

Well and caisson sinking , Cofferdam

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Contents

#CASSION OR WELL FOUNDATION

- Introduction
- components of well foundation
- shape and size
- depth of well foundation
- construction of well foundation
- tilting and shifting

#COFFER DAM

- introduction
- types of coffer dam
- Criteria for Selection
- Advantages and disadvantages



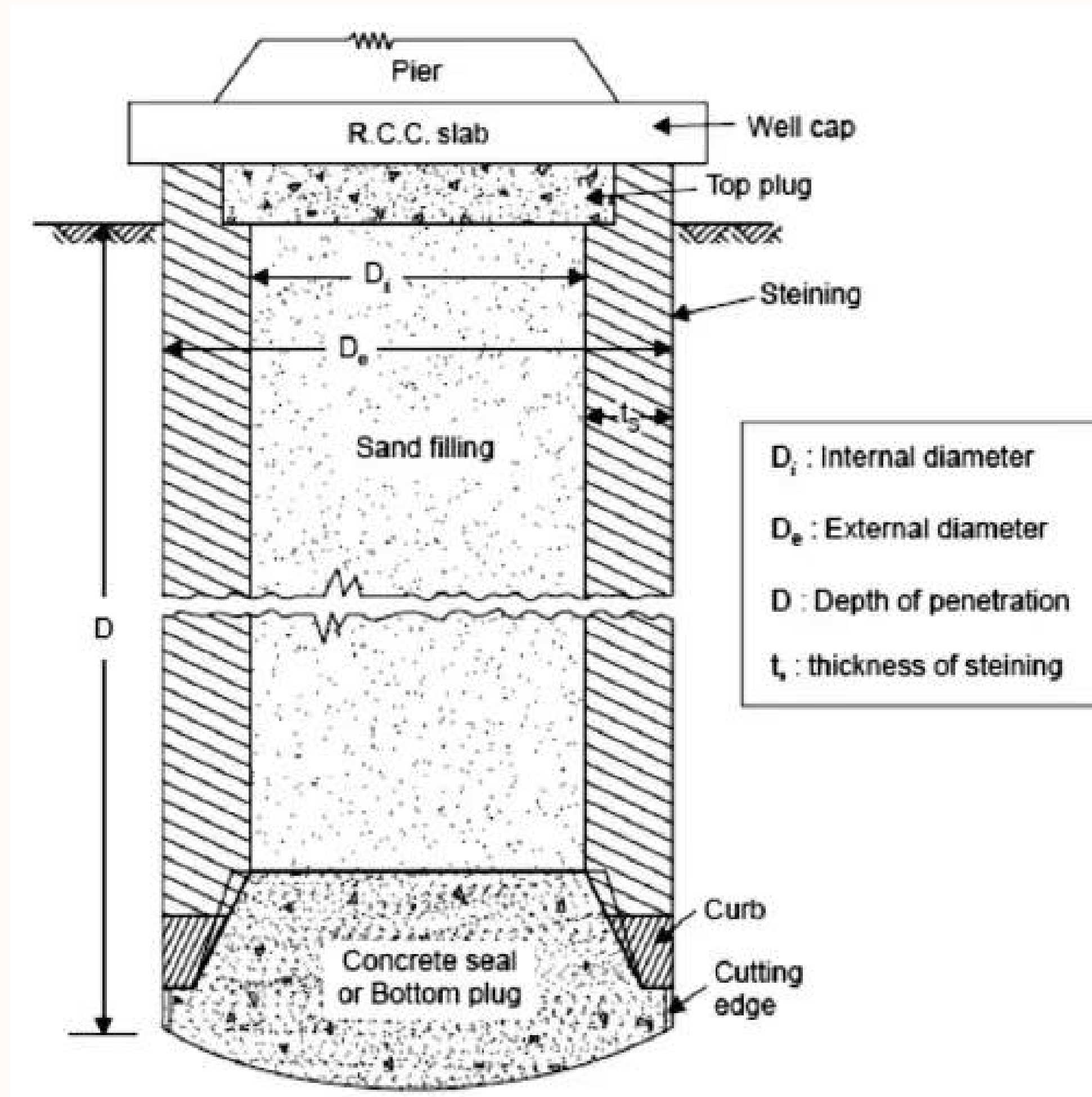


Well foundation

Well foundation is a type of deep foundation which is generally provided below the water level for bridges. Cassions or well have been in use for foundations of bridges and other structures since Roman and Mughal periods. The term 'cassion' is derived from the French word *caisse* which means box or chest. Hence cassion means a box like structure, round or rectangular, which is sunk from the surface of either land or water to some desired depth.



COMPONENTS OF WELL OR CASSION FOUNDATION



CUTTING EDGE

the function of the cutting edge is to facilitate penetration or sinking into the soil to the desired depth .



CURB

the well curb is a transition member between the sharp cutting edge and the steining . it is tapering in shape .



STEINING

the steining is constructed with brick or stone masonry or with plain or reinforced concrete . it transfers load to the subsoil .

BOTTOM PLUG

after the well foundation is sunk ,a thick layer of concrete is provided at bottom inside well , this layer is called bottom plug.

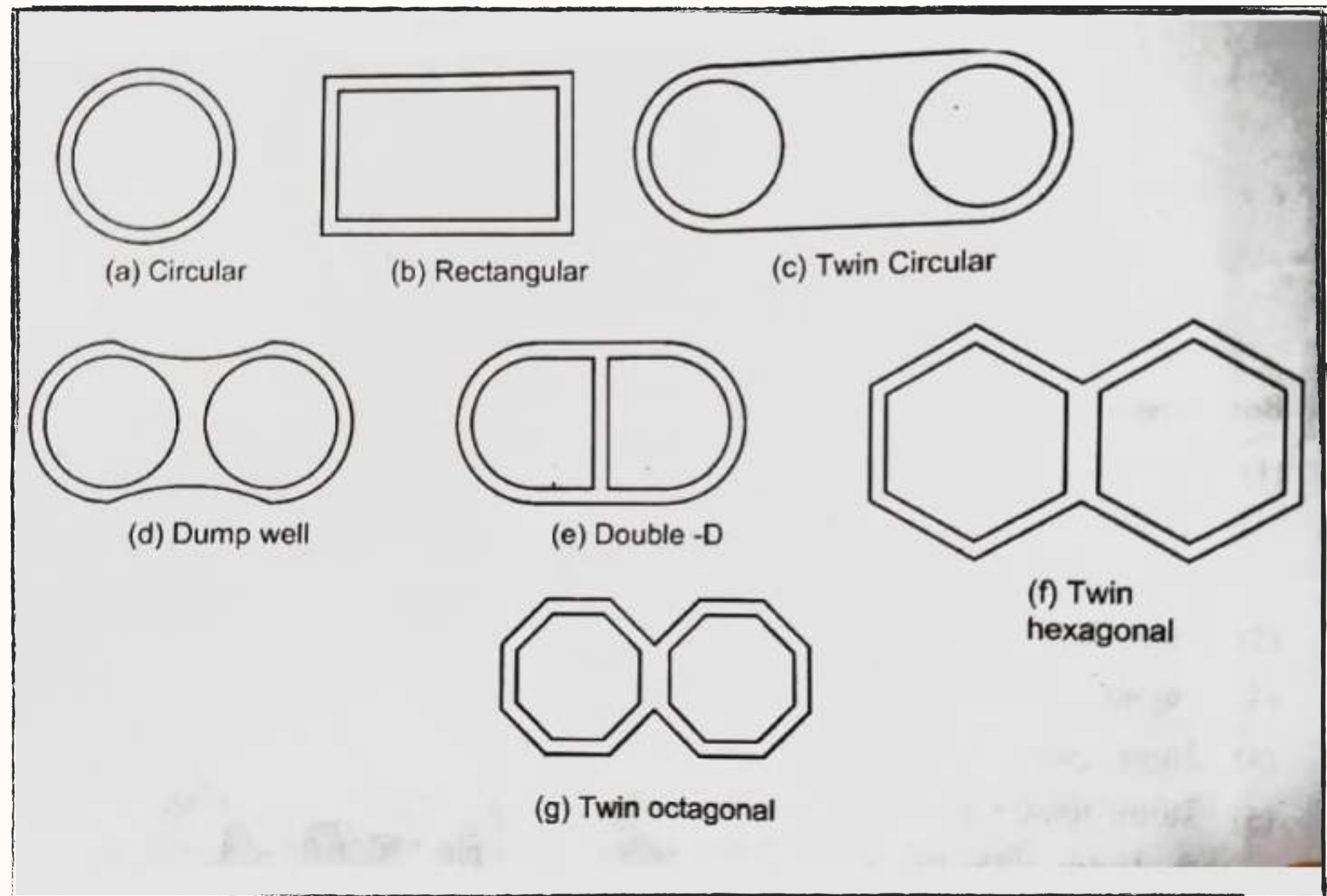
TOP PLUG

after the well is filled with sand a top layer of concrete is placed. this is known as top plug.

WELL CAP

the well cap serves as a bearing pad to superstructure. it distributes the superstructure load onto well steining uniformly.

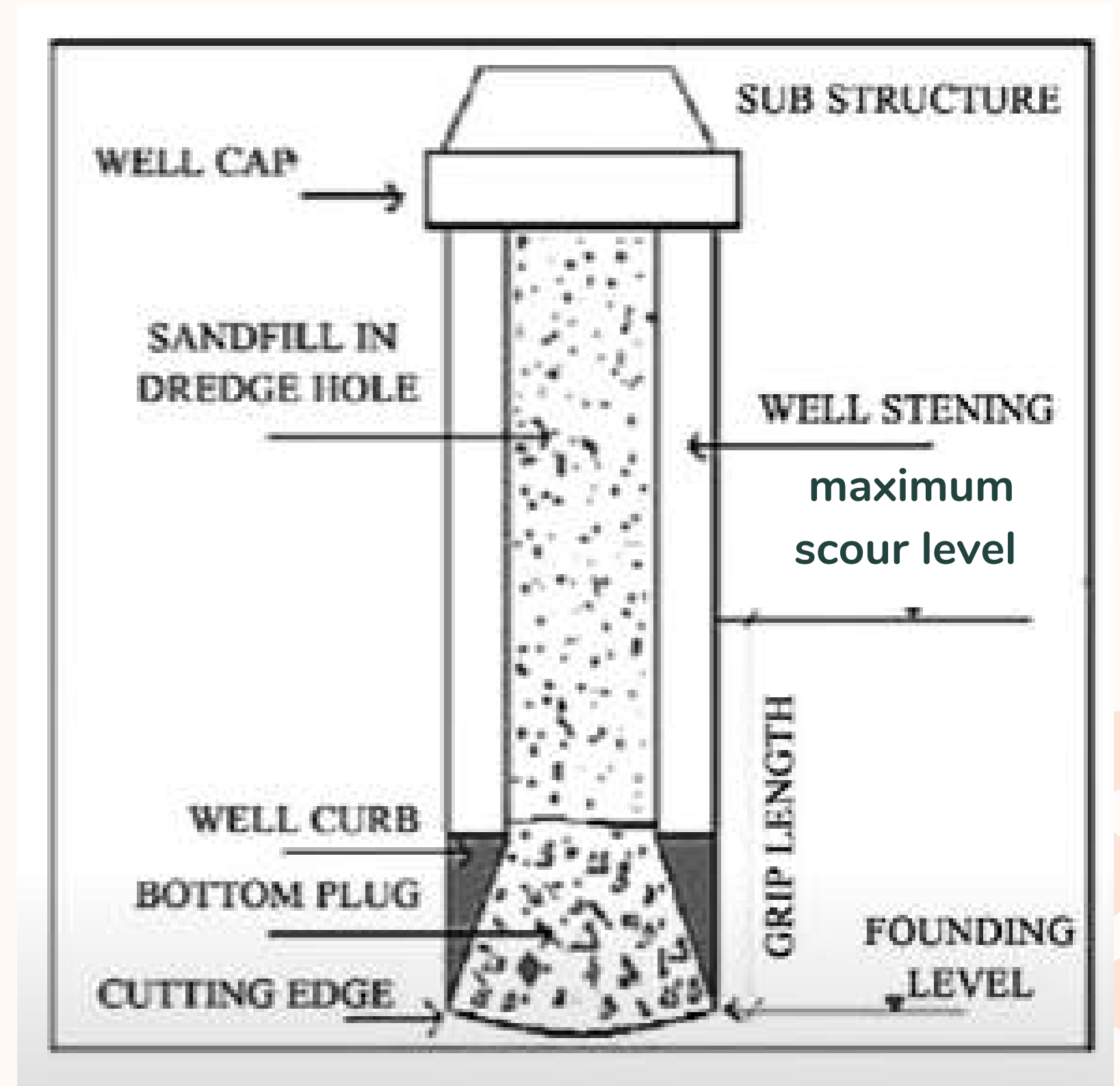
SHAPE AND SIZE



DEPTH OF WELL FOUNDATION

Depth depends on following two factors

1. minimum grip length below the scour depth
2. base pressure to be within permissible limits

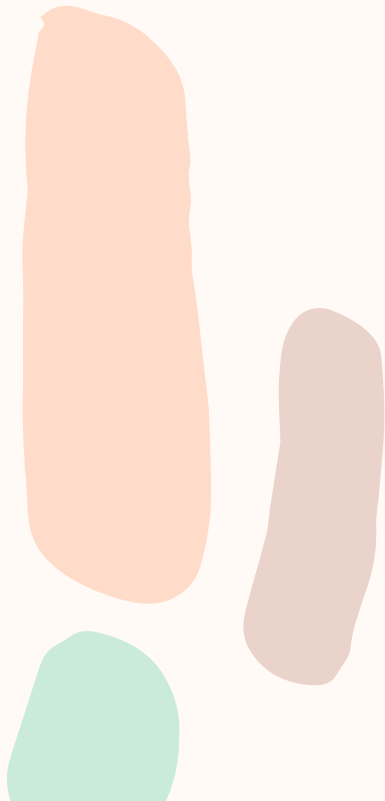




CONSTRUCTION OF WELL FOUNDATION

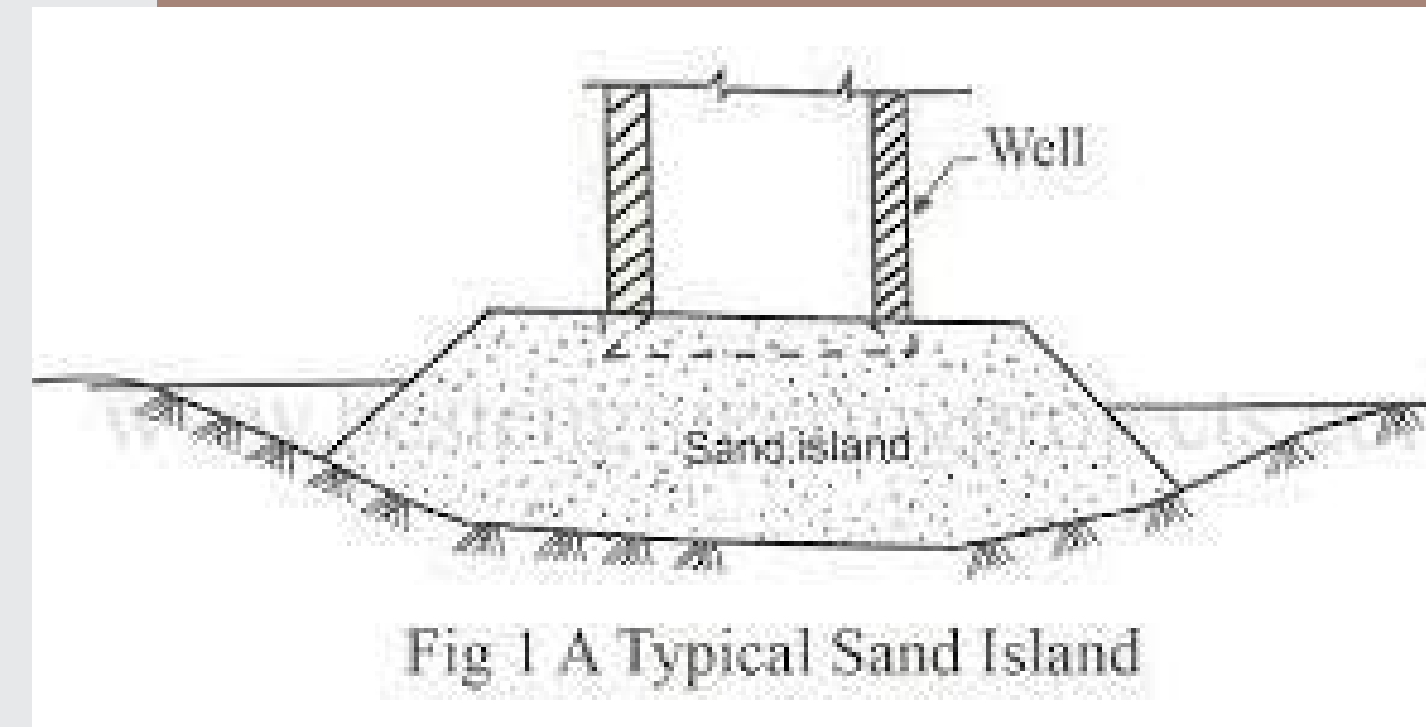
Well foundation are constructed in stages by sinking under self-weight as well as dredging the soil inside the dredge hole.

stages for construction

- laying the cutting edge
 - alignment control
 - construction of well curb
 - construction of well steining
 - well sinking
- 

laying the cutting edge

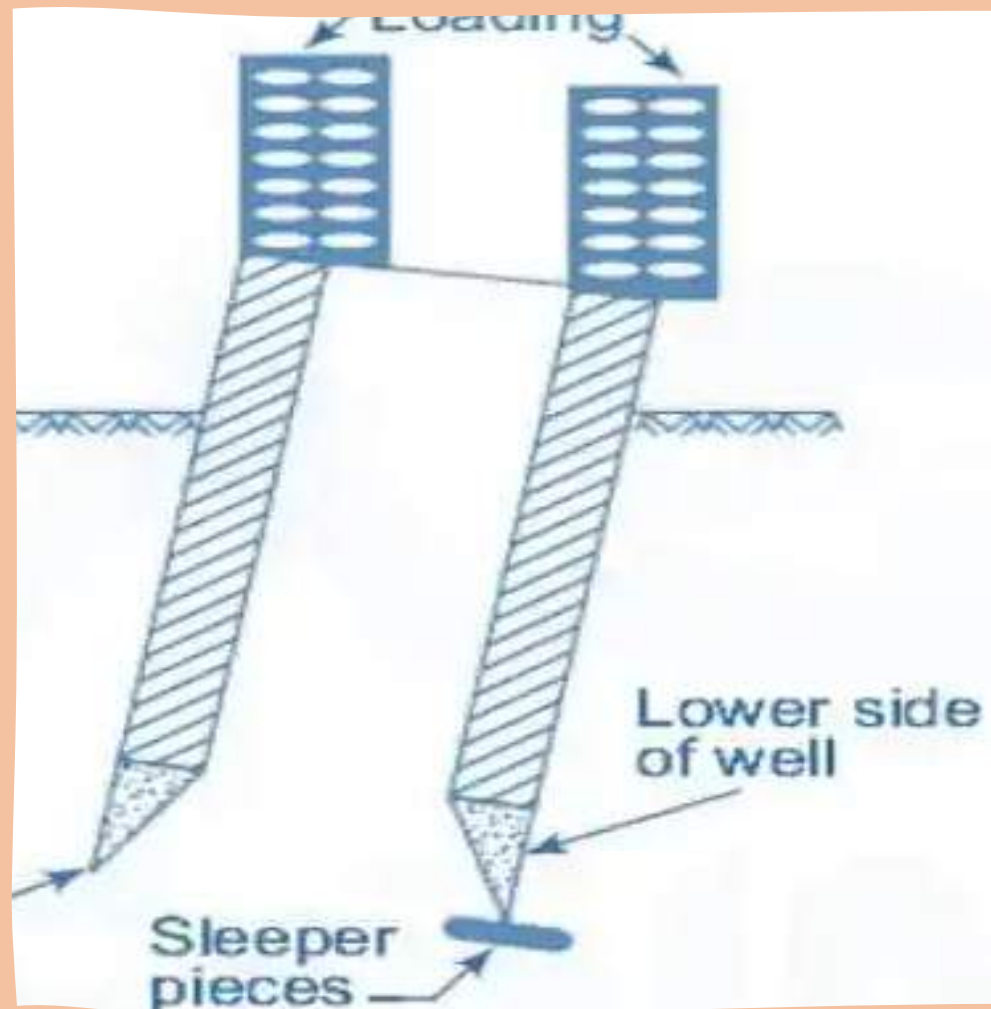
- if the river bed is dry the cutting edge is placed in position after removing the top loose layer of sand about 15cm .
- when the depth of water is up to 5m a temporary structure , known as sand island is made before placing the cutting edge and curb. the size of island should be large enough to accommodate the well with adequate working space all around.
- if the depth of water is more than 5m , the cutting edge and the well curb are fabricated on the shore and dragged to the sand island for installation .



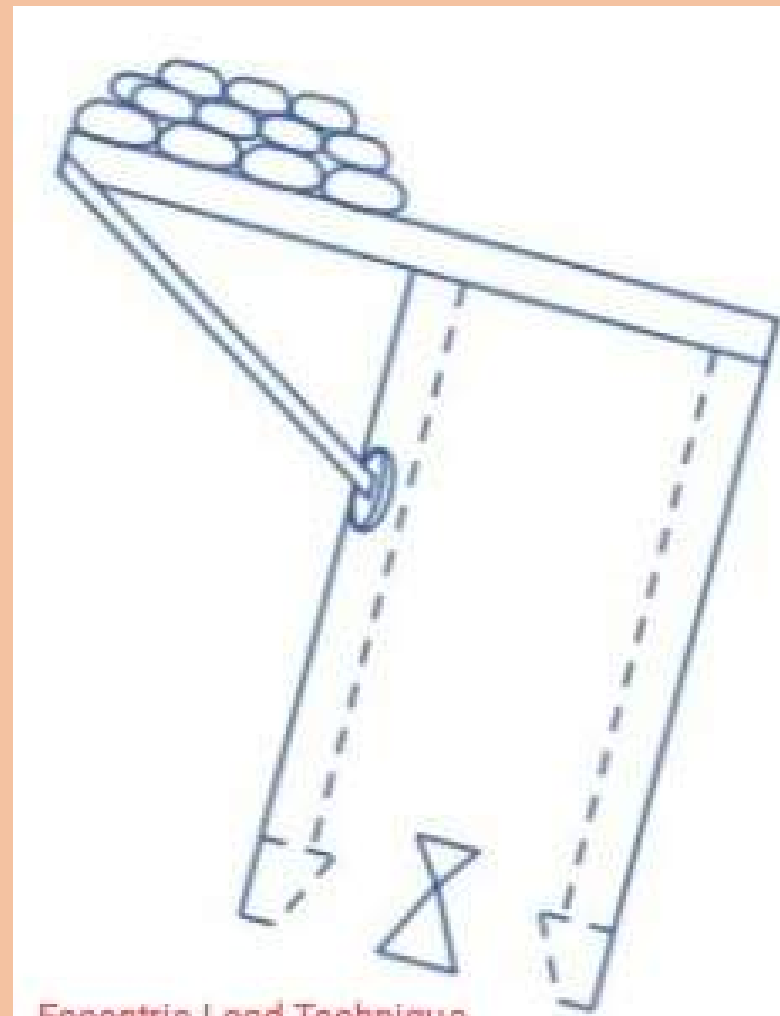
Shifting and Tilting of Well Foundations

- When the well is moved away horizontally from the desired position, it is called shifting of the well foundation.
- When the well is sloped against vertical alignment, it is called tilting of the well foundation.

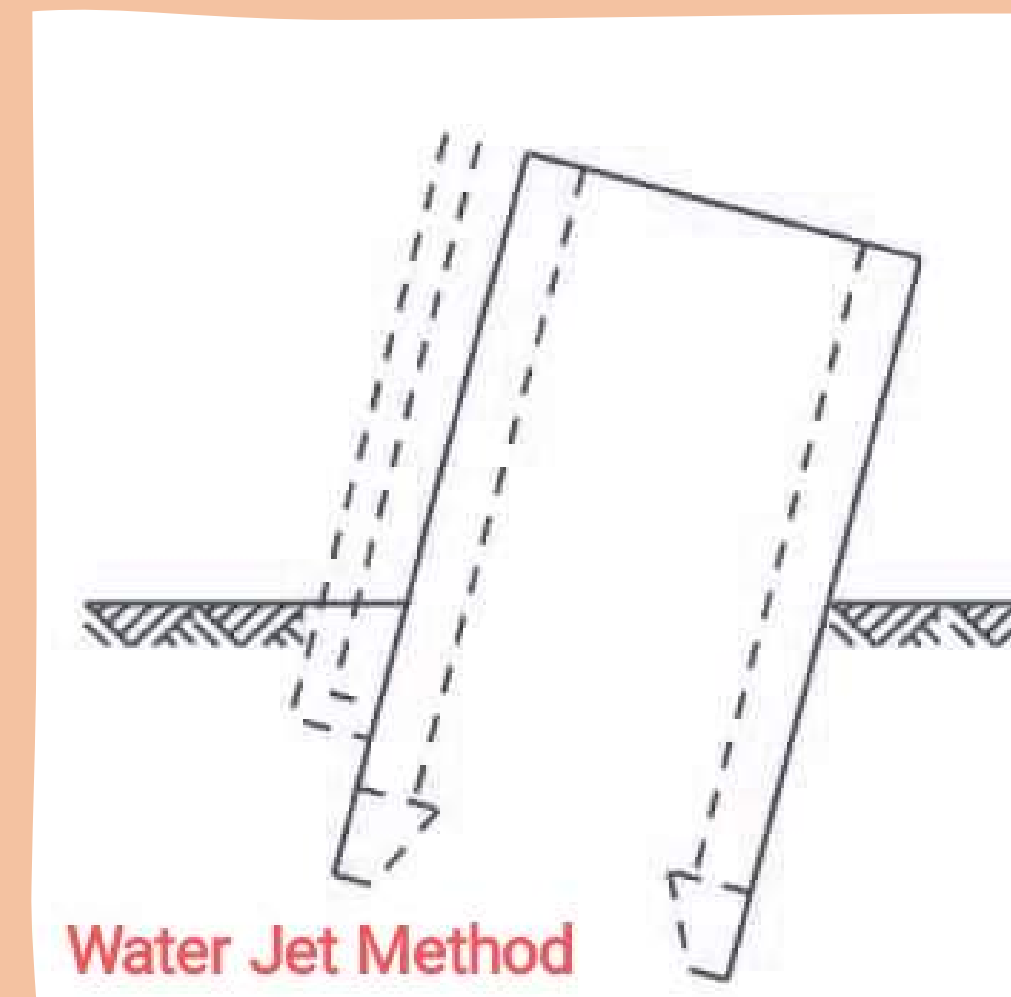
Rectifying Methods



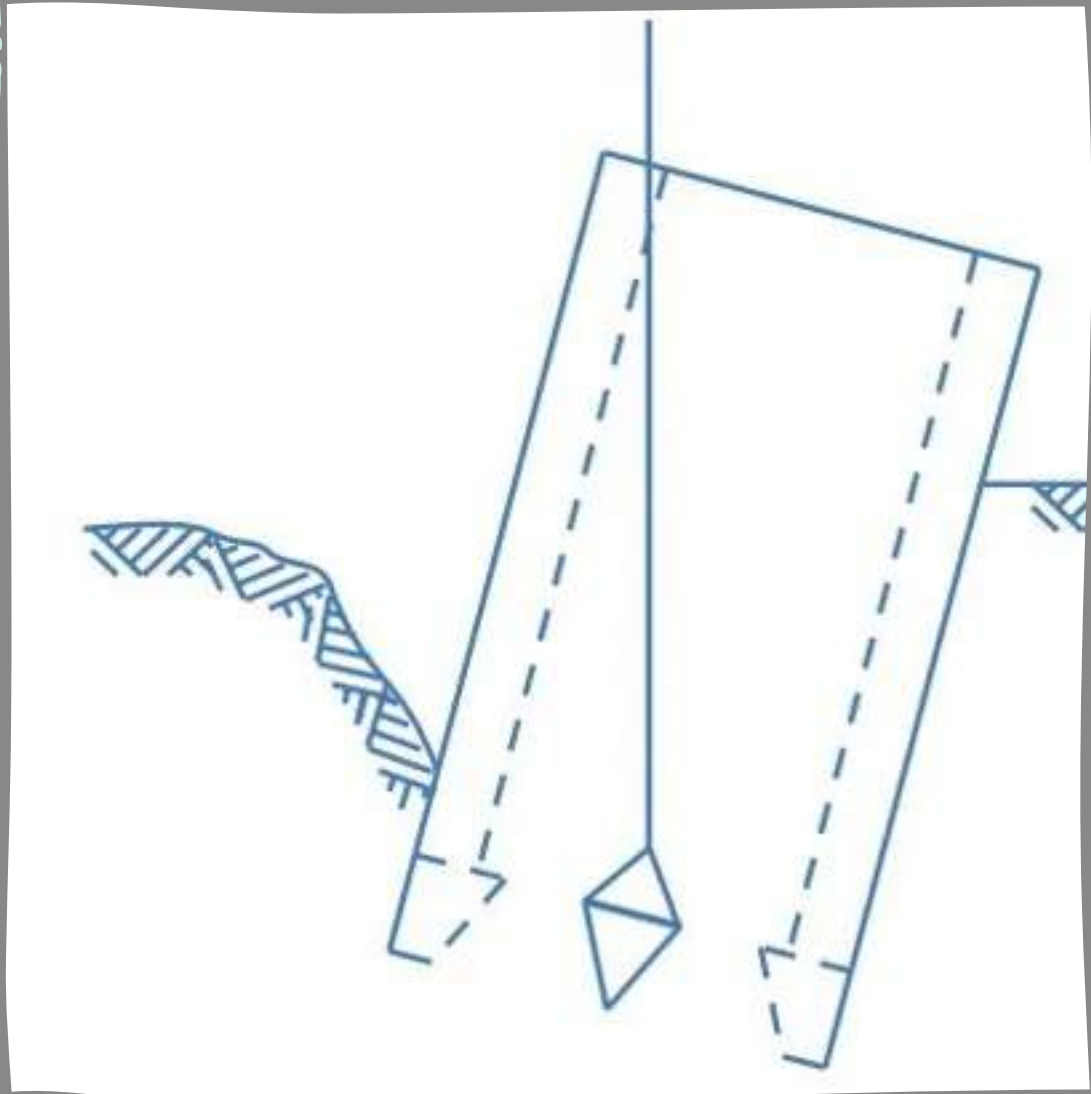
**Wood sleeper under
cutting edge**



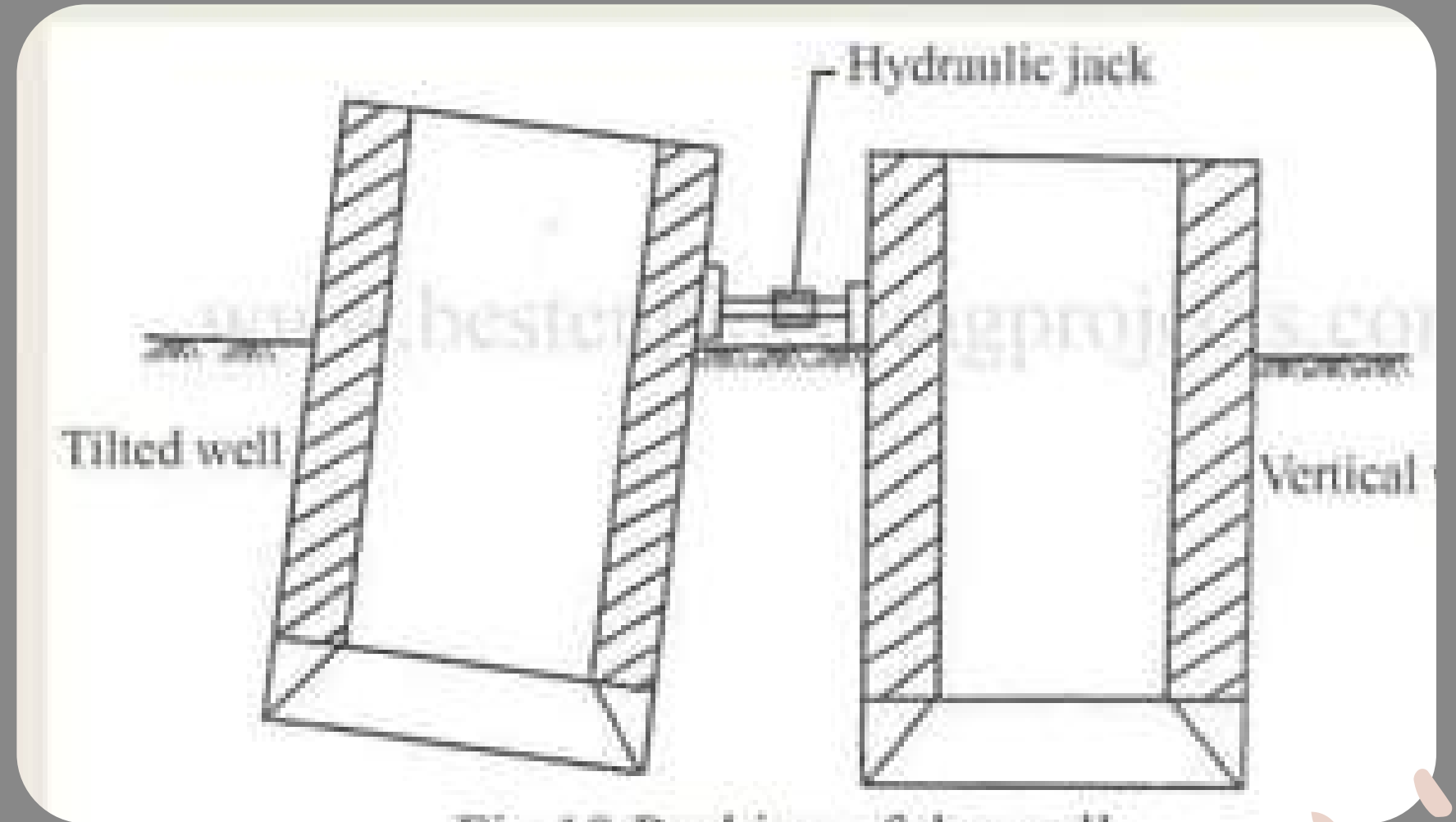
Eccentric loading



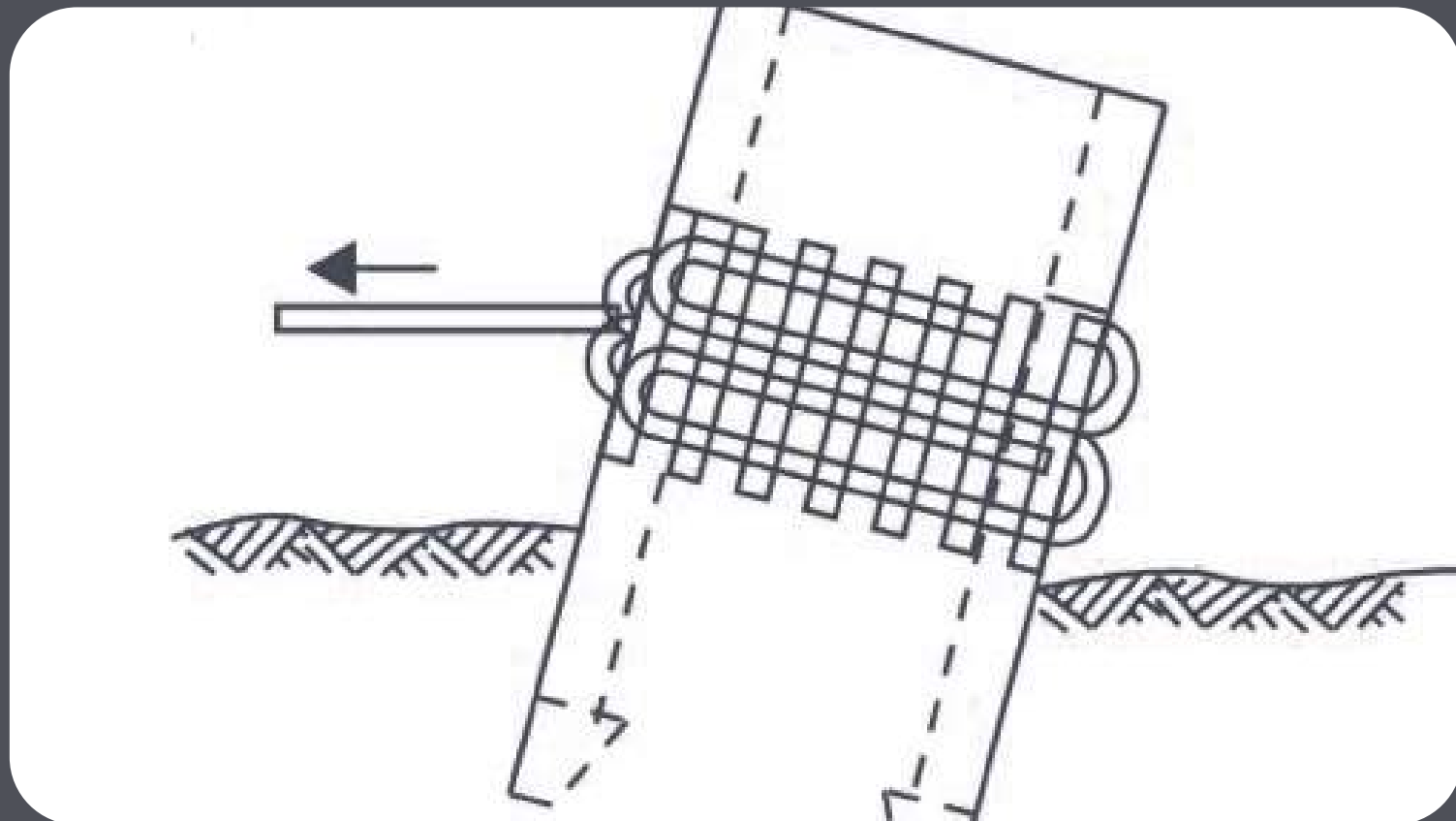
Water jetting



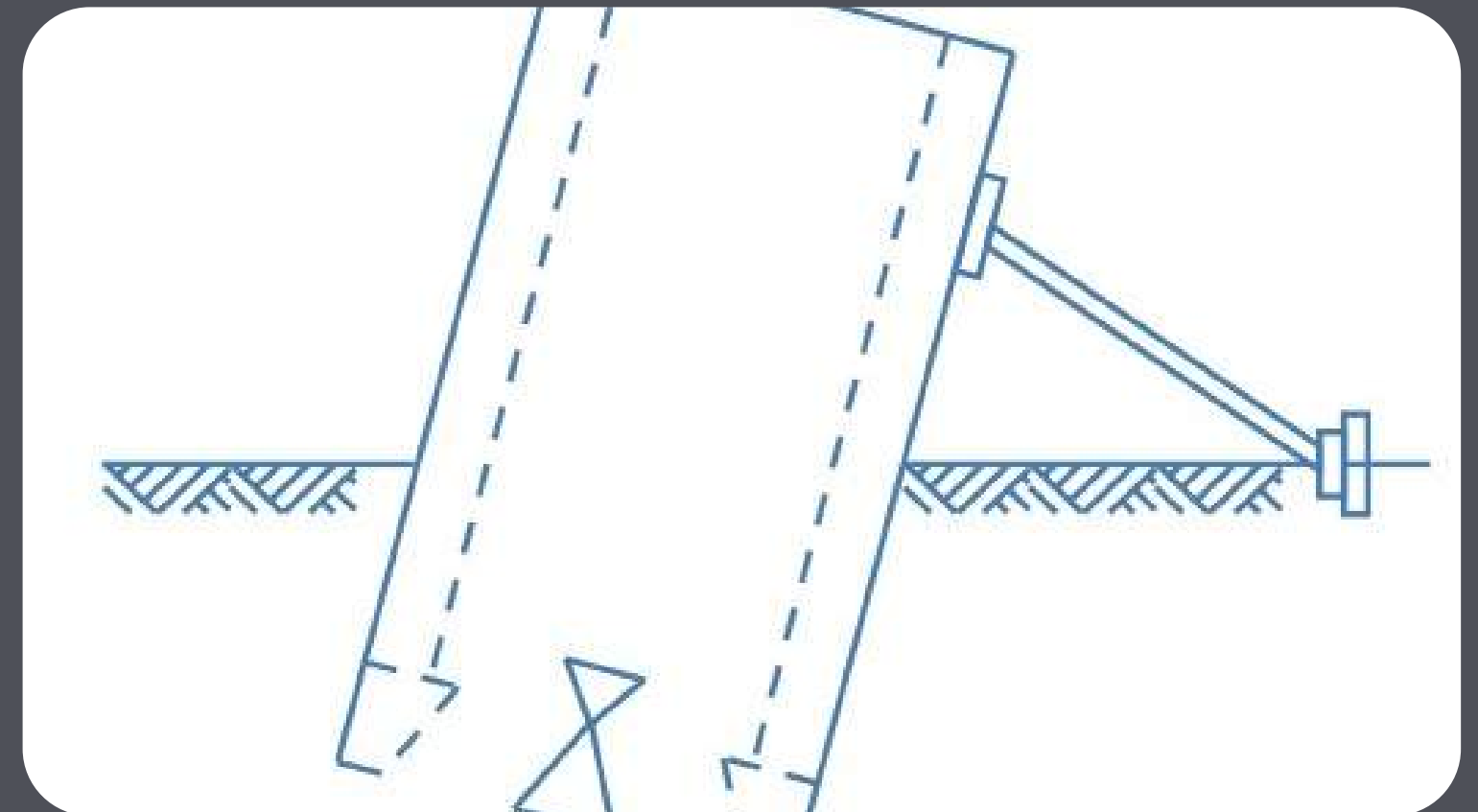
Excavation on higher side



Using hydraulic jacks



Pulling the well



Using struts

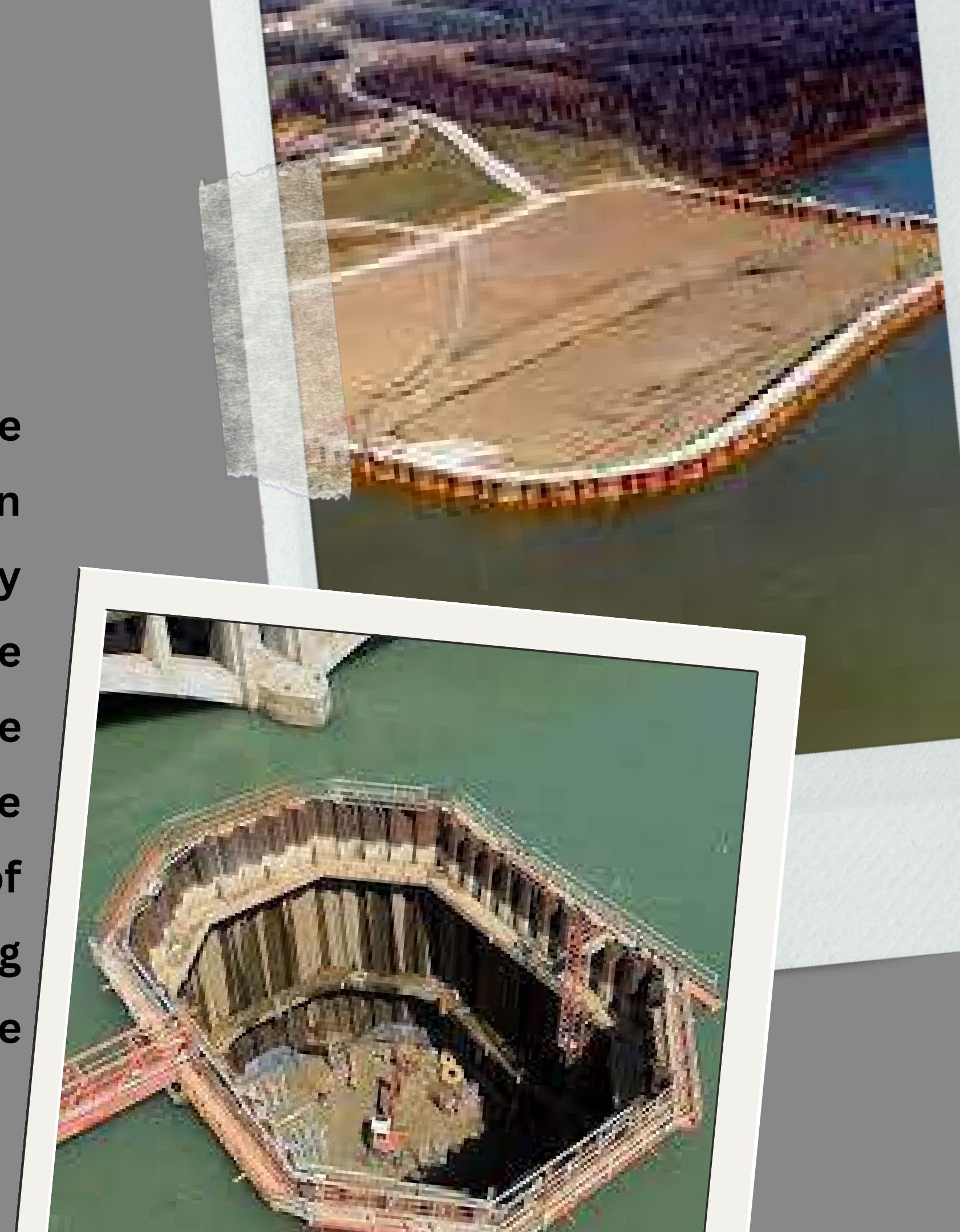


COFFER DAM



COFFER DAM

Cofferdam can be defined as the temporary structure that is built to keep the water away from the execution site, so that the structure can be built on the dry surface. The cofferdams should have walls that exclude water from building site. For this the walls must be water proof and the height of the wall must be more than the maximum water level. These types of cofferdams are preferred where the area of building site is large and the dry soil bed is at reasonable depth. The height of the dam is can be up to 3m.



TYPES OF COFERDAMS

- **Earthen cofferdam**
- **Rockfill cofferdam**
- **Single-walled cofferdam**
- **Double-walled cofferdam**
- **Cellular cofferdam (Circular or diaphragm type)**





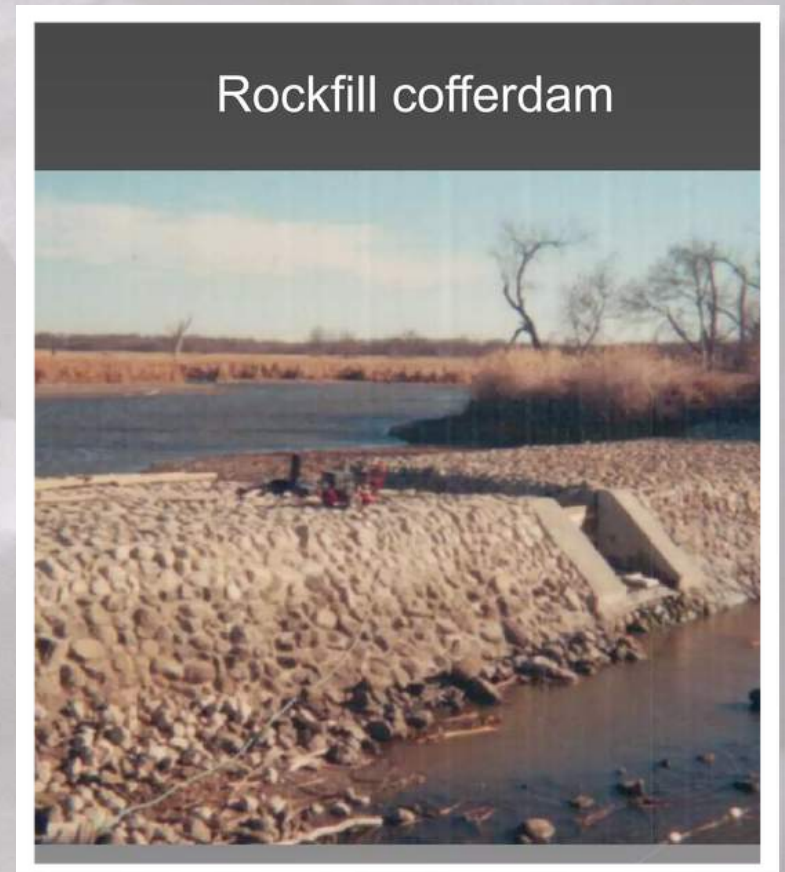
Earthen Cofferdam

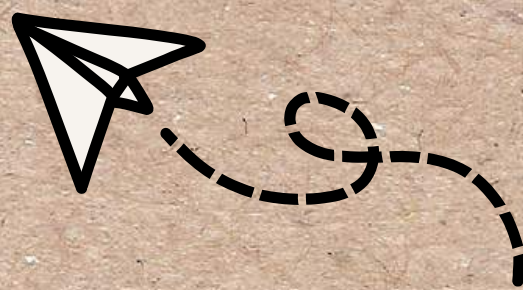
Earthen cofferdams are constructed at the place where the height of the water is less say 3m and the current velocity is low. These dams are built using the local available material such as clay, fine sand or even soil. The height of the dam is kept 1m more than that of max water level. The slope is usually given but 1:1 or 1:2.



Rockfill Cofferddam

Rock-fill cofferdams are better than that of earthen dams. These dams are preferred when the rock is available easily at the construction site. These dams are very pervious, to prevent water from seeping an impervious membrane of soil is provided in the dam. The slope can be maintained at 1:1.5 to 1:1.25.





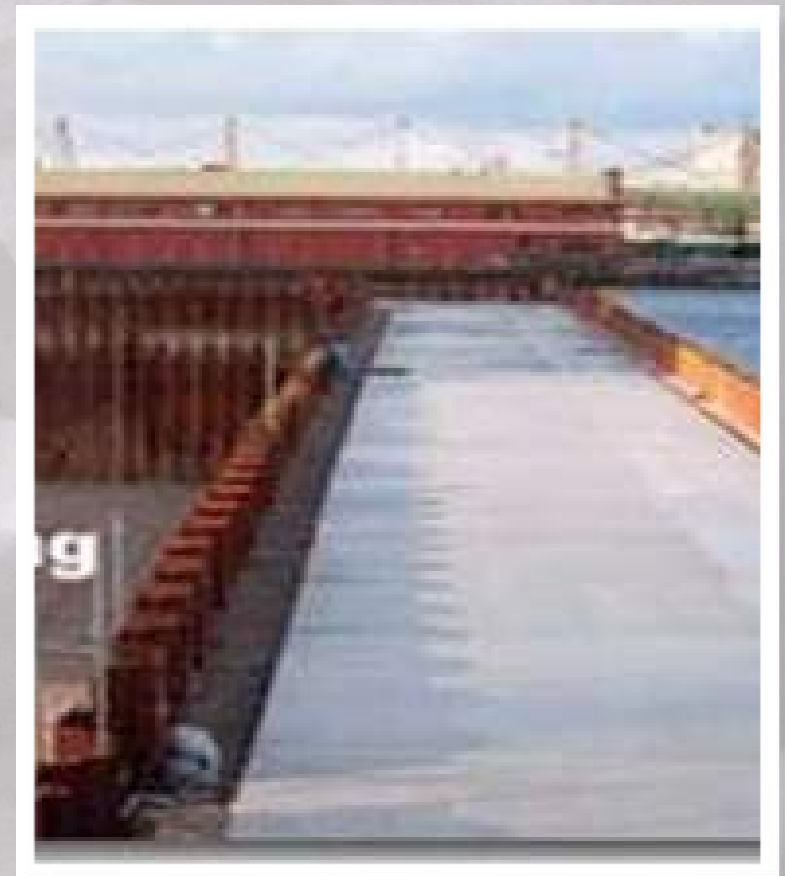
Single-Walled Cofferdam

single-walled coffer dams are primarily built by driving steel sheets into the inside as a support layer after driving timber sheets into the exterior as guide piles. In situations where the water is deep, guide piles may be steel sections.



Double-Walled Cofferdam

Double-walled cofferdams consist of two straight, parallel vertical walls of sheet piling coupled together, with the space between them filled with soil. If the height is greater than 3 mtr, double wall sheet piles must be strutted as illustrated in the figure.



Cellular Cofferdam

Cellular cofferdam is made by driving straight web steel sheet piles, arranged to form a series of interconnected cells. The cells are constructed in various shapes and styles to suit the requirements of site. Finally, the cells are filled with clay, sand or gravel to make them stable.



(i) Circular Type



(ii) Diaphragm Type

Criteria for Selection of Cofferdam Types

- Depth of water
- Depth and size of excavation
- Soil type
- Velocity of flow in waterway
- Tide levels
- Risk of damage by floating debris or ice
- Availability of construction materials
- Ease of transportation of construction materials



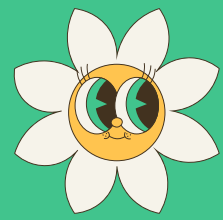
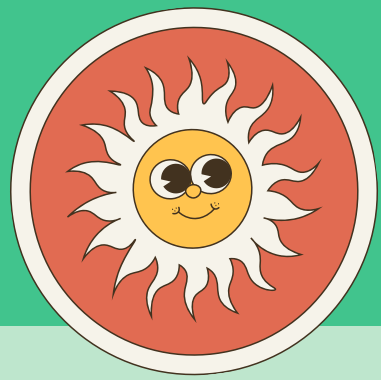
Advantages of Cofferdams

- Permit excavation and construction of structures in an otherwise poor environment.
- It will provide a safe environment to work.
- Materials can typically be reused for other projects.

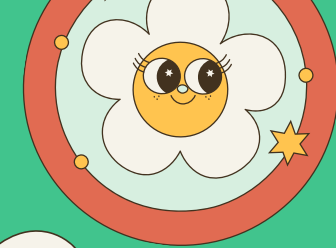
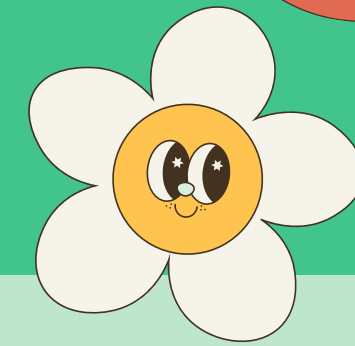


Disadvantages of Cofferdams

- **Special and expensive equipment is needed.**
- **Expensive.**
- **It is a very time-consuming and boring process of construction.**
- **If rushed, sheets can be driven out of locks or out of plumb.**
- **When in flowing water, 'log jams' may occur creating added stress on the structure.**



QUESTIONS



Q1. Which type of foundation is well foundation?

Q2. Which shape is best for well foundation and why?

Q3. What is grip length in well foundation?

Q4. What is the maximum height of a cofferdam?

Q5. Name different types of cofferdam



THANK YOU ALL FOR YOUR ATTENTION

