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Where to flare

Installing wall-mounted split systems.

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WHERE TO FLARE

The use of low-flammability refrigerants such as R32 in common air conditioning equipment is necessary if the HVAC&R industry is to successfully meet its obligations for the HFC phase-down under the Montreal Protocol. But there has been some confusion as to whether flare joints are allowed for connection indoors. HVAC&R Nation sets the record straight.

THE ISSUE

Some confusion exists as to whether flare joints are suitable for use indoors on wall-mounted split systems charged with R32 (classified as a Class 2L lower flammability refrigerant) or any other flammable refrigerant. The alternative, a permanent connection such as a brazed joint, can only be achieved with an open flame. This contradicts flammable refrigerant safety advice.

THE BACKGROUND

The standards that refer to the use of permanent joints indoors (between pipes, fittings and plant) for refrigeration and air conditioning systems that you should be familiar with are AS/NZS 60335.2.40 (2006 and 2015) and AS/NZS 5149.2:2016.

Then there is the international standard ISO 14903 *Refrigerating systems and heat pumps – Qualification of tightness of components and joints* (referred to in AS/NZS 60335.2.40:2015) and the advice of the *AIRAH Flammable Refrigerant Safety Guide* Clause 4.8.

Like other parts of the Australian standards, full comprehension of the entire standard and subsequent interpretation, is required.

WHAT DO THE STANDARDS SAY?

Here's an abbreviated version of the standards as they relate to connections, and our take on what they mean.

AS/NZS 60335.2.40:2006
Household and similar electrical appliances – Safety

Part 2.40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

22.118 When a flammable refrigerant is used, all appliances shall be charged with refrigerant at the manufacturing location or charged on site as recommended by the manufacturer.

A part of an appliance that is charged on site, which requires brazing or welding in the installation, shall not be shipped with a flammable refrigerant charge. Joints made in the installation between parts of the refrigerating system, with at least one part charged, shall be made in accordance with the following.

- A brazed, welded or mechanical connection shall be made before opening the valves to permit refrigerant to flow between the refrigerating systems parts. A vacuum valve shall be provided to evacuate the interconnecting pipe and/or any uncharged refrigerating system part.

- Reusable mechanical connectors and flared joints are not allowed indoors.
- Refrigerant tubing shall be protected or enclosed to avoid damage.

Flexible refrigerant connectors (such as connecting lines between the indoor and outdoor unit) that may be displaced during normal operations shall be protected against mechanical damage.

Compliance is checked according to the manufacturer's installation instructions and a trial installation if necessary.

OUR VERDICT

Flare joint is allowed indoors.

Both the indoor unit and the interconnecting pipe of wall-mounted split systems are not charged with refrigerant.

AS/NZS 60335.2.40:2015

Household and similar electrical appliances – Safety

Part 2.40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

22.118 When a flammable refrigerant is used, all appliances shall be charged with refrigerant at the manufacturing location or charged on site as recommended by the manufacturer.

A part of an appliance that is charged on site, which requires brazing or welding in the installation, shall not be shipped with a flammable refrigerant charge. Joints made in the installation between parts of the refrigerating system, with at least one part charged, shall be made in accordance with the following.

- A brazed, welded or mechanical connection shall be made before opening the valves to permit refrigerant to flow between the refrigerating systems parts. A vacuum valve shall be provided to evacuate the interconnecting pipe and/or any uncharged refrigerating system part.
- Mechanical connectors used indoors shall comply with ISO 14903. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be re-fabricated.
- Refrigerant tubing shall be protected or enclosed to avoid damage.

Flexible refrigerant connectors (such as connecting lines between the indoor and outdoor unit) that may be displaced during normal operations shall be protected against mechanical damage.

Compliance is checked according to the manufacturer's installation instructions and a trial installation if necessary.

OUR VERDICT

Flare joint is allowed indoors.

AS/NZS 60335.2.40 was changed in 2015, with the addition of the reference to ISO 14903 compliance for mechanical connectors used indoors. The standard requires re-fabrication of a flare joint when reused indoors.

AS/NZS 5149.2:2016

Refrigerating systems and heat pumps – Safety and environmental requirements

Part 2: Design, construction, testing, marking and documentation

5.2.3.7 Specific requirements for the installation of piping for equipment intended to use A2, A3, B2 or B3 refrigerants.

Note: This clause is modified by Appendix ZZ.

Piping and joints of a split system shall be made with permanent joints when inside an occupied space, except joints directly connecting the piping to indoor units.

Components shall be shipped without refrigerant charge.

Refrigerant piping shall be protected to avoid damage.

OUR VERDICT

Flare joint is allowed indoors.

The standard says permanent joints are to be used inside an occupied space "except joints directly connecting the piping to indoor units."

AIRAH Flammable Refrigerant Safety Guide

Clause 4.8 System jointing and construction standards

The joining of refrigerant piping and components should, where possible, use permanent mechanical joints or be brazed. The use of serviceable-type joints such as flare nuts must not be used in the occupied space or in any area where leaked refrigerant could pool.

Note: Serviceable-type joints are permissible on the outside of outdoor units as long as they are in an area with good ventilation and no risk of leaked refrigerant pooling.

Refrigerant piping should be enclosed or protected to avoid mechanical damage during transport, installation and use.

OUR VERDICT

Flare joint is allowed indoors.

While this would appear to conflict with both of the above Australian Standards, the *AIRAH Flammable Refrigerant Safety Guide* was prepared in 2013, prior to the AS/NZS 60335.2.40:2015 update. Additionally, Australian standards take precedence over any industry Safety Guide.

THE MANUFACTURER'S TAKE ON THINGS

According to Daikin's engineering manager, Gary Knox, M.AIRAH, the misunderstanding around the use of flare joints with split systems charged with R32 relates to the complicated phrasing of international standards (which has been adopted into Australian standards).

FREQUENTLY ASKED QUESTIONS

Q: What is the main difference between R32 and R410A?

A: R32 is a Class 2L (lower flammability) refrigerant and R410A is a Class 1 (no flame propagation) refrigerant. (Reference AS/NZS/ ISO 817-2016)

Q: How easy is R32 to ignite?

A: R32 is difficult to ignite. For ignition to occur its concentration in air must be between 14% (300g/m^3) and 29%, the concentration must be relatively still and there must be a sufficient energy source present at the same time to cause ignition. Sparks generated by relays or switches in household appliances as well as common static electricity do not have sufficient energy to ignite R32.

Q: Why use a flare connection indoors?

A: There is no requirement to use a special mechanical connector indoors when the piping and indoor unit is not pre-charged with refrigerant. Installers already have the appropriate tools and are skilled in making flare connections, so … this will produce the most reliable connection.

Source: Daikin R32 Pocket Guide.

"For flammable refrigerants, Clause 22.118 of AS/NZS 60335.2.40:2006 includes the sentence 'Reusable mechanical connectors and flared joints are not allowed indoors'," says Knox.

But he points to a sentence immediately preceding this, which states that "Joints made in the installation between parts of the refrigerating system, with at least one part charged, shall be made in accordance."

"Wall-mounted split systems comprise of three parts – the indoor unit, interconnecting piping and the outdoor unit," says Knox.

"The indoor joining parts are the indoor unit and the interconnecting piping. Neither part is pre-charged with refrigerant, so it follows that indoor flared joints are permitted. This was later confirmed when the 2015 edition of AS/NZS 60335.2.40 was revised, and states that 'When flared joints are reused indoors, the flare part shall be re-fabricated'".

Knox says that when installers are in doubt, the best source of information is usually the manufacturers' installation instructions. Beyond that, installers should ask the manufacturer for help.

"Brazing is not required to install our R32 wall-mounted split systems, and our recommended installation method is the flare joint," Knox says.

Daikin considers the flare joint to be the best method of installation for wall-mounted split systems, giving consideration to industry practice, cost and reliability.

"Our recommended installation for wall-mounted split systems fully conforms to AS/NZS 60335.2.40:2015."

ONE LAST PIECE OF ADVICE

We can't say it enough – good practice is required when replacing refrigeration parts. Remove the part by a pipe cutter and never by a brazing torch.

Please refer to SafeWork NSW Safety Alert | 07/11/2016 – Servicing Refrigerant Systems at www.safework.nsw.gov.au/news/safety-alert/servicing-of-refrigerant-systems for more information. ■