Stop-End-Element

The experience gained in over 25 years of activity allows the Italian manufacturer to stand out in the production of rotary tools. Its wide product range includes stop-end-element to satisfy companies needs operating in the field of special foundations for the construction of diaphragms walls

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DIAPHRAGM WALLS

Diaphragm walls are concrete or reinforced concrete walls constructed in slurry-supported, open trenches below existing ground. Concrete is placed using the tremie installation method or by installing precast concrete panels (known as a precast diaphragm wall). Diaphragm walls can be constructed to depths of 100 meters and to widths of 0.40 to 1.50 meters. Diaphragm wall construction methods are relatively quiet and cause little or no vibration. Therefore, they are especially suitable for civil engineering projects in densely-populated inner city areas. Due to their ability to keep deformation low and provide low water permeability, diaphragm walls are also used to retain excavation pits in the direct vicinity of existing structures. If there is a deep excavation pit at the edge of an existing structure and groundwater is present, diaphragm walls are often used as the most technically and economically favorable option. They can be used for temporary support or as load-bearing elements of the final building. Diaphragm walls can be combined with any anchor and bracing system. Diaphragm wall panels are also used in deep, load-bearing soil layers as foundation elements to carry concentrated structural load in the same way as large drilled piles do. These foundation elements are known as "Barrettes". If diaphragm are socketed into impermeable soil layers of sufficient thickness or if they are combined with seal slabs (grout injection or tremie concrete slabs) almost waterproof excavation pits are created. After reducing the initial groundwater level within the excavation, only small amounts of residual water will penetrate.

DIAPHRAGM WALL CONSTRUCTION

- Preliminary excavation to 1.0 - 1.5 meters below ground elevation to install guide walls
- Prior to diaphragm wall excavation, cast-in-place or pre-cast concrete guide walls are placed. These braced guide walls stabilize the soil in the upper diaphragm level and provide a stable guide-way for the grab. In addition, they also support the diaphragm wall reinforcement and provide sufficient bearing for the hydraulic jacking system to remove the Stop-End Pipes. The space between both guide walls serves as a storage space for the stabilizing fluid
- Individual panels are excavated with a grab, at deeper levels, earth walls are stabilized 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
- Stop-End-Element Installation. To separate the single concreting phases, stop-end-elements are installed at both panel fronts. These have the same width as the panel's wall thickness and are removed after initial concrete setting. The remaining trapezoidal joint provides a very good interlock between the individual concrete panels. This flat steel panel element contains one or two elastic joint tapes, which remain in the setting concrete after the joint element has been removed. Removal of the element can only take place after the adjacent panel was completely excavated. The plan stop end is extracted by the side, after the excavation of the adjacent panel. This is the biggest advantage of this joint: you can take off it after days from the concreting operation. It allows flexibility in the organization of the job site.
- Slurry Refreshing
- Placing of Rebar Cage
- Concrete Placing by tremie method. Simultaneously with placing concrete, slurry is pumped from the panel to be refreshed and re-used

in the next panel excavation. Since the slurry is replaced by concrete, this method is called "Double-Phase Method"

► Removal of Stop-End Element after concrete setting using hydraulic pipe extractors

STOP-END-ELEMENT MAIN FEATURES

During production of cast in situ concrete diaphragm walls, the most important factor, especially to achieve a watertight joint, will be the use of the right stop end elements. They contain the concrete on the lateral side meanwhile they create a particular casting profile that offers a high seal against water infiltration. Stop End Elements are coupled together through special steel shafts even better special o-ring ensure a perfect seal between the areas of the diaphragm. They are made of sheet metal welded and its special profile is achieved by a process of press bending and finally an internal reinforcing structure increases its strength and avoids the risk of deformation. The excavation of a follow-up panel is carried out by clamshell grab, with the help of a special flat chisel if needed, both guided by the channel in the pipe. While digging, these tools clean the exposed side of the pipe. The trapezoidal design of the Stop End Elements, and its constructive characteristics, allows a spontaneous lateral movement after the excavation, making a delayed extraction very easy.

The continuity of two following panels is guaranteed even in the presence of small vertical deviations, because the excavation is guided along the stop-end element. With this method as opposed to other working system, there is no urgency to remove the stop-end element. It can be left in place for days or even weeks before extraction. A water stop can be added to the stop-end element to improve water tightness between joints. For this purpose, a special rubber seal will be mounted on the side of Stop End Element which will come into contact with the concrete. The lateral movement of the stop-end element during extraction leaves the water-stop fixed in the concrete. SIP&T can supply Stop End Elements in various widths and lengths. They are easily jointed each other through special steel. The Stop End Elements are: head element that is used for their lifting and extraction, intermediate elements and element shoe (Starter). In addition, to facilitate the use of Stop End Elements, SIP & T manufactures a chisel cleaner kit (dedicated to the cleaning of the channel guide) and a Platform Suspension Jig (dedicated to the support of Stop End Element during installation).

HYDRAULIC EXTRACTOR AND POWER PACK

As soon as the concrete begins to set, hydraulic extractors pull out the stop end elements. They have been designed for the extraction of diaphragm wall stop-end-element having a width from 400 to 1500 mm and length up to 100 meters. SIP&T unit is operated by an indipendent power pack and it is composed of heavy-duty base frame with two trapezoid sliding columns maneuvered by four hydraulic rams. The system is complete with locking system pins to ensure the stop end element to the sliding frames and to prevent dropping of the column. A remote control panel to operate the unit is also available as an optional supply.

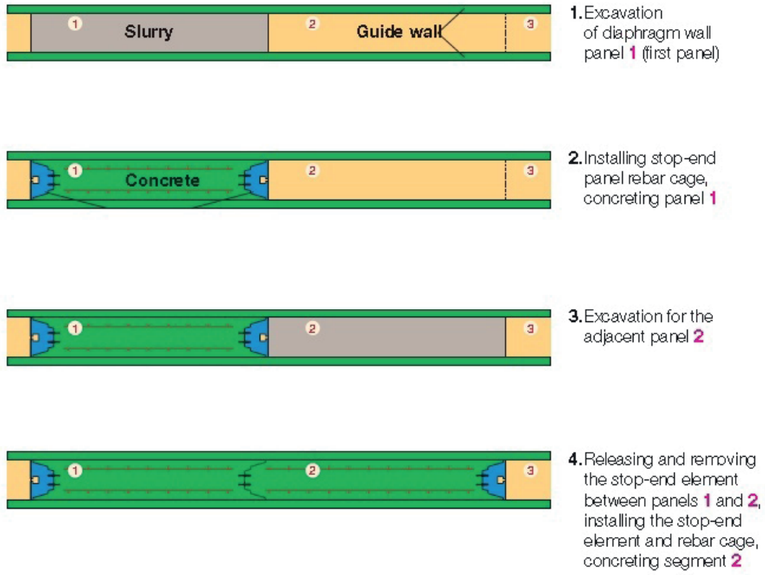
INSPECTION

Grabs can be equipped with electronic devices (inclinometers) to control and monitor the vertical deviation along two or three axes. The ultrasound devices, which measures the distance between a lowered sonde inside the excavation and the panel sides, provide a "Profile" of the excavation. By this method, you have to stop the excavation of panel.

REMARKS

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. The advantages of using diaphragm walls as permanent structures are many, but there are also some disadvantages. Various shape of wall can be achieved with this method (for example, provisions for other lines).

Diaphragm walls are applicable to any ground conditions. The range of construction is wide and the application goes from silt to rock. Inner city environment: diaphragm wall and secant piles are commonly used in congested areas. They can be installed in close proximity to existing structures with minimal loss of support to existing foundations. In addition, construction dewatering is not required, so there is no associated subsidence. Excellent waterproof: over cutting joint is possible without changing the underground water table level. High cost: Diaphragm wall are more expensive than other method. Nevertheless, the cost is lower when diaphragm walls are used as a permanent structure. It is used for projects under construction as a permanent support. Moreover, it has been used on several metro projects with no internal structure inside. Not economical for small & shallow basements. Requires special equipment. They are unsuited to strong soils conditions where penetration is slow and difficult due to the use of the slurry trench method.◄



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**