

Taking tech underground

Tecnimont has delivered technological excellence to Italy's underground mass transport systems.



THE rapid expansion of cities combined with environmental and transportation issues have created the need of modern mass transportation systems, that are mainly developed underground and that are linked to railways, parking and other underground systems, therefore requiring massive underground excavations and in particular tunneling.

The risks associated with the insertion of a transport (or service) infrastructure in a urban environment are very high, because of geologic-geotechnical conditions, water presence, buildings with different static design and actual conditions, interferences with already existing facilities, environmental constraints, etc. These risks are strictly connected with situation of surface buildings and activities, ie the topography of the site (urbanised site), and to the presence of other infrastructures and structures. Moreover, in several areas there might be presence of archaeological remains, which, even if not directly interfering with the tunnel, can be an important obstacle to the construction of ancillary systems, such as stations, ventilation shafts, entrance and/or emergency access.

Obviously, the first and most important action to be taken in planning a metro system is therefore the correct identification

and management plan of such risks, and in particular the correct investigation of the soil and in general of the existing conditions of the site and of the surrounding areas, both underground and above ground.

During project execution, the above mentioned aspects require a continuous investigation, monitoring and control of all the parameters identified in the planning and design phases. This creates a continuous project-work interaction and a strong attention to the environmental aspects.

Surely, the mechanized excavation by Tunnel Boring Machine (TBM) is a technique which satisfies the safety and productivity needs of the works, if correctly studied and executed.

The high interaction level between the execution phase and the traffic and the other surface activities should be carefully studied from the very beginning in order to not incur in another fundamental issue: the public opinion.

In fact the realisation of an underground system inside a city does not only mean the boring of a tunnel. The impact of the construction site depots, where machineries, equipment and systems used to realize the excavation are located, can last for a long time and consequently the interference with the city must be managed through

long term mitigation interventions.

The stations and/or other parts of the work are very often inserted in the urban environment and have direct influence on the receptors (buildings and inhabitants), for what concerns both the physical aspects (traffic restrictions, entrance modifications, etc.) as well as environmental aspects (noise, dusts, water, visual impact, etc.).

The management of these issues has significantly gained importance during the last years, both from the instrumental, investigating and mitigation points of view. Generally, the limited areas of the construction sites, the legislative conditioning and the environmental requirements involve a thorough study of the execution phases, a precise planning of the delivery and the evacuation of construction materials, and a study of utilisation of machineries inside the tunnel, aimed to minimisation of vibrations, which may affect adjacent buildings. This requires particular provisions such as use of wheeled vehicles, belted conveyor to remove excavated soil, mud pumping, etc.

All these aspects have been studied in detail and put successfully into practice by Tecnimont during the realization of underground systems in highly urbanized and heritage cities in Italy, Turin (Line 1), Rome (Line B1) and Milan (Line 1).