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Processes - Diaphragm Walling

The principal of a Diaphragm Wall is to construct a retaining wall within a slot excavated in the ground. Once completed the diaphragm wall can be used as a retaining wall for a multitude of applications, for example basement walls, earth retaining wall, water storage tank, cut off walls, etc.



Excavation

The excavation can be made with conventional cable grabs, hydraulic grabs or reverse circulation Hydrofraise equipment. Standard sizes of trench range from 600mm to 1500mm. However, thicker trenches can be constructed in exceptional cases. At the outset a guide wall is built to ensure correct positioning and it also acts as a support for the reinforcement cage prior to concreting.



The drilling fluid used is generally Bentonite, a naturally occurring clay with thixotropic properties. As the excavation continues bentonite slurry is poured into the trench to support the sides of the excavation. Having a higher specific gravity than the ground water, the sides of the excavation are 'supported' until concrete is finally poured in. In some specific cases bentonite can be replaced by polymer or more often a mixture of polymer and bentonite.



Prior to concreting the bentonite is treated in the mud plant to remove fine particles, fresh or treated bentonite is returned to the trench to maintain the overall stability of the excavation. Typical properties of bentonite can be found here.

Once the drilling fluid is cleaned and within specification, the reinforcement cage can be lowered into the trench.





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Reinforcement Cages

There are a number of factors which determine whether the cage is fabricated and placed in one piece or several elements spliced together. For example, size, weight, length, space on site, etc.

Care should be taken when detailing the reinforcement cage to ensure that concrete flows between the bars and that box outs, pull out bars and the like are carefully arranged to prevent congestion of steel and ensure the quality and buildability of the panel.



Concreting

Concrete is placed into the trench by tremie pipe .This is necessary to avoid segregation of the concrete by pouring it through the bentonite fluid.

At the beginning of concreting a plug is made in the tremie using vermiculite or a similar material, and the concrete is poured into the hopper. As it emerges from the bottom it displaces the bentonite which is pumped out from the top.

As concreting continues the tremie pipe is gradually lifted up and shortened but all the time remaining embedded in the concrete.



Joints

To form a watertight joint between panels of a diaphragm wall we developed the CWS (Coffrage avec WaterStop) joint. This system, now the accepted standard, provides for a profiled metal shutter (or stop end) to be placed at the end of the panels to form a 'keyed' joint. Incorporated in the steel shutter are grooves which hold a water bar. After the concrete has set and the adjacent panel is excavated the shutter (CWS) can be removed laterally. One half of the water bar remains in the concrete and when the adjacent panel is cast the other half forms a barrier to water ingress through the joint.



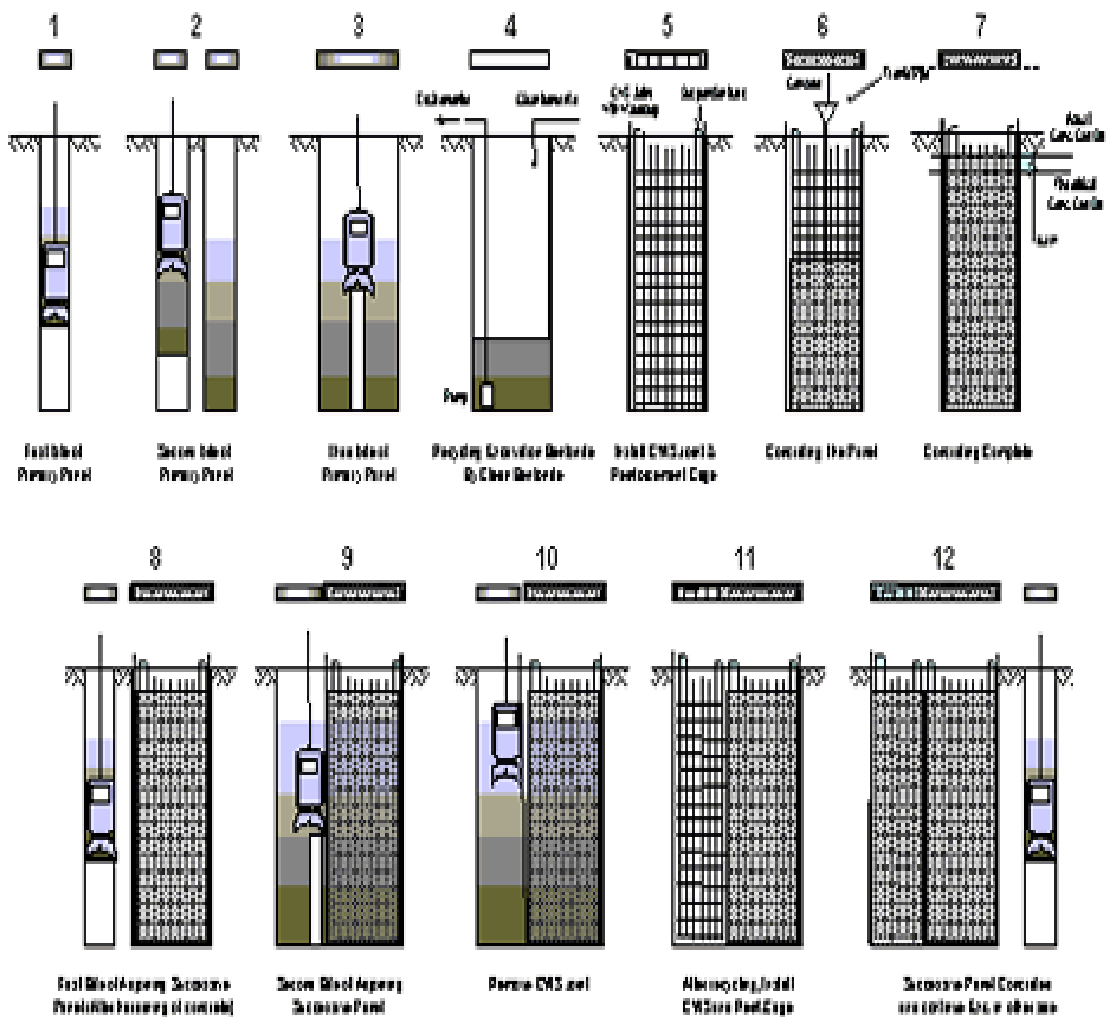


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Stages of Diaphragm Wall Construction



Diaphragm Wall Construction