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WESTERN CAPE

Drilling is **thrilling**



TRENCHLESS TECHNOLOGY is currently making significant contributions to the construction sector. One of the most popular and widespread applications of this innovative technology is horizontal directional drilling.

With the introduction of directional drilling into South Africa, complex pipeline installations – similar to international trends – were widely anticipated. However, for various reasons, these did not occur. Instead, smaller, less risky projects became the norm. In 2006, TT Innovations, a specialist contractor in the field of trenchless technology, purchased its first drill rig, with the expectation of providing specific



- ① & ② Installation at Cape Town International Airport
- ③ & ④ Laying of stormwater pipelines across Lansdowne Road in Phillipi
- ⑤ & ⑥ Pipes being laid under the Berg River at Velddrift

solutions for this segment of the drilling market, focusing on larger installations.

One of the recurrent issues faced by the drilling fraternity is the capital outlay associated with the purchase of equipment and tooling, often making the implementation of this technology too costly for the local market. In the Western Cape, drilling contractors are further plagued by a range of varying soil conditions, each requiring a tailored mix of down-hole tooling and drilling fluids. Fortunately, with the introduction of larger rigs and more meticulous drilling fluid compositions, the tide seems to be turning, with larger, longer bores being undertaken. The following are some of the notable projects undertaken in the Western Cape in recent times. Drill rig designations are indicated in brackets.

CAPE TOWN INTERNATIONAL AIRPORT – 315 MM DIAMETER INSTALLATION (Vermeer D20x22 drill rig)

In February 2008, a 315 mm diameter HDPE water main was installed under one of the taxiways at Cape Town International Airport. The installation spanned a length of 162 m at a depth of approximately 1,5 m. Sandy soil conditions, a calcrete layer and zero tolerance for failure did little to deter the drilling team, who duly completed the project in five days.



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LANSDOWNE ROAD, PHILLIPI (Vermeer D20x22 drill rig)

Also during February 2008 two parallel 450 mm diameter stormwater pipelines were required across Lansdowne Road in Phillippi. The installation length spanned 42 m at a diagonal angle across the road, with a maximum depth of 4,5 m being achieved. Installing a pipeline of this size and parallel configuration involved a technical and complex drill. Critical gradients and adjacent services further complicated the matter. It is general practice for graded drills that the pilot bore is plotted and assessed to determine whether it is satisfactory and within tolerance. Once both pilot bores had been approved, the installation commenced and both pipelines were successfully installed at a 1 m centre-to-centre distance.

To add value, a crawler camera equipped with an inclination sensor is deployed (down the pipe) and used to plot the installed pipeline's gradient in order to compare it with the pilot bore data. Unfortunately, a "dip" in both pipelines at approximately the same location required corrective action. A 4,5 m deep excavation of the last 5 m of the pipeline length was undertaken to rectify the gradient. Fortunately, this section was on the edge of the traffic stream and rectification was done fairly unobtrusively. It is unusual for a pipeline to deviate from the initial pilot path during installation. The excavated material, however, indicated a highly porous organic soil composition at that particular point, which proved rather unstable under drilling conditions (resulting in poor load-bearing characteristics when disturbed), unlike the in situ sandy soil which, despite a high water table, proved more stable.

VELDRIFT RIVER CROSSING (Vermeer D20x22 & Vermeer D36x50 drill rigs)

The West Coast town of Veldrift and the Berg River set the scene for the next challenging encounter. After much effort and perseverance, two sets of 2 x 160 mm duct clusters were installed under the Berg River, reaching a maximum depth of 9 m below the water level, with the installation length measuring 168 m. The water's salinity, which counteracts drilling fluid

7 & 8 Replacement of a water main pipeline under the Diep River at Table View

9 & 10 Four main roads had to be crossed at Alphen Hill



properties, along with a range of varying and largely unknown soil compositions, provided almost insurmountable challenges; consequently, the project exceeded the estimated completion time and budget. Important lessons were learnt regarding specific drilling fluid requirements for extreme conditions such as these. A comprehensive geotechnical investigation would have assisted the contractor greatly in making a reasonable assessment of the risks and ensuring a specific and calculated drilling fluid design, negating the need for costly trial and error. The project was completed at the end of May 2008.

DIEP RIVER – TABLE VIEW (Vermeer D36x50 drill rig)

Having tasted success with the previous river crossing, the team once again undertook the challenge of a river crossing. In the Diep River at Table View, with its minimal summer flow, there was a leaking 300 mm diameter AC water main which required urgent replacement. Site

conditions clearly dictated the use of a trenchless solution for this replacement. The local authority duly commissioned the installation of a 315 mm HDPE pipeline spanning 220 m, at an approximate depth of 4 m below the natural ground level. As standard practice, the pressure pipeline was welded into a continuous length and tested prior to installation. The installation was successfully completed in mid-March 2009, having taken approximately three weeks, albeit with a few hiccups and delays along the way. At present, this is the longest length of pipe installed by the contractor using horizontal directional drilling. Important lessons learnt from previous drilling fluid compositions allowed a more technically sound approach to this fluid design and ultimately proved invaluable to the success of this project.

ALPHEN HILL DRILLING (Vermeer D36x50 drill rig)

More recently, a civil contractor required the installation of a 500 mm

HDPE pipe sleeve at four locations, crossing various main roads, including the busy M3 in the Constantia area. The four crossings were successfully installed, with the longest length being 72 m. Installation depth varied according to the site topography, ranging from 1,5 to 6 m measured to the top of the pipe relative to the natural ground level. Favourable ground conditions allowed a fairly hassle-free installation in this case and the project was completed in mid-May 2009. At present this is the largest diameter of pipe installed by the drilling contractor. In similar conditions, pipe installations in excess of 600 mm in diameter could be achieved.

CONCLUSION

With ever-increasing demands to install, maintain and improve underground infrastructure, trenchless technology offers an excellent solution, being efficient, environmentally friendly and non-disruptive. □

Source:

http://www.saice.org.za/downloads/monthly_publications/2009/2009-Civil%20Aug/#/0