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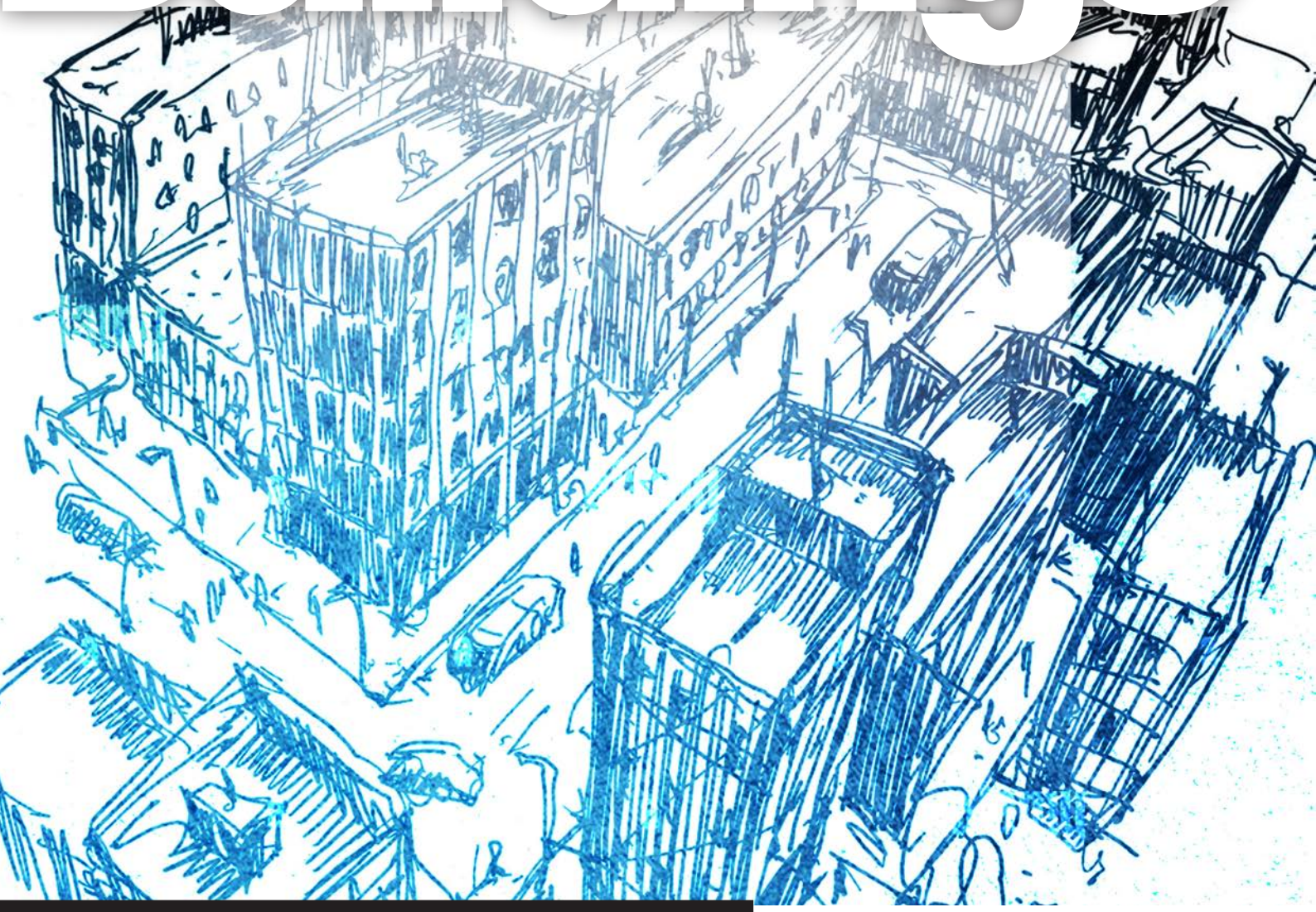
Buildings



Building is the most used man-made construction, it's designed to accommodate people and connected activities.

Its market is constantly growing led by urban and industrial development. Residential and commercial complexes, multi-floor buildings and skyscrapers have a wider adoption, especially in the densely populated metropolis. The rise of huge factories and warehouses, large facilities and plants are the direct consequence of having everything we want at our fingertips.

Along with the variety of types they also grew in dimension, size and weight involving more and more the ground engineering.

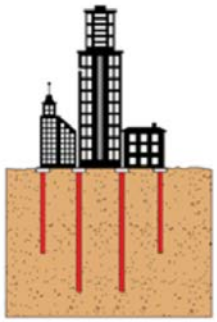
Construction in

- **urban,**
- **industrial,**
- **commercial**
- **and residential fields**

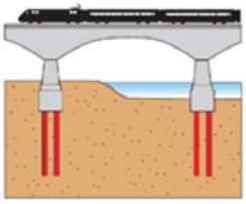
is booming and challenges foundation engineering.

Types

Single piles



Group of piles



Inclined piles

Deep foundations are troublesome and, at the same time, crucial to a project's success. Their role, just like the roots for a tree, is to withstand loads and thrusts ensuring stability and safety in and all around it.

Several factors, as well as the project specifications, may influence the types of interventions. The weight of the structure, the location *(and relative space on job site),* the geology of the area, whether in a seismic area or subject to severe weather, and the composition of the subsoil contribute to define the type, drilling methods and specifications of foundations to be used.

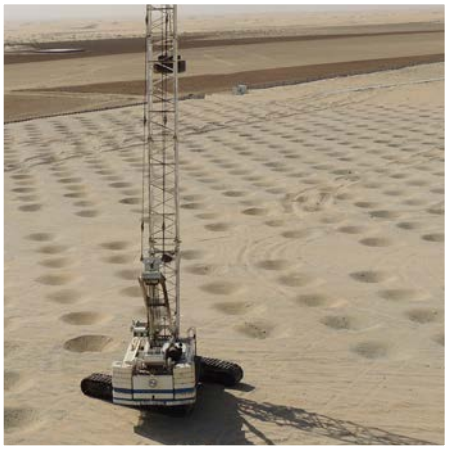
The deep foundations for buildings can be divided into two major categories. The technologies that use a vertical structural element to link the building down the earth up to stable soil and those that increase the bearing capacity of the original soils through consolidation methods.

Piles and barrettes

The vertical elements can be done in circular or rectangular shape named foundation piles and barrettes. Usually, these elements are cast in situ with concrete and reinforced with a steel cage but can be also done with precast piles. Depending on technologies used can be made with a complete, partial or no soil removal. Piles and barrettes can be use as single element, linked to create a diaphragm wall or secant piles wall and both together. The elements can be equipped with sensors to monitor the integrity and quality or with geothermal probes to get the natural heat energy stored in the earth. In this case are generally named energy piles.

Consolidation

Where the project does not require structural elements but it still necessary to grant a safe building understructure it's possible to proceed with an improvement of the soil features. There are several methods to obtain this result. Compact the soil, in particular the sands, by dropping heavy steel pounders repeatedly on the ground. Re-organize the soil particles until reaching a denser configuration by means of powerful vibrators. Mixing soil with cement in site to treat sand and clay formations in a homogeneous, continuous and non-polluting way. Improve the strength of a soil mass through the inclusion of elements constituted by material with better characteristics than those of the surrounding natural ground.



Given the importance of a building's foundation to its overall structural integrity, getting this decision right is essential. To build foundation elements and consolidations works dedicated technologies and equipment are required. Work execution must be perfect in terms of quality and time, to minimize environmental impact (low vibrations, noise, emissions, waste to be disposed of to landfill, etc.) and increase profitability.

OROGEL 3

Cold store plant (Cesena - Italy)

CFA
Rigid inclusion

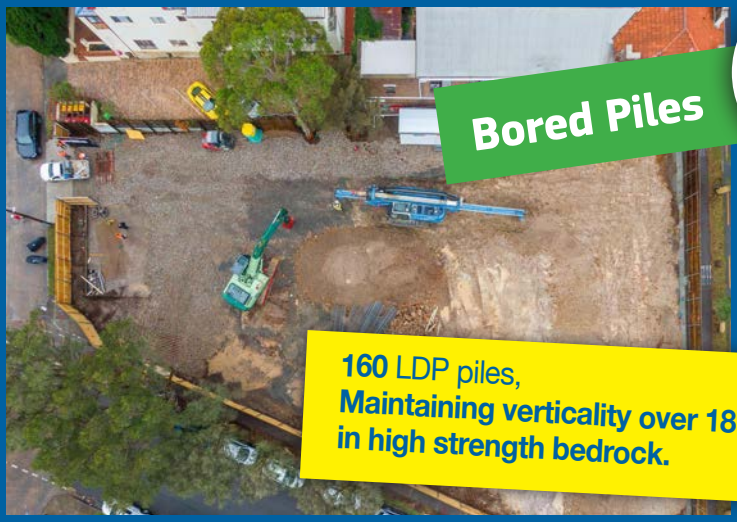
486 CFA Piles
800 mm diameter
26÷ 36 m deepth

The project involves building three new production departments, one refrigerated warehouse with a product selection department and two cold stores 30 metres high and with a footprint of 65m x 120m and 65m x 80m respectively. All this on a site of approximately 45,000 m2, of which more than 6000 m² will be used as a public green area.

Petersham

(Sydney - Australia)

11-storey apartment building with a new two-storey 3,500sqm RSL at its centre. Shoring walls for a five-level basement presence of significant groundwater and high strength rock



160 LDP piles,
Maintaining verticality over 18 m in high strength bedrock.

Diaphragm walls

Bored piles

Four Frankfurt

Complex of 4 skyscrapers (Frankfurt - Germany)

230 DW columns, **45 m** depth
380 LDP piles, **Ø 1500-2000** mm, **50 m** depth

FOUR Frankfurt is an imposing project in the financial heart of Frankfurt, which involves the construction of 4 skyscrapers (that will host more than 600 apartments as well as offices, restaurants, gyms and many others activities) making up a district that will perfectly integrate with the public spaces of the city and its inhabitants.

DOCKs - Stage V

Prague (Czech Republic)

Segmental/Cased Bored Piles

274 pilots
Cased Segmental Piles Ø 900 mm
11 m depth

DOCK IN FIVE is the fifth of a total of five phases of the commercial part of DOCK project in Prague. The DOCK is a modern office district in Prague 8, with a total of 120000 sq.m of office and residential premises , offering a plethora of retail stores, coffee shops, restaurants, and various other amenities that create a comfortable environment for professionals who work there.

South Station Tower Project

Boston, MA (United States)

Bored Piles

The South Station Tower is a 51-storey mixed use skyscraper under construction a top Boston's historic South Station complex as part of the South Station Air Rights project, which includes other upgrades and improvements of the historic South Station Transportation Center.

DW max **depth 52,7 m**
6200 mm tail swing radius

Auburn project

Residential building project (Alabama - USA)

Bored piles

177 piles
Ø 1200 mm, 60 m depth

The project consisted of the deep foundations for a condominium in Auburn. It was done a temporary shoring in progress and then two phases of perforated shaft work. In the first phase 22 shafts were drilled and in the subsequent 150.