
Executive Certificate in Underground Construction

Tunneling Techniques and Equipment

Tunneling techniques and equipment are crucial in the field of underground construction. This explanation will cover key terms and vocabulary related to this topic.

1. **Tunnel Boring Machine (TBM):** A TBM is a piece of equipment used to excavate tunnels in soil and rock. It consists of a rotating cutterhead that excavates the ground while a conveyor system removes the excavated material. TBMs can be classified into two main types: hard rock TBMs and soft ground TBMs.
2. **Hard Rock TBMs:** Hard rock TBMs are designed to excavate tunnels in solid rock formations. They use disc cutters mounted on the cutterhead to crush the rock. The excavated material is removed through the bore of the TBM by a conveyor system.
3. **Soft Ground TBMs:** Soft ground TBMs are used for excavating tunnels in soil or weak rock formations. They use a rotating cutterhead with replaceable digging tools, such as buckets or disc cutters, to excavate the ground. The excavated material is removed by a screw conveyor located behind the cutterhead.
4. **Shielded TBMs:** Shielded TBMs are a type of soft ground TBM that uses a pressurized fluid to stabilize the excavation face. The fluid is injected through nozzles located on the shield of the TBM, creating a mud cake that supports the soil.
5. **Microtunneling:** Microtunneling is a trenchless technology used for the installation of small-diameter pipelines. It uses a remotely controlled microtunneling machine that excavates the ground while a laser guidance system ensures the accuracy of the drive.
6. **Pipe Jacking:** Pipe jacking is a trenchless technology used for the installation of pipelines in soft ground. It involves the excavation of a pilot tunnel using a microtunneling machine, followed by the installation of pipes behind the machine. The pipes are jacked into place as the machine advances.
7. **Auger Boring:** Auger boring is a trenchless technology used for the installation of pipelines in soft ground. It involves the use of an auger boring machine that excavates the ground while a rotating auger removes the excavated material.
8. **Direct Pipe:** Direct pipe is a trenchless technology used for the installation of pipelines in soft ground. It combines the features of microtunneling and pipe jacking, with the pipeline being installed as the excavation takes place.
9. **Cut and Cover:** Cut and cover is a method of tunnel construction where a trench is excavated, the tunnel is built, and then the trench is backfilled. This method is commonly used for shallow tunnels in urban areas.
10. **Sequential Excavation Method (SEM):** SEM is a method of tunnel construction used in soft ground. It involves the excavation of the tunnel in sequential steps, with the ground being supported by a combination of shotcrete, steel ribs, and lattice girders.
11. **New Austrian Tunneling Method (NATM):** NATM is a method of tunnel construction used in rock formations. It involves the excavation of the tunnel using a minimum amount of support, with the rock providing the necessary support for the tunnel.
12. **Tunnel Lining:** Tunnel lining is the structural element that provides support to the tunnel. It can be made of concrete, steel, or a composite material. The lining is installed after the excavation of the tunnel and

provides the necessary support to the ground.

13. Segmental Lining: Segmental lining is a type of tunnel lining that uses precast concrete segments to form the tunnel lining. The segments are installed as the TBM advances, creating a watertight and structurally sound tunnel lining.

14. Sprayed Concrete Lining (SCL): SCL is a method of tunnel lining that uses sprayed concrete to form the lining. The concrete is sprayed onto the excavated surface of the tunnel, creating a thin and structurally sound lining.

15. Ground Support: Ground support is the system used to provide support to the ground during tunnel excavation. It can include shotcrete, steel ribs, lattice girders, and rock bolts.

16. Rock Bolts: Rock bolts are a type of ground support used in rock formations. They are long rods that are installed into the rock, providing support to the tunnel lining.

17. Shotcrete: Shotcrete is a method of applying concrete to a surface using compressed air. It is commonly used in tunnel lining, providing a thin and structurally sound lining.

18. Steel Ribs: Steel ribs are a type of ground support used in tunnel excavation. They are installed in the tunnel to provide support to the ground.

19. Lattice Girders: Lattice girders are a type of ground support used in tunnel excavation. They are installed in the tunnel to provide support to the ground.

20. Ground Freezing: Ground freezing is a method of ground support used in tunnel excavation. It involves the freezing of the ground using refrigeration equipment, creating a frozen block that provides support to the tunnel lining.

In conclusion, tunneling techniques and equipment are crucial in the field of underground construction. Understanding the key terms and vocabulary related to this topic is essential for anyone working in this field. From Tunnel Boring Machines to ground freezing, this explanation has covered the essential terms and concepts related to tunneling techniques and equipment. Whether you are a student, a professional, or just interested in the field, this explanation will provide you with a comprehensive understanding of the subject.