



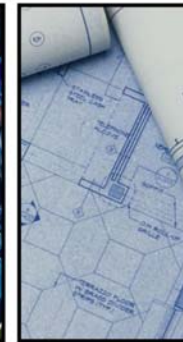
ITALTHAI TREVI

Foundation Specialists



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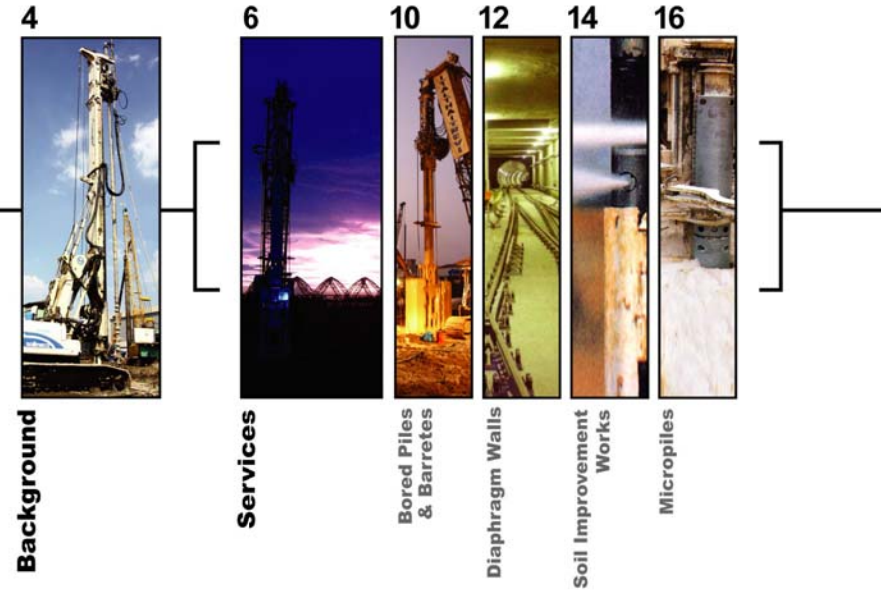


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Bored Piles and Barrettes [building works] Diaphragm Walls Jet Grouting, Grout Columns, Soil Cement Columns, Vertical Drains
Soil Improvement Bored Piling for infrastructure
Micropiling, Drilling and Grouting, Anchors



Italhai Trevi was brought into being by two already well-established and renowned International contractors, namely Italian-Thai Development Public Co., Ltd. of Thailand and Trevi S.p.A. of Italy.

The decision by these two companies to form a permanent foundation contractor to cater for the fast-expanding Thai market was result of the highly successful collaboration between the two on the Khao Laem Dam Project. This project, completed between 1980 and 1984, still stands as one of the most technically accomplished large scale projects ever undertaken in Thailand.

With the integration of the experience and skill of the partner companies, Italhai Trevi can guarantee the best execution of complex works using the most modern technologies and the most advanced equipment and plants.



OUR BACKGROUND



Few companies can today offer the range of specialized services that Italtai Trevi can provide to a Client. Our major strengths include construction of bored cast-in-situ piles, diaphragm walls, barrettes, soil improvement, micropiles, drilling and grouting, consolidation and impermeabilization, rock anchors, as well as other services which may be required by the client from time to time.

[1. Bored Piles and Barrettes]

This form of substructure construction is the most appropriate and effective for deep foundations necessary to sustain the high capacity loads generated by building and infrastructure works. Italtai Trevi has offered this type of pile from 600mm up to 2,000mm in diameter, and to a depth of 70m from existing ground level. The equipment we used for these procedures is the most modern and effective of its kind, and can be adopted to meet the most technologically demanding of working conditions, including piling in rock foundation. Italtai Trevi's bored piles equipment fleet includes among the most modern hydraulic rigs, such as SR40, SR70 and R930 capable to carry out piles up to 2,500mm in diameter to 80m in depth. Rectangular shaped panels, also called barrettes, are carried out when high vertical and lateral loads are foreseen and are executed with hydraulic grabs.

[2. Diaphragm Walls]

The reinforced concrete diaphragm wall is the most essential supporting structure for deep excavation, berthing wharves, car parks and underground railways. Italtai Trevi is able to provide reinforced concrete diaphragm walls from 600mm to 1,500mm in thickness and up to 70m in depth.

Diaphragm walls and barrettes are constructed by digging a panel filled with bentonite mud, putting a reinforcement in place and removing the slurry by means of concrete pouring from bottom up.

For the excavation, Italtai Trevi uses hydraulic or mechanical grabs according to the depth of the wall. With hydraulic grab, Italtai Trevi has performed barrettes 70m deep.

[3. Soil improvement]

The company has developed several soil improvement methods, the most common are jet grouting and soil cement columns. There are 3 different types of jet grouting application:

- with injection water / cement mix
- with high pressure jet of cement grout and air to break up and mix the soil in situ
- with high velocity jet of air and water to break up and partially remove the soil in situ, followed by injection of cement grout mix.

The soil-cement columns consist of mixing in-situ cement grout with existing soil with high speed agent coming through a fly-auger of selected diameter, creating a column of stabilized soil.

[4. Micropiling, Drilling and Grouting, Anchors]

Using micropiles, Italtai Trevi can overcome foundation problems which cannot be solved by using other systems due to existing restrictions, such as low headroom (basement, tunnel etc.)

Drilling and grouting is widely used for rock impermeabilization, especially for dam construction. Italtai Trevi was actively involved in most of the dams constructed in Thailand.

Anchors are implemented to stabilize rock sections and are commonly installed in tunnels, excavated in rock formation, to prevent caving in.

The double-movement drilling machine was conceived by Leonardo before his arrival in Milan.

OUR SERVICES



Bored Piles & Barrettes



Diaphragm Walls



Soil Improvement



Micropiling, Drilling & Grouting, Anchors





Bored Piles & Barrettes at "The River" Project

[Mass Transit System]

Our Company is proud to have been involved in the execution of piling works for The Bangkok Mass Transit System Project (BTS). The first phase involved the construction of over 4,700 bored piles to support track and Station structural columns and thus formed an integral part of the construction of this Project of approximately 22 km. of track and 25 Stations, starting from Mochit to Sathorn and Onnuch.

The extension, which 5 km. of track, connecting Onnuch with Lasat, had a single pile for each column, 2m and 1.8m in diameter to a depth of 52m.



The restricted working environment of this Project coupled with the high profile image of same to the residents of Metropolitan Bangkok meant that the Company had to utilize to the full its equipment and technological knowledge to ensure that our piling works progressed as smoothly as possible and caused the least disruption to existing road users.

[Building Works]

Italthai Trevi was involved in the foundation works of many building projects, such as Italthai Tower, New Government Complex, Bank of Thailand and among the most challenging there is "The River" Project.

BORED PILES & BARRETES

"The River" Project on the Chao Phraya river's bank in Bangkok called for 521 bored piles (up to 70m. in depth) and for 87 barrettes (800mm x 3,000mm), 70m. depth, for the foundation of 2 Towers, the highest with 77 storey. A pre-consolidation of the soil was required prior to the excavation of the barrettes, due to the extremely soft upper layer of clay.



Diaphragm Walls at Suvarnabhumi International Airport

DIAPHRAGM WALLS



For developing the Metropolitan Rapid Transit System, ItalThai Trevi Co.,Ltd. was involved in the construction of diaphragm walls for Morchit, Kamphaeng Phet and Bangsue Underground Train Stations and Train Tunnels (MRT,Chaloem Ratchamongkhon Line). The diaphragm wall was executed with hydraulic grabs, to a depth of 39m.

The works required the execution of panel 1,000mm x 3,000mm to a depth of 34m, with strict verticality control and were carried out with hydraulic grab.

For Suvarnabhumi International Airport, ItalThai Trevi had completed several contracts. Among the most important are :

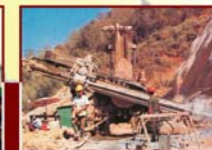
- Diaphragm wall and Barrettes for the Southern of Railway Tunnel ;
- Barrettes for Northern of Railway Tunnel.



Soil Improvement with Soil Cement Columns at Drainage System Project

[Soil Cement Columns]

For Suvarnabhumi International Airport, Drainage System Part 3 more than 50,000 columns, (average depth 15m) had to be constructed to stabilize the banks of the Drainage Channel. Itai-Trevi has employed hydraulic drilling rigs SR40, equipped with automatic recorder, to form columns by injecting grout mix with 200 bar pressure into the existing soil. While injecting the mix, the specially designed auger was drilling the soil to create homogeneous columns having a strength over 6 kg/cm². In the mean time the penetration rate, rotation speed, grout flow rate, grout pressure were recorded with an automatic data processing for achieving the best quality control.



SOIL IMPROVEMENT WORKS

[Jet Grouting]

The Company can provide solution to any requirements to increase soil strength and reduce its permeability by means of jet grouting by the Trevi-jet method. This treatment system is achieved by mixing the soil and stabilizing mix directly, by means of a very high velocity jet to ensure a homogeneous continuous and pollution-free treatment.

[Synthetic Vertical Drains]

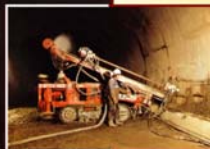
Mainly used in the consolidation process of extensive areas such as airport runways, reservoirs, large storage areas and embankments. The Company has installed synthetic vertical drains to assist embankment consolidation at the Klong Sip Kao-Kaeng Khol Railway Project and Suvarnabhumi International Airport.

[Drilling and Grouting Works]

Our experience in Dam Construction in Thailand goes back to the early days of our establishment in the Kingdom and since then we have successfully executed works on many major Dam Projects from Khao Laem Dam to Chiew Lam, Huai Sapha Hin and Nam Mae Mao. Geotechnical Investigation works have also been undertaken on the site of the Nam Theun 2 Dam in Lao PDR, where some 4,500 meters of core drilling was performed in very demanding working conditions. The Company has been also involved in the execution of foundation works for Theun Hinboun Hydro Power Project in Lao PDR, with micropiles, rock anchors, drilling and grouting. Nearly 1000 Nos. of rock anchors were carried out by Itai-Trevi for the stabilization of tunnel and underground pump station at Lam Ta Kong Dam (Thailand).



Aichors Installation at Lam Ta Klong Dam



MICROPILES



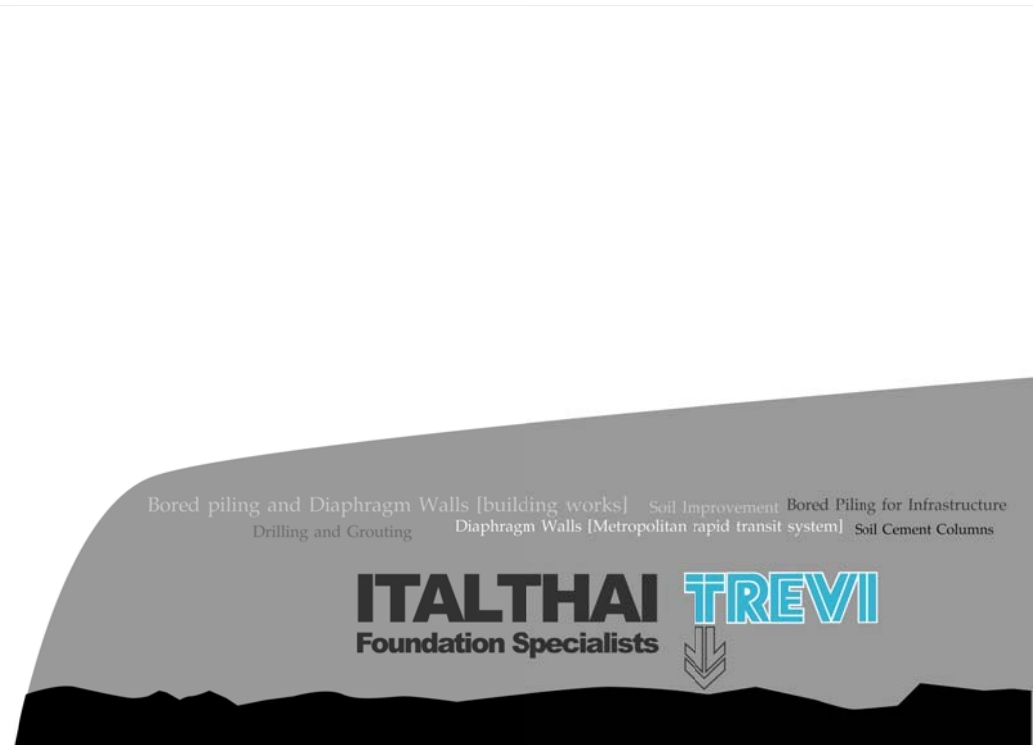
Micro piles provide a means of overcoming certain foundation problems that cannot be solved by normal piling techniques. They are now widely used as they permit underpinning and consolidations operations to be performed even in the most difficult conditions.

Micro piles can be the solution in cases where conventional bored piles are not convenient or difficult to execute and where the load is not very high. This is the case of area like Rayong, Map Ta Put and Laemchabang where

the foundation of several factories have been carried out with micropiles. This was also the case in Vientiane (Lao PDR) where Italtel Trevi carried out the foundation of Beer Lao Factory.



Bored Piling and Diaphragm Wall [building works] Soil Improvement Bored Piling for Infrastructure
Drilling and Grouting Diaphragm Walls [Metropolitan rapid transit system] Soil Cement Columns



Bored piling and Diaphragm Walls [building works] Soil Improvement Bored Piling for Infrastructure
Drilling and Grouting Diaphragm Walls [Metropolitan rapid transit system] Soil Cement Columns

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