

## Enhanced Life for Sewage Exposed Concretes



The SA Water Corporation of South Australia built a corrosion resistance testing tank which allows them to test the comparative corrosion resistance of new acid proof coatings and concrete mixes for sewage concretes, under real but accelerated conditions. A wide variety of different materials are put in this tank, and left over time to see how long they will last.

Of course, such a tank must itself be more corrosion proof than the corrosion testing samples it will hold! It was decided to build the tank using the Cementaid Everdure Caltite System (HPI™) in the structural concrete. The Caltite concrete floor and walls tank was duly constructed. Now coatings were applied to the Caltite concrete. Removable metal lids cover the tank's open top, hermetically sealing the unit. Raw, untreated sewage flows through the sealed off tank from the South end and out of the North end. At the same time there is a continuous flow of Hydrogen Sulphide gas from a reservoir tank, pumped in from the South end above the sewage flow, into the upper ("crown") portion of the tank.

SA Water has their own, high grade sewer concrete specification using limestone aggregate. This is a sensible idea, as the acid attack that would otherwise be borne solely by the cement/sand matrix, is also now diluted by the availability of reactive, limestone aggregate, slowing down the destruction of the concrete mass as a whole.

Test samples are standard concrete blocks, 400 x 400 x 70 mm, with U-shaped steel reinforcing cast in to the tops for easy handling. If coatings are being tested, those coatings are applied to these concrete blocks and allowed to cure before being placed, partially submerged, on the floor of the test tank. (No scratching or other damage to the surface integrity is made.)

As a measure of the ferocious rate of accelerated destruction achieved in this test tank, standard, properly cured SA Water structural concrete samples last less than 6 months to where the sample is reduced to a pile of slush.

The test tank was inspected in 2010 by Cementaid and an SA Water representative, where the attached photos were taken. As can be clearly seen, the tank is still in service and functioning, shown here at an age of 4 ½ years old. There has been corrosion but only of the exposed extreme surface of the Caltite concrete. (Normal basalt aggregate was used in the Caltite concrete, not limestone aggregates.) The worst area, at the South end of the tank where the raw sewage and fresh Hydrogen Sulphide gas is introduced, the above water line Caltite concrete has lost approximately 10-15 mm of cover and the tank's hard, inert basalt aggregate is exposed to that depth. The North end, far less, about 4 – 8 mm.

**The life of standard SA Water concrete under these accelerated corrosion conditions is less than 6 months for a 70mm thick sample exposed both sides.** That is a rate of destruction approximately 35mm every 6 months. **70 mm per annum.** So a 150mm sewage pipe would be slush within two years of such accelerated exposure.

Obviously, in real service life, sewage does not destroy SA Water standard concrete pipes in two years. In the service environment the sewage pipe will operate, how long does it normally last?

## Enhanced Life for Sewage Exposed Concretes The Cementaid Everdure Caltite System

This accelerated test regime can not predict destruction dates but it shows that we can now reasonably measure the expected 'lives' of different concretes. So, if standard concrete alone gives a life of 6 months in the test tank, that is matchable, related to, a real time life of say xx years in real service. To the owner then ***what is the cost of that one life?***

Then, what is the **value** to the owner of an enhanced concrete sewage pipe that delivers TWICE the life of standard concrete? The economics of the enhancement are relatively easy to work out, once the relationship between test tank life and real service life is established.

Look then to the Everdure Caltite System concrete tank, and its enhanced service life in the exact same environment as the SA Water standard concrete. **Caltite concrete clearly demonstrates a service life more than 20 times that of the standard concrete.** But just one extra life would be of more than sufficient value to the owner, to justify the cost of the Everdure Caltite System enhanced outcome.

It is proven possible to extend even this dramatic service life. Ask your Cementaid representative to demonstrate the case history of the Hardman Chemicals acid floor.

It is time to look closely at the economics of using super durable concretes in sewage works. The initial cost is one thing, but over the dramatically increase maintenance-free, replacement-free life of one project, the funds available to owners to put to **new**, vitally needed sewage plant is exponentially larger.

