

## Trenchless Technologies cc scoops SASTT Award of Excellence

by Sam Efrat and Marco Camarda

### Introduction

SASTT's *Joop van Wamelen Award of Excellence* for 2009 was won by the *ABSA energy centre sleeves reticulation project*, undertaken by Trenchless Technologies cc, and installed by means of horizontal directional drilling.

### Project description

The works comprised connecting ten of ABSA Bank's buildings in Johannesburg's CBD with 100 underground sleeves for electricity, gas, fibre optic, as well as low-temperature hot water and chilled water.

Drilling took place from building basement to basement beneath the busy CBD streets at depths of up to 16 metres, using horizontal directional drilling.

The sleeve had diameters of 160, 225, 450, 500, 560 and 710mm and consisted of PE 100 PN 8 HDPE pipes. The 160 mm and 225 mm sleeves were installed in bundles of 3, 4 or 6 pipes.

The 10 month contract had a value of R13 million. The contract document used was the NEC3 type.

The project team consisted of:

- employer: ABSA Bank Limited
- contractor: Trenchless Technologies cc
- project managers: Mokala Collins/JM Henrey & Associates Joint Venture
- consultants: Taemane/SDE and Asak/LC.

### The award ceremony



At the award ceremony (l-r): Marco Camarda, Sam Efrat and Johann Wessels

The award was presented by the outgoing president of SASTT, Johann Wessels, to Sam Efrat (managing member) and Marco Camarda (general manager) of Trenchless Technologies cc at the annual general meeting held on 2 February 2010 in Midrand.

The members who missed the AGM missed a spirited presentation of the project by Efrat!

## Challenges and solutions

The basement floors of the ABSA buildings were originally designed to support the weight of typical sedan vehicles. Consequently the automatic rod-loading system of the *Terra-Jet 7520* HDD machine was removed to decrease the imposed floor load of the machine. In addition propping was undertaken from the floor below to support all areas over which the drill needed to travel into the required positions within the basements.



*The Terra Jet 7520 with the automatic drill-loader removed, drilling in the confined basement*



*The remodelled TJ 7520 drill - all of 1,8 m high*

A floor to sprinkler height restriction required that all equipment be less than 2,1 m in height. Consequently the Terra-Jet 7520 was further modified by removing the operator cabin, rebuilding the hydraulic oil tank at a lower position and lowering the encapsulating bodywork such that the remodelled drill resembled a tank with a height of only 1,8 m.



*Air percussion head, diameter 95 mm*

Most of the installations took place in clay whilst the remaining twenty were in rock. The rock necessitated the use of a percussive hammer and rock reamers to expand the holes to the required diameters.

Lateral-support ground anchors were encountered during drilling on 26 of the crossings. The presence and position of these were unforeseen and resulted in the entanglement of drilling equipment in several instances. Drilling tools were pulled, pushed and rotated until they became free or broke the ground-anchoring cables.

In two instances the entangled cable would not break

and an acetylene-oxygen cutter was modified and inserted within the bore to cut the cable and free the drilling tools.

In order to gain access to the drill face, coring was required to remove cylinders of concrete from the lateral walls, which were from 300 to 500 mm thick.



*Intrusion of a ground anchor into a bore in rock*

Containment of the large volumes of bentonite and spoil was a necessity as the basements are maintained in a pristine condition and are in daily use. This was achieved by using specially constructed tanks and brick berms.

The removal of bentonite to the surface was one of the greatest challenges the project faced. Initially pumping, which is by far the preferred method of spoil removal, did not look feasible. This was due to the extremely long lengths of pipe (up to 600 m) to remove the bentonite from basement to basement up the vehicular ramps. However, at the

planning stage the idea was put forward to core holes through the slabs and enable vertical pumping along the shortest route. This reduced the pumping lengths to less than 200 m.

For the first six months of the contract no drilling was allowed during the “freeze period” from the 26<sup>th</sup> of one month to the 5<sup>th</sup> of the next month. This was to prevent any potential damage to cables and infrastructure during the busy end-of-month banking period. This resulted in a very tight work schedule necessitating crews to work day and night shifts, seven days a week.

The tracking of the drilling equipment on either side of the walls required the transmission of location signals through concrete and rock - and at depths of up to 16 metres. Trenchless Technologies used the *Radio Detection itrack* system to track the equipment horizontally from the basements on either side of each crossing.

Confined access into basements via vehicular ramps required short viz 6 m lengths of HDPE pipe to be individually transported down into basements where they were butt-welded into continuous lengths for installation.

In the *Museum* the only access was by means of a lift and pipe lengths were limited to 3 metres. Here, and in other confined spaces, storage areas and plant rooms, the bentonite was collected in tanks and removed in “wheelie” bins.

In two instances the HDPE pipe was hammered into the completed bore from the drill machine side in a pipe ramming operation, as there was no access to pull the pipes in from the opposite side of the bore.

### **The benefits of using trenchless technology for the ABSA project**

The installations were exceptionally deep, precluding conventional means of excavation. There was no damage to roadways and existing buried infrastructure, nor was there any disruption to pedestrian and vehicular traffic in the busy CBD area. Cost savings were also significant when compared to other possible methodologies.

### **Why horizontal directional drilling?**

HDD allowed the insertion of the preferred HDPE sleeves without requiring the installation of a temporary pipe or permanent rigid pipe, followed by the HDPE pipe installation. HDD required no thrust abutment wall and allowed for adequate steering accuracy. The equipment is self-propelled and capable of drilling in a wide range of soil conditions, including clay and rock. It is also sufficiently compact and manoeuvrable to be able to operate in the confined basement spaces.



*Low-torque rock reamer*

## **The authors**

Sam Efrat and Marco Camarda are with Trenchless Technologies cc. The company was established in 1991 and to date has completed over 220 000 metres of trenchless pipeline rehabilitation and new installation works. It has been the southern African agent for Terra AG since 1993.

Previous awards include:

- the *SAICE Pretoria branch award for technical excellence* in 2000, along with the City of Tshwane and consultants Bigen Africa, for the rehabilitation of sewers in Mamelodi.
- the *SASTT Award of Excellence* for 2007, along with Johannesburg Water and consultants Vela VKE for the rehabilitation of sewers in the Klipspruit Basin.

## **The installation of cables without sleeves by means of horizontal directional drilling**

by Niel Botes

### **Introduction**

The project described below entailed using directional drilling to install medium-voltage cables. These cables were directly installed into the ground in lengths of 300 m at a time. There were no conduits or sleeves as typically done when installing any product by means of directional drilling. This has the advantage that the cable is in intimate contact with fine soil particles mixed together with the remaining solids of the drilling medium, such as bentonite. The ground around the cable is finely ground and densely compacted. This results in good thermal conductivity of the soil - it allows heat to be dissipated rapidly into the ground.

### **The first project**

The Kliprivier project was the first of its kind in South Africa. The cable that Ampvar cc installed was a 185 mm<sup>2</sup> three core cross-linked polyethylene (XPLE) cable. The outer sheath was also XPLE. Specified by Eskom, this cable is wire-armoured which gives it longitudinal strength that supplements that of the XPLE. This specific cable is very tough and can withstand abrasive conditions. In this specific project the bore path was located directly under a certain conductor of an overhead transmission line so that the position of the cable will be easily found by Eskom when necessary.

The pulling tension for the cable is specified by the manufacturer. This tension can be monitored while pulling the cable during the drilling process to ensure that it is not exceeded. So far this cable has not given any problems with regard to this installation method.

After every 300 m the cable was tested for sheath- as well as insulation integrity.

To eliminate water ingress a cable boot was heat-shrunk on either end. After a cable sock had been fitted over this heat-shrunk end another heat shrunk boot was put over the cable sock. This ensured that the sock would never come off unless the permissible pulling tension were exceeded.

### **Motivation for this method of installation**

The primary reason for installing cables, directly into the ground without conduits, by means of directional drilling is that it makes the cables very difficult to steal. The prospective cable thief will not be able to see where the cable is. Sometimes he will not even be aware of cable installation taking place.

Obviously there remains the question of the entry and exit points of the cable. Normally this is something that can be planned ahead to minimise visibility and also ensure that the least number of people know what is happening.

### **Applicability of the method**

Due to the costs of installing by this method it should only be chosen where high security for the cable is warranted. Typically it would be used where certain sections of 6,6 kV, 11 kV or 22 kV cables were stolen and replaced a few times.

### **Conclusion**

Although the best depth of installation is 1 m for thermal dissipation, this method is very promising at greater depths.

We are likely to see more of these installations in South Africa for specialised projects.

### **The author**

Niel Botes is with Ampvar cc and can be reached at cellphone no 082 807 5800.

### **The ISTT *No-Dig Award 2010***

Entries are invited for the *No-Dig Awards* for 2010, to be presented at *International No-Dig 2010* in Singapore from 8 to 10 November 2010.

Awards will *inter alia* be made for entries for work completed during 2009-2010 as follows:

- training aid/course
- trenchless project completed
- new machine, tool, material, system or technique introduced.

The judges will be asked to consider:

- does the entry make a contribution to the advancement of trenchless technology world-wide?
- does the entry contribute to protecting the environment and/or reduce social costs?
- are the above benefits clear from the entry?
- is the entry innovative, ingenious, elegant or novel?
- is the entry commercially and economically practicable?
- will the award make an impact with the media, decision-makers and the general public?
- will the award impress ISTT members?
- has the entry been well explained and presented?

Entries can relate to the practical use or development of trenchless systems, or to equipment for the installation or rehabilitation of underground utility networks. For example, entries may address achievements in:

- improved economy and competitiveness of trenchless installations
- length and speed of drive for installation, replacement or renovation
- accuracy or size of installation
- materials used
- ground conditions successfully dealt with
- improved acceptability for clients, operators and/or environment
- underground detection, recording and mapping of obstacles, both natural and man-made
- health and safety of employees and the general public
- matters related to training in the field of trenchless work
- research into any of the topics related to working on underground utilities.

Entries are required in English and should be prepared with the above criteria in mind to a maximum of 1000 words supported by suitable illustrations in one of the standard electronic formats (for example MS Word<sup>®</sup>). Illustrations should be in JPEG format so that they can be circulated quickly to the judges.

Further information and details are available from ISTT at [info@istt.com](mailto:info@istt.com).

The closing date for entries is **30 July 2010**.

Entries should be submitted to the ISTT at [info@istt.com](mailto:info@istt.com)

## **Call upon SASTT members to serve on a steering committee for TT standards**

### **Introduction**

Many members are already aware that Vela VKE Consulting Engineers completed the draft of a SASTT standard for sliplining. Alaster Goyns is currently doing a peer review of the draft standard. When this review is complete, the draft will be published for comment.

When these comments have been received SASTT will need a committee to evaluate the draft together with the comments, after which the final SASTT standard will be published.

In the meantime the board has decided to call for proposals to develop further standards. This call appears at the end of this number of *SASTT News*.

At the AGM the president announced that the board had realised that it was time to establish a wider forum to guide the development of TT standards. The outcome of the work of such a committee will be TT standards appropriate to our unique, southern African conditions.

Standards will do more than anything achieved by SASTT up to now to promote TT in southern Africa - to the direct benefit of the community at large as well as all our members.

### **Committee members wanted**

SASTT hereby issues an earnest call on members with relevant expertise to make themselves available to serve on a steering committee for TT standards. Once assembled, the committee will decide on its own mode of work, within the framework of the constitution of SASTT.

Prospective committee members must please advise the honorary director ([director@sastt.org.za](mailto:director@sastt.org.za)) of their willingness to serve.

## **Encouragement for members to host site visits in collaboration with SASTT**

Every so often one hears of a member of SASTT who arranged an excellent site visit to a TT project, which contributed significantly to the promotion of TT. One can only commend such actions, but one often hears afterwards that it would have been very beneficial to have had a wider audience, including, particularly, decision makers in local authorities.

With this in mind, the board of SASTT calls upon members to give consideration to liaising with SASTT prior to starting the arrangements for a site visit. It is recognised that members wish to keep control of the inclusion of persons to be invited and this is respected.

Nevertheless, SASTT could assist in publicising the visit and could suggest the inclusion of decision makers in the guest list.

## **Request for proposals to develop standards for various aspects of trenchless technology**

The Southern African Society for Trenchless Technology (SASTT) invites consultants who are interested in the writing of standards for various trenchless technology (TT) techniques and support services currently used in South Africa, to submit proposals for doing this.

### **Background**

There are several organisations involved with TT installations, namely client, designer, contractor and specialist service-provider that make decisions about the different aspects of a TT project. The standards needed fall into several categories, namely:

- codes of practice providing designers with guidelines for designing TT installations

- product standards providing manufacturers with required product properties
- standard installation-specifications giving construction details to contractors.

This project is a step in producing SASTT standards for TT so that there will eventually be a set of documents that will be available to:

- set minimum performance levels for TT projects
- provide a consistent means of communication between the various parties
- compare alternatives
- evaluate quality of workmanship
- determine whether or not the specified requirements are met.

There is a prescribed process for having documents accepted as SASTT standards. Once the documents are available this process will be initiated, and client organisations will be encouraged to start using these documents. It is to be expected that the contents will be adjusted on a regular basis to cope with problems that occur.

### **Scope of work**

Initially the required standards are to be produced as stand-alone modules that cover specific techniques. Each module will consist of a series of documents that may or may not include a separate one dealing with the design, material and installation aspects of the specific technique. The proposed modules and documents within each module are detailed in the table that appeared in *SASTT News No 2* – October 2007. This list may be modified when new techniques are developed or introduced.

Although the standards are intended to be SASTT standards, the documents are to be written so that they conform to the requirements of the relevant SANS standard/s for producing such documents.

As it is impractical to produce all these documents simultaneously, the following trenchless techniques have been selected as priorities. They are the most frequently used techniques - hence there is an urgent need for standards.

- CCTV inspections
- condition assessment
- cured-in-place pipe linings
- close-fit linings
- horizontal directional drilling
- pipe bursting, splitting and cracking.

### **Submission details**

Those interested in producing *any or all* of these documents must include the following details with their submissions:

- a list of projects where they have specified TT, giving client, technique used, standards used for liner design, product manufacture and construction, project size and dates
- the documents they intend producing
- the reference standards, and/or information sources they intend using
- an itemised quotation covering any or all of the documents listed above
- a plan detailing the time for producing the documents
- the experience of the person/s in their organisation who will be writing these documents
- a covering letter detailing any other relevant items and signed by the responsible person at the organisation.

The closing date for submissions is **17:00 on Friday 30 April 2010**.

The documentation may be submitted electronically to the honorary director of SASTT ([director@sastt.org.za](mailto:director@sastt.org.za)), but a signed original must be received before a final award is made.

**Additional notes**

The evaluation of the bids will be done by a committee consisting of SASTT board members and anyone they choose to advise them. The decision of this committee will be final. No one on this committee may have a vested interest in the current phase of the project.

The lowest bidder may not necessarily be given the project and the work may be split between various bidders.

It is intended that the evaluations will be available for consideration at the board meeting of SASTT to be held on 18 May 2010.