Cementation

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Diaphragm Walls

Application
Diaphragm walls can be used in most ground conditions to construct underground stations in city centres, multi-level underground car parks, road junctions and underpasses, and open cut and cut & cover rail tunnels – as well as deep shafts for tunnel ventilation, intervention shafts and water treatment plants.

Diaphragm walls are often located in confined inner-city areas where space is at a premium.

Diaphragm walls are typically constructed in reinforced concrete to provide the required structural capacity, but they may also be designed as unreinforced plastic cut offs (or slurry walls) to stop water flow through porous strata.

Diaphragm walls are typically 20m to 50m deep, but may extend to considerably greater depth.

Advantages
- Box outs can be incorporated in diaphragm walls to facilitate easy connections for slabs, stairs, etc
- Waterbar can be incorporated
- Less joints required than a piled wall
- Top-down basement construction gives significant advantages in programme

Trademark
CEMLOC®

Patents
UK Patent No. 2371069
Europe (DK, FI, IE, IT, NL,SE) Pub No. 1223248
Hong Kong Pub No. 1045720
USA Patent No. 6739805
USA Pub No. 2002119013

Diaphragm walling refers to the in-situ construction of vertical walls by means of deep trench excavations. Stability of the excavation is maintained by the use of a drilling fluid, usually a bentonite suspension.

The walls are constructed in discrete panel lengths ranging typically between 2.5m and 7.0m using purpose built grabs or, in appropriate circumstances, milling machines (hydromills).

Excavation is typically carried out using either rope-suspended mechanical or hydraulically operated grabs. Standard grabs range in weight from 8-20 tonnes. The grabs are mounted on 80-120 tonne hydraulic base crane units providing stability and suitable line pull.

Specific applications and ground conditions demand the use of hydromills – hydraulically operated reverse circulation trench cutters where the excavation technique is by 'cutting' as opposed to 'digging'. This technique is appropriate for deeper diaphragm walls and walls located in granular materials and soft rock.

Where panels are constructed in a line, abutting one another to form a retaining wall, the term diaphragm walling applies. Purpose made stop ends are used to form the joints between adjacent panels and a water bar can be incorporated across these joints. Where additional bending moment capacity or wall stiffness is required more complicated arrangements can be constructed, e.g. 'L' shaped or 'T' shaped panels.

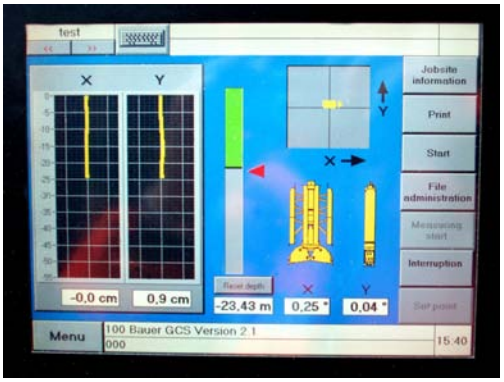
Standard widths of diaphragm walling equipment are 600, 800, 1000, 1200 and 1500mm although greater can be provided. Depths are typically constructed up to 50m using grabs and up to 80m using standard hydromills. One significant advantage of using diaphragm walling is the facility to incorporate floor slab connections and recessed formwork into the walls.

Verticality tolerances are typically up to 1:200 and onboard monitoring is now available to provide real-time monitoring of excavation accuracy.

Management of the bentonite or alternative drilling fluid requires controlled use of specialist

desanding, desilting and centrifuge equipment. Unit capacities range from 100 to 500m³/hour.

Diaphragm walls are particularly suited in the construction of deep basements when used in conjunction with "top down" construction techniques. The "top down" method of construction is designed to enable above ground construction work to be carried out simultaneously with the excavation of the basement resulting in significant saving of time on a project.



The technique can be further enhanced when columns are accurately installed into bearing piles, cut off below basement slab level. Cementation Skanska's unique CEMLOC® device enables steel columns to be plunged and accurately located into piles to structural engineering tolerances, even when the piles are constructed using drilling fluid, such as bentonite.