

# Civil Engineering

saice

Isivili Enjinyering



**KASHIMBILA  
DAM: ASPECTS  
OF GEOLOGY AND  
GEOTECHNICS**

**BLASTING AND  
EXCAVATION OF A  
NEW HIGHWALL  
FOR EXXARO**

**SAICE GUIDELINES  
FOR AMICABLE  
SETTLEMENT  
PROCEDURES**





Isivili Enjinieri = SiSwati

## ON THE COVER

*Leveraging its experience of executing technically challenging geotechnical projects with accelerated programmes, Keller, formerly known as Franki Africa, once again proved its mettle at the Harbour Arch project in Cape Town.*



### PUBLISHED BY SAICE

Block 19, Thornhill Office Park,  
Bekker Street, Vorna Valley, Midrand  
Private Bag X200, Halfway House, 1685  
Tel +27 11 805 5947/8 | Fax +27 11 805 5971  
<http://www.saice.org.za> | [civilinfo@saice.org.za](mailto:civilinfo@saice.org.za)

### CHIEF EXECUTIVE OFFICER

Vishaal Lutchman PrEng PMP  
[vishaal@saice.org.za](mailto:vishaal@saice.org.za) | Tel: +27 11 805 5947/8

### EDITOR

Danielle Petterson  
[danielle@saice.org.za](mailto:danielle@saice.org.za)  
Tel +27 11 805 5947 | Cell +27 83 226 5614

### EDITORIAL PANEL

Marco van Dijk (chairman), Irvin Luker (vice-chairman), Vishal Krishandutt (president), Vishaal Lutchman (CEO), Andile Gqaji, Jeffrey Mahachi, Avi Menon, Prisca Mhlongo, Jones Moloisane, Beate Scharfetter, Danielle Petterson (editor), Verelene de Koker (journal editor), Barbara Spence (advertising)

### ANNUAL SUBSCRIPTION RATE

R730.00 (VAT included)

### ADVERTISING

Barbara Spence, Avenue Advertising  
[barbara@avenue.co.za](mailto:barbara@avenue.co.za)  
Tel +27 11 463 7940 | Cell +27 82 881 3454

### DESIGN AND REPRODUCTION

Marketing Support Services, Ashlea Gardens, Pretoria

The South African Institution of Civil Engineering accepts no responsibility for any statements made or opinions expressed in this publication, and all information is provided without prejudice. Consequently nobody connected with the publication of the magazine, in particular the proprietors, the publishers and the editors, will be liable for any loss or damage sustained by any reader as a result of his or her action upon any statement or opinion published in this magazine.

ISSN 1021-2000



► The major talking point for this project was the ability to keep up with the programme in the face of the Covid-19 pandemic and an array of unforeseen challenges

## FROM THE PRESIDENT'S DESK

Identifying opportunities in trying times ..... 1

## ON THE COVER

Keller supports Amdec Group's Harbour Arch project ..... 4

## CEO'S CORNER

New market development opportunities – can Africa trade with itself? ..... 6

## FUN QUIZ



SAICE Know Your Sector Competition ..... 9

## GEOTECHNICAL ENGINEERING

Kashimbila Dam: aspects of geology, engineering geology and geotechnics ..... 13

Application of unsaturated soil mechanics – two years on ..... 18

Blasting and excavation of a new highwall for Exxaro ..... 24

Digging Deeper – a review of South African practice on deep excavation design in urban areas – Part 3 ..... 31

## MARKET CONTRIBUTION

Infrastructure spend needed to cushion impact of Covid-19 ..... 43

Cement & Concrete SA to drive the industry to new heights ..... 45

Let BAUER take you into the future with energy-efficient power ..... 46

# Keller supports Amdec Group's Harbour Arch project

Leveraging its experience of executing technically challenging geotechnical projects with accelerated programmes, Keller, formerly known as Franki Africa, once again proved its mettle at the Harbour Arch project in Cape Town.

That the Harbour Arch is set to become an iconic landmark in Cape Town is not disputed. Developed by the Amdec Group which boasts, among others, The Yacht Club, Melrose Arch and Evergreen Lifestyle in its portfolio, the Harbour Arch project is set to be the largest mixed-use precinct in the 'Mother City' CBD. Consisting of six individual towers, the development will offer a 360-degree view of the city, Table Mountain, the harbour and beyond.

Keller's contracts engineer, Daryn Cloete, explains how the approximately 11 m deep three-level basement was constructed. The excavation consisted of loose sandy soils, stiff clays, and hard rock

material, all amounting to 66 000 m<sup>3</sup> of material to be removed to spoil sites.

"The project comprised both lateral support and foundation piles. The lateral support was essentially a triple basement, constructed by means of soldier piles, jet grout columns, anchors and gunite arches with dewatering included in the scope of works. The foundation piles comprised large diameter temporary cased augered piles, which were socketed into hard rock," explains Daryn.

## NOT WITHOUT CHALLENGES

One of the major challenges the team had to contend with was the disruptive nature of the Covid-19 pandemic. The site

handover for the start of the project was on 22 January 2020. After mobilising on site and commencing the lateral support piling in February 2020, Covid-19 struck, halting operations for three months from March to May, before work could resume in June 2020.

"Apart from Covid-19, concrete obstructions and old foundation footings as well as the relocation of services presented major challenges and necessitated resequencing of the works, including building of a cable tray capping beam on top of the lateral support piles to house the relocated services," explains Daryn.

"The jet grouting proved to be a winner with regards to sealing off the

Day 1 on the Harbour Arch project



basement against large scale water ingress. It was an important factor in the design of the project.”

“Apart from the basement final level being below mean sea level, the Keller site team also had to contend with substantial groundwater in the excavations, which required dewatering. This water was pumped and filtered prior to removing it from site,” Daryn continues.

Despite the Covid-19 lockdown setting the project back by three months, as well as the service relocations and additional works, Keller was able to meet the prescribed six-month construction programme, handing over the project in September 2020.

### OTHER ASPECTS OF THE PROJECT

The challenges of sequencing the earthworks, with all its obstructions, changes in rock, and dewatering, highlighted the importance of the jet grouting in sealing off the basement to strong underground water flows from both the ocean and mountain side of the site, explains Daryn.

The Keller arsenal of equipment, local network, and team effort on site with professionals, client, main and subcontractors, allowed for changes to scope and programme to be accommodated without incurring further programme drag. Additionally, the rock level on one section of the project site was much deeper than envisaged, and Keller had to install large diameter temporary cased auger piles for the foundations.

Daryn says the major talking point for Keller on this large project was the ability to keep up with the programme in the face of the Covid-19 pandemic and an array of unforeseen challenges. “We had to do partial handovers to the building contractor to allow them access to the foundation piles and other portions of the basement while we were still busy on site. This was another challenging, yet well executed and flagship project for Keller.”

As Henry Ford said, “If everyone is moving forward together, then success takes care of itself” and that is what Keller, along with the client, professional team and subcontractors, achieved on this project.



Gearing up for the auger piles installation



Works well under way



Completed works on final level

#### For more information contact

**Anton Stoll**  
+27 (0)21 797 0525  
anton.stoll@keller.com  
Keller Geotechnics SA