Diaphragm Walls ■ Slurry Walls

Planning
Technology
Execution
The Diaphragm walling technique offers improved verticality tolerances to CFA or rotary bored piling and delivers a smoother finish. Walls can be made extremely stiff and therefore better resistant to deflection. Diaphragm walls have a minimum wall thickness of 60 cm.

To construct them, individual panels are excavated with a grab or by cutting. Walls are built at ground level to guide the excavation tools and to stabilise the soil. At deeper levels, earth walls are stabilised by a bentonite slurry. In order to prevent inflow of groundwater the diaphragm walls are either lined with naturally occurring material having low water permeability or else artificially constructed sealing slabs are installed. When the planned trench depth is reached, a rebar cage of the required structural length is installed in the slurry and the panels are set in concrete using the tremie method. During excavation, the individual panels are separated by stop-end panels or shuttering. When using FRANKI stop-end panels, two sealing strips can be incorporated in order to add an additional seal to the joints between the individual panels. The movements of the diaphragm wall grab are monitored by an inclinometer and are electronically recorded.

In the case of diaphragm walls, there is the possibility of also using them as geothermal elements. Appropriate piping can be installed for this, thus enabling geothermal heat to be used to heat or cool buildings.

Performance:
- approx. 4,000 m² seal wall, \( d = 150 \) cm,
- Depth up to 34.5 m

Frontispiece: Renaturation of the Tollerortspitze in the port of Hamburg. FRANKI’s task was to create a seal wall for the main supporting wall made of sheet piling profiles and supporting tubes for the 220 m long backfilling element.

Flyover construction, Vleugel, NL: Construction of diaphragm walls between the railway tracks and adjacent structures

Silkeborg, Denmark: A look into the finished excavated pit
Diaphragm wall construction technique

1. Excavation of diaphragm wall panel 1 (first panel)
2. Installing stop-end panel rebar cage, concreting panel 1
3. Excavation for the adjacent panel 2
4. Releasing and removing the stop-end element between panels 1 and 2, installing the stop-end element and rebar cage, concreting segment 2

New Coca-Cola Head Office in Berlin, concreting a diaphragm wall panel

New office building Linz, Austria: Mixer system and diaphragm wall digger
Slurry walls with load bearing elements

Slurry walls are a low cost method for constructing waterproof excavation pits. The construction of slurry walls is on the same principle as that for diaphragm walls. In contrast to these walls, however, a slurry wall mix, which does not need to be replaced, is used to stabilise the earth walls. The high proportion of cement means that the slurry wall hardens and using arch pressures it can act as a load bearing element. The slurry walls also end in an artificial sealed base or a sealed soil layer with low water permeability. When the target depth is reached, the load bearing elements of the structurally required dimensions are installed in the still liquid slurry wall compound.

When sheet piling profiles are used, they absorb both the earth and the water pressure loads, and the slurry wall mix is only used for sealing. Versions with HEB profile or precast concrete load bearing elements are particularly economical here as the sealing mix provides the horizontal load transmission between the elements.

As with diaphragm walls, the movements of the grab are monitored during construction by an inclinometer and are electronically recorded.

The seal walls are created acc. to DIN 4126 or DIN EN 1538 and the recommendations of the Excavation Pit Work Group (EAB).

Load bearing element systems

![Slurry wall with precast concrete component](image)

![Slurry wall with U profiles](image)

![Slurry wall with sheet piling wall](image)

Excavation pit “Hammer Straße”, Hamburg, 22,000 m² of slurry walls with integrated sheet piling wall, 750 m² of diaphragm walls, up to 4 anchor positions, working with no interruption of rail operations and partially during mandatory breaks.

Excavation pit “La Maison Claire”, Frankfurt am Main, 3,900 m² slurry wall with precast concrete components.
If there is enough space to create a supporting embankment or if a contaminated site (e.g. landfills) need to be enclosed, seal walls are an inexpensive option.

The formula slurry wall compound is adapted to the respective requirements. Similar to other procedures, the movements of the diaphragm wall gripper are monitored by the inclinometer during production and logged electronically.

The slurry walls are created acc. to DIN 4126 or DIN EN 1538 and the recommendations of the Excavation Pit Work Group (EAB).
References Slurry walls

Hammer Straße, Hamburg: working during daily operations

VHV administration building, Hannover: slurry wall with finished part elements

VHV Hannover: Slurry wall with precast concrete components

Motorway A4 Rotterdam/Delft: approx. 94,000 m² slurry wall with integrated sheet piling wall for a trough section
References Diaphragm walls

Humboldt University, Berlin: A look into the finished excavation pit

Hammer Straße, Hamburg: working during a mandatory break

Construction for the Transportsiel Isebek (sewer) in Hamburg (Landungsbrücken)

Silkeborg, Denmark: works closely near local shops

Sinter pit + pump room, Salzgitter
Contacts

Franki Grundbau
GmbH & Co. KG
Hittfelder Kirchweg 24-28
D-21220 Seevetal
Tel. +49 4105 869-0
Fax +49 4105 869-124
info@franki.de
www.franki.de

Office Oldenburg
Nadarower Straße 125-127
D-26123 Oldenburg
Tel. +49 441 30 165-0
Fax +49 441 30 165-10
oldenburg@franki.de

Office Berlin
Berliner Str. 26b
D-13507 Berlin-Tegel
Tel. +49 30 40 571 0
Fax +49 30 40 571 10
berlin@franki.de

Office Dusseldorf
Benrather Schloßallee 49-53
D-40597 Düsseldorf
Tel. +49 211 779271-0
Fax +49 211 779271-10
duesseldorf@franki.de

Office Frankfurt
Beethovenstraße 46
D-63263 Neu-Isenburg
Tel. +49 6102 367369-11
Fax +49 6102 367369-9
frankfurt@franki.de

Office Stuttgart
Otto-Lilienthal-Str. 39
D-71034 Böblingen
Tel. +49 7031 46844-20
stuttgart@franki.de

Denmark
Office Kopenhagen
Tuborg Boulevard 12
DK-2900 Hellerup
Tel. +45 5377 1220
info@franki.dk
www.franki.dk

Ingenieurservice Grundbau GmbH
Hittfelder Kirchweg 24
D-21220 Seevetal
Tel. +49 4105 58057-0
Fax +49 4105 58057-29
info@isg-seevetal.de
www.ingenieurservice-grundbau.de

Office Kassel
Ludwig-Erhard-Straße 12
D-34131 Kassel
Tel. +49 171 3831302
kassel@isg-seevetal.de

Poland
FRANKI POLSKA Sp. z o.o.
ul. Jasnągórka 44
PL-31-358 Kraków
Tel. +48 12 6227560
info@frankipolska.pl
www.frankipolska.pl

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