Ha-BeTunnel Team

PRE-QUALIFICATION

Tunnel & Underground Construction



Ha-BeTunnelTeam

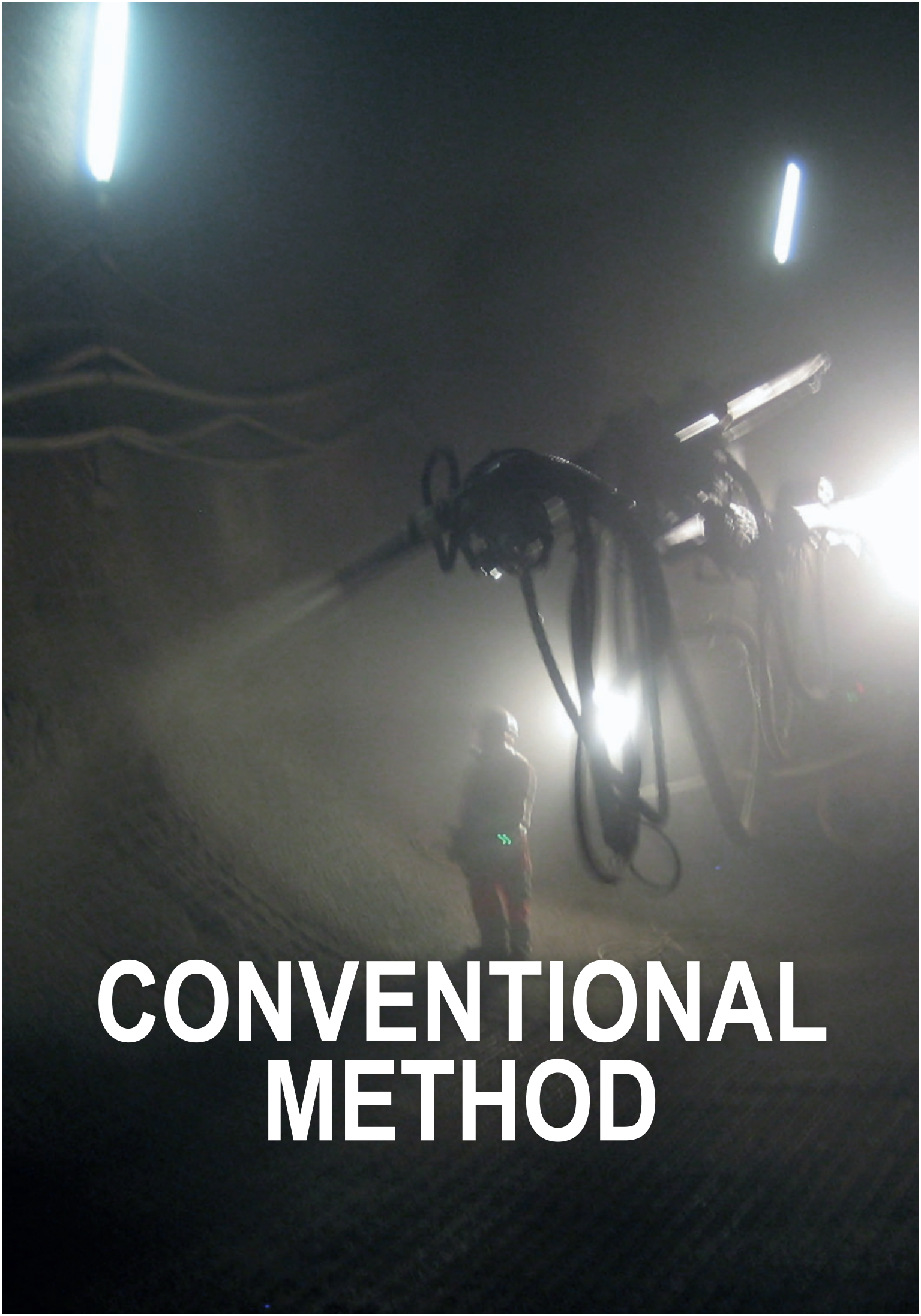
PRE-QUALIFICATION

Tunnel & Underground Construction

General Information

- Conventional Method | Product Overview
- TBM Construction | Product Overview

Selected References


CONVENTIONAL
METHOD

GENERAL INFORMATION

Conventional Method

Concrete used in tunnel and underground construction must endure extreme conditions, including constant mountain pressure, high fire protection demands, and chemical exposure. The construction method depends on the varying geological conditions, such as the load-bearing capacity and stability of the substrate. Tunnels are generally constructed using shotcrete or TBM-driven methods. The concrete requirements and designs differ based on the chosen method.

CONVENTIONAL METHOD

The conventional tunnelling method, using standard equipment and providing nearly continuous access to the excavation face, offers exceptional flexibility. This adaptability is ideal for situations requiring changes to structural analysis, design, or support measures during construction. This flexibility ensures efficient and responsive tunnelling, even in complex or changing environments. Additionally, it allows for seamless adjustments during construction to accommodate varying conditions:

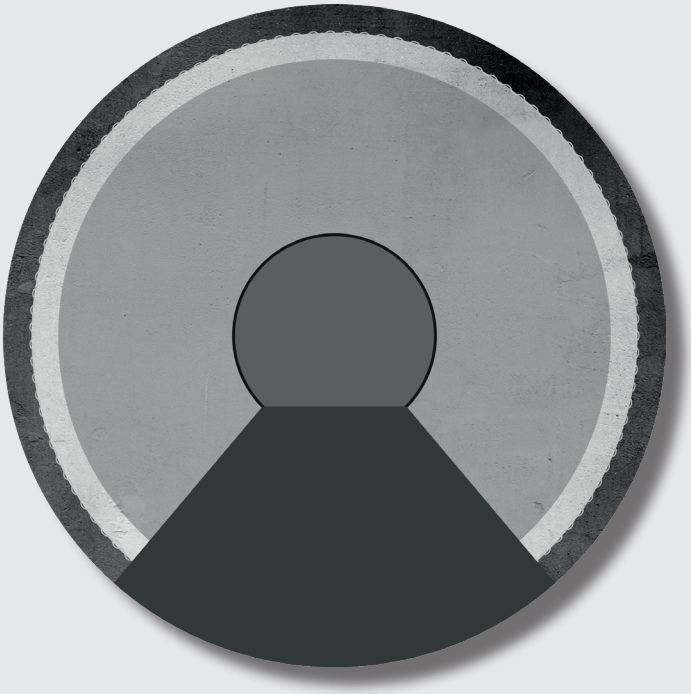
- Support modifications as required
- Adjustment of ring closure timing
- Implementation of primary support rings when necessary
- Modification of explosive charges based on conditions
- Variation of excavation segment lengths
- Excavation face splitting for specific geological challenges
- Adaptation of ground treatment methods to geological conditions

In conventional tunnelling, shotcrete plays a critical role as an immediate support system. Typically, tunnels constructed using shotcrete have two shells: an outer shell made of shotcrete for initial stabilization and an inner shell made of ready-mix concrete for long-term durability. This dual-shell system is a key characteristic of conventional tunnelling and enhances flexibility in design and construction.

Our product system for shotcrete includes specially designed PANTARHIT® superplasticizers, PANTARHOL® retarders, DURAHIT® SILICA FLUID, and Ha-Be PP-Micro- and Macrofibres, ensuring excellent workability, pumpability, and sprayability, and allowing for precise adjustments and stable application during the tunnelling process.

PRODUCT OVERVIEW

Ha-Be Admixtures | Conventional Method



SHOTCRETE

ADMIXTURES	ADDITIVES	FIBRES	ACCELERATORS	PROTECTION
PANTARHIT® Plasticizers & Superplasticizers	DURAHIT® SILICA FLUID Microsilica Slurries	Ha-Be PP-Microfibres	PANTAQUICK® Accelerators	DURAHIT® Water resisting admixtures
PANTARHOL® Retarders	MICROFUME® SLURRY Silica-containing additive	Ha-Be PP-Macrofibres		

INNER SHELL

ADMIXTURES	ADDITIVES	FIBRES	PROTECTION
PANTAQUICK® Hardening accelerator	DURAHIT® SILICA FLUID Microsilica Slurries	Ha-Be PP-Microfibres	DURAHIT® Water resisting admixtures
PANTARHIT® Superplasticizer	MICROFUME® SLURRY Silica-containing additive	Ha-Be PP-Macrofibres	
STABILISIERER Stabiliser			



TBM CONSTRUCTION

GENERAL INFORMATION

TBM Construction

TBM CONSTRUCTION

The Tunnel Boring Machine (TBM) construction method is a highly specialized technique used for efficient, large-scale tunnel excavation. The TBM, equipped with a rotating cutter head, excavates rock or soil while simultaneously installing pre-cast tunnel lining, ensuring continuous and precise tunneling operations.
TBM technology is particularly advantageous in complex geological conditions, enabling tunneling through hard rock, soft ground, and mixed terrains with reduced operational risks.

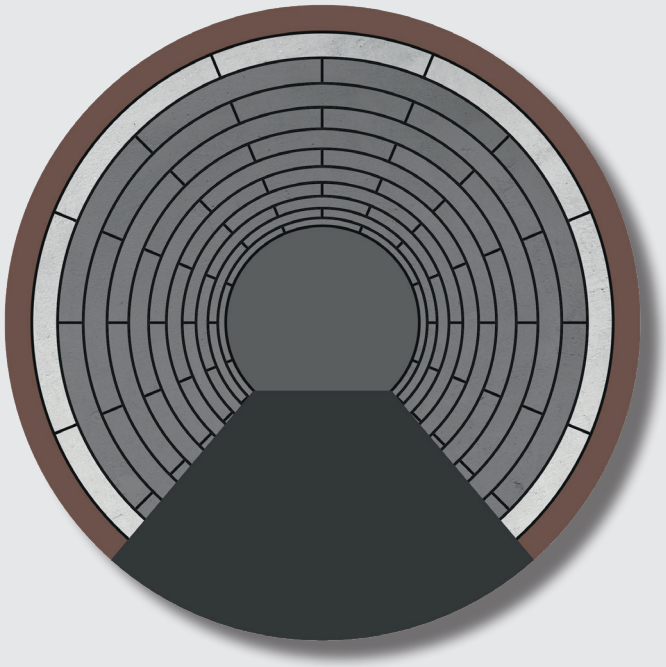
Key benefits of the TBM method include:

- Enhanced precision and control provided by TBMs for superior alignment and tunnel shape reducing rework and deviations
- Reduction of surface impact minimizing disruption in urban or sensitive areas
- Increased safety through the enclosed TBM working environment reducing worker exposure to ground instability and hazardous conditions
- Operational efficiency achieved by continuous excavation and lining processes offering higher productivity compared to traditional methods

Typically, tunnels constructed using the TBM method have a single shell made of prefabricated concrete segments, which are installed immediately after excavation. These segments form a complete ring and are designed to last up to 100 years. The annular gap between the excavation wall and the segmental lining is continuously filled with mortar to ensure a firm bed for the segments. For enhanced durability and quality, the specialized plasticizers and high-performance superplasticizers from our PANTARHIT® line are used to meet the unique lining requirements of each project.

PRODUCT OVERVIEW

Ha-Be Admixtures for TBM Construction



LINING SEGMENTS

ADMIXTURES	ADDITIVES	FIBRES	CURING	PROTECTION	RELEASE
PANTAQUICK® Hardening accelerators	DURAHIT® SILICA FLUID Liquid microsilica	Ha-Be PP-Microfibres	CURING Curing agents	DURAHIT® Water resisting admixtures	VORMIOL Release agents
PANTARHIT® RSM Superplasticizers	MICROFUME® SLURRY Silica-containing additive	Ha-Be PP-Macrofibres			
STABILISIERER Stabiliser					

ANNULAR GAP MORTAR

CONDITIONERS	RHEOLOGY OPTIMISERS	ADDITIVES	ACTIVATORS	SHRINKAGE REDUCING ADMIXTURES
PANTARHIT® RSM Admixtures	PANTARHEO® RSM Viscosity modifying additives	Ha-Be Bentonite	PANTAQUICK® RSM Accelerating admixture	DURAHIT® SRA Shrinkage reducing admixtures
		DURAHIT® SILICA FLUID Liquid microsilica		
		MICROFUME® SLURRY Silica-containing additive		

SOIL CONDITIONER

FOAMING AGENTS	POLYMERS
ROCK Foam Foaming admixtures	PANTAROCK Liquid dispersing agents



SELECTED REFERENCES

Tunnel Fachingen, Redevelopment, Germany



SELECTED REFERENCES

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PROJECT	CONSTRUCTION COMPANY / PLANNER
Cityringen Metro, Copenhagen, Denmark	Salini Impregilo S.p.A. & Mobil Baustoffe GmbH
Ismailia Tunnel, Suez Egypt	National Authority for Tunneling Petrojet & Concord
Port Said Tunnel, Suez Egypt	National Authority for Tunneling JV Arab Contractors Company & Orascom Construction
Ahmed Hamdi Tunnel 2, Suez Egypt	National Authority for Tunneling JV Concord-Petrojet
Metro Line 3 Cairo Egypt	National Authority for Tunneling Egyptian-French JV VINCI
Metro Line 4 Cairo Cairo Egypt	National Authority for Tunneling N.O.C.E. Arab Contractors,Hassan Allam, Concord, Petrojet
Crossrail C 510, London, England	JV BBMV
Tunnel Trimberg Motorway A44 Germany	JV HOCHTIEF Infrastructure GmbH, Ed. Züblin AG
Tunnel Herleshausen Motorway A44 Germany	Hessen Mobil
Tunnel Fachingen Redevelopment Germany	Deutsche Bahn AG
Tunnel Elleringhausen Redevelopment Germany	Deutsche Bahn AG
Rüßdorfer Tunnel Redevelopment Germany	Deutsche Bahn AG
Tunnel Küchen, Hessisch-Lichtenau Germany	Marti Tunnelbau AG & GODEL-BETON GmbH



SELECTED REFERENCES

Tunnel & Underground Construction

PROJECT	CONSTRUCTION COMPANY / PLANNER
ARGE Flughafentunnel PFA 1.3, Stuttgart, Germany	JV STRABAG, Max Bögl, Züblin, GODEL-BETON
Tunnel Łódź, Metro, Łódź, Poland	JV PBDIM & Energopol
Golden Line, Doha Qatar	Qatar RAIL, Al Jaber Engineering. L&T, STFA, Atkor SA, Yapi Merkezi (Joint venture ALYSJ) ATKINS
Dubai Storm Water Tunnel, DS 233-2, Dubai, UAE	JV PORR AG & BESIX
Dubai Metro Extension Route 2020, Dubai, UAE	JV Gülermak & ACCIONA Dubai Precast LLC

SELECTED REFERENCES

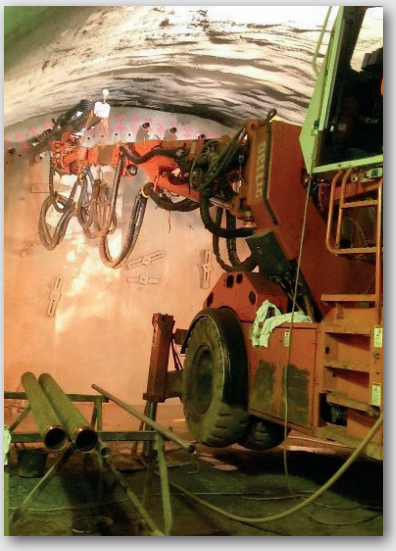
Tunnel & Underground Construction



Dubai Storm Water Tunnel, DS 233-2,
Dubai,
UAE



Crossrail C 510,
London,
England



Tunnel Küchen,
Hessisch-Lichtenau,
Germany



Port Said Tunnel,
Suez,
Egypt



IsmailiaTunnel,
Suez,
Egypt



Tunnel Łódź, Metro
Łódź,
Poland