

TEST COVERAGE

In order to verify the above competencies, the test is aimed to evaluate the workers' knowledge in the following fields:

A. Basics of mathematics / natural sciences

- Units and their conversion
- Calculation of cross-section and volumes (i.e. annuli, pits)
- Basic of technical mechanics (power, torque, tension)
- Work, energy, capacity
- Basics of fluid mechanics (hydrostatic pressure, flow-rate, viscosity, pressure loss in fluids)

B. Microtunneling & Pipe jacking units

- General operation techniques;
- Type of drilling units and basic selection criteria;
- Laser guidance and remote control system;
- Spoil removal system;
- Pipe lubrication system;
- Jacking or propulsion system;

C. Project basics

- Location plans and terrain profiles;
- Basics of classification of soils and physical characteristics of subsoil;
- Basics of detection techniques like cable locator, GPR.
- Classification of the subsoil;
- Ground water conditions;
- Line installation plans (overhead lines, lines installed underground);
- Basics of bore path investigation (geo-radar);
- Practical training.
- Pollution hazards of drilling spoils with remedial measures / precautions;

D. Project realization

- Job site set-up;
- Documentation of system basics;
- Daily job reports;

E. Pipe lubrication Selection

- Fluid types;
- Functions and compositions;
- Measuring lubricating fluid requirements;
- Selection criteria;
- Lubrication plant.

F. Spoil removal system

- Slurry system:
 - ⇒ Fluid composition
 - ⇒ Slurry pumps;

TTOQP 6

- ⇒ Slurry supply/discharge line;
- ⇒ Slurry tanks;
- ⇒ Slurry separation plants;
- ⇒ Disposal of slurry.

- Mucking screw system

G. Shaft design and construction

- Sizing shafts;
- Shaft excavation support methods;
- Groundwater control methods;
- Lateral earth, groundwater and surcharge pressure considerations;
- Lateral resistance for the thrust block;
- Launching and exit seal requirements.

H. Tunneling

- Cutter heads;
 - ⇒ Types of cutter heads
 - ⇒ Cutter heads selection considerations
 - ⇒ Construction and mode of operation;
- Cone section
- Over cut:
 - ⇒ Considerations;
 - ⇒ Requirements.

I. Guidance and control system

- Laser guidance system;
 - ⇒ Passive system
 - ⇒ Active system
- CCTV monitoring;

J. Casing/Jacking pipe materials & design considerations

Pipe materials;

- Investigation of the various pipe materials
 - ⇒ Steel;
 - ⇒ Concrete pipe;
 - ⇒ Glass-Fiber reinforced pipe
- Basics of the technical standards and norms

Pipe Design considerations;

- Cased installations
 - ⇒ Rigid casing design
 - ⇒ Flexible casing design
 - ⇒ Axial loads
 - ⇒ Dimension tolerance
 - ⇒ Grouting of annular space
- Uncased installation
 - ⇒ Corrosion consideration
 - ⇒ Corrosion protection
 - ⇒ Product pipe testing

TTOQP 6

K. Jacking system

- Jacking frame
- Hydraulic jacks
- Hydraulic pressures pump
- Thrust block
- Anchoring system
- Intermediate jacking station

L. Recording and monitoring

- Distance
- Machine torque & thrust
- Steering jack pressure and position
- Inclination and position
- Slurry charge and discharge pressures and flow rates
- Rate of excavation and penetration

M. Authority regulations / safety at work / environmental protection / work sheets

- Responsible persons;
- Work safety;
- Water protection;
- Pollutant and noise emission;
- Regulations for handling dangerous materials and agents;
- Basics of working and civil laws for drilling operations (liability, negligence etc.);
- Regulatory guidelines;
- Relevant laws, rules and regulations;
- Work sheet standards.