



NAPLES: MECHANIZED SHAFT CONSTRUCTION FOR MORE SAFETY IN METRO LINE 1.

- Project: Metro Line 1
- Location: Naples, Italy
- Background: Ventilation shafts and emergency exits for Metro Line 1
- Client: Icotekne S.p.A.
- Contractor: Metropolitana di Napoli S.p.A.
- Machine: V-006, VSM9000
- Construction method: Shaft Lining
- Shaft depth: Max. 45m



Despite narrow streets and urban life, shaft no. 4 was completed on April 29, 2009 after only 11 days of excavation.

EXPANSION OF METRO LINE 1 IN NAPLES.

REQUIREMENT

METRO LINE 1, NAPLES



Function: emergency exit and ventilation
 Shaft depth: 10x max. 45m
 Diameter (ID): 4,500mm
 Geology: sand, silty sand, volcanic tuff
 Challenges: compact dimensions of the site in the lively historic old quarter
 Client: Icotekne S.p.A.
 Contractor: Metropolitana di Napoli S.p.A.

The city of Naples is expanding its metro system. The existing Line 1 is to be extended in order to link the city center with the airport outside the city. Two Herrenknecht EPB Shields crossed underneath the historic city center each creating 4 kilometers of tunnel. In line with the safety standards, ventilation shafts and emergency exits must be in place for the new dual tunnels – they go from the lively city center through the groundwater into the layer of tuff at a depth of 20–40 meters. 10 shafts are required from Dante Station to Garibaldi Station.



THE FAST WAY DOWN.

SOLUTION

VSM9000



Diameter: max. 9,000mm
 Rated power: 315kW
 Total weight: 65t
 Max. torque: 80kNm
 Construction method: simultaneous excavation and Shaft Lining

Using a Herrenknecht VSM (Vertical Shaft Sinking Machine), shafts with an inner diameter of 4.50 meters were sunk to a depth of 45 meters. This precise and safe construction method permitted a clearance of 5 meters from the tunnels. Prefabricated concrete segments were used for shaft construction. The shaft segments can be

removed at the planned openings for the cross-cuts. The load-bearing capacity of the segments across the openings was reinforced by additional armoring. For urban applications, Herrenknecht VSM technology displays some advantages over conventional methods: machine operation is silent as excavation takes place under water in the flooded shaft; the site dimensions for both machinery and equipment are low, and thanks to this automatic working process with parallel shaft lining and excavation, considerable savings in time can be gained. It was possible to complete shaft no. 4 with a daily best performance of 4.70 meters of shaft and within 11 net cutting days.



Herrenknecht AG
 D-77963 Schwanau
 Phone + 49 (7824) 302-0
 Fax + 49 (7824) 34 03
 pr@herrenknecht.com
 www.herrenknecht.com

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