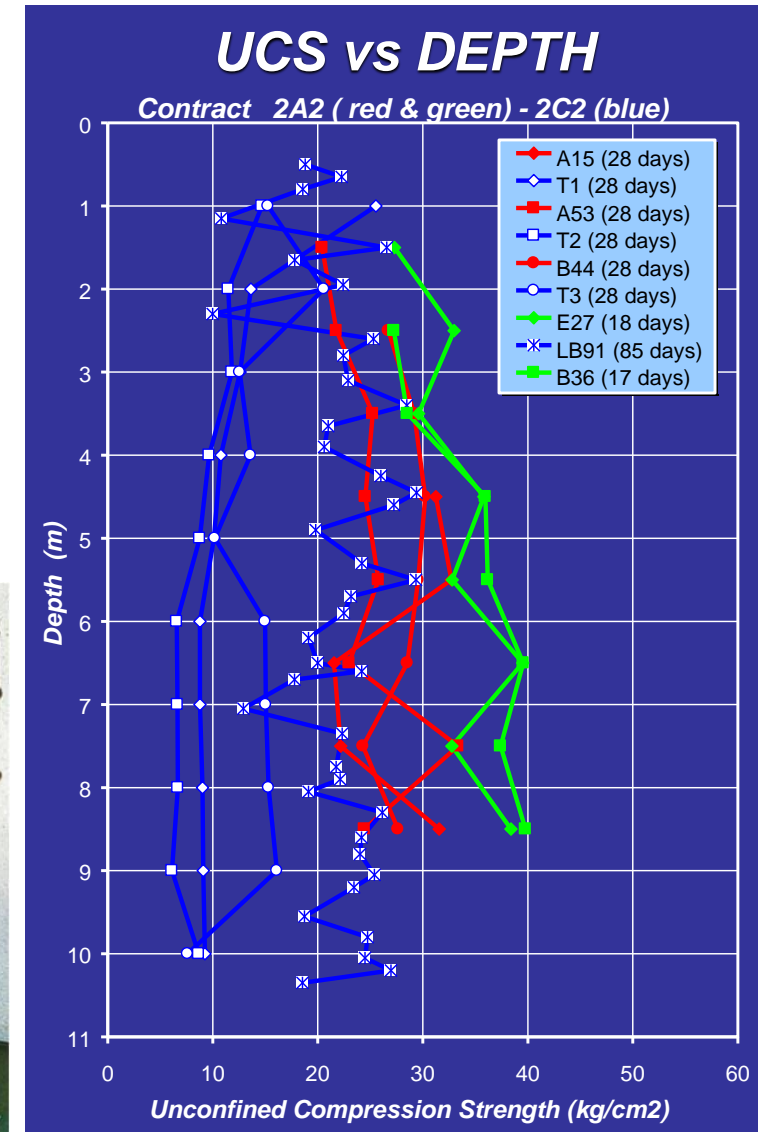
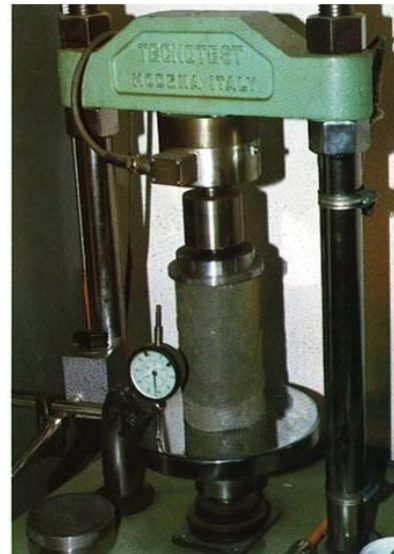
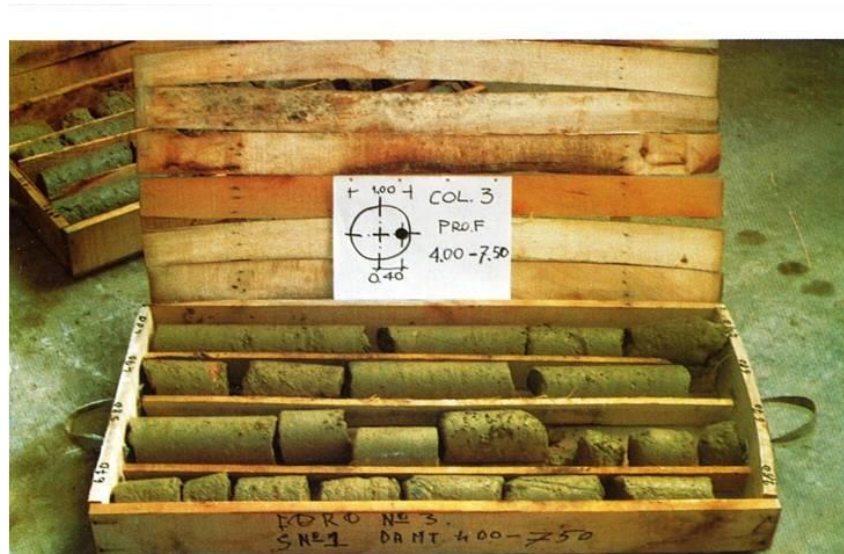


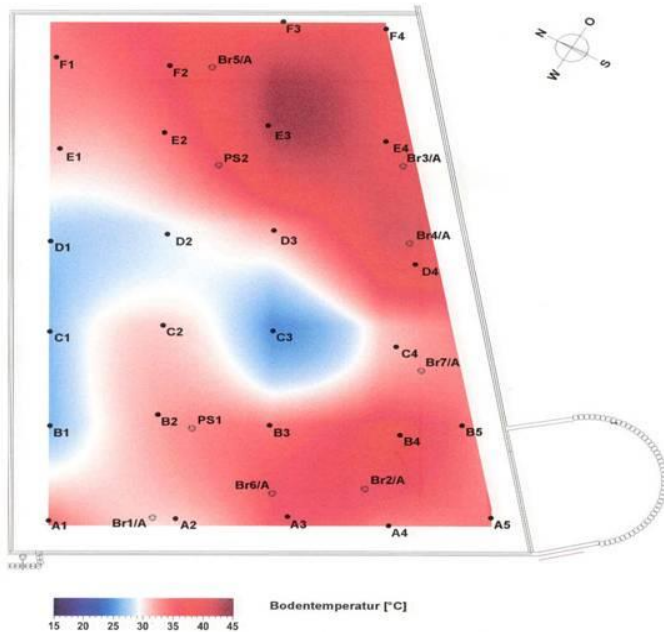
Quality controls at the end of the treatment

- ❑ Controls on the geometry and homogeneity of the treatment through columns' coring, cross hole or seismic test, thermal controls;
- ❑ Controls on the mechanical and permeability features of the treated soil by means of in-situ tests (i.e. SPT, CPT, pressuremeter tests, water tests ecc.) and/or laboratory tests executed on cored samples or wet grab.

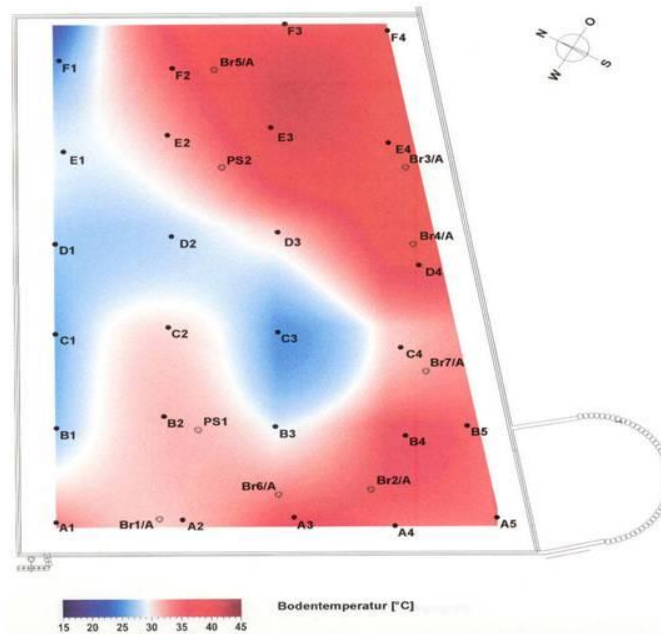


Quality controls at the end of the treatment – Thermal detection

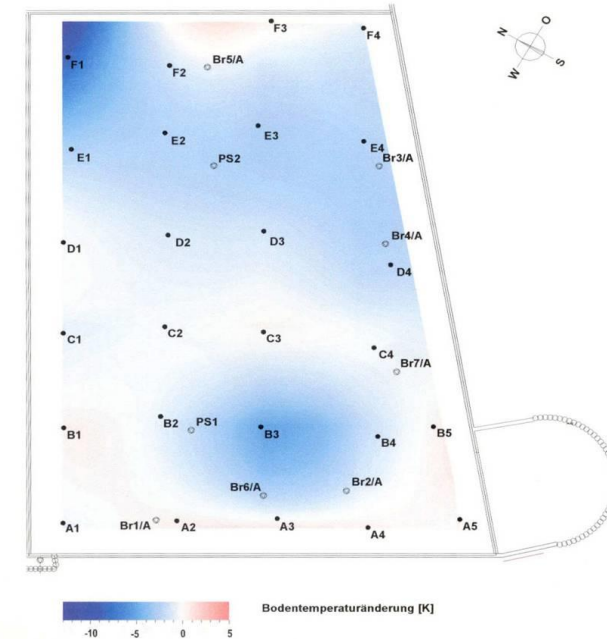
Reference measure at rest



Measure during pumping test



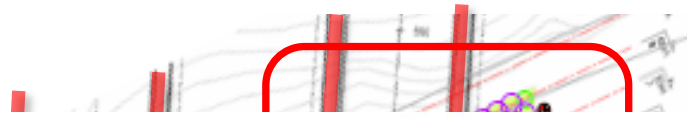
Difference



After the completion of DW and the bottom plug (closed box), a reference termographic measure can be performed (by means of thermic probes, piezometers). Then a second measurement can be performed during a pumping test. The data of the two readings shall be compared. The detected differences of temperature, shown with different colors, underline the inflow of ground water, colder than that existing in the closed box.

Quality controls at the end of the treatment – Cross Hole

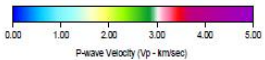
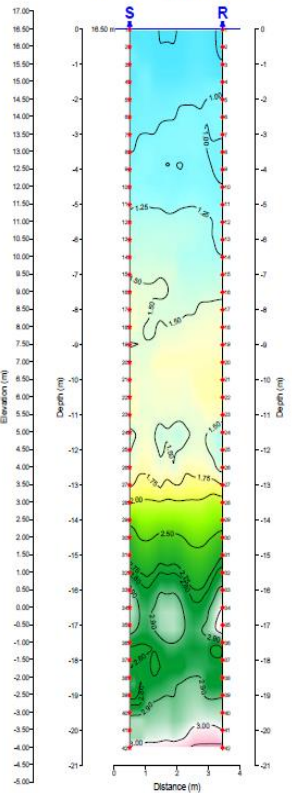
JG for tunnel consolidation, executed as massive block from surface.



SET V
Natural soil

SET A
TRIALS COLUMNS ø1400 - mesh side 1.08

CROSS HOLE TOMOGRAPHY
P-Wave velocity [Vp - km/sec]



CROSS HOLE TOMOGRAPHY
S-Wave velocity [Vs - km/sec]

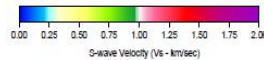
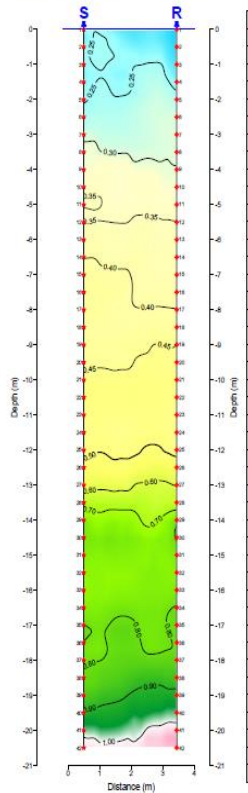
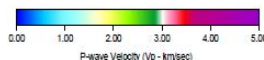
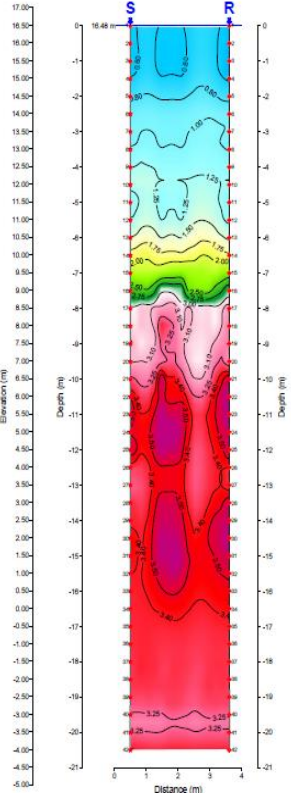


Fig 4

CROSS HOLE TOMOGRAPHY
P-Wave velocity [Vp - km/sec]



CROSS HOLE TOMOGRAPHY
S-Wave velocity [Vs - km/sec]

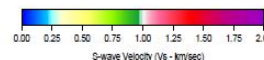
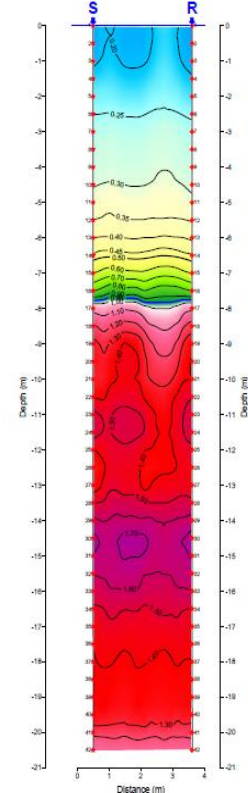
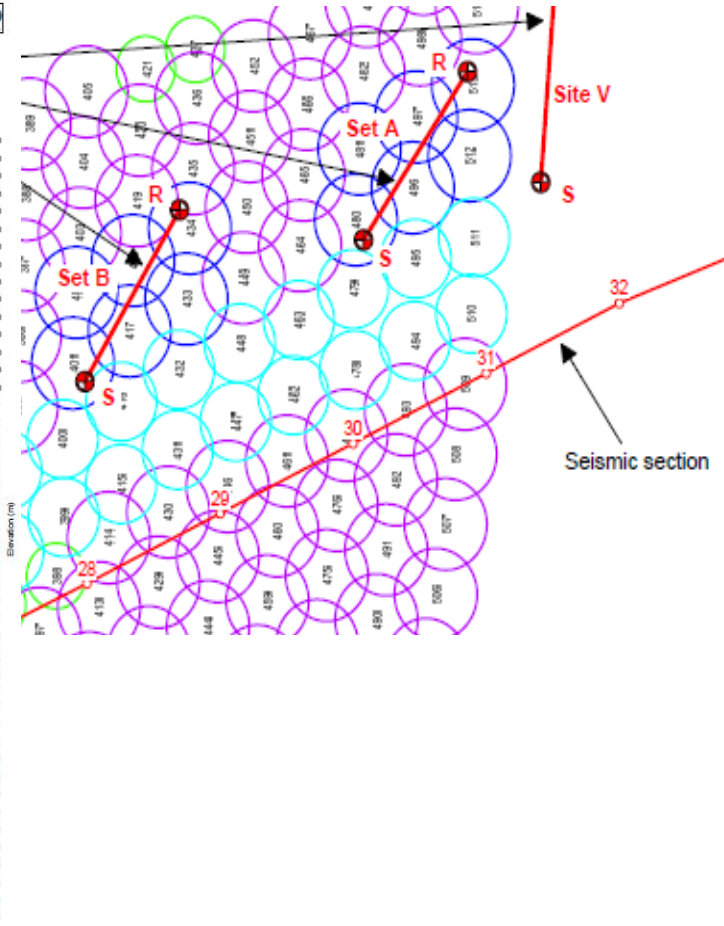


Fig 6



Seismic section

1. GENERAL VIEW

2. TECHNOLOGY & DESIGN

**3. QUALITY CONTROLS AND
MONITORING SYSTEM**

4. CASE HISTORY

Applications of Jet Grouting Technology in Hong Kong



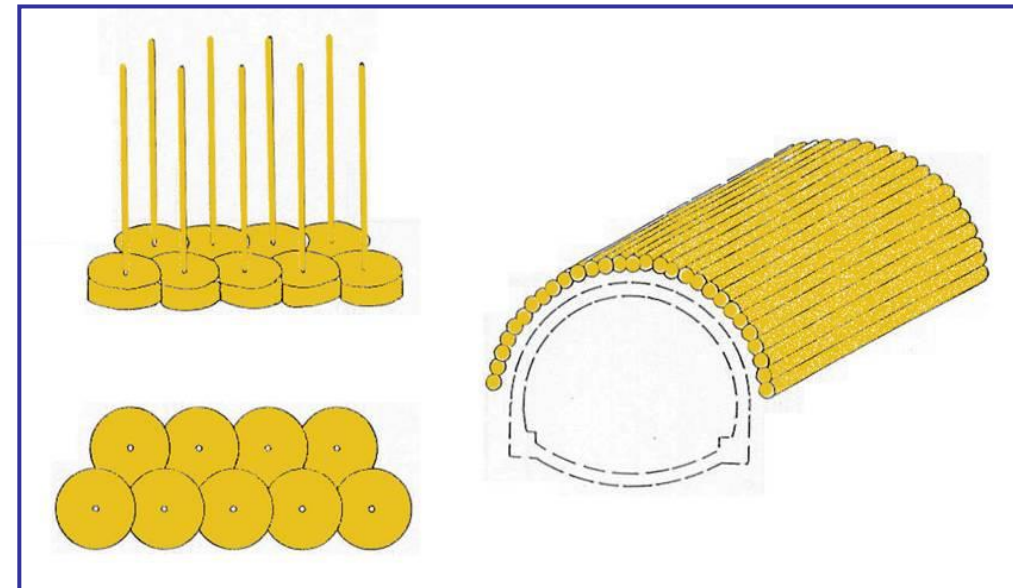
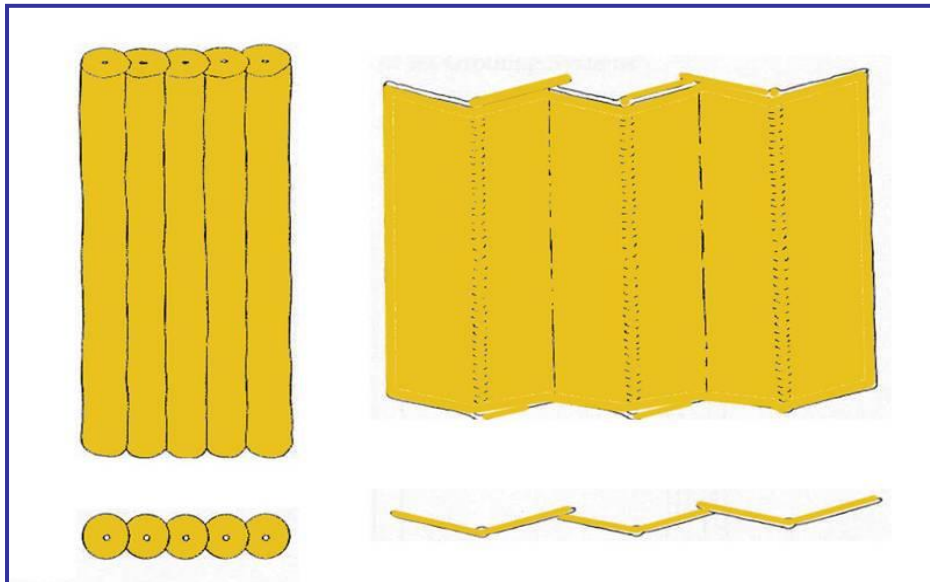
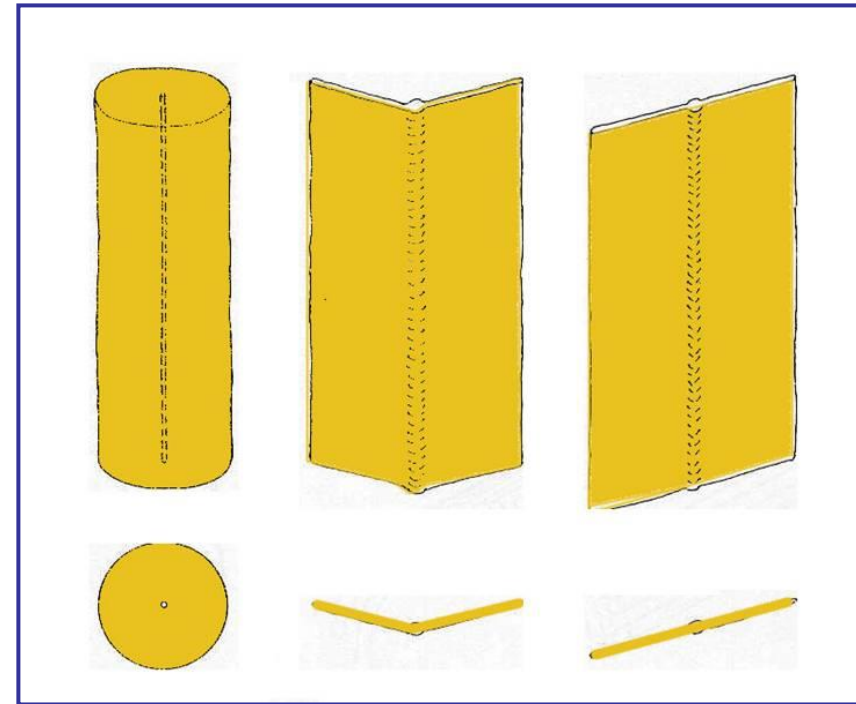


TAM Grout Treatment Zone

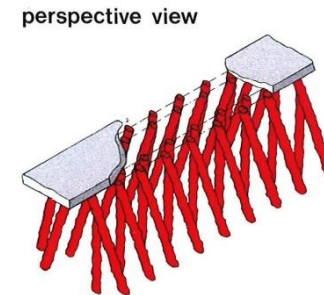
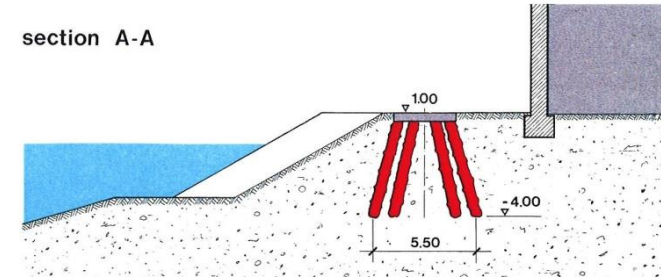
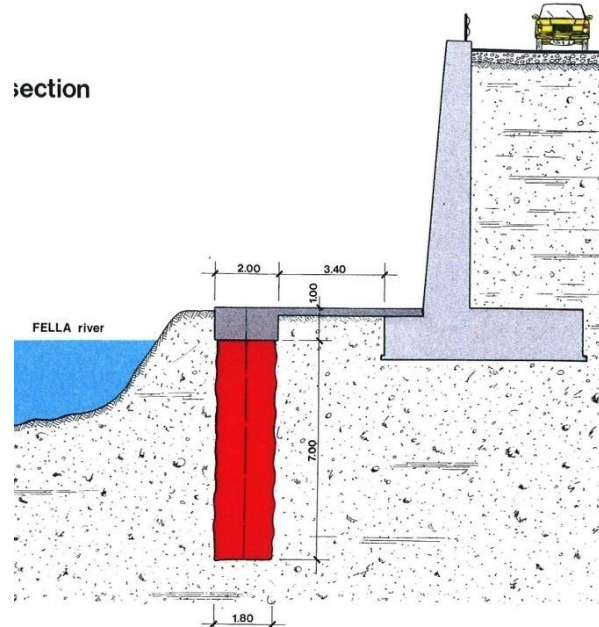
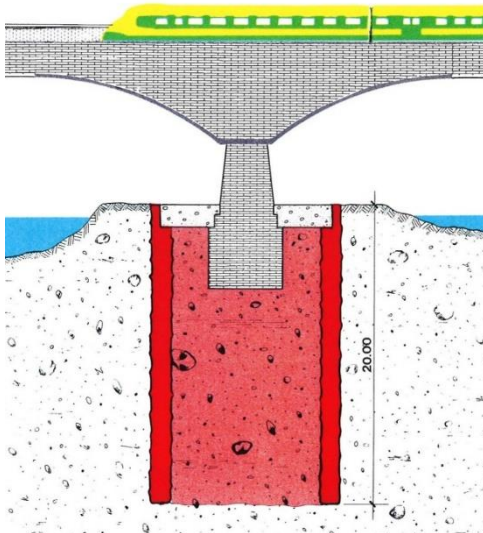
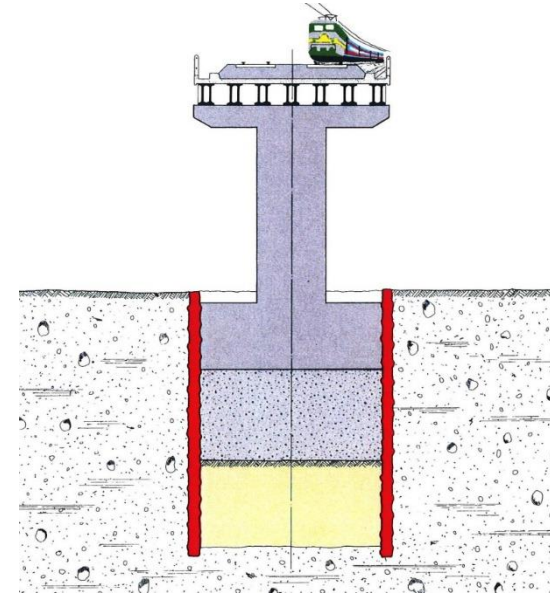
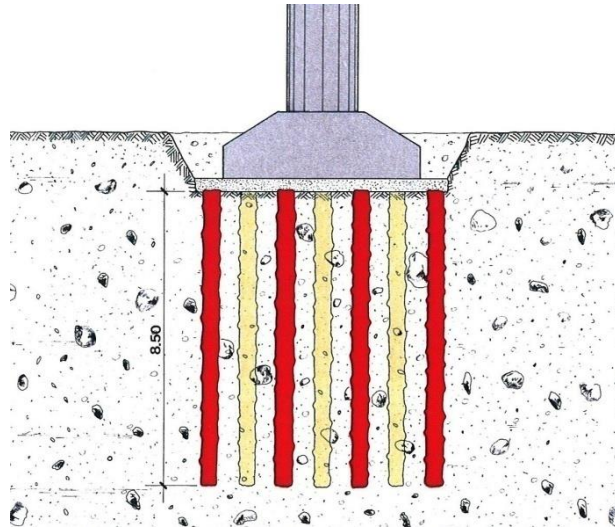
GEOMETRIES

The jet grouted elements are basically columns and panels (or lamellae).

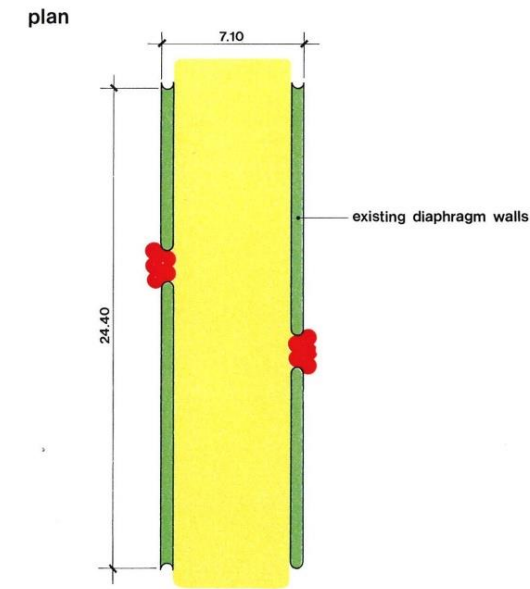
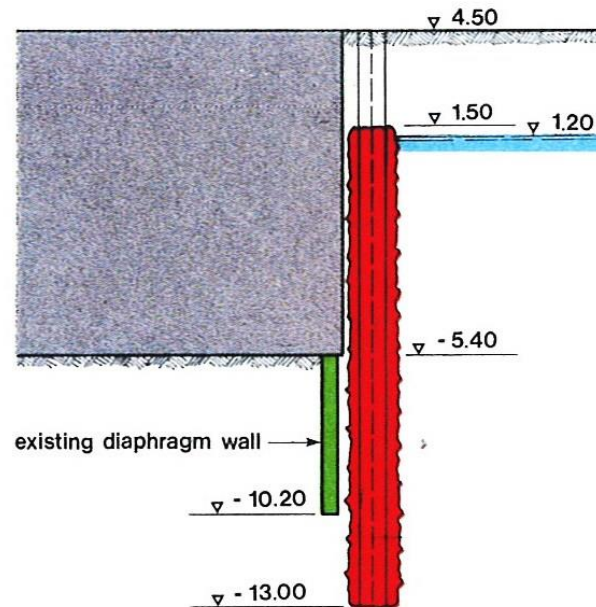
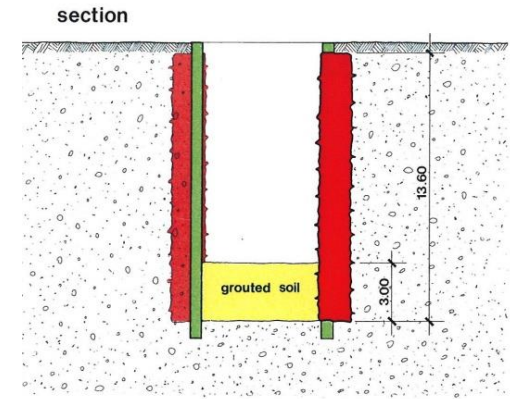
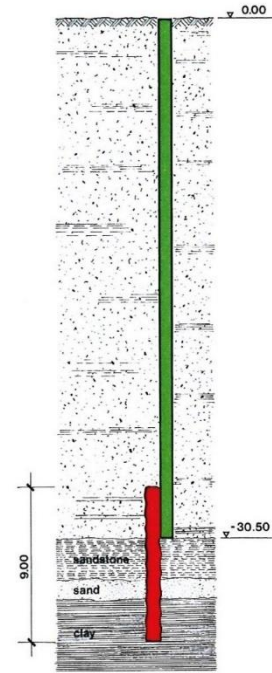
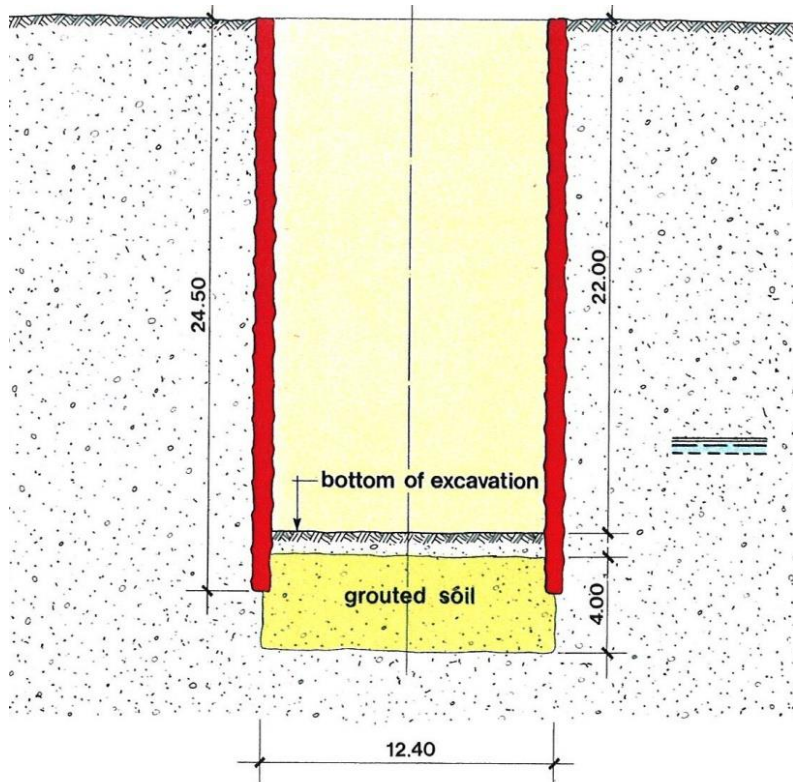
By combining single elements, is possible to form strips, slabs, diaphragms, canopies and other geometries.



- Foundations and underpinnings
- Protection from erosion phenomena
- Consolidation works concerning embankments and slopes
- Diaphragm walls of any shape
- Sealing of structural diaphragm walls

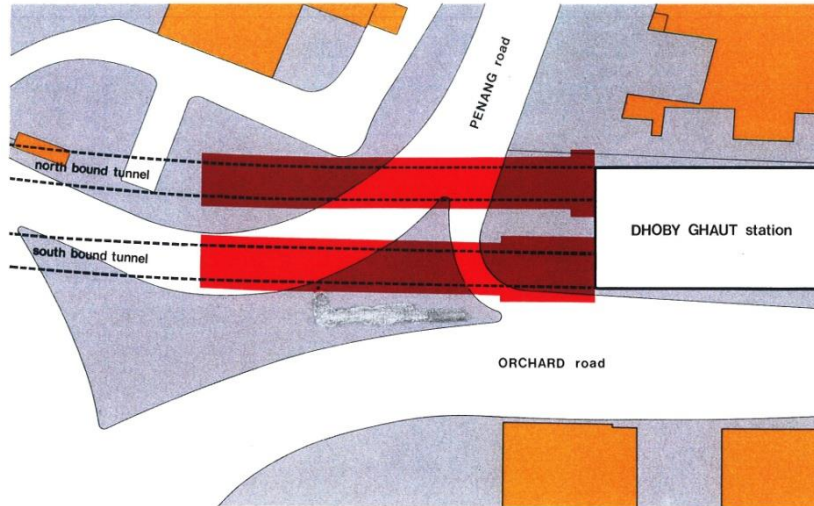


- Impermeable “bottom plugs”
- Deepening of waterproof diaphragm walls
- Sealing of structural diaphragm walls

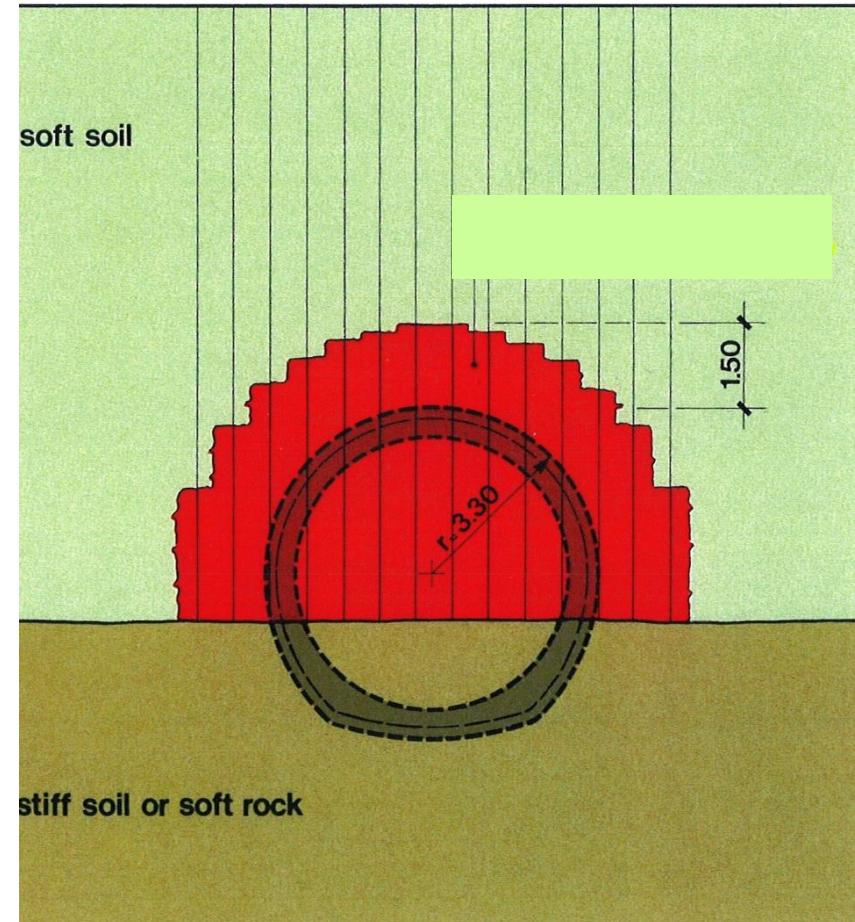
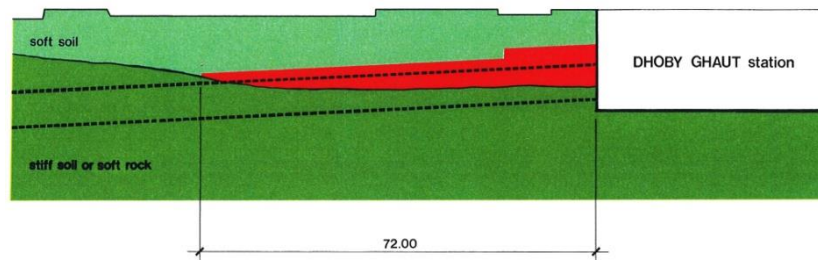


- Soil consolidation around a tunnel performed from the surface

plan



longitudinal section



Summary



**HY/2010/02 – Hong Kong – Zhuhai – Macao Bridge
Hong Kong Boundary Crossing Facilities – Reclamation Works**

DC/2007/16 - Lai Chi Kok Transfer Scheme TBM Maintenance Chamber

MTR 1109 – Stations and Tunnels of Kowloon City Section

MTR 810A – West Kowloon Terminus Station North

MTR 1107 – Shatin to Central Link - Diamond Hill to Kai Tak Tunnels

Alameda Jet grouting in water

Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



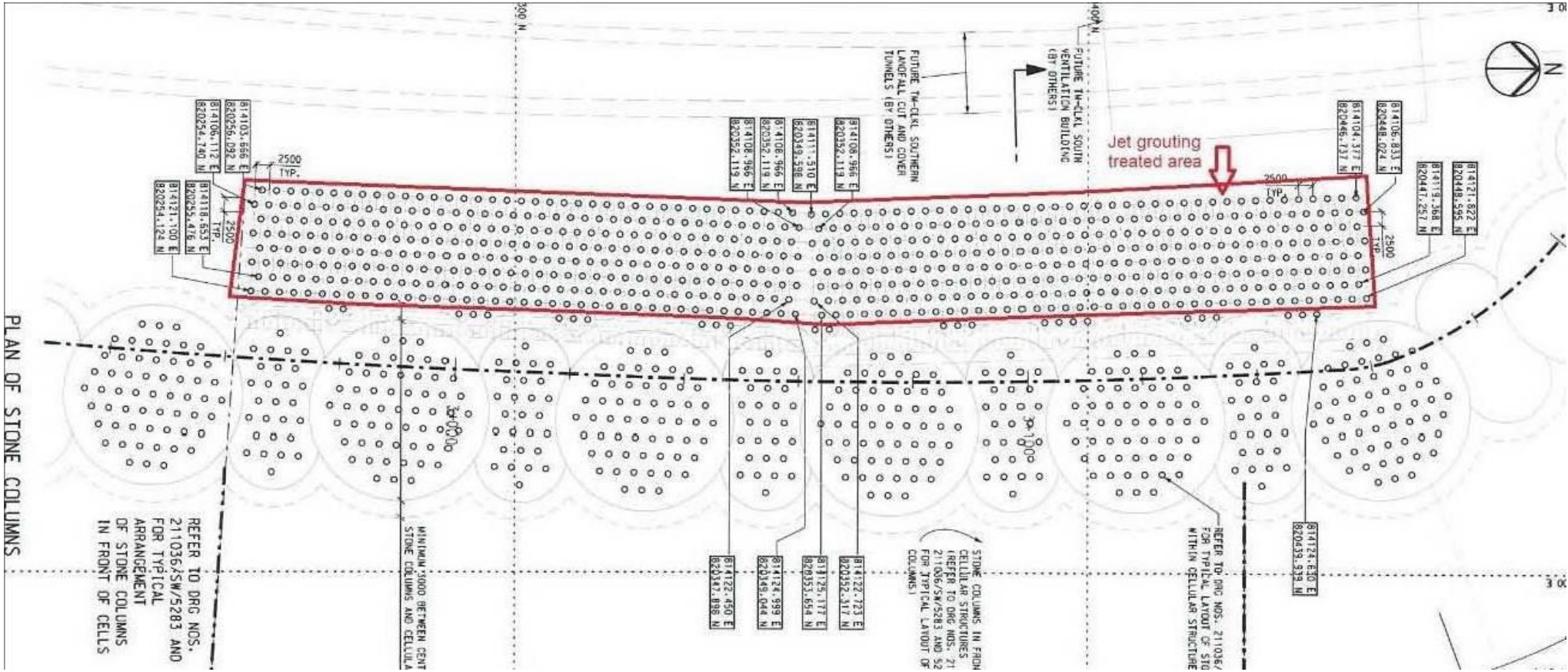
Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



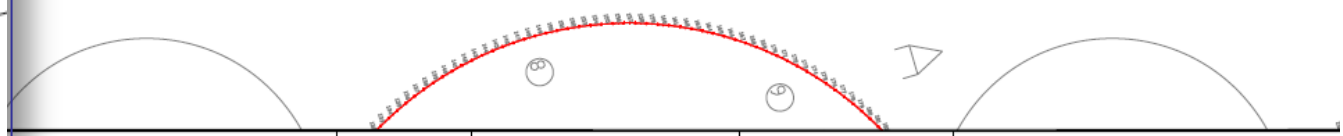
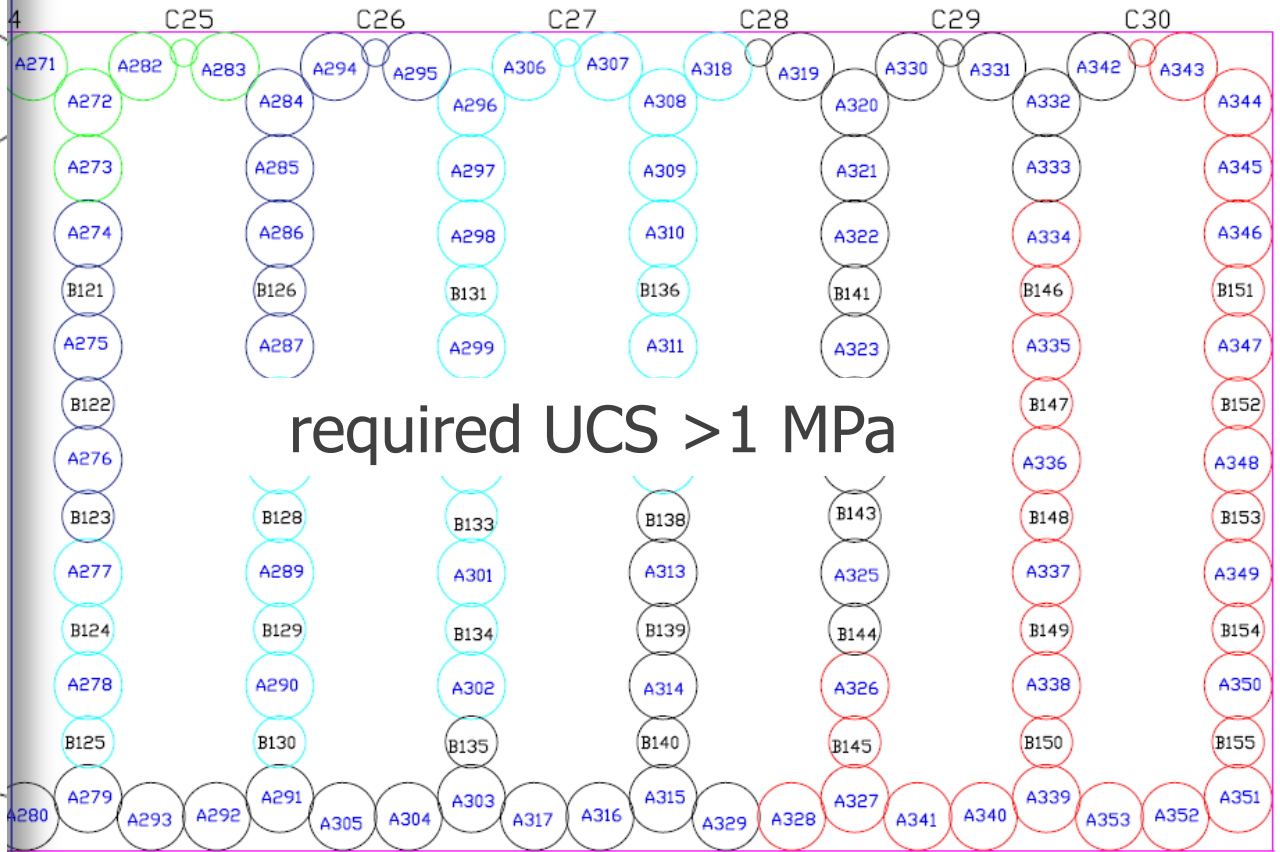
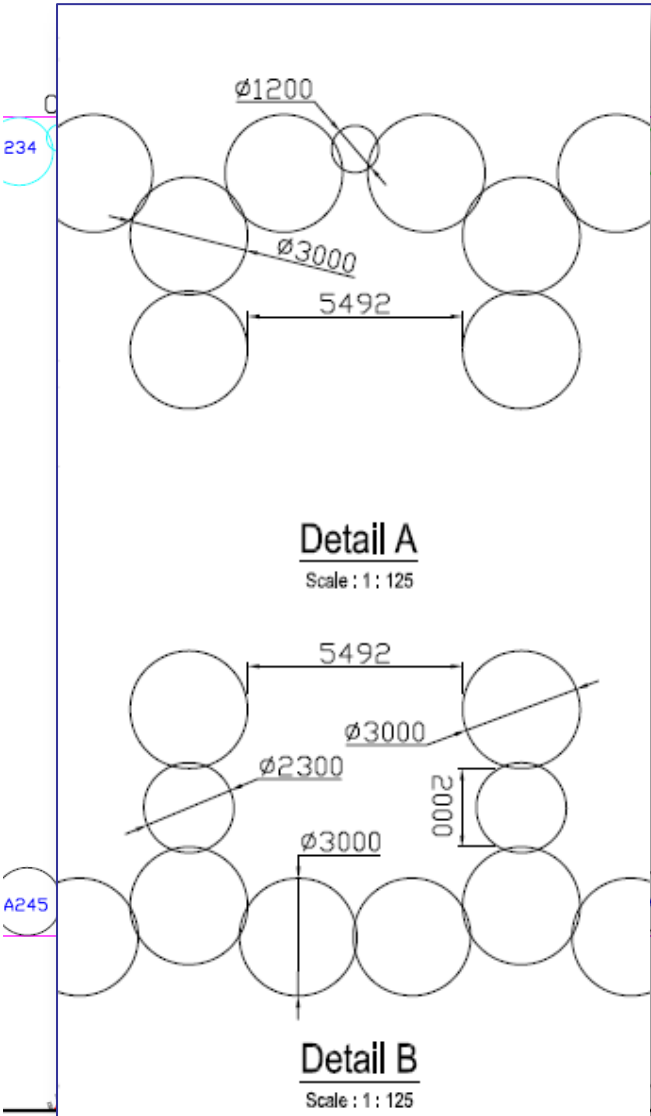
Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment

Production capacity up to 1200 cu.m/day

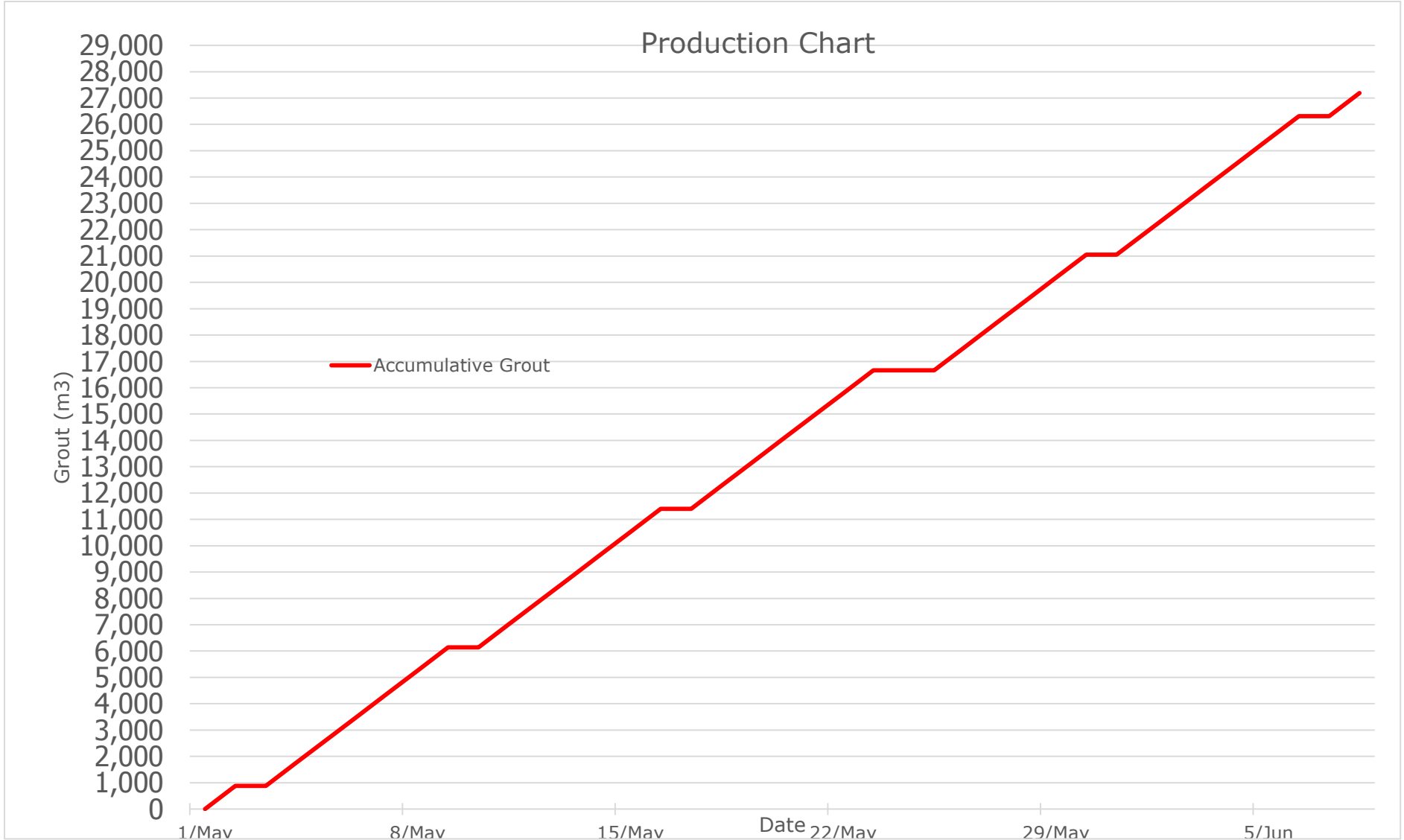


Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment

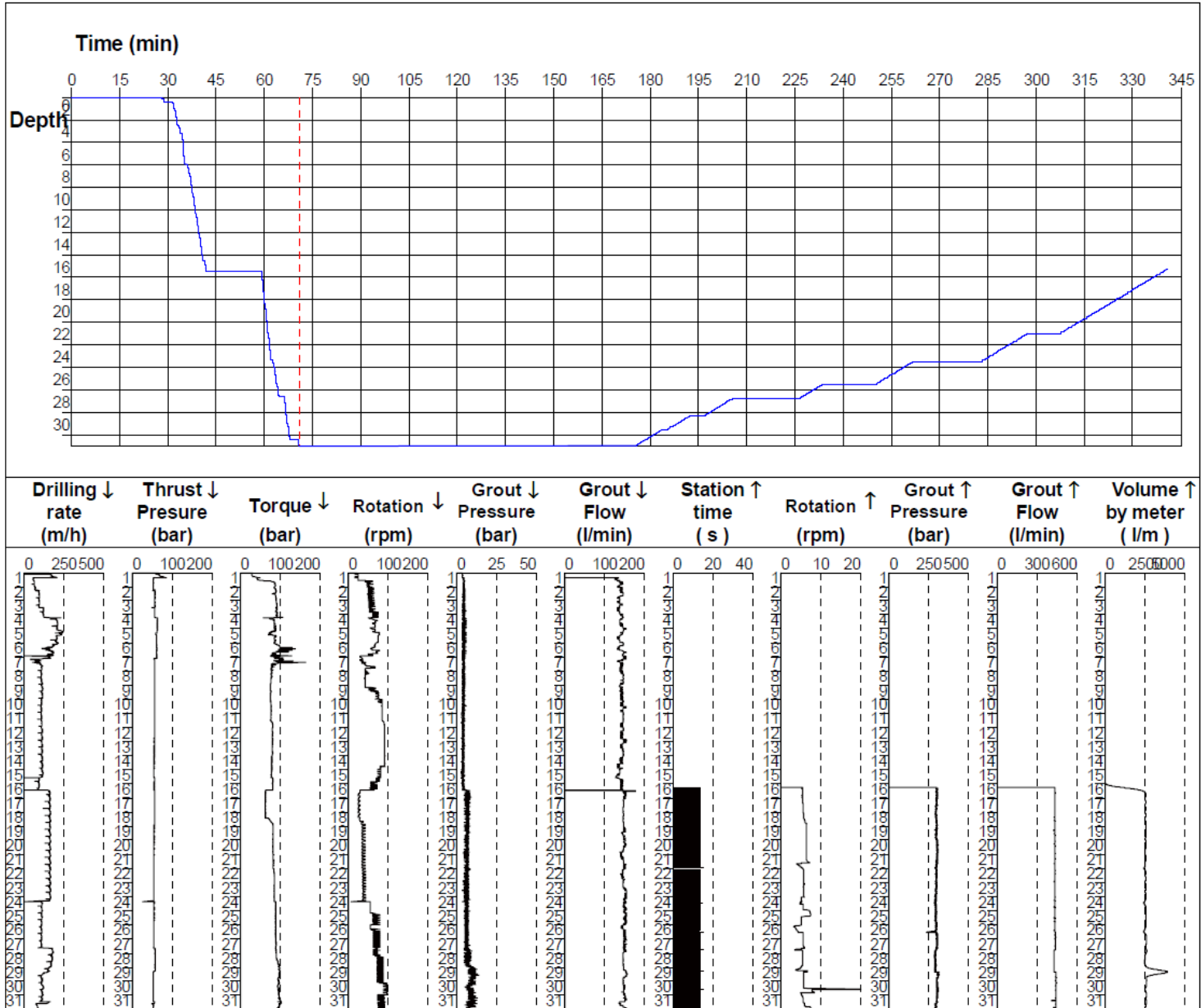
6 Nos. of Jetting Rigs SM-20



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Hong Kong – Hong Kong-Zhuhai-Macau Bridge Toll Plaza – Ground Treatment



Contract No : DC/2007/16

荔枝角雨水排放隧道

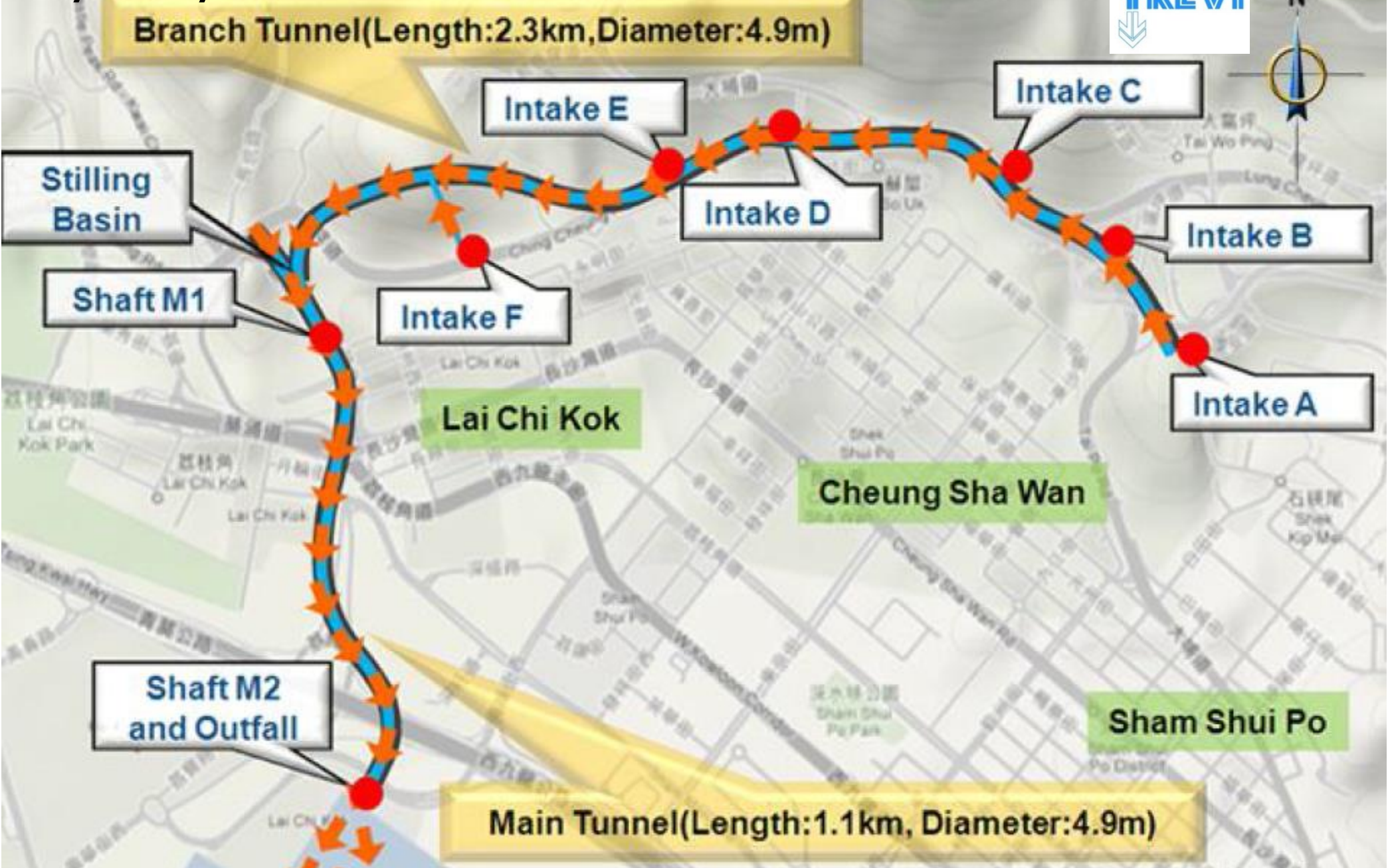
Lai Chi Kok Drainage Tunnel

Jet Grouting Works for
Tunnel Break Out

Introduction

- Leighton John Holland JV had been awarded a contract to construct the Lai Chi Kok Drainage Tunnel
- The tunnel outfall will be at the shaft M2
- The tunnel will be constructed by TBM and break out at M2 whereas site investigation shows that the soil at M2 is of not adequate strength and high permeability.
- Horizontal pressure was designed by the LJHJV as the improvement scheme but TFJV considered jet grout being a more effective scheme and was awarded the sub-contract based on jet grouting method.

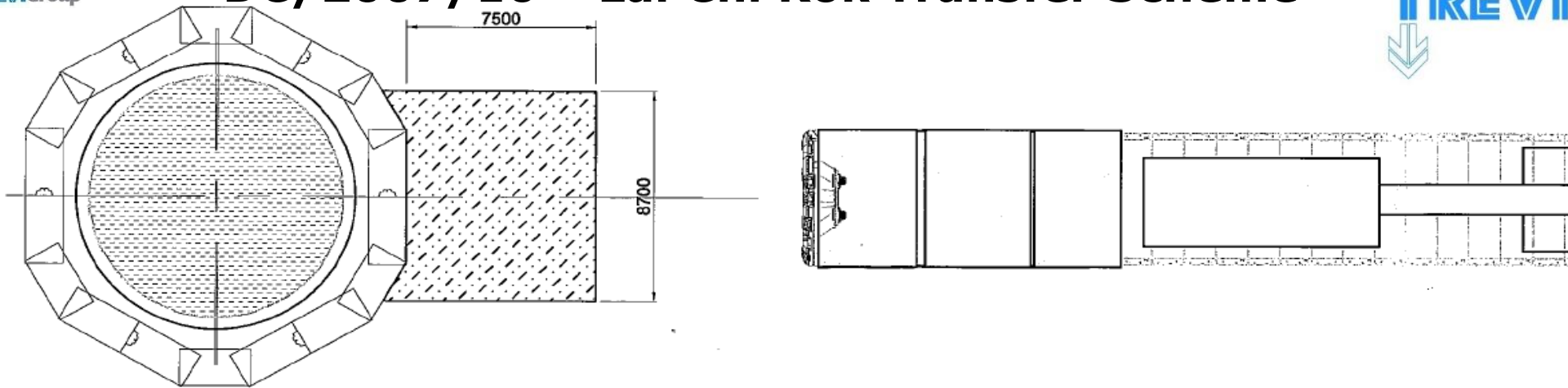
DC/2007/16 – Lai Chi Kok Transfer Scheme



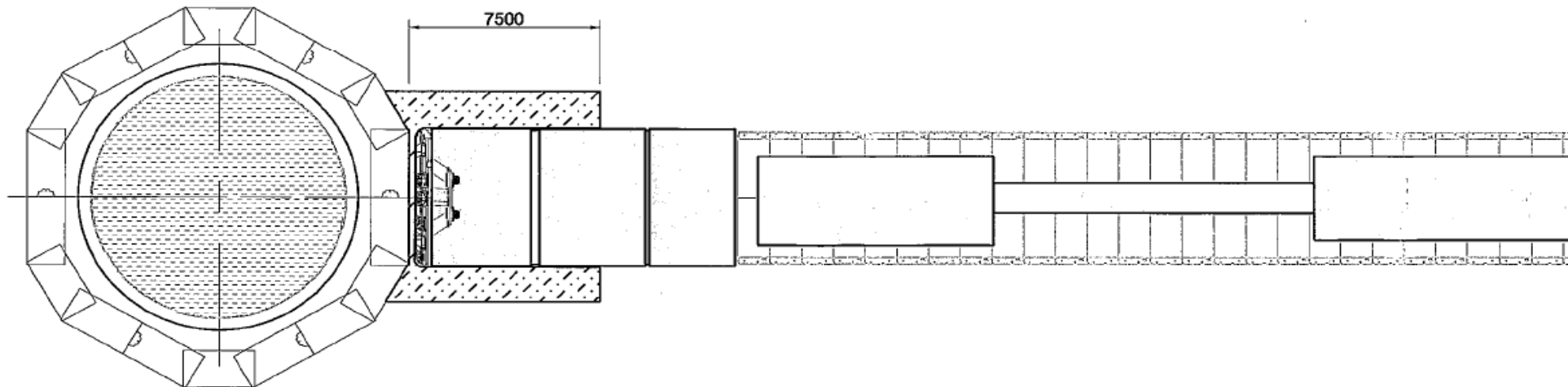
Site General Layout



Location of Outfall at Shaft M2



Stage 1 – Jet Grouting carried out before TBM excavate into the grouting zone



Stage 2 – TBM excavating into the jet grouting zone

Requirement for Jet Grouting work at tunnel breakout (1 of 2)