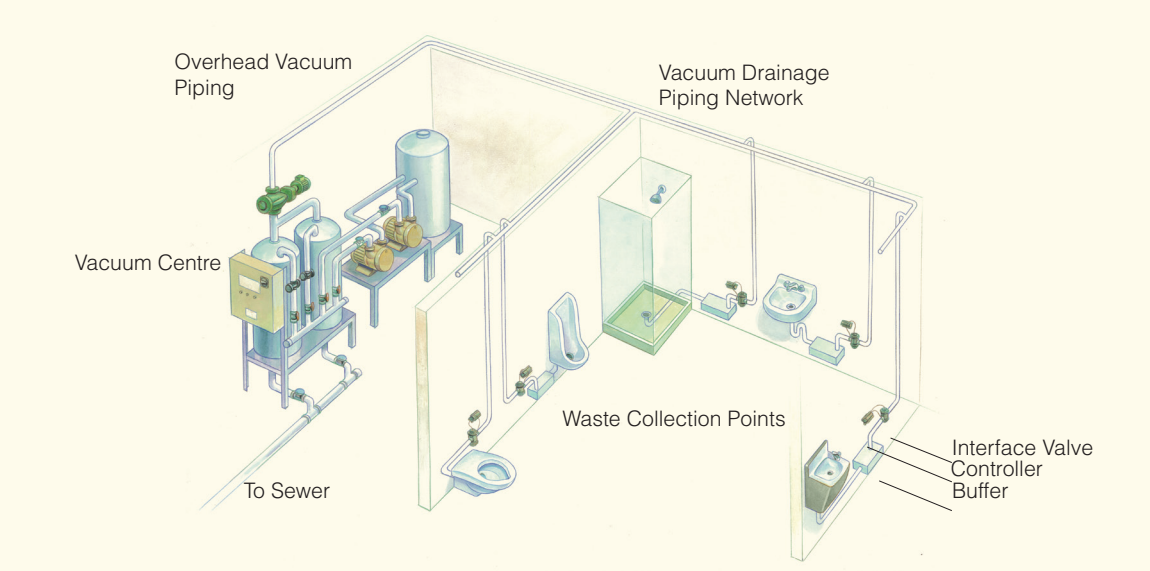
VACUUM DRAINAGE 101



VACUUM DRAINAGE 101 - An Introduction to Vacuum Drainage Systems

Vacuum drainage systems utilise vacuum pressure and gravity for the collection, conveyance and disposal of sewage, condensate or grey water through a piping network that can be routed vertically or horizontally - making it the most versatile drainage solution for any new construction or renovation project.

A vacuum drainage systems consist of three basic components:

1. Waste Collection Points
2. The Vacuum Drainage Piping Network
3. The Vacuum Generating Station

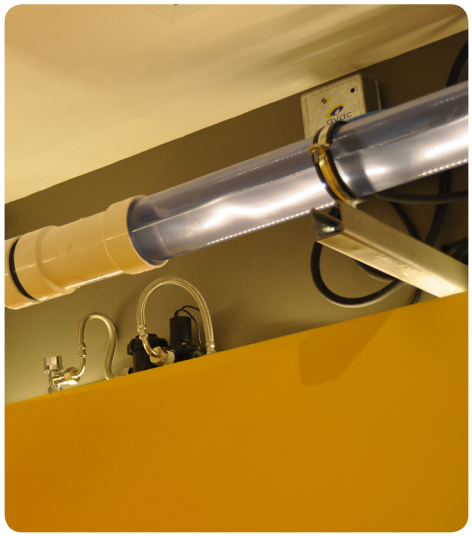
Waste Collection Points

Typical sanitary and grey water collection points include toilets, sinks, showers, urinals and drinking fountains. Typical condensate collection points consist of refrigeration coils, service coolers and freezers as well as frozen and refrigerated food display cases. These collection points are connected to the main piping network via a Vacuum Interface Valve and for non-flushing fixtures a Buffer is also required. The normally closed vacuum interface valve separates the vacuum in the piping from atmospheric pressure surrounding the fixture. When activated by the Controller, it allows waste to be introduced into the vacuum waste piping network and transported to the vacuum centre.

For flushing fixtures e.g. toilets (See Appendix 1, page 3), the interface valve is connected to the waste outlet, separating the toilet from the piping network. When the flush valve is activated, the Controller opens the Interface Valve, allowing atmospheric pressure at the toilet bowl to push waste through the waste outlet, through the Interface Valve and into the waste piping. Because air is used to transport wastewater, no water is required to initiate the flush cycle. The Controller also activates the flush water valve for rinse and re-fill of the bowl. The opening and closing of the Interface Valve is precisely controlled so that all waste is completely removed from the bowl.

Since only 1.0-1.8 litres of water per flush is required, Avac toilets provide a significant reduction in water use and sewage output. The reduced water requirement also allows water supply line sizing to be significantly smaller than that required for flush valves. In addition, conventional waste venting is not required. For non-flushing fixtures such as showers, basins, skinks, grey water drains, the waste drainage process is similar, but typically includes the use of a Buffer. As waste drains from the fixture, it is temporarily collected at the Buffer. Upon reaching a set point, the controller activates the interface valve. This causes air to enter the Buffer, mixing with the waste and transporting the resultant emulsion into the piping network.

The Vacuum Drainage Piping Network



The Vacuum Drainage Piping Network is a closed piping network that is typically maintained under a continuous vacuum pressure of 55 – 65 kPa and is generally fabricated out of standard pressure rated PVC, High Density Polyethylene, Stainless Steel or other smooth bore, non-porous material.

The piping network consists of “risers” or “droppers” which transport the collected waste vertically from the point of origin to horizontal mains and branches leading to the Vac Centre. Much like conventional waste piping, the mains and branches are typically installed with a slope toward the Vac Centre allowing the movement of waste to be assisted by gravity. However, unlike conventional waste piping, a continuous slope to the Vac Centre does not need to be maintained.

The vacuum waste piping network can be offset to recover grade, which allows the piping network to route horizontally over long distances in very shallow space. In addition, the vertical or horizontal piping can be easily offset to route around obstacles in its pathway toward the Vac Centre. This feature can provide a significant benefit to the designer and installer when mechanical space is limited or when a conventional waste piping network can’t be readily accommodated or installed.

The Vacuum Generating Station

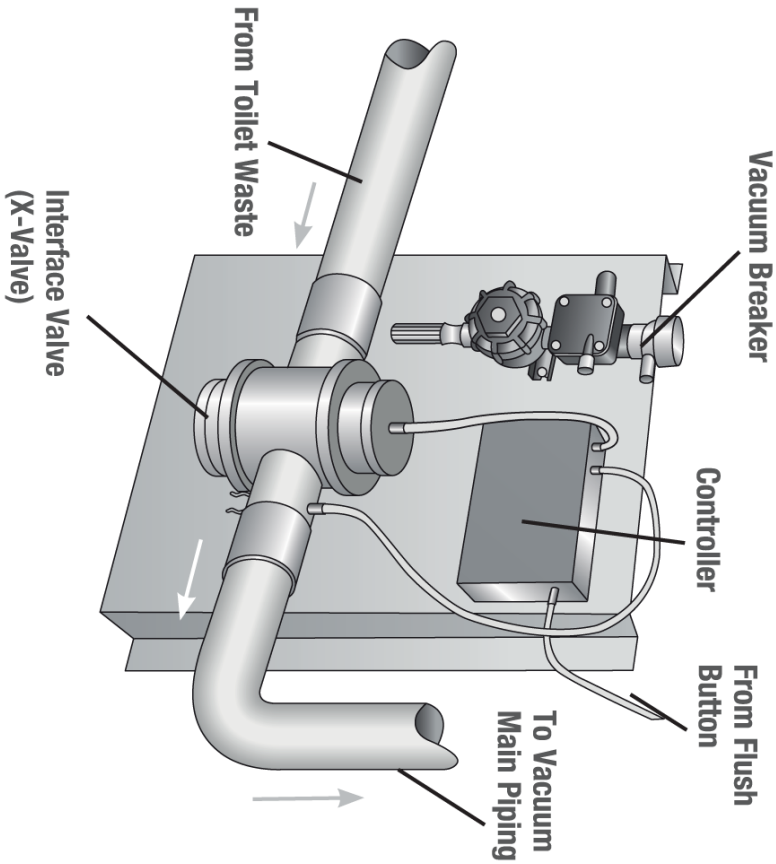
Commonly referred to as ‘Vac Centre’, the vacuum generating station includes vacuum pumps to create a continuous vacuum pressure within the piping network, and storage tanks that collect and discharge the waste, typically into the facilities sewer main. In the case of sanitary waste, the Vac Centre waste storage tanks are directly connected to sanitary sewer waste lines. Vacuum systems which provide drainage for greasy waste from food storage, display, or food preparation utility sinks are designed to allow for drainage from Vac Centre waste collection tanks into grease interceptors, while vacuum systems processing condensate and grey water typically drain to a sanitary sewer, but can be routed for reuse in toilet flushing etc.

The vacuum waste piping network is directly connected to the Vac Centre waste storage tanks. Waste travels under vacuum pressure from the fixture, through the piping network and into the Vac Centre waste storage tanks, where it is temporarily held before discharge to sanitary waste lines or treatment equipment. Operation of the vacuum pumps and waste collection tanks is fully automated by controls provided with the Vac Centre. The size of the vacuum pumps and waste collection tanks are determined by the total and potential future waste loads. In all cases, the Vac Centre waste collection tanks and vacuum pumps are always selected and designed to provide redundant capacity. The Vac Centre Controls automate the operation of the vacuum pumps which run only on demand as required to restore vacuum pressure to the waste collection tanks and piping network. Optional features allow remote visibility of the system operating status as well as visibility and control of individual valve operation.

Avac’s Offer

Avac offer a range of pre-fabricated Vac Centres (The Championship Series) which are available quickly and at a lower cost. Alternatively, for larger more complex projects, Avac can design and size a customised system to suit specific project needs. To find out which Vac Centre is most suitable for your project download the Championship Series PDF in our Technical files.

Toilet Flush and Drainage



Grey Water Drainage