

Material and Methods of Construction

Lecture # 7

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Shoring/Underpinning



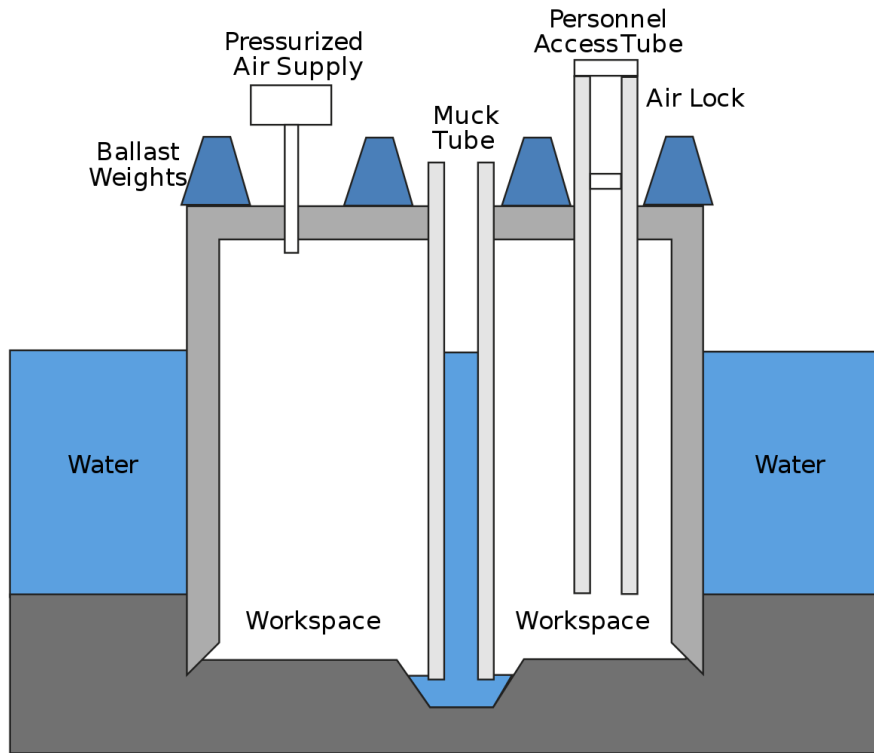
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Deep Foundation

12.4 Types of Deep Foundations

The deep foundations are of the following types :

1. Pile foundation,
2. Pier foundation,
- and 3. Caisson or well foundation.

Out of these types, pile foundation is more commonly used in construction.

A pile is a long vertical load transferring member composed of either timber, steel or concrete.

In pile foundations, a number of piles are driven in the base of the structure. The pile foundation is generally used when the soil is compressible, water-logged and made-up type. It is most suitable for bridges.

In pier foundations, hollow vertical shafts are sunk upto the hard bed and hollow portions are then filled up with inert material such as sand or lean concrete. The pier foundations are specially suitable for heavy structure such as flyovers in sandy soil or soft soil overlying hard bed at reasonable depth.

The open caisson (called well) is a box of timber, metal, reinforced concrete or masonry which is open both at the top and at the bottom and is used for building and bridge foundation. The well foundation form the most common type of deep foundation for bridges in India.

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12.5 Classification of Piles

The piles may be classified as follows :

1. *Classification based on the function.* The piles based upon the function or use may be classified as follows :
 - (a) *Bearing piles.* The piles which do not support the load by themselves, but act as a medium to transmit the load from the foundation to the resisting sub-stratum, are known as bearing piles.
 - (b) *Friction piles.* The piles which are driven in the type of soil whose strength does not increase with depth or where the rate of increase in strength with depth is very slow, are known as friction piles.

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(a) *Concrete piles.* The concrete piles may be pre-cast piles and cast-in-situ piles. The *pre-cast concrete piles* are usually reinforced concrete or pre-stressed concrete piles. These piles require space for casting and storage, more time to set and cure before installations and heavy equipment for handling and driving. The precast concrete piles are generally used for a maximum design load of about 800 kN except for large pre-stressed piles. The length of precast concrete piles varies from 4.5 m to 30 m. The pre-stressed concrete piles as compared to pre-cast and reinforced concrete piles are lesser in weight, easy to handle, have high load carrying capacity and are extremely durable.

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✓ The *cast-in-situ concrete piles* are casted in position inside the ground and need not to be reinforced in ordinary cases. These piles are not subjected to handling or driving stresses. The cast-in-situ concrete piles are generally used for a maximum design load of 750 kN except for compacted pedestal piles.

The cast-in-situ piles are of two types, i.e. driven piles (cased or uncased) and bored piles (pressure piles, pedestal piles and under-reamed piles). The cased cast-in-situ piles are suitable in practically all ground conditions. The common types of cased cast-in-situ piles are Raymond standard pile, and step-taper pile, Mc-Arthur pile and sewage pile.