Diaphragm walls Terra
Metro Quito, Jipijapa, Iñaquito, La Carolina, El Ejido, El Recreo, El Calzado, Solanda and Morán Valverde Stations (Ecuador)
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Grand Paris Express Line 16 (Paris)
Diaphragm walls have prevailed in various fields of engineering. Initially used only for the construction of waterproof curtains in the ground, they are currently used in a number of elements (bearing structures, provisional or definitive retaining walls contention, etc.) that provide a solution to problems ranging from the underground excavation, such as parking lots or basements, side walls for underpasses, collectors, shafts, etc., to the waterproofing elements in embankment dams.

TERRATEST continued developing this technique through the experience transmitted by the uptake Company I.CO.S. S.A. which was the one that did the first works in the late 40's of construction of diaphragm walls with the use of thixotropic slurry.

Currently TERRATEST is one of the leading specialists in the ground engineering sector, thanks to the use of advanced equipment of large production capability that encompasses all commercial thicknesses from 0.45 m to 1.20 m.
**Thickenss of the wall:**

0.45, 0.60, 0.80, 1.00, 1.20 m.

**Width of the panels:**

Initial panels: 2.60 m to 4.20 m (according to the type of grab).
Successive panels: between 5 y 7,20 m.

**Types of spoons**

TERRATEST bases its experience in the use of suspended grabs, cable operated weights between 5 and 12 tons and openings between 2.60 m and 4.20 m. This type of grabs can accommodate virtually any type of ground and depth, presenting fewer deviations in depth and increasing the precision with its weight (working as a plumb).
The circular joint has the advantages of providing a footprint that guides the grab in the excavation of the side panels, providing a good bond between adjacent concrete panels and increasing the path from the backfill that the water has to go through, increasing the impermeability of the joint.
Panel execution

Panel execution nº1

- Excavation
- Tube-joint placing
- Reinforcement placing
- Concreting
- Tube-joint removal

Panel execution nº2

- Excavation
- Heel digging
- Tube-joint placing
- Concrete reinforcement positioning and removal of joint

Closing panel execution

- Excavation
- Reinforcement and concrete positioning
- Closing panel completion
4 IMPLEMENTATION METHODS. REINFORCED CONCRETE DIAPHRAGM WALL WITH THIXOTROPIC SLURRY

Panel execution

- Bentonite entrance
- LOW WALL GUIDE
- Beginning of panel excavation
- Tube-joint placing
- Reinforcement placing
- Concreting
- Tube-joint removal

- Excavation advance panel
- Placing tube-joint in advance panel
- Reinforcement and concrete positioning
- Tube-joint removal

4 PLASTIC DIAPHRAGM WALL

Closing panel execution

- Bentonite-cement mixture entrance
- LOW WALL GUIDE
- Excavation panel beginning
- Primary panel excavation
- Secondary panel excavation (primary contact drilling)
- Completion closing panel
The constitutive materials of the walls must meet the specifications given in the tender Project Specific Requirements.

For the choice of cement the aggressiveness of the soil, in accordance with the geotechnical report, must be taken into account.

The length of the reinforcement will be specified in the drawings as well as its composition, including the auxiliary stiffening parts.

The walls are concreted upwards using a Tremie pipe. Concrete, additionally to the resistance specified in the tender, must show the flow conditions needed to be placed without segregating or jamming the Tremie pipe. The following characteristics are recommended: 300 kg of cement per m^3 of concrete, Abrams cone settlement between 16 and 20 cm, continuous grain size, recommending the use of a plasticizer retarder but not of superfuidizers.
Depending on the depth of excavation, ground features and the set of acting forces it might be necessary to brace the cut-off walls in one or more levels, as the excavation progresses. The following drawings schematically show the most commonly used systems.

CANTILEVER

METAL STRUTS

METAL STRUTS AND ANCHORS

ANCHORS

TOP-DOWN SYSTEM

UPPER AND LOWER SLAB

BERM AND FLOOR STRUCTURE

SELF-SUPPORTING ELLIPTICAL OR CIRCULAR GUIDELINE

Strut diaphragm walls using metal structures and anchors
Aqaba New Port Phase II (Jordan)

Empalme I Combined Cycle Plant, Sonora (Mexico)

Plaza Cali Commercial Mall Centre (Colombia)
SPECIAL PROJECTS

Parking de la Place de L'indépendence in Dakar (Senegal)

Line 9 of Barcelona Metro

Line 2 of Barcelona Metro
Special Projects

Diaphragm Walls with Trench-Cutter for Barcelona Metro Line 9 Pozos Station

Line 3 & 5 of Valencia Metro

Underground railway line at Erandio (Bilbao)
Diagonal 0 Rambla Prim Passeig Taulat (Barcelona)

Line 3 & 5 of the underground parking in Plaza de la Glorieta (Alicante)

International Convention Center in the city of Madrid CíCIM
Underground works on the M-30 Bridge San Isidro - Prague Bridge
Prague bridge - SOUTHERN junction

Retaining Walls and Foundation of Shopping and Tower Puerto Triana-Sevilla

Underground works on the M-30 Bridge San Isidro - Prague Bridge
Prague bridge - SOUTHERN junction