

# CONCRETE

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## trends

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**An architecture of place**

**Circa: a dramatic new gallery**

**Industry supports community initiatives**

# Water treatment a win for new division

**R**ainbow Construction, a company already well respected for its capabilities in constructing multi-level building structures, has expanded and developed a civil and infrastructure division that recently completed its first water treatment project successfully – the Optimum Water Reclamation Plant. Situated near Pullenshope on BHP Billiton's Optimum Colliery (between Middelburg and Hendrina in Mpumalanga), the project involved constructing a number of intricate, high-quality structures designed by Keyplan Consulting.

Colin Ackroyd, Rainbow Construction's senior site agent and divisional alternate director, told *Concrete Trends* more about this challenging project.

## Unique features of project

Asked what was unique about the structures, Ackroyd explained that the 'oddly shaped' clarifiers had been designed utilising precast Z-beams as well as precast panels that were placed on the beams. The precast elements were supplied by a local contractor who was already on board for other work on the mine.

"The balance of the structure is constructed using in-situ concrete. The bases of the clarifiers are cone-shaped sumps that collect the sludge and the by-products are then investigated and tested. These sumps were constructed with soffit shutters only and the low-slump concrete was hand packed to create the conical walls. The cone shape was cast using a spindle to achieve the symmetrical shape and I'm pleased to say that this unusual approach gave us results that are really excellent."

Ackroyd continued: "From the clarifier floor, the precast Z-beams were placed and the turbine floor that held the beams in position was cast in situ. Thereafter it was all about circular walls, circular sloping walls, circular downstand walls and vertical circular walls.

"The large water tanks with wall heights of 6,5 m were all cast with as few construction joints as possible, using ready-mixed concrete supplied by Witcrete from their Pullenshope batch plant. Potain tower cranes were used to place the concrete for the fairly large wall pours, which peaked at 80 m<sup>3</sup> per lift."

The concrete design strength was 35 MPa and it was a 70/30 cement/fly ash mix. The total volume used for the project was 3 000 m<sup>3</sup> and the production rate was 450 m<sup>3</sup> per month, delivered to the site by Witcrete. Quality control was achieved by checks at both the batch plant and on site.

"It was not all plain sailing," continued Ackroyd. "No project ever is, and one of our challenges was the fact that, when



it rained, the soil on site turned into very slippery mud. This made site safety – always a priority – difficult to achieve. We were, however, able to maintain a good safety record.

"In fact, considering the unusual shape of the clarifier structures, I am very pleased with the concrete finish we achieved. I feel it is one of our greatest achievements on this project."

## On the green side

Mine sites always generate drainage water that is contaminated by minerals from the processing of coal, gold, uranium and platinum. While this acid drainage water is a major threat to the environment, it can also, through the process of desalination, constitute a substantial resource for the production of high-quality drinking water.

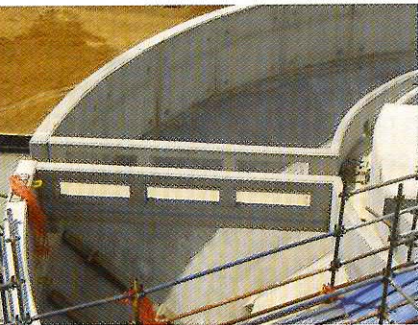
All desalination processes co-produce water, as well as a more concentrated brine effluent. In order to fully exploit the economic potential of desalination at inland sites, the brine effluent volume must be minimised so that final disposal costs, through solar or mechanical evaporation, can be kept as low as possible.

Keyplan Consulting developed a high-recovery precipitation reverse osmosis process that significantly outperforms any comparable technology for the treatment of acid mine drainage water. This high-tech process has been successfully demonstrated and water of high acidity, with a high sulphate concentration, was transformed into superior-quality drinking water.

What sets this process apart from other technologies is the high water recovery of 97%, based on the feed volume. In order to achieve this, the process utilises multiple stages of ultra-filtration and reverse osmosis membrane systems, operating in series, and with inter-stage precipitation of low solubility salts. The result is that only 3% of the raw feed water remains to be disposed of in a lined evaporation dam. A portion of the treated potable water gets released back into the river system to the benefit of downstream communities.

"We at Rainbow Construction are proud to have been part of this project and to play a role in helping South Africa manage its diminishing water resources," concluded Ackroyd. ■

**More information from: [www.rainbowcon.co.za](http://www.rainbowcon.co.za)**



**Project data**  
Client: Keyplan Consulting  
Contractors: Rainbow Construction  
Engineers: Delf Consulting Engineers  
Size/Value: R30 mil  
Duration: 12 Months  
Completion Date: 30 November 2009

