PUSHING THE PROVERBIAL UPHILL: MACERATION MATTERS

As demand grows for more and more bathrooms in houses, renovators face severe challenges trying to add fixtures to dwellings that were designed to accommodate just one bathroom. However, writes Paul Oliveri from Prove Standards & Engineering, solutions do exist...

Adding supplementary bathrooms facilities to existing buildings has historically meant plumbers have had to break into and/or add in-ground service connections to join the new additions to the existing sanitary plumbing network.

In some cases, you might be lucky and get an existing waste nearby that is able to handle a few extra fixture loadings and away you go, but that's often not the case in today's homes where bathrooms are increasingly becoming a 1:1 ratio with the number of bedrooms available. Homes built decades ago usually relied on a single bathroom to service a four-bedroom family home, which was considered a normal and practical design. Renovating an older building to match buyers' modern expectations means additional facilities top the list for improvement opportunities to generate quick and easy equity. Additional bathrooms are also a necessity for dwellings that are internally subdivided to provide opportunities to generate rental income from long or short-term stays.

So, when you quote that new powder room, bathroom or laundry for your client and it has a few extra zeros in the quote for in-ground works, they may counter it with an option to run a cheaper pumped system that avoids turning any soil at all. Units that have the ability to pump wastewater up and over to discharge in existing sewer services provide possibilities to position a new bathroom in a spot that was previously unfeasible or even impossible.

Need to create more bathrooms in your renovation? Overcoming higher loadings is possible!

MACERATOR UNIT

Step in the macerator unit, which makes all of this possible.

A macerator unit takes in wastewater from fixtures (toilets, basins, showers, etc) and pumps it through smaller bore pipes under pressure to a discharge point, where it then enters the existing sanitary drainage network. To do this the units have internal blades that cut up and churn any solid matter to turn the outflow into a fluid which can be pumped, meaning that build-up of settlement over time does not occur in the holding tank. In essence, the system is quite simple but there are some very important aspects that plumbers need to be aware of if they want to avoid being called back to clean up a steaming pile of mess.

MACERATOR SPECS

Macerator units have only recently been given a new WaterMark Technical Specification, WMTS-106. Under the WaterMark Certification Scheme a macerator unit is required to be assessed against the requirements of this new specification, which covers design and performance test criteria. WMTS-106 itself does not contain the majority of the test methods, but references a series of EN Standards which have been used overseas for over 20 years. Because of the extensive period that these Standards have been in circulation in Europe, it should mean

that the same units (in principle) used overseas in Europe should be suitable for Australia too. And in principle this is correct. But only in principle...

DESIGN PRINCIPLES

Hydraulic design principles of pipework always have, and probably always will, rely on the velocity of the fluid passing through it. The speed at which the fluid passes through the pipe is an important part of hydraulic design, and the type of fluid it carries becomes part of the equation. Fluid that contains solids or particles needs to be within a specific range. If the fluid moves too slowly then a build-up of solids forms like a crust on the pipe to slowly choke the waterway over time. If the fluid moves too fast, then the pipe is susceptible to damage from erosion or even cavitation. Typically, a desired velocity (speed) of flow should be within 1.0 – 3.0 metres per second (m/s) as a guide. WMTS-106 requires an absolute minimum fluid velocity of 0.7m/s to mitigate the build-up of solids on the internal walls of the discharge pipes. The velocity of the fluid is directly related to the internal diameter of the pipe, which is where aligning products from similar international specifications can be an issue.

Macerator units are designed to reduce particle size to an optimal level, in accordance with pipe size, to achieve an ideal fluid velocity.

BEWARE PIPE SIZING

Units initially designed for EN specifications would be reliant on pipes that are used in European nations. Australia uses pipe sizes that are different to international markets, meaning the discharge velocity through these pipes changes. A unit made intended for European standard pipe sizes will need to be connected using Australian Standards pipes, which will leave it inevitably between sizes. And this is important because the test methods are all based on the manufacturer's claimed pumping performance.

A pump that claims to lift fluid a height of 10m may need to be re-rated for Australian conditions depending on what DN pipe size it is intending to be certified for here. A unit rated for DN50 in Europe will need to be de-rated if it intends on ➤

The principles of maceration have a long history, essentially involving the shredding of solids to create a slurry.

being certified for DN50 in Australia, because Australian PVC pressure pipe is larger. Larger pipe means slower fluid velocity and therefore a necessary de-rating in claimed pumped head pressure. Using a different PN rated pressure pipe will also alter the hydraulic capacity, as the lower the PN the larger the inside diameter of the pressure pipe. Claimed pumping height, pipe size and fluid velocity are all related together in what is known to engineers in pumping curves. Changes to any of these variables will affect performance, and it requires careful understanding of how these variables fit into equations to ensure that a WaterMark conformity assessment body properly considers all results before granting a WaterMark licence based on the manufacturer's claims.

COMPONENT IDENTIFICATION

Another possible pitfall for plumbing practitioners is attempting to identify the exact components of the small-bore pumping units. The components of the pumping unit itself, as part of its WaterMark certification, are covered under its licence. This means any adaptors or connectors that are supplied with the unit have been assessed by the certifier to ensure that they are fit for purpose. The line between where the 'product' begins and ends is very important, because the outlet of the unit is pumped and therefore under pressure. It can be a confusing task to ensure that correct materials and connections are used, when fluid that usually passes through the drain waste vent network now has to be pumped through pressure-rated pipes and fittings (originally intended for the potable network).

> At least when the sparkies on site tell you the proverbial runs downhill, you can point them in the direction of the new macerator installation

A metal-banded flexible coupling, which is often a useful connection between varying waste pipes sizes, may not be appropriate for a pressurised discharge connection. PVC pipes for DWV applications are only intended for fluid under gravity flow. Ensuring that the correct materials and connection types used on the discharge side of the unit is critical. Apart from the unit being capable of macerating and effectively pumping the waste up, over and out, the unit must be paired with a suitable non-return valve that has been tested alongside the unit during the WaterMark process to ensure it complies. Non-return valves are a critical performance component and are required to protect the unit from a backflow condition, as most domestic units can only hold around two full flushes from a toilet before overflowing. Plumbers must ensure the units they have been tasked to install have the correct non-return valves provided, and that they are installed as per the manufacturer's instructions.

Another issue arises with the specified wastewater the unit is certified to pump. Under the WMTS-106 Standard, macerator units are classified into two main groups: those that can pump faecal matter, and those that can't. Installing a unit that has only been certified for pumping non-faecal matter means it can't handle any toilet solids, paper or sanitary items and is a sure-fire way to get the plumber called back to deal with an unsightly mess.

So, while these units can solve a number of problems for clients wanting to position fixtures in areas that may have been difficult to near impossible previously, plumbers need to ensure the units that they are sourcing (or being provided with) meet the Australian Standard to avoid issues.

At least when the sparkies on site tell you the proverbial runs downhill, you can point them in the direction of the new macerator installation.

Paul Oliveri (BE Mech) is a Senior Engineer at PROVE Standards and Engineering in Victoria.
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