



SHAFT EXCAVATION BELOW WATERTABLE

Italy, 1995

PROJECT CHARACTERISTICS

Works: A deep excavation below water table. The shaft is enclosed by anchored diaphragm walls.

Purpose: to build a shaft for an underground, multi-storey urban parking.

Dimensions:

- shaft horizontal cross section: 1 500 m²
- maximum depth of waterproofing treatments: 14 m
- maximum depth of excavation: 25 m below ground level, 8 m below ground water table

Materials:

- a layered deposit of silts, sands and gravels of different grading, typical of the subsoil of the city of Milan. Permeability coefficients of the individual layers are highly variable, ranging from $K = 10^{-4}$ to 10^{-6} m/s. Some of the horizons are prone to suffusion phenomena.

PROFESSIONAL SERVICES PERFORMED

Geotechnical analyses and computations, design of additional anchoring and strutting of the peripheral diaphragm walls. Design of deep waterproofing treatments, planning of dewatering and excavation steps. Structural design of the foundation slab. Assistance during jet grouting, dewatering and excavations. Processing of monitoring data.



Deep underground excavations to create parking space in downtown sections of Milan are frequent.

Excavation must be carried out in confined spaces, well below the watertable and against a rising water level. In most cases, the bottom of the excavation is not watertight and measures must be taken to ensure dewatering while excavation proceeds.

The project consisted of a first phase of works aimed at stabilising the diaphragm walls surrounding the site.

The second operation consisted in creating a short jet-grouted curtain all along the inner toe of the diaphragm walls and deep silica grouted cut-off wall built with the sleeve pipe method, along one side of the lot, to reduce seepage flow entering the excavation. Excavation was carried out while the water table was controlled by well points and deep wells.