REG 16/10/V

Construction Techniques of Building Constructions

Textbook :-

(i) Building Construction by BC punmia
(ii) Building construction by Rangwala

Syllabus :-

chapter → 01 → Introduction
chapter → 02 → Foundation
chapter → 03 → Brick Masonry
chapter → 04 → Partition wall and Retaining wall
chapter → 05 → Doors and windows
chapter → 06 → Roof
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chapter → 01 (Introduction)

⊕ Structure :-

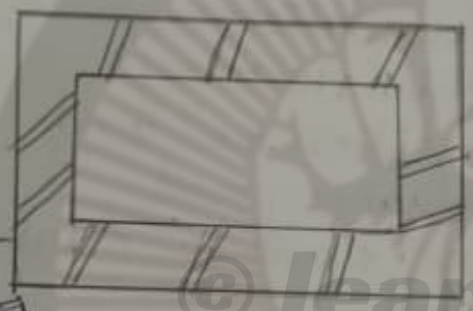
It may be defined as the assemblance (जोड़) of various components in such a manner that it can withstand (सहन शक्ति) the load and transfer it safely to the soil. For example :- Building, cinema hall, Hospital, Highway (Road) etc.

(#) Types of Structure :→

On the basis of load transfer mechanism structure is classified into three categories :→

(i) Load bearing structure
(ii) Frame structure
(iii) Composite or Complex structure

(#) Load bearing Structure :→



Top sectional view

Room

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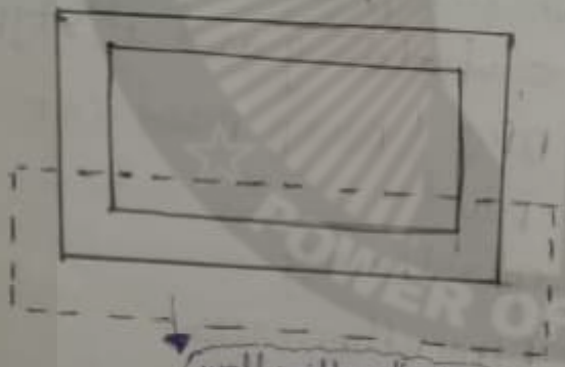
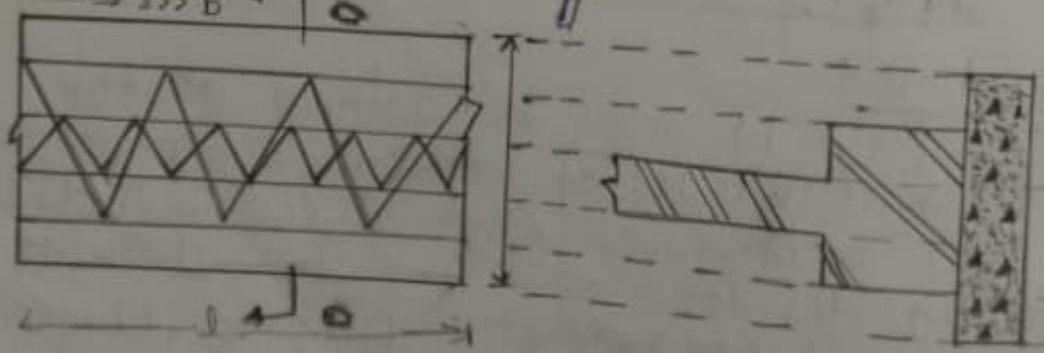


PCC → Plane cement concrete or simply concrete

wall without step
or wall with step

STRIP FOOTING

go° Rotated



↳ In the load bearing, the entire load of the structure is taken by the brick masonary.

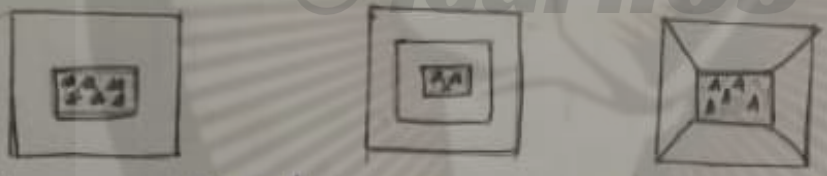
↳ In the load bearing, brick wall is constructed below the ground level and it is taken above the ground level.

↳ Durability of load bearing is less.

↳ By load bearing structure we construct our building upto Ground floor & first floor.

↳ In load bearing structure we generally provide "strip footing".

② Frame structure :→

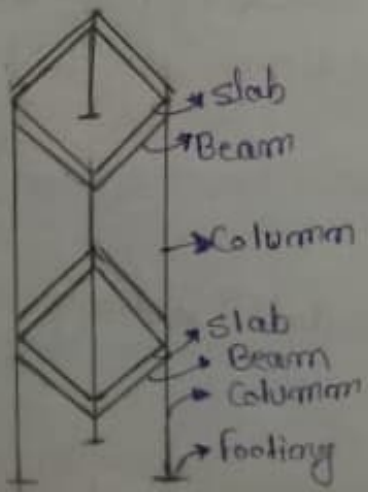


Column without step | Column with step | sloped footing or foundation

- Column without step
- Column with step
- sloped footing or foundation

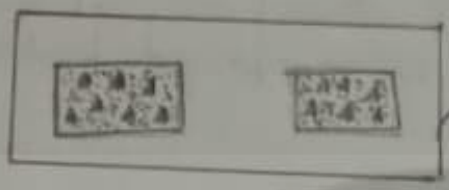
⟹ Isolated footing

(Load transfer mechanism in frame structure)

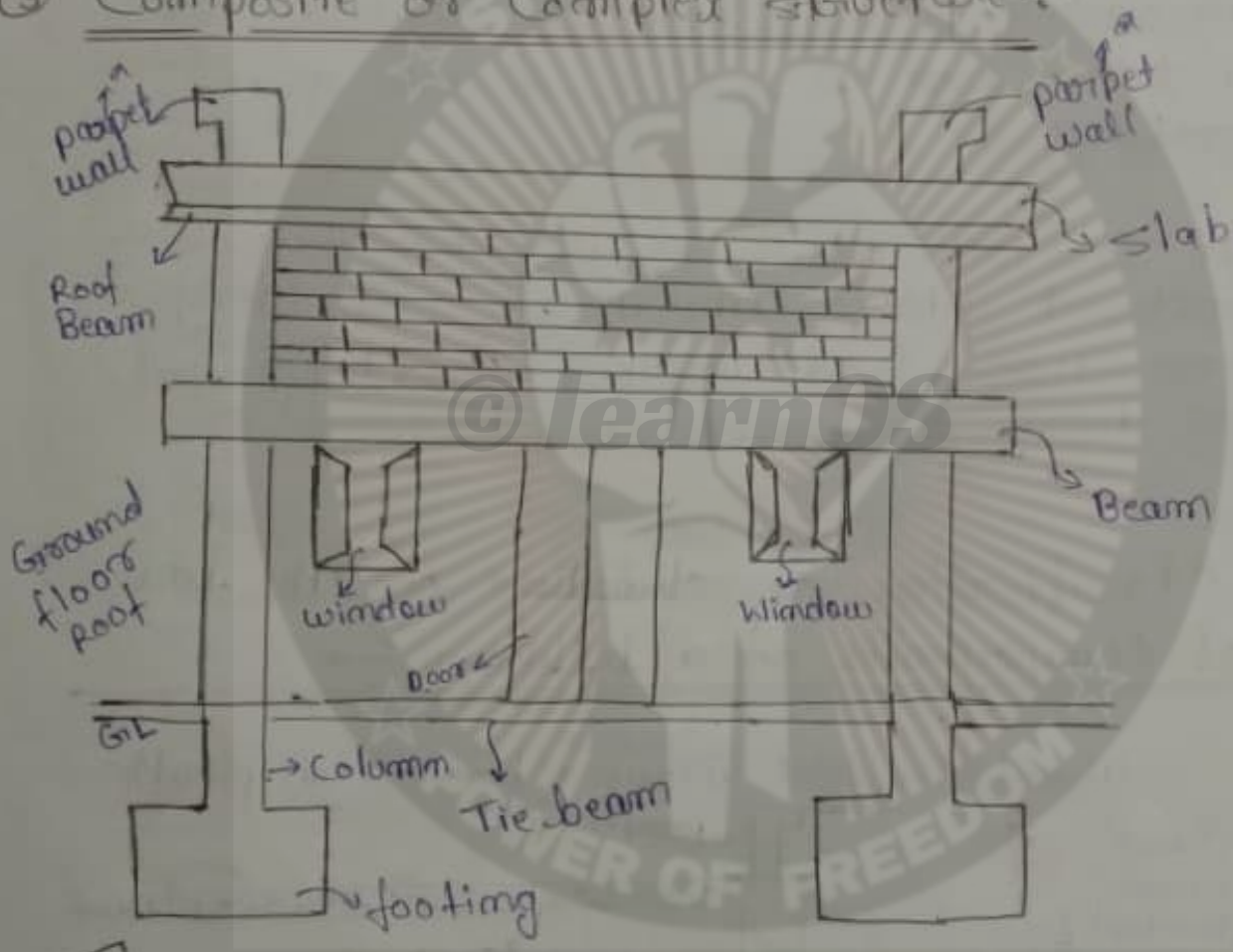


Floor or Roof (special name i.e slab)
↓
Beam
↓
Column
↓
Footing
↓
Soil

↳ when two column are constructed on a on single footing then the footing is said to be combined footing.



③ Composite or Complex structure :-



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↳ In Complex or composite structure, brick Masonry and column both take the load.

↳ The Combination of load bearing and the frame structure; is said to be complex or Composite structure.

(11) Foram Structure :→

↳ In frame structure ; the entire load is posses through the slab , beam, column, footing and at last to the soil.

↳ In main function of brick masonary in this type of structure is to provide partition.

↳ The durability of frame structure is far better than the load bearing structure

↳ By frame structure , we can construct G+2 , G+3, G+4, G+5, G+6 , G+7, and so on as per our requirement.

↳ In modern time house are generally constructed with frame structure forequently.

↳ In frame structure generally isolated footing or combined footing is provied.

↳ When a single column is constructed on a single footing then the footing is said to be Isolated (आइसोलेटेड) footing.

→ Isolated footing

↳ The durability of complex or composite structure is less than the frame structure the durability of complex or composite structure is more than the load bearing structure.

↳ In complex or composite structure, columns are provide with isolated footing as combined footings.

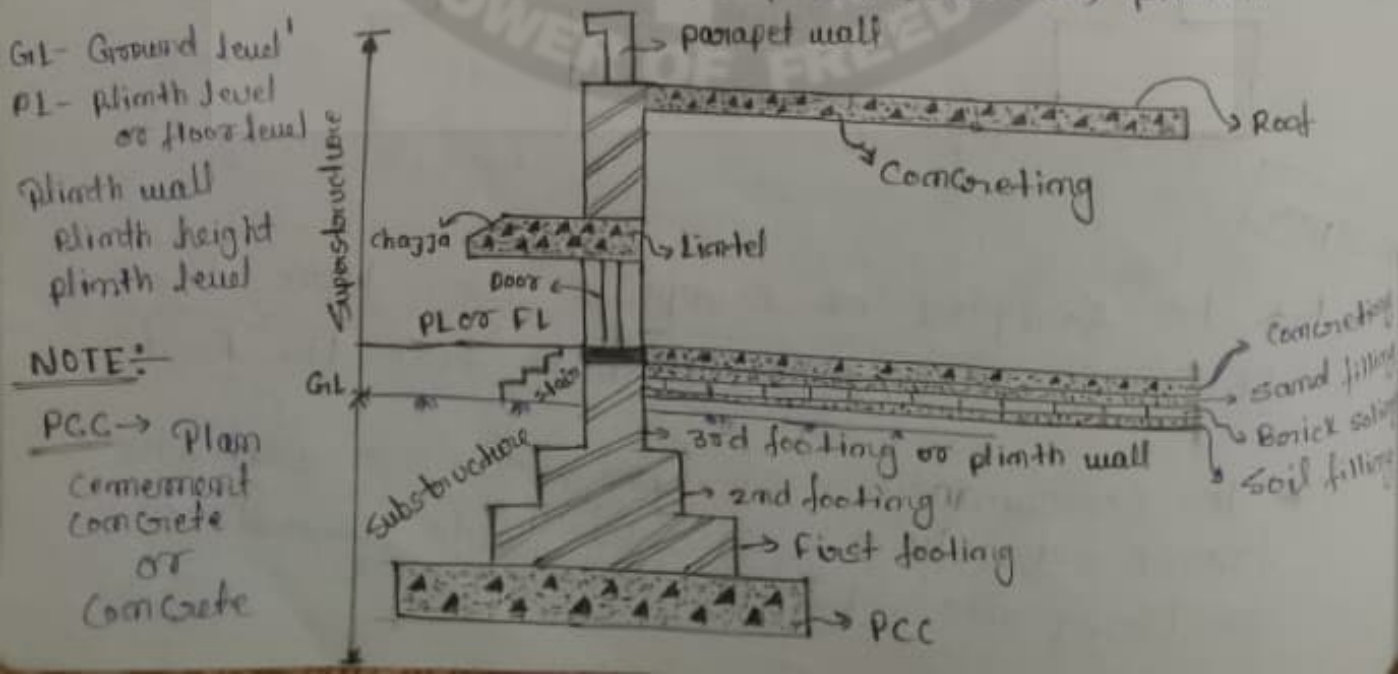
↳ In

↳ In complex or composite structure, brick masonary perform both the function i.e it takes load as well as it acts as a partition.

↳ In complex or composite structure; we construct storey (floor) of a building more than load bearing structure but less than the frame structure.

(iii) Classification of structure on the basis of components of a building :→

(i) substructure (ii) superstructure (iii) plinth



Ques: Why we provide plinth in a building?

Ans: For the effective drainage of water from the building, we required plinth in a building.

And also to prevent the entry of polluted water from the road or the street to the building; we required plinth in a building.

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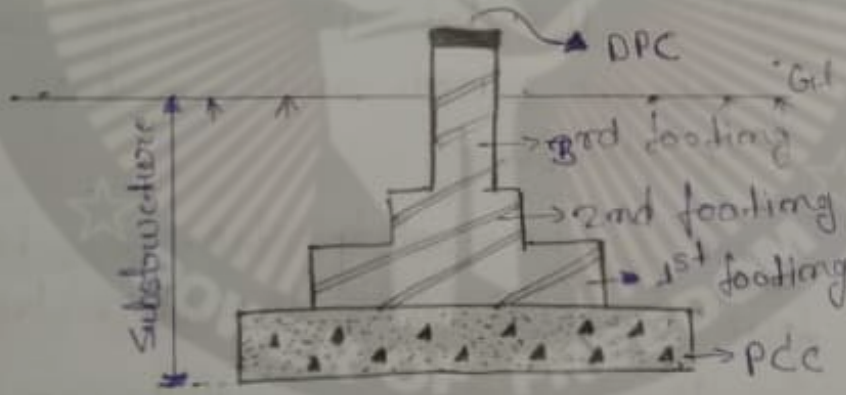
(11) Substructure :- The component of the building below the ground level is known as "substructure".

For eg :- foundation.



NOTE :- The stepping part of foundation; is known as "Footing".

Foundation :- The horizontal component of substructure built below the ground level to withstand the load of superstructure load and transfer it safely to the soil.

NOTE :-

Plinth level coincides floor level
Plinth height ⟶ Total height of the Plinth wall
Plinth wall ⟶ one of the type footing.

Plinth

(11) Superstructure :- The component of the building above the ground level known as "superstructure". For eg :- Lintel Door, window, chhajja, stair, slab, parpet wall etc.

NOTE :- Slab means ⟶ Roof or floor or ceiling.

5th Dec

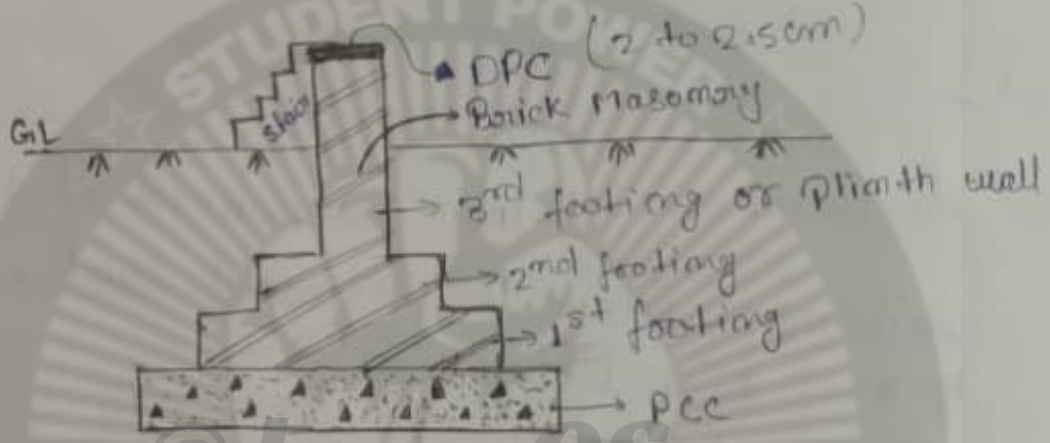
Component of superstructure :-

(i) Door :- It is opening provided in the brick masonry wall for the entry or exit of person in a particular room.

(ii) Window :- It is an opening smaller than the door opening in the brick brick masonry wall for the exchange of sunlight and air in a particular room.

(iii) Floor :- It is a bottom horizontal platform of a room. The main function of floor is to provide separation of storey (मंजिल).

(ii) Plinth :- It is one of the important component of building that neither to be a structure superstructure component nor do be a substructure component that's why plinth is considered as special type structure in a building.



(iii) Plinth level :- The top portion or surface of the plinth wall; known as "Plinth level".

(iii) NOTE :- During the construction of building plinth level consider with the floor level.

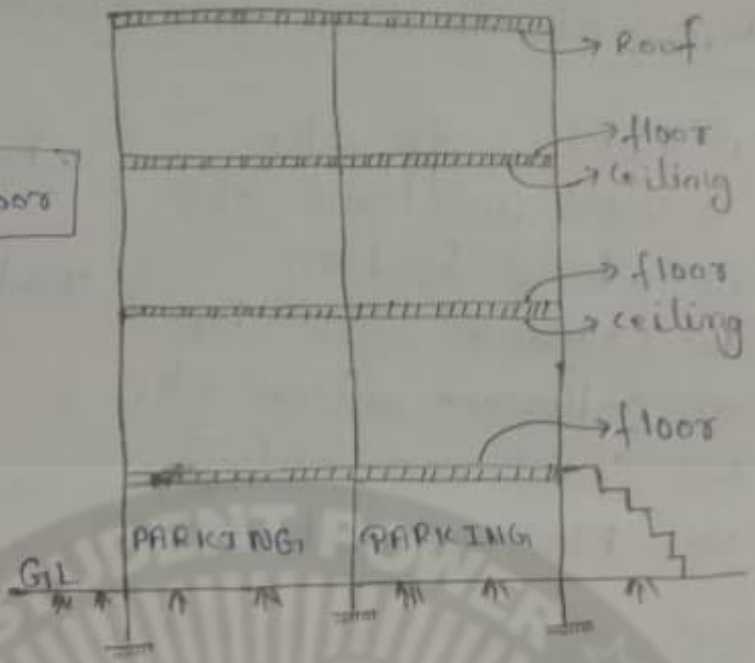
full foram of DPC → Damp proof course.

Ques :- Why we provide DPC at the plinth level ??

Ans To Prevent the moisture from the substructure wall to the superstructure wall, we provide DPC at the plinth level.

NOTE :- DPC $\xrightarrow{\text{Mixture}}$ Concrete or PCC + Damp proofing compounding.

Roof, ceiling, floors → Slab



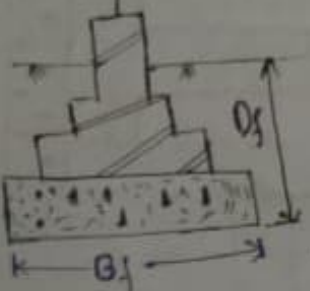
UNIT → 02 (FOUNDATION)

(#) **Foundation** :→ It may be defined as the component of substructure built as a horizontal platform to bear the load of column or brick masonry wall and transfer it safely to the soil.

(#) **Types of foundation** :→

Foundation

($B_f > D_f$) — Deep foundation



Shallow foundation

$\frac{B_f}{D_f} > 1$

↳ A type of foundation D_f → Depth of footing whose width is greater

B_f → width of footing than its Depth.

$\frac{B_f}{D_f} < 1$

↳ A type of footing whose width is smaller than it Depth

Types of shallow foundation :→

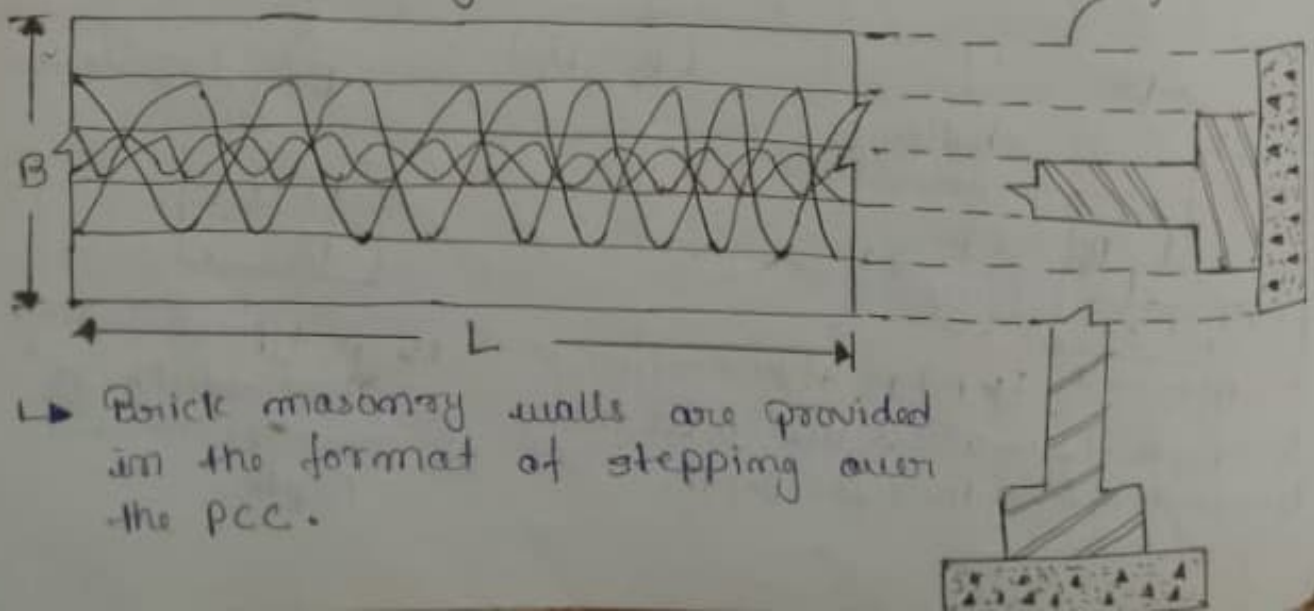
(i) Wall with step
(ii) wall without step } strip footing
(iii) strap footing
(iv) Column with step } Isolated footing
(v) Column without step
(vi) Combined footing.
(vii) Mat or Raft footing

From above conclusion ; we should have do atleast these four foundation types of shallow foundation :→

(i) strip footing
(ii) strap footing
(iii) Isolated footing
(iv) Combined footing
(v) Mat or Raft footing

(1) Wall with step :→

↳ Wall with step footing is provided in "load bearing structure".



↳ Brick masonry walls are provided in the format of stepping over the PCC.

④ Roof :→ It is the top most horizontal platform of a building provided to prevent the internal entry of rain water in a room of a building.

⑤ Lintel :→ It is a horizontal component provided over wall the top level of door and window to bear the load of of st superstructure wall built over it.

⑥ Cantilever chhajja or chajja :→ It is one of the type of slab whose one end is fixed into the wall / column and other and is suspended.

⑦ ~~Ver~~ Stair (सीढ़ी) :→ It is one of the type of vertical communication provided for the purpose movement of people or person from one floor to another.

⑧ Beam :→ It is a horizontal component that bears the load of slab.

⑨ Column :→ It is a vertical component that bears the load of beam and transfer it safely to the toting or foundation.

⑩ Parapet wall :→ It is one of the type. provided on the roof for the safety point of view.

NOTE :→ Roof, slab, floor, ceiling :→

↳ when two or more footing are inter connected with the help of strap beam; then the footing is said to be "strap footing"

Advantage of strap footing :→

: By the help of strap footing; all the interconnected footing are unite and perform a single function

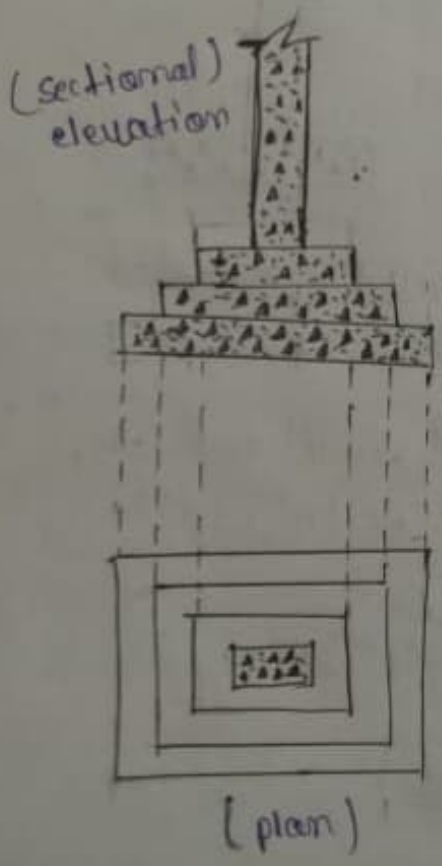
④ Isolated footing :→

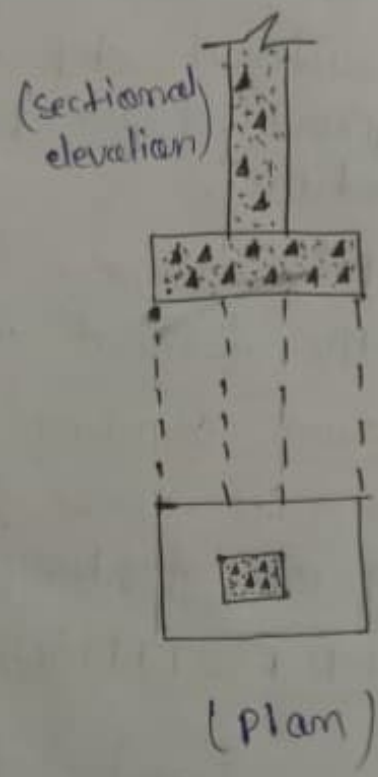
meaning— Single column on the single footing.

Isolated footing

Column with step ⇒ $P\downarrow = \frac{F}{A\uparrow}$

Column without step ⇒ $P\uparrow = \frac{F}{A\downarrow}$





(#) Isolated footing :→

↳ Isolated footings are provided for the frame structure and the composite structure.

↳ Isolated footing are of two types :→

(i) Column with steps

(ii) Column without steps

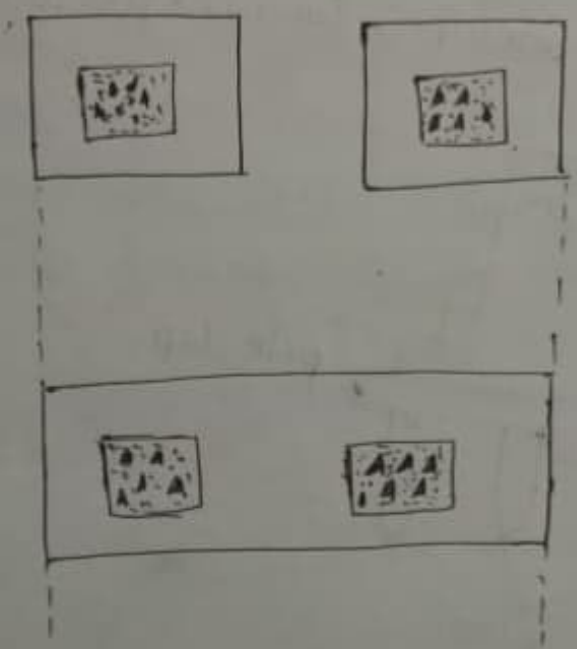
↳ Now these days isolated footings are frequently used for the construction of buliding.

↳ Isolated footings are more strength in compare with strip footing.

↳ Isol footings are consist of R.C.C (ie Reinforced cement concrete).

(#) Combined footing :→

↳ when the space between two isolated footing is very less, the for economical design; we should prefer Combined footing.



↳ Combined footing on which two column are casted on a single footing.

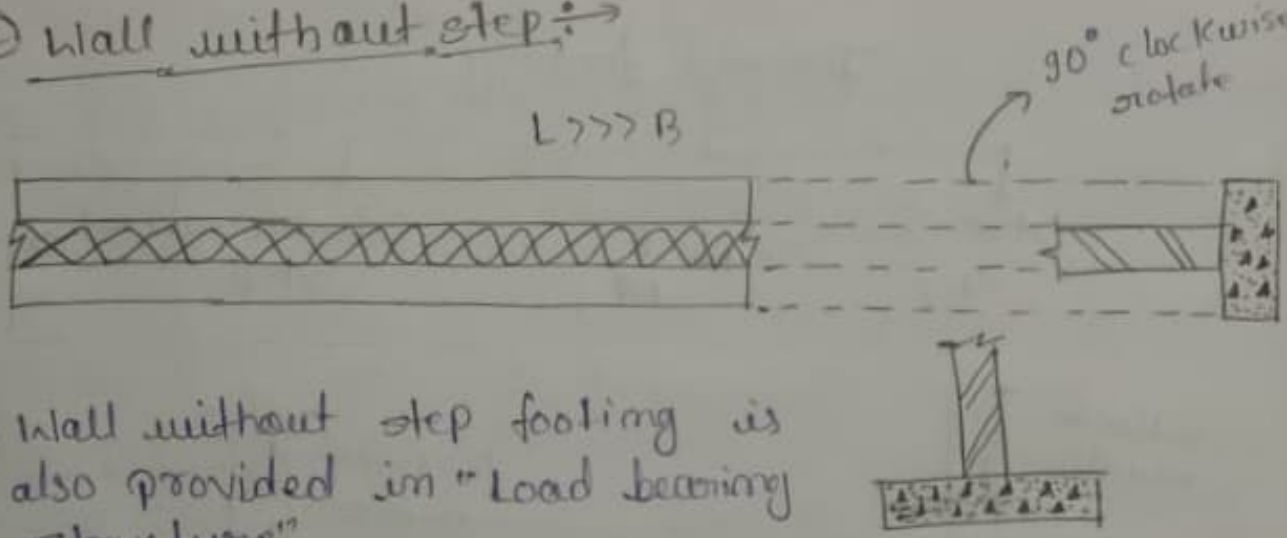
Advantage of providing wall with step footing :→

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$P \downarrow = \frac{f}{A \uparrow} \quad \left[\begin{matrix} P \propto F \\ P \propto \frac{1}{A} \end{matrix} \right]$$

Conclusion :→ Wall with step footing have larger area in compare with wall without step footing. Therefore pressure is less in wall with step footing as compare to wall without step footing.

② Wall without step :→

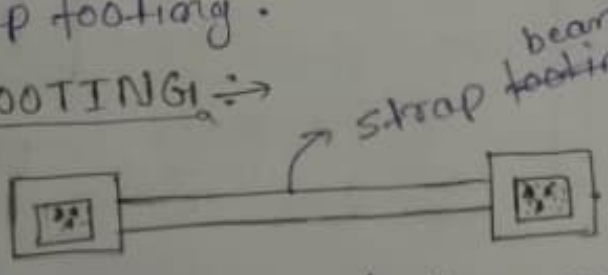


↳ Wall without step footing is also provided in "Load bearing structure".

↳ Brick masonary walls are not provided in the format of stepping over the PCC.

↳ Pressure coming on the wall without step footing is more in compare with wall with step footing.

③ STRAP FOOTING :→



↳ when two or more footing are inter connected with the help of strap beam; then the footing is said to

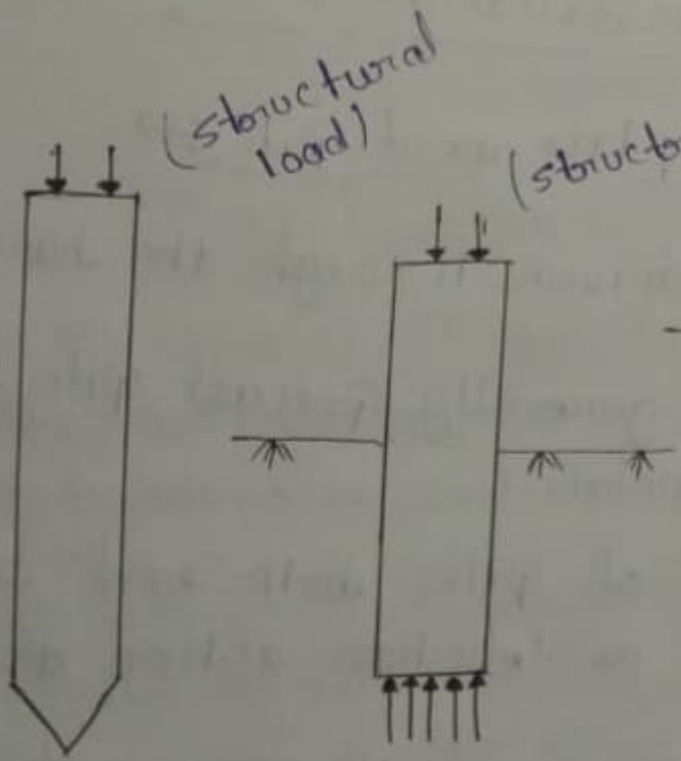
Pier :→ Intermediate support of the bridge structure known as pier Abutment → End support of the bridge structure is known as Abutment

10th DEC

(11) Types of Piles :→

(B) Classification of pile on the basis of their action :→

(i) End bearing pile
(ii) Friction pile or Hanging pile
(iii) End bearing and friction pile



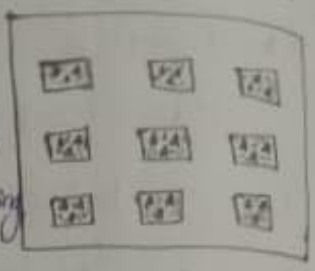
(ii)

End bearing pile :→

A types of pile on which structural load is resisted by the end strata ; is known as End bearing pile.

(ii) Mat or Raft :→

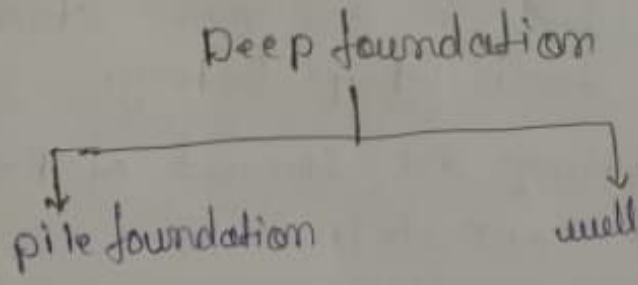
$P1 = \frac{\text{load}}{\text{Area}}$



↳ When the allowable or permissible soil pressure is low and load is very high; then in this condition; we should prefer mat or Raft footing

↳ Mat or Raft footing is type of shallow foundation in which more than two columns are constructed on a single footing.

(ii) Deep foundation :→

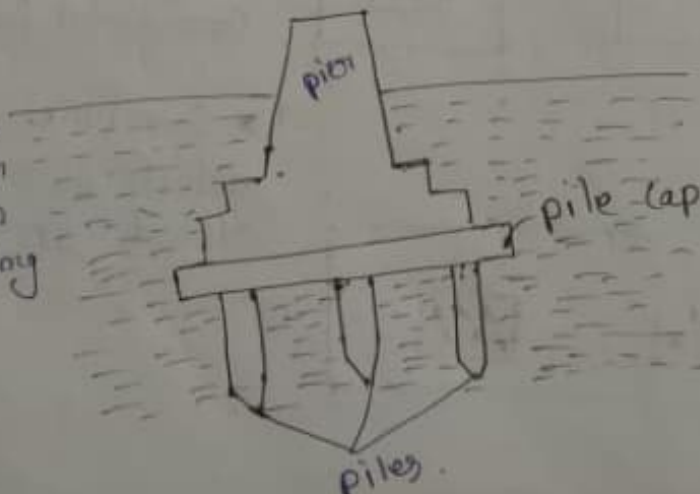


(vertical

↳ **PILE :→** It may be defined as the long, slender member driven into the ground to support the structure

Column :→ vertical member (made of RCC)

pillar :→ vertical member (made up of brick masonry)



NOTE :→ Columns are known by pier or abutment in Bridge engineering

(ii) Classification of Pile on the basis of their Function

(i) Compaction Pile :→

↳ These are driven in lose or soft sand in order to increase their respective density and bearing capacity.

↳ These Piles are provied in those soil which are prone to liquefaction.

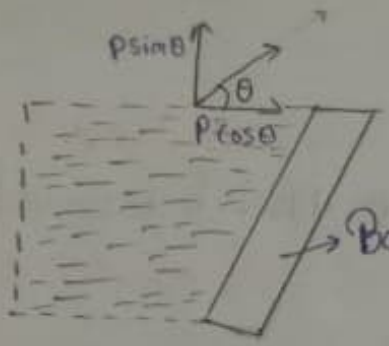
Liquefaction ⟹ Soil state
⇓ losses
completely strength

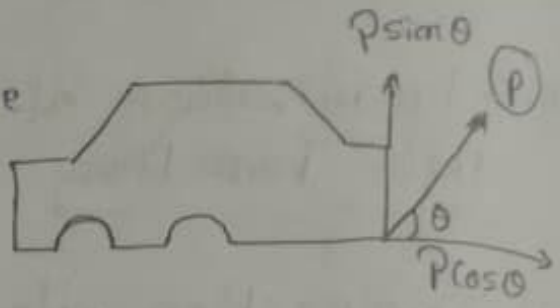
METHOD

(ii) Tension Pile (or uplit Pile) :— It is use to anchor (बांधना) the structure subjected to uplift Pressure caused by swelling of soil for eg :- Black cotton soil.

(iii) Fender Pile :- It is used to anchor the structure subjected to tidal waves (ज्वार की लहरें) or sets seismic waves (भूकंप की लहरें).

(iv) Batter Pile :→ These piles are driven in the inclined direction to prevent the horizontal thrust or force.





$P\cos\theta$ → Horizontal thrust or Horizontal force

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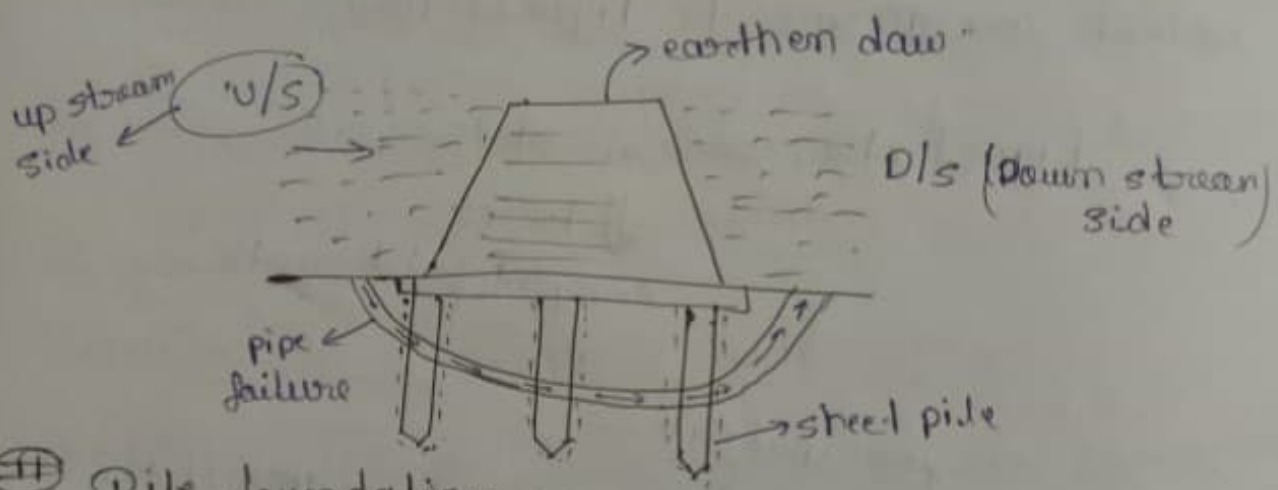
(iv) Sheet Pile :→ It is used to retain the earth mass below the hydraulic structure minimize the failure.

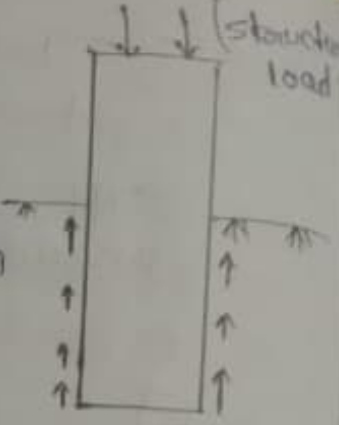


(II) Pile foundation :→ It is a type of deep foundation in which number of piles are cast deep into the ground and these piles are held together by pile cap and over this pile cap our abutment or pier are cast in effective and efficient manner.

NOTE :→ Pile foundation is used in Bridge engineering.

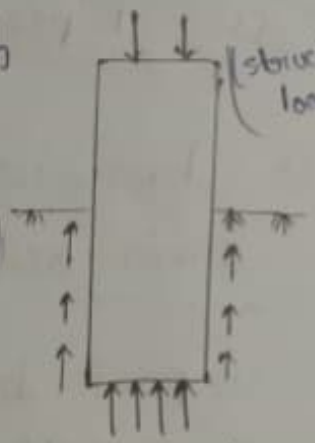
(ii) Friction pile or Hanging pile :→

A type of pile on which structural load is resisted by the side strate, is known as friction pile or "hanging pile".



(iii) End bearing and friction pile :→

A type of pile on which structural load is resisted by the end strate as well as side strate; is known as End bearing and "fraction pile"



(II) Classification of pile on the basis of method of installation :→

(i) Driven or Displacement Pile :→

- These piles are driven through the hammer action.
- These piles are generally precast pile made up wood or metal.
- In these types of piles both end bearing action as well as friction action developed.

(i) Bored Pile :→ These are the precast or cast-in-situ pile. These are less efficient pile.

(11) Component of well foundation :-

① Steining :- It made up of RCC. It acts as a cofferdam and provides need dead load during the sinking of well.

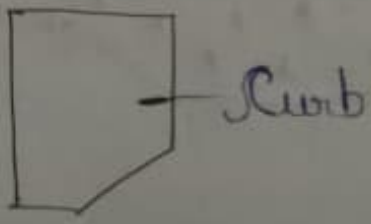
② Well Cap :- It is RCC slab provided at the top of the well to support and abutement or pier.

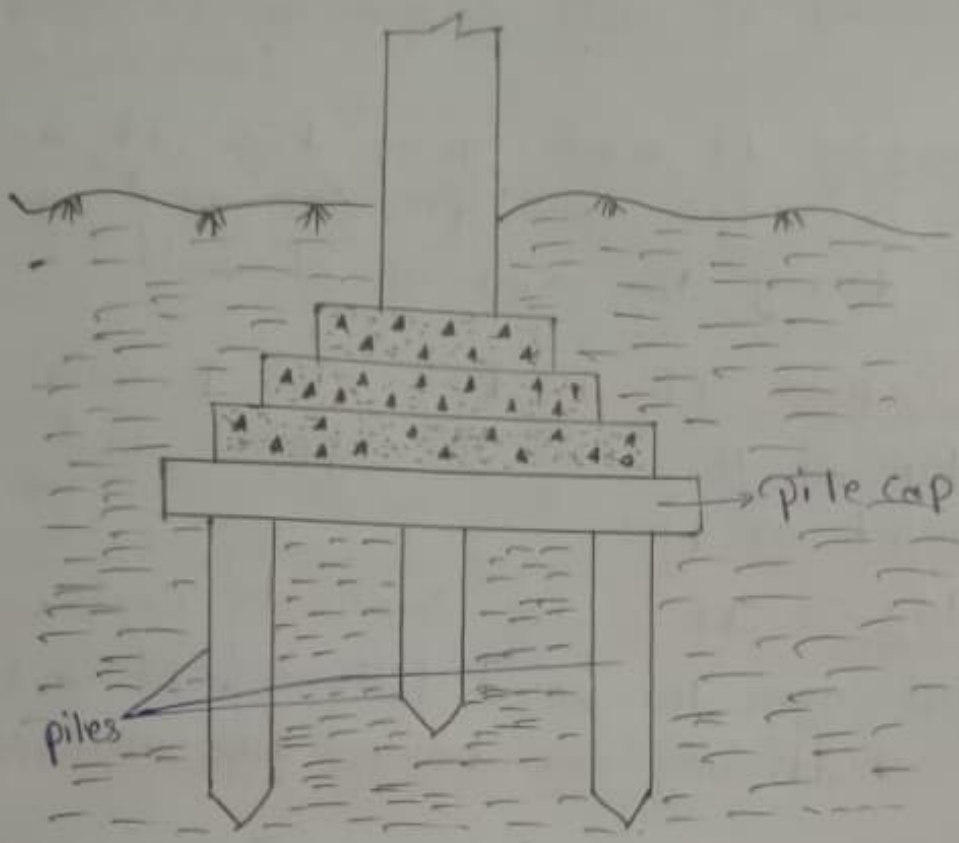
③ Top Plug :- It is the concrete covering provided over the sand filling. It acts as a shuttering for laying the well up

④ Bottom Plug :- The concrete layer provided at the bottom of the well after its sinking is called bottom plug. The bottom plug is a via media for transferring the load from steining to the soil.

⑤ Sand filling :- It is used of fill the blank space between the wall of the well. It increases the weight of the well. and thus, adds to stability of well.

⑥ Curb :- This is the bottom most part of a well. It is shaped in the form of a wedge to facilitate easy sinking. It is provided with a steel angle all around.

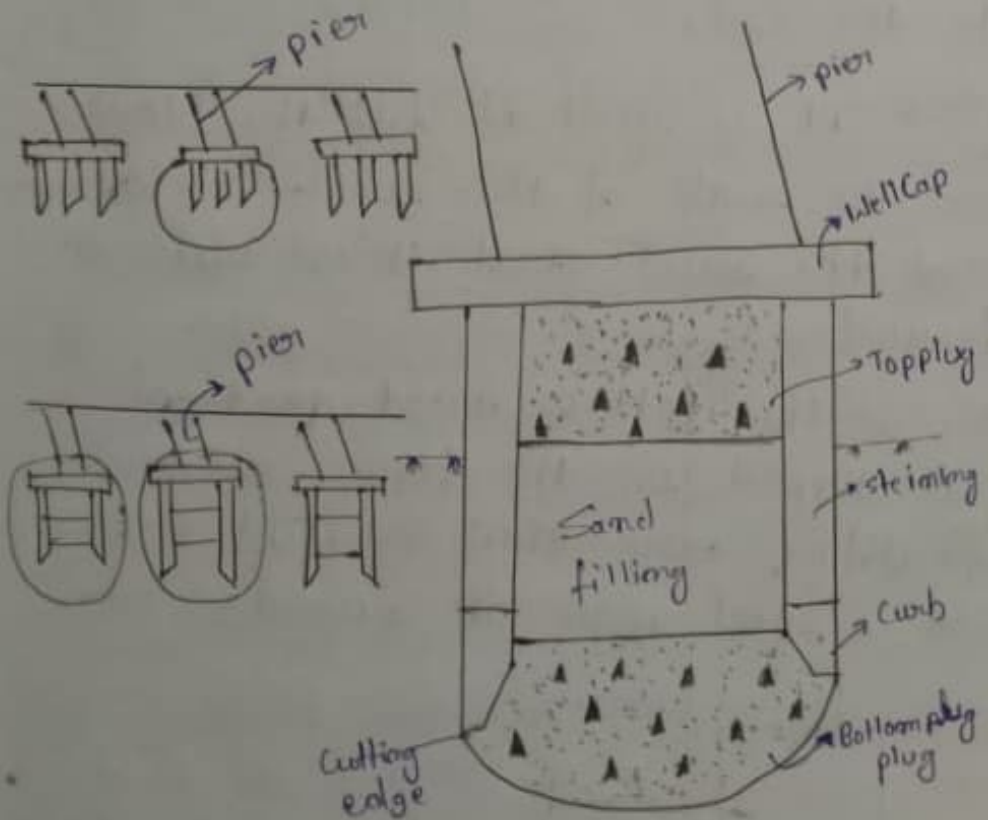




14th Dec

(ii) Well foundation :-

Engineering principle
↓
Safety and economical



NOTE :- Now in to' these days, well foundation is frequently used for the bridge foundation.

(11) Requirement of a good foundation :→

① Foundation should be such that, it should be uniform settled under the action of load of superstructure.

② Foundation should be sufficient strong and strength that it bear the load of superstructure and transfer it safely to the sub soil.

③ foundation should be such that ; it resist the swelling and shrinkage action.

④ The performance foundation for taking and transfer

(11) SUITABILITY OF VARIOUS FOUNDATION ACCORDING TO VARIOUS COUNDITION :→

Condition	Foundation
(i) structure is load is less and soil is medium to dense.	→ shallow foundation
(ii) structure load is heavy and soil is medium to load.	→ Either raft foundation or deep foundation.
(iii) structure load is heavy and foundation is to be plays on owning wate	→ well foundation
(iv) for expensive soil the soil subject swelling and shrinkage action for rain. Black cotton soil.	→ under reamed pile foundation

Condition	Foundation
(5) soil is loose saturated sand which is prone for liquefaction	→ Compaction pile
(6) For individual houses or light building (2 to 4) floor building	→ Strip footing or Isolated footing.

Chapter → Brick Masonry.

(#) Masonry → जोड़ना → जोड़ने का काम

जोड़ने के लिए वस्तु → Brick or stone (ईंट पत्थर)

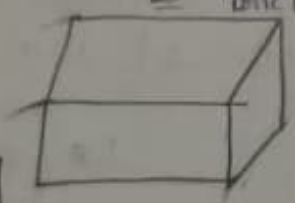
जोड़ने का काम → Mason (मिस्त्री)

(#) **Masonry** ÷ Addition or Assemble of two or more object, known as Masonry.

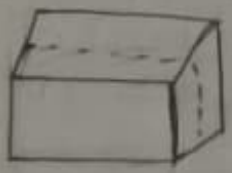
(#) **Brick Masonry** ÷ The addition or assemble of two or more brick in a definite pattern to construct a wall so that it bear the load coming on it and transfer it safely known as "brick Masonry."

(#) **Stone Masonry** ÷ The addition or assemble of two or more stone in a definite pattern to construct a wall so that it bear the load coming on it and transfer it safely; known as stone measonry.

31/10/18

one full brick = 

Queen closer



field tradition brick →

$= 9'' \times 4\frac{1}{2}'' \times 3''$

$= 10'' \times 5'' \times 3''$

Half brick = 5" wall ⇒ breath of wall = 5"

one brick = 10" wall → breath of wall = 10"

one and half = $1\frac{1}{2}$" wall → breath of wall = 15"

Two brick = 20" wall ⇒ breath of wall = 20"

Two and half = 25" wall ⇒ breath of wall = 25"

Queen closer = Cutting of a full brick along it's length into two equal parts.

Queen closer →

length = 10"
breath = 2.5"
thickness / Height = 3"

→ for construction a brick wall and "b" of queen closer plays an important role.

Bat ⇒ Cutting of brick along the breath.

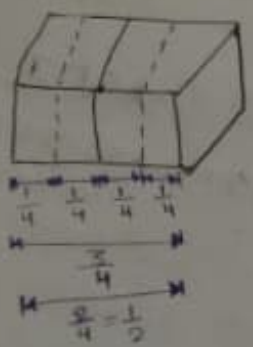
$\frac{1}{2}$ bat = $\frac{2}{4}$ bat = दो चौथाई

bat = $\frac{1}{2}$ bat

$\frac{3}{4}$ bat = तीन चौथाई = three quater bat

$\frac{1}{4}$ bat = Quater bat = एक चौथाई bat

One quater bat.



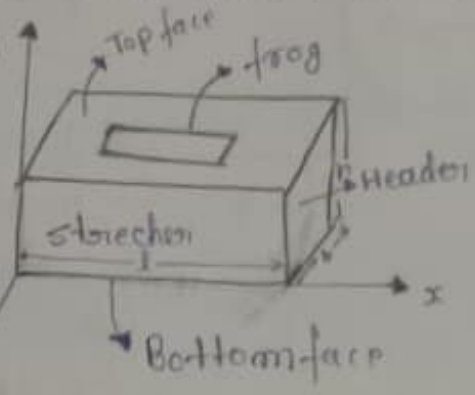
→ **Quater bat** = $\frac{1}{4}$ bat = एक चौथाई bat

length = 5"
breath = 2.5"

(11) **Bond** → It may be defined as the arrangement of bricks in such a manner to bear load. Some of the important bonds are listed below →

1. Header Bond
2. Stretcher Bond
3. English Bond ⇒ English bond is considered to be the strongest bond in brick masonry
4. Flemish Bond

(II) **Brick** :→ Brick may be defined as the building unit for the construction of wall.



↳ Length of brick is represented by x-axis.

↳ Breath of brick is represented by z-axis.

↳ Height of the brick is represented by y-axis.

↳ frog is situated on the top face of a brick.

↳ Brick is 3D object.

↳ Dimension → l x b x h

↳ Dimension of frog = 10cm x 4cm x 1cm

↳ frog :→ "The indent or depression made on the top face of the brick for holding mortar is known as "frog".

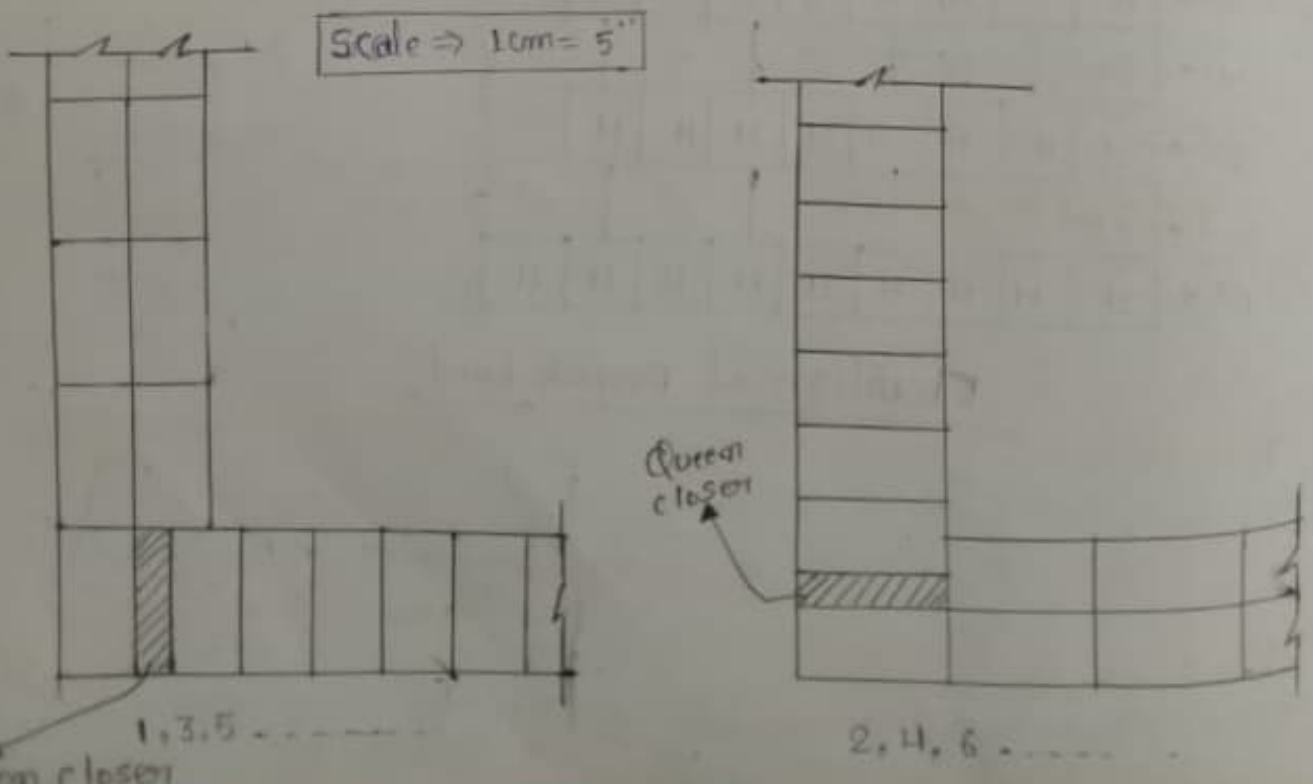
Size of Brick

- Standard size or Modular size
  - Actual standard size or modular size → without considering mortar thickness → 19cm x 9cm x 9cm
  - Nominal standard size or Modular size → Considering mortar thickness → 20cm x 10cm x 10cm
- Conventional size or traditional size
  - Actual CS or TS → without CMT → 22.9cm x 11.2cm x 7.0cm
  - Nominal CV or TS → CMT → 22.9cm x 11.4cm x 7.6cm

(iii) English bond :-

(iv) PLAN OF ODD AND EVEN COURSES FOR VARIOUS BRICK WALL IN ENGLISH BOND :-

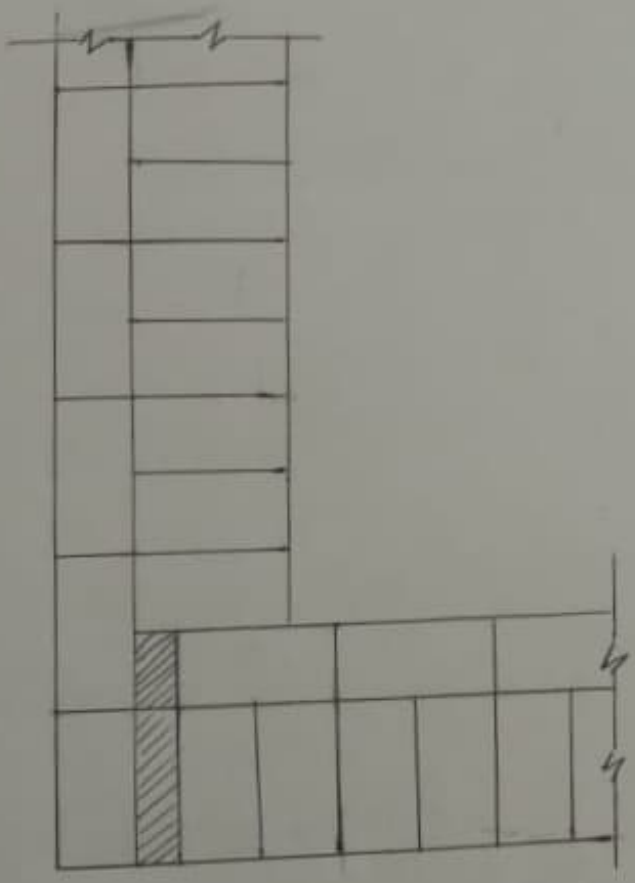
(1) ONE BRICK WALL = 10" thickness of wall



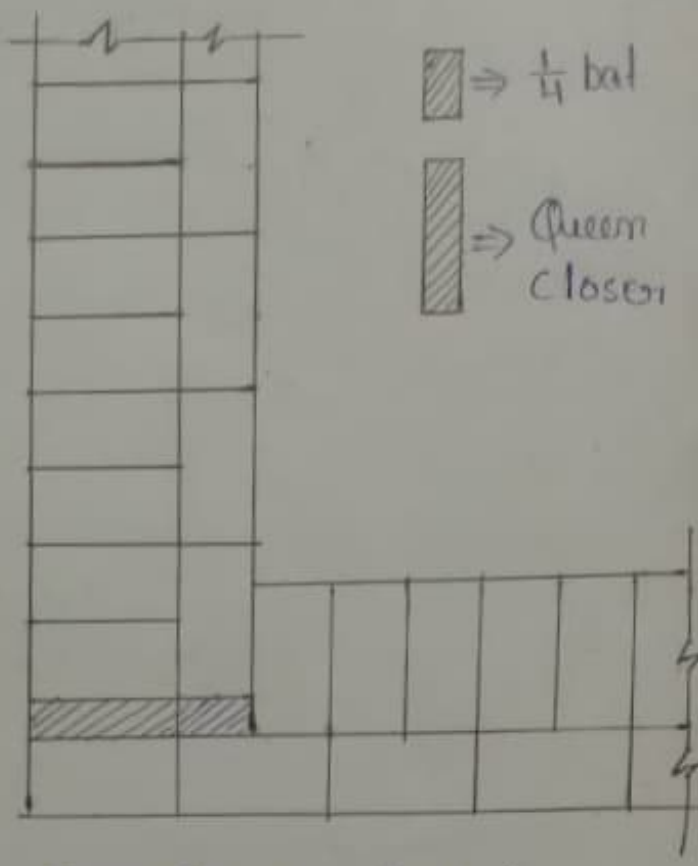
$\frac{1}{4}$ bat (Quater bat) = Length = 5", Breath = 2.5"

② One and half Brick = 15" = thickness of wall

Scale ⇒ 1 Cm = 5"



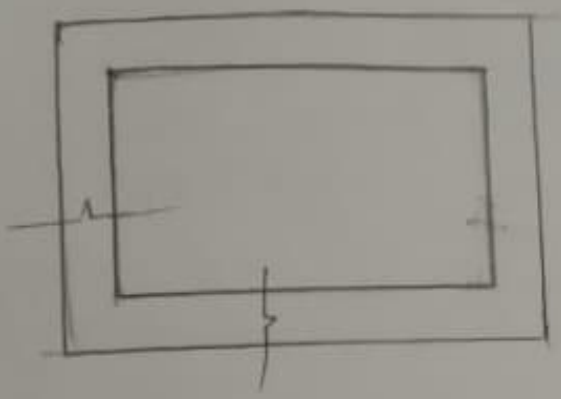
Odd Course = 1, 3, 5 - - -



Even Course = 2, 4, 6 - - -

(11) One brick wall plan in english bond :-

Brick wall ⟹ Bricks are arranged layer by layer :-



Odd layer starting :-

1, 3, 5, ...

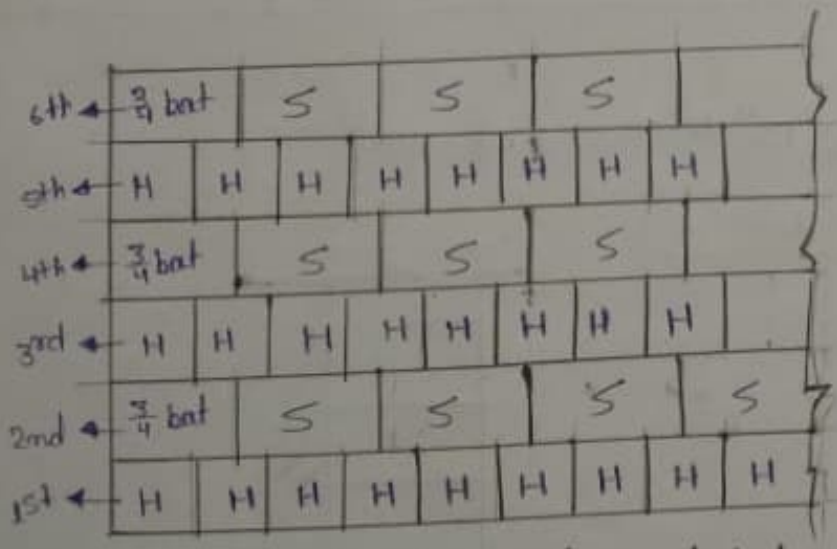
↳ In odd layers bricks are arranged in same way.

Even layer starting :-

2, 4, 6 ...

↳ In even layer bricks are arranged in same way.

(12) English bond :- A type of bond in which header and stretcher are arranged in alternate layer. This can be seen in the elevation of the english bond.



Elevation of English bond.