Lecture 12
DEEP FOUNDATION

UCE306: ARCHITECTURE DRAWING AND BUILDING CONSTRUCTION

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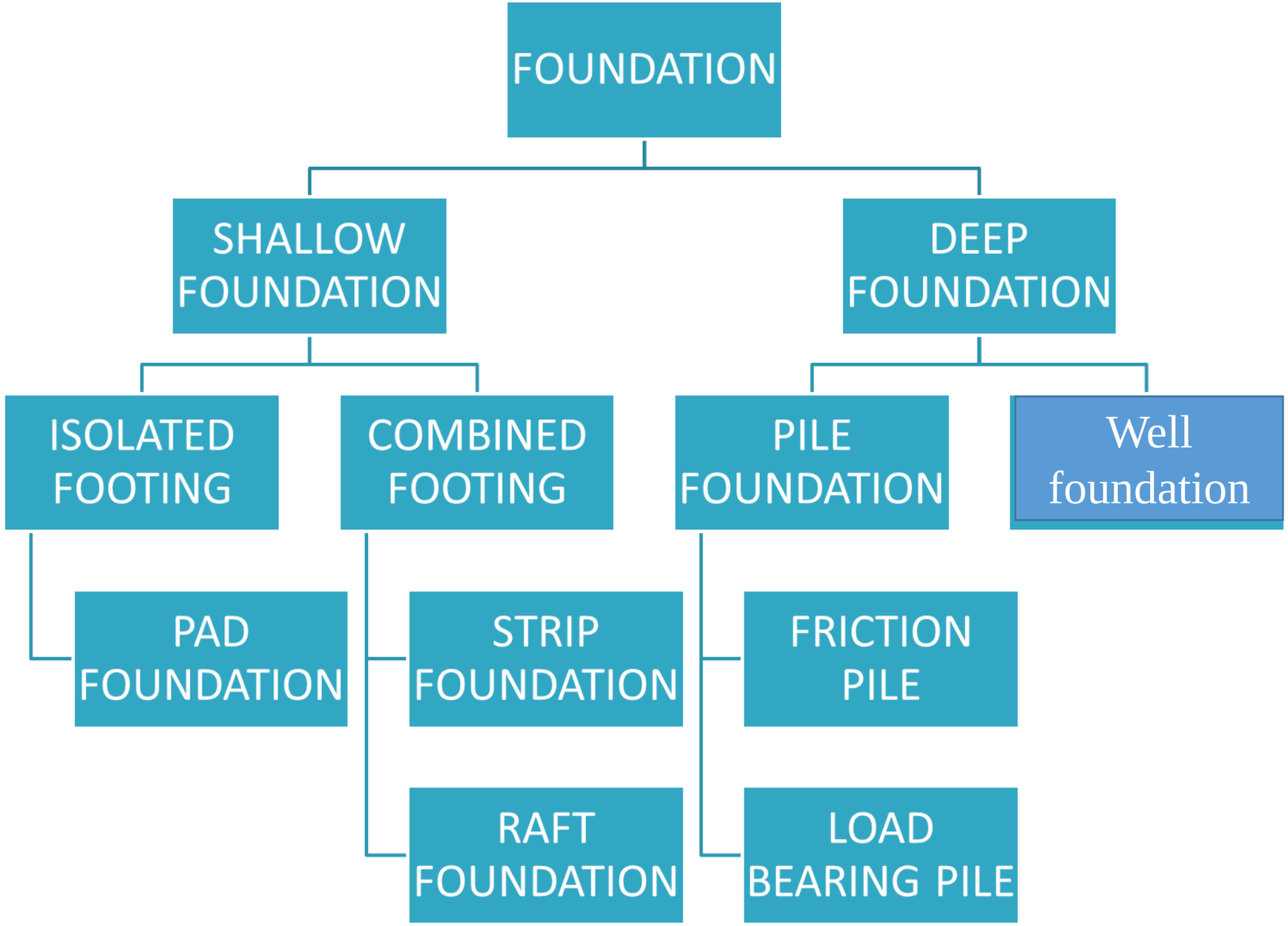
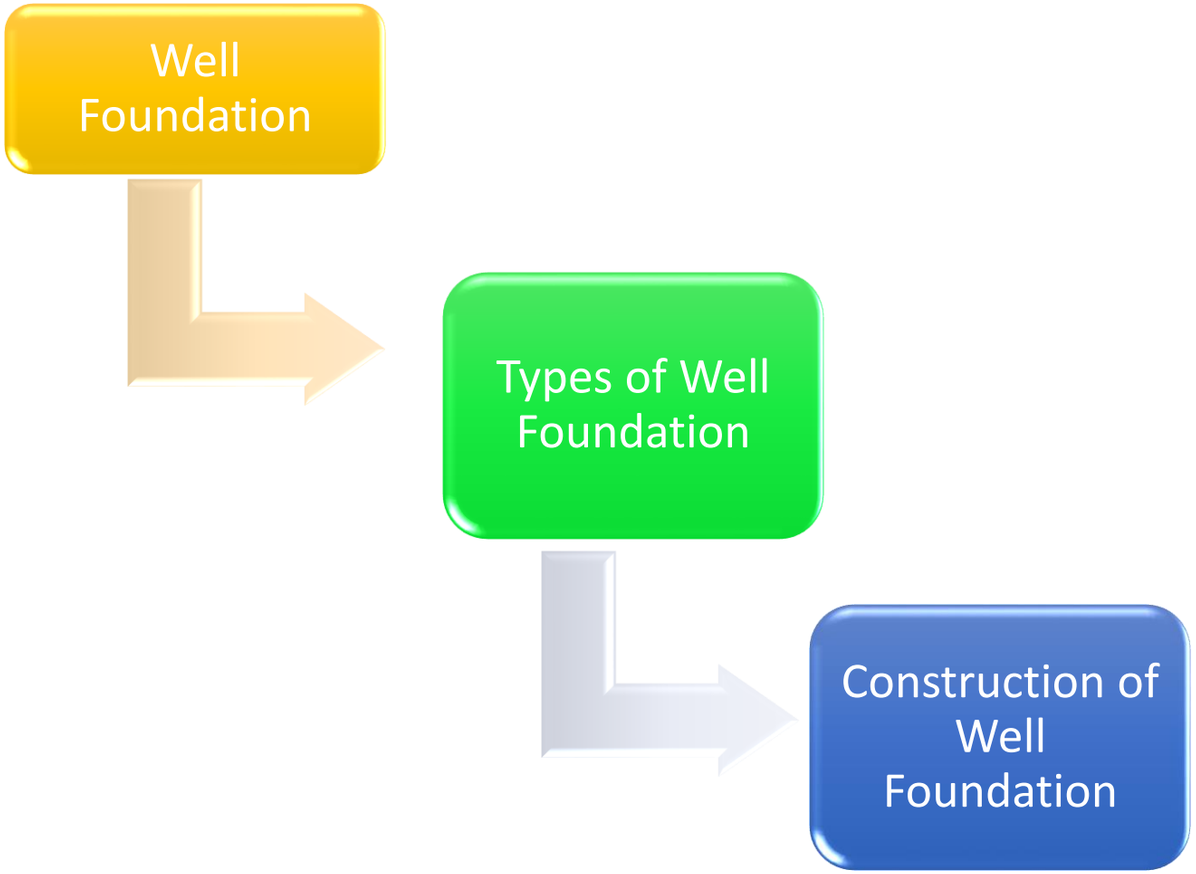
(Deemed to be University)


FOUNDATION
SHALLOW FOUNDATION
DEEP FOUNDATION
ISOLATED FOOTING
COMBINED FOOTING
PILE FOUNDATION
Well foundation
PAD FOUNDATION
STRIP FOUNDATION
FRICTION PILE
RAFT FOUNDATION
LOAD BEARING PILE


Well Foundation
Types of Well Foundation
Construction of Well Foundation

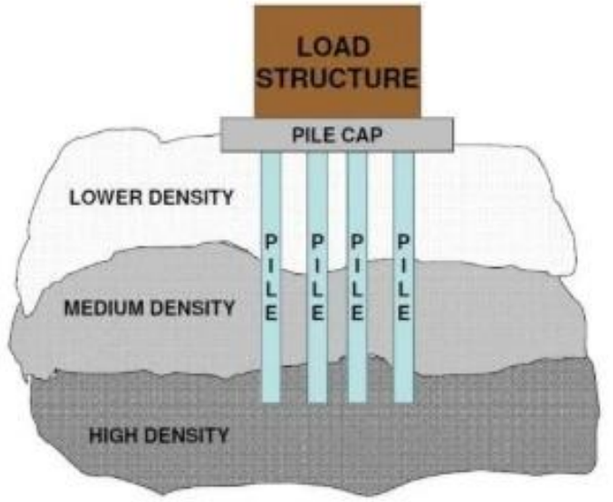
Deep Foundations

- **Deep Foundations** are those, in which the depth of the foundation is very large in comparison to its width.
- Deep Foundation is used where the bearing capacity of the soil is very low.
- The load coming from the superstructure is further transmitted vertically to the soil.

The major types of Deep Foundation are:

(i) Pile foundation

(ii)Well foundation



Pile foundation

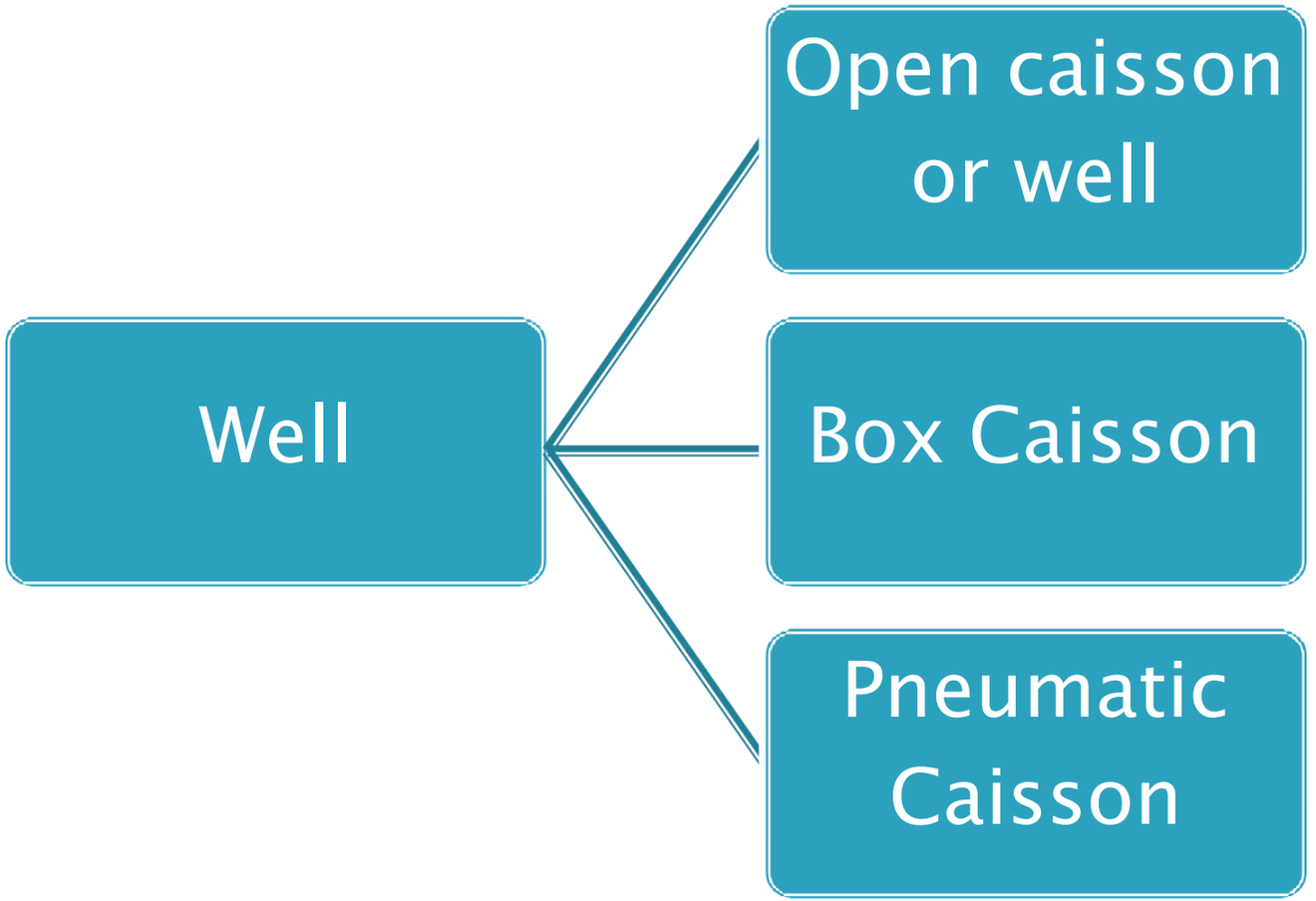
Well foundation

Well foundation

- Well foundation is the most commonly adopted foundation for major bridges in India. Since then many major bridges across wide rivers have been founded on wells.
- Well foundation is preferable to pile foundation when foundation has to resist large lateral forces.

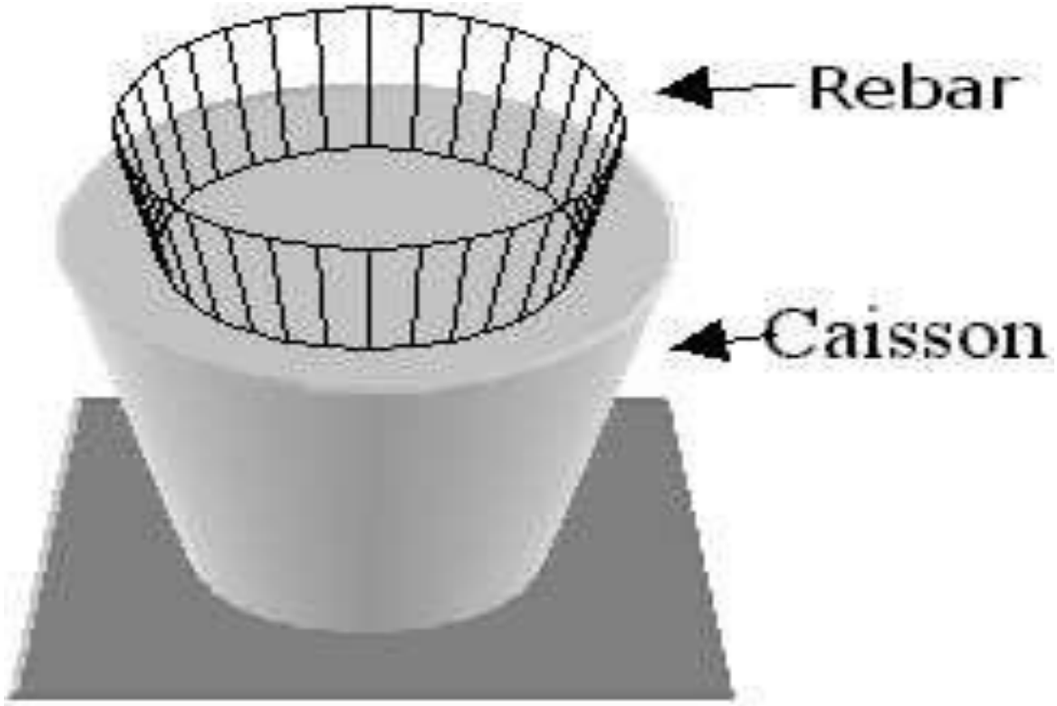
Well foundations have been used in India for centuries. The famous Taj Mahal at Agra stands on well foundation.

Types of Well Foundation



WELL CASSIONS

- It’s a prefabricated hollow box or cylinder.
- It is sunk into the ground to some desired depth and then filled with concrete thus forming a foundation.
- Most often used in the construction of bridge piers & other structures that require foundation beneath rivers & other bodies of water.



CONSTRUCTION OF WELL CASSIONS

Open caissons

Depending upon their shape, **open caissons** can be further classified as,

(i) Single wall open caisson

(ii) Cylindrical open caisson

(iii) Open caisson with dredging wells.

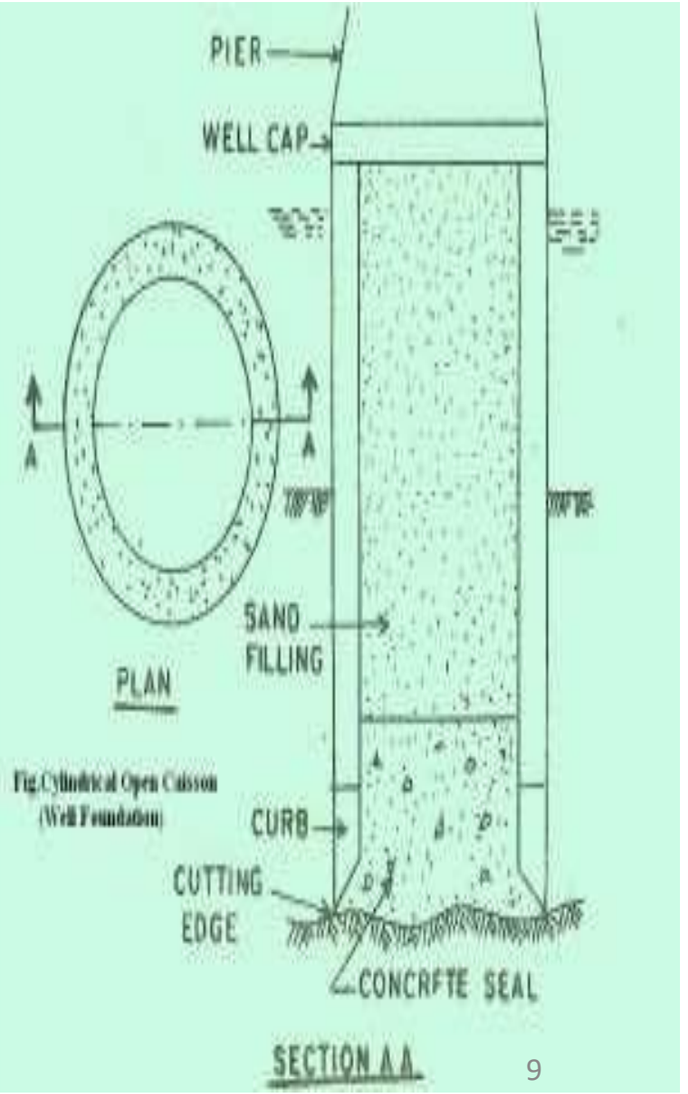


Fig. Cylindrical Open Caisson (Well Foundation)

(i) Single wall open caisson

This is a box type structure having no top or bottom (during construction) and mainly consists of vertical walls.

(ii) Cylindrical open caisson (well)

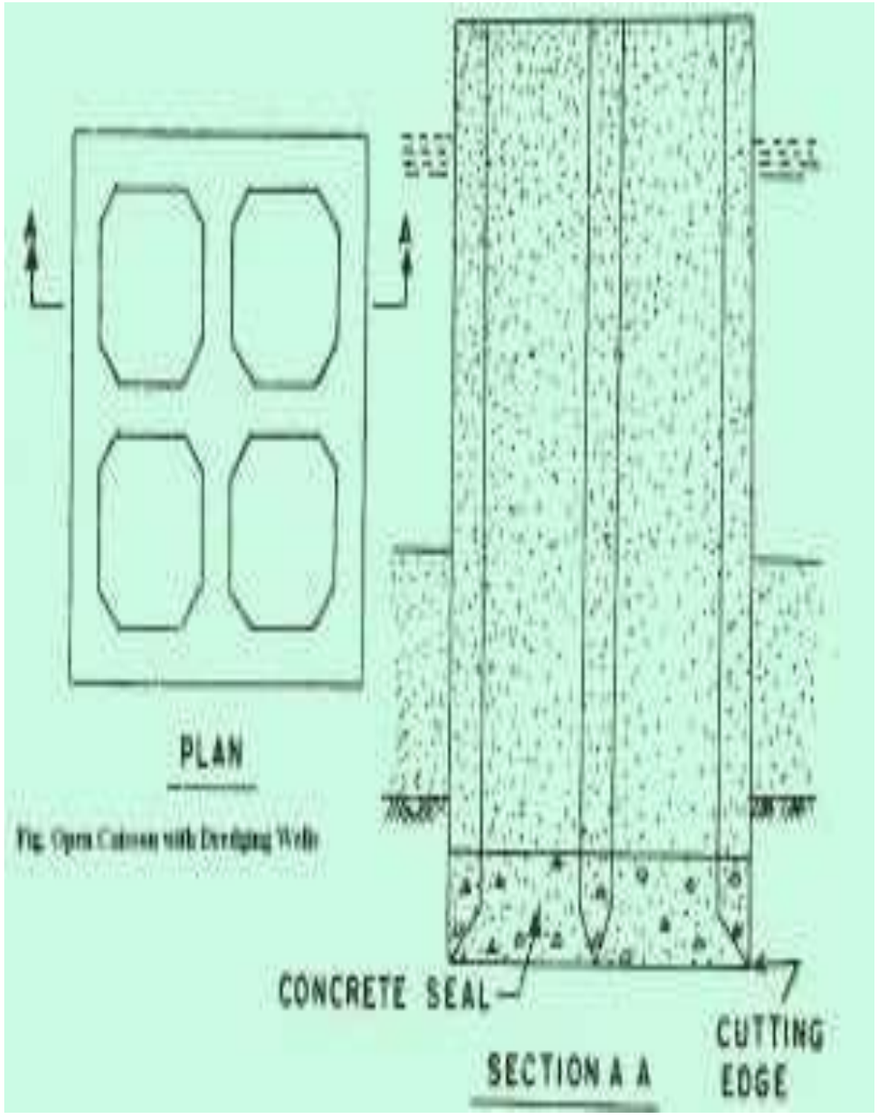
This may be defined as a cylindrical shell made up of timber, masonry, steel or reinforced concrete shod with a cutting edge and which is sunk by excavating the soil within the shell.

(iii) Open caisson with dredging wells

•This type of caisson has the distinction of being employed for the deepest foundation for, bridge piers, abutments and other similar structures.

•The caisson in this case is rectangular or square in plan and is further sub-divided into smaller sections from inside forming open walls.

•The outside walls as well as the inside divider walls are normally made up of reinforced concrete.



Construction of Box caisson

(2) Box caisson

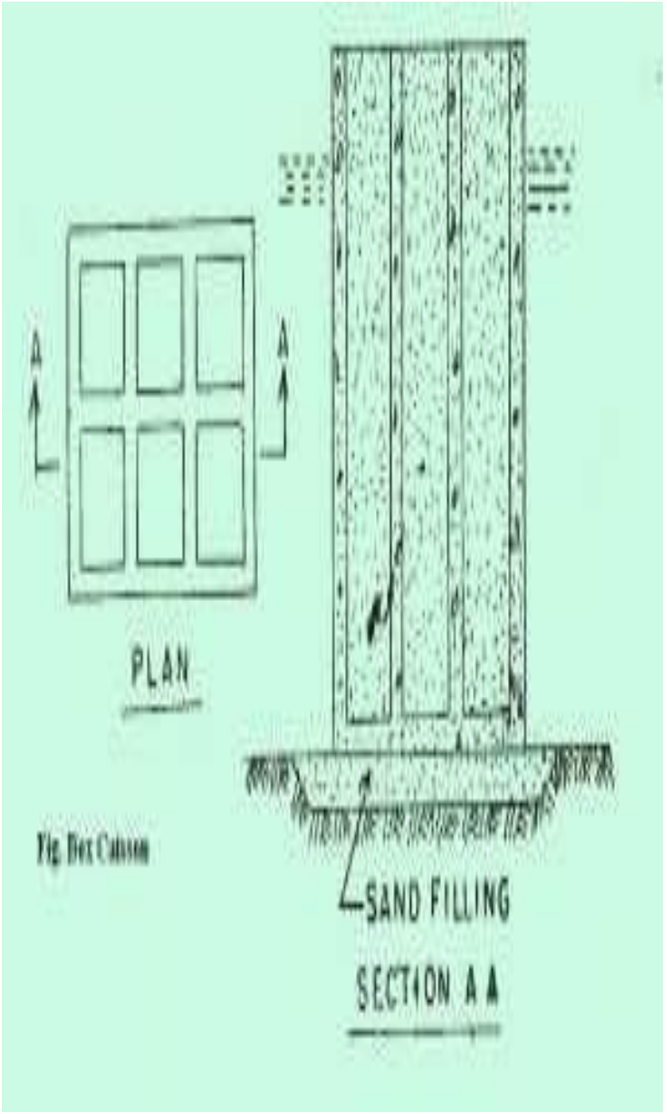
•This type of caisson is similar to open caisson except that it is closed at bottom.

•The caisson is cast and cured on land and when required, it is launched in water and towed to the site for sinking. The caisson is sunk by filling sand, gravel, or concrete in the empty space inside.

•The place where the caisson base is to rest must be leveled and as such box caissons are used in places where the strata of sufficient bearing capacity is available near the ground.

•In normal practice, the soft natural bottom soil of the river bed is dredged out to some depth and the trench thus formed is filled with sand to have a leveled base.

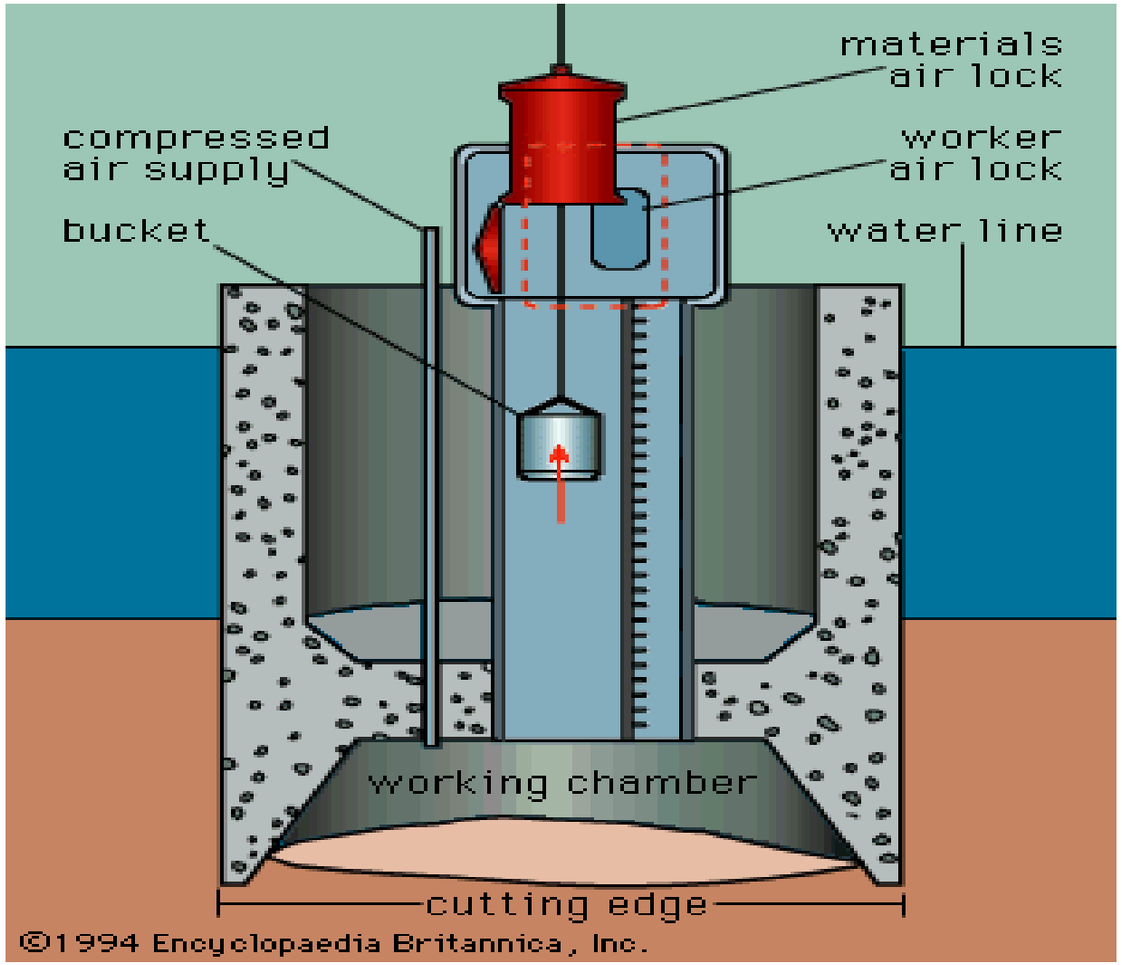
•The function of the sand layer is to uniformly distribute the superimposed loads over the soil below and thus avoid tilting of the caisson.



Construction of Box caisson

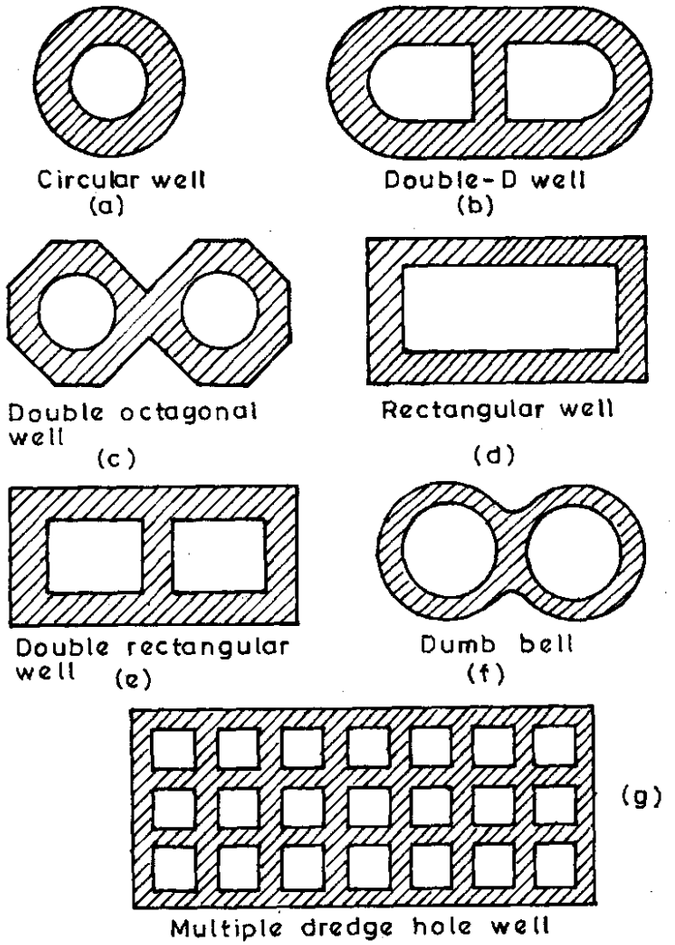
(3) Pneumatic caisson

This type of caisson is closed at top and open (during construction) at the bottom. The water is excluded from the caisson chamber by means of compressed air.

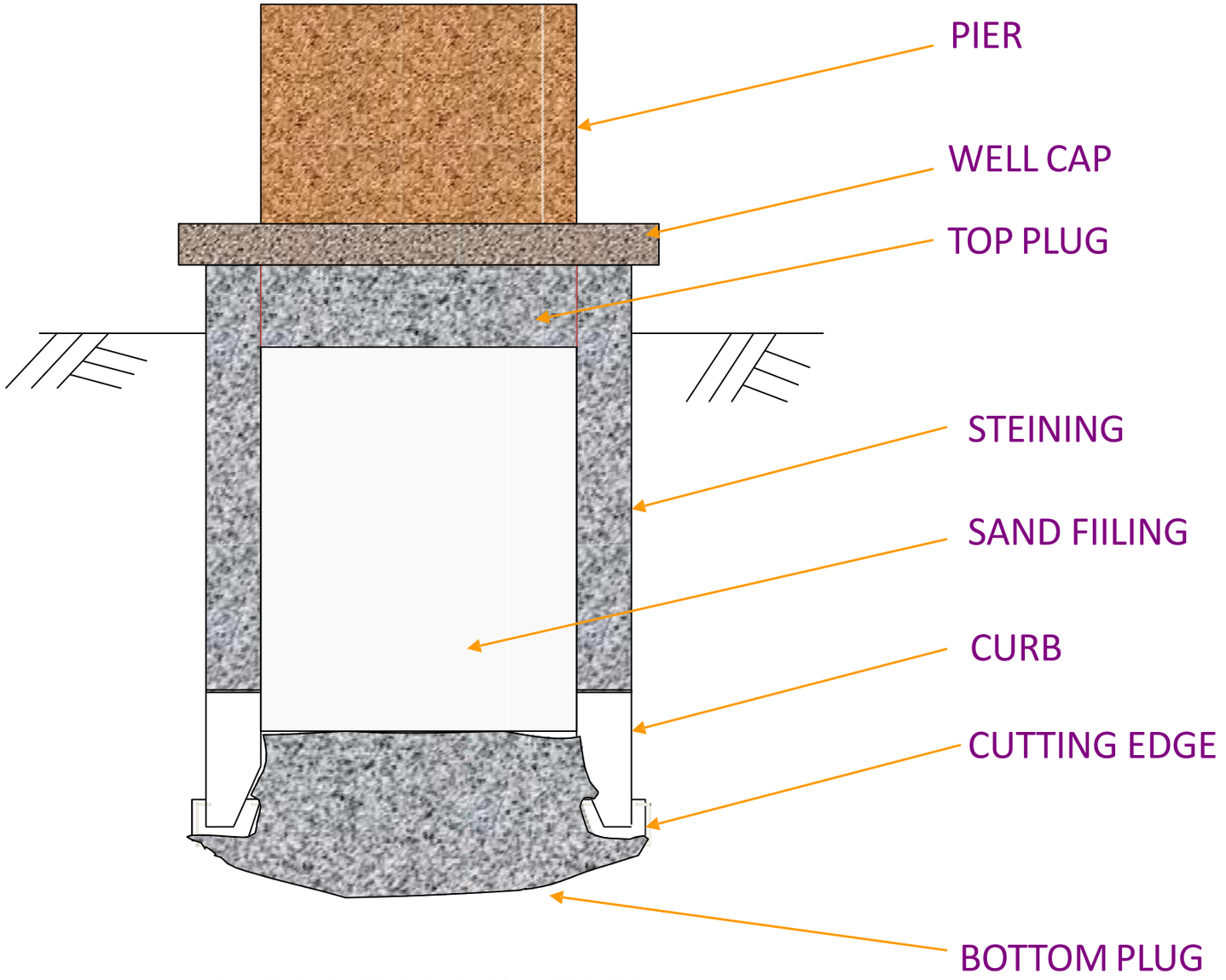


Types of well shapes:

- Circular well
- Rectangular well
- Double Rectangular well
- Double Octagonal well
- Double – D well
- Twin circular well



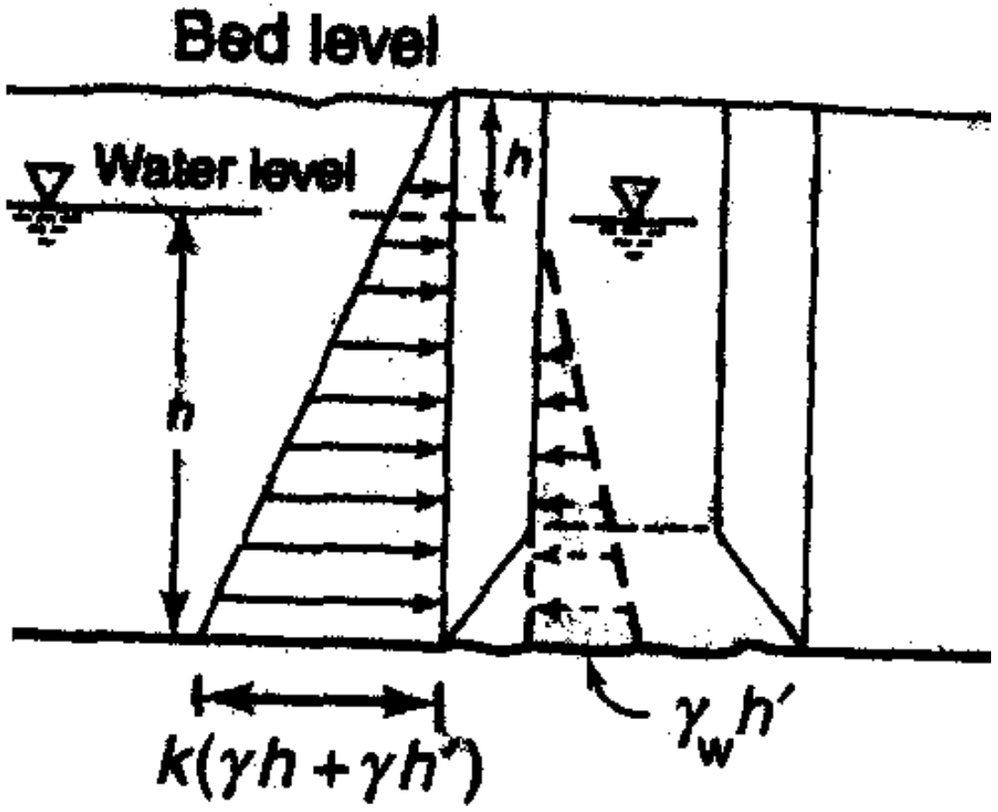
Components of well foundation



WELL FOUNDATION

Steining

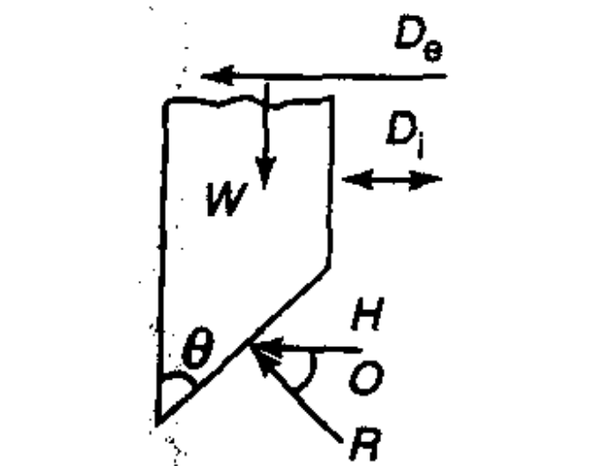
- Walls of the wells are known as **steining.**
- Made of brick masonry, stone masonry, plain or reinforced concrete.
- The design of steining reinforcement rely on skin friction & unit weight of well.
- The thickness of steining is designed in such a manner that all platforms of well are sunk under its own weight.



Pressure distribution on steining

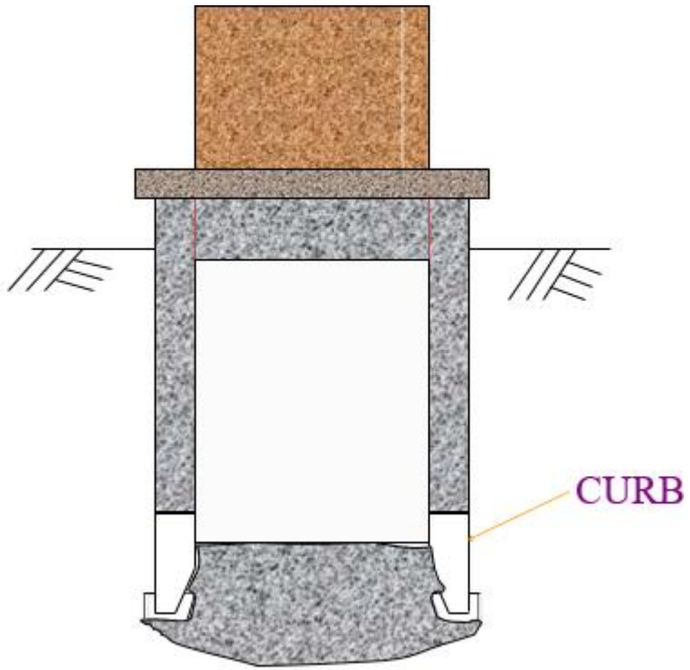
Curb

The curb of a well transfers all the superimposed loads to the soil through the cutting edge while sinking. The material used for curbs may be timber or RCC. The forces acting on well curb are shown in Figure.



D_e – external diameter
D_i – internal diameter

Force acting on curb



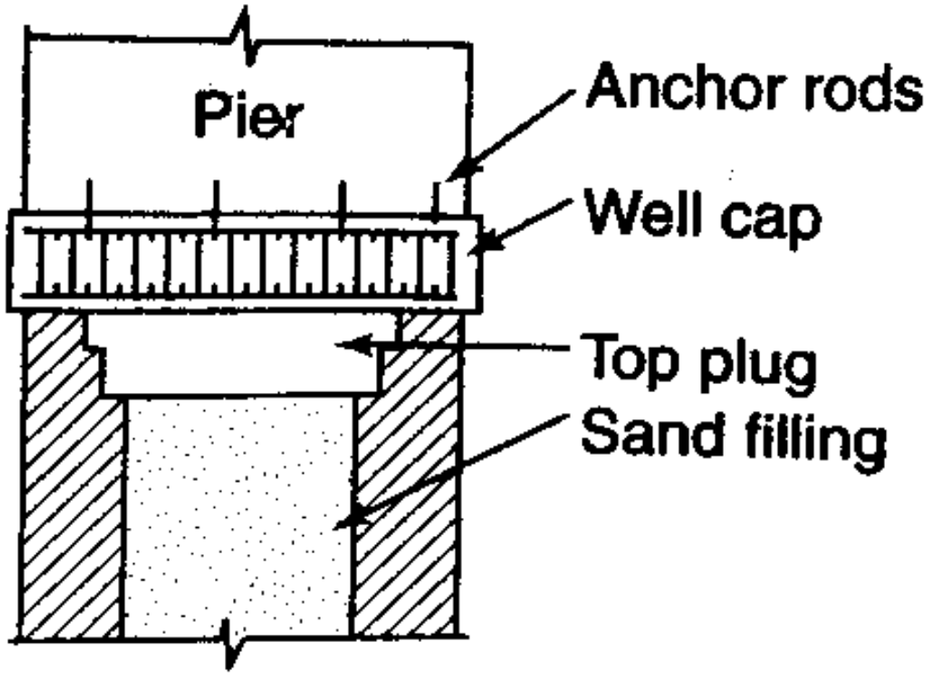
WELL FOUNDATION

Sand Filling

The bottom plug concrete is cured and after curing, the well is filled with sand in saturated condition. Sand filling provides

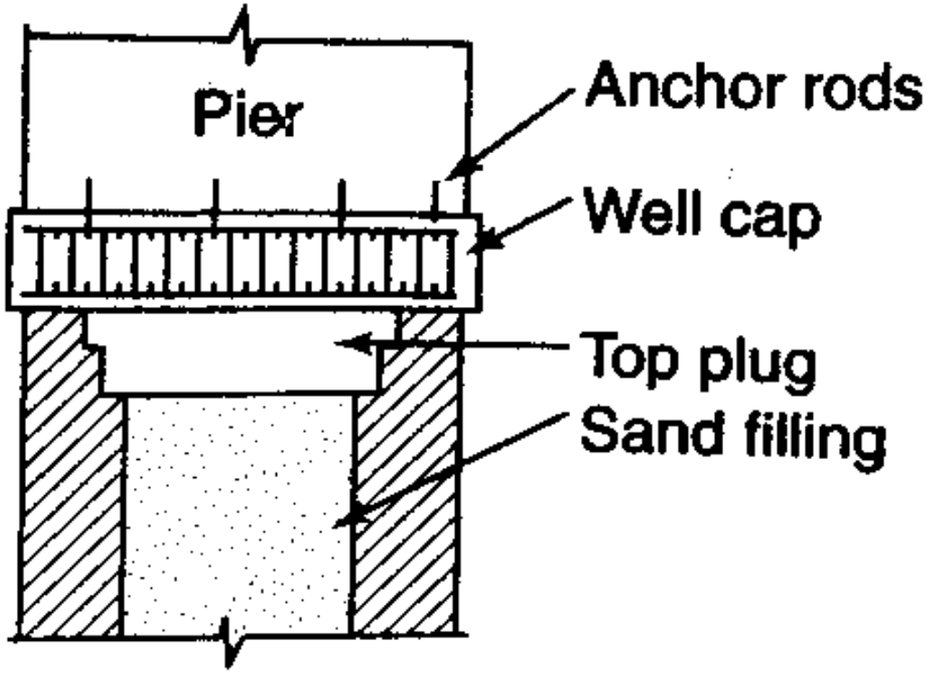
1. Stability to the bottom of the well.

2. Eliminate the tensile forces at the base.



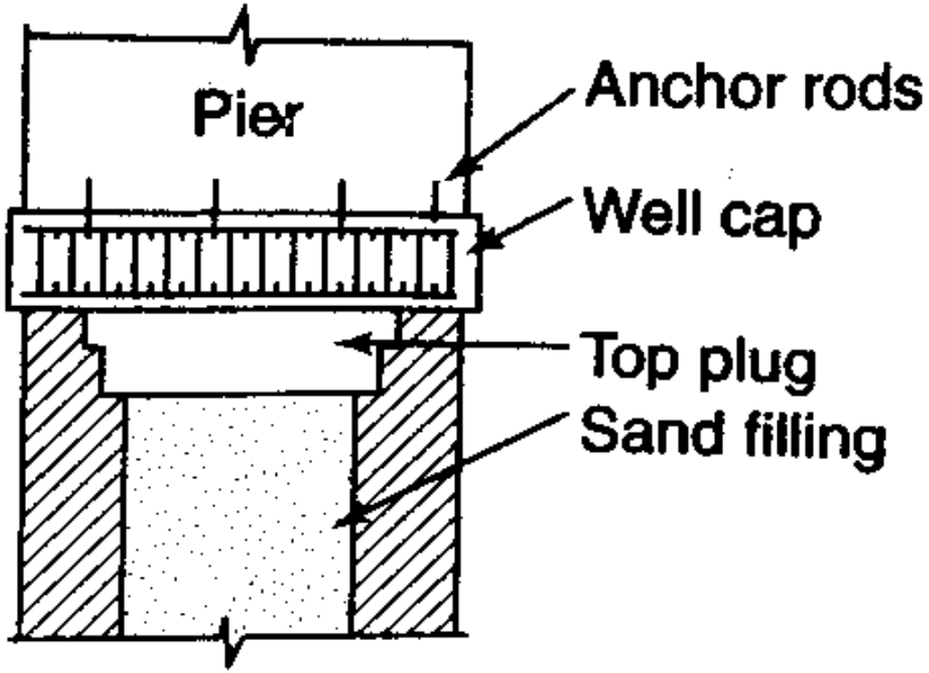
Top Plug

- The top plug is provided after the filling is completed.
- Top plug helps in transferring the load of the pier and superstructure to the stening.
- The thickness of the top plug is generally kept greater than 50% of the smaller dimension of the dredge hole.
- If the sand filling is used, the top plug is simply constructed using PCC of 1:2:4 otherwise it is reinforced with steel bars and lean concrete of 1:3:6 is used.

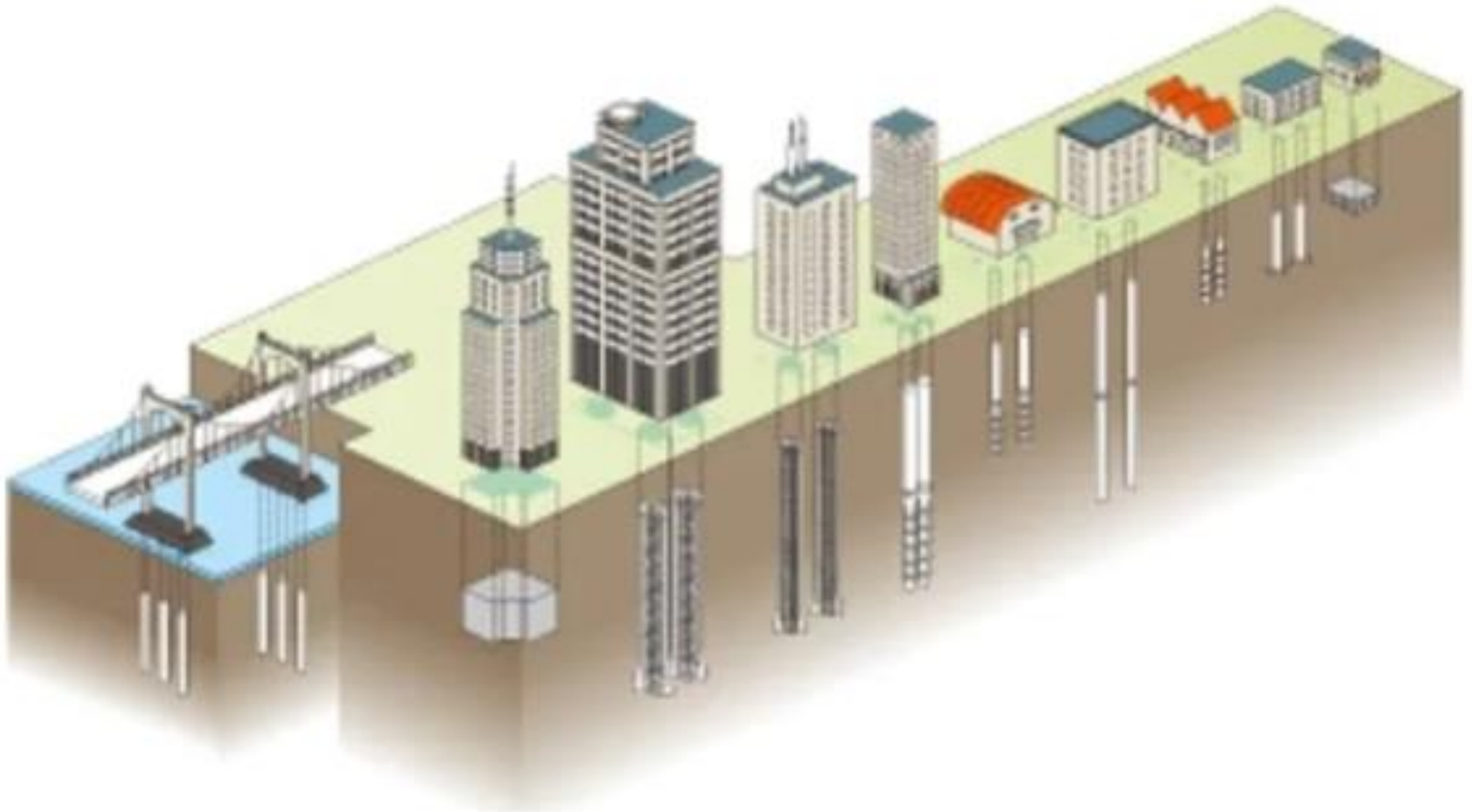


Well Cap

- Well cap is constructed as a slab resisting on the well it is used to transfer the load of pier to the well.
- As the shape of the well pier and cap are different the well cap forms an interim layer to accommodate the pier.
- The well cap is so designed that the base of the pier is provided with a minimum all round offset.
- The centre of the well cap is made to coincide with that of the pier and not with that of the well.
- Such positioning nullifies the effect of the minor shifts which might have occurred during well sinking.



THANKYOU



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