

MUHAMMAD SHAH AHMED

Geological Engineer | Senior Tunnel & TBM Specialist

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Pakistan

PROFESSIONAL SUMMARY

Results-driven Geological Engineer with 10+ years of hands-on expertise in TBM and NATM (Drill & Blast) tunnel construction, construction supervision, and underground construction management on large-scale hydropower projects. Demonstrated track record managing complex ground conditions — including fault zones, weak rock, and heavy water ingress — from excavation through final lining. Experienced in leading multi-disciplinary site teams, ensuring QA/QC & HSE compliance under FIDIC environments, preparing Inspection Test Plans (ITP) and Non-Conformance Reports (NCR), and delivering results on multi-billion dollar infrastructure projects in Pakistan.

KEY ACHIEVEMENTS

- Led tunnel construction on Diامر Basha Dam Project (world's largest roller-compacted concrete dam) — managing full NATM excavation cycles, pre-excavation grouting, pipe roof umbrella support, and complex grouting under challenging geological conditions.
- Supervised TBM excavation of 28 km headrace tunnel (8.5 m diameter) for Neelum Jhelum 969 MW Hydroelectric Project — overseeing TBM maintenance, troubleshooting, lining works, and crack repair on one of Pakistan's most technically demanding infrastructure projects.
- Successfully stabilized tunnel face through forepoling, spiling, and pipe roof umbrella methods in multiple weak rock and fault zones, preventing collapses and ensuring crew safety.
- Coordinated across client, consultant, and contractor teams under FIDIC environment — handling claims, variations, and technical approvals.

CORE COMPETENCIES

Tunneling Methods	TBM Operations NATM / Drill & Blast Sequential Excavation Method (SEM) Portal Construction & Face Stabilization
Ground Engineering	Geological Mapping & Face Logging Rock Classification (Q-System, RMR) Pre-Excavation Grouting Ground Probing
Ground Support	Forepoling / Spiling Pipe Roof Umbrella Method Shotcrete Rock Bolts Steel Ribs
TBM Specialist	TBM Excavation Management TBM Maintenance & Troubleshooting Cutterhead Inspection Advance Rate Optimization
Grouting	Pre-Excavation Grouting Consolidation Grouting Contact Grouting PU Grouting Seepage Control
Lining & Repair	Waterproofing & Final Lining Invert Concrete Tunnel Lining Crack Repair Defect Rectification
Instrumentation	Convergence Monitoring Settlement Monitoring Extensometers Deformation Analysis
Project Management	Construction Supervision Underground Construction Management Construction Planning Cycle Time Optimization Subcontractor Management Progress Reporting Project Controls
Compliance	QA/QC Procedures HSE Standards Method Statements FIDIC Contract Management Inspection Test Plans (ITP) Non-Conformance Reports (NCR) Site Records Management
Technical	Technical Drawing Review Probe Drilling Drainage Systems Claims & Variations
Software	AutoCAD MS Office (Word, Excel, PowerPoint) Plaxis

PROFESSIONAL EXPERIENCE

Senior Construction Manager — Tunnel (Contractor Side)
PowerChina | Diامر Basha Dam Project

Jan 2023 – Present

- Lead complete tunnel construction execution including NATM / Drill & Blast operations on one of the world's largest roller-compacted concrete dam projects
- Plan and manage full excavation cycles: drilling pattern design, charging, blasting, mucking, and ventilation systems
- Apply forepoling / spiling and pipe roof umbrella method for face pre-support and stabilization in weak, fractured, and squeezing ground
- Execute pre-excavation grouting programs ahead of tunnel face to treat water-bearing zones, fault zones, and weak ground before excavation
- Supervise installation of primary support systems: shotcrete (wet & dry mix), rock bolts (systematic & spot), lattice girders, and steel ribs
- Oversee secondary lining works: waterproof membrane installation, reinforcement fixing, formwork (travelling shuttering), and concrete pouring
- Manage invert concrete works including invert formation, drainage channel construction, and invert lining
- Supervise wall concrete works including wall shuttering, reinforcement, and concrete placement
- Manage all grouting operations: consolidation grouting, contact grouting, curtain grouting, and PU grouting for seepage and leakage control
- Identify, assess, and repair tunnel lining cracks and defects — preparing repair schemes and supervising corrective works to restore structural integrity
- Handle complex geological conditions: weak zones, shear zones, fault zones, heavily jointed rock, squeezing ground, and heavy water ingress
- Coordinate geological face mapping and rock mass classification (Q-System, RMR) to optimize support design
- Manage tunnel drainage systems: weep holes installation, drainage pipes, collection channels, and pump sumps
- Monitor tunnel behavior through instrumentation: convergence monitoring, crown settlement, wall displacement, and extensometers
- Supervise hydrostatic pressure monitoring and groundwater control operations
- Control overbreak, manage tunnel profile, and ensure excavation within design tolerances
- Ensure strict compliance with QA/QC procedures, HSE standards, method statements, and ITP (Inspection Test Plans)
- Coordinate with client and consultant under FIDIC environment for approvals, technical submittals, inspections, claims, and variations
- Manage subcontractors, manpower planning, shift scheduling, and equipment utilization
- Optimize excavation cycle time and construction productivity — tracking KPIs and advance rates
- Prepare daily, weekly, and monthly progress reports, S-curves, planning schedules, and technical documentation
- Prepare and review method statements, risk assessments, and work procedures for tunnel activities
- Manage construction materials: shotcrete mix design, grout mix design, concrete mix design approval and control

Manager Technical
Ultimate Engineering Associates

Sep 2018 – Jan 2023

- Supervised engineers and geologists across multiple tunneling, civil, and geotechnical projects
- Analyzed borehole logs, site investigation data, and geotechnical reports to provide technical input for tunnel design and construction
- Reviewed and approved engineering drawings, specifications, method statements, and work procedures for tunneling works
- Provided technical guidance on tunneling methodologies, ground support selection, and grouting programs
- Reviewed geological mapping reports, face logs, and instrumentation data to assess tunnel stability
- Evaluated overbreak conditions, lining defects, and proposed remedial measures
- Ensured QA/QC standards and HSE compliance across all active tunnel and civil project sites
- Coordinated with consultants and contractors for technical issue resolution and design clarifications
- Prepared technical reports, tender documents, and Bills of Quantities (BOQ) for tunneling projects

Assistant Resident Engineer — TBM

Jan 2016 – May 2018

National Development Consultants (JV: Norplan, MWH, NESPAK, ACE, NDC) Neelum Jhelum Hydroelectric Project (969 MW)

- Supervised TBM excavation for 28 km headrace tunnel (8.5 m diameter) — one of Pakistan's longest and most technically complex hydropower tunnels
- Monitored TBM operational parameters: thrust, torque, penetration rate, cutterhead rotation, and advance rate
- Coordinated TBM maintenance schedules, cutterhead inspections, cutter changes, and troubleshooting to minimize downtime
- Supervised erection of precast concrete segmental lining during TBM advance
- Managed tunnel finishing works: final lining concrete, invert concrete, wall concrete, and drainage systems
- Supervised waterproofing membrane installation and geotextile works prior to final lining
- Reviewed construction drawings, shop drawings, and verified execution in accordance with design intent
- Inspected, identified, and supervised repair of tunnel lining cracks, honeycombs, and defects
- Executed consolidation grouting, contact grouting, and PU grouting for leakage control and seepage mitigation
- Managed hydrostatic pressure control, drainage systems, and groundwater pressure relief
- Supervised weep holes installation and invert drainage channel construction
- Monitored tunnel instrumentation: convergence, crown settlement, and extensometers
- Coordinated between client, contractor, and consultant teams under FIDIC environment for approvals and inspections
- Prepared inspection requests, technical submittals, and non-conformance reports (NCRs)

Junior Engineer — TBM

Jul 2013 – Jan 2016

National Development Consultants — Neelum Jhelum Hydroelectric Project (969 MW)

- Conducted detailed geological face mapping and face logging during TBM advance — recording rock type, joint sets, RQD, and groundwater conditions
- Performed systematic probe drilling ahead of tunnel face to investigate ground conditions and detect water-bearing zones
- Classified rock mass using Q-System and RMR classification methods for support optimization
- Assisted in TBM maintenance activities, cutterhead inspection, and fault diagnosis to support uninterrupted tunnel advance
- Executed pre-excavation grouting programs to treat weak and water-bearing zones ahead of TBM face
- Prepared geological daily reports, weekly reports, and face log records
- Supervised installation of tunnel support systems: rock bolts, steel ribs, wire mesh, and shotcrete application
- Supervised consolidation grouting and contact grouting operations
- Managed drainage systems: weep holes drilling, installation, and groundwater flow measurement
- Monitored instrumentation: installation and reading of convergence tapes, settlement points, and extensometers
- Reviewed construction drawings for execution and identified discrepancies for resolution
- Maintained site documentation, progress records, and material consumption logs

Junior Engineer — Drill & Blast / NATM

Jul 2012 – Jul 2013

National Development Consultants — Neelum Jhelum Hydroelectric Project (969 MW)

- Supervised complete drilling, charging, blasting, and excavation cycles under NATM methodology
- Designed and checked drilling patterns, burden, spacing, and blast timing sequences
- Supervised mucking operations, scaling, and tunnel face cleaning after each blast
- Supervised ventilation system operation and air quality monitoring after blasting
- Installed and supervised primary support systems: shotcrete (immediate and systematic), rock bolts, wire mesh, lattice girders, and steel ribs
- Applied forepoling and spiling for face pre-support in poor ground conditions
- Conducted geological face mapping after each blast cycle and classified rock using Q-System and RMR
- Assessed ground conditions and recommended support class adjustments based on observed geology
- Managed consolidation grouting and contact grouting operations
- Handled groundwater ingress control and drainage system installation

- Installed and monitored convergence stations and settlement points
- Assisted in wall lining and invert concrete works
- Ensured QA/QC compliance, safety procedures, and blasting regulations
- Maintained blasting logs, explosive consumption records, and daily site documentation

EDUCATION

B.Sc. Geological Engineering | University of Engineering & Technology (UET) Lahore | 2011

CERTIFICATIONS & LICENSES

- Pakistan Engineering Council (PEC) — Registered Geological Engineer | Registration No: GEOLOGY/00409

LANGUAGES & ADDITIONAL INFORMATION

Languages: Urdu (Native) | English (Professional)

Nationality: Pakistani | Available for relocation internationally