

Jet Grouting

Foxton Road, Birmingham

Midlands, U.K.



Installation of Jet Grouted Plug at the base of a Cased C.F.A. Secant Piled Storm Water Shaft

Introduction

Bachy Soletanche were awarded a contract to install a secant pile shaft and design and construct a temporary jet grout plug in the base of the shaft. The 900mm diameter, 18.0m long secant piles were installed using the Cased CFA technique.

The jet grout plug allowed the shaft to be fully dewatered without risk of settlements to surrounding buildings. The plug provided a temporary groundwater cut-off to avoid the ingress of water during excavation of the shaft and construction of the permanent base slab.

A number of trial columns were constructed by the A.G.M. (Anchors, Grouting and Mini-piles) Division using the different jet grout systems proposed for the works. The jet grout plug was built up from a series of primary, intermediate and secondary columns of different diameters.

Measurements of the trial jet grout column diameters were then made using the in house Cyljet Geophysics testing system, to prove the overlapping of the columns.

Ground Conditions

Approximately 2.5m of made ground is underlain by loose to medium dense silty fine and medium Sand. The groundwater level was close to existing ground level.



Jet Grouted Column under construction

CLIENT:	Severn Trent Water
MAIN CONTRACTOR:	Forkers Ltd
CONSULTING ENGINEER:	Mott MacDonald
DURATION OF WORKS:	6 Weeks

Scope of Works

- 4no. trial jet grout columns.
- 74no. 5.2m thick jet grouted water plug.
- Testing of test area by Cyljet.

Sustainability Innovations



- ✓ CSP delivered the verticality and quality of Rotary piling with the CFA productivity
- ✓ Jet grouting used to provide an effective plug solution for dewatering

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Jet Grouting Rig and Tool

Design

Calculations were carried out to assess the required thickness of the jet grouted plug in order to provide overall stability of the combined structures and the internal stability of the plug alone.

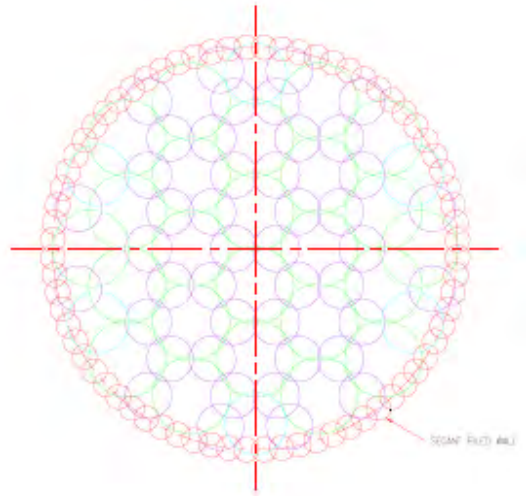
A layout was developed to build up the plug across the shaft area using a combination of primary, intermediate and secondary columns of different diameters.



Construction of Jet Grouted Plug

A Klemm 704-1-E drilling rig was used to construct the jet grout columns. The rig was equipped with Enpajet, our in-house computer control and recording equipment for jet grouting. The use of this electrically powered rig also led to less environmental impact for the local residents with reduced noise and emissions.

It was critical that the grout columns would overlap with no gaps left between them to ensure that the plug would be watertight. Trial columns were constructed outside of the shaft perimeter.



An in-house state-of-the-art geo-physics system, Cyljet, was used to check the quality and diameter of the jet grouting using a soil resistivity survey following construction of the trial columns.

The columns that would make up the plug were constructed from ground level. 4No. vent holes were installed down to the top of the plug to allow the air pressure to dissipate as the plug was closed. The shaft was later excavated successfully and in a dry condition.

Permeability Testing

Falling head tests were carried out in-situ in the jet grouted material. Further testing on samples cored from the jet grouted soil confirmed that the base plug had a permeability in the region of 1×10^{-9} m/s, a level normally associated with cut-off barriers.



Excavation of Shaft Base below the water table in the dry