring the obvious standout, the two timber supports sitting on-end can act like a dam during a heavy downpour and force water back up under the tiles. A couple of coats of paint would have helped the plywood deck survive the elements. The tape used to hold the insulation together was not up to the job, and a Dektite over the penetration through the roof tile could have hinted at a degree of professionalism … But sadly, no, nothing to write home about on this job!

2. That's cooked

"I could smell and hear the black smoke billowing out of this kebab joint well before I could see it," says Nick, who encountered this kitchen exhaust nightmare in the CBD of Adelaide. We're pretty sure that if your exhaust is fuming like a coal power plant, then it's probably not up to standard.

STEVE SAYS

This is a very common problem stemming from a serious lack of maintenance. Some of the cooking fat in the hot fryer evaporates and is drawn up into the extraction hood, where it solidifies again after making contact with the cool metal ducting. After many years, a thick layer of fat accumulates in the ductwork, emitting smoke and an "old burnt fat" smell as the new hot fat collects on the surface. This is easily fixed, but not much fun for the person doing it!

3. What the duct?!

A while back, the team at Shepherd Filters shared this mind-blowing story of takeaway containers being used to "fix" grease leaking from ductwork. "Aluminium BBQ trays that are purchased at local supermarkets are not a satisfactory way to manage leaking ductwork," the team rightfully points out. "Yet it gets worse – one site had plastic ice-cream containers!"

STEVE SAYS

A great sequel: cooking fat collecting in the extraction system and leaking through the duct joints. I once had the pleasure of digging congealed fat from an extraction system in a fried chicken store. The 400mm round duct that housed the extraction fan and motor was totally encased in fat for 2m on either side of the fan. The store was 15 years old and had never been maintained.

4. Buyer beware

In his 20 years in the industry, Gordon had never come across anything quite like this. "The customer just bought a shop and found that the previous owner had done this to the evaporator: twisted and taped the electrical with duct tape, then drained to a bucket with a garden hose," he says, presumably still in shock. Thankfully, Gordon put a new evap cooler in a week later.

STEVE SAYS

Where to start?! A single fan has recently been replaced with two smaller fans. The motors and blades are correct for the job (although the motor mounting brackets are typical of those used in the outdoor unit of a split system). The coil is iced up for a couple of reasons. The cowling around the blades – which prevents air slipping off the blade tips and improves air throw – is missing, but the greater issue is the blades themselves. They are counterclockwise blades, and if rotated in the intended direction, will push the air out through the back of the coil. The airflow needs to be drawn through the coil and thrown out to the opposite end of the room. Quite a disaster!

Additional comments and observations provided by **Steve Smith, Affil.AIRAH, Education Relationship Manager at Superior Training Centre.**
Please note that the comments are provided on the basis of the photos only and should be read with this in mind – not all issues or solutions are apparent from a 2D image.

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