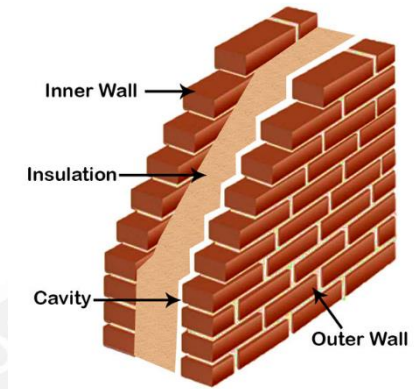


3.3 Cavity Walls – Diaphragm Walls

Cavity walls are constructed with two separate walls for single wall purpose with some space or cavity between them. These two separate walls are called as leaves of cavity wall. The inner wall is called as internal leaf and outer wall is called as external leaf. Cavity wall is also called as Hollow wall.



For non-load bearing cavity wall, two leaves are of equal thickness or sometimes internal leaf with more thickness is provided. The cavity size should be in between 4 to 10cm. The internal and external leaves should have at least 10mm thickness. The two leaves are interconnected by metal ties or links

Diaphragm wall

A diaphragm wall is a structural concrete wall constructed in a deep trench excavation, either cast in situ or using precast concrete components. Diaphragm walls are often used on congested sites, close to existing structures, where there is restricted headroom, or where the excavation is of a depth that would otherwise require the removal of much greater volumes of soil to provide stable battered slopes. Diaphragm wall is a continuous reinforced concrete wall constructed in the ground to support major construction activities like the construction of dams, tunnel approaches, deep basements and enclosures. They act as a retaining wall, support for the underground structure, as a foundation or facilitate cut off provision in order to support deep excavation.

A diaphragm wall forms a rectangular section constructed in-situ under the soil. Hence, this is an underground concrete wall. These walls are constructed panel-by-panel each interlocked to ensure structural stability and water tightness. The diaphragm walls can have a thickness ranging from 60cm to 150cm with a width of 2.0 to 3.5m. The diaphragm walls can be constructed up to a depth of 60m.

The construction sequence mainly has three steps:

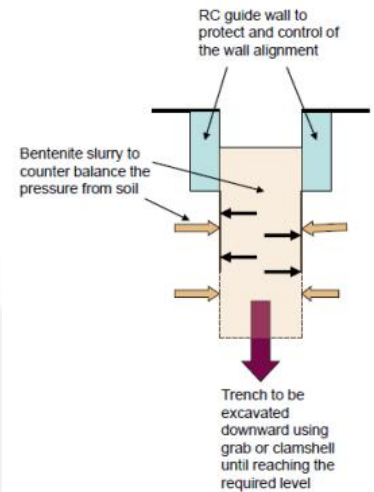
1. Construction of Guide Wall
2. Excavation of the panel
3. Wall Concreting

1. Construction of Guide Wall

Guide walls are two temporary parallel beams constructed along the side of the wall in order to guide the excavation tool and stabilise the top portion. The implementation of guide walls prior to diaphragm-wall construction helps to maintain the horizontal alignment and continuity of the diaphragm walls constructed. Guide walls also:

- Avoid Soil collapse
- Help mark the panel positions
- Support the reinforcement steel cages

As the slurry levels of soil vary largely, it is necessary to have a temporary support like guide wall. The dimensions of the guide wall constructed changes with the type of surface soil. In case, the water table level in the area is too high, the guide wall is constructed at a height above the ground level to guide the construction.



2. Excavation of Panel

This stage includes soil-removal and stabilization. A rectangular excavation tool is used to excavate the panel section. A clamshell or grab is used to excavate the trench in normal soil. Grab suspended by a crane or cable easily moves into the soil. If any obstruction is encountered, it is broken by the means of a gravity hammer and taken out by means of the grab. The above procedure must be conducted with adequate excavation support, otherwise, the sides of the excavated trench can collapse. To protect the sides, bentonite slurry is used. The slurry helps in producing lateral pressure that is sufficient to retain the vertical soil.

3. Wall Concreting

This stage involves the concreting of the panel excavated. Initially, the reinforcement cage is inserted into the trench. If the depth of the diaphragm wall is more, two or more steel reinforcement cages have to be inserted to cover the depth and these cages are lapped. Once the reinforcement is placed, the concrete is poured into the trench with the help of tremie pipes. The use of tremie pipes helps to avoid segregation of concrete. The poured concrete replaces the bentonite clay in the trench. The density of

bentonite is low compared to concrete hence is replaced during the concreting. The bentonite clay displaced is collected and reused.

Diaphragm Wall Connections

Mainly two types of joint design are employed in diaphragm walls. They are by using:

1. Stop End Pipes
2. Disposable Pipes

1. Stop End Pipes

In this method, two steel pipes are inserted into the trench before concreting, so that after concreting a semi-circular end section panel is obtained. The panel formed with concave ends forms the primary panel. Alternatively, an intermediate section is formed where the secondary panel is constructed. Once the primary panel is made, the secondary panels are executed.

2. Disposable PVC Pipes

In this method, two pipes are arranged at the ends of the steel reinforcement cage of the panel. The concreting is performed for the primary panel leaving the pipes with slurry. During the concreting of the secondary panel using a dedicated tool, the separation is broken as shown in figure -4 below. A round indentation is made in the primary panel in connection with secondary. While concreting the secondary panel, the indentation too is filled thus making a joint with the primary panel.

