

# 8. Deep Foundations

# Deep Foundations, Foundations Piles

- **Deep or vertical foundations** transmit the load to the depth through vertical elements.
- **Foundation piles** are rod elements of circular or square section, which transfer the load of the building on the foundation soil in depth.
- **Depending on the transmit the load** to the subsoil, the piles are pushed, tensile, oblique, and piled loaded by bending and buckling.
- **End-bearing piles** carry the load predominantly by a tip. **Bearing-cum-friction pile** carry the load on both the tip and the friction on the casing. **Friction piles** carry the load only by friction on the casing.

# Foundation Piles

- **Depending on the material** piles are distinguished by wood, concrete, reinforced concrete, prestressed concrete and steel.
- According to the relationship, we distinguish the **solitary pilots** and group pilots
- **According to the manufacturing process**, we distinguish pilots prefabricated (driven) and monolithic piles (excavated).

# Prefabricated (driven) piles

- **Prefabricated driven piles** are driven by ramming (The most widespread), flushing (flooding of the soil under the pile tip), pushing (hydraulic presses) , vibrating (steel pilots).
- **Wooden piles** - square or circular diameters of 200 to 400 mm in length are up to 10 meters.
- **Reinforced concrete piles and prestressed concrete piles** are used to a depth of 20 meters, exceptionally up to a depth of 50 meters.
- **Steel piles** are used up to 60 meters deep.

# Monolithic (excavated) piles

- **Monolithic piles** are manufactured on-site into pre-drilled wells as either sheeted or non-sheeted. Monolithic piles are made of concrete or reinforced concrete.
- **Non-sheeted piles** - can only be carried out in cohesive soils and above the groundwater level.
- **Piles with a casing pipe withdrawn** - are used in all soil types and below groundwater.
- **Piles with a casing pipe left** - are used in an aggressive environment where it is necessary to protect concrete against harmful effects (**pre-drilled piles x pre-driven piles**).
- **Micropiles** - are used for reconstructions and for the capture of buildings.

# Large-Diameter piles

- **Large-dimensional** piles are prismatic or cylindrical deep foundations with a diameter of more than 0.6 meters. In the case of a diameter of more than 1.2 m are referred to **shaft pillar**. Large-diameter piles are used as a single pile and replace the whole group of pilots. Large-diameter piles are made of reinforced concrete, possibly coupled with a steel pipe.
- The shaft pillars are either dredged or drilled. They are used up to a depth of up to 4 m, to which the piloting is not economical and at a depth of more than 4 meters in case of higher load carrying. In larger buildings, only pillars are drilled. Dredged shaft pillars are suitable for dry or soils with little leakage of water.
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# Foundation Wells

- **The foundation wells** are underground structures of cylindrical or prismatic shape with a minimum diameter of 1 meter. The foundation wells are mainly used for the foundation in water-borne and easily disconnectable soils that allow the wells to be quick submerged.
- The lifting of the soil is carried out under the protection of the shell consisting of hollow prefabricated elements, usually from the rings provided at the bottom with the cutting edge. The soil is extracted from the interior of the foundation well, and the substructures are gradually undermined and their own weight enters the subsoil. The inner space is concreted after reaching load-bearing soil.

# Caissons

- **The caissons** are used for building foundations in the water. The caissons are large-area wells enclosed by a ceiling structure that creates a working chamber secured against water ingress and allows construction work under water.
- To dispose of water from a caisson, it is necessary to achieve a pressure equal to the pressure from the outside of the caisson. Afterwards, workers can enter the caisson, where the earth extracts, and so the caisson submerges. After lowering to the desired depth inside the caisson be cast. Caisson forms deep foundations overlying structure.