Terratest

Diaphragm walls Terra

TERRATEST

Metro Quito, Jipijapa, Iñaquito, La Carolina, El Ejido, El Recreo, El Calzado, Solanda and Morán Valverde Stations (Ecuador)

I N D E X

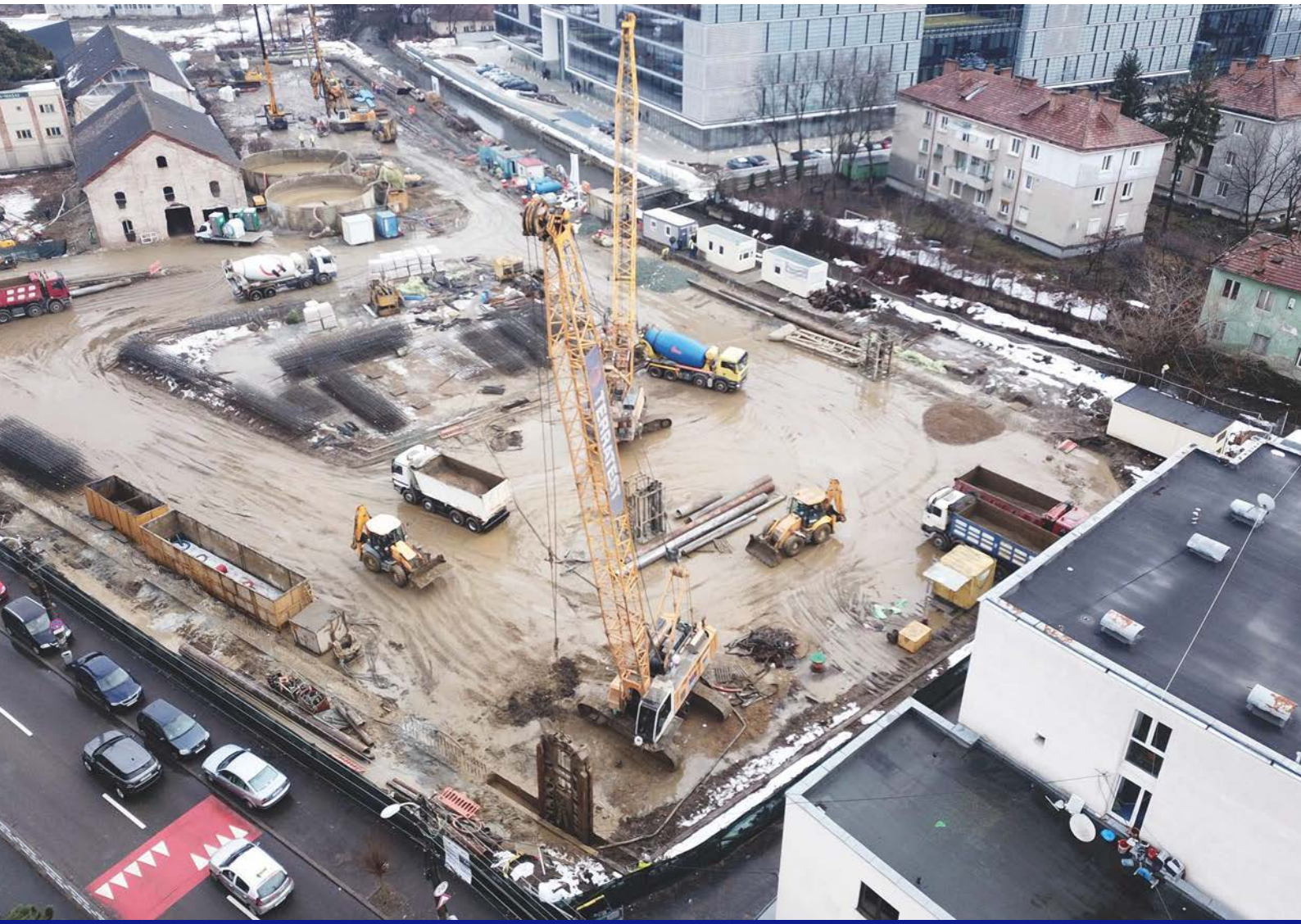
Grand Paris Express Line 16 (Paris)

1 CONCEPT

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.



Argo and Record Mix Office and Residential Project in Cluj-Napoca (Romania)

2 CHARACTERISTICS OF TERRATEST DIAPHRAGM WALL

Thickness 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).

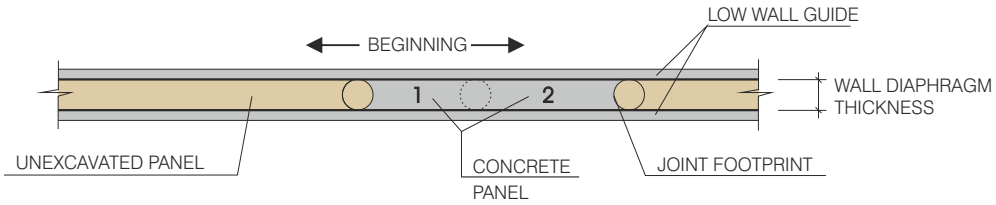
El Corte Ingles Mall on Avenida de España (Albacete)

3 DIAPHRAGM WALL JOINTS

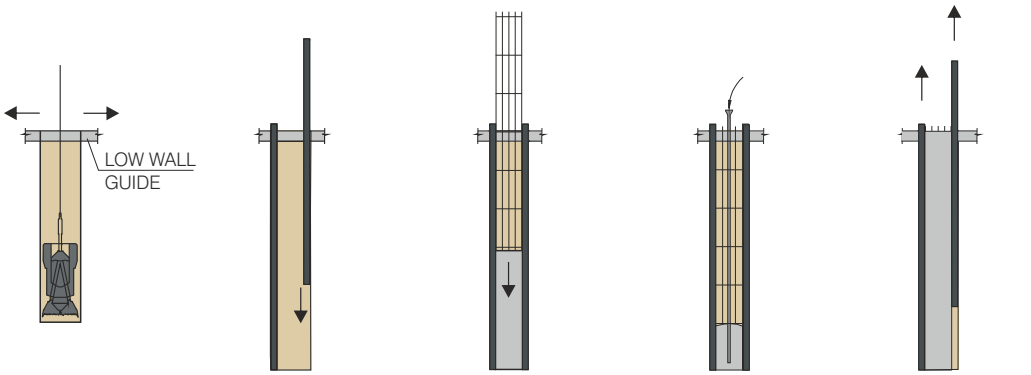
The circular joint has the advantages of providing a footprint that guides the grab in the excavation of the side panels, providing a good bond between adjacent concrete panels and increasing the path from the backfill that the water has to go through, increasing the impermeability of the joint.

Metro Quito, Iñaquito Station (Ecuador)

Panel execution

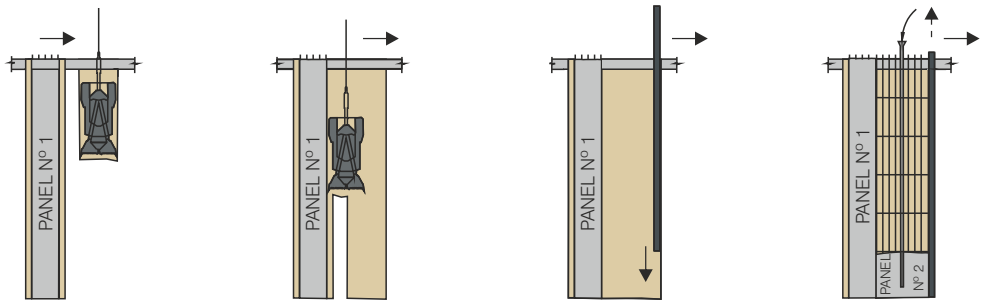


Panel execution nº1



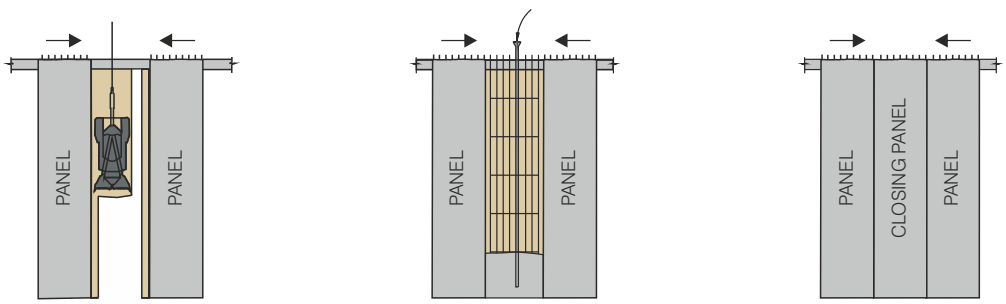
Excavation | Tube-joint placing | Reinforcement placing | Concreting | Tube-joint removal

Panel execution nº2



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

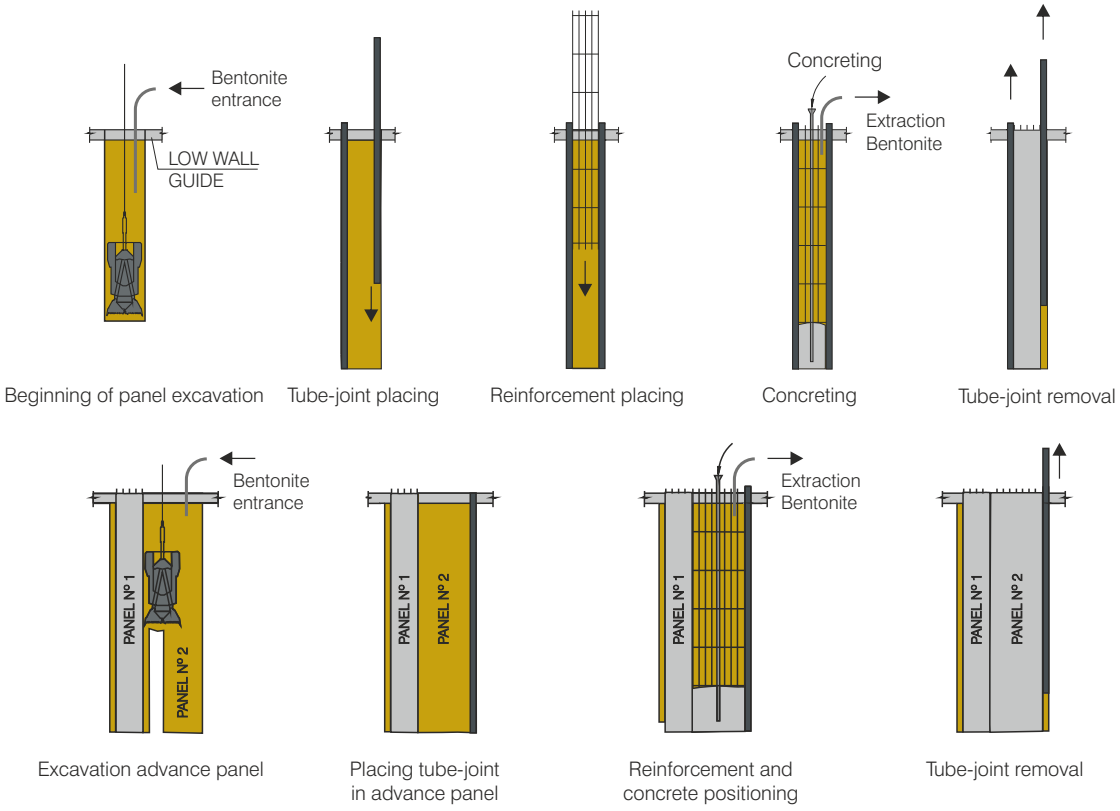
Closing panel execution



Excavation | Reinforcement and concrete positioning | Closing panel completion

4 IMPLEMENTATION METHODS. REINFORCED CONCRETE DIAPHRGAM WALL WITH THIXOTROPIC SLURRY

Panel execution

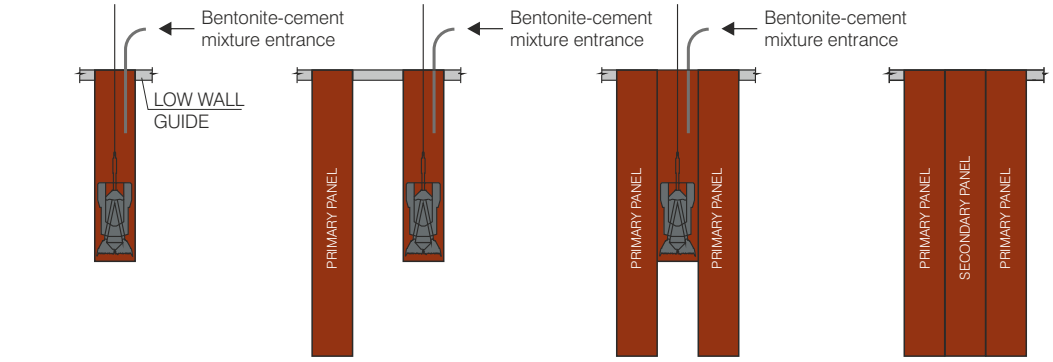


Beginning of panel excavation | Tube-joint placing | Reinforcement placing | Concreting | Tube-joint removal

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

4 PLASTIC DIAPHRAGM WALL

Closing panel execution



Excavation panel beginning | Primary panel excavation | Secondary panel excavation (primary contact drilling) | Completion closing panel

5 CHARACTERISTICS OF THE MATERIALS

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.

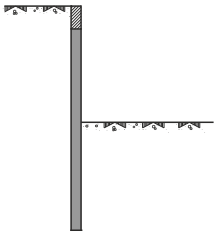
The walls are concreted upwards using a Tremie pipe. Concrete, additionally to the resistance specified in the tender, must show the flow conditions needed to be placed without segregating or jamming the Tremie pipe. The following characteristics are recommended: 300 kg of cement per m3 of concrete, Abrams cone settlement between 16 and 20 cm, continuous grain size, recommending the use of a plasticizer retarder but not of superfluidizers.

Armed and concrete placement through tremie pipe

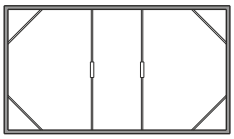
6 TYPES OF BRACING

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.

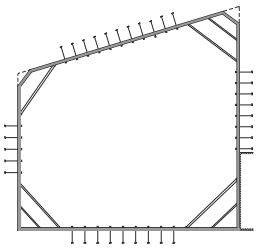
CANTILEVER



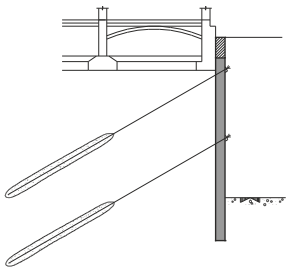
METAL STRUTS



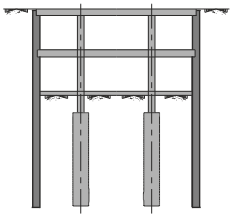
METAL STRUTS AND ANCHORS



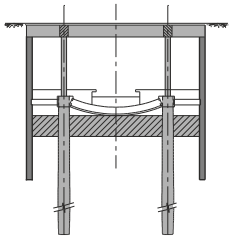
ANCHORS



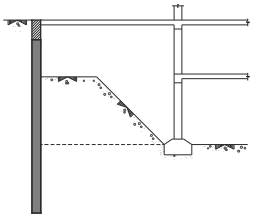
TOP-DOWN SYSTEM



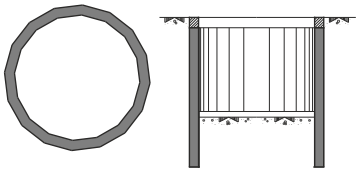
UPPER AND LOWER SLAB

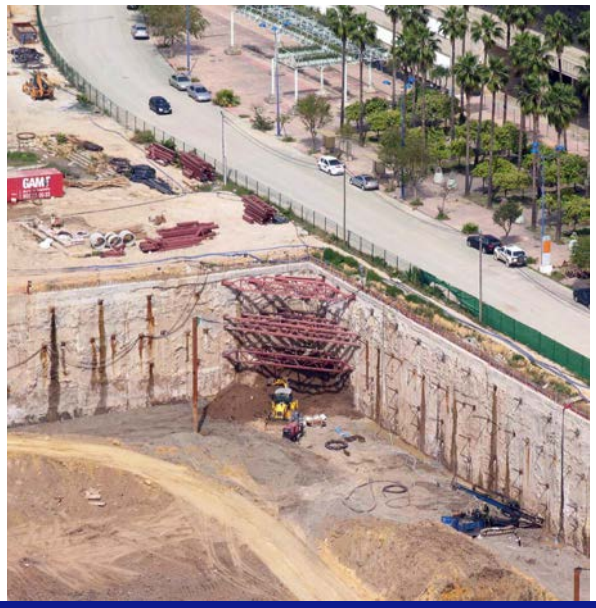


BERM AND FLOOR STRUCTURE



SELF-SUPPORTING ELLIPTICAL OR CIRCULAR GUIDELINE





Strut diaphragm walls using metal structures and anchors

7 SPECIAL PROJECTS

Aqaba New Port Phase II (Jordan)

Empalme I Combined Cycle Plant, Sonora (Mexico)

Plaza Cali Commercial Mall Centre (Colombia)

7 SPECIAL PROJECTS

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

Line 9 of Barcelona Metro

Line 2 of Barcelona Metro

7 SPECIAL PROJECTS

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

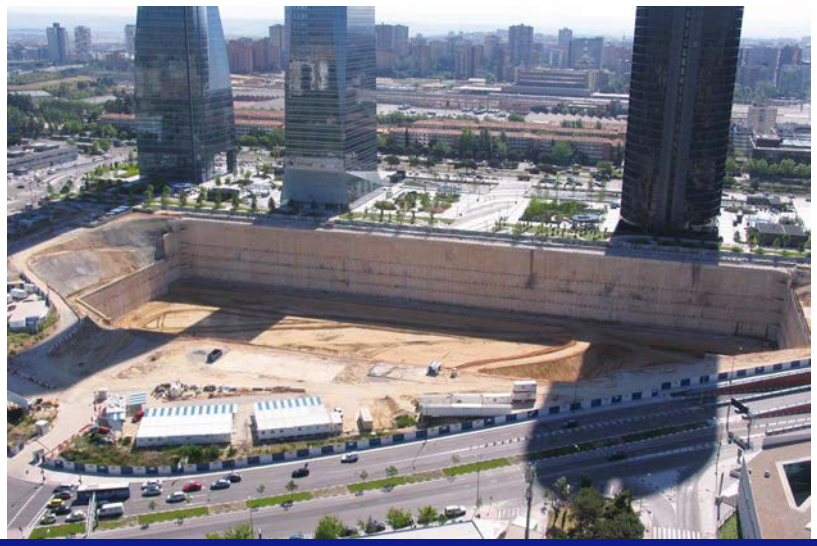
Line 3 & 5 of Valencia Metro

Underground railway line at Erandio (Bilbao)

7 SPECIAL PROJECTS

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 CICCM

7 SPECIAL PROJECTS

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

Underground works on the M-30
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