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Tough lessons

Avoiding common pitfalls

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WATCH YOUR STEP!

*Ours is an industry full of pitfalls that need to be avoided. This month, **Sean McGowan** speaks with two leading consultants to discover some of the lesser-known issues, as well as those related to the installation of the common split system. Yes, even the simplest installations can trip you up if you're not careful.*

You've no doubt come across your fair share of shoddy installations. If not, you only have to look at The Lighter Side in each issue of HVAC&R Nation to see what goes on when no one is looking. But while you might be aware of many pitfalls, it never hurts to share other people's wisdom – especially when they are industry experts.

Alastair Chapman, M.AIRAH, is an associate with GWA Consultants Australia. Working for a mechanical consultancy specialising in refurbishing and upgrading existing occupied buildings, Chapman has seen the best and worst of the HVAC industry. We pulled him out of the plant room to describe some of the pitfalls he has come across, including kitchen exhausts, essential services and the time wasted in testing systems.

#1 FAN PERFORMANCE IN KITCHEN EXHAUSTS

The problem

Underperforming system due to poor fan connections.

Why it happens

Inadequate footprint allocated during design. Poorly designed and/or constructed fittings will affect fan performance. Increase in required system duty post-design or construction.

> "Set and manage client expectations – always in writing."

How to do it correctly the first time

Ensure sufficient space is allocated or created for the installation. Set and manage client expectations – always in writing. Carefully select/design/manufacture fittings at the fan connections, as these can be the major points of pressure loss.

Test the sensitivity of your ductwork design and fan selection. How will a 20 or 50 per cent increase in flow affect the fitting pressure losses, system effect and fan performance? How could the fan connections be improved? Would the fan handle the revised duty? Could the fan be modified to handle the revised duty? Or would it need to be replaced?

Need more information?

AIRAH DA03, chapters 6 and 7, AS 4254.2, ASHRAE Fundamentals Chapter 21, Fan manufacturer's literature, peers.

#2 TENANCY FIT-OUT OF INTERNAL STAIRS REQUIRING MODIFICATIONS

The problem

Connecting two or more floors as a single fire compartment in a zone pressurisation building means the base building essential services must be modified to suit. Sometimes, however, the required modifications are overlooked or inadequately scoped. The existing base building systems may not support the required changes, and/or the works may not be adequately documented.

Why it happens

Project scope gap due to knowledge gap. Inadequate documentation, or documentation that is not carried through into base building working documents (e.g., fire matrix and testing procedures). There is also a potential "us versus them" attitude due to reluctance of fit-out project team to get involved in base building essential services works and reluctance of base building contractors to get involved in tenancy works.

How to do it correctly the first time

Ensure that the existing system operation and proposed system operation are clearly documented and the modifications are clearly scoped for all services. Undertake pre-testing to ensure that the systems currently perform and will achieve the proposed performance requirements. Ensure that one contractor is responsible for the outcome of the works, ideally the head contractor. Ensure that the existing base building documentation is modified as part of the works and handed back to the client/building management.

Need more information?

NCC Volume 1 Part E2, AS/NZS 1668.1.

#3 WASTING TIME

The problem

Huge amounts of time are wasted during essential services tests, including issues with delayed starts, access and under-resourcing.

Why it happens

Inadequate planning.

How to do it correctly the first time

Get hold of all existing testing documentation, do a dry run by yourself and come up with your own procedure. What sub-contractors do you need and how many personnel from each? Who is organising security and how many guards are needed? Where do you need access and what keys and passes are required? Who is notifying the tenants? Do you need to get above ceilings? Do you need anything moved or protected? The more questions asked and answered in the lead-up to testing, the smoother things will run on the night.

Need more information?

AS/NZS 1668.1, project and or base building documentation.


Smoke fan fire dampers installed in a common wall.

To subduct or not

There are many pitfalls to avoid when it comes to applying alternative solutions to the Building Code of Australia (BCA).

With regards to entry of smoke for smoke-spill systems, the AS/NZS 1668.1-1998 guidance notes state that to prevent smoke from infiltrating into other compartments, subducts are required at each entry point into the shaft such that smoke has to flow downwards before it can enter the other compartment.

But in lieu of subducts, high-temperature fire and smoke dampers are often used. Those in the fire-affected compartment open, and those within non-fire-affected compartments close, to mitigate smoke spread between compartments to the extent required by the deemed-to-satisfy provisions and AS/NZS 1668.1–1998.

Ivan Steed, M.AIRAH, project team leader – essential services with Grosvenor Engineering Group shares some of the pitfalls associated with applying alternative solutions to the use of subducts.

#1 BCA alternative solution 1 FIRE DAMPER/SMOKE DAMPER IN LIEU OF SUBDUCTS

The problem

As a cost-effective performance solution, motorised fire dampers/smoke dampers are sometimes installed in smoke exhaust shafts in lieu of subducts. In the example on the right, a surface-mounted smoke damper was installed with a high-temperature curtain fire damper behind it.

Why it happens

A cost-effective alternative solution installed by an inexperienced project manager is combined with a lack of internal design review and the fire engineer not using the correct mechanical services terminology.

How to do it correctly the first time

In lieu of subducts, motorised fire dampers with smoke tip seals should be installed with their thermal release mechanisms omitted.

Need more information?

AS/NZS1668.1:2015 Appendix B, Principles of Subducts.

#2 BCA alternative solution 2 SMOKE CLEARANCE FANS IN LIEU OF SMOKE EXHAUST FANS

The problem

Rationalisation of a required specification E2.2b smoke exhaust system involved 20 supply air fans being installed on a warehouse roof. The supply air fans stop in fire mode and are manually switched to reverse and exhaust the compartment via an override switch adjacent to the fire indication panel. The fire engineering report specifies fire-rated fans and cabling. However, the installed fans and associated cabling are only rated for normal duty.

Why it happens

A cost-effective alternative solution installed by an inexperienced project manager is combined with a lack of internal design review coupled with no independent review.

How to do it correctly the first time

Read the fire engineering report and discuss the rationalised design with the mechanical and/or fire consultants to ensure that you understand what is to be installed. Ensure that the fan supplier knows the fans' application, normal duty, fire-rated etc.

Need more information?

There are no prescribed requirements for a smoke clearance system, so you need to ensure that you understand the fire engineer's design and installation requirements.

#3 BCA alternative solution 3 FIRE DAMPERS AND SMOKE DAMPERS INSTALLED IN A COMMON WALL

The problem

As a cost-effective performance solution, smoke dampers and fire dampers were nominated over several revised design changes for a wall that is common to an atrium.

Why it happens

The installation contractor did not review, understand and/or contribute to the final installation detail proposed by the fire consultant.

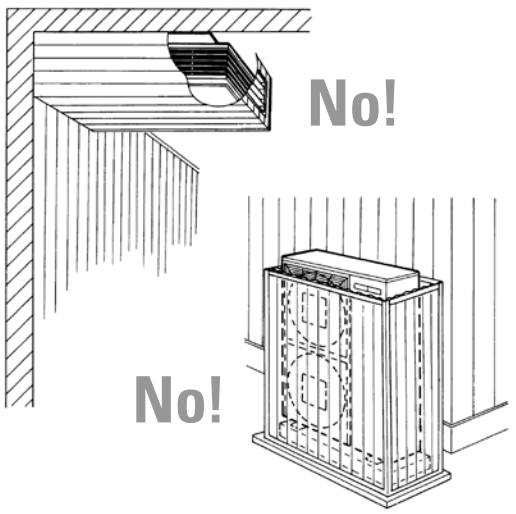
How to do it correctly the first time

If you are the mechanical contractor, make sure you are involved in the review process of the mechanical services performance solution.

Need more information?

Ensure that whoever is reviewing the fire engineering report has the appropriate knowledge to be able to provide compliance input regarding the proposed mechanical services installation detail.


A smoke damper installed in lieu of subduct.



Don't enclose units.

The pitfalls of splits

There are also plenty of pitfalls to avoid when installing split systems.

According to post-installation research conducted by Daikin, gas leaks from flare joints made up over 26 per cent of faulty installations in Japan, followed by faulty control wire connections making up almost 19 per cent of faulty installations.

"Nearly 70 per cent of the mistakes belong to five error categories," says Daikin. "You can greatly improve your installation work by paying close attention to these five areas."

These five areas include flare joints, faulty control wire connections, improper electrical wiring, improper drainpipe installation, and unsuitable installation locations.

Daikin highlights three common pitfalls when it comes to split system installation.

#1 DON'T ENCLOSE THE UNIT

The problem

As we saw in last month's "Locked Up" feature, enclosing the unit will result in a short cycle of the outlet air, and create difficulty in the replacement of filters. The air conditioner's capacity is degraded, and if the air conditioner is used in this state for a long time, an abnormal load is imposed on the compressor, and the compressor becomes defective.

Why it happens

Customers will often prioritise aesthetics over function. Guide them as to the best installation locations. Similarly, don't install in a place that's the easiest and quickest – install in the correct position.

How to do it correctly the first time

Indoor units are designed for direct blowing. Therefore, don't install a cover. If the air conditioner must be hidden because of design requirements, use the appropriate model (such as a ceiling cassette). Additionally, provide the necessary space as shown in the product specification.

Need more information?

Speak to the product manufacturer or supplier.

#2 TWO OR MORE CONDENSERS ARE INSTALLED TOGETHER

The problem

When two or more outdoor units/condensers are installed together in one place, the warm air blown out the back of one unit is sucked into the unit located in front, and normal heat exchange cannot occur, degrading performance and in some cases damaging the compressor.

Why it happens

Restriction of appropriate outdoor space, or ease in installation might result in two or more outdoor units being placed in close proximity.

How to do it correctly the first time

When two or more outdoor units are installed in a single location, they must be placed so that they do not directly suck the air blown by the other unit(s), with adequate distance between them as shown in the product specification.

Need more information?

Speak to the product manufacturer or supplier.

#3 REFRIGERANT PIPING TREATMENT

The problem

A crimped or damaged refrigerant pipe disturbs the normal flow of the refrigerant. The capacity drops and imposes a load on the compressor that may result in problems. Additionally, cracking may develop from a crushed point, resulting in refrigerant leaks.

Why it happens

Sometimes the refrigerant pipe run needs to go around corners, but creating too sharp a bend reduces the flow of the refrigerant.

How to do it correctly the first time

Since the bent section of refrigerant piping creates resistance to the flow, the number of bends should be kept to a minimum. Additionally, any bends in the pipe must be made carefully to avoid crimping the pipe. Whenever possible, use a pipe-bending tool. A very gentle bend may be made by slowly applying force by hand, but avoid bending abruptly or it may break or crimp.

Need more information?

Speak to the product manufacturer or supplier.

FIELD PIPING

Remember that with refrigerant piping:

- Shorter refrigerant lines with minimal bends optimise system performance.
- Knowing the maximum allowable piping length for the unit is vital.
- Cap the ends of the piping to protect them from dust and moisture.
- Avoid bending the piping too much, and when necessary, use a pipe-bending tool.
- Be sure to apply insulation around the indoor drainpipe.

Source: Daikin

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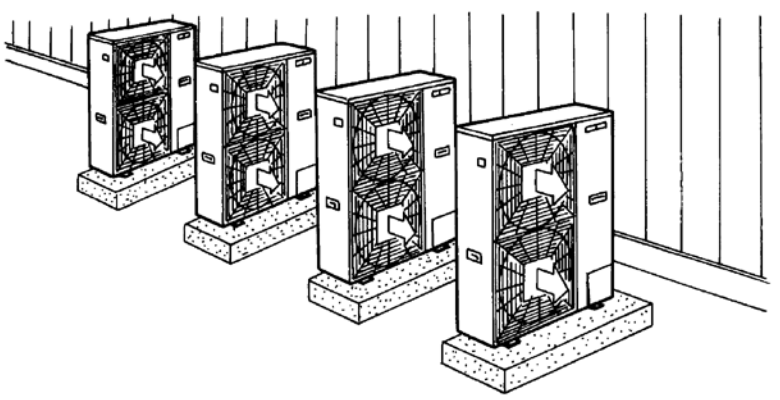

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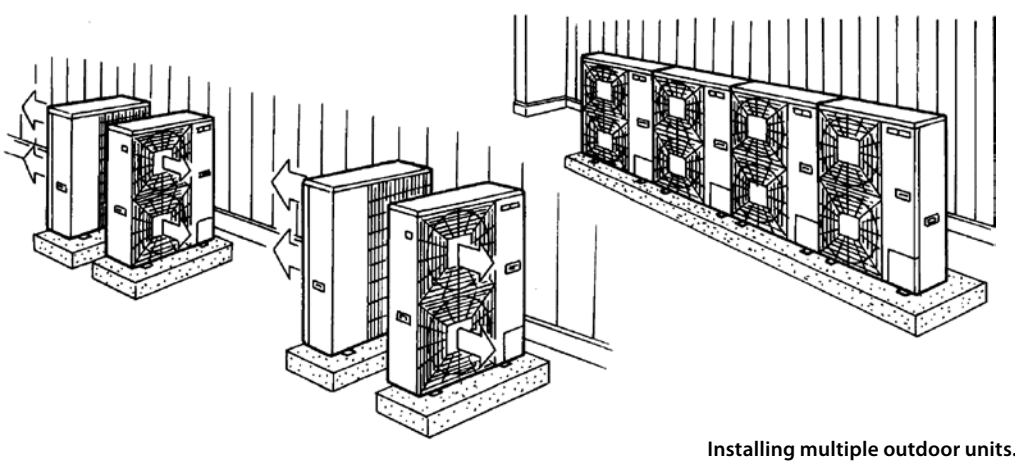

Installing multiple outdoor units.