



Gongbei Tunnel of the Hong Kong-Zhuhai-Macau Bridge China

Presented by Peixin Shi







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2.74

km

80

km/h

62

months

Total Duration



Key Stakeholders



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Plane & Profile View of Gongbei Tunnel



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Conventional Section of Gongbei Tunnel

- Length: 255 m
- Cross-section Area: 336.8 m²
- Minimum Burial Depth: 4.5 m
- Complicated Site Conditions:
 - Poor ground condition
 - High groundwater level
 - Dense adjacent structures
 - Politic sensitivity



Construction Method:

Pipe roof + Artificial ground Freezing









Hydro-filling Manmade Island





Deep Excavation Supported by Concrete Diaphragm Wall

- Max Exca. Depth: 26.9 m
- Max Width: 32.7 m
- Max Wall Depth: 52 m
- Max Wall Thickness: 1.2 m



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Pipe Roof





<image>





- Manufacturer: Herrenk Necht AG
- Type: AVN1200TC
- Max. Jacking Load: 6000 kN
- Diameter: 1667 mm
- Cutter Opening Ratio: 35%
- Cutter Head: 6 Hobs & 16 Scrapers

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Pipe Jacking







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Artificial Ground Freezing

- Freezing Zones
 - 5 zones in cross-section
 - 3 freezing loops
- Frozen Ring Thickness
 - Min.: 2 m
 - Max.: 2.3~2.6 m
- Freezer Pipe Design
 - Circular Freezer Pipe+ Irregular Shape Freezer Pipe+ Heating Pipe











Artificial Ground Freezing



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♦ Grouting







■ Grouting before freezing ■ Grouting before excavation ■ Thaw-settlement grouting

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- **Excavation Stages:** 5 Benches 14 Headings
- Excavation Sequences:
 - $A1 \rightarrow A2 \rightarrow B1 \rightarrow B2 \rightarrow C1 \rightarrow C2 \rightarrow D1 \rightarrow D2 \rightarrow E1 \rightarrow E2$
- Bench Height: 3.8-5.1 m
- Initial Support: I-beam + C25 Shotcrete
- 2nd Liner: Lattices Girders + C35 CIP Concrete
- Final Liner: C45 Steel Reinforced Concrete

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CONSTRUCTION

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ITA Criteria

- Followed China National Code: Roadway Tunnel Design (JTG D70-2004)
- Design-bid-build Mode & Unit Price Contracts
- Site Inspection Team for Environmental Protection
- Clear Regulation on Differing Site Conditions Clauses (DSCs)
- Detailed Claim Management System & Standard Insurance Policy

	JTG
中华人民共和国行业标准	JTG D70/2 -2014
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Safety Management

- Implement Strict Safety Regulations
- Form a Safety Management Department
- Organize Regular Safety Meetings
- Develop Task Specific Risk Management Plans
- Prepare for Comprehensive Emergency Plans

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Publications & Patents

The construction experience of Gongbei tunnel was published in more than 50 technical papers (journals, conference proceedings, and monographs) and won over 20 patents.

Dozens of TV channels including CCTV-1, -2, -4, -10 & -13, more than 100 websites, and many newspaper agencies tracked the construction process of Gongbei tunnel in the past five years.

A Peer Evaluation

Based on the evaluation from tunneling experts from both domestic and abroad, the technology involved in Gongbei tunnel construction is innovative and cutting edge.

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