Active venting stacks up

No more unsightly vent pipes – the smarter way to keep waste flowing smoothly down pipes in high-rise buildings is based on sound scientific research.

When someone first came up with the idea of putting toilets and sinks in multi-storey buildings, the vent stack was born.

The job of these structures – which are separate to soil stacks – is to allow only a small (but harmless) pressure differential to each trap seal connected to the waste pipe.

Vent stacks or relief vents stabilise the air pressure within the soil stack – which can be particularly turbulent during peak flows – to maintain it near atmospheric pressure and reduce the incidence of 'hydraulic shock', which damages trap seals.

The higher the soil stack, the greater potential for pressure differentials to arise, so the greater the requirement for venting to prevent loss of trap seals in high-rise buildings.

David Griffiths of Studor Australia demonstrates the power of P.A.P.A to building designers, engineers and consultants at the Gore Hill TAFE rig earlier this year.

Added to the problem of these negative pressure transients in the drainage stack is that of positive transients due to surcharge at the base of the stack, when the waste, travelling at terminal velocity, literally 'trips up on itself'. Positive transients can move back through the drainage stack at the speed of sound – 320m/s – and, in extreme cases, lead to the trap water-seal blowing out of the fixture leaking sewer gases into the building's interior.

Today, there are a number of 'single stack' solutions to the vent stack, such as the Geberit Sovent system.

More recently, Studor has been active in developing a solution to positive air pressure transients – to complement its AAV (air admittance valves), which ventilate branches and stacks to stabilise air pressure for effective waste flows.

The Studor solution – a positive air pressure attenuator or P.A.P.A. device – is the result of five years research by a team at Edinburgh's Herriott-Watt University. The team is headed by renowned plumbing engineer, Professor John Swaffield.

A P.A.P.A. unit acts like a shock absorber, absorbing pressure waves and stopping them bouncing around the drainage system. The units eliminate the need for vent piping and roof penetrations. The number and location of PAPA units will depend on the building and plumbing design – obviously, the higher the building, the more units will be required.

At the World Plumbing Council conference in Auckland earlier this year, Professor Swaffield gave an insight into the sophisticated research behind the design of the P.A.P.A. device.

As well as computer modelling, the Herriott-Watt team have used a massive test rig to develop and refine the invention.

It's what you might call 'big science' (not surprising when you consider what's at stake!).

Studor Australia recently unveiled a similar rig built here with the assistance of plumbing students at Gore Hill TAFE. The rig simulates the wet and dry stacks of a 10-storey building.

The idea is to demonstrate to designers and specifiers Professor Swaffield's concept of 'active control' of air pressure transients – as opposed to the 'passive approach' of traditional vent stacks.

"Active control can be achieved by introducing devices to limit pressure changes adjacent to the trap," says Professor Swaffield.

"We can limit negative pressure transients by adding extra air flow via AAVs, or limit positive transients by soaking up the extra flow with positive air presure attenuator (P.A.P.A.).

"The benefits of active control include removing the need for long, convoluted vent connections. Local suppression also prevents transient propagation through the network, providing better protection for trap seals.

"Active control reduces system complexity and increases the predictability of system operation." ■

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