Definition of Foundation

A foundation is the lowest part of the structure which provides a base for distributing load of the super structure

Purpose of Foundation

- To distribute weight of the structure over large area
- To prevent unequal settlement
- To provide a level surface
- To increase the stability of the structure by preventing overturning

Site Exploration

Study of site exploration can be broadly divided as:

- Purpose of site exploration
- Site inspection and preliminary investigation
- Methods of site exploration
- Depth and spacing of trial pits and bore holes
- Choice of method of exploration

Site exploration contd....

Purpose of Site exploration

- To fix the value of safe bearing capacity
- To select an economical and safe type of foundation
- To fix the depth of foundation
- To know the underground water level
- To forecast the difficulties

Site inspection and preliminary investigation

Information that are collected during inspection are:

- All neighbouring quarries
- The existing structure
- The type of soil
- Classification of soil
- Behaviour of the ground during the GWT
- Sub-soil water conditions

Methods of Site Exploration

- Test piles
- Probing
- Sub surface sounding
- Boring
- Geo-physical method

Bearing Capacity of Soil

The maximum load per unit area which the soil can carry without displacement.

Commonly used terms:

- Ultimate bearing capacity
- Safe bearing capacity
- Net pressure intensity

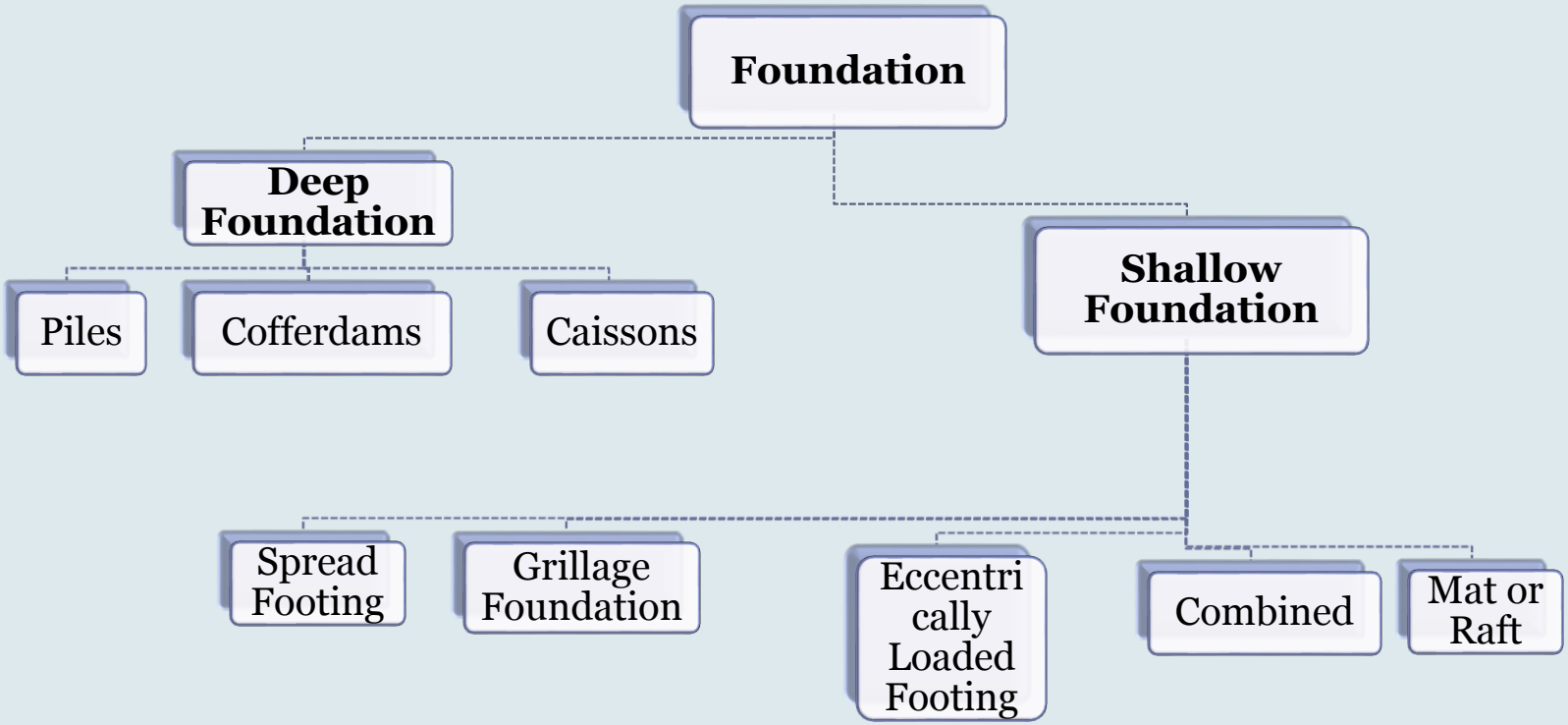
Safe Bearing Capacity of Soil

Types of Soils	Safe Bearing Capacity (KN/m^2)	Safe Bearing Capacity (Kg/cm^2)
Coarse sand , compact and dry (with GWT at a depth greater than width of foundation below the base of footing)	450	4.5
Coarse sand , compact and dry	250	2.5
Fine sand, silt	150	1.5
Fine sand, loose and dry	100	1

Methods of Improving Bearing Capacity

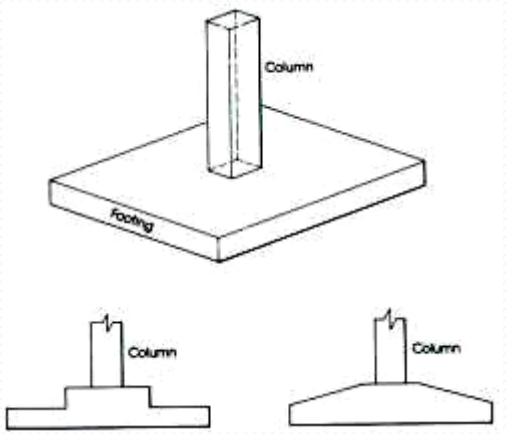
- Increasing the depth of footing
- Drainage
- By blending granular material
- By confining the soil in an enclosed area
- By driving sand piles

Types of Foundation

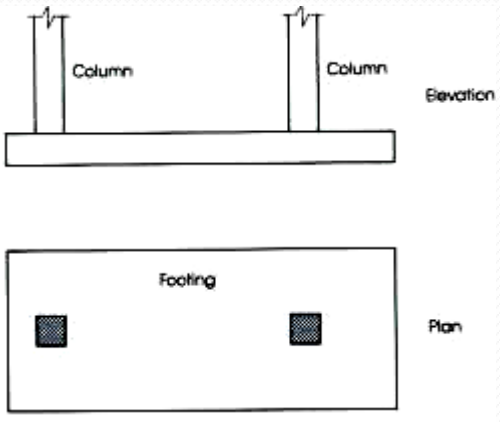


SHALLOW FOUNDATION

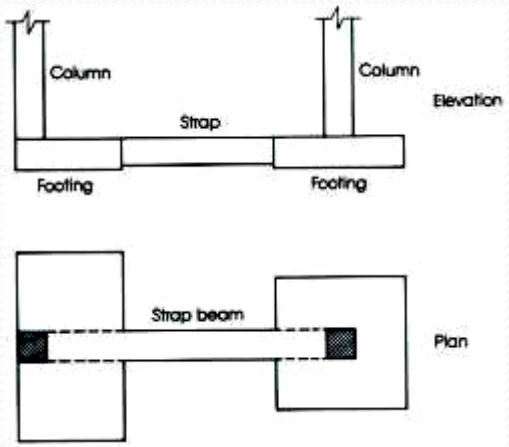
SHALLOW FOUNDATION



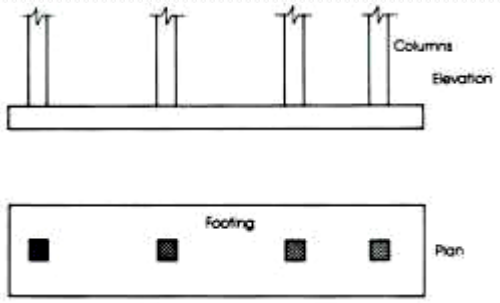
Isolated Column Footing



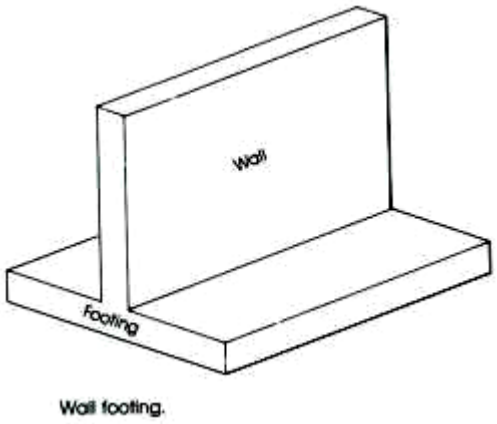
Combined Column Footing



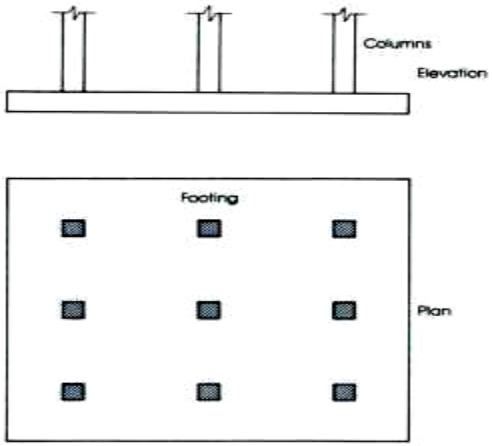
Cantilever



Continuous footings



Wall Footings



Mat (Raft) footings

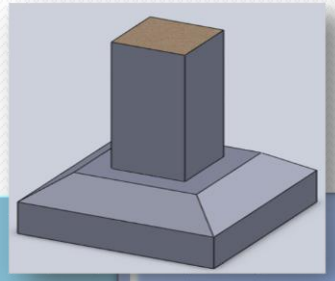
Depth of Foundation depends on:

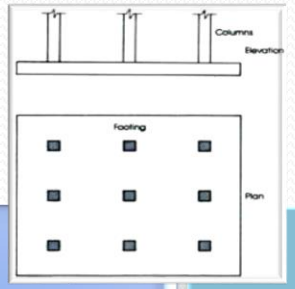
1 Load of structure

2. Soil Condition

3. Surroundings

Difference between Single footing & Mat foundation:





Single Footing

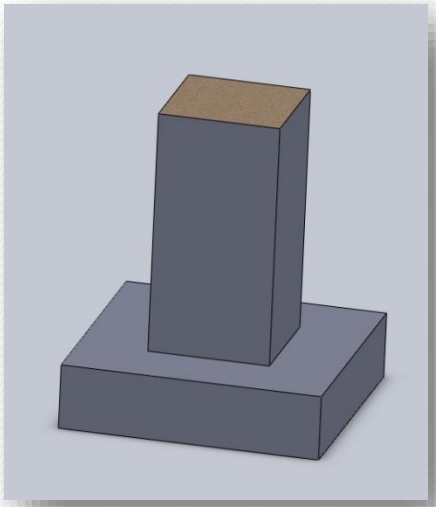
- Single footing is used for less load of total structure.
- Total area isn't excavated for single footing.
- Single footing cannot distribute the load to the total area uniformly.
- It is used when no basement is required.

Mat foundation

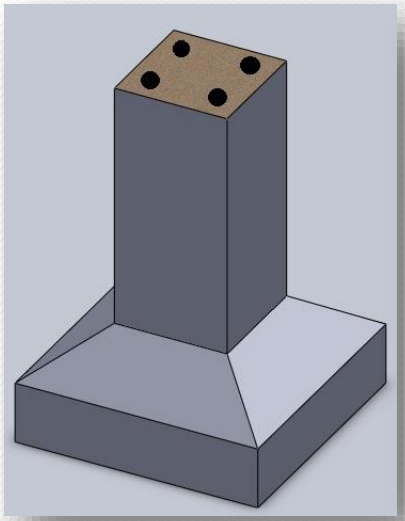
- Mat foundation is used for carrying huge load of structure.
- Total area is excavated for mat foundation.
- Mat foundation can distribute the load to the total area uniformly.
- Mat foundation is a mast for one or multiple basement.

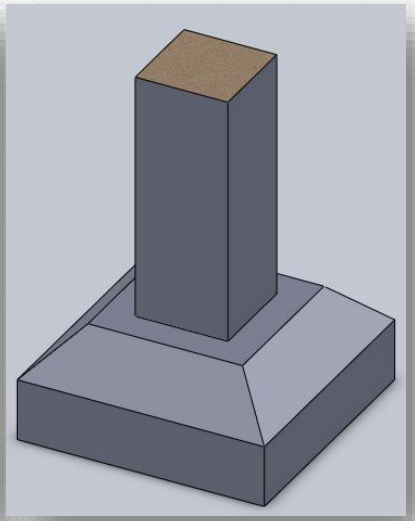
Single Footing

Types Of Single Footing

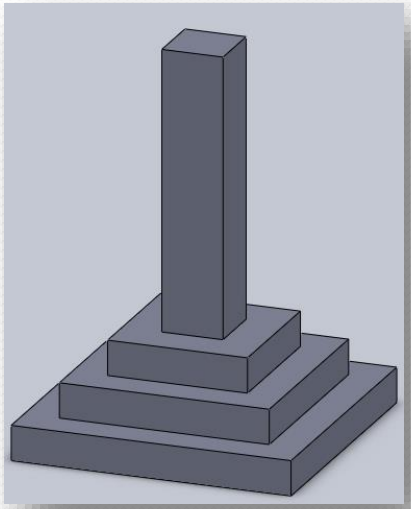


Simple/Spread Footing





Slopped/Tapered Footing



Stepped Footing

STEPS OF SINGLE FOOTING CONSTRUCTION:

1. Excavation
2. Leveling and Dressing
3. Brick flat soling
4. C. C. Layer
5. Reinforcement
6. Form work
7. Concrete Casting
8. Removal of form work
9. Curing
10. Back Filling

Locating the C.G of the footing for the column to be placed

Shuttering/Formwork

- Two types of formwork: 1. Steel and 2. Timber
- Can be re-used:
  - Steel: 10-15 times
  - Timber: 2-3 times
- Shuttering can be removed after 3 days.
- Shuttering must be:
  - Smooth inside
  - Leak Proof
  - Properly Aligned

Shuttering(contd.)

Steel Shuttering

Shuttering(contd.)

Wooden Shuttering

OTHER STEPS

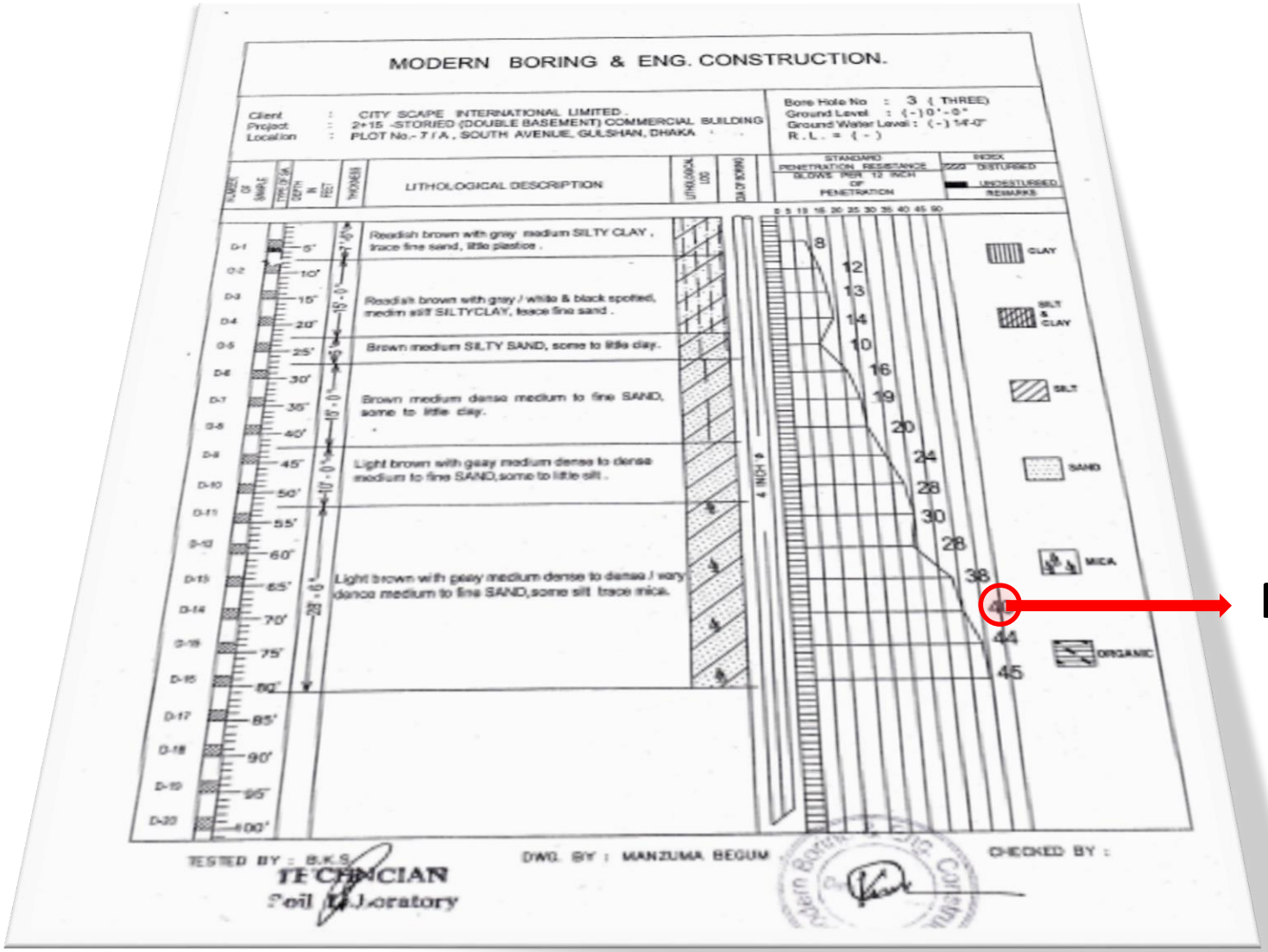
** Removal of Form Work
** Curing
** Back Filling

Mat (Raft) Foundation

STEPS OF MAT FOUNDATION:

1. Soil test
2. Shore pile construction
3. Excavation
4. Form work
5. Leveling & Dressing
6. C.C. layer construction
7. Column positioning
8. Reinforcement
9. Concrete Casting
10. Curing

SOIL TEST REPORT:



MODERN BORING & ENG. CONSTRUCTION.

Client : CITY SCAPE INTERNATIONAL LIMITED.
Project : 2+15 -STORIED (DOUBLE BASEMENT) COMMERCIAL BUILDING
Location : PLOT No.- 7 / A, SOUTH AVENUE, GULSHAN, DHAKA

Bore Hole No : 3 (THREE)
Ground Level : (-) 0 '- 0 "
Ground Water Level : (-) 14'-0"
R. L. = (-)

LITHOLOGICAL DESCRIPTION

Reddish brown with gray medium SILTY CLAY, trace fine sand, little plastice.

Reddish brown with gray / white & black spotted, medim stiff SILTYCLAY, leace fine sand.

Brown medium SILTY SAND, some to little clay.

Brown medium dense medium to fine SAND, some to little clay.

Light brown with geay medium dense to dense medium to fine SAND,some to little silt.

Light brown with geay medium dense to dense / very dence medium to fine SAND,some silt trace mica.

CLAY
SILT & CLAY
SILT
SAND
MICA
ORGANIC

TESTED BY : B.K.S
TECHNICIAN
Soil Laboratory

DWG. BY : MANZUMA BEGUM

CHECKED BY :

N-value

SHORE PILE CONSTRUCTION

King-post

SHORE PILE CONSTRUCTION

Circular shore piles' reinforcements are being constructed.

Boring work is going on.

EXCAVATION

Excavator

Bern

BRACING

C.C. LAYER

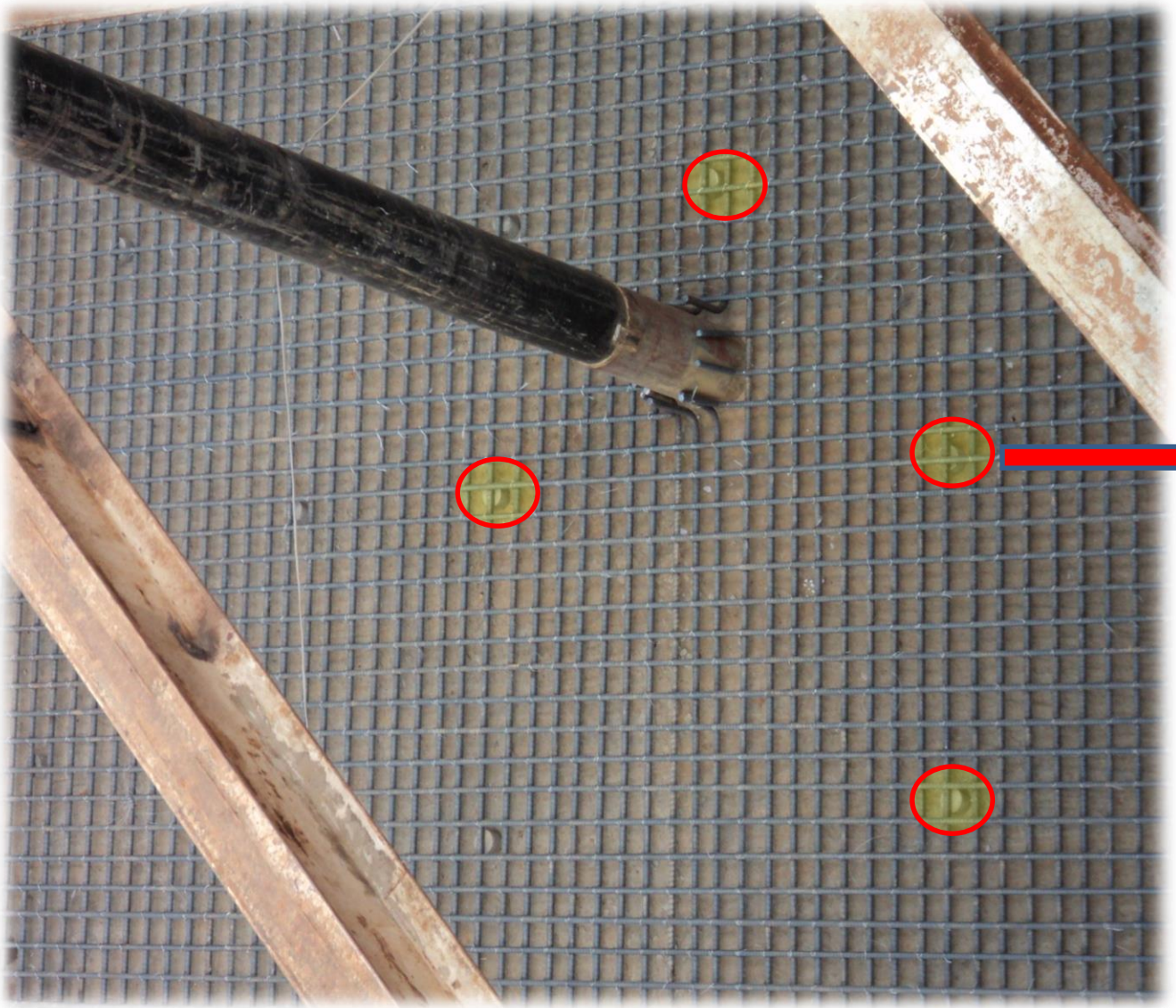
C.C. layer is constructed. Now reinforcement of raft will be given.

Shoring and Auxiliary Structures

COLUMN POSITIONING:

The centre of a column is being pointed

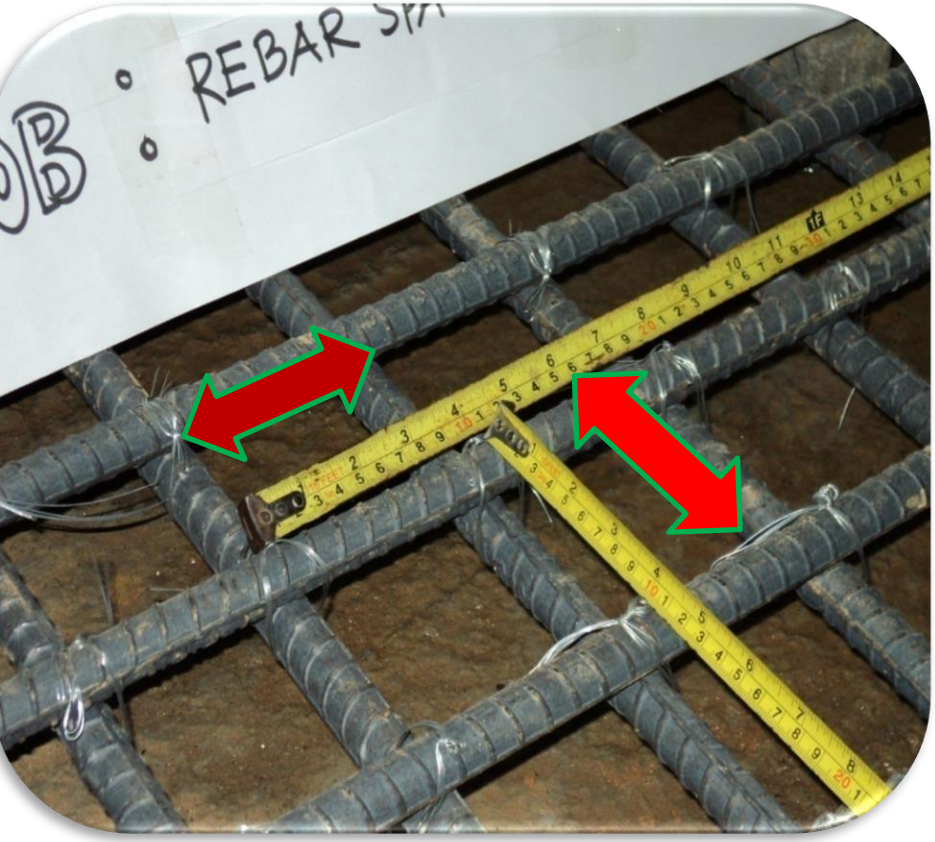
REINFORCEMENT:



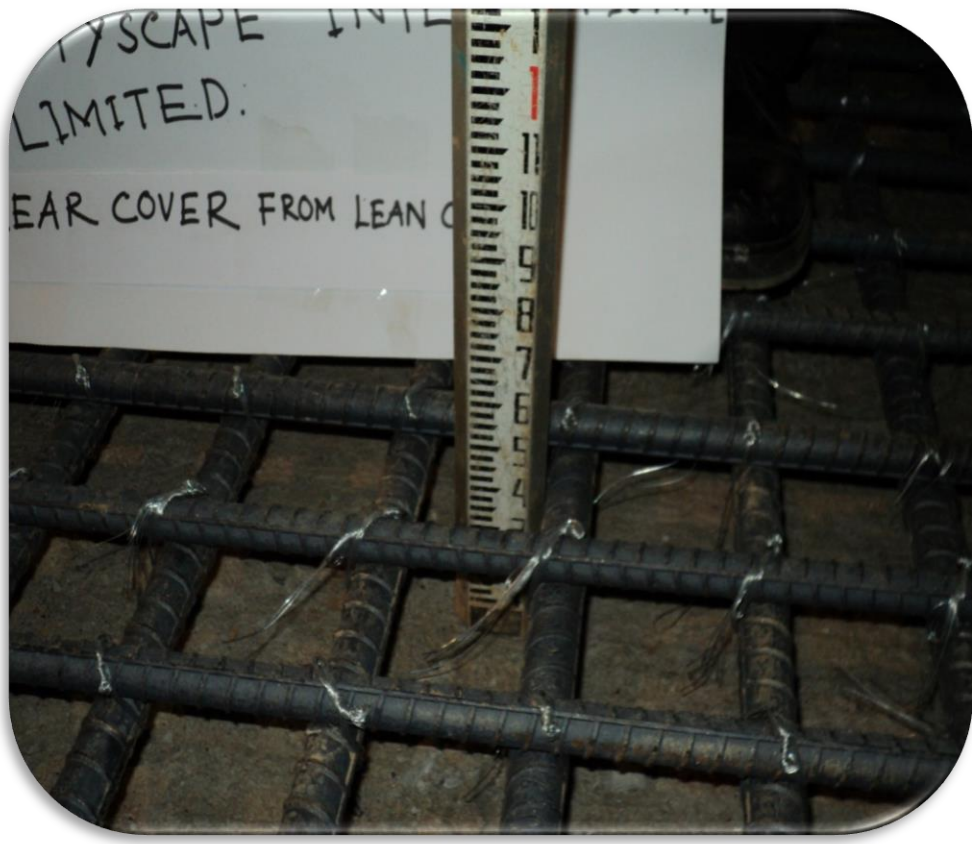
Bottom layers' reinforcement.

C.C. Block

REINFORCEMENT:



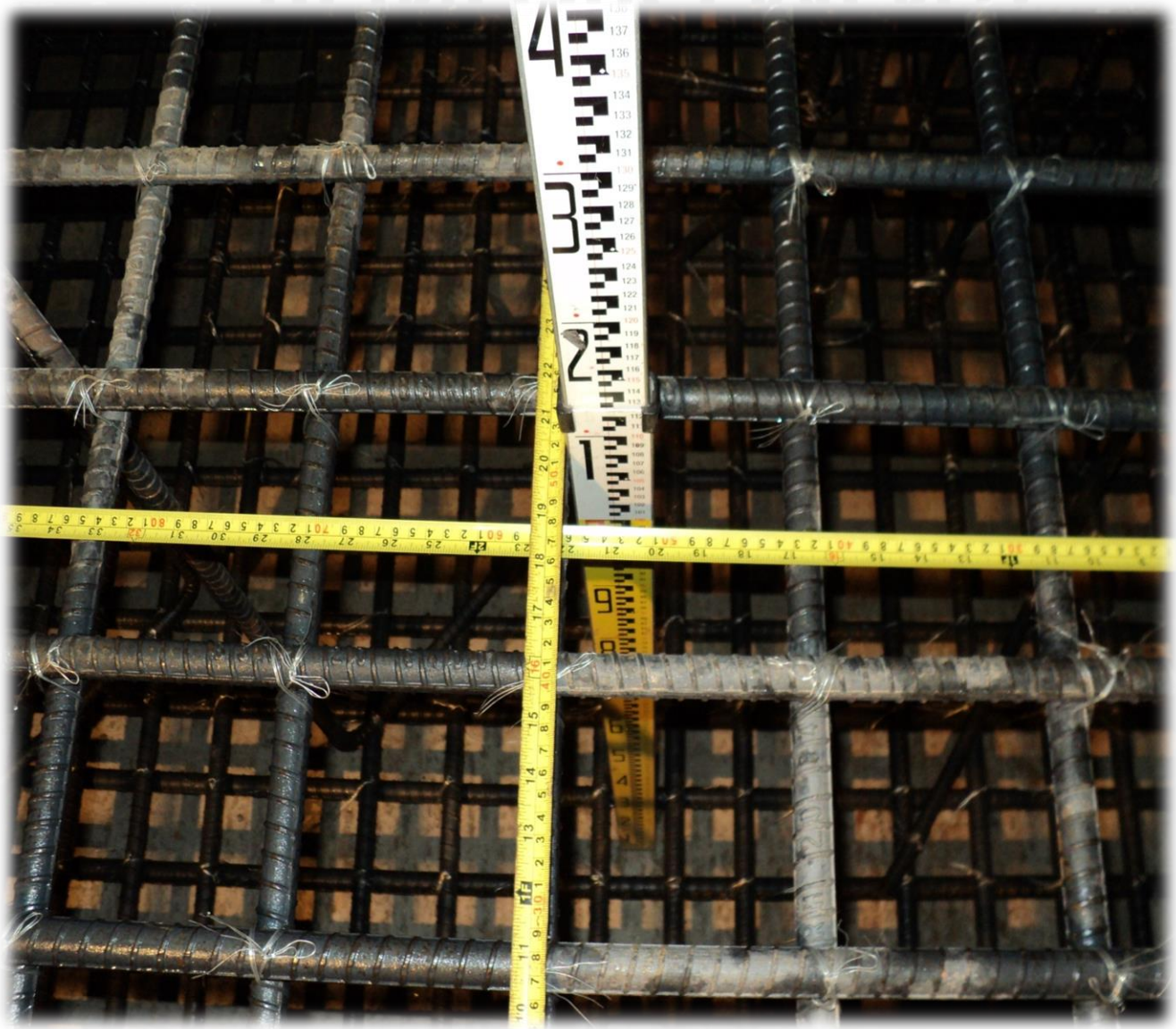
Each rods are placed 4 or 5in centre to centre.



Clear cover was measured 3 inch.

REINFORCEMENT:

REINFORCEMENT:



Mat thickness is 45inch.

REINFORCEMENT:

CONCRETE CASTING:

Ready mixed concrete was used for casting mat foundation.

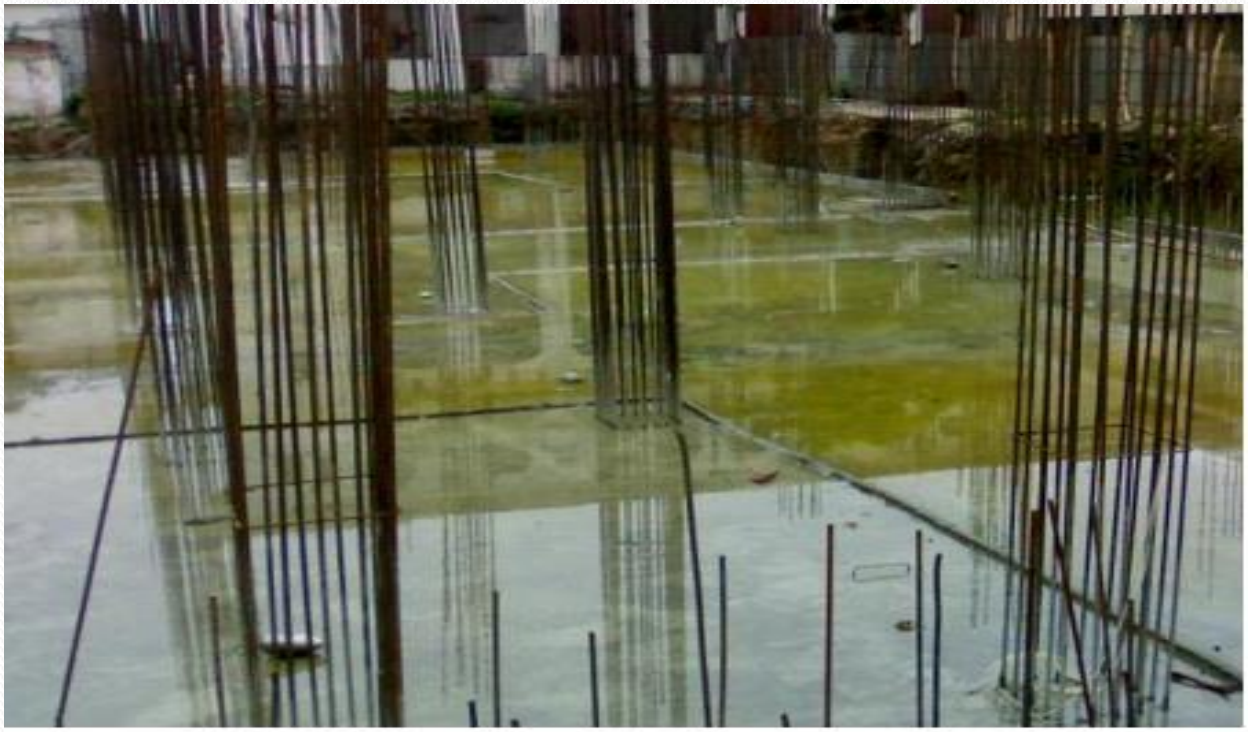
CONCRETE CASTING CONTD...

Vibrator was used for compaction.

CONCRETE CASTING CONTD...

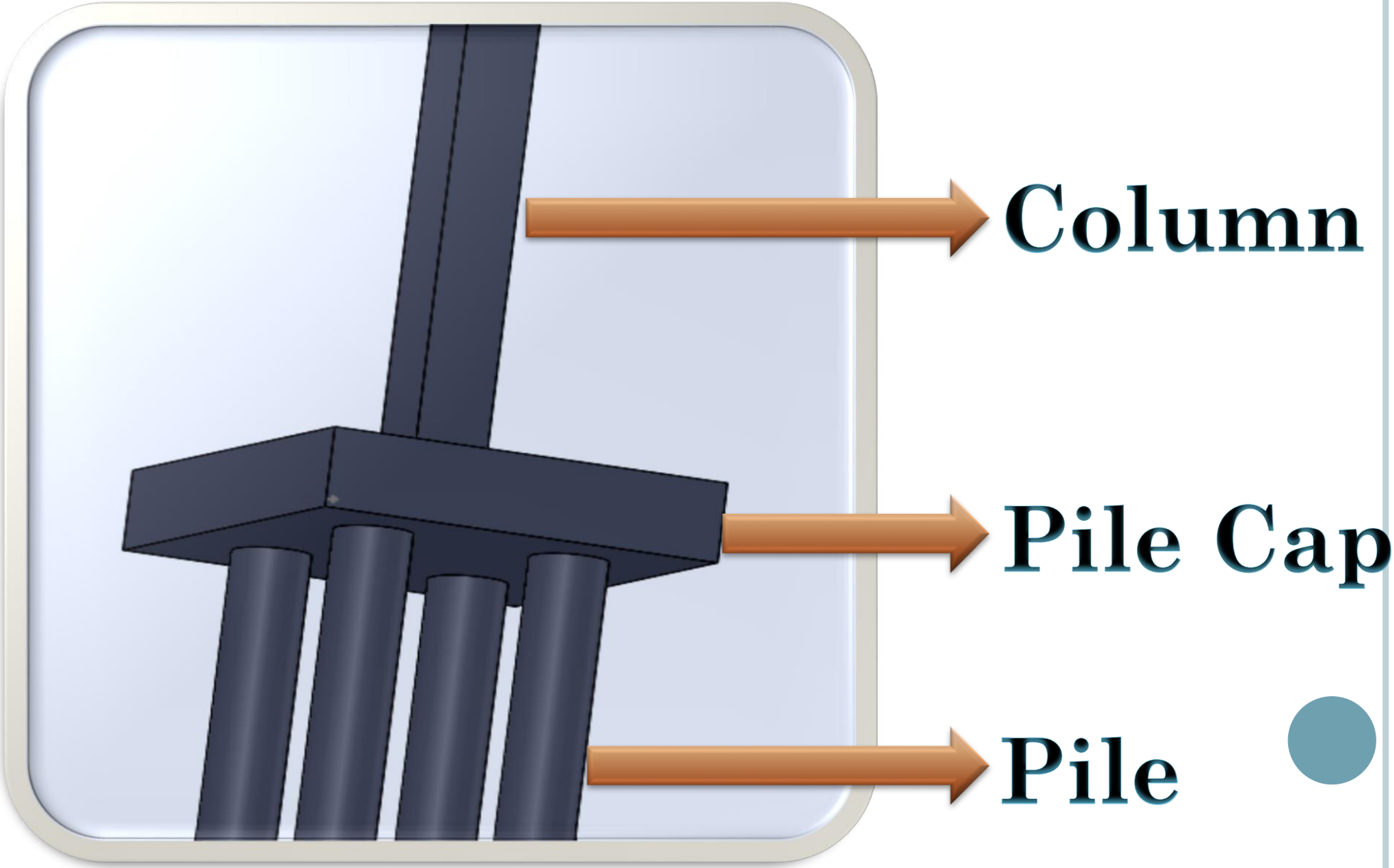
One of the part of raft foundation is casted.

CURING:

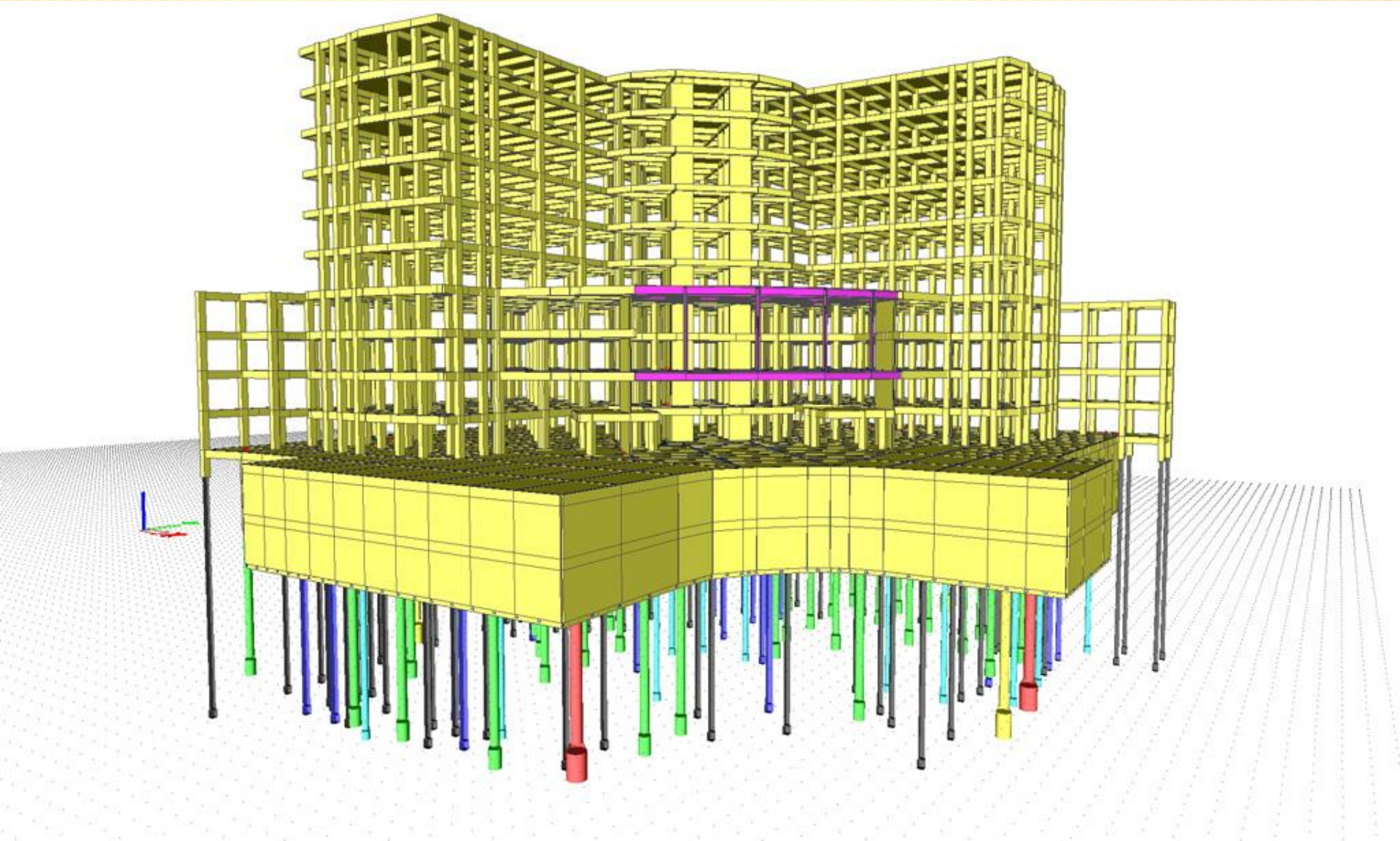


DEEP FOUNDATION

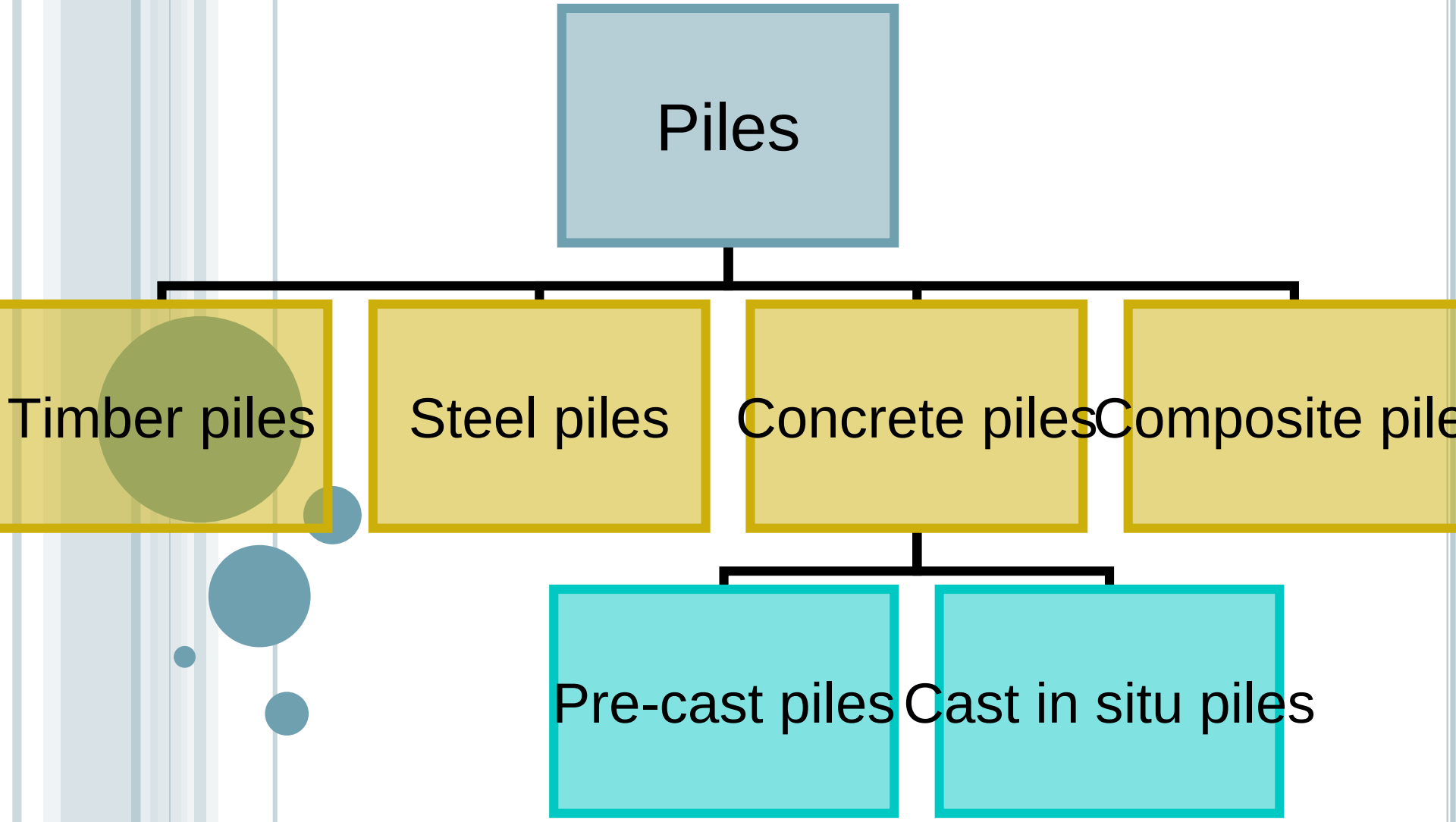
DEEP FOUNDATION



PILE BENEATH STRUCTURE



Types of piling



Pre Cast Piles

- Piles of any size are made in advance and then used at the site

Cast in Situ Piles

- Non-displacement pile in which a hole of the specified diametre is bored to the required depth.
- Cast with concrete of specified strength after the reinforcement is placed into the hole.

Timber Piles

- ✓ Is the first material used in piling work

Steel Pile

- Can be driven in very long lengths
- Liable to corrosion above the soil line
- More expensive than timber or concrete

Composite Piles

✓ Combinations of materials are used.

✓Most common materials are steel and concrete.

Pile Cap

- It is a thick concrete mat that rests on driven concrete or timber piles.
- Provides stability to the foundation in soft and unstable ground
- It distributes the load of the building into the piles.

Pile Cap

Pile cap for two piles

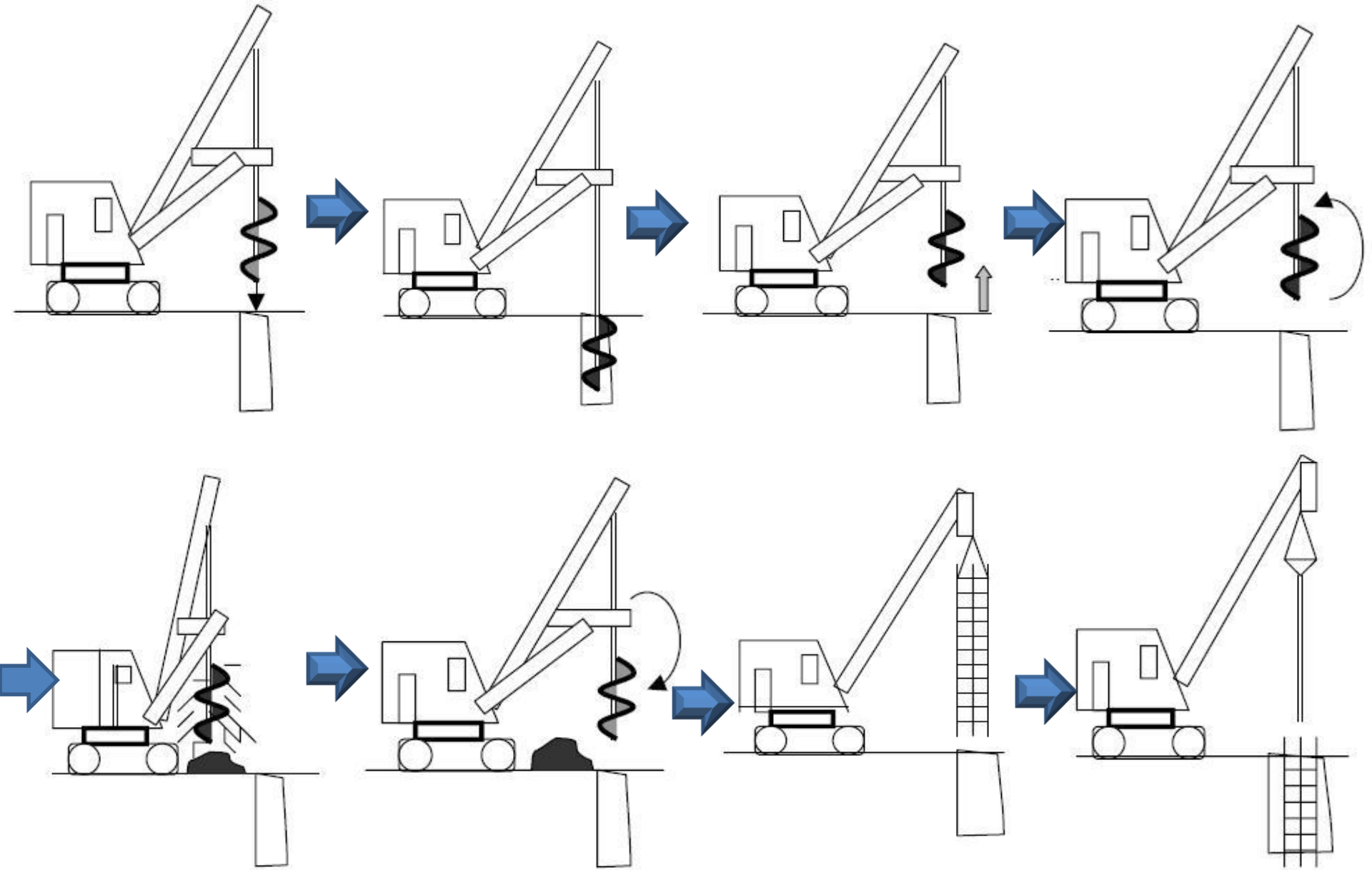
Pile cap for three piles

Pile cap for four piles

Necessity of Pile Foundation

- **If the soil near the surface do not have sufficient bearing capacity to support the structural loads**
- **If the estimated settlement of the soil exceeds tolerable limits**
- **To increase factor of safety of heavy load structures**

Procedure for Pile driving



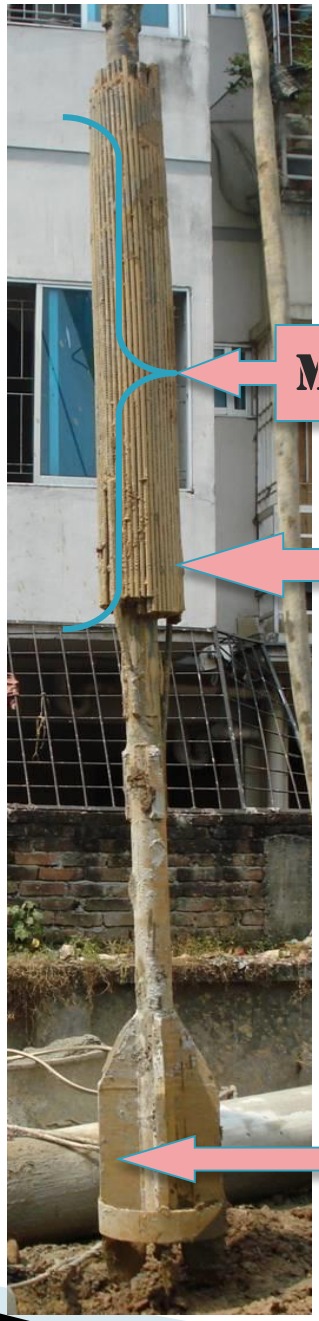
Sight @ Site

Tripod

Tripod Placing

Augar Placement

AUGER



Drilling

Joint

Procedure

PREPARATION OF THE HOUSE

CONNECTING THE AUGER TO THE RIG

1. HOOKING THE AUGER TO THE ROPE OF THE RIG.

CONNECTING THE AUGER TO THE RIG

2. CONNECTING THE HOSE PIPE TO THE AUGER.

CENTERING

CENTERING THE AUGER BY MOVING THE RIG

BORING

MUD COMING OUT OF THE BORE HOLE

DRIVING THE CASING

THE CASING HELPS TO DRIVE THE AUGER IN THE SAME PLACE

BORING THROUGH THE CASING

CONNECTING THE DRILLING ROD

1. HOOKING THE DRILLING ROD WITH THE ROPE OF THE RIG

CONNECTING THE DRILLING ROD

2. CONNECTING THE HOSE PIPE TO THE DRILLING ROD

CONNECTING THE DRILLING ROD

3. JOINING THE DRILLING ROD TO THE HEAD OF THE AUGER BY THREADING

BORING WITH THE DRILLING ROD

3 X DRILLING ROD(20')

+

AUGER(15')

=

75' BORE HOLE

BRINGING OUT THE DRILLING ROD

PREPARATION OF THE REINFORCEMENT

1.SPIRAL REINFORCEMENT BARS ARE DRIVEN INTO THE STRAIGHT BARS

PREPARATION OF THE REINFORCEMENT

16MM DIA STRAIGHT BARS

10MM DIA SPIRAL BARS

PREPARATION OF THE REINFORCEMENT

2. SPIRAL BARS ARE JOINED WITH THE STRAIGHT BARS WITH WIRES.

3. THE BARS ARE WELDED FOR EXTRA STRENGTH.

Rebar Placement

DRIVING THE REINFORCEMENT

REINFORCEMENT BARS ARE WELDED AFTER PLACING

SETTING UP THE TREMIE PIPE

JOINING BY THREADING

CLAMPING THE TREMIE PIPE

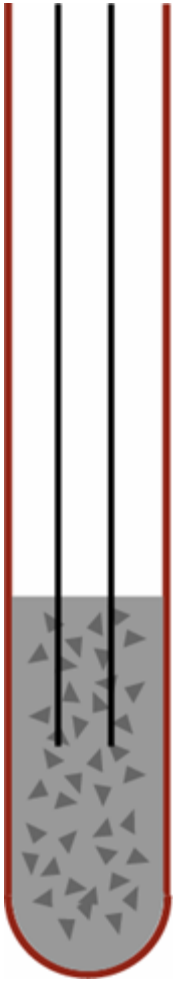
SETTING UP THE FUNNEL

CONCRETE CASTING

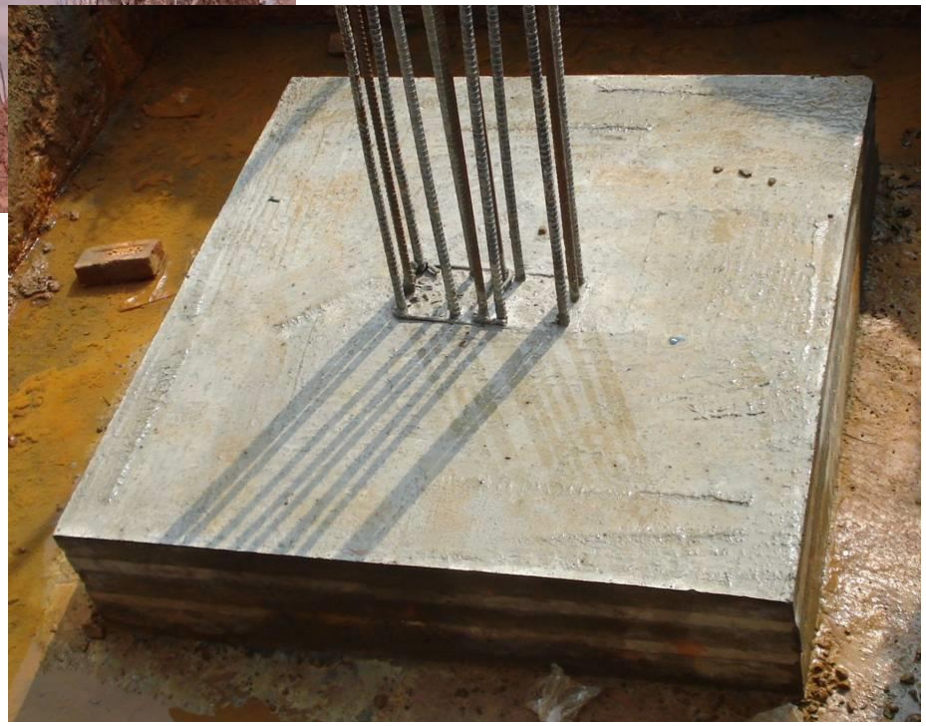
TREMIE PIPE

CONCRETE FALLING INTO THE BORE HOLE FROM THE BUCKET THROUGH THE FUNNEL

CONCRETE



PILE CAPS



Some Problems of construction

Before constructing mat foundation a huge area is required to excavated:

Excavation Problems:

A destructive natural problem is:

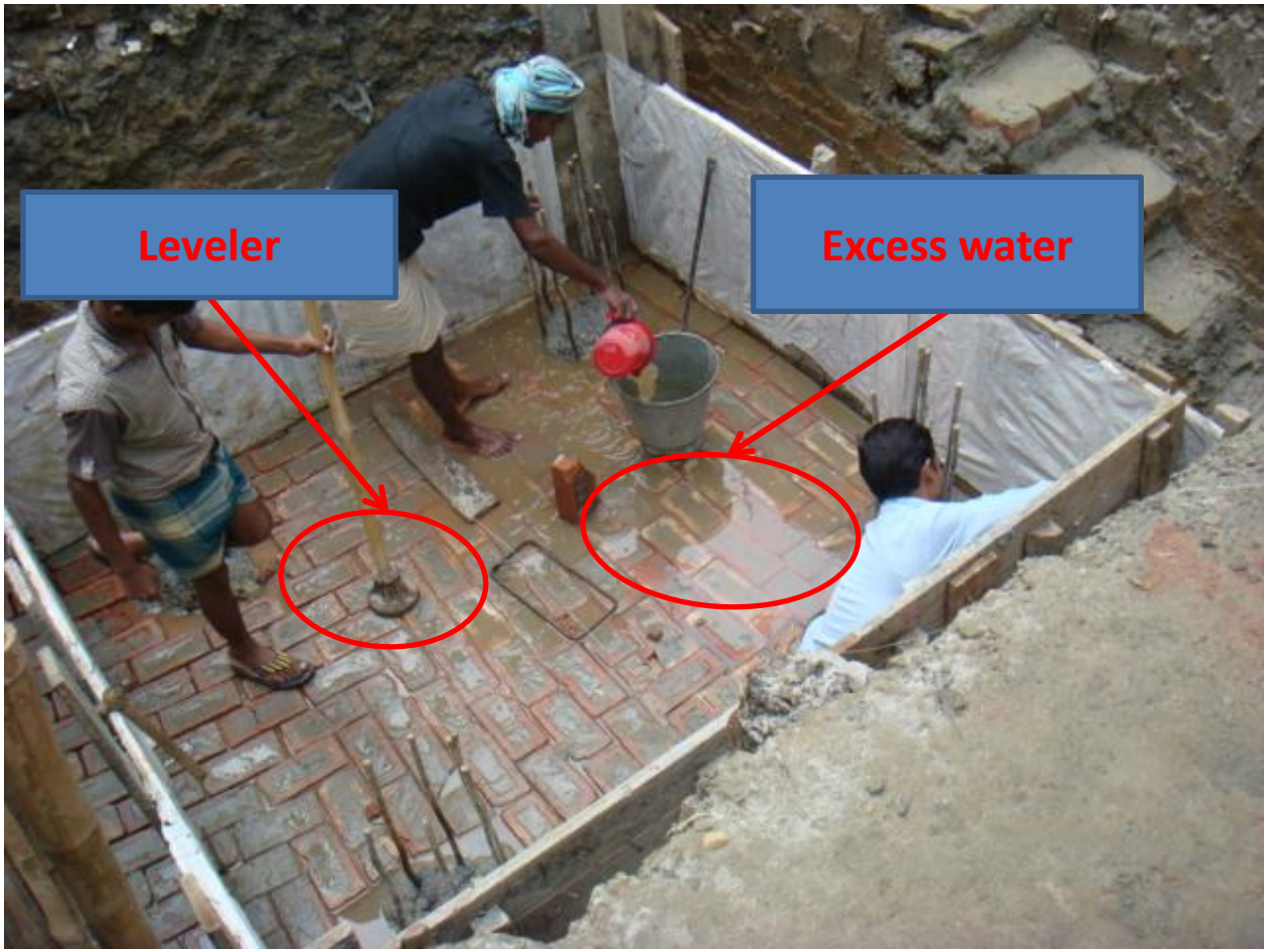
Excavation Problems:

1. Rain water make the soft soil clay and it is easy to collapse.

2.Rain water can stay in the excavated area.

polythene

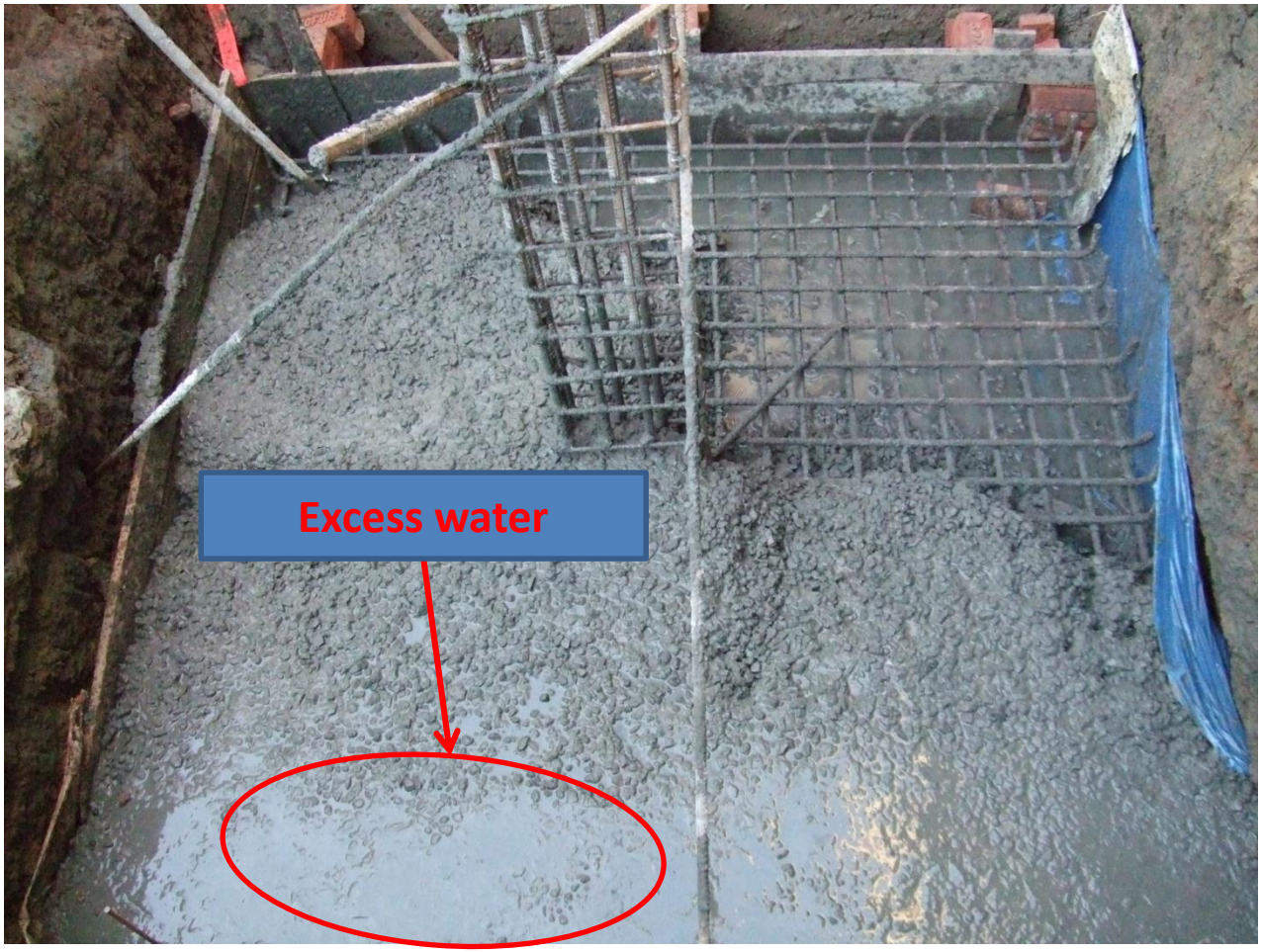
Draining the extra water manually



Vibrator touching reinforcement

No shuttering close to property line

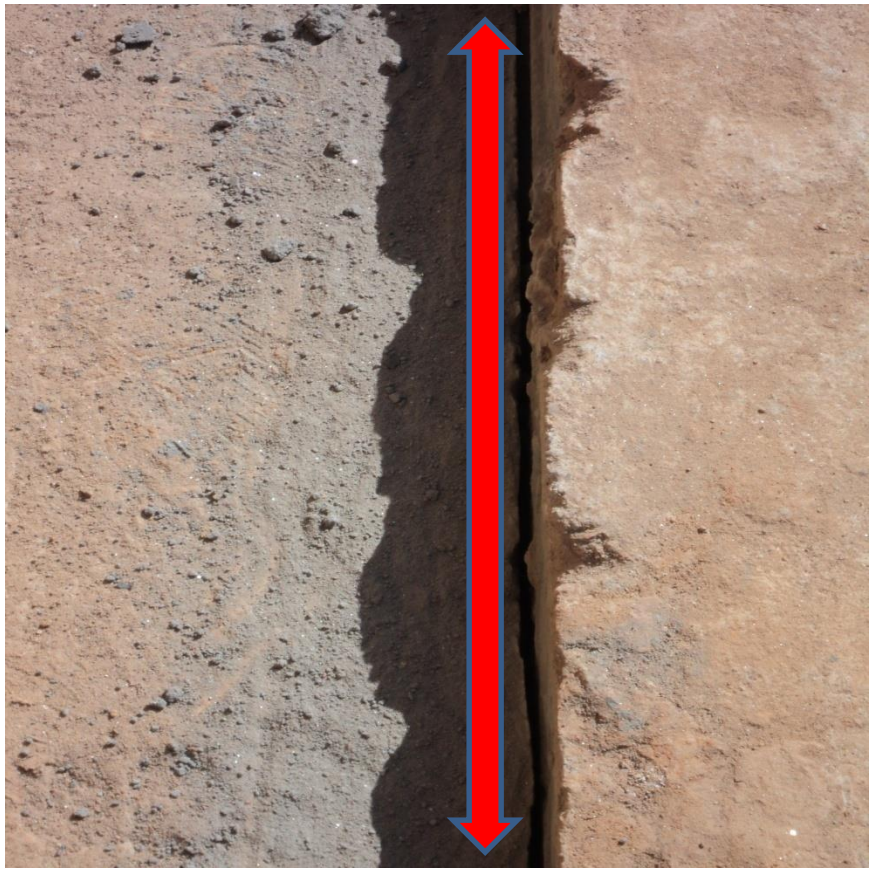
Excess water in concrete



For part by part work , there arise

Joining effect:

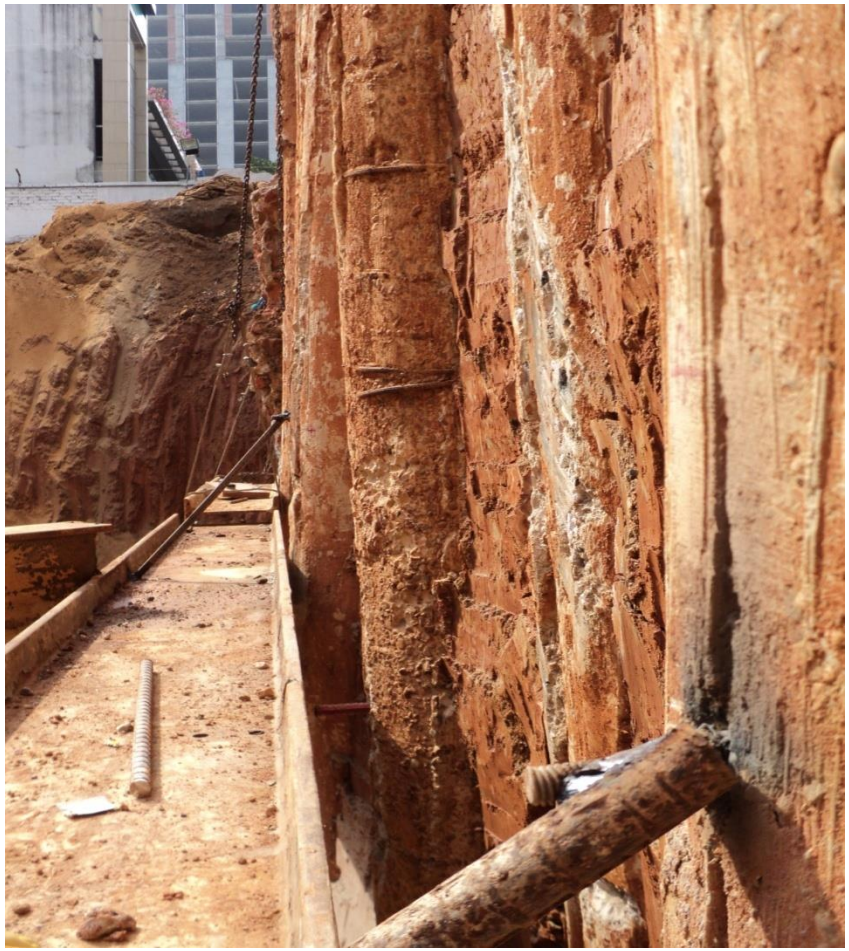
Different Instant Problems:



Shrinkage at Tie beam

A joint of king post became weaker

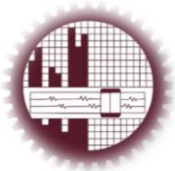
Different Instant Problems:



Piles were not on the same line

A displaced pile is creating problems for reinforcement work

THE END



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