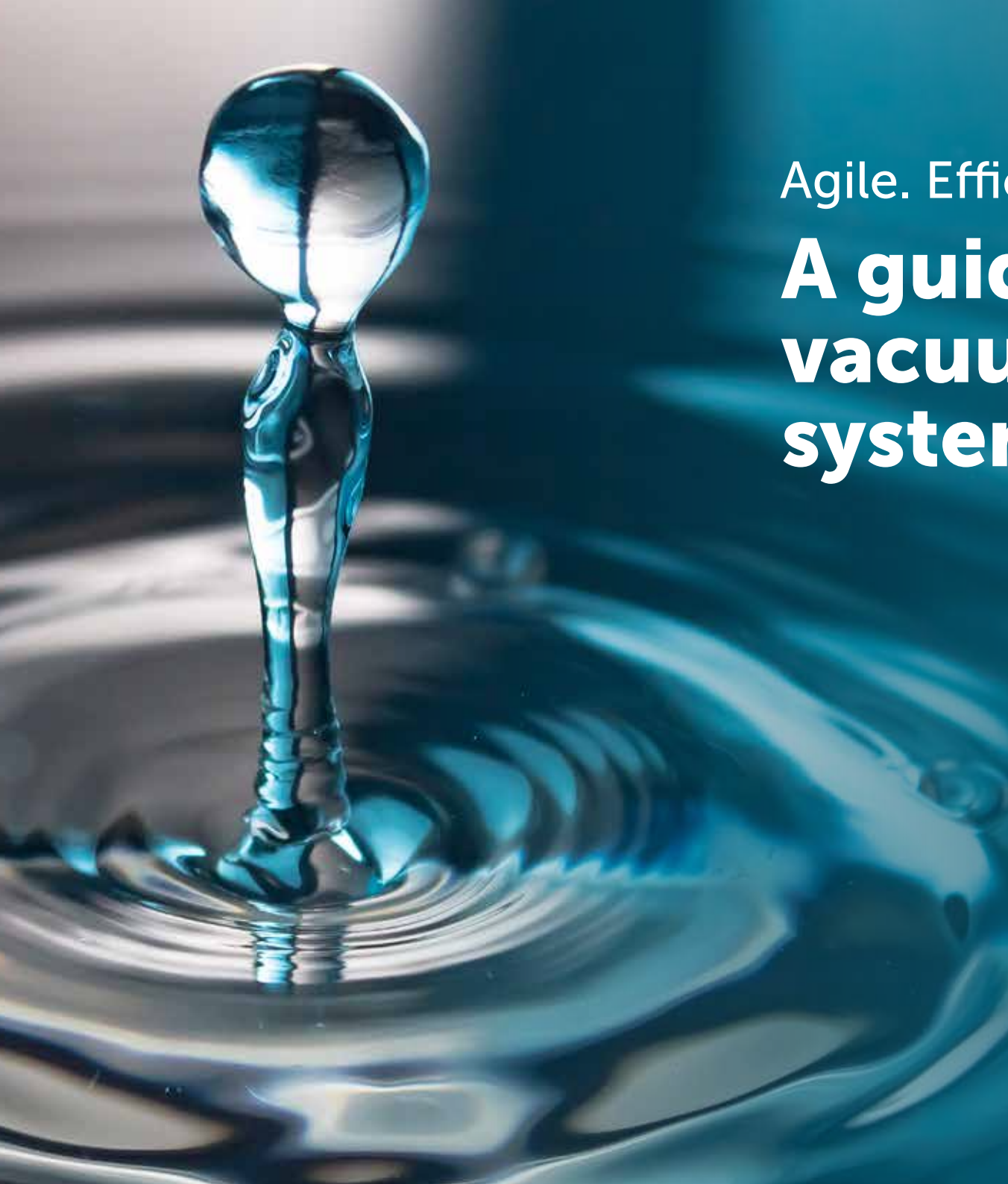


evac

Agile. Efficient. Future-ready:

A guide to vacuum plumbing systems

The perfect plumbing system is not just a pipe dream!

A good plumbing system is one that you never have to think about. It should be an invisible operation that works smoothly and reliably without a hitch to ensure optimal comfort, hygiene, and safety for its occupants.

While gravity systems are often the conventional choice of plumbing, vacuum plumbing systems are fast challenging the status quo and emerging as a smart and efficient alternative. Vacuum systems collect wastewater in a future-proof way with minimal energy and water consumption.

In this guide, you will find out more about vacuum plumbing systems, how they work, where they can be used and the impressive benefits they offer to the building sector.

Armed with the right knowledge, you can make a choice that would not only meet your design goals during construction but also offer you future savings in water, time, and money.

Contents

What is a vacuum drainage system?

A vacuum drainage system is a complete plumbing system that is quite simple in its operating principle, yet often overlooked. Vacuum technology is fast becoming a more widely-embraced primary plumbing choice for a host of reasons that we will delve into in this guide.

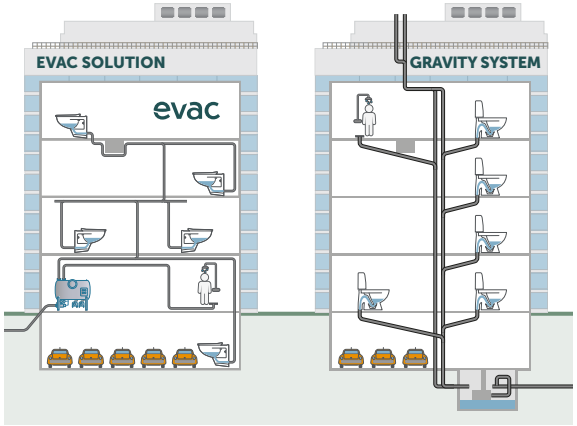
Instead of relying on traditional solutions that use gravity to remove wastewater, vacuum systems create a powerful vacuum — wastewater is transported with high efficiency under air-water mixture, by the pressure difference.

So, how does it exactly work?

The main elements in a vacuum system are the vacuum interfaces, vacuum toilets and the vacuum collection units. The generation units generate the vacuum in the piping using a vacuum pump. When a toilet is flushed, the higher-pressure atmospheric air flows into the lower pressure piping throug the toilet or the interface. The air travels at high velocity because of the pressure difference, carrying the wastewater with it.

Typically, one toilet flush transports the wastewater between 10 and 25 meters to the next transport pocket, where a reserve is created to form a slug of water. When the toilet is flushed again, the wastewater moves another 10 to 25 meters until it finally reaches the collection unit. From here, it can be lifted where needed or released to the sewer.

A smart alternative to traditional evacuations and gravity



Key features

- The removal of wastewater or liquids through suction from specific interfaces
- Collections are done by a vacuum generating plant through pressure pipes.
- Effluents can be collected before being discharged or treated.

What you get with the Evac vacuum plumbing system

Design flexibility

- ✓ Smaller pipes
- ✓ Flexibility of being able to transport wastewater around obstacles, overhead or horizontally without a continuous slope
- ✓ Eliminates the need for slab penetrations
- ✓ No need for lift pump stations with multiple collection points underground

Reliable operations

- ✓ Non-existent blockages and sedimentation because of high water velocity in vacuum pipe
- ✓ Pipe breaches lead to only air leaking in the pipe, instead of wastewater leaking into the room
- ✓ Appliances and interfaces do not need vent stacks anymore

Ease of remodeling

- ✓ Reduced installation time
- ✓ Easier and more economical choice for building conversion, underground installation, store remodeling, or historical building renovation
- ✓ Offers more layout options and flexibility while implementing changes, and reduces the need for drilling holes, making it a quicker and more cost-effective affair

High on hygiene and water savings

- ✓ Up to 90% saving on flushing water compared to a standard toilet
- ✓ Our vacuum toilets use only 0.8-1.2 liters/0.3 gal per flush
- ✓ Helps your building achieve green certifications
- ✓ More hygienic than traditional toilets — Evac vacuum toilets suck 60 liters/2.1 cft of air per flush
- ✓ Reduces airborne mist, significantly increases ventilation
- ✓ No risk of water seal failure

More flexibility, better creativity, and wider options.

Solving design problems with Evac vacuum technology

Vacuum technology has been around for over 40 years now, empowering designers to make bolder and more cost-effective architectural design choices and simplifying construction challenges. You can make your creative goals come true without being held back by the constraints of a gravity plumbing system.

Defying gravity: Vacuum technology allows wastewater to be transported around obstacles, overhead or horizontally without a continuous slope — pipes can be routed upwards, to enable very high lifts depending on specifications. This means you have a lot more plumbing design options than you would with gravity systems. It also eliminates the need to dig the ground to build lifting pump stations.

Smaller pipes, bigger benefits: Pipes used in vacuum drainage systems are significantly smaller than traditional gravity pipework, making design and installation simpler and more flexible. Vacuum systems also negate the need for traditional stack design as vacuum drainage pipework can rise to a high level with small bore pipework.

More flexibility, more freedom: With vacuum systems, you have the flexibility to position sanitary appliances anywhere in the building. You can easily add drains and fixtures without having to undertake major work. This not only gives you the freedom to design a structure the way you want but also helps you save valuable space that could be used more efficiently.

Technical details

	VACUUM TOILET	GRAVITY TOILET
Pipe diameter	DN25-65/NPS1 - 2 1/2	DN32-100/NPS1 - 1/4-4
Appliances connection	DN50	DN100
Interfaces, greywater appliance	DN40 with multiple fixtures connected to the same interface/box	DN40 per fixture
Main or branch pipe	DN65	DN100

Photo: Flickr

30 extra rooms

Saving space at the Andaz London Liverpool Street hotel

Andaz London Liverpool Street hotel was originally built in the 1800s and was once the flagship hotel of the Great Eastern Railway Company — many of its areas are listed as being of Historical and Architectural Interest. During remodelling, the flexibility of the vacuum system enabled the designers to route drainage runs around these areas without extensive and costly building work. Vacuum technology has given durability and longevity for the system for over 20 years. Over 300 rooms are served by the vacuum system. Without the requirement for a continuous slope, the Evac system saved space and allowed for 30 extra bedrooms.

CASE

Easier, quicker, and hassle-free installation

Saving time and space with Evac vacuum technology

Sometimes conventional gravity plumbing is cost-prohibitive, doesn't meet design goals, or just won't work in many situations. Vacuum technology is not just easier to install but offers you the flexibility to make changes on the go a lot more effortlessly, which proves to be more economical in the long run.

Last-minute modifications made easy. One big benefit of choosing vacuum technology is that it lets you make last-minute changes easily. This is rarely possible with gravity systems as the large pipes, the number of trenches, and the amount of drilling involved could complicate matters. Smaller PVC pipes allow you to make quick and simple modifications and add features on-site at short notice. In fact, vacuum drainage helps decrease construction and remodeling time, letting you make adjustments at a lower cost.

Smarter and more efficient installations. Installing a vacuum system is less cumbersome. Waste piping is typically routed from the ceiling, minimizing the need for trenching, and saving time and costs on both new construction and remodeling projects. The risk of cutting in-slab electrical, potable water lines, and sewer lines can be eliminated. Additionally, the need for floor X-rays can be eliminated or reduced, allowing architectural and historical features to be preserved.

With pipes taken into the ceiling voids in vacuum installations, the need for expensive underground drainage is eliminated. Compared to a gravity system, there are far fewer floor and ceiling penetrations, and also no need for vents, continuous pipe slope, toilet cisterns, and WC overflow pipework.

Underground installations made easy. Underground installation is easy and cost-effective without the need for a lifting pump station. This makes toilet installation in places like subway and metro stations more viable. Vacuum technology offers versatility in underground and suspended slab construction, eliminating or reducing core drills and slab penetrations, roof penetrations, floor drains, and cleanouts. It lets you have a single collecting point, with no multiple lifting pump stations needed. This keeps your wastewater collection point on the same level as bathrooms, kitchens, and any other drainage collection points.

Flexible supermarket design for collecting condensate water. Unlike conventional gravity drainage, vacuum generation units transport condensate water through an overhead piping network by withdrawing air. Evac´s technology prepares your stores for potential future expansion and speeds up construction schedules. Displays can easily be changed overnight, extra refrigeration space added, and store layouts designed with more freedom.

Ideal in challenging situations. In environments where digging into the ground may not be an option — such as an archaeological site, or land with a high water table or polluted soil — a vacuum system offers efficient and non-intrusive above-ground solutions that can save you time, major costs, and delays.

Less disruption, more convenience. With lower levels of dust and groundwork and higher levels of site safety, any disturbance to current tenants is significantly reduced. Lower-level departments or tenant spaces don't need to be accessed when remodeling or installing a vacuum system on one floor. In situations like the remodeling of stores that will remain open during work, sales floor safety hazards can be reduced. The possibility to install toilets on underground levels makes vacuum systems an ideal choice for subways and metro stations — people with reduced mobility won't be forced to climb up to upper levels to access toilet facilities.

Photo: ALDI

Reduce construction time and add flexibility

ALDI, a leader in the grocery retailing industry since 1976, operates more than 1,800 U.S. stores in 35 states.

In 2017, ALDI announced aggressive plans to expand and remodel 1,300 stores in addition to building nearly 900 new stores. ALDI is installing hundreds of Evac vacuum systems annually. Evac systems prepare all stores for potential future expansion and reduce construction schedule time. Evac is uniquely qualified to manage large programs like this based on years of experience in the market.

CASE

Easy on the environment, health, and your pocket

Stay future-ready with Evac vacuum technology

The need for raising standards of sustainability, cleanliness, and safety in public sanitation has taken on greater significance in recent years. Harnessing the power of vacuum technology to solve common problems concerning water usage, hygiene, and overall comfort can give your building a winning advantage.

Water savings of up to 90%. The numbers speak for themselves — Evac vacuum toilet offers up to 90% saving on flushing water compared to a standard toilet. Our toilets are designed to use only 1.2 liters. In comparison, a conventional dual-flush toilet uses 4–9 liters per flush. The vacuum system also offers a separation of grey water and black water, with the recycled grey water made feasible for other non-potable uses. Choosing a vacuum system can help your building achieve LEED, BREEAM, AQUA, DGNB, and other green building certifications.

Improved hygiene, health and comfort. Evac vacuum interfaces and toilets offer a more sanitary environment than traditional gravity toilets. While gravity systems can lead to an overspray of up to 80,000 polluted droplets that could stay suspended one meter in air for hours, vacuum toilets allow suction of 60 liters of air during flush, suppressing the risk of contaminated mist, odors, and bacteria, according to an *NSF International (National Sanitation Foundation) report* from March 2019.

Minimal water usage also means less chance for bacteria to spread, which makes it a particularly sound choice for healthcare facilities, and high-traffic buildings with public restrooms.
In addition, the risk of leakage with a vacuum piping system is greatly reduced because of the pressure differential which sucks air instead of leaking water out in case of a pipe breach. Vacuum system also solves the risk of the water seal failure that can happen in gravity pipeline. Evac vacuum toilets and greywater interfaces do not need vent stacks anymore, the odor is safely sent away and optionally filtered at the point of collection. And thanks to the system's flexibility, there is no need to store wastewater near the public.

Evac's specially designed vacuum toilets come with a seat and push-button made from an advanced antimicrobial material that provides long-lasting protection against a wide range of bacteria. They also offer the benefit of hygienic, contact-free auto flushing.

Significant savings in the long run. Apart from savings during the design and installation stage, choosing a vacuum plumbing system can drastically reduce operational costs, thanks to the overall savings in water, and reduction of wastewater bills.

Maintenance costs are also reduced because vacuum technology greatly reduces main line blockages and the exposed piping makes it easy to access, repair, and carry out cleanouts. When used in high-rise buildings, vacuum systems reduce the amount of
potable water that has to be lifted to the top of the building, and also help save on energy costs.

Easy to maintain and repair. Choose a vacuum plumbing system for smooth and efficient system operation, management, and troubleshooting — Evac systems can be monitored and controlled via a user-friendly interface. Wherever your building, business, store, or office, we ensure constant quality with our large presence worldwide. We offer full support, right from design to maintenance, and train local actors whenever needed.

Photo: Pexels

Optimizing operations at dialysis clinics

Evac vacuum systems have proven to be an ideal solution for dialysis clinics that have unique and extensive drainage needs.

- Eliminates the need for x-ray, demolition of building foundations, soil stacks, reworking existing mechanicals, or extensive floor trenching and wall penetration.
- Reduced water consumption, improved hygiene, space savings with smaller diameter piping, and contaminated waste stream separation and confinement.
- Reduced risk of overspray with aerosolized feces, aiding in the prevention of airborne infectious diseases.
- Savings on construction costs and time compared to other solutions

CASE

Busting top myths about vacuum drainage system

It's NOT new technology:

Vacuum plumbing technology has been around for over four decades solving plumbing problems that gravity solutions cannot. Evac was established in 1979 and it now has completed over 40,000 marine projects and equipped more than 4,500 buildings worldwide.

It's NOT expensive:

When designing, constructing, and modernizing buildings, Evac vacuum drainage gives you the flexibility needed for cost-effective work. Delays due to weather are reduced or eliminated, as are the costs and time needed for change orders. A short payback time can be achieved thanks to lower water and sewage costs associated with our vacuum collection systems.

It's NOT just used on airplanes and cruise ships:

There's more to vacuum drainage systems than an airplane, marine or train toilet. Our vacuum waste systems have successfully been offering design flexibility, efficiency, ease of remodeling, cost-efficiency, and significant water savings to buildings across the globe for more than 40 years. Vacuum toilets are also more comfortable and hygienic as they effectively remove odors and mists.

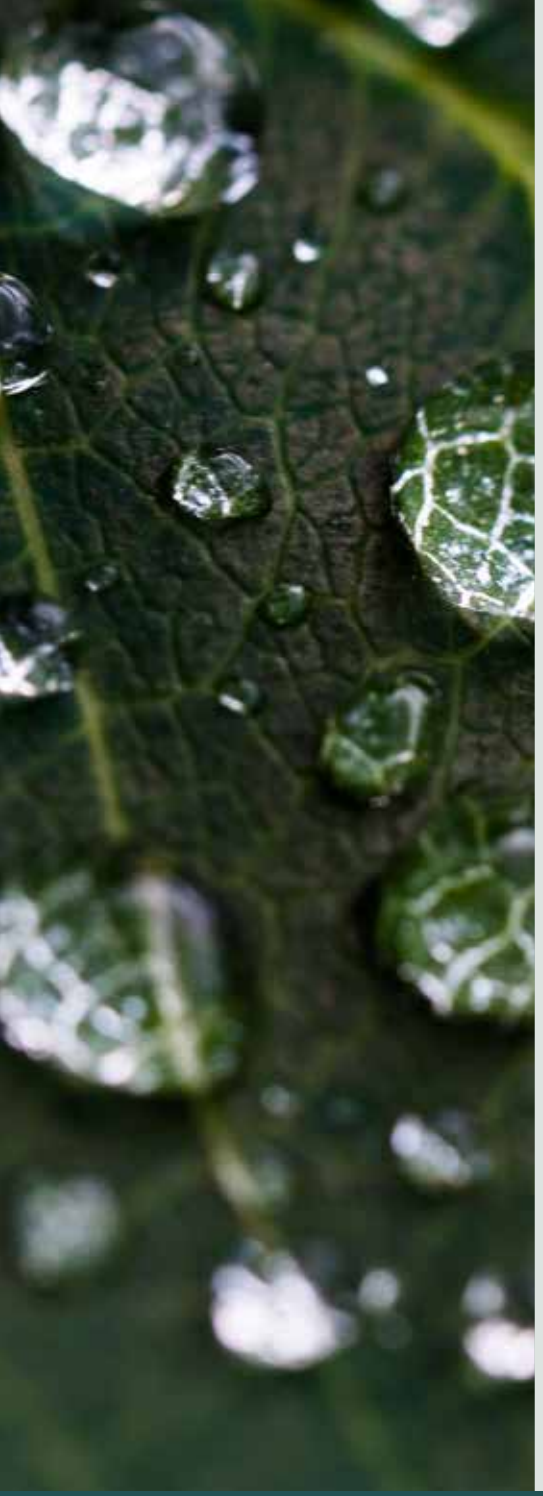
It's NOT complicated:

Vacuum plumbing technology is a complete plumbing system that follows more simple rules than a conventional gravity drainage system. Installation is easy and efficient — pipes are easily routed around construction obstacles to avoid complicated and costly structural changes. Underground installation is made easy and cost-effective without a lifting pump station.

Good for your building, better for the environment

Our energy-efficient vacuum collection systems play an important role in conserving the world's scarce water resources, reducing waste, and helping you achieve your environmental goals through smart solutions.

- The volume of wastewater that needs to be treated is reduced, which in turn reduces the amount of equipment and energy consumption.
- Reduces water and energy consumption in applications like skyscrapers where you need to lift fresh water to the highest of floors.
- Saves material resources. Smaller pipes mean less plastic and no need for trenches, the usage of concrete is reduced, and the construction site is much cleaner with reduced dust.
- In areas with water scarcity, like some areas in Brazil where water is rationed, our customers can manage the gap with their reserves.
- The flexibility that the vacuum systems offer makes it easier and more cost-effective to convert existing buildings for new uses.
- No need for in-ground plumbing makes vacuum technology a particularly ideal choice in protected sites and fragile ecosystems.



Evac's vacuum plumbing solutions
in a nutshell

40
years of expertise

Formed in 1979, Evac is now the world's leading provider of integrated water and waste management systems for marine, offshore, and building industries.

4500
buildings
and still counting

Since the 70s, we have successfully equipped more than 4500 buildings with vacuum systems.

Up to 90%
water savings

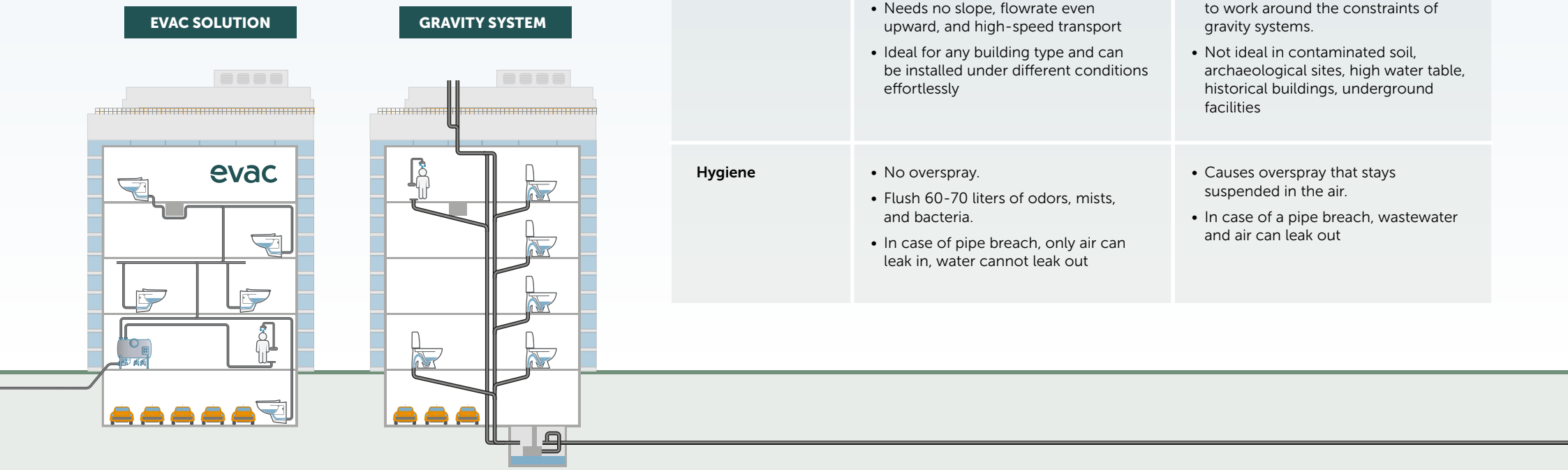
The Evac vacuum toilet offers up to 90% savings on flushing water compared to a standard toilet and can help achieve green building certifications.

100%
right choice...

...if you are looking for a system that offers design flexibility, easy installation, improved hygiene, and huge savings in water, time, and money in the long run.

So, why should you choose vacuum over gravity systems?

	VACUUM	GRAVITY
Piping	• Small diameter piping (DN25-65/NPS1 - 2 1/2)	• Large diameter piping (DN32-100/NPS1 - 1/4-4)
Toilets and interfaces	• Vacuum toilets with an integrated interface that isolates the vacuum environment when off along with a parallel greywater interface that collects greywater to send to the vacuum. • Central collection point	• Toilets require drains and large sloping piping with a vent. • In some cases, there is a need for lifting pump stations which are harder to maintain.
Water consumption	• Uses vacuum suction, and pocket transport with only 1.2 L/flush	• Needs continuous slope, uses water transport with 4-9L/flush
Design and operation	• Design flexibility offered by vertical lifts, horizontal runs, smaller diameter piping, and the ability to go around obstacles • Needs no slope, flowrate even upward, and high-speed transport • Ideal for any building type and can be installed under different conditions effortlessly	• Slope required, multiple floor penetration, slow gravity flowrate downward only • Buildings need to adapt themselves to work around the constraints of gravity systems. • Not ideal in contaminated soil, archaeological sites, high water table, historical buildings, underground facilities
Hygiene	• No overspray. • Flush 60-70 liters of odors, mists, and bacteria. • In case of pipe breach, only air can leak in, water cannot leak out	• Causes overspray that stays suspended in the air. • In case of a pipe breach, wastewater and air can leak out



When you choose Evac, you get more than just a vacuum drainage system.

You get a clean and green solution that ensures efficiency, convenience, and reliability while making your building future-ready. If you want more information on why the vacuum system could be an ideal fit for your building, get in touch with your local Evac sales representative;

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