

TRICKLE-DOWN EFFECT:

UNDERSTANDING THE LATEST, SPACE-SAVING
DEVELOPMENTS IN WATER MANAGEMENT



INTRODUCTION

Plumbing and sanitary systems are a central part of any building project, and consume significant amounts of space, cost, and materials. This is particularly the case in multi-storey buildings, where soaring heights complicate integration into public water mains¹. As urban populations continue to increase and vertical developments are touted as the next big thing in architecture², the need to carefully consider water management in high-rise buildings is more pressing than ever.

Luckily, advances in technology mean that new rain and wastewater management options are constantly entering the market. While this flood of new products is beneficial in driving down prices and increasing competition and the drive to innovate, it can be overwhelming: how can designers decide between conventional and new technology? In this white paper, we follow the journey of rain and wastewater through a typical multi storey building. Charting the water's progress from the roof, through the building, from the toilet or washbasin, and to the underground pipes, we present an overview of the popular and emerging methods for managing water at all stages.



FROM THE ROOF

Conventional stormwater roof drainage

As its name implies, a gravity roof drainage system is one that relies on gravity and water's natural tendency to flow to the lowest point and drain. Water that collects on the roof due to rainfall flows to the rooftop drains, where it begins its long downward journey. Though these systems are effective in that rain is eventually conveyed to the underground pipe system, they are slow. Air enters the downpipe alongside rainwater, limiting the water flow and reducing overall efficiency.

Gravity roof drainage systems are also problematic in cases of heavy rain and storms, particularly where a drain cover is not used. The speed of drainage from the roof may be inadequate to address high rainfall, and leaves and other debris may enter the roof drain, clogging the pipes. In both scenarios, the ponding of water on the roof may cause damage to the building. Leaves and other debris may enter the roof drain, clogging the pipes and causing water to pond on the roof, which may in turn result in building damage.

Siphonic drains

Developed in Scandinavia over 40 years ago and in popular use worldwide ever since, siphonic drains are a more efficient alternative to gravity roof drainage. Like their conventional gravity-reliant counterparts, siphonic drains are installed on building rooftops. Unlike conventional drains, they employ an anti-vortex plate as a baffle that prevents air from entering the pipes. As a consequence, the pipes fill entirely with water and function at full capacity. The combination of the downward pull of water and the lack of air results in a vacuum that siphons water down from the roof at a high velocity.

Quick and highly efficient, siphonic drain systems reduce downpipes by up to 40%.³ Thanks to the constant vacuum force, lateral pipes require no gradient to channel water effectively, resulting in a significant space saving. When specifying siphonic drains, architects and specifiers must consider the drainage system as a whole, and be mindful of rainfall intensity rates and the sizing, materials, and configuration of pipes. Siphonic drains are ideal for large roof areas and high rainfall rates.

THROUGH THE BUILDING

Fully vented stacks

In all wastewater drainage systems, venting is necessary to maintain the atmospheric pressure of air inside the drain and prevent the build up of a concentration of gas⁴. The absence of proper ventilation affects the seal in water taps, which are easily affected by compression or siphonage. In traditional fully vented stacks, a parallel ventilation pipe must be attached to a large discharge stack at regular intervals in order to cater for water flow.

This consumes a high amount of space, and exacerbates the susceptibility of fully ventilated stacks to rapid pressure changes.

Special self-ventilating fittings

Ideal for cost-conscious multi-storey projects, self-ventilating fittings eliminate the need for a secondary ventilation pipe/line and reduce the need for floor penetrations. The streamlined fittings have low space requirements – particularly when compared with fully vented stacks – and are highly adaptable to any building design.

Self-ventilating fittings enhance drainage system efficiency throughout a building by controlling the flow capacity of the discharge stack. Higher flow rates are afforded down the length of the building, thus allowing fewer stacks to be used.

FROM THE TOILET/WASHBASIN

Close coupled toilets

The most widely recognised cistern type, the close coupled or front of wall toilet is mounted directly on top of the toilet pan with no visible pipes. This type of cistern is suitable for new builds and renovations alike, with its exposed installation allowing it to be more quickly and easily retrofitted than its concealed counterparts.

However, designers and specifiers should carefully consider aesthetics when specifying close couple or front of wall systems: many contemporary bathrooms are now moving away from the clunky appearance of the exposed cistern, favouring instead the cleaner, minimal look of a concealed cistern.

Concealed cistern

As mentioned above, contemporary tastes and the desire for a minimalist bathroom aesthetic have led to the increasing popularity of concealed cistern options. The discreet, space-saving systems are ideal for compact bathrooms but provide design flexibility in bathrooms of all sizes and layouts. Traditionally they were particularly popular in the commercial and hospitality sectors, although these – alongside the residential sector – are increasingly moving toward in-wall cisterns.

Alongside their clean, modern aesthetic, concealed cisterns offer advantages in sustainability and efficiency. Most standard cisterns of this type are available in a 6/3L or 4.5/3L dual flush and have extended product lifespans. Designers and specifiers considering a concealed cistern must be mindful that they may be costlier than close coupled or front of wall cisterns and should consider access in the case of maintenance or repairs.

TO THE UNDERGROUND

PVC Pipes

Affordable and easy to install, polyvinyl chloride (PVC) pipes are a popular inclusion in many drainage systems. While they are efficient in certain contexts, PVC pipes are not resistant to high temperatures or many chemicals, and are susceptible to impact damage.

PVC pipes themselves are durable, though the special PVC cement used to connect them is toxic when inhaled^{6,7}, and may fail over time. Other drawbacks in the use of PVC pipes include the scope for user error during installation and the possibility for sediment and other residue to accumulate at joints where cut edges are not perfectly smooth. Over time, this may become substantial enough to cause a blockage in the pipe.

HDPE Pipes

High Density Polyethylene (HDPE) pipes are a highly durable, impact resistant alternative to PVC pipes. Compatible with plumbing systems of all scales and natures, HDPE pipes are available with a range of connection options and are easy to install. They are highly resistant to chemicals and corrosion, can withstand temperatures up to 100OC with a low shrinkage rate, and will not release toxic emissions in case of fire.

Heavy duty but lightweight, HDPE pipes are ideal for trade waste and in multi-storey projects in which constant, high flows of water are expected to enter underground pipes.

GEBERIT

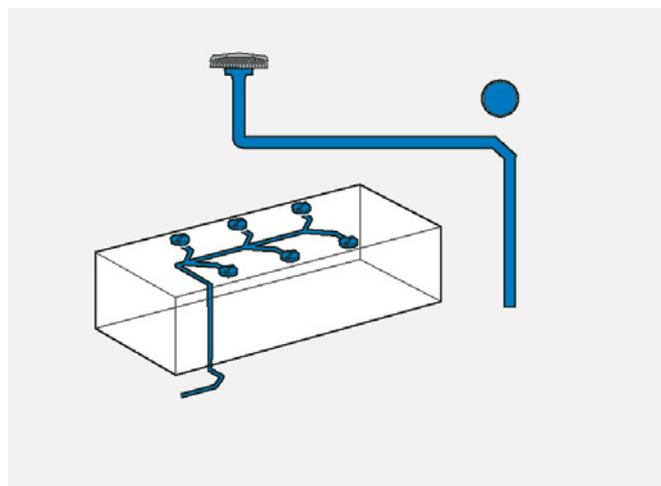
With over 50 years' global experience as a trusted provider of drainage solutions for builders, architects, and developers, the Geberit name is synonymous with high quality, reliability, and longevity. Backed by research and extensive testing, Swiss design and manufacture delivers low maintenance, cost-effective products that allow unrivalled design flexibility. Geberit's plumbing and sanitary systems have been available in Australia since 2002, and can be found in Reece plumbing stores across the country.

Since introducing the first concealed cistern 50 years ago, Geberit has continued to innovate, expanding to a diverse range of high-performance products that incorporate common elements for maximum compatibility. Now, to meet the demands of an increasingly vertical architecture and construction industry, Geberit has developed Pluvia, a roof drainage system, and Sovent, a building drainage system. Both complement Geberit's trade waste solutions, and emphasise cost and space savings without compromising performance.

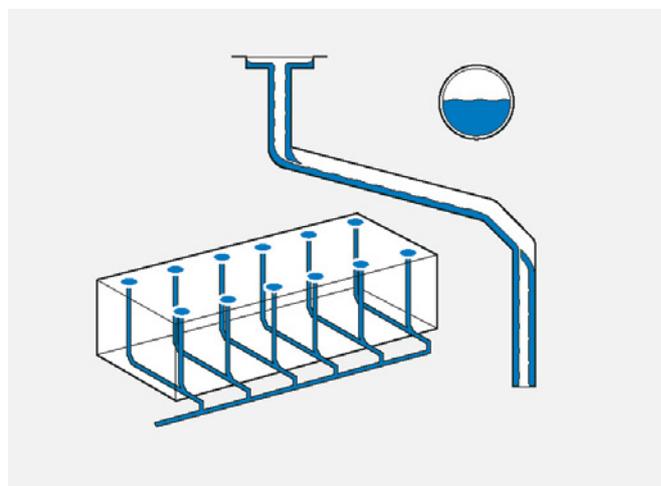
Availing of the latest in siphonic drainage technology, the Pluvia system features a high discharge rate that significantly reduces the required number of pipes in comparison with conventional roof drainage systems. A non-sloping collector pipe is connected to fewer discharge stacks that in turn use pipes of reduced dimensions; used together, Pluvia and Sovent can offer a space advantage of up to 63% more usable space. The self-cleaning pipes are quick and easy to install in all types of roofs, including green roofs, and can discharge up to 100L/s of rainwater per outlet.⁹

Pluvia can be paired with Sovent, a space-saving, high-performance single stack drainage system. Using a patented branch inlet fitting, Sovent reduces fluctuations of pneumatic pressure inside stacks, thus preventing the siphonage of connected taps and offering a 30% increase in discharge capacity when compared with other fittings.¹⁰ The inexpensive fittings are ideal for use in multi storey buildings, and are manufactured from a durable HDPE plastic.

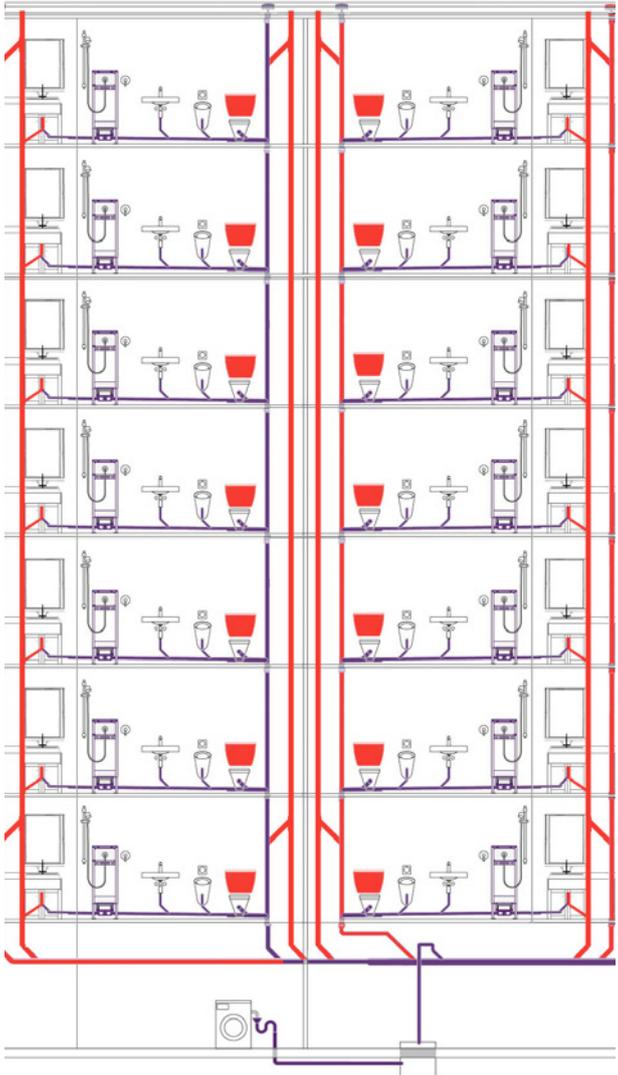
A non-sloping collector pipe is connected to fewer discharge stacks that in turn use pipes of reduced dimensions; used together, Pluvia and Sovent can offer a space advantage of up to 63% more usable space.



Siphonic roof drainage



Conventional stormwater roof drainage.



The red elements can be eliminated when specifying Geberit Pluvia, Sovent and concealed cistern, saving at east 63% space (compared to conventional systems).

Geberit also offers concealed cisterns and flush buttons for sleek, contemporary bathrooms. With more than 60 million units installed worldwide, customers can be sure that Geberit concealed cisterns deliver discreet performance, efficiency, and sustainability in bathrooms of all sizes and designs. The 3 or 4-Star WELS rated cisterns can fit in standard 80mm walls, and are easily accessed for service or repair through the flush plate.

Alongside their suite of reliable, long-lasting plumbing and sanitary solutions, Geberit offers support and expertise at all phases of the project, offering an exceptional level of design support and detail drawings. Readily available BIM data and easy integration with Revit makes specifying and designing with Geberit products easy at any scale.

REFERENCES

- ¹ http://www.who.int/water_sanitation_health/hygiene/plumbing14.pdf
- ² <https://www.hassellstudio.com/en/cms-urban-futures/stories/superdensity>
- ³ <http://www.fullflow.com/syphonic-explained>
- ⁴ https://www.dlswab.rmit.edu.au/toolbox/plumbing/toolbox12_01/units/cpcpdr4001a_sanitary/00_groundwork/page_005.htm
- ⁵ <http://plumbingconnection.com.au/concealed-cisterns/>
- ⁶ <http://www.vinidex.com.au/wp-content/uploads/SDS-Type-N-Blue-Solvent-Cement-20161004.pdf>
- ⁷ <http://athertonchemicals.com.au/pdf/plummas/msds/Plummas%20Type%20N%20Blue%20Solvent%20Cement.pdf>
- ⁸ 'Geberit saved the developers of Marco Apartments 104sqm of space and over \$876,000', Geberit.
- ⁹ 'Geberit Pluvia', Geberit Australia. Accessed on 8 November 2017. www.geberit.com.au/local-media/files/pluvia-one-brochure.pdf
- ¹⁰ 'Geberit Solvent Planning Manual', Geberit International Sales. Accessed on 8 November 2017. www.geberit.com.au/local-media/files/geberit-solvent-installation-guide.pdf