

Technical Solution Sheet 3.14

3: Drainage (below ground sewer)

Vacuum Sewerage Systems

AIM

The aim of this technical solution is to provide information on the operation of typical vacuum sewerage systems, and to clarify the requirements for property sewerage drains connected to such systems.

PLUMBING REGULATIONS 2008

The *Plumbing Code of Australia* (PCA) is adopted by and forms part of the *Plumbing Regulations 2008*. Part C2 of the PCA specifies the objectives and performance requirements related to the installation of sanitary drainage systems. *AS/NZS 3500.2 Plumbing and drainage Part 2: Sanitary plumbing and drainage* is a "Deemed-to-Satisfy" document listed in Part C2 of the PCA and contains a section on vacuum systems.

BACKGROUND

In areas where there is flat terrain involving long strips of development, or where there is bad ground or high ground water, sewerage authorities may provide a vacuum sewerage disposal system for properties, rather than the conventional gravity system.

A vacuum sewerage system is made up of three main components (see Figure 1 for a typical vacuum sewerage system):

- Property sewer point for connection of the property sewerage drain.
- Collection chamber and vacuum interface valve.
- Vacuum pump station and delivery to main sewerage system.

VACUUM SEWERAGE SYSTEM

Wastewater from each property gravitates to the collection chamber. When the collection chamber sump fills to a pre-determined level, the automatic pneumatically operated vacuum interface valve opens. Pneumatic pressure forces the wastewater plus some air from the collection chamber into the collection lines that are laid in a saw-tooth profile.

When the chamber sump is emptied and after a short period of time the interface valve closes again. It is this valve that is susceptible to blockage if rubbish is permitted to enter the property sewerage drains. If the valve blocks and is not working, there will be sewage overflows from the property sewerage drain.

PROPERTY SEWER POINT FOR THE CONNECTION OF THE PROPERTY SEWERAGE DRAIN

Vacuum sewerage collection systems are normally located at the front of properties. It is common practice for one collection chamber and interface valve to be provided for four properties. A separate sewer connection point is provided inside each property for the connection of the sewerage drain.

Figure 2 shows a typical collection chamber location, with two entry branches at the chamber and with a further branch sewer across the roadway for the two opposite properties.

VACUUM PUMP STATION AND DELIVERY TO MAIN SEWERAGE SYSTEM

Technical Solution Sheet 3.14

A series of pipes connect each of the chambers to the Central Vacuum Pump. This pump operates automatically to maintain a strong vacuum throughout the whole system. The discharge from the vacuum pump station is to the authority's main sewerage system.

PROPERTY CONNECTIONS

Each property sewerage drain is constructed as normal to discharge via gravity to the connection point provided by the sewerage authority. The construction of the below ground drains are as normal in accordance with AS/NZS 3500.2 which in addition, lists the following requirements:

3.18 Vacuum Systems

Drains connected to vacuum systems shall be installed in accordance with the following:

- An inspection shaft connected to the drain with a junction shall be placed as close as practicable to, and upstream of, the collection tank.
- The junction inlet to the inspection shaft shall be against the grade of the drain so that any rodding of the line is in the direction away from the collection tank.
- Where more than one drain is connected to a collection tank, the spill level of both overflow gullies of the drains shall be installed level with each other wherever practicable.
- A DN 100 open vent pipe shall be provided at the upstream end of each drain connected to the collection tank and a DN 100 downstream vent shall be located within 10 m of the collection tank. No fixtures shall be connected between the collection tank and the downstream vent connection unless otherwise authorized by the authority having jurisdiction.

Notes:

- In addition to the open vent, air admittance valves (AAVs), may be used to provide additional venting of drains

connected to a collection tank. The AAVs must be installed in accordance with the manufacturer instructions and AS/NZS 3500.2

- Jump- ups should be avoided

DRAINAGE VENT

An open drainage vent of minimum size DN100 must be provided upstream and downstream to ensure sufficient air into the property sewerage drain for ventilation. This is important for the protection of fixture trap water seals and satisfactory operation of the vacuum sewerage system.

Under normal circumstances, the property sewerage drain to each house is fitted with a DN50 min. drainage vent, usually concealed in a stud wall. As it may be difficult to accommodate a DN100 vent in a stud wall, an acceptable solution is to fit a DN100 low level vent. The acceptable configuration is similar to that for downstream ground vents that may be used where boundary traps are installed. Additional ventilation may also be provided by fitting an AAV.

PREVENTION AGAINST BUILDING WASTE ENTERING PROPERTY DRAINS

The automatic pneumatically operated interface valve is sensitive in its operation.

Normal sewage disposal through the interface valve is not a problem; however, the valve will easily block and remain in the open position if building waste or foreign material is permitted into the property sewerage drain.

If a blockage occurs, sewage will flow out of the overflow relief gullies or the low level vent (if fitted) at any property or properties connected to the chamber.

PLUMBERS / DRAINERS MUST, PRIOR TO FIT-OFF AND AT ALL TIMES, ENSURE THAT ALL OPEN ENDS ARE PROPERLY CAPPED DURING

Technical Solution Sheet 3.14

CONSTRUCTION TO PREVENT BUILDERS WASTE OR OTHER FOREIGN MATERIAL FROM ENTERING THE PROPERTY SEWERAGE DRAIN.

SELF SEALING DEVICES

It is recommended that self-sealing devices not be fitted as an option to a fixture trap in any vacuum system. The vacuum may inadvertently activate the rubber seal causing noise.

GULLIES

A vacuum system is no different to a gravity system in that stormwater is not permitted to enter property sewerage drains. Any stormwater entering the drain would unnecessarily activate the vacuum sewerage system during wet weather. The overflow relief gully requirements for location, height above surface level and separation below the outlet of the lowest fixture apply equally to vacuum systems as for gravity systems.

FIGURE 1 - TYPICAL VACUUM SEWERAGE SYSTEM

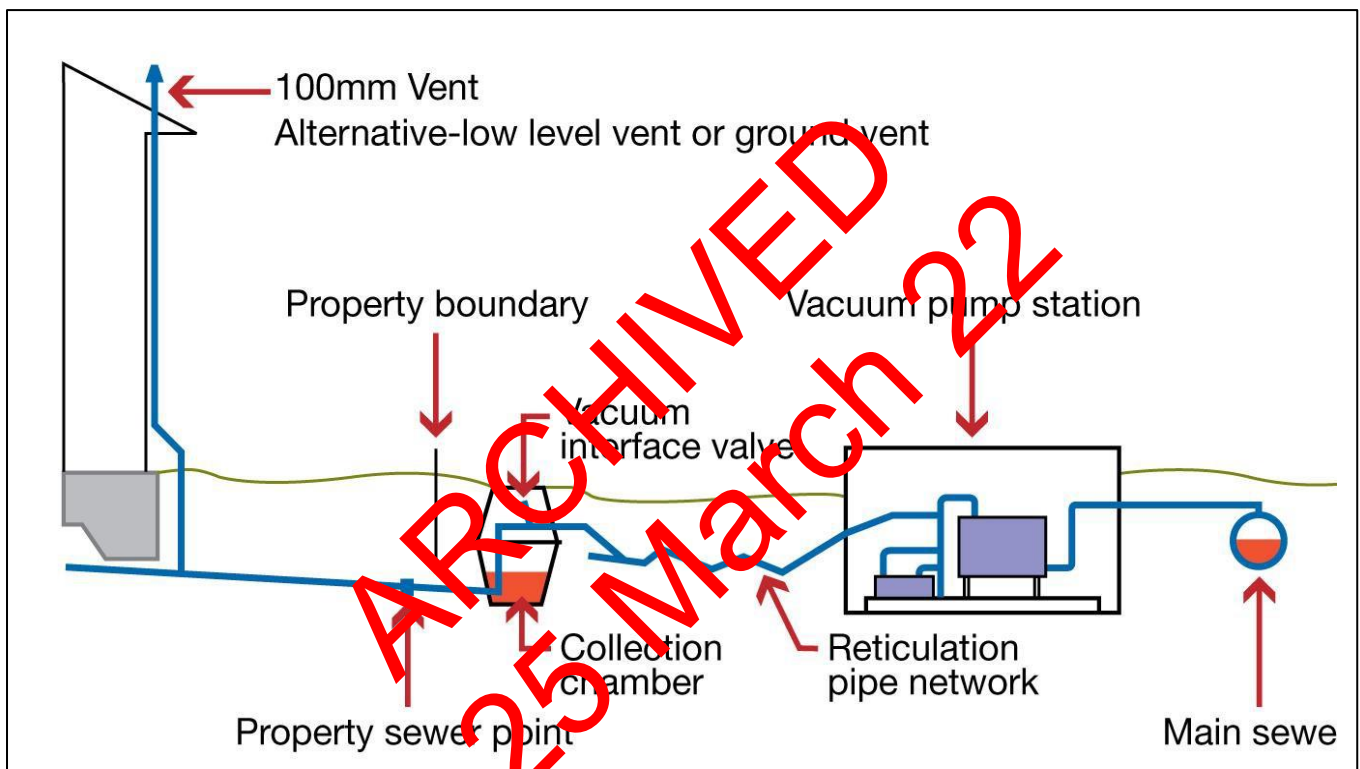


FIGURE 2 - TYPICAL COLLECTION CHAMBER LOCATION WITH FOUR CONNECTIONS

