Technical Bulletin

‘V’ profile channels - Faster flow, less maintenance

HOW THE SHAPE OF A TRENCH DRAIN AFFECTS HYDRAULIC PERFORMANCE

Stormwater runoff, particularly from peak flows needs adequate drainage to minimise the hazards associated with excessive surface water.

The internal profile of the flow section has a major influence on the hydraulic performance of trench drains. This is why ACO’s ‘V’ profile Polycrete® *Channels* have been developed on the back of the same drainage principle used for decades in the design of sewers with “egg-shaped” profiles.

‘V’ profile channels in combination with the smooth surface of polymer concrete produce a hydraulically efficient trench drain.

Trench drains are sized to capture, carry and discharge the flows from a design storm event which can occur on average 1 in 10, 20, 50 or 100 years. For the majority of its service life, however, the trench drain will only need to remove very small amounts of runoff on wet days. It is for this purpose, the ‘V’ profile channels outperforms the traditional ‘U’ shaped or rectangular shaped profiles.

During minor rainfall, the lower narrower part of the ‘V’ profile channel ensures high liquid velocities. The high velocities originate from a high depth of water which can only be produced by ‘V’ profile channels. In contrast, ‘U’ shaped or rectangular shaped channels allows only for liquids to travel at lower depths and therefore at lower velocities.

Fluid mechanics can further explain this phenomenon, *the greater the cross-sectional area in comparison to the wetted perimeter, the more freely flowing the stream will be, this is because less of the water is in proximity to the frictional bed. So as hydraulic radius increases so will velocity. Furthermore, in combination with the smooth finish of polymer concrete with a ‘Mannings coefficient’ of 0.011, this results in less resistance thereby preserving the high velocities.*

Higher velocity liquids will produce a better self-cleaning effect which is extremely important because it clears the drain and ensures the full drainage cross section is available for that major storm event which produces peak flows.

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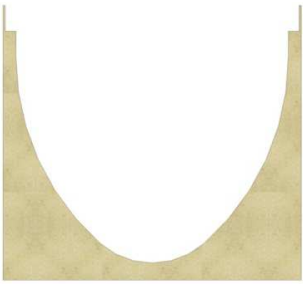
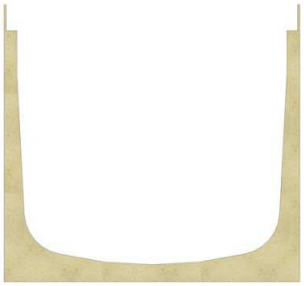
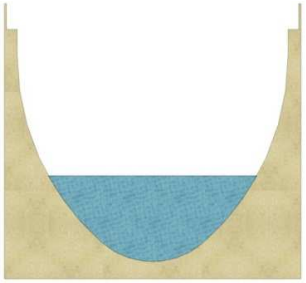
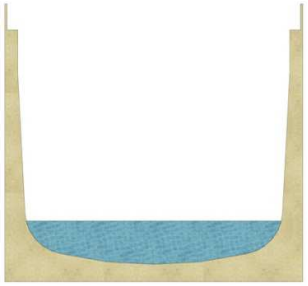
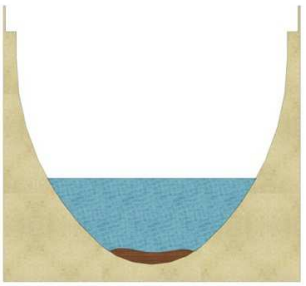
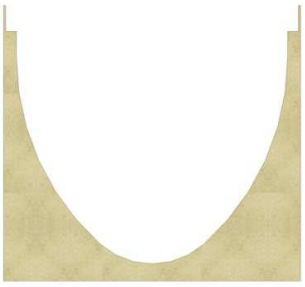
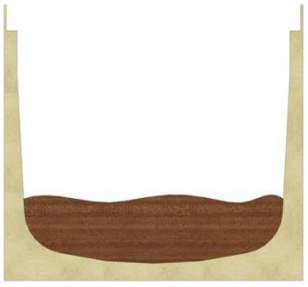
Channel Comparison – ‘V’ vs ‘U’

	‘V’ Profile Channel	‘U’ Profile Channel
1. Cross section profile: • The internal width of ‘V’ profile channels progressively narrows to the invert of the channel. • The ‘U’ profile channels have vertical walls and a relatively flat base.		
2. During minor storm events, with the same amount of flow: • Liquid levels (head) are deeper in ‘V’ profile channels, resulting in higher velocities. • The head in ‘U’ profile channels are lower, resulting in slower velocities.		
3. During periods of low rainfall, silt and debris may build up inside the channel: • The faster velocities in ‘V’ profile channels are more likely to wash away silt and debris. • The ‘U’ profile channels have a slower velocity, therefore a higher risk that silt will continue to build up.		
4. In the long term: • ‘V’ profile channels will be clear of silt and ready to discharge the peak flows during the major storm. • ‘U’ profile channels have a higher risk of siltation, therefore reducing the capacity of the channel. During the major storm event the channel will surcharge causing ponding. Regular maintenance is required to remove silt and debris.		

ACO’s Technical Service department can provide a recommendation for a simple run of trench drainage. The online trench drain design request form can be accessed by clicking:
http://www.acoaus.com.au/trench_request/trench_request.php

For more information on ACO’s Technical Support click:
http://www.acodrain.com.au/technical-support.htm