

TECHNICAL BULLETIN

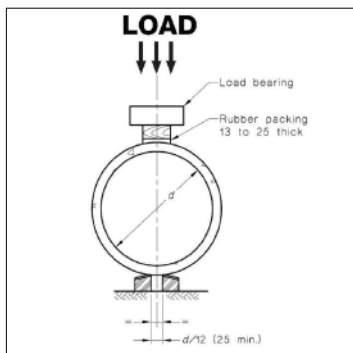
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Strength performance of **FRCPIPES** when saturated.

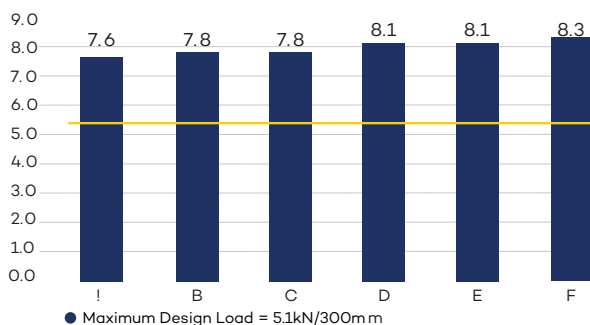
Fibre reinforced concrete (FRC) pipes maintain their strength and will perform to specifications when installed in a saturated environment, such as below a water table or in a tidal zone. The above statement is supported by years of testing conducted by RCPA as part of our durability assessment testing conducted in our quality accredited testing laboratories. Below are two examples of long-term testing conducted to validate the saturated strength of **FRCPIPES**.

Test One

A sample of DN375 Class 2 pipes were taken from production stock in December 2011, cut into 300mm test specimens and placed into a water tank to saturate. These samples were intended for use in Regression testing in accordance with Appendix H – Determination of Regression Factor (R) of AS4139-2003. Once saturated for a minimum of 28 days, six samples were tested in accordance with Appendix E of AS4139-2003 for ultimate strength. A diagram of the load testing setup is shown below:



Samples of saturated pipe specimens were placed under constant load in a load testing rig, with loads ranging from 775kg up to 850kg (actual weights 775, 800, 800, 825, 825, 850kg). These load testing rigs and pipes are submerged for the duration of the testing.



This test far exceeds the requirements of typical pipe service requirements, as the maximum design load for a DN375 Class 2 pipe is 5.1kN/300mm. This equates to a load of 520kg for a 300mm pipe length.

The test loads applied to the pipe samples exceed the design value by a factor of at least 1.5 times the maximum design load. After 10 months of testing underwater with a load of at least 1.5 times the maximum design load, the samples were withdrawn from the testing tank and, while still saturated, were tested for ultimate strength.

The results are shown below, and indicate that during the 10 months of testing the pipe strength increased even though the pipes were heavily loaded during the testing.

Pipe Ultimate Crush Load when Saturated (6 samples)			
DN375 Class 2	Prior to Load Testing (Jan 2012)	After 10 months of Load Testing (Oct 2012)	% change
Average	13.2	14.7	+11%
Std. Deviation	0.6	1.0	

Test Two

Further research conducted by VantagePipe Research & Development indicates that FRCPIPES does not lose strength with time under load in the saturated state.

In the second longer term test a set of four 225mm diameter fibre reinforced concrete pipes was maintained in a saturated state for 17 years before being tested for strength in a saturated state. The results for the immersed pipes showed a strength increase of 18% during the 17 years of immersion in water

Conclusion

For steel reinforced concrete pipe, the standards specify a minimum cover thickness over the steel and a maximum permitted water absorption because these are critical factors to the prevention of corrosion in the reinforcement. In **FRCPIPE**, the fibre is distributed throughout the matrix, and there is nothing to corrode.

In addition, the standards and design principles outlined for **FRCPIPE** automatically assume that the pipe in the ground is in the fully saturated condition for its entire service life. The data from the above tests clearly demonstrates that there is no loss of strength as a result of either installation in saturated conditions or sustained load application, in fact, these tests demonstrate that **FRCPIPE** continues to gain strength over time.

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