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Energy Demand, Efficiency and Safety | Energy | Department of Energy, Environment and Climate Action

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) thanks DEECA for the opportunity to provide feedback on the consultation on space heating and cooling consumer fact sheet.

AIRAH is Australia's peak membership body for professionals and practitioners working in the heating, ventilation, air conditioning and refrigeration (HVAC&R) industry.

It is our mission to create an Australian HVAC&R industry that is highly skilled and professional, safe, sustainable and environmentally effective. AIRAH encourages world's best practice within the industry through continuing professional development, accreditation programs and technical publications – and by providing input on initiatives related to HVAC&R, such as this one.

For this consultation, we have called on the expertise of members who have been involved in activities such as:

- Developing our [FairAir website](#) for sizing heating and cooling systems in Australian homes
- Working with the [Building Codes Committee](#) to provide input on requirements in the National Construction Code for residential dwellings
- Developing best practice guides for the installation of air conditioners in residential settings
- Expert witness work on jobs such as those covered by the VEU program.

The replacement of gas heating and the installation of high-efficiency electric heating and cooling in Victorian homes is a vital part of our journey towards net zero, and we applaud the Victorian government's leadership in this space. It is vital that it is done rapidly. But it is just as vital that it is done properly.

Our review of the fact sheet has highlighted a number of issues that we believe represent significant risks for the success of the program. These are noted below, along with some direct feedback on the content and presentation of the fact sheet.

If you have any questions or would like to discuss any of the points in more detail, please let me know.

Regards,

A handwritten signature in black ink, appearing to read "Trish Hyde". The signature is fluid and cursive, written over a white background.

Trish Hyde
Chief Executive
AIRAH

1. Do you have any comments on the requirement for accredited providers and their installers to provide the space heating and cooling fact sheet to consumers?

We agree that it should be a requirement for accredited providers and their installers to provide the fact sheet to consumers. Nevertheless, the onus should remain on the department to appropriately pre-qualify the contractors and to (randomly) inspect the work with risk of deregistration if inappropriate work is found. This should include sizing, outdoor unit location, refrigeration work (is the system contaminant free?) and duct installation as relevant.


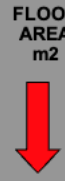
2. Do you agree with the air conditioner size guidance being set based on room size?

No.

The range nominated in the size guide is 80–130W/m². 80W/m² is on the low side typically for heating only, not cooling. Also, suggesting putting a 2.5kW system in a small kitchen with all the other heat sources is questionable.

The sizing guide does not consider important factors such as those listed below in Question 3. The concern is the VEU Accredited Person (AP) would always go for the cheapest option, which is the smallest.

The following wall split sizing chart provides more context. The VEU should consider a sizing chart that covers these three scenarios (addressing exposure, construction type, insulation and glazing levels, as well as floor area). The more building characteristics that the size guideline address, the more accurate the estimate is likely to be, but there is no substitute for an onsite load assessment and calculation. There are a range of free and paid software and apps available to industry professionals to assist in calculating accurate heating and cooling loads.

EXPOSED ASPECT	FLOOR AREA m ²	AVERAGE ASPECT	FLOOR AREA m ²	PROTECTED ASPECT
<p>STRONG AFTERNOON SUN LITTLE OR NO EXTERNAL SHADE</p> <p>WEATHERBOARD, FIBRO OR BRICK VENEER WALLS</p> <p>NO CEILING INSULATION</p> <p>LARGE OR WEST FACING WINDOWS - LITTLE OR NO PROTECTION FROM THE SUN</p>	 (2.6m Ceiling)	<p>NORTH FACING SOME EXTERNAL SHADE</p> <p>BRICK VENEER OR DOUBLE BRICK</p> <p>CEILING INSULATION</p> <p>AVERAGE SIZE WINDOWS WITH SOME INTERNAL OR EXTERNAL WINDOW SHADING</p>	 (2.6m Ceiling)	<p>SOUTH FACING SOUTH ASPECT WILL HAVE SHADED WALLS AND WINDOWS ALL YEAR AROUND</p> <p>BRICK VENEER OR DOUBLE BRICK</p> <p>CEILING INSULATION</p> <p>AVERAGE SIZE WINDOWS WITH LITTLE OR NO EXPOSURE TO DIRECT SUNLIGHT</p>
INVERTER REVERSE CYCLE HIWALL SPLIT MODELS & NOMINAL kW RATING				
2.5kW HSNBR26	10 11 12 13	2.5kW HSNBR26	10 11 12 13	2.5kW HSNBR26
3.2kW HSNBR32	14 15 16 17		14 15 16 17	
4.2kW HSNBR42	18 19 20 21 22	3.2kW HSNBR32	18 19 20 21 22	3.2kW HSNBR32
5.0kW HSNBR50	23 24 25 26		23 24 25 26	

3. Do you agree with the recommended size ranges for single-split and multi-split air conditioners?

No, refer to Question 2.

The accurate calculation of heating and cooling loads is the first step to an energy-efficient installation. AIRAH cautions against basing installations on simple floor area rules of thumb. An air conditioning system load is made up of the following components:

- Transmission load – Sensible heat gain through walls, floors and ceiling
- Solar load – Sensible heat gain through transparent building fabric elements (windows, doors)
- Internal loads – Heat gains from lights, appliances, equipment, activities and people
- Infiltration air load – Heat gain from air infiltrating from outside and adjoining spaces through doors and other openings
- Ventilation air load – Heat gain from minimum outdoor ventilation air provided in occupied spaces

- System related loads – heat gain from the air conditioning system itself including fan motors and reheat (for humidity control)
- Safety factor– safety factor added by the design engineer to account for discrepancies between design and actual operation conditions.

All of these separate loads are then added together to get the full load on the air conditioner for that room. Many of these loads are not related to floor area.

4. Do you agree with the recommended cooling output for ducted air conditioners? (0.8–1.3kW cooling output for every 10m²)

No. These are only check loads, and a full heat load survey should always be done for a ducted system. As per Question 2, 80W/m² is too low for cooling.

Above 10kW, ducted systems have other losses, such as through ductwork, and should be required to be provided with a proper calculation rather than a rule of thumb.

Some suppliers suggest the following guide for domestic homes:

- Low load: 110W/m²
- Average load: 126W/m²
- High load: 142 W/m²

AIRAH also provides an online load estimator for residential and light commercial heating and cooling systems at [FairAir](#), but even this level of calculation is provided as an estimate only. AIRAH recommends that a full heating/cooling load calculation should be performed by the designer/installer, specific to the space to be conditioned.

5. Do you agree with the department's guidance on which rooms need heating and cooling?

There is an increased risk of mould in bathrooms and bedrooms, particularly in older houses where ducted heating is being replaced with split systems to only select areas, leaving some spaces cold where indoor humidity may condense. Better to remain silent on the matter, or provide advice of the risks where insulation levels may be limited.

6. Do you believe the information in this fact sheet is sufficient to ensure consumers are able to make an informed decision?

No.

Oversimplifying equipment sizing without the appropriate disclaimers and qualifiers, or without addressing the risks of exposed loads, provides a false sense of security. Also, without highlighting the risks, VEU APs may use the simplified guide as a de facto compliance document, when there is no real substitute for undertaking a proper heat load calculation.

AIRAH believes that consumers should be provided with the following additional information in the scheme fact sheet:

- **AS/NZS 5141: 2018**
Installers and consumers should be made aware of the Australian Standard on residential heating/cooling AS/NZS 5141:2018 *Residential heating and cooling systems — Minimum applications and requirements for energy efficiency, performance and comfort criteria*. This standard outlines the industry standards for design and installation, eliminating the risk of customers being provided with false information or incorrect air conditioning systems for their particular needs.
Ideally this standard would be made a conditional requirement of the certificate creation scheme.

- **Equipment Coefficient of performance (COP)**

While it is recognised that a COP of 3.7–3.9 is deemed to comply for the creation of Victorian energy efficiency certificates (VEECs), consumers should be made aware that the higher the COP of the equipment purchased, the lower the energy use and associated costs into the future. Many equipment formats have best in class COPs of 5.0 or higher; consumers should be made aware that purchasing equipment that exceeds the minimum scheme COP is beneficial to them in the medium to long term. The minimum ACOP allowed under GEMS/MEPS is 3.0, and the best reverse cycle unit currently on the market has an ACOP of 5.76 (90 per cent more efficient). Consumers should be referred to the [energy star rating scheme](#) – the more stars the more energy efficient.

- **Sizing guidelines**

Although size guidelines and rules of thumb based on floor area or assumed space characteristics are a useful estimating tool, a proper heat/cooling load calculation for every conditioned space is essential for any successful installation. Correct equipment sizing protects consumers from unnecessary capital costs and higher ongoing operating costs.

As the complexity of the space increases (i.e., living areas, glazed areas, open-plan layouts, multi-zone systems) the variety in loads and the inaccuracy of rule-of-thumb size guidelines increases. Solar orientation, glazing ratios, shading, construction form and date, microclimate and owner preferences will all have a significant impact on system size, and these characteristics can only be adequately evaluated and addressed by an industry professional onsite.

Providing sizing guidelines in the fact sheet may not provide consumer protection if the low end of the sizing guidelines are adopted by industry practice as a de facto maximum standard for scheme compliance. It is better that the designer/installer takes responsibility for the system sizing by conducting a proper heat load calculation, as required by the Australian standard. This should all be documented to the consumer, again as required by the Australian standard.

- **Retrofitting to existing ductwork**

AIRAH supports the electrification of building and water heating, and the replacement of gas fired heating by air conditioning heat pumps as a legitimate pathway to the decarbonisation of buildings. It is noted, however, that the air distribution ductwork of many existing heating systems may not be suitable for plug-and-play replacement by air conditioning equipment. Existing ductwork systems may need to be upgraded, to provide an energy-efficient system.

- **Heating**

The fact sheet does not make clear that this is primarily for heating – getting households off gas onto electricity. Moreover, there is no mention to focus on the heating star rating over the cooling star rating, as this is the dominant energy use of this equipment when replacing gas heating. There should be a minimum star rating of around 4 stars for heating for equipment to qualify. Where ducted heating is replaced with a ducted heat pump, all ducts must be replaced with new larger ductwork with better insulation – this is where there needs to be careful regulation and inspection follow-up.

7. Do you propose anything else be included in the fact sheet?

- List the qualified trades and licenses.
- If size guidelines are to remain, additional building characteristics should be included (e.g., exposed aspect, average aspect and protected aspect). Update the check load values along the lines of the range of aspects.
- Ensure that the installer takes responsibility for selecting and sizing the equipment specifically for the space to be conditioned.
- See AIRAH disclaimer from FairAir cooling load calculation:

AIRAH recommends a full load calculation be completed by an air conditioning contractor or designer. Individuals with load estimation experience are best placed to provide the most accurate cooling load estimate, appropriate to the actual cooling (and heating) loads and the occupant needs.

- Work is to be carried out in accordance with the requirements Under Part 4 of the *Plumbing Regulations 2018*, Refrigerated Air-conditioning work.
- The law requires the outdoor unit to be located more than 3m from the property boundary, to meet the EPA noise limits.
- Installation of an outdoor unit between the house and the fence severely compromises capacity and energy efficiency due to air recirculation. Outdoor units use a lot of air and so need free air circulation to operate at the design capacity – otherwise householders may pay for 8kW but only ever get 5kW.

8. Do you have feedback on the design and accessibility of the fact sheet?

Consider including more images if space allows. Use a warm colour palette, not blue, as heating is the goal.

9. Do you have any other comments on the fact sheet?

Be clear that cooling is a bonus, not the main objective.

Add links for improving insulation and air tightness, shading and so on, and highlight that this is the best way to be more comfortable – not higher capacity air conditioning units.

10. Other than the fact sheet, what measures could be undertaken to ensure consumers make informed decisions and the product installed meets their needs?

AIRAH recommends including a mandatory requirement for:

- A heat load calculation
- A duct plan showing locations and duct sizes
- A commissioning report including airflow measurement and balance and leak test
- Co-payment by end-user of more than \$750 to trigger regulations
- Photos of key areas where good practice can be overlooked (multiple photos of R rating of ductwork, condenser clearance, condenser mounting, service access to evaporator electrics and fans, location of thermostat, use of suitably insulated BTOs, etc.)
- Relevant plumbing and electrical compliance certificates
- Inverter compressor units – this should be added as there is still non-inverter equipment on the market.

Also, an auditing panel should be established to audit a sample of installations to check compliance and avoid a “pink bats” situation where installations are performing poorly and leaking refrigerant. The VEU APs should commission an auditor to inspect and approve a sample of their completed work (i.e., 10 per cent) with significant penalties or suspension of creations for no compliance.

There are a range of existing installation scenarios that need to be considered. For example, around 40 per cent of gas ducted heaters have add-on refrigerated cooling (applications that have whole-house heating, however, typically may have capacity to effectively cool upstairs or down downstairs, i.e., partial but not whole house). Possibly another 40 per cent will have evaporative cooling that runs through separate ductwork, and a further 20 per cent will have heating only and no cooling, or maybe a room split installed in some room.

Some other important unanswered practical questions the VEU must consider (if not already covered off) are as follows:

- To cut installation cost, some APs could leave the decommissioned unit in the roof space. Is there a requirement to remove the gas ducted heater and provide evidence the unit has been scrapped (i.e., removed from roof space, equipment rendered unusable so it cannot be re-used in another job, etc.)?

- If there is gas ducted heating with add-on refrigerate cooling, the installer will have to decommission both to install a ducted heat pump. How will this be managed (i.e., refrigerant handled), and will the installer be permitted to leave the coil in roof space?
- What procedures will be put in place by the VEU to manage the safe removal of asbestos flues? The trade understands the risks and will have come across this before, but APs may not be aware.
- When replacing a gas ducted heater servicing a whole house with multiple supply outlets (i.e., eight or more), can the installer replace the ducted system with a multi-head split system that only services three rooms?
- When replacing a gas ducted heater that is heating only with a ducted heat pump, all the ductwork will have to be replaced, as the ducts will be sized for heating (i.e., smaller and air delivery system may be designed for heating only). The VEU needs to make this clear to APs – it is not a straightforward “plug and play” situation.
- If an application has a gas ducted heater with add-on refrigerated cooling, under what circumstances will they be able to use the existing ducting. For example, it may be a good duct layout, but the R ratings may not be up to current, or some or all parts of the duct is not accessible.
- If an application has gas ducted heating and evaporative cooling, will the installer be required to remove the evaporative cooling? Or will the VEU allow evaporative and refrigerated HP to co-exist? Or will the VEU provide consumers advice on how to use the two different technologies, as the evaporative would potentially eject the refrigerated cooling out the window.
- Is there a requirement to use capping (i.e., pipe covers to provide a neat installation and prevent premature break down on insulation) on refrigerant pipes?
- Is there a requirement to remove rubbish?