

# **Geotechnical Control for Tunnel Works ETWB TC(W) No. 15/2005**

**AGS(HK) – Tunnelling in Hong Kong  
HKUST – 14 January 2006**

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# HATS Stage I Project

- GEO had provided some input to this Engineer Design Contractor Build project at the project planning stage.
- In May 1999, serious problems – high rates of water inflow into sections of tunnels
- Significant ground settlement in many areas (TKO & IE) – up to 1.8 km from the tunnels
- Major public concerns due to the extent and magnitude of the impacts
- Major increase in cost and contract completion delayed (4.5 years)
- Government lost credibility
- SETW/DDS reported to PAC on 23 June 2004 (extra \$2.3B cf original sum of \$6.2B) and presented a Review Report to the LegCo Panel on PLW on 29 June 2004
- GEO assisted and is still assisting DSD to deal with the outstanding problems

# Differential Settlement (about 1m) between the Oxygen Storage Tanks and their Adjacent Ground



# HATS Stage I Project Implementation Review and Monitoring Group

- After the problems arose, SETW gave an undertaking to LegCo to produce a public report on the project
- A Review Group led by ETWB was formed and completed a review with the assistance of DSD, GEO and others, and made recommendations for improvement
- A Monitoring Group was formed under ETWB and drew up implementation plans:
  - GEO Actions:
    - Establish a New ETWB Policy – preparation of a new ETWB TC(W) on Geotechnical Control for Tunnel Works
    - Prepare geotechnical guidance documents:
      - TGN 24 – Site Investigation for Tunnel Works
      - TGN 25 – Geotechnical Risk Management for Tunnel Works
      - Other TGNs will be considered (GEO already has a full suite of technical guidance documents e.g. Geoguides, etc)

# **Developments in ETWB Policy on Risk Management and Tunnel Works**

- **ETWB TC(W) No. 17/2004 on Impossibility/Unforeseen Ground Conditions/Utility Interference (1.6.2004)**
- **ETWB TC(W) No. 6/2005 on Systematic Risk Management (21.6.2005)**
- **ETWB TC(W) No. 15/2005 on Geotechnical Control for Tunnel Works (29.9.2005)**

# The Geotechnical Control Mechanism

- **Key Elements:**

- GEO serves as Government's in-house geotechnical advisor to PDs on matters related to **risk to public life and property arising from tunnel works**
- At the project planning stage, the PD will carry out a risk assessment to identify whether risk to public life and property is significant in the event of failure of any part of the proposed Works (taking into account the likely Temporary Works) – if so, the PD needs to document the design and follow the requirements in the Circular to make submissions to GEO for audit

# The Geotechnical Control Mechanism

- **Key Elements:**

- GEO will review the design documentation and carry out audits on the standard of implementation of the design and risk management during construction
- Under the contract, responsibilities of the various parties needs to be defined as well as the specification of safety-critical equipment/procedures, competence of key personnel, standards on GI and on ground stability, performance limits on sensitive receivers, testing and method of measurement for contract acceptance, etc.

# The Geotechnical Control Mechanism

- **Prior to tender:**

- For Engineer Design Contractor Build contracts, GEO will:
  - review the design documentation to assess the adequacy of the standard of the proposed geotechnical design and risk management
  - advise the PD on the geotechnical standards/requirements to be included in the Particular Specifications



# The Geotechnical Control Mechanism

- **Prior to tender:**

- For D&B contracts, GEO will also advise the PD on the geotechnical standards/requirements to be included in the Employer's Requirements

# The Geotechnical Control Mechanism

- **During construction:**

- Where the risk to public life and property is significant, GEO will carry out audits during construction to assess the adequacy of the standard and implementation of the geotechnical design, risk management and site supervision – the focus will be on risk to public life and property and the basis will be the available geotechnical standards
- For D&B Contracts, GEO will review the design documentation to assess the adequacy of the standard of the proposed geotechnical design and risk management, in parallel with the SO

# The Geotechnical Control Mechanism

- **Other Issues:**

- GEO will not deal with matters relating to construction site safety where there is no risk to members of the public or public property
- For an Engineer Design Contractor Build contract, the responsibility for the design of the tunnel works (and detailed design checking) rests with the Engineer. Design and checking responsibility for the Temporary Works continues to rest with the Contractor and the Independent Checking Engineer he employs, respectively
- For a D&B contract, the responsibility of the design of both the tunnel works covered by the scope of the Works under the contract and the Temporary Works, and the detailed design checking, continues to rest with the Contractor and the Design Checker he employs, respectively

# The Geotechnical Control Mechanism

## • Other Issues:

- There is no requirement for the E or SO to obtain the agreement of GEO prior to giving consent to design or its construction
- The GEO will not normally carry out detailed design checking (unless GEO agrees to do so in particular cases)
- The GEO only interfaces with the PD (and the E or SO but this is up to the PD), but NOT with the Contractor
- Key personnel under the contract need to be identified to document the design and the geological observations, undertake the geotechnical risk management and geotechnical supervision (for both the Works and the Temporary Works), and to check their reliability/correctness and completeness with respect to the contract requirements
- The E or SO need to pass the documentation on geological observations to the GEO (for updating of the geological maps)

**The End**