

Dr.-Ing. Ulrich-Peter Rehm



Status	born 20.12.1964; married since 1990, 2 great sons
School education	1984 A-level
Studies	1985 - 1991 Civil-engineering at the Technical University of Karlsruhe/Germany; Specialised in rock- and soilmechanics. 1992 – 1998 Ph.D. on silo- and soilmechanics at the Institute for Construction Management at technical University of Karlsruhe/Germany. Research and development as scientific assistant on cohesive soils. Programming of expert systems. Supervision and lecturing of graduands.
Career	since 2008 Tunnelling Consultant GmbH Chief Executive Officer 2005 Tunnelling expert adviser of Herrenknecht, worldwide consultancy 2004 Lecturer for mechanised tunnelling at University of applied science Stuttgart/Germany 2001 Director of research & development of TBM manufacturer Herrenknecht 1998 Director of the geotechnical department of TBM manufacturer Herrenknecht company

Experiences

Soil- and rockmechanical calculations for static design of soft- and hardrock tunnel boring machines (TBM) (examples: St. Gotthard/Switzerland, Gripper TBM \varnothing 9m; Guadarrama/Spain, double-shield TBM \varnothing 9,5m; Madrid M30 EPBM \varnothing 15,20m, Sydney/Australia Mixshield \varnothing 10,7m ;Hallandsas/Sweden Mixshield \varnothing 10,5m; Zuerich-Thalwil/Switzerland; single-shield TBM; \varnothing 12,2m; Limmern/Switzerland; double-Gripper-TBM \varnothing 8m; Uma Oya/Sri Lanka; double-shield TBM \varnothing 4,2m).

Feasibility studies and risk analysis for world-wide TBM projects in soft- and hardrock (Mexico City, Teheran, Sydney, Rio de Janeiro, Cairo, Italy, Copenhagen, Stuttgart, Sri Lanka)

Application of classical rockmechanical models (CSM, NTNU, BÜCHI, EWENDT, SANIO) for prediction of performance rates and tool consumption for hardrock TBM (shielded and open gripper TBM)

Design of TBM components (cutterhead, hardrock tools, tool distribution, muck flow, wear protection, back-up systems)

Design of logistical mucking solutions

Spoil conditioning concepts for EPBM

Ground treatment works (jet-grouting, freezing)

Bentonite-slurry application concepts, separation plant design

Environmental studies for muck disposal

Planning of world-wide job-site logistics; concepts for assembly and disassembly of TBM

Trouble-shooting on-site for difficult tunnel projects (Sydney, New Delhi, Rotterdam, Hamburg, Berlin, Freiburg, Teheran, Loetschberg, St. Gotthard, Mexico City, Turkey, Sri Lanka).

Feasibility studies on several TBM tunnel projects (Germany, Spain, Australia, Georgia, Switzerland)

Member of important tunnel associations (DAUB, ITA, ÖIAV); attendance on international working groups for TBM standards

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Development of numerical models for TBM design (face-pressure, drive-torque, thrust forces, slurry circuit, etc.).

Cost estimation and quantification for TBM projects (bill of quantities)

Claim Management (Dublin/Ireland, Freiburg/Germany, Singapore, Vienna, Vancouver)

Official court-surveyor (Canada, Austria); mediator for tunnel issues

R&D activities:

- Soil and rock treatment (application of foam and polymers); design of foam generators, ground treatment concepts
- Rock support measures for Gripper-TBM.
- Optimisation of segmental lining (gaskets etc.)
- Optimisation of chipping process for hardrock TBM.

Presentation at world-wide TBM-conferences, lecturer for TBM master courses on hardrock and softrock tunnelling (Germany, Switzerland, Italy, Malaysia)

Official Coach for project management system iTWO of the German Railway Company (Deutsche Bahn AG).

Projects involved

Stuttgart/Germany – Stuttgart21: Railway tunnel

- Heavily swelling heterogeneous mixed ground conditions; settlement sensitive inner-city tunnelling, preparation of tender documents, risk analysis, cost estimation ((\varnothing 11,0m Hardrock/EPB)

Copenhagen/Denmark – Newhaven: Road tunnel

- Big diameter inner-city tunnel in glacial ground conditions; feasibility study and cost estimate for TBM tunnel (\varnothing 14,45m Mixshield)

Copenhagen/Denmark – Cityringen: Metro tunnel

- Long inner-city tunnel in glacial ground conditions under historic buildings; risk analyses and TBM expertise (Mixshield and EPBM)

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Copenhagen/Denmark – Fehmarnbelt link: Railway and road tunnels

- Feasibility study for 3 long and very big tunnels (⊙18m) between Denmark and Germany in glacial ground conditions , risk analysis and cost estimate

Salzburg/Austria – Seekirchen: Railway tunnel

- Environmental study for a big tunnel profile in mixed ground conditions (Mixshield).

Waldkirch/Germany – Hugewaldtunnel: Refurbishment road tunnel

- Rock tunnel to be refurbished with innovative concept to avoid traffic interruption

London/England – Crossrail: Railway tunnels

- Biggest infrastructure project in the world (2009) with 17 bil.€; new east- west connection under London within heterogeneous ground and inner-city challenges; preparation of tender docs; support of design team as TBM expert

Mexico City/Mexico - Emissor Oriente: Sewage tunnel

- Longest sewer system in the world with approx. 60 km of length and very deep coverage. Feasibility study for hard- and softrock sections due to changed ground conditions; performance optimization on-site

Mexico City/Mexico – Rio dela Compania: Sewage tunnel

- TBM tunnelling concept for very soft ground conditions for EPBM; optimization of tunnelling works on-site

Beijing and Hangzhou/China – Metro line 1,9, 10: Metro tunnel

- TBM analysis on-site; development of spoil conditioning concept for improved performance of the EPBM in grainy ground

Melbourne/Australia - Kew North/North Yarra: Sewage tunnel

- Tender docs review and expertise on pipe jack in heterogeneous ground (mixed face conditions), risk analysis

Teheran/Iran – Metro Line 6: Metro tunnel

- Segment design and all related TBM constructions; segment plant design; tunnelling concept (spoil conditioning, face pressure calcs; soil mechanical FEM calcs)

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Cochem/Germany - Kaiser Wilhelm Tunnel: Railway tunnel

- Tunnelling concept for big EPBM/HardrockTBM with very low coverage under houses; ground treatment concept, tunnelling optimization on-site spoil conditioning concept

Sparvo/Italy – Galleria di Sparvo: Railway tunnel

- Tunnelling concept and risk analyses for the biggest EPBM in the world (to that time) \varnothing 15,55m EPBM within heavily methane gas containing claystone; development of spoil conditioning concept for improved performance

Karlsruhe/Germany – Kombisolution: Metro tunnel

- Tunnelling concept and risk analyses for very low coverage under sensitive buildings (Mixshield); concept for jet-grouted tunnel (NATM)

Shenzen/China – GSG Yitianlu Tunnel: Railway tunnel

- Improvement of slurry technology on the job-site; big Mixshield \varnothing 13,17m under sensitive buildings; improvement of TBM tunneling concept

Eskisehir/Turkey – high-speed train connection: Railway tunnel

- tunnelling concept for EPBM \varnothing 13,72m in highly squeezing rock conditions; spoil conditioning concept; practical support on the job-site

Auckland/NewZealand – Waterview: Road tunnel.

- TBM bids review of all bidders (Japan, China, France, Germany) and assessment for a very big EPBM \varnothing 14,41m in mixed ground conditions

Sydney/Australia – Airport Link Tunnel: Subway tunnel

- Trouble shooting on-site due to heavy clogging and wear (clay and sandstone); innovative cutting tool development and improved slurry concept; concept for ground treatment works against inner-city settlements. Mixshield \varnothing 10,17m.

Istanbul/Türkei – Bosporus: Road tunnel

- Consultancy on the feasibility of TBM tunnelling in heterogeneous mixed face conditions with high water-pressure; checking of technical tender docs

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Limmern/Switzerland – hydro-power plant: 24°-inclined adit tunnel

- TBM expert for double-gripper hardrockTBM to check TBM-design

Vienna/Austria – commercial court: Metro tunnel

- Authorized court-expert for TBM tunnelling in litigation for line U2/5 (Mixshield)

Sri Lanka, Uma Oya Multipurpose project: Headrace tunnel

- TBM expert for 2 double-shield hardrockTBM; tunnelling logistics and Job-site installation; TBM design and tunnelling concept; final workshop acceptance; logistical concepts

Oberhausen/Germany – Emscher: Sewage canal section BA 40

- Feasibility (segmental lining), tunnelling concept, cost estimate for 2x10 km segmental lining

Tibilisi/Georgia - Liakhvi River Crossing: Pipe-line

- Feasibility study and risk analyses for river crossing (segmental lining)

Tibilisi/Georgia – Kura East: Pipe-line

- Feasibility study and risk analyses for river crossing (pipe-jack)

Medellin/Kolumbien – Interceptor Norte: pipe-jack

- Workshop to contractors and client on pipe-jacking technology; consultancy on reinforcement optimization for concrete pipes (DN 2600)

Vancouver/Canada – Capilano Filtration Project: Water tunnel

- Hardrock-TBM expert for the client in pre-litigation phase to defend claim from the contractor (main beam gripper TBM)

Oberhausen/Germany – Emscher: Sewage canal section BA 30

- Comprehensive consultancy of the client (41 km of pipe-jacking; DN1600 – DN 2800) in terms of tunneling concept and cost control

Rastatt/Germany: High-speed-train tunnel

- Pricing of bill of quantities, tunnelling concept for the client (Mixshield); optimization of underground works

Esfahan/Iran: Cable tunnel

- Trouble shooting for a small segmental lining slurryTBM(3,15m); improvement of slurry-tunnelling concept

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Andana/Turkey: Headrace tunnel

- Trouble shooting for a single- and double-shield hardrock TBM in terms of TBM specification, operational aspects and tunnel lining concept

Seoul/Korea: Hardrock tunnel

- Workshop on TBM design for hardrock tunneling (with Prof. Jamal Rostami/USA)

Makkah/Saudi-Arabia: Metro-tunnel

- Risk analyses and TBM feasibility study for multi-mode TBM type (EPBM/Mix)

Doha/Qatar: Metro-tunnel

- Risk analyses and TBM feasibility study; development of an assessment system for various tunneling concepts

Riyadh/Saudi-Arabia: Metro tunnel

- Checking tunneling tender documents; recommendation of TBM specifications

Guadalajara/Mexico: Metro tunnel

- Development of TBM bidding documents for a contractor (who finally won the tender)

Tel Aviv/Israel: Railway tunnel

- Neutral mediator between client and contractor for all tunneling related issues (hardrock tunnel for high-speed line between Tel Aviv and Jerusalem).

Potash tunnel/UK: Hardrock tunnel

- Feasibility study and support on tender document preparation for access-tunnel to potash fields

Seattle/USA – SR99: Road tunnel

- Practical support for the biggest TBM in the world (to that time) \varnothing 17,48m on spoil conditioning; trouble shooting after severe disruption of tunnelling.

Perth/Australia - Forrestfield Airport Link: Metro-tunnel

- TBM Expert consulting the owner (PA) from bidding to construction phase; evaluating TBM proposals, assessing TBM tunnelling concepts; checking TBM manufacturing; supervising tunnelling activities

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German Railway Company (DB AG) - certified Coach for project management system iTWO:

- Trainer for new project management system iTWO of the German Railway Company (DB AG); topics: cost planning, billing and purchase, controlling (of complex construction projects).

Minsk/Belarus: Deep Shaft

- Geotechnical study and performance assessment for Shaft Boring Roadheader SBR \varnothing 9m, shaft depth: 700 m through mixed face conditions for potash salt mining.

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