Tunnel Blasting Methods Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Tunnel Blasting Methods Training Course is designed to build advanced competency in underground excavation, controlled blasting, rock fragmentation, and drilling and blasting optimization for modern tunneling projects. The course focuses on high-performance skills in precision blast design, explosive energy control, vibration management, ground stability, and safety compliance in underground construction environments. Participants gain exposure to industry-leading practices used in hydropower tunnels, metro rail projects, mining tunnels, highway tunnels, and civil infrastructure excavation, with emphasis on cost efficiency, cycle time reduction, and geotechnical risk mitigation.

This training integrates real-world engineering applications, digital blast modeling, and modern tunneling technologies including non-electric initiation systems, electronic detonators, ANFO optimization, and rock mass classification techniques. It is structured to meet global standards in mine safety regulations, OSHA-aligned blasting safety protocols, and international tunneling best practices, ensuring participants are capable of executing safe, efficient, and environmentally controlled blasting operations in complex geological conditions.

Programme Curriculum

Tunnel Blasting Methods Training Course

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5 days

Course Objectives

1. Master controlled blasting techniques for tunnel excavation efficiency
2. Apply advanced blast design optimization for rock fragmentation
3. Understand drilling pattern design and tunnel round advance systems
4. Implement vibration control and ground shock mitigation strategies
5. Analyze rock mass behavior using geotechnical classification systems
6. Execute explosive selection and energy distribution techniques
7. Develop skills in electronic detonator sequencing and delay timing systems
8. Ensure blast safety compliance and underground risk management protocols
9. Optimize cycle time reduction in tunneling operations
10. Evaluate flyrock control and overbreak minimization techniques
11. Integrate digital blast simulation and predictive modeling tools
12. Improve ventilation safety and post-blast gas management systems
13. Enhance sustainable blasting practices and environmental impact reduction

Target Audience

1. Mining Engineers
2. Civil and Structural Engineers
3. Tunnel Construction Supervisors
4. Blasting Engineers and Shotfirers
5. Geotechnical Engineers
6. Project Managers in Infrastructure Projects
7. Safety Officers in Mining & Tunneling
8. Heavy Construction Contractors

Course Modules

Module 1: Fundamentals of Tunnel Blasting

- Principles of rock fragmentation
- Energy transfer in explosive systems
- Tunnel geometry and blast rounds
- Burden and spacing concepts
- Introduction to blast efficiency
- **Case Study:** Metro tunnel excavation efficiency improvement using optimized blast rounds

Module 2: Drilling Pattern Design & Layouts

- Cut holes, relief holes, and perimeter holes
- Precision drilling alignment techniques
- Advance per round calculation
- Drill deviation control methods
- Equipment selection for drilling accuracy
- **Case Study:** Highway tunnel delay reduction through improved drilling pattern optimization

Module 3: Explosives and Detonation Systems

- ANFO, slurry, and emulsion explosives
- Non-electric initiation systems
- Electronic detonator programming
- Shock tube vs electronic systems
- Explosive energy management
- **Case Study:** Hydropower tunnel blasting using electronic delay sequencing

Module 4: Blast Design and Fragmentation Control

- Blast hole timing sequence design
- Fragmentation size distribution control
- Powder factor optimization
- Overbreak and underbreak control
- Energy confinement techniques
- **Case Study:** Mining tunnel fragmentation improvement with optimized powder factor

Module 5: Vibration, Air Blast & Environmental Control

- Ground vibration measurement
- Air overpressure control
- Flyrock prediction methods
- Environmental noise reduction
- Monitoring instrumentation usage
- **Case Study:** Urban tunnel blasting with strict vibration threshold compliance

Module 6: Geotechnical Analysis for Tunneling

- Rock mass classification
- Fault zone identification
- Ground support interaction
- Stress distribution in rock mass
- Stability assessment techniques
- **Case Study:** Tunnel collapse prevention through geotechnical risk mapping

Module 7: Safety Management in Blasting Operations

- Blast area evacuation protocols
- Misfire detection and handling
- PPE standards for blasting crews
- Regulatory compliance frameworks
- Emergency response planning
- **Case Study:** Industrial blasting safety upgrade reducing incident rate to zero

Module 8: Advanced Digital Blasting & Optimization

- Blast simulation software applications
- AI-based blast performance prediction
- Data-driven optimization models
- Real-time monitoring systems
- Digital twin in tunneling operations
- **Case Study:** Smart tunnel project using predictive blast modeling for cost reduction

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

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