Smet Group

Project sewage rehabilitation Antwerp Ring

Client: AWV
Main contractor: SCREG (THV Van Broekhoven- Van Gorp-Wegebo)
Execution: 2004-2005
Technique: pipe bursting

The first stage of the work on the Antwerp Ring proceeded very smoothly. For the most part, the previously anticipated traffic problems failed to materialise. A total of 54 km of drainage pipe was installed during the construction of the Antwerp Ring. A thorough inspection of the existing drainage system showed that most of the drainpipes urgently required replacement. The necessary work for replacing most of the drainage system can be performed in open trenches. However, this method cannot be used in certain critical locations, such as near bridge pillars and gantries for traffic signage and signalling or beneath cable alignments, so a trenchless technique is also needed. Smet-Tunnelling offered a solution in the form of 'pipe bursting' technique.

Operating principle

The pipe-bursting technique allows a new HDPE drainpipe to be drawn through an old, existing drainpipe. With this process, the diameter of the new drainpipe is slightly larger than the diameter of the existing pipe. A bursting head is pulled through the existing drain, which causes the pipe to shatter and the surrounding soil to be pressed back by the displaced pipe wall. The new HDPE drain pipe follows immediately behind the bursting head.

Existing drainage system

The existing drainage system of the Antwerp Ring is largely composed of 'Porosit' concrete pipes, which are made from non-reinforced concrete with a porous structure. The pipe sections are 1 m in length and have an internal diameter of 200 mm. The drainpipes were installed embedded in draining sand bodies with dimensions of approximately 1 x 1 m. Inspection shafts with an inside diameter of 1 m were placed approximately every 40 m.

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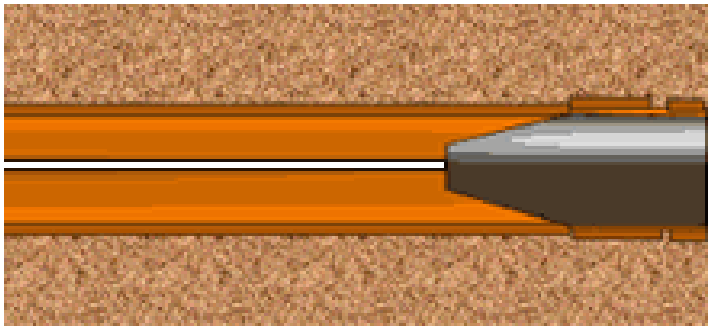
Pipe bursting system

A compact, powerful hydraulic pipe bursting and towing system, suitable for replacing underground gas, water and sewer pipes with diameters ranging from 60 to 300 mm, was used for this project. This system is suitable for replacing pipes made from concrete, clay, plastic, steel (using a special cutting head), or fibre cement. The compact design of the system makes it easy to set up. This allows it to be used in small or poorly accessible shafts.

The machine consists of the following components:
- a sturdy base frame with pressure distribution plates
- a metal structure with sealed bearings and hydraulic cylinders, with a towing capacity of 600 kN and a maximum pressing force of 450 kN.
- a hydraulic pump assembly fitted with a control panel using manually operated valves
- compact draw rods made from highgrade steel alloy

The system can be powered from the regular electricity grid or a motorgenerator set. The system weighs approximately 660 kg.



Execution

The superstructure of the shaft must first be removed. After this, a guide rod made up of 50-cm rod sections is pushed through the existing drainpipe. After the guide rod emerges in the arrival shaft, a bursting head is fitted to the end of the rod. A cone expander (expander head) follows immediately behind the bursting head. The new HDPE pipe is in turn attached to the cone expander. The entire arrangement is then carefully pulled back through the existing pipe. The Porosit pipe is simultaneously shattered and pressed back into the surrounding soil (draining sand body). A trench with dewatering is excavated behind the arrival pit to allow the new HDPE drain pipe to pass through with the permissible radius of curvature and be drawn into the recess in the ground provided in the arrival shaft. The shattered pieces of the existing drainpipe are pressed back into the surrounding sand body, with displacement of the soil. The degree of bursting is sufficient to avoid interfering with the proper functioning of the new drainpipe. The surrounding sand body continues to fulfil its function as a draining surround.

Advantages of the system

- simple, compact site installation
- usable with shaft diameters as small as 1 m
- vibration-free method - trenchless method
- diameter range: 60–300 mm
- remote control
- high maximum towing and pushing forces
- towing force can be recorded
- fast and effective

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