LEARNING MATERIAL

SEMESTER & BRANCH: 3RD SEMESTER CIVIL ENGINEERING

THEORY SUBJECT: BUILDING MATERIALS & CONSTRUCTION TECHNOLOGY (TH-3)

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12 Aug 2020 STONE

Building Material

Stone :- Small pieces of rock agg of mineral found of earths crust.

Rocks :- (i) Geological classification
(ii) Physical classification
(iii) Chemical classification

The building stones are obtained from the rocks which are in the following 3 ways.

V-V.I

(*) (i) Geological classification :- According to this classification the rocks are divided in to 3 types.

(i) Igneous rock
(ii) Sedimentary rock
(iii) Metamorphic rock

Igneous Rock :- => The inside portion of earth surface has high temperature so as to cause fusion by heat at even ordinary pressures.

=> The molten or pasty material is known as magma & this occassionally rises to come out to the earth surface.

=> The rocks which are formed by cooling of magma is called Igneous rock.

=> Igneous rocks are divided in to 3 types.

(i) Plutonic Rock
(ii) Hypabyssal Rock
(iii) Volcanic Rock

Plutonic Rock

(i) Such rocks are formed due to collection of magma at a considerable depth from earth surface.

(ii) The cooling process is slow and rock posses coarsely grained crystalline structure.

(iii) The igneous rocks commonly used in building industry.

Ex:- Granite

Hypabyssal Rock :- 13 Aug 2020

(i) Such rocks are formed due to cooling of magma at a relatively shallow-depth.

(ii) The cooling process is quick and hence rocks are posses finely grained structure.

Ex:- Dolerite Rock.

Volcanic Rock :- Such rocks are formed due to pouring of magma at earth surface.

(ii) The cooling process is rapid as compared to the previous two cases.

(iii) These rocks are extremely fine grained structure.

Ex:- Basalt Rock.

Sedimentary Rock :- (i) These rock are formed by the deposition of products of weathering on the pre-existing rock.

(ii) All the products of weathering are ultimately carried away from their place of origin by the agents of transport such agents are wind, water ice etc.

(iii) These rocks are divided 3 types.

(i) Residual deposit

(ii) Sedimentary deposit

(iii) Chemical deposit

Residual deposit :- Some portion of the products of weathering remain at the site of origin such a deposit is known as residual deposit.

Sedimentary deposit :- The insoluble product of weathering are carried away by some agents & deposited at a new place such deposits are known as sedimentary deposit.

Chemical deposit :- Some particles are carried away in solution by chemical process & gives rise to chemical deposit.

Ex:- Gravel, sand stone, lime stone etc.

(c) Metamorphic Rock :-

> These rocks are formed by the change in character of the pre existing rock.

> The igneous as well as sedimentary rock are changes in character when they are subjected to high heat & pressure. The process of

> In this process the original consti
-ng minerals which are converted
in to new ones which are more stab
under changed condition.

> There are three agents of meta
-phism such as heat, pressure &
chemical

> There are four types of metamorphis

(i) Thermal metamorphism

(ii) Cataclastic metamorphism

(iii) Dynamo-thermal metamorphism

(iv) Plutonic metamorphism

(1) Thermal metamorphism :-

→ The heat is predominent factor

(2) Cataclastic Metamorphism :-

At the surface of earth the
temprature are low and metamorph
is brought about by directed pres
-ure only.

(3) Dynamo-thermal metamorphism :-

There is rise in temperature
with increase in dept. Hence
the heat in combination with
stress brings about the changes
in rock. Such metamorphism is kno
as dynamo-thermal metamorphism

(4) Plutonic metamorphism :-

→ The effective agent

→ this is due to the fact that the rock becomes plastic in nature at certain depth.

(B) Physical classification :-

This classification based on general structures on rocks. According to this classification Rocks are divided in to 3 types.

(i) Stratified Rock

(ii) unstratified Rock

(iii) foliated Rock

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Stratified Rock :- these rock possess planes of stratification or cleavage and such rocks can easily be split up along these plane.

→ Fine sedimentary rock are distinctly stratified rock.

unstratified Rock :- these rocks are unstratified (not layer) this structure may be crystallin granular or compact structure.

Foliate of rock :- these rocks have tendency to be split up in a definite direction.

Ex :- metamorphic Rock

(C) Chemical classification :- According to this classification rocks are divided into 3 types :

(i) Siliceous Rock
(ii) Argillaceous Rock
(iii) Calcareous Rock

(i) Siliceous Rock :- In these rocks the silica predominates. The rock is durable & are hard.
=> They are not easily affected by the weathering agencies.
-> The silica however in combination with weaker materials may disintegrate easily. It is therefore necessary that these rock should contain silica making them hard & durable.
ex:- Granite, quartz etc.

Argillaceous Rock :-

In these rocks, the argilla or clay predominates such rocks may be dense & may be soft this rock argilla in nature (soft) (contain water)

(iii) Calcareous rock :- In these rocks calcium carbonate predominates.
=> The durability of these rock depends

Surrounding atmosphere.
(durability surposing)

ex:- Lime stone, marble

(viii) Usess of stone

Following are the various uses of stone

(I) Structure :- The stones are used for foundation, walls, columns, lintels etc.

(II) Face work :- The stones are adopted to give massive appearance to the structure. The walls are of bricks and facing is done in stone of desired shade & this is known as composite massonary.

(III) Paving :- The stones are used to cover floor of buildings of various types such as residential building, industrial building, commercial building etc.

(IV) Base material :- The stones are disintegrated and converted in to from a basic material for cement concrete, macadam of road etc.

Natural bed of stone
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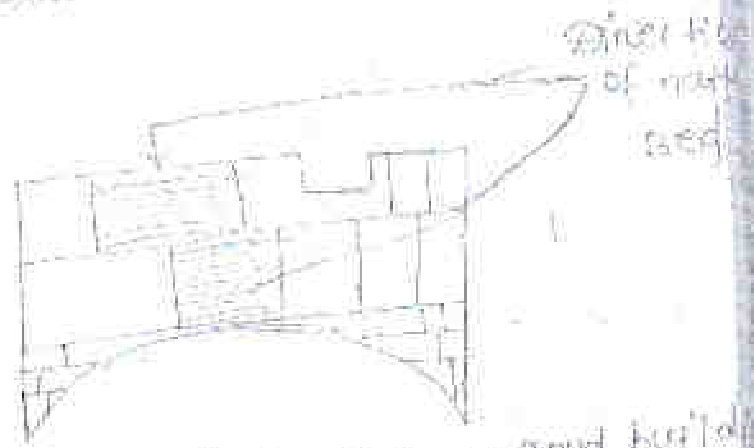
The building stones are obtained from rock. These rocks have a distinct plane of division along which stone can easily be split. This plane is known as natural bed of stone.

Qualities of good building stone:-



(i) Crushing strength :- For a good building stone or structural stone should be greater than 100N/mm²

(ii) Appearance :- The stone which are to be used for fair work should be decent in appearance and they should be capable of preserving their colour uniformly for a long time.

(iii) Durability :- A good building stone should be durable.

The various factors contributing to durability of a stone are it's chemical composition.

(iv) Facility of dressing :- The stone should be such that they can be easily dressed ... is avoided. It is an important consideration from the economic point of view.

(v) Fracture :- For a good building stone its fracture should be sharp, even bright & clear with grains well cemented together.

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(vi) Hardness :- The reflection of hardness of stone is done in hardness test. Should be greater than 14 for a stone used in road work.

⇒ If it is between 14 & 17, then the stone is said to be of medium hardness.

⇒ If it is less than 14, i.e stones is said to be poor hardness & such stone should not be used in road work.

(vii) Percentage of wear (wear) :- % of wear

(i) In attrition test if wear is more than 3% the stone is not satisfactory.

(ii) If it is equal to 3% the stone is just tolerable for a good building stone.

(iii) Wear should be equal or less than 3%.

(viii) Seasoning :-

(i) The stone should be well seasoned before putting into use.

(ii) The stone obtained fresh from a quarry contain some moisture which is known as the quarry sap.

(iii) The presence of this moisture makes the stone soft. Hence the stone is easy to work.

(iv) The stone should be dried in seasoned before they are used in structural work. A period of about 6 to month is considered to be proper seasoning.

(iv) water absorption :-

All the stones are more or less porous but for a good building stone % absorption by weight after 24 hours must not exceed 0.6

-> the porous stone seriously affect the durability of stone.

stone quarrying :- the process of taking out stone from natural rock bed is known as quarrying.

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Dressing of stone :-

xox

the stone after being quarried are to be cut into suitable sizes and with suitable surfaces. This process is known as the dressing of stone. It is carried out for the following purposes :-

(i) To get the desired appearance for stone work

To make the transport from quarry easy & economical.

-> following are the qualities of finishes obtained by the dressing of stones

(i) Axed finish :- The surfaces of hard stones such as granite are dressed by means of an axe such a finish is known as axed finish.

(i) Boasted or Reeved finish :-

In this type of finish, the tooth is used to make non-continuous parallel marks on the stone surface.

The mark may be horizontal, vertical or inclined & boasted is chiseled having an edge of width about 6mm.

(Boasted or Reeved finish)

(ii) Chisel - dressed margins :-

In order obtained uniform joints in stone work, the margins are fixed which may be either square or pitched.

(iii) Circular finish :- In this type of finish the surface of stone made roughly or circular as in case of column.

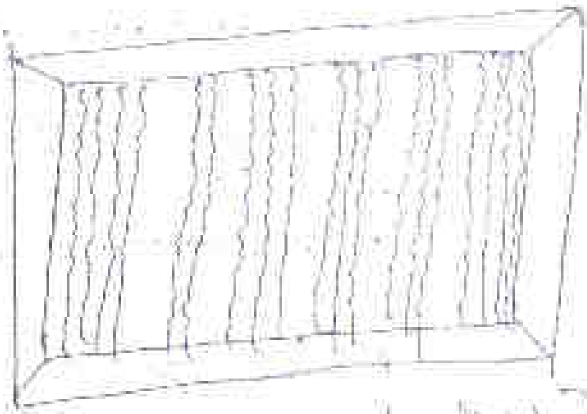
(iv) Snagged or Combed finish :-

In this type of finish, a snag or a comb which is a piece of steel with a number of teeth is worked on the surfaces. In all directions and surfaces.

(Snagged finish)

(xi) Furrowed finish :- In this type of finish width is stait margin of about 20mm on all the edges of stones and the central portion is made to project about 15mm.

=> A number of vertical or horizontal grooves about 10mm wide are formed in project portion.



(Furrowed finish)

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(xii) Moulded finish :- The surface can be moulded on any desired shape so to improve the appearance of the finish.

-> The moulding can be made in them by machine or hand.

(xiii) Rough-dressed finish :-

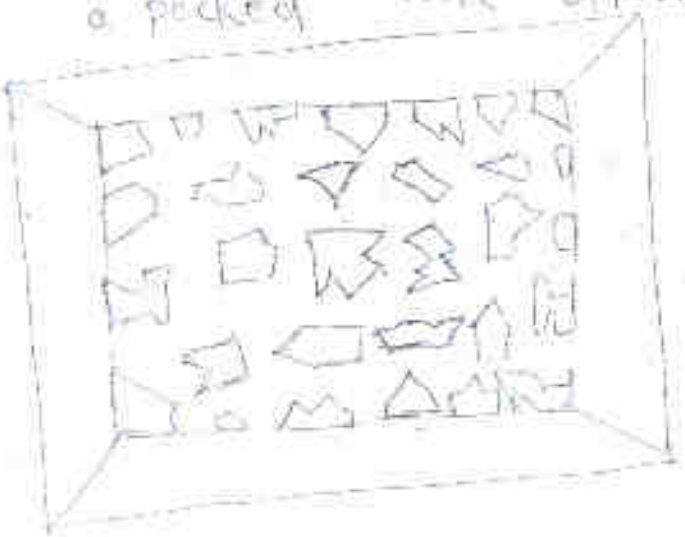
In this type of finish the stones are made roughly square or rectangular by means of walling hammer.

(Hammer - Dressed finish)

(ix) Plain finish :- In this type of finish, the surface of the stone is made approximately smooth with saw or width chisel.

(x) Rectilineated finish :- In this type of finish presents a red-like appearance.

→ A margin about 2cm wide is mark on the edge of stone & irregular sinking are made on the enclosed space. A point tool is used to put the mark on the surface. So as to present a pecked mark appearance.



(xi) Scabbling finish :- In this type of finish the irregular projection are removed with a scabbling hammer.

	Stone	Classification	Qualities	Uses
(1)	Basalt and trap	Igneous	Hard and tough, difficult to work. Its sp. gr. is 3 to 3 and compressive strength varies from 150 to 185 N/mm². Its weight varies from 18 to 29 kN per m³.	Road metal, for rubble masonry, foundation work etc.
(2)	Chalk	Sedimentary	Pure white limestone, soft and easy to turn in powder.	In preparing glazing putty, as colouring agent, manufacture of portland cement.
(3)	Gneiss	Metamorphic	Splits into thin slabs, easy to work. Its sp. gr. is 2.69 and compressive strength is 206 N/mm².	Street paving, rough masonry work etc.
(4)	Granite	Igneous	Hard, durable and available in different colours, weather resistant to natural forces, can take nice polish. Its sp. gr. varies from 2.6 to 3 and compressive strength varies from 75 to 127 N/mm². Its weight is about 26 to 27 kN per m³.	Steps, sills, facing work, bridge piers, column, road metal, ballast, suitable for carvings.
(5)	Kankar	Sedimentary	Impure limestone	Road metal, manufacture of hydraulic lime etc.
(6)	Laterite	Metamorphic	Porous and spongy structure, easily quarried, contains high percentage of oxide of iron, available in different colours. Its compressive strength varies from 1.9 to 2.3 N/mm² ...	Building stone, road metal, rough stone masonry.

(7)	Marble	Metamorphic	Can take good polish and available in different colours. Its SP. gr. is 2.63 and compressive strength is 71 N/mm².	Flooring, facing work, columns, steps, ornamental work etc. It can take also polish. It can easily be sawn and carved.
(8)	Murum	Metamorphic	Decomposed laterite, deep brown or red in colour.	Blindage for metal roads, for fancy path and garden walls.
(9)	Quartzite	Metamorphic	Hard, brittle, crystalline and compact, difficult to work and dress.	Retaining walls, ornamental, concrete aggregate, pitching, rubble masonry of [illegible] etc.
(10)	Sand stone	Sedimentary	Consists of quartz and other minerals, easy for work and dress and available in different colours. Its sp. gr. varies from 2.63 to 2.95 and compressive strength is 64 N/mm². Its weight is about 20 to 22 kN per m³.	Steps, facing work, columns, flooring works and [illegible] carving etc.
(11)	Slate	Metamorphic	Black colour and splits along natural bedding planes, non-absorbent. Its SP. gr. is 2.89 and compressive strength varies from 75 to 207 N/mm².	Roofing tiles, sills, damp proof courses etc.

21 July 2020

Brick :- The bricks are obtained by moulding clay in rectangular blocks of uniform size & shape.

⇒ As bricks are of uniform size they can be properly arranged.

Composition of Brick :-

— or —

S	Silica (SiO_2)	(50-60%)
A	Alumina (Al_2O_3)	(20-30%)
L	Lime	(7-3%)
I	Iron oxide	(5-6)%
M	Magnesia	(1%)

(i) Silica :- It exist in clay either as free or combined. As free sand it is mechanically mixed with clay in combined form, it exists in chemical composition with alumina.

⇒ A good brick earth should contain about (50-60)% of silica. The presence of this constituent prevents cracking, shrinkage, warping of raw bricks.

⇒ It helps bricks to retain uniform shape to the brick.

⇒ The durability of brick depends on proper proportion of silica in brick earth. The excess of silica destroys the cohesion between particles

It is the chief constituent of every kind of clay. A good earth should contain about (20-30)% of alumina. This constituent imparts plasticity to the earth so that it can be moulded. If alumina is present in excess the raw bricks shrink and warp during burning.

Lime (3%) :-

A small quantity of lime not exceeding 3% is desirable good brick earth should be present in a very finely powdered state because even small particle of size of a pin-head cause flaking of bricks. The lime prevents shrinkage of raw bricks & helps the bricks to melt.

Iron oxide (5-6)%

A small quantity of iron oxide to about (5-6)% is desirable the presence of iron oxide makes the brick reddish. Excess of iron oxide makes the brick blackish. On the other hand, the quality of brick considerably less the presence of lime.

(5) Magnesia :- A small quantity of magnesia in brick earth imparts yel tint to the and decreases shrinkage.

-> Excess of magnesia leads to the decay of brick. 1%

(4) 28 Aug 2020

Manufacturing of bric

(1) Preparation of clay :-

The clay for bricks is prepared in the following.

(i) unsoiling (iv) Weathering
(ii) Digging (v) Blending
(iii) Cleaning (vi) Tempering

(i) unsoiling -> The top layer of soil about 200mm in depth is taken out and thrown away.

-> The clay in top soil is full of impurities and hence it is to be rejected for the purpose of preparing bricks.

(ii) Digging :- The clay is then dug out from the ground. It is spread on the levelled ground just a little deeper than the general level of ground. The height of heaps of clay about 600mm to 1200mm.

(iii) Cleaning :- The clay as obtained as result of digging should be cleaned of stones pebbles vegetable matters etc.

=> If this particles are excess one in excess the clay is to be washed and screened.

(iv) Weathering :- The clay is than expos to atmosphere for softening

=> The period of exposer various from few weeks to full season.

=> for a large project the clay is dug out just before the mansoon and it is allowed to weather through out the mansoon.

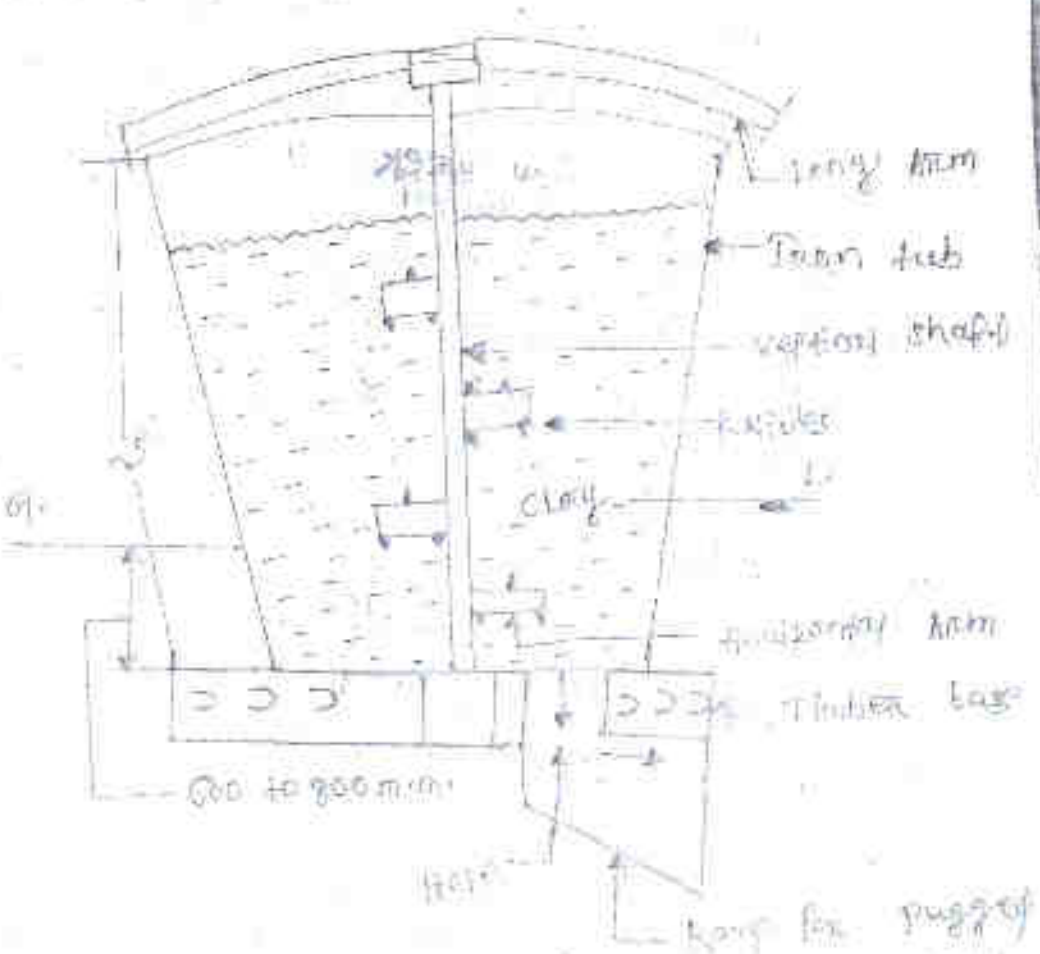
(v) Blending :- The clay is made loose & any ingredient to be added to it is spread out at its top.

=> The blending is carried out by tearing small portion of clay every time and by turning it up & down in vertical direction. The blending makes clay fit for the next stage of tempering.

Tempering :- In the process of tempering makes clay fit is brought to a proper degree of hardness & it is made fit for the next operation of moulding.

⇒ The water in required quantity is added to clay whole mass is kneaded or pressed under the feet of men or cattle.

⇒ The tempering should be done to obtained homogeneous mass of clay of uniform character.



(pug mill)

⇒ For manufacturing good bricks on large scale, the tempering is usually done in a pug mill.

2 Sep 2020

(2) Moulding :- The clay which is prepared as above is then sent for the next operation of moulding.

=> Following are the two types of moulding.

(i) Hand moulding

(ii) Mechine moulding

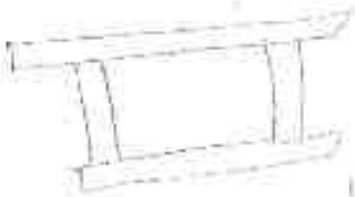
Hand moulding :-

In hand moulding the bricks are moulded by hand.

=> It is adopted where temp. manufacture is cheap & reading available, for the manufacturing process of brick on a small scale.

=> The moulds are rectangular boxed which are open at top & bottom either may be of wood or steel.

Elevation



=> The bricks prepared by hand moulding are of two types.

(i) Green or moulded brick

(ii) Table moulded brick

(A) Ground moulded brick :-

> The ground is first made level & fine sand is sprinkled over it.
> The mould is dipped in water and placed over the ground. The lumps of tempered clay is taken and it is dashed in the mould.
> The clay is pressed or forced in the mould in such a way that it fills all the corners of mould. The extra clay is removed either by wooden strikes or metal strike.
> The mould is then lifted up & raw brick is left on the ground. The placed just near the previous brick. This process is repeated till the grounds is covered with raw bricks.

(B) Table moulded brick :-

> The process of moulding these brick is just similar to as above but in this case the moulder stands over a table of size about 1m x 1m.
> The bricks are moulded on the table & sent for the further process.
> Then it is drying.

(C) Machine moulding :-

The moulding may also be active by machines. The process is the same when bricks in large

Quantity are to be manufactured are the same space at short time.

> It also helpful for moulding hard & strong clay.

> This machines are classified in the two catagories.

(i) plastic clay machines

(ii) Dry clay machines.

(3) Drying :- 3 sep 2020

> The dam bricks, if burnt, are likely to be cracked and distoted. Hence the moulded bricks are dried before they are taken for next operation burning.

> For drying bricks are laid longitudinally in stacks of width equal to two bricks

> Drying of bricks are 5 types.

(i) Artificial drying :-

The bricks are generally dried by natural process when bricks are to be rapidly dried the artificial drying may be adopted.

> In such a case the moulded bricks are allowed to pass through special drying which are in the form of tunnels or kilns or channels.

(ii) Circulation of air :- The bricks in stacks should be arranged in such a way that sufficient air space

is left between them.

(iii) Drying yard :- For the drying purpose special drying yards should be prepared.

(iv) Period of drying :- The time required by moulded bricks to depends on prevailing weather condition. usually it takes about 3 to 20 days bricks to become dry.

(v) Screens :- It is to be seen that bricks are not directly exposed to wind or sun for drying suitable screens if necessary may be provided to avoid such situations.

(vi) Burning :- This is a very important operation in the manufacture of bricks. It imparts hardness & strength to the bricks and make them durable.

⇒ The bricks should be burnt properly if bricks are over burnt they will be brittle & hence break easily if they are under burnt they will be soft & hence cannot carry loaded.

⇒ The burning of bricks is done either in clamps or in kilns.

⇒ The clamps are temporary structure & they are adopted in manufacture bricks on small scale like kilns are permanent structure & they are adopted when large scale

brick required.

Clamp :- Following procedure is adopted in construction of clamp.

(i) A piece of ground is selected in its shape in plane is generally trapezoid - al. The floor of clamp is prepared in such a way that shortend is slightly in the excavation & wider end is kessed at an angle of about 5° from the ground level.

(ii) The bricks will in mud is constructed on the shortend & layer of fuel is laid on the prepared floor. The fuel may consist of grass, cow dung etc. The thick-ness of this layer is about 100mm. to 300mm. the wood or coal dust may also be used as fuel.

(iii) A layer consisting of 4 or 5 course of raw bricks is then put up the bricks are laid on edge with small spaces between them for the circula-tion of air.

(iv) A second layer of fuel is then placed over it, another layer of raw bricks are formed the thickness of fuel layer gradually decreases as the height of clamp increases.

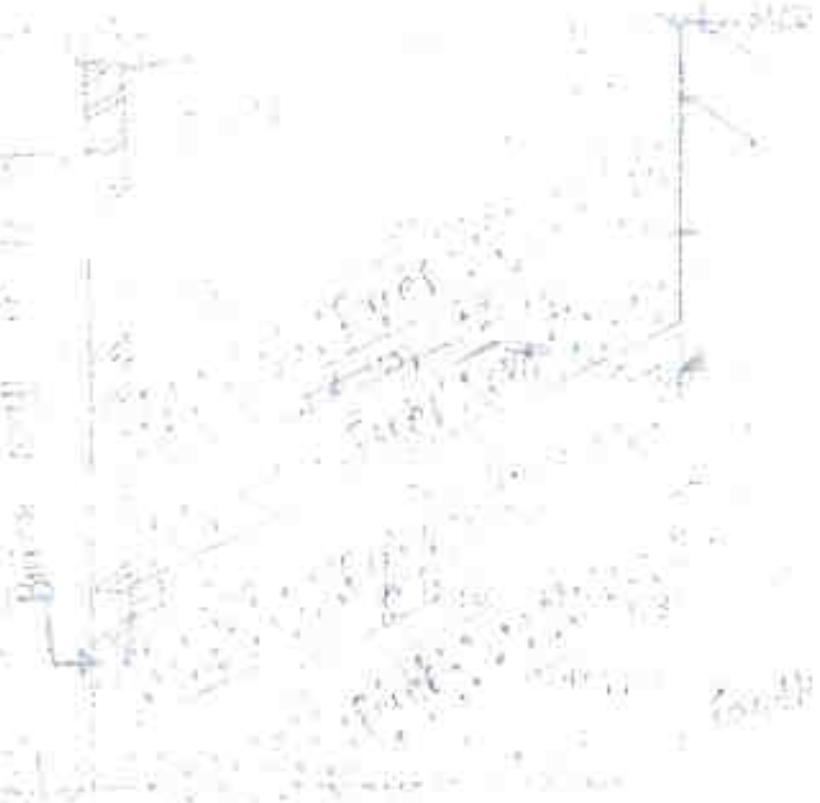
(v) The total height of the clamp is about 3m. to 4m.

(vi) when clamp is completely constructed it is plastered with mud on sides.

(vii) The clamp is allowed to burn for a period of about one to two months.

(vii) It is then allowed to cool for three or less the same period as burning

(viii) The burnt bricks are then taken out from the clamp.



Clamp

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Advantages of clamp burning :-

Following are the advantages of clamp burning.

(i) The burning and cooling of bricks are gradual in clamp Hence the bricks produced are tough & strong.

(ii) The burning of bricks by clamps proves to be cheap & economical

(iii) The special labour required

Disadvantages of clamp burning :-

Following are the disadvantages of clamp burning :-

(1) The bricks are not of regular shape this may be due to the settlement of bricks when fuel near bottoms is burnt & turned to ashes.

(2) It is a very slow process.

(3) Bricks are liable to uneven burning.

* KILN :- A kiln is a large oven which is used to burn bricks the kiln which are used in the manufacturing of bricks are of the following two types

(1) Intermittent kiln

(2) Continuous kiln

(1) Intermittent kiln :- These kilns are intermittent in operation which means that they are loaded, fired, cooled and unloaded. such kilns may be either rectangular or circular in plan. they may be over ground or under ground they are classified in to two ways

i) Intermittent - updraught kiln

ii) Intermittent - down draught kiln.

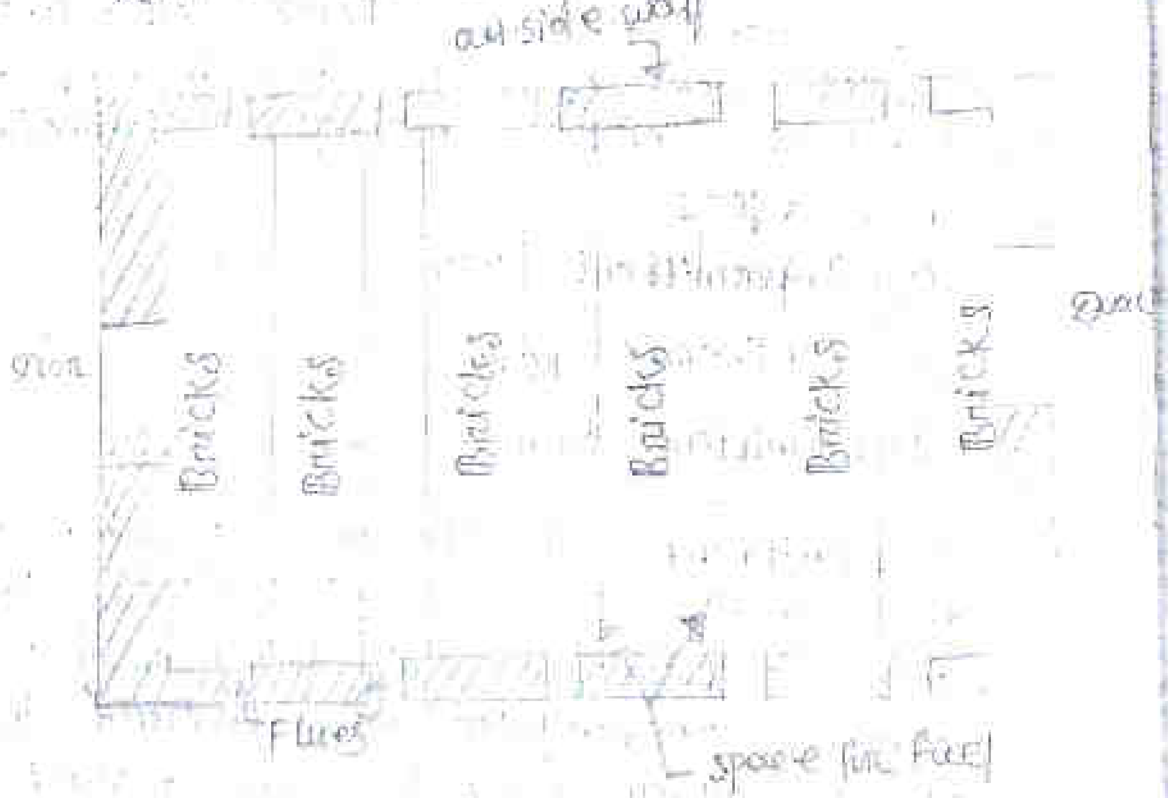
(1) Intermittent - updraught kiln :-

> these kilns are in the form of rectangular structures with thick outside wall the side arms are provided

ends and for loading & unloading.

-> The flues are channels or passages which are provided to carry flames or hot gasses through the body of kiln.

=> A temporary roof may be installed anylight material such roof give protection to the raw bricks from rain while their being placed. This roof is to be removed when the kiln is fired.



(Intermittent kiln)

(2) The raw bricks are laid in rows in thickness equal to 2 to 3 bricks and of height equal to 8 to 9 bricks. A space of about 2 bricks is left between adjacent rows.

is left for loading. Place is utilising for placing fuel.

8th Sep 2020

Intermittent down-draught kiln:-

⇒ These kilns are rectangular or circular in shape they are provided with permanent walls and closed light roof.

⇒ The floor of the kiln has openings which are connected to a common chimney stack through flues.

⇒ The working of this kiln is more or less similar to updraught kiln but is arranged in this kiln the hot gases are carried through vertical flue up to the level of roof.

⇒ These hot gases move downward by the chimney and in doing so they burn the bricks.

(2) Continuous kiln:- These kilns are continuous in operation. This is mean that loading, firing, cooling and unloading are carried out simultaneously in these kilns. There are various types of the continuous kiln following three types of continuous kilns will be described:-

(i) Bull's tunnel kiln

(ii) Hoffman's kiln

(iii) Tunnel kiln

Bull's trench kiln

This kiln may be of rectangular circular or oval shape in plan.

⇒ The kiln is constructed in a trench excavated in ground. It may be fully underground or partly projecting above ground.

⇒ The ramps of earth should be provided on outside wall. The outer & inner walls are to be constructed of bricks.

⇒ The openings are generally provided in the outer walls to act as flue holes.

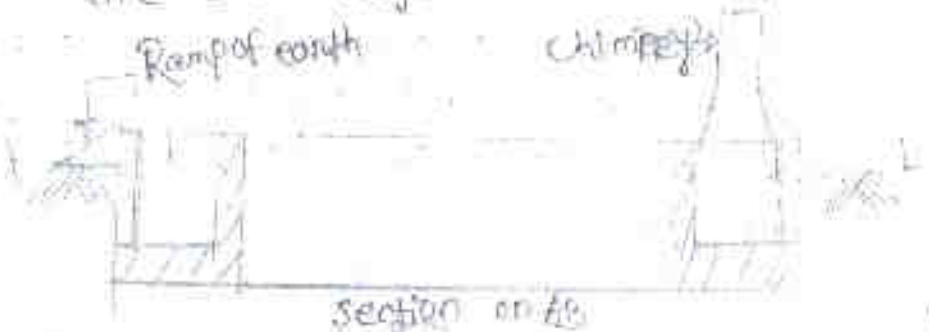
⇒ The dampers are in the form of iron plates & they are used to divide the kiln into suitable. This is the most widely used kiln in India and it gives continuous supply of bricks.

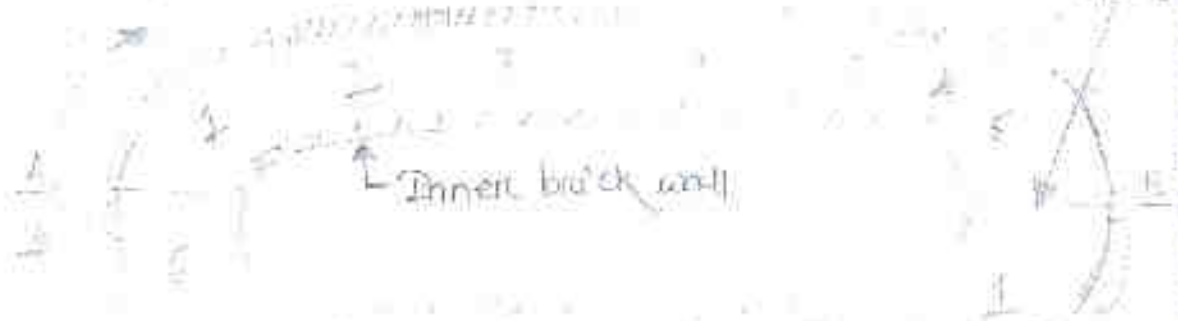
operation :- The bricks are arranged in sections they are arranged in such a way that flues are formed the fuel is placed holes after covering top surface with earth and ashes to prevent the escape of heat.

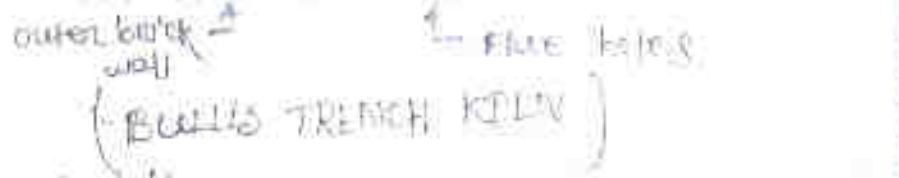
⇒ The flue holes provided in sufficient number at top to insert fuel when burning is in progress usually five two movable iron chimneys are to four openings.

⇒ Hence the hot gases leaving the chimneys make up the bricks in next section each section required about one day to burn.

⇒ When a section has been burnt, the flue holes are closed and it is allowed to cool down gradually. The fire is advanced to the next section and the chimneys are moved forward.







(BULLS TRENCH KILN)

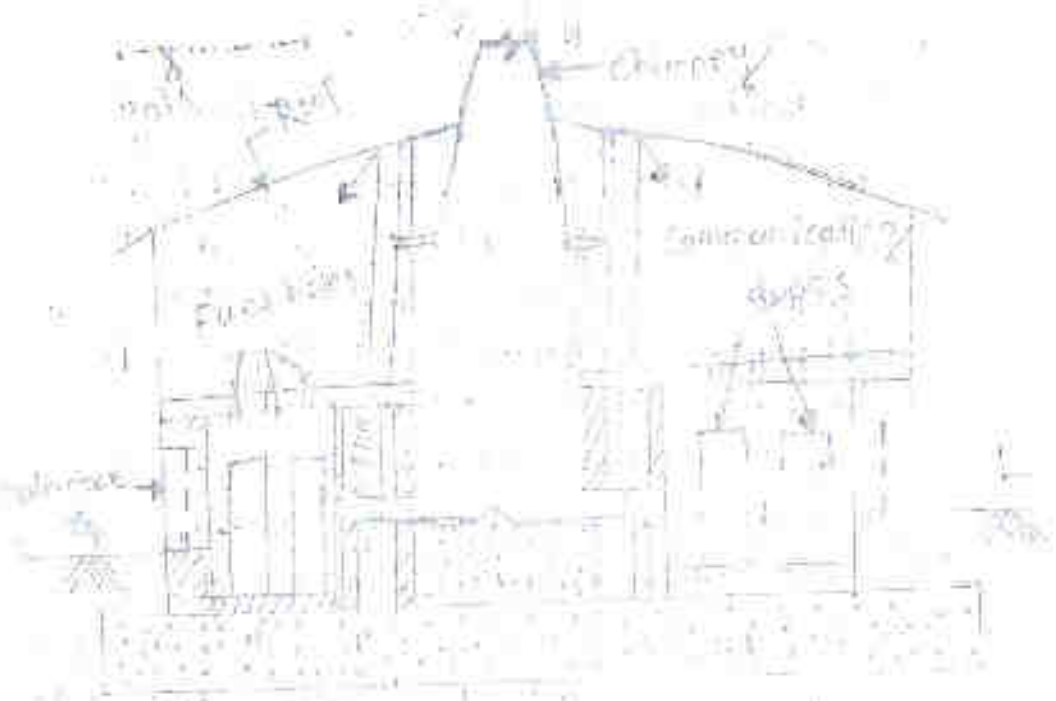
Hoffmann's Kiln :- This kiln is consisted over ground and hence it is sometime known as the flame kiln. Its shape is circular in plan and it is divided in to a number of compartments or chambers. As a permanent unit it is provided; the kiln can even function during season. Each chamber is provided with fire holes.

(c) A main door for loading and unloading of bricks

(d) Communicating doors which would act as flues in open condition.

(e) A radius flue connected with a central chimney.

⇒ The main door are closed by dry bricks and covered with mud, when required. For communicating door and radial flues, the damper are provided to shut or open them.



(Hoffmann kiln)

In this type of kiln, each chamber performs various functions i.e loading, deging, burning, cooling and unloading.

chamber 1 ——— Loading

Chamber 2 to 5 ——— Drying & Preheating

Chamber 6 to 7 ——— Burning

Chamber 8 to 11 ——— cooling

Chamber 12 ——— unloading

with the above arrangement the circulation of flue gases as shown by curves in fig. the cool air enters through the open 1 & 12 as their main doors are open. After crossing the cooling Chambers 8 to 11, it enters the burning section in a heated condition.

> It then moves to Chamber 2 to 5 to dry and pre heat the raw bricks. The damper of chamber 2 is open & hence it escapes to the atmosphere through chimney.

Advantages of Hoffman kiln :- (Hoffman's kiln)

(i) The bricks are burnt uniformly equally & evenly - Hence the high percentage of good quality bricks can be produced.

(ii) It is possible to regulate heat inside the chambers through fuel holes.

(iii) The supply of bricks is continuous because of the fact that the top of kiln is closed and it can be made to work during the entire.

(iv) There is considerable saving in fuel due to preheated of raw bricks.

(v) There is no air pollution in the Low quality because the exhaust gases don't contain black or coal dust particle.

(3) Tunnel kiln :- This type of kiln is in the form of tunnel which may be straight, circular or oval in plan. It contains a stationary zone of fire.

=> The raw bricks are placed on trolleys which are then moved from one end to the other end of tunnel.

=> The raw bricks will get dried & preheated as they approach zone of fire & the bricks are burnt and they are pushed forward for cooling.

(1) Qualities of good bricks :-

following are the ~~max~~ qualities of good brick

⇒ The brick should be table moulded well burnt in kiln, copper-coloured, bricks form cracks and with sharp & square edges. The colour should be uniform & bright.

⇒ The brick should be uniform in shape and should be of standard size.

⇒ The brick should give a clear metallic ringing sound when struck with each other.

⇒ The bricks when broken should show a bright homogeneous & uniform compact structure form voids.

⇒ The brick should not absorb water more than 20% by weight for the first class brick & 22% for 2nd class bricks when soaked in cold water for a periods of 24 hours.

⇒ The brick shouldn't be sufficiently hard no impression should be left on hard surface when it is scratched with finger nail.

⇒ The brick should not break in to pieces when dropped flat on hard ground form a height of about one metre.

⇒ The brick should have the crushing strength below 5.5 N/mm²

classification of bricks :-

Two types :- (i) Unburnt or sun-dried brick
(ii) burnt bricks

Burnt brick :-

(i) 1st class brick
(ii) 2nd class brick
(iii) 3rd class brick
(iv) 4th class brick

1st class brick :- compressive strength 10 N/mm²
=> these bricks are table moulded and standard shape and they are burnt in kiln & edges of bricks are sharp square & smooth & straight.
=> these bricks are used for superior work of permanent nature.

2nd class brick :-

=> these bricks are ground moulded and they are burnt in kiln.
=> the surface of these bricks is some what rough & shape is also slightly irregular.
=> these bricks may have hairy cracks and their edges may not be sharp & uniform.

=> these bricks are commonly used at places when brick work is to be provided with a face of pleasing color texture strength.

3rd class brick :- these bricks are ground moulded and they are burnt in clamps.

=> these bricks are not hard & they have rough surface with irregular dissigned edges.

=> these bricks give dull sound when struck each other.

=> they are used for unimportant and temporary structure and places when rainfall is not heavy.

4th class brick :-

=> these are over burnt bricks with irregular shape and dark colour.

=> these bricks are used as aggregate for concrete in foundation, floors, roads etc. because of the fact that the over burnt bricks have a compact structure hence they are sometimes strength than even the first class brick found to be

size of brick :-

=> the bricks are prepared in various sizes.

Small bricks which are not standardised are known as traditional brick.

(i) standard size of bricks
(190 x 90 x 90) mm
(or)
(19 x 9 x 9) cm

(ii) nominal size of modular bricks with mortar (200 x 100 x 100) mm

30 sep 2020

New chapter :-3

Cement :-

cement is a binding material obtained by burning & crushing the stone containing clay, lime and some amount of carbonate of magnesia.

=> the artificial cement is obtained by burning at a very high temperature a mixture of calcarious and argillaceous materials. the mixture of ingredients should be intimate & they should be in correct proportion. the colored is known as the product.

Klinker :- A small quantity of gypsum added to the clinker & it is then grinding in to very fine powder which is known as the cement.

(x) Types of cement :-

Following are the different types of cements

(i) ordinary portland cement (OPC)
(ii) Pozzolana portland cement (PPC)
(iii) Coloured cement
(iv) White cement
(v) Fine resistance cement
(vi) Quick setting cement
(vii) Acid Resistance cement
(viii) Low heat cement
(ix) Rapid hardening cement
(x) Extra rapid hardening cement.

* Following are the important physical properties of cement :-

(i) It gives strength to the masonary
(ii) It is an excellent binding material
(iii) It is an excellent binding mate rial
(iv) It is workable easily
(v) It offers good resistance to the moisture
(vi) It posses good plasticity.
(vii) The initial setting time of ordinary cement is above 30min.
(viii) The final setting time of ordinary cement is 10 hours.

Mechanical properties of cement :-

(i) The compressive strength of the end of 3 day should'nt be less than 11.5 N/mm². Also the end of 7 days should be less than 17.5 N/mm².

(c) The tensile strength at the end of 3 days should not be less than 2.5 N/mm² and that the end of 7 days strength be less than 2.5 N/mm².

Chemical properties of cement :-

⇒ The ratio of % of alumina to iron oxide should not be less than 0.66.

⇒ The ratio of % of lime to alumina iron oxide & silica, known as lime saturation factor (L.S.F.) should not be less than 0.66 and not be more than 1.02.

Composition of ordinary cement :-

Lime (CaO)	62%
Silica (SiO_2)	22%
Alumina (Al_2O_3)	5%
Calcium sulphate ($CaSO_4$)	4%
Iron oxide (Fe_2O_3)	3%
Magnesia (MgO)	2%
Sulphur (S)	1%
Alkalies	1%
Total	100%

(iii) Pozzolana cement :-

The pozzolana is a volcanic powder. It is found in Italy. It resembles Surkhi which is prepared by burning bricks made from ordinary soil. The percentage of pozzolana material should be between 10 to 30.

(iii) Acid resistant cement :-

Acid resistant cements are the first acid resistance materials known and widely used in chemical resistant masonary.

(iv) Coloured cement :-

Coloured cement are made by grinding (5 to 10)% of suitable pigment with white or ordinary grey portland cement. The amount of colouring material may vary from (1 to 10)%. If this percentage exceed 10% the strength of cement is affected.

The chromium oxide gives green colour, the cobalt give blue colour, the iron oxide in different proportion gives brown, red or yellow colour. The manganese dioxide is used to produce black or brown coloured cement.

(v) White cement :- This is just a variety of ordinary cement and it is prepared from such raw materials which are practically free from colouring oxide of iron, manganese or chromium.

It is white in colour and it is used for finishing plastered work. It is more costly than ordinary cement.

(vi) Low heat cement :- Initial - 1 hour
final - 10 hours

The considerable heat is produced during the setting action in cement. In order to reduce the amount of heat, this type of cement is used. It is mainly used for mass concrete work.

(vii) Quick setting cement :- This cement is produced by adding a small percentage of aluminium sulphate and by finely grinding the cement. The % of gypsum is added for reduce the setting time of cement. The cement sets within five minutes after addition of water and it becomes hard less than 30 minutes or so. This cement is used by Concrete under running water.

(viii) Rapid hardening cement :- The initial and final setting times of this cements are the same as those of ordinary cement. But it attains high strength in early days.

Initial setting time 30 minutes

Extra rapid hardening cement :-

This type of cement accelerates the setting and hardening process. It increases strength of about 25% higher than that of rapid hardening cement.

Manufacture of ordinary cement

Following process are adopted for manufacturing of cement.

(i) Mixing of raw materials.

(ii) Burning

(iii) Grinding & packing

(i) Mixing of raw materials :- The raw materials such as lime stone & clay may be mixed either in dry conditions or in wet condition. The process accordingly known as mixing of raw materials.

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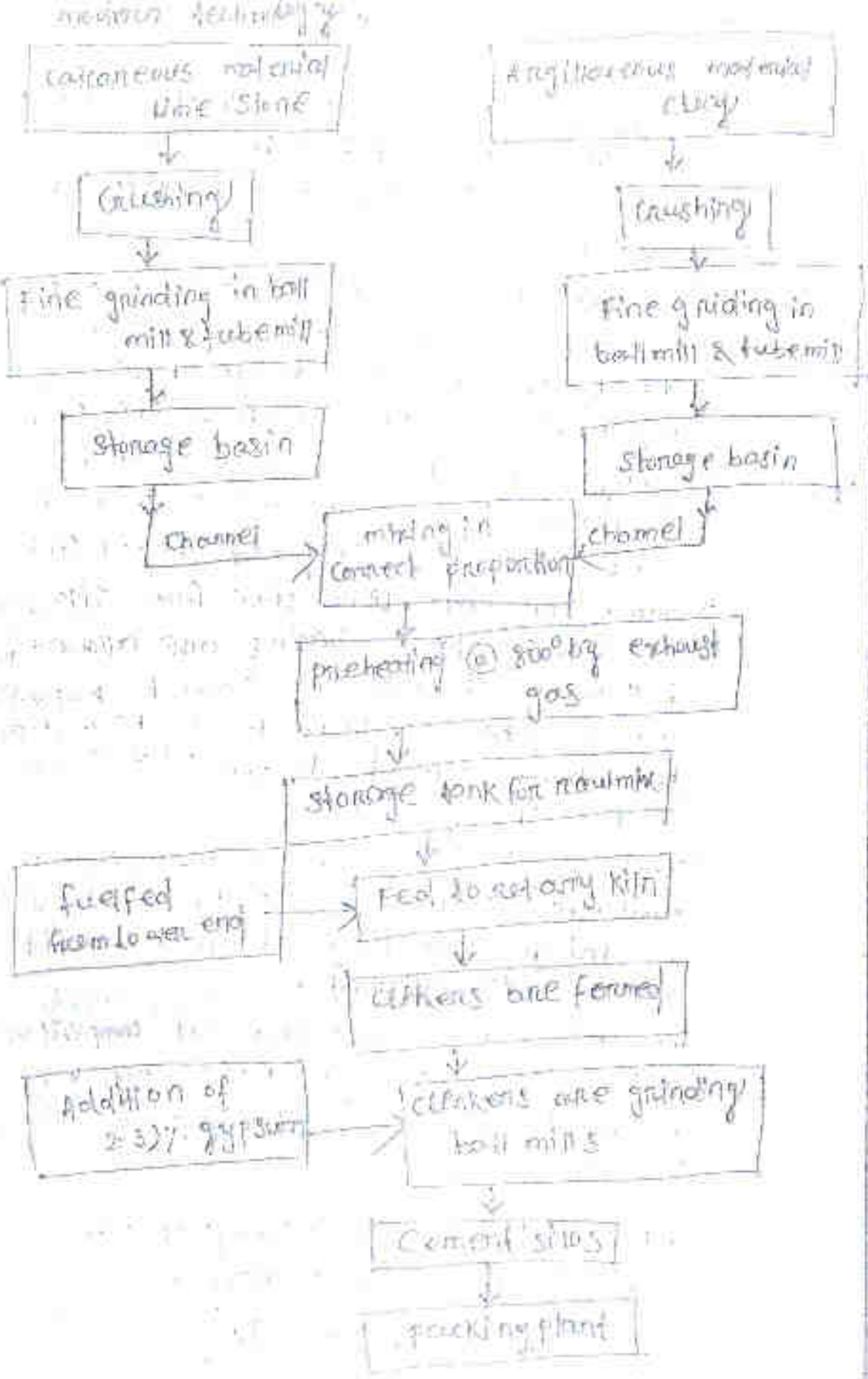
(ii) Dry process (modern technology) :-

In this process the raw materials are first reduced in size of about 25 mm in crushers. A current of dry air is taken passed over these dried materials are then powdered in to fine powdered in ball mills & tube mills all these operations are done separately for each raw materials & they are stored in separate. They are then mixed in correct proportion and made ready for the feed in rotary kin. This slurry formed consists of raw materials is known as the raw mix and it is stored in storage tank.

⇒ Following is the procedure of manufacture of cement by the dry process adopted


Calcareous material
White Stone
Argillaceous material
Clay
Crushing
Crushing
Fine grinding in ball mill & tube mill
Fine grinding in ball mill & tube mill
Storage basin
Storage basin
Channel
mixing in correct proportion
Channel
preheating @ 800°C by exhaust gas
Storage tank for raw mix
Fuel fed from lower end
Fed to rotary kiln
Clinkers are formed
Addition of 2-3% gypsum
Clinkers are grinding ball mills
Cement silos
packing plant

(c) wet process :- (old technology)

In the earlier part of the century i.e from 1913 to 1960, the wet process was used for the manufacture of cement.

⇒ In this process, the calcareous material such as lime stone are crushed and stored in silos as storage tank. The argillaceous material such as clay is thoroughly mixed with water in a container known as the wash mill. The washed clay is stored in basin.

⇒ The crushed lime stone from silos and wet clay from basins are allowed to fall in a channel in correct proportions. This channel leads to material to intimate contact to form what is known as the slurry.

⇒ The grinding is carried out either in ball mill or tube mill or both. The slurry is led to correcting basin where it is finally blended.

⇒ At this stage the chemical composition is adjusted in storage tanks and kept ready to serve as feed for rotary kiln.

Flow diagram of mixing of raw materials in wet process.

Burning :-

→ The burning is carried out in a rotary kiln. A rotary kiln is formed of steel tubes. It's diameter varies from 2.5m to 5m. It's length varies from 40m to 120m. It is laid at a gradient of about 1 in 25 to 1 in 30. The kiln is supported at intervals by crowns of refractory air concrete.

→ The concreted slurry is ~~re~~ge inserted at the upper end of kiln. The fig shows the rotary kiln for the wet process. The hot gases or flames are fired through the lower end of kiln.

→ The portion of the kiln near it's supported is known as the dry zone and in this zone, the water of slurry is evaporated. The small lumps known as nodules are formed at pure stage.

→ The nodules then gradually roll down passing through zones of rising temperature and ultimately reach to the Burning zone where temperature of about 1400°C to 1500°C.

→ In burning zone the calcined product is formed and nodules are converted in to small hard dark greenish blue balls which are known as the clinkers.

Rotary kiln diagram

> In the modern technology of dry process, the coal brought from the coal fields is pulverised in vertical coal mills and it is stored in silo. It is pumped with required quantity of air through the burner.

> The preheated raw materials flow down the kiln and get heated to such an extent that the carbon dioxide is driven off with the combustion gases.

> The material is then heated to temperature of nearly 1400°C to 1500°C when it gets fused together to the final product is known as the clinker or raw cement.

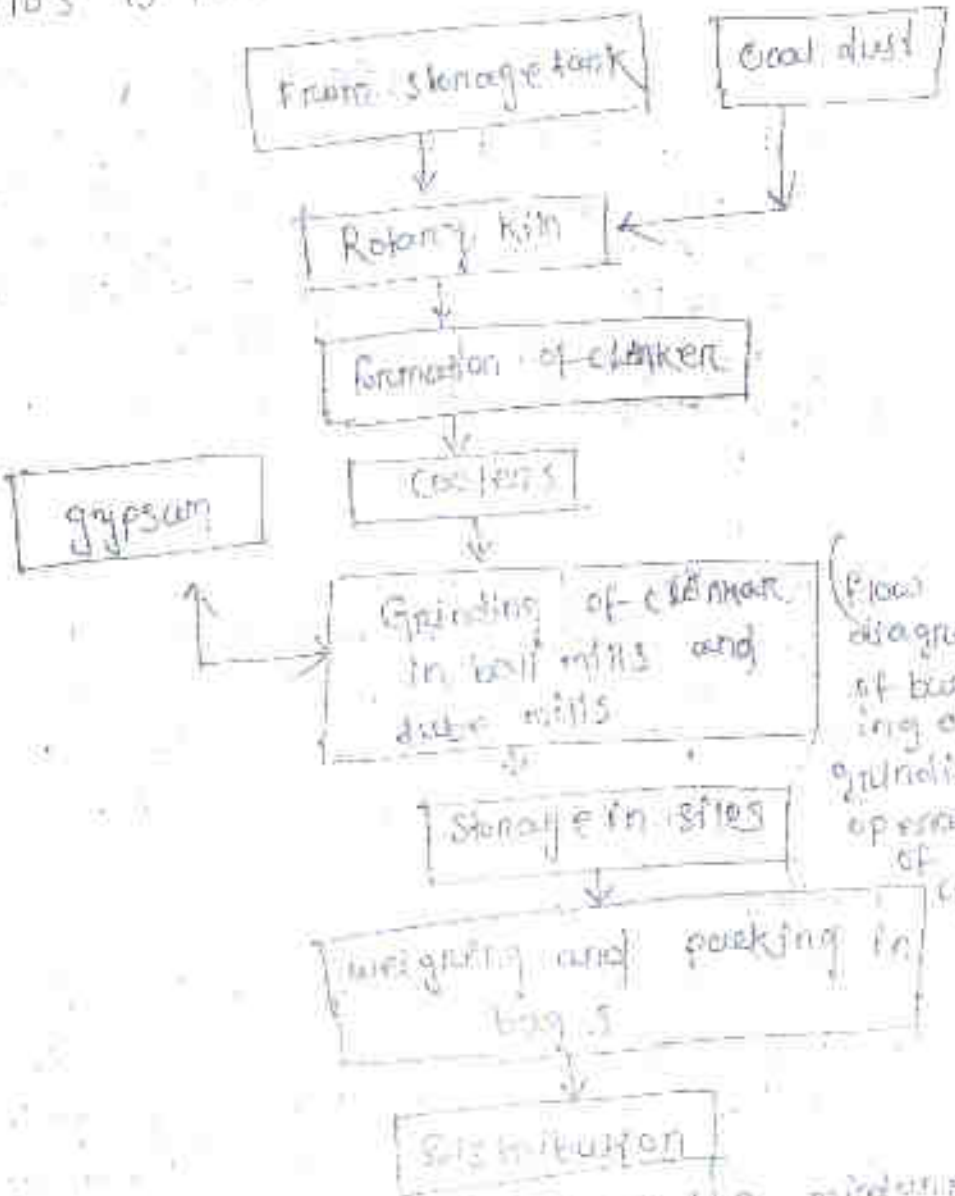
Grinding

The clinkers are obtained from the rotary kiln are finely ground in ball mill and tube mill using grinding media a small quantity around (3 to 4) % of gypsum is added.

> The gypsum controls the initial setting time of cement. If gypsum is not added the cement would set as soon as water is added, the gypsum acts as a retarder.

retarder and it delays the setting action of cement.

⇒ The grinding of clinkers in modern plants technology is carried out in the cement mill which contains chromium steel ball of various sizes. These balls roll within the mill and grind the mixture which is circulated in a hopper end taken in the bucket elevator for storage in silos. The cement from silos is fed to the packer machines.



(Flow diagram of burning and grinding operation of cement)

Mortar :- It is defined as the mixture of binding material like cement, lime, sand & water with/in cement proportion.

Binding material + sand + water

Classification of mortar :- The mortar are classified on the basis of following.

(i) Bulk density
(ii) Kind of binding material
(iii) Nature of application
(iv) Special mortar

(i) Bulk density :- According to the bulk density of mortar in dry state, there are two types of mortar.

(a) Heavy mortar (>15KN/m³)
(b) Light mortar (<15KN/m³)

(a) Heavy mortar :- The mortar having bulk density of 15KN/m³ or more are known as heavy mortar, and dry are prepared from heavy quantity of other sand.

(b) Light we mortar :- The mortars having bulk density less than 15 KN/m³ are known as the light weight mortar & are prepared from light (low weight) sand.

(ii) Kind of binding material :-

According to the kind of binding material of the mortar are classify in to following 5 categories.

(a) Lime Mortar

(b) Surkhi mortar

(c) Cement mortar

(d) Gauged mortar

(e) gypsum mortar

Cement + Sand + water	= Cement mortar
Binding material + Sand + water	= mortar
Lime + water + Sand	= Lime mortar

17 sep 2020 (a) Lime mortar :-

→ In this type of mortar the lime is used as binding material. The lime may be fat lime or hydraulic lime.

→ The fat lime shrinks to a great extent and hence it requires about 2 to 3 times it's volume of sand.

→ The lime should be slaked before use. This mortar is unsuitable for water logged areas or in damp situations.

→ For hydraulic lime the proportion of lime to sand by volume is about 1:2. This mortar should be consumed within one hour after mixing it. It produces good strength and shrinks very often surfaces.

→ It is sufficiently durable, but it is not as strong as cement mortar. It is generally used for ordinary building. In general types of

(b) surkhi mortar :-

this type of mortar is prepared by using fully surkhi instead of sand or by replacing half of sand in case fat lime mortar.

→ the surkhi mortar is used for ordinary masonary work of all kind in foundation and supper structure.

→ but it cannot used for plastering.

(c) Cement mortar :- In this type of mortar the cement is used as binding material depending upon the strength requirement and importance of work, the proportion of cement to sand by volume varies from 1:2 to 1:6 or more

→ the cement mortar is used where a mortar of high strength & water resisting properties is required such as under ground construction.

→ this mortar may be used for building and for thick brick walls.

(d) Gauged mortar :- To improve the quality of lime mortar and to achieve early strength the cement is sometimes add-ed to it. this process is known as gauging.

→ it makes lime mortar economical strong & dense. the usual proportion of cement to lime by volume is about 1:6 to 1:8 it is also known as composite material

→ this mortar may be used for building and for thick walls.

gypsum plaster :- this mortar is prepared from gypsum binding material such as building gypsum and anhydrite binding material.

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(3) Nature of application :-

According to the nature of application the mortars are classified in to two categories.

i) Brick laying mortar

ii) Finishing mortar

i) Brick laying mortar :- the mortars for brick laying are intended to be used for brick work and walls. depending upon the working conditions and type of construction the composition of masonry mortars with respect to the kind of binding materials is decided.

ii) Finishing mortar :-

these mortars includes common plastering work and mortars for developing architectural or ornamental effect.

→ the cement or lime generally used as binding material in masonry plastering mortar for effective finishing. the mortars are composed of suitable materials with due consideration of workability, weather resistance etc.

(v) special mortar :- Depending on the working types of special mortar which are used for certain condition.

(i) fire - resistance mortar
(2) Light weight mortar
(3) packing mortar
(4) Sound absorbing mortar
(5) X-ray shielding mortar

(i) Fire - resistance mortar :-

This mortar is prepared by adding aluminous cement to the finely crushed powder of fire bricks & the usually proportion is 1 part of aluminous cement to 2 parts of powder of fire bricks. This mortar is fire resistant and it is therefore used with fire bricks for lining furnaces fire places, oven etc.

(ii) Lighted weight mortar :-

This mortar is prepared by adding materials such as saw dust, wood powder etc. to the lime mortar or cement mortar. This mortar is used in the sound proof & heat-proof construction.

(iii) Packing mortar :-

This mortar is prepared by adding oil wells special materials used as to pack mortars possessing the properties of high homogeneity, water resistant, predetermined setting time have to be formed.

(v) Sound - absorbing mortar

To reduce the noise level, the sound absorbing plaster is formed with the help of sound absorbing mortar. The bulk density of such a mortar varies from 6 to 10 kN/m and the binding materials employed in its composition may be portland cement, lime, gypsum etc.

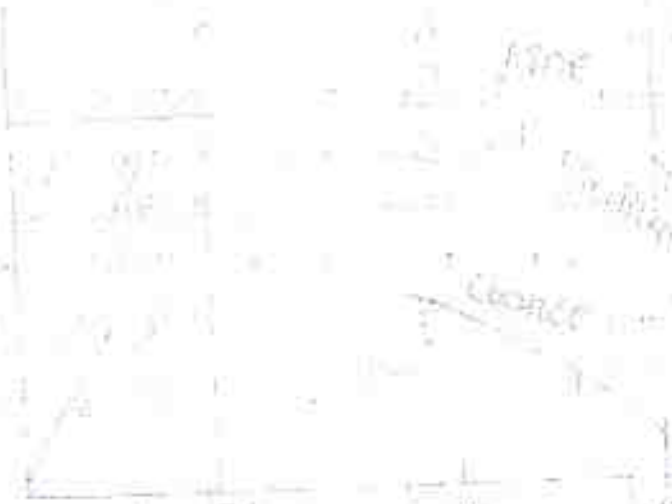
(vi) X-ray shielding mortar

This type of mortar is used for providing the plastering coat to the walls and ceiling of X-ray cabinets. It is heavy type of mortar with bulk density over 22 kN/m³.

Bulking of sand :- The process of increase in volume of sand due to the presence of moisture in sand is known as bulking of sand. This is due to the fact that moisture causes film of water around sand particles which results in the increase of volume of sand.

-> For moisture content of about (4 to 8)%, this increase of volume may be as much as (20-40)%, depending upon the grading of sand.

-> After that the material, the more will be the increase in volume for a given moisture content. This phenomenon is known as the bulking of sand.



(percentage by weight of moisture (Chart showing sorting of sand)

Sand :-

Natural sources of sand :-

The sand particle consist of small grain of silica (SiO_2). It is formed by the decomposition of sand stones due to various effect of weather.

=> There are 3 types of sand

(i) Pit sand

(ii) River sand

(iii) Sea sand

(1) Pit sand :-

This sand is found as deposits in soil and it is obtained by mining pits in the soil. It is excavated from a depth of about 1m to 2m from ground level.

=> The pit sand consist of sharp angular grains which are free from salt & mixed to be excellent material for making cement concrete.

(ii) River Sand :- This sand is obtained from beds of river. The river sand consist of fine rounded grain probability due to mutual attrition under the action of current. The colour of river sand is almost white. As river sand usually available in clean condition. It is widely used for all purposes.

(iii) Sea Sand :- This sand is obtained from sea shore. The sea sand like river sand consists of fine rounded grains. The colour of sea sand is light brown.

⇒ The sea sand contains salts which salts absorb moisture such absorption causes dampness efflorescence and disintegration of work. The sea sand also retards the setting action of cement.

⇒ Due to all reasons, it is the general rule to avoid the use of sea sand for engineering purposes or except for filling of basements etc.

⇒ It can however be used as local materials after boiling thoroughly washed to remove the salt.

Classification of Sand :-

According to the size of grain the sand in classified as

(i) Fine Sand

(ii) Coarse Sand

(iii) Gravel Sand

(i) Fine sand :- The sand passing through a screen with clear opening of 1.676 mm is known as the fine sand It is mainly used for plastering.

(ii) Coarse Sand :- The sand passing through a screen with clear opening of 3.175 m.m. is known as the coarse sand. It is generally used for masonry work.

(iii) Gravel Sand :- The sand passing through a screen with clear opening of 7.62 mm is known as Gravel Sand It is generally used for concrete work.

Concrete :- It is the mixture of binding material and water within proper proportion.

Cement Concrete :-

Cement + Coarse aggt fine agg + water.

It is the mixture of cement, Coarse agg. fine agg + water within proper proportion.

Water - Cement ratio :-

The water in concrete has to perform following two function.

(i) The water in concrete enters into chemical action with cement and this action causes setting & hardening of concrete.

(ii) The water lubricates the aggregate and it facilitates the passage of cement through voids of aggregate thus means water makes the concrete workable.

⇒ It is found theoretically that water required for these two functions is about 0.30 to 0.60 times the weight of cement.

⇒ The ratio of amount of cement water to the amount of cement by weight is known as water - cement ratio.

⇒ The strength & quality of concrete depend upon this ratio.

⇒ The important points to be observed in connection in the water cement ratio are as follows :-

(1) The minimum quantity of water should be used to have reasonable degree of workability. The excess water occupied space in concrete and on evaporation the voids are created and on evaporation, the voids are created in concrete. Thus the excess water affects the strength & durability of concrete. In general, it may be stated that addition of one extra litre of water to the concrete of one bag of cement will reduce the strength by about 1.97 N/mm2. In other words strength of concrete is inversely proportional to the water - cement ratio.

Workability :- The term workability is used to describe the ease with which concrete can be handled & transported and placed between the forms minimum loss of homogeneity

7 The workability as a physical property of concrete.

Mixing the materials of concrete is the process of rolling, folding & spread ing of particles. is known as the mixing of concrete.

⇒ The materials of concrete should be mixed thoroughly so that there is uniform distribution of materials of concrete

(i) Hand mixing :

⇒ For hand mixing, the materials are stacked on a water tight platform which may either of wood, brick or steel.

⇒ The material should be thoroughly mixed at least three times in dry conditions before water is added. The prepared mixed should be consumed in 30 minutes after adding water. The mixing by hand is allowed in case of small works or unimportant works where small quantity of concrete is required.

⇒ For important works, if hand mixing is to be adopted it is advisible to use 10% more cement than specified.

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Machine mixing :-

For machine mixing all the material of concrete including water are collected in a revolving drum & then the drum is rotated for a certain period the resulting mix is taken out of the drum. The features of machine are as follows.

⇒ It is found that mixing the materials of concrete with the help of machines is more efficient and it produces concrete of better quality in a short time.

⇒ The mixers of various types and capabilities are available in the market.

⇒ The water should enter the mixer at the same time or before the other materials are placed. This ensure even distribution of water.

⇒ The concrete mixture should be thoroughly washed & cleaned after using.

⇒ The time of mixing the material in the mixer & the speed of the mixer are very important factor in deciding the strength of concrete which is formed.

⇒ The mixing time should be at least one minute and people two minutes should be noticed by the mixer manufacturer of mixture.

⇒ The concrete discharged by the mixture should be consumed within 30 minutes

Transporting & placing of concrete :-

The concrete as it comes out the mixer or as it is ready to use on the platform, is to be transported and placed in the form work.

The type of equipment to be used for transport of concrete depends on the nature of work, the two important factors in the transportation of concrete are as following :-

(i) The concrete should be transported in such a way that there is no segregation of aggregate.

(ii) Under no circumstances, the water should be added to the concrete during its passage from mixer to the form work.

The precaution to be taken during the placing of concrete are as following.

(i) The form work or the surface which is receive the fresh concrete should be properly cleaned prepared & well watered.

(ii) It is desirable to deposit concrete as near as practicable to its final position.

22 Sep 2021

Curing of concrete :- The concrete surfaces are kept wet for a certain period after placing of concrete so as to promote the hardening of concrete.

⇒ It consist of a blend of temperature and of the moisture movement in a concrete.

period of curing :-

This depends on the type of cement & nature of work. For ordinary portland cement the curing period is about 7 to 14 days. If rapid hardening cement is used the curing period can be considerably reduced.

Grading of aggregate :- In order to obtain concrete of denser quality the fine & coarse aggregate are properly graded.

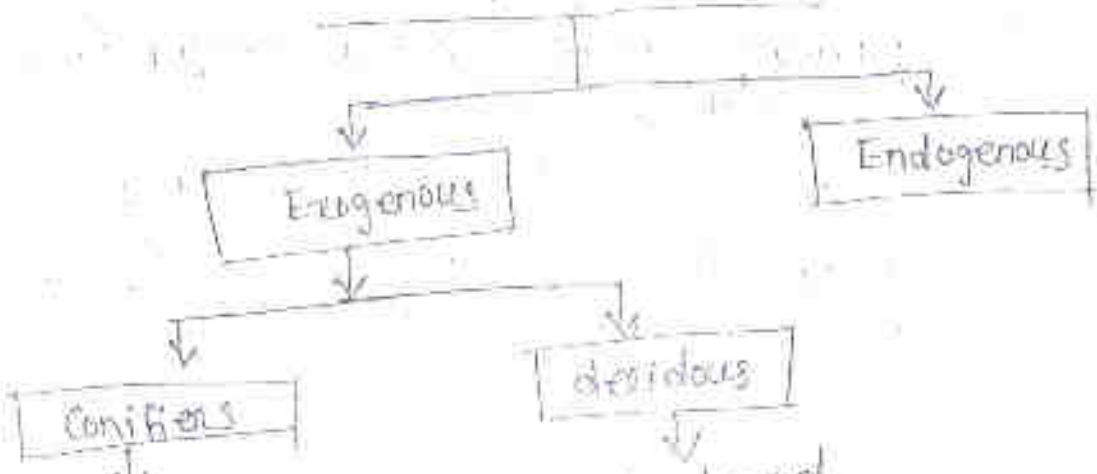
⇒ The grading of fine aggregates is expressed in terms of IS (Bureau Indian Standard) test sieve no 480, 240, 120, 60, 30 & 15.

⇒ The grading of coarse aggregate may be varies through wide limits than those of sand without appreciable effect on the workability of concrete.

wood description

timber :- the word timber is derived from an old english word timbran which means to build. the timber thus denotes wood which is suitable for building or carpentary on various other engg purposes & it is applicable to the trees measuring not less than 600mm in girth at the circumference of the trunk.

classification of trees



23 sep 2020

Exogenous trees :- this trees increases in bulk by growing new woods and distinct consecutive rings are formed in the horizontal section of such a tree.

⇒ these rings are known as the annual rings, because one such ring is added every year and these rings are useful in predicting the age of tree.

⇒ the timber which is mostly used for engineering purposes belongs to this

The exogenous trees are further divided into two groups

(i) Coniferous
(ii) Deciduous

(i) Coniferous :- The conifers are also known as ever-green trees and leaves of these trees dont fall till new ones are grown.

=> These trees yield soft woods which are generally light coloured, light in weight & weak.

=> They show distinct annual rings.

=> As these trees bear cone-shaped fruits they are given the name conifers.

(ii) Deciduous :- These trees are also known as the broad-leaf trees and leaves of these trees fall in autumn and new ones appear in spring season.

=> The timber for engineering purposes is mostly derived from deciduous trees.

=> These trees yield hard wood and strong timber, dark in colour.

=> They do not show distinct annual rings.

21 sep 2020 :-

Endogeneous trees:- these tree grow in words & fibrous mass is seen in their long -itudinal section. the timber from these trees have very limited engg application.

ex:- bamboo, cane, palm etc.

structure of a tree :- A tree basically consist of 3 parts namely trunk, crown & roots. the structure of a tree can be divided into two categories.

(i) macro structure

(ii) micro structure

following are its different components :-

(i) pith :- the innermost central portion of the tree is called the pith or medulla. it varies in size and shape for different types of trees. It consists of tissues and it nourishes the plant in its young age.

when the plant becomes old, the pith dies up and decays and the sap is then transmitted by the woody fibres deposited around the pith. The pith of branches is not nothing but merely a prolongation of the pith of stem.

Cross-section of an exogenous tree

(2) Heart Wood :-

The inner annual rings surrounding the pith constitute the heart wood. It is usually dark in colour. As a matter of fact, it indicates dead portion of tree and as such, it does not take active part in the growth of tree. But it imparts rigidity to the tree and hence it provides strong and durable timber for various engineering purposes.

(3) Sap wood :- The outer annual rings between heart wood and cambium layer is known as sap wood. It is usually light in colour and weight. It indicates recent growth and it contains sap. The annual rings of sap wood are less sharply defined than those of heart wood. It takes active part in the growth of tree and the sap moves in an upward direction through it. The sap wood is also known as the albumnum wood.

Cambium layer :- This thin layer of sap
between sap wood and inner bark is
known as the cambium layer. It indicates
sap which has yet not been converted
into sap wood. If the bark is removed
for any reason, the cambium layer gets
exposed and the cells cease to be active
resulting in the death of tree.

b) Inner bark :- The inner skin or layer
covering the cambium layer is known
as the inner bark. It gives protection to
the cambium layer from any injury.

c) outer bark :- The outer skin or layer
covering the cambium layer is known as the
outer bark. It is the outermost protective
layer and it sometimes contains cracks
and fissures. It consists of cells of wood
fibre and is also known as the cortex.

d) Medullary rays :- The thin radial lines
extending from pith to cambium layer are
known as the medullary rays. The
function of these rays is to hold together
and in volume varieties of trees, they
are not very prominent.

24 sep 2020

Fibre structure :- The structure of
wood visible to the naked eye or
by small magnification is called fibre
structure.

Micro structure :- The structure of wood apparently at a great magnification is called the micro structure when studi under a microscope it becomes obvious that wood consist of living & dead cells of various sizes & shape.

⇒ A living cell consist of four parts namely, membrane : protoplasm : sap & core.

⇒ The cell membrane consisting of cellular tissue & cellulose.

⇒ The protoplasm is a granular transparent various vegetable proditions composed of carbon, hydrogen etc.

⇒ The core of cell differs from protoplasm

⇒ The cells according to the function they perform, are classified in to the following 3 categories.

(i) Conductive cell

(ii) mechanical cell

(iii) Storage cell

i) Conductive :- These cells are serve mainly to transmit nutrients from roots to the branch of tree.

ii) Mechanical cell :- These cells are strengthened with wall & heavily lignified intercepted narrow internal cavities.

⇒ These cells strength to the wood.

strength & transmit materials to the stem & transmit materials to the upper cells in the horizontal direction & they are usually located in medullary rays.

Seasoning of timber :-

→ When a tree is newly felled, it contains about 50% or more of its own dry weight as water.
→ This water in in the form of sap & moisture.
→ The water is to be removed before the timber can be used for any engineering purposes.
→ The process of drying of timber is known as seasoning of timber.

Importance of seasoning :- 26 sep 2023

The seasoning of timber is carried out to achive the following objects.

(i) To allow timber to burn readily, if used as fuel
(ii) To decrease the weight of timber & thus by easy to transporting.
(iii) To impart hardness, stiffness strength & better electrical resistance to timber.
(iv) To increase the resisting power of timber, as most of the causes of decay of timber are nine unless moisture

(vi) To maintain the shape & size of the components of the timber articles which are expected to remain unchanged in form.

(vii) To make timber easily workable.

(viii) To make timber fit for receiving treatments of paints, varnishes etc.

(ix) To make timber safe from the attack of fungi & insects.

(x) To make timber suitable for gluing etc. To reduce the tendency of timber to crack, shrink & warp.

✓ * Qualities of good timber :-

(i) Appearance
(ii) Colour - dark
(iii) Durability
(iv) Hardness
(v) Mechanical wear
(vi) Shape
(vii) Smell
(viii) Sound
(ix) Strength
(x) Weight
(xi) Weathering effect

(i) Appearance :-

A freshly cut surface of timber should exhibit hard and shining appearance.

(ii) Colour :- The colour of timber should be dark as the lighter colour indicates timber with less strength.

(iii) ~~Durability~~ :- A good timber should be free from serious defects such as dead knots, flaws, shakes etc.

(iv) Durability :- A good timber should be durable. It should be capable of resisting the actions of fungi, insects, chemicals agencies. If wood is exposed to the action of acid and alkalies for prolonged period, it is seriously damaged.

(v) Fibres :- The timber should have straight fibres.

(vi) Elasticity :- This is the property by which timber returns to its original shape when load causing its deformation is removed.

(vii) Fire resistance :- The timber is a bad conductor of heat. A large wood offers good resistance to the fire i.e. it requires sufficient heat to cause a flame.

(8) Hardness :- A good timber should be hard i.e. it should offer resistance when it is being penetrated by another body.

(9) Shape :- A good timber should be capable of retaining its shape during seasoning & should not bow or warp or split.

(10) Smell :- A good timber should have sweet smell. An unpleasant smell indicates decayed timber.

(11) Sound :- A good timber should give out a clear ringing sound when struck. A dull heavy sound when struck indicates decayed timber.

(12) Strength :- A good timber should be strong enough for withstanding the stresses such as joints, beam etc. It should be capable of carrying loads slowly & suddenly.

(13) Toughness :- A good timber should be tough i.e. it should be capable of offering resistance to the shock due to vibrations.

Paints & Varnishes

The paints are coatings of fluid materials & they are applied over the surfaces of timber & metals.

The varnishes are transparent solution of resinous material and they are applied over the painted surfaces.

✓ Types of paints

1) Aluminium paint :- The very finely ground aluminium is suspended in either boiled oil varnish, fat, slow drying drying spirit varnish as per requirement. The spirit or oil evaporates and a thin metallic film of aluminium is formed on the surface.
   => The aluminium paint is widely used for painting gas tank, hot water pipes, marine plant etc.

2) Anticorrosive paint :- This paint essentially consist of oil and strong drier. A pigment such as chromium oxide or lead or red lead or zinc chrome is taken and after mixing it with some quantity of very fine sand, it is added to the paint.

3) Asbestos paint :- This is a peculiar type of paint and it is applied on the surfaces which are exposed to the acidic gases & steam.

(4) Bituminous paint :- This paint is prepared by dissolving asphalt in mineral pitches or vegetable bitumen in any type of oil or petroleum. A variety of bituminous paints is available. The paint presents a black appearance & it is used for painting iron work under water.

(5) Cellulose paint :- This paint is prepared from nitro-cotton, cellulose sheets (photographic films etc.) An ordinary paint hardness by evaporation. A cellulose paint hardness by evaporation of thinning agent. It thus harden quickly.

⇒ It is a little more costly, but it present a flexible, hard & smooth surface.

⇒ Also the surface painted with cellulose paint washed & easily cleaned.

⇒ The cellulose paint not affected by contact with hot water & the surface can stand extreme degree of cold & heat.

(6) Cement paint :- This paint consists of white cement, pigment, accelerators and other additives. It is available in dry powder form. The cement paint is available in variety of shades & it gives excellent decorative appearance.

(1) Quick drying :- The paint presents a black colour & it is applied on iron surfaces which come in contact with ammonia, chlorine, sulphur etc.
=> It is also used in mines & underground railways.

Oil

(✓) Composition of paint :-

An oil paint essentially consists of the following ingredients

(1) a base
(2) a vehicle or carrier
(3) a drier
(4) a colouring pigment, and
(5) a solvent

Bases :- A base is a solid substance in a fine state of division and it forms the bulk of a paint. It determines the character of the paint & imparts durability to the surface which is painted.
=> It reduces shrinkage cracks formed on drying

Vehicles :- The vehicles are the liquid substances which hold the ingredients of a paint in liquid suspension.
=> They are required mainly for two reasons
(1) to make it possible to spread the paint evenly and uniformly on the surface in the form of thin layer.

(iii) to provide a binder for the pigment particles of a paint so that they may stick to the surface.

Driers - the substances accelerate the process of drying & dilm absorbs oxygen from the air and transfers it to the linseed oil, which in turn gets hardened.

> the various type of driers available in the market. they may be either in the form of soluble driers or paste driers.

> the former driers are compounds of metals such as cobalt & lead, manganese etc. dissolving in linseed oil.

Colouring pigments - when it is desired to have a different colour then the base of a paint a colouring pigment is to be added.

> the pigments are available in the form of fine powders in various colours and qualities.

Following are the colouring pigments which are used in great in production of ink or a paint.

Kind of paint	pigment
Black	Graphite, lamp black, vegetable black.
Blue	Indigo, blue
Brown	iron number, burnt number

Green ——— Chrome yellow + Copper sulphate.

Red ——— red lead

Yellow ——— Chrome yellow + zinc chrome

Solvents :- The function of solvent is to make the paint thin so that it can be easily applied on the surface. It also helps the paint in penetration through the porous surfaces.

-> The most commonly used solvent is the spirit of turpentine.

✓ Varnishes :-

The term varnish is used to indicate the solution resins prepared either in alcohol, oil or turpentine

> Following are the main objectives of applying varnish on a wooden surface

(i) It brightness the appearance of the wood.

(ii) It protects the painted surface from atmospheric action.

(iii) It protects the unpainted wooden surfaces of doors, windows, roof trusses etc.

✓ Composition of a varnish / Ingredients of varnish

Following are the ingredients of varnish-

(i) Resins or resinous substances

(ii) Driers

(iii) Solvents

(1) Resins or Natural substances :-

The commonly used resins are copal or resin.

⇒ The copal is a hard substance & is available from the earth of places where pine trees existed in past. It is available in various forms.

⇒ The resins is obtained from pine tree.

Driers :- The function of a driers in varnish is to accelerate the process of drying.

⇒ The common driers used in varnishes are white copper.

Solvents :- Depending upon the nature of resin the type of solvent is decided.

Type of varnishes :-

Depending upon the solvent the varnishes are classified in to the following four categories

(i) Oil varnishes

(ii) Spirit varnishes

(iii) Turpentine varnishes

(iv) Water varnishes

(i) Oil varnishes :- The linseed oil is used as solvent in this type of varnish. The hard resins such as copal are dissolved

instead of oil, if the varnish is not workable a small quantity of turpentine is added.

=> The oil varnishes dry slowly but they form hard and durable surface. Infact these are the hardest and the most suitable varnishes.

=> They are specially adapted for exposed works which require frequent cleaning.

(2) Spirit varnishes :- The methylated spirit or wine are used as solvent in this type of varnish.

=> The spirit varnishes dry quickly but they are not durable & easily affected by weathering action.

=> They are generally used for furniture.

(3) Turpentine varnishes :- The turpentine is used as solvent in this type of varnish.

=> These varnishes dry quickly and posses bright colours. They are not durable and tough as oil varnishes.

(4) Water varnishes :- The shellac is dissolved in hot water and enough quantity of either ammonia or borax or potash or soda is added such that shellac is dissolved.

=> These varnishes are used for varnishing maps, pictures etc. They are also used for decorative interior work & as a covering for wood paper.

Introduction :-

1.1 - Building and classification of building based on occupancy.

1.2 - Different components of a building

1.3 - Site investigation - objectives ; site reconnaissance and explorations.

Building :- The dictionary meaning of building is very simple. It simply indicates anything i.e built with walls and a roof.

⇒ The term building in civil engg. parlance is used to mean a structure having various components like foundations ; walls ; columns ; floors ; roofs ; doors ; windows ; ventilators ; stairs ; lifts ; various type of surface finishes etc.

classification of buildings based on occupancy

As per national building code of India, building are classified in to nine groups :-

Group A : Residential buildings

Group B : Educational buildings

Group C : Institutional buildings

Group D : Assembly buildings

Group D : Mercantile Buildings

Group E : Industrial buildings

Group F : Storage buildings

Group G : Hazardous buildings

Group H : Residential Buildings :-

The buildings which are provided with sleeping accommodation for normal residential purposes, with or without cooking or dining or both the facilities ; except any buildings classified under Group C. The buildings of Group 'A' are further sub divided in to five groups.

(i) sub-group A-1 :- Lodging or rooming houses.

(ii) sub-group A-2 :- One or two family private dwellings.

(iii) sub-group A-3 :- Dormitories

(iv) sub-group A-4 :- Apartment house (Flats)

(v) sub-group A-5 :- Hotels

Group B :- Educational buildings :-

Any school, college building or day care centre used for educational purpose for more than 8 hours a week involving assembly for instruction, education or recreation and which is not covered by Group C comes under this group.

Group ①: Institutional building :-

These includes any building which is used for purpose like medical or other treatment or care of persons suffering from physical or mental illness, diseases, care of infants, aged person etc. This group is further divided in to 3 groups.

(i) Sub-group ①-1: Hospital & Sanitoria
(ii) Sub-group ①-2: Custodial Institution
(iii) Sub-group ①-3: penal Institution

Group ②: Assembly Buildings:-

Any building or part of a building like the stress assembly house drama theatres, auditorium, museum, restaurants, dance halls etc where group of people gather for amusement, social & religious or other similar purposes are included in this group. This group is further divided in to five sub-groups.

(i) Sub-group ②-1
(ii) Sub-group ②-2
(iii) Sub-group ②-3
(iv) Sub-group ②-4
(v) Sub-group ②-5

Group ③:- Business Building :-

Any building or part of a building which is used for the transaction of

of business for the keeping of records and records and similar purposes, barber shops, beauty parlours, lunch counters serving less than 100 people is include in this group.

Group F : Mercantile Buildings :-

This includes any building or part of building which is used as shops, offices, stores, show room for display and sale of merchandise, either wholesale or retail.

Group G : Industrial building :-

This includes any building or parts of a building in which products or materials of all kinds and properties are fabricated or processed. These include assembly plants, smoke houses, gas plants.

Group H : Storage building :-

This includes any building or part of a building which primarily used for the storage of goods, wall etc.

Group I : Hazardous Buildings :-

The building includes or part of a building which is used as storage, handling, manufacture of explosive materials or product which are highly combustible or burn with extreme rapidity or acids or other chemical producing flame.

Usually a building is divided in to 3 parts (1) foundation
(2) plinth and
(3) Super structure

(i) foundation :-

It is the part of building constructed bellow ground level and which is in direct contact with sub-strata and transmit all the loads to the sub-soil.

plinth :- It is the building above the ground level up to the floor level above the plinth level is known as plinth area.

(iii) Super structure - It is the part of the building constructed above the plinth level.

(v) Doors, windows & ventilators

(vi) Roofs

(vii) Stairs, lifts, ramps etc.

(viii) Building finishes like plastering, painting, white washing, flooring etc.

(ix) Utility fixture

(1) Foundation:- It is also known as substructure of building. It is the most critical part of the building which transmit the entire load of the building to the sub soil.

(2) Plinth:- It is a part of superstructure located between the ground level & the floor level. The height of the plinth should not be less than

(3) Masonry or RCC wall & columns in superstructure:-

→ Wall are used to enclose or divide the floor space load bearing wall should be strong enough to take its own weight super imposed load etc.

→ They should provide stability, weather resistance, fire resistance privacy & security.

(iv) Basement, ground floor & upper floors

A floor provides support to the occupants, furnitures, fixtures & equipment of buildings.

→ different floors divide the building in to different levels to provide more accomodation on given plot of land.

→ the floor of a building at immediately above the ground is called ground floor.

→ All other floor above the ground floor is known as upper floors.

→ the floor below the ground table is known as basement floor or lower floor.

v) Sills, lintels & weather shed :-

→ Window sills are provided between the bottom of window frames & above the top of the wall below.

→ a lintel is provided above the openings of the windows, doors & ventilators

(vi) Doors, windows & ventilators :-

Doors are provided in a building to allow the free movement outside & to the interior part of the

> Windows & ventilators are generally provided for proper light ventilation & vision.

(vii) Roofs :- A roof is the upper most part of a building which is constructed in the form of a frame work to give protection to the building against rain, heat, wind etc.

(viii) Stairs, lifts, ramps :-

Stairs, lifts, ramps, escalators are the means of vertical transportation between.

> out of these a stair is the most common. It is defined as sequence of steps suitably arranged for the purpose of ascent or ascent between the floors or landing.

> A ramp is a sloping surface and it is adopted as a substitute for stair for easy movement between the floors.

(ix) Building finishing like painting, pointing etc.

To protect the exposed surface of walls and floors from the effect of weather action, building finishes are used.

Utility fixtures :- utility fixtures are
built in items in the building
Ex:- wooden, cupboards, wash in units
shelves etc are utility fixtures.

Site selection :-

Principles of site selection

> The purpose of the building, extent of privacy is desired.
> The site should be located in fully developed areas.
> The site should be located in such a way that community service like police & fire protection, cleaning of waste & street cleaning, utility services like market, cinema, bank etc. shopping facility, and means of transport, school, College electricity, water supply also available within short distance.
> Area of plot should be such that the building constructed on it meets the requirements of the owner.
> Shape of the plot should be rectangular or square having only short corners.

=> Foundation is the lowest part of the structure which provide a base for the super structure.

=> It transmit all loads of super structure to the sub soil.

=> It is also called sub structure part of building.

Purpose of foundation:-

=> Foundation is provided to support the super structure. It is transmit all loads of super structure to the sub soil.

Foundation is provided for the following four main purpose:

(i) To distribute the weight of the structure over large area so as to avoid over-loading of the soil beneath.

(ii) To load the sub-stratum evenly and thus prevent unequal settlement.

(iii) To provide a level surface for building operations.

(iv) To take the structure deep in to the ground and thus increase its stability, especially eathquake.

(V) Types of foundation

(i) Shallow foundation

(ii) Deep foundation

(i) Shallow foundation

Shallow foundation are those in which the width of the foundation is very large in comparison to its depth.

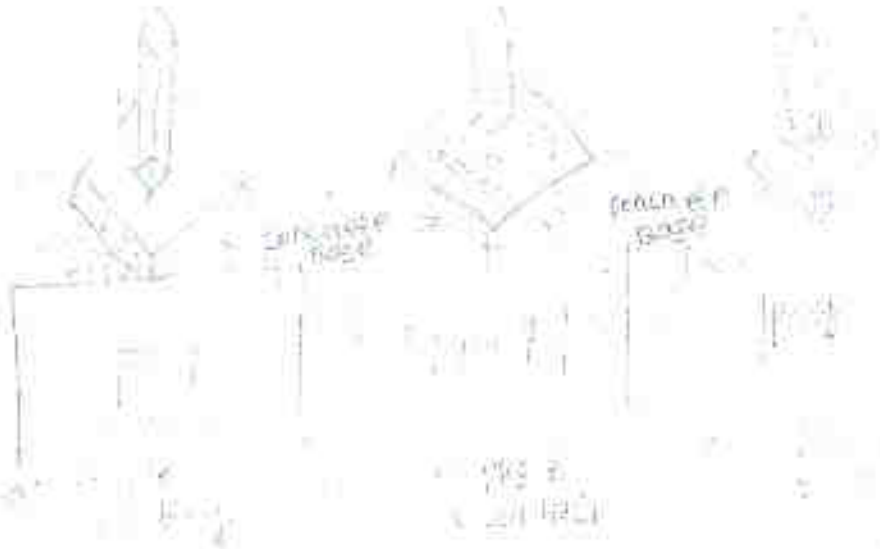
Types of shallow foundation :

(i) Spread foundation
(ii) Isolated footing
(iii) Combined footing
(iv) Inverted arch footing
(v) Grillage footing
(vi) Raft / mat foundation
(vii) Strap footing or Cantilever footing
(viii) Continuous footing

Spread foundation :- The spread foundation is a type of shallow foundation. The spread foundation all common & use in the building industry.

> The base of the structure enlarges to spread to provide individual support. The spread foundation is strong & it can withstand, therefore many buildings spread foundation.

> There are many types of spread foundation like :-



- There are many types of spread foundations like
  (i) wall footing
  (ii) Isolated footing
  (iii) Combined footing
  (iv) Inverted arch footing
  (v) Grillage footing
  (vi) Raft foundation or mat foundation
  (vii) Strap footing or Cantilever footing
  (viii) Continuous footing

(1.) Wall footing:- Wall footing can be either simple or stepped. Simple footing use to convey uniform loads, whereas stepped footing used to convey heavy loads.

=> Simple footing has only one projection on either side of the wall, whereas stepped footing has number of projection on either side of the wall.

(v) Isolated footing or Column footing :-

They are to support individual columns they can be either of stepped type or have projection in the concrete base. In the case of heavy loads, can be trapezoidal if there are special restrictions and they carry unequal loads.

(vi) Combined footing :-

A combined footing supports two or more columns in a row. The combined footing can be rectangular in shape if both other columns carry equal loads or can be trapezoidal if there are special limitations and they carry unequal loads.

Strap footing or cantilever footing :-

Strap footing consist of two or more individual footings connected by a beam called a strap. It is also some times called as cantilever footing.

Continuous footing :- In this a single continuous RCC slab provided as the foundation for more than two columns in the row. The resultant of the column loads of the footing in the floor. This type of foundation is suitable in the earthquake area.

Inverted arch footing :- The inverted arch footing is not a common type of foundation.

=> This type of foundation used in where the bearing capacity of the soil is very poor and the load of the structure is concentrated even the walls are deep foundations are not

Grillage foundation - A grillage foundation used to transmit heavy loads from the steel column to the soil having low bearing power. This type arrangement avoids deep excavations and provided a necessary area at the base to reduce the intensity of pressure.

Raft foundation - Raft foundation is a Combined footing that covers the entire area beneath a structure and support all the walls & columns.

Deep foundation - CBT 2020

It is the foundation that its depth is greater than its width.

-> In case the strata of good bearing capacity is not available near the ground, the foundation of the structure has to be taken deep with the purpose of attaining a bearing stratum which is suitable to all respects

Types of deep foundation

1. Piles
2. Caissons
3. Caissons

(v) Pile Foundation

Pile foundation is generally used when simple spread foundation or a suitable depth is not possible either because the stratum of required bearing capacity is at a greater depth or steep slopes are encountered.

→ In compressible soil or water-logged soil or soil of made up type piles are used with advantage for providing safe foundation for any type of structure.

Types of piles :-

Piles depending upon their function are used may be classified into following types.

① Bearing piles
② Friction piles
③ Compaction piles
④ Sheet pile
⑤ Anchor piles
⑥ Batter piles

Bearing piles :- Bearing piles are those which are driven into the ground until a hard stratum is reached.

→ Such piles act as pillars supporting the super structure & transmitting the loads through the soil at which it can be safely borne by the ground.

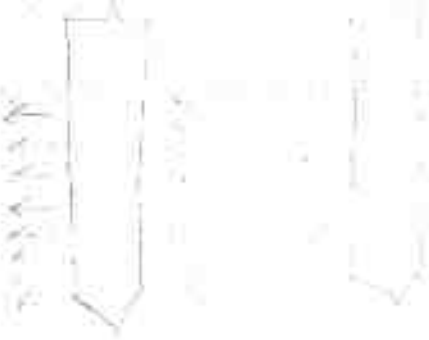
→ Thus bearing piles by themselves do not transmit the load, rather they

Friction pile :- When piles are required to be driven at a site when the soil is weak or soft to a considerable depth the load carried by a pile is borne by the friction developed between the side of the pile & surrounding soil.

Friction pile

Compaction pile :- Test 2020

Clayey soil used to compact loose granular soil in order to increase its bearing capacity.



Sheet pile :- they are used as bulk impervious cut off to reduce seepage & uplift

Anchor pile :- When piles are used to provide anchorages against horizontal pull from sheet piling walls or other pulling forces, they are termed as anchor pile.

Batter pile :- When piles are driven at an inclination to resist large horizontal or inclined forces, the piles are termed as batter piles.

(3) Composite piles

(4) Steel piles

Timber pile :- Transmission of load through timber piles take place by the frictional resistance of the ground and the pile surface

> Timber piles prove economical for supporting light structures to be located in compressive soil consisting only saturated with water.

> The piles are made from timber obtained from trees like Sal, teak deodar, babul etc.

> It has been found that piles made from plain wood can stand action of sea water better & thus commonly used for marine work.

> Timber piles may be circular or square cross section.

(2) Concrete pile :- 8 Oct 2020

> Cement concrete like possess excellent compressive strength these piles can be reinforced or prestressed pile.

> They can be divided in to following two groups -

(i) precast concrete pile

(ii) Cast-in-situ concrete pile

(i) Precast concrete pile - Precast pile may be defined as a reinforced concrete pile which is moulded in square, circular, rectangular or octagonal form.

⇒ The piles are cast & cured in a casting yard & transported to the site for driving.

⇒ Where space is available pile can also be cast and cured near the construction work.

⇒ They are driven in a similar manner as timber piles with the help of pile drivers.

⇒ The diameter of pile normally varies from 20 cm to 60 cm & their length varies from 4.5m to 30 m.

The name of the various type of cast-in-situ piles are

1. Simple pile
2. Franki pile
3. Vibro pile
4. Pile expanded pile
5. Reynard pile

3. Composite pile:- This is a type of construction in which piles of two different material are driven one over the other, so as to enable them to act together to perform the function of a single pile.

> In such a combination advantage is taken of the good qualities of both the materials.

> Composite piles prove economical as they permit the utilization of the great compression resistance property of one material with the cheapness or strength of the other.

> The different stages in the construction of a composite pile namely a timber pile at its lower part & precast concrete pile at its upper part.

> This type of composite pile is used with the object of obtaining economy in the cost of piling work.

Wooden pile

The type of steel pile commonly used are

(i) H-pile
(ii) pipe-pile
(iii) Screw pile

(i) H-pile :- The use of rolled steel H-beams to function as bearing pile is a comparatively recent development in piling technology.

⇒ H pile can with stand large impact stressed developed during hard driving.

⇒ This type of pile has proved to be especially useful when the pile is expected to penetrate a rock or through hard substrates.

⇒ On account of the smaller cross-section area of the pile, it can be driven to the desired depth without setting or causing an adopting error.

⇒ They require less storage space and can be handled without much difficulty.

(3) Steel piles :-

⇒ Seamless or welded steel piles are often driven to function as end bearing or friction piles.

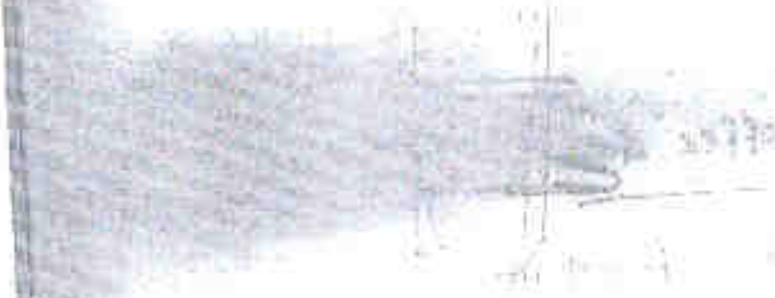
⇒ The pipe piles may be driven either open ended or close ended.

⇒ When the driving end of the pipe is left open, it is called opened pipe. Open ended piles are usually driven to penetrate rock or hard pan.

⇒ In case of closed end piles, the driving end of each pipe is closed by welding a conical steel or cast iron shoe to the pipe end.

Screw pile

- A screw pile consist of a cast iron or steel shaft of essential diameter normally varying from 15 to 30 cm terminating in to a helical or screw base. The pile shaft may be hollow or solid.
- Screw piles function most efficiently in soft clay or loose sand.



Sheet pile

Sheet pile may be made up of wood concrete or steel steel piles are driven side by side in to the ground to form a continuous vertical wall for retaining soil

Depending upon the material used for manufacture, sheet piles can be divided in to following categories.

(a) wooden sheet piles
(b) precast concrete sheet pile
(c) steel sheet piles
(d) Pre stressed concrete sheet pile

14 oct 2020

Coffer dam

A coffer dam is a temporary structure which is built to remove water from an area and make it possible to carry on the construction work under reasonably dry condition.

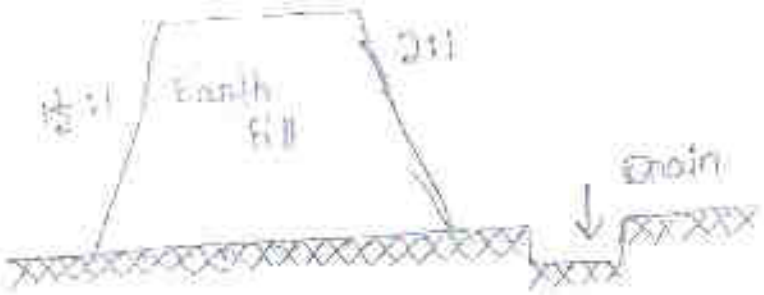
→ Cofferdams are usually required for projects such as dams, locks & construction of bridge piers & abutments

Types of coffer dam

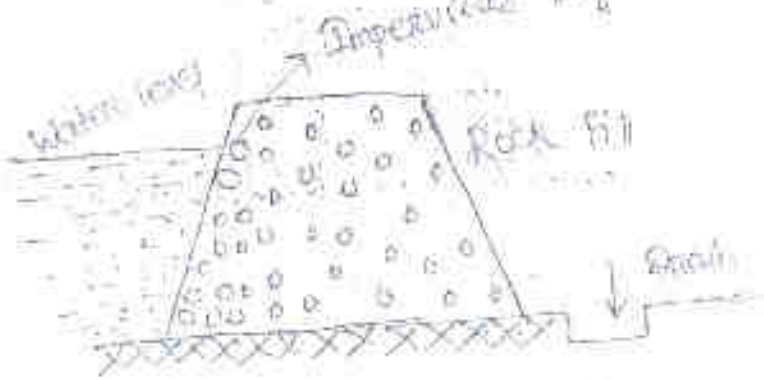
(i) Earth fill cofferdam
(ii) Rock fill cofferdam
(iii) Rockfill crib cofferdam
(iv) Single wall cofferdam
(v) Double wall cofferdam
(vi) Cellular cofferdam

(i) Earth fill cofferdam :- This is the simplest form of coffer dam it's use is limited in the vicinity where the impervious earth is available and water depth is shallow with low velocity of flow.

→ It should never be used where there is danger of over topping by water.



iv) Rock fill cuffer dam :- They are constructed by floating rock along stream. They can be used for depth of water up to about 30 m. They are economical in places where rock is available in plenty.



Rock fill cuffer dam

15 oct 2020

Timber crib cuffer dam :-

> A rock fill crib cuffer dam is composed of timber cribs. A crib is a frame work of wooden horizontal & cross beams held in alternate

⇒ The cells are open at the bottom & are filled with rock or gravel or earth.

⇒ This gives stability to the cells against overturning or sliding.

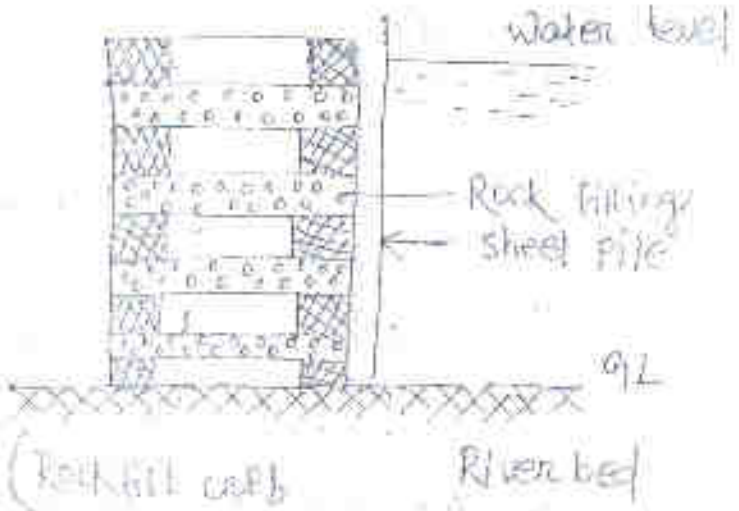
⇒ The following set of conditions are favourable for this type of coffer dam.

(i) The stream has a hard bottom.

(ii) The working space is limited.

(iii) The depth of water is high.

(iv) The timber is relatively cheap.



(Rock fill cell coffer dam)

(vi) Single wall coffer dam :-

⇒ This type of cofferdam is suitable when available working space is limited & area to be enclosed is small.

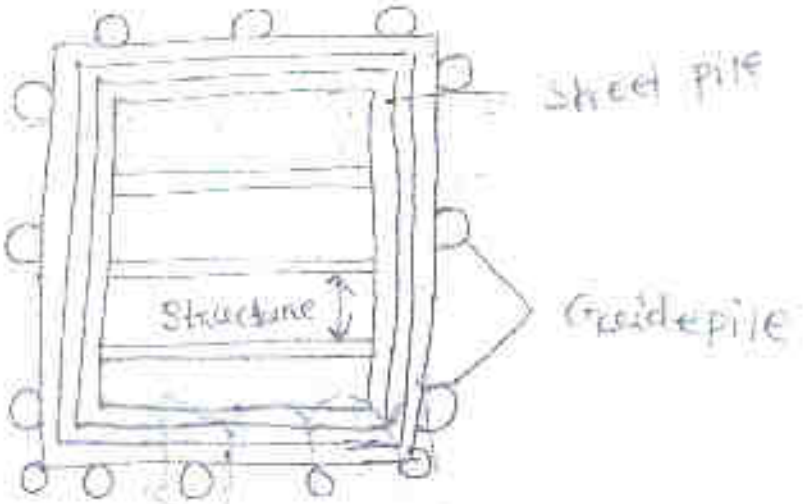
⇒ It may be used up to the maximum depth of water of 25m.

⇒ The walls of a coffer dam are usually made up of steel sheet pile commercially

available to a maximum length of 12 m.

> Reinforced & prestressed concrete sheet pile have also been used.

> The crane operated grabs are utilized to carry out the excavation inside the enclosed space.

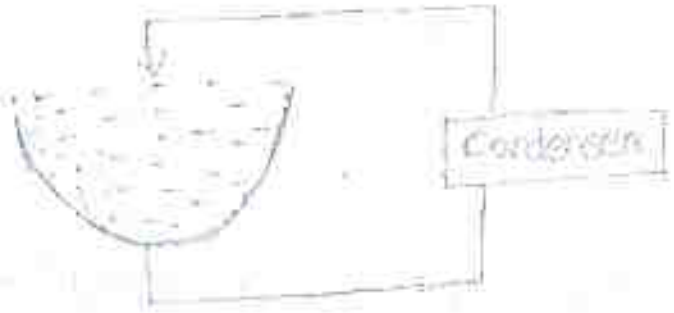


(v) Double wall cofferdam :-

> Double wall cofferdams are provided to enclosed a larger area.

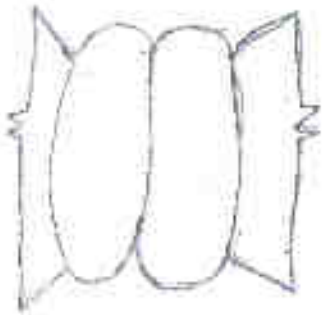
> The double wall gives stability to the cofferdam.

> This type is useful where seepage problem and space limitation are prevalent.



(vi) Circular Cofferdam :-

> They are made of steel sheet piles and are suitable for developing large areas.
> They are comprised of diaphragm cell series of areas are connected to straight walls.
> Archetype of cofferdam are quite extensive & should be used only incase of long span bridge.



Diaphragm cellular cofferdam.

Caissons :-

> The caisson is a structure used for the purpose of placing a foundation in correct position under water.
> The term caisson is derived from the french word caisse meaning a box.
> It is a chamber with hollow portion which after installing in place by any means is filled with concrete or other material.
> Caissons are preferred in sandy soil the caissons can be devided in the

> It is also known as Pier foundation.

(i) Box caisson

(ii) open caisson or wells

(iii) Pneumatic caisson

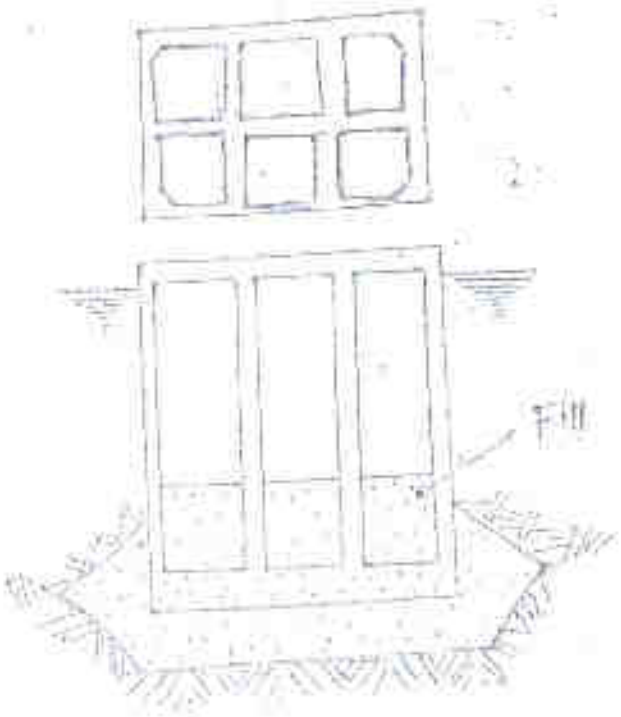
(1) Box caisson:-

> A box caisson is a strong water-tight vessel open at the top & closed at the bottom.

> They are generally built of timber, reinforced concrete or steel.

> This type of caisson is suitable when bearing stratum is available at shallow depth & where loads are not heavy.

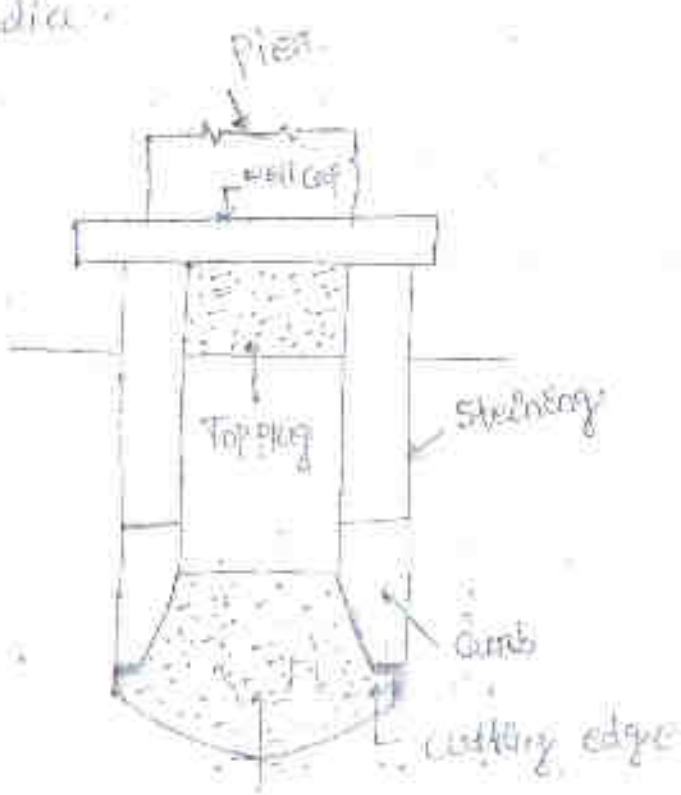
> To place the caisson in position, it is launched & floated to pier site where it is sunk in position.



Box caisson

(2) Open caissons :-

> The open caissons are open both at the top & at the bottom.
> They are used on sandy or soft bearing strata.
> They are generally built of timber, metal, reinforced concrete or masonary.
> They form the most common types of deep foundation for bridges in India.



Open caissons or wells

Pneumatic caisson

- A pneumatic caisson is open at bottom & closed at top.
- The compressed air is used to remove water from the working chamber & the foundation work is carried out in dry conditions.
- The pneumatic caisson become useful when it is not possible to adopt wells.
- The pneumatic caisson adopted when the depth of water is more than 12mt.

Walls & plinth Works

Walls :- A continuous vertical brick or stone structure that encloses or divide an area of land.

Purpose of wall :-

> The purposes of walls in buildings are to support roofs, floors & ceilings to enclose a space as part of building envelope along with a roof to give building forms.

> To provide shelter & security.

> In addition, the wall may house various types of utilities such as electrical wiring or plumbing.

Classification of walls :-

The wall classified based on function :-

(i) Load bearing wall

(ii) Non - load bearing wall

(iii) Retaining wall

Load bearing wall

> A load bearing wall is a wall that is an active structural element of a building which has the weight of the elements above it by conducting its weight to a foundation structure

below it.

Non-load bearing wall :-

=> A non-load bearing wall doesn't support floor, roof loads above.

=> It is not a part of the structural frame system.

=> Most of the time they are interior walls whose purpose is to divide the floor in to rooms.

Retaining wall :- Retaining walls are relatively stiff walls used for supporting soil laterally so that it can be retain on different levels on the two sides.

(or)

A retaining wall is a structure design & constructed to resist the lateral pressure of soil, when there is a desired change in ground elevation that exceeds the angle of repose of the soil.

Partition wall :- A dividing or a screen wall which is constructed inside the enclosed area is known as partition & it can be constructed either on ground floor or upper floors.

Requirements of bearing wall :-

> It should be strong enough to carry it's on, dead weight.
> It should be capable of resisting impact developed due to the use of the building.
-> It should act as a sound barrier especially when it divides a room into two units.
-> It should have the capacity to support suitable decorative surface

Brick Masonary :- Brick masonary is defined as the placement of brick in a systematic manner using mortar bind the bricks together & create solid mass that can withstand a great deal of pressure.

Some definition

Stretcher :- This is a brick laid with its length parallel to the face or front or direction of a wall.
-> The course containing stretchers is called a stretching course.

Header :- This is a brick laid with its breadth or width running to the face or front or direction of a wall.

The course containing headers is called a header course.

(v) Arrises :- The edges formed by the intersection of plane surface of brick are called the arrises & arrises should be sharp, square and free from damage.

Bed :- The lower surface of the brick when laid flat is known as the bed.

Bed joint :- The horizontal layer of mortar upon which the brick are laid is known as bed joint.

Perpend :- The vertical joints separating the bricks in either length or cross direction are known as the perpend.

Lap :- The horizontal distance between the vertical joints in successive courses is termed as lap.

Definitions

Closer :- A piece of brick which is used to close up the bond at the end of brick courses is known as closer.

Types of closer :-

① Queen closer :-

⇒ This is obtained by cutting the brick longitudinally into two equal parts. It can also be made from two quarter bricks is known as the quarter closer.

⇒ A queen closer is generally placed near the quoin header to obtain the necessary lap.

(iii) King closer :- This is obtained by cutting a triangular portion of the brick such that half a header & half a stretcher are obtained on the adjoining end face.

⇒ A king closer is used near the door & window openings to get satisfactory arrangement of the header joint.

(iv) Bevelled closer :- This is obtained by cutting a triangular portion of half the width but of full length.

⇒ A bevelled closer appears as a closer on one face and the header on other face.

(v) Mitred closer :-

This is obtained by cutting a triangular portion of the brick through its width & making an angle of 45° to 60° with the length of the brick. It is used at co

(v) Bat :- This is a piece of brick, usually considered in relation to the length of brick & accordingly known as half bat or three quarter bat.

(Three quarter bat)

(Half bat)

(Bevelled bat)

(vi) Bull nose

A brick moulded with a rounded angle is termed as a bull nose.

Bond :-

A bond is an arrangement of layers of stones or bricks by which no continuous vertical joints are formed.

→ The bond distributes the load coming on the structure evenly and prevent the formation of vertical crack.

(✓) Bonds in brick work :-

→ The bricks being of uniform size can be arranged conviently in a variety of forms.

→ The various types of bonds with their featured name have been constructed following are the types of bond in brick work.

(a) Stretcher bond
(b) Header bond
(c) English bond
(d) Flemish bond
(e) Garden-wall bond
(f) Raking bond
(g) Dutch bond
(h) Patch-or-edge bond
(i) English cross bond
(j) [illegible] bond

→ In this type of bond, all the bricks are arranged in the stretcher courses.

→ The stretcher bond is useful for one brick partition walls as there are no headers in such walls.

→ As this bond doesn't develop proper internal bond, it should not be used for wall having thickness greater than that of one-brick wall.

(Stretcher bond)

(2) Header bond :-

→ In this type of bond, all the bricks are arranged in header courses.

→ The overlap is usually kept equal to half the width of brick and it is achieved by using three-quarter brick bats in alternate courses.

→ This bond doesn't have strength to transmit pressure in the direction of the length of the wall.

→ Stone is not suitable for load bearing walls

(Header bond)

(1)

This type of bond is generally used in practice. It is considered as the strongest bond in brick work.

Following are the features of an english bond.

(i) The alternate courses consists of stretchers & headers.

(ii) The queen closer is put next to the outer header to develop the face bond.

(iii) Each alternate header is centrally supported over a stretcher.

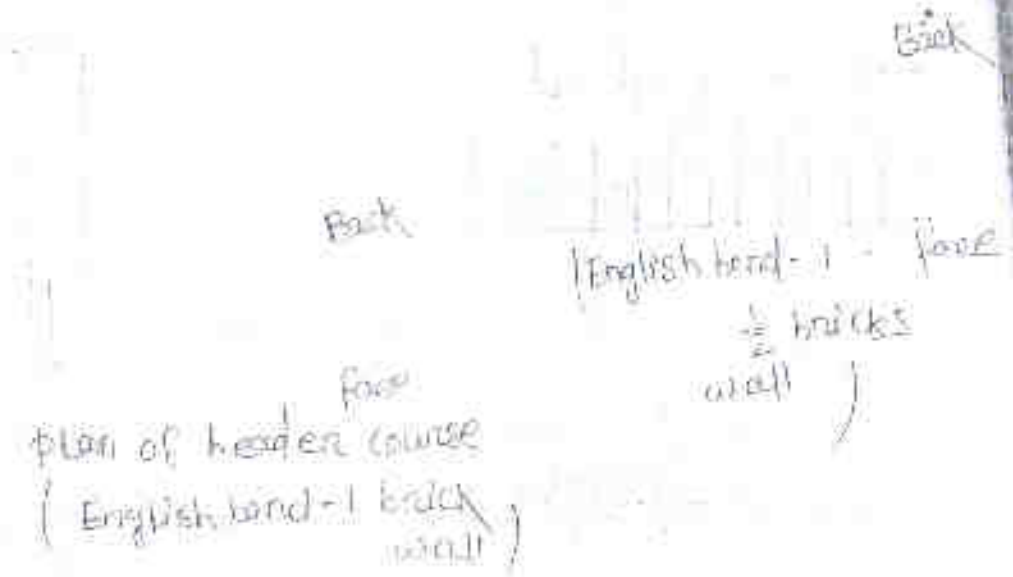
(iv) The bricks in the same course don't break joints with each other. The joints are straight.

(v) In this bond the continuous vertical joints are not formed except at random & offset ends.

(vi) A header course should never start with a queen closer.

(vii) The queen closers are not required in the stretcher courses

Elevation


Back
Back
(English bond - 1 - face
½ bricks
wall)
face
plan of header course
(English bond - 1 brick
wall)
Back
Back
plan of header course face
(English bond - 2 bricks
plan of header course face
(English bond - 2 ½ bricks
wall)

(✓)

→ In this arrangement of bonding work, each course consist of alternate headers & stretcher.

→ The alternate headers of each course are centred over the stretchers in the course below.

→ Every alternate course start with a header at the corner.

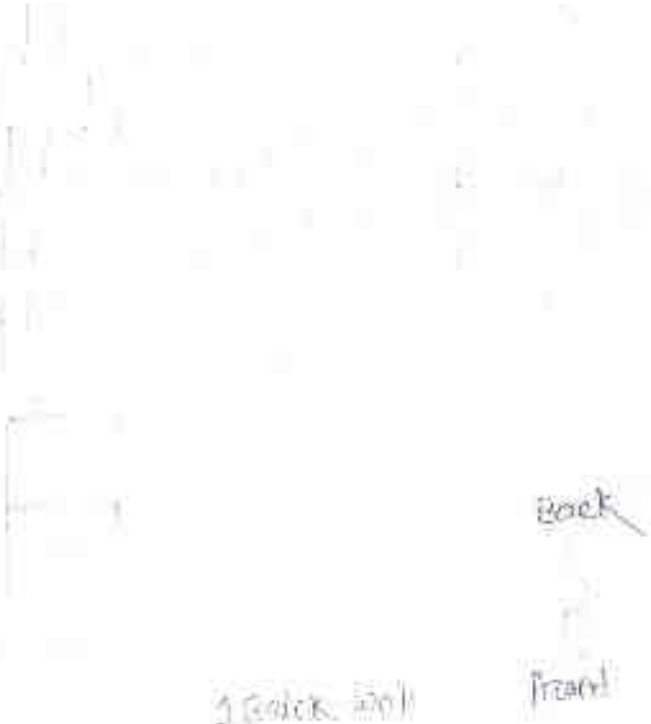
→ For the breaking of vertical joints in the successive courses, closer are inserted in alternate courses next to the quoin header.

This bond is a combination of English & Flemish bond. In this work the facing of the wall consists of Flemish bond and the backing consist of English bond in each course.

→ In this system of bonding brick work course presents the same appearance both in the front & back elevation.

→ Every course front & back elevation consist of headers & stretchers laid alternately.

→ This type of bond is best suited from consideration of economy & appearance.



Double Flemish bond

→ The term masonry is used to indicate the art of building the structure in stones.

→ The construction of stones bonding together with mortar is termed as stone masonry where the stones are available in nature on cutting and dressing to the proper shape they provide an economical material for the construction of various building components such as walls, Column, Fuelings, arches, Lintels beams etc.

(a) Corbel - A corbel is a projecting stone which is usually provided to serve as support for roof, truss beams → The corbels are generally moulded to and given ornamental treatment.

→ A cornice is a course of stone provided at the top of wall.

→ It is generally moulded and given ornamental treatment.

A coping is a course of stone laid on the top wall which is used to protects the wall from rain water.

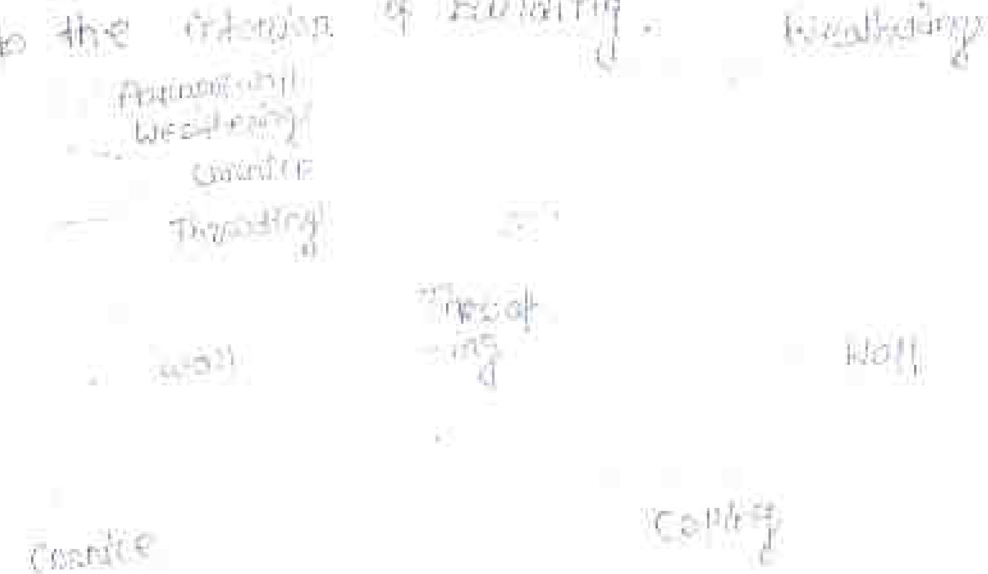
(4) Throating :- A groove is provided on the under side sill, cornice & coping so that the rain water can be discharged clear of the wall surface. This is known as the throating.

(5) Strain Course :- The horizontal course provided at suitable levels between the plinth & a cornice is termed as a string course.

(6) Weathering :- The upper surface of stones used for sills cornice and coping is dressed in a sloping way so that the water may flow off. This is known as weathering.

(7) Soffit :- The bottom surface of a door or window coping is known as sile.

=> The prevent the entry of water to the interior of building.



A buttress is a sloping pier & it is provided to work as lateral support of the wall.

A rectangular column projection from wall is known as pilaster.

Joints in stone masonry :-

In order to secure the stones firmly with each other the following joints are provided.

(1) Butter square joint
(2) Rebated or lapped joint.
(3) Tongued & grooved joint
(4) Table joint
(5) Rusticated joint
6) plugged joint

In this type of joint, the square surface of one stone is placed against that of another stone. This is the most common joint in stone.

(iii) Rebated or Tongued joint

In this type of joint, the rebates are provide which prevent the movement of stone.

In this type of joint, a projection in kept on one stone & a corresponding sinking is provided in the other stone as shown in fig. This joint is also known as Jaggle joint & it is very rarely used.

Tabic joint In this type of joint a Jaggle is kept on the bed of the stone to prevent lateral

movement.

Some times the edges of stones used for plinth and walls etc. are sunk below the general level.

-> The term rusticated is used to indicate such masonry.

classification of stone masonry :-

The stone masonary is classified in to two categories.

(i) Coursed Rubble
(ii) Uncoursed Rubble
(iii) Random Rubble

(i) Ashlar fine
(ii) Ashlar Rough tooled

(iv) Random Rubble

(v) Polygonal Rubble

(vi) Flint Rubble

(vii) Ashlar work or Quarry faced

(viii) Ashlar Chamfered

(ix) Ashlar block in course.

(A) Rubble masonry:

-> In this type of construction, the stones of irregular sizes are used.

-> The stones as obtained from quarry are taken to use in the same form or they are broken & shaped in masonry depends on 3 factors.

① The quality mortar

② The use of long through stone at a frequent intervals.

③ The proper filling of mortar between the spaces.

Good Filling

Good Filling

1) [illegible] ⇒ In this type of rubble masonary the heights of stones vary from 5cm to 20cm. The stones are sorted out before commencement.

⇒ The masonry work is then carried out in courses such that the stones in a particular course are of equal height.

⇒ This type of masonary is used for the construction of public buildings residential buildings etc.

The coursed rubble masonary is farther divided in to 3 catagories.

(i) Coursed Rubble masonry I sort :-

⇒ In this type, the stones of the same height are used then courses are also of the same height.

⇒ The face stones are dressed by means of hammer & the bushings do not project by more than 10 m.m. The thickness of mortar joint does not exceed 10 m.m.

(Coursed rubble masonry I sort)

(ii) Coursed Rubble masonry II sort

> It is similar to I sort except the followings

(a) The stones to be used are of different heights.

(b) The courses need not be of equal height.

(c) Only two stones are to be used to make up the height of one courses.

(d) The thickness of the mortar joint is 12 mm.

Course Rubble masonry II sort.

(iii) Coursed Rubble masonry III sort :-

=> This type is similar to II sort except the followings

(a) The stones to be used are of different heights the minimum being 50 mm.

(b) The courses need not be equal heights.

(c) Only 3 stones are to be used to make up the height of one course

(i) The thickness of random joint rubble masonry

(ii) Coursed Rubble masonry :-

⇒ In this type of rubble masonry, the stones are not dressed. But the used as they are available from the quarrying except knocking out some corners.

⇒ The courses are not maintained and the regularity.

⇒ The larger stones are laid first and the space between them are then filled up by spalls on sheets as shown in figure.

⇒ The wall is brought to a level every 300 mm to 600 mm.

⇒ This type of Rubble masonry being cheaper, is used for the construction of compound walls godown, labour quarters, etc.

[Coursed Rubble masonry 1.1 sort]

(uncoursed rubble masonry)

16

> In this type of rubble masonry the stones of irregular sizes & shapes are used. The stones are arranged so as to have a good appearance.

> It is to be noted that more skill is required to make this masonry structurally stable.

> If the face stones are chisel-dressed and the thickness of mortar joint doesn't exceed 6mm, it is known as the random rubble masonry (or) ashlar). If the faces stones are hammer-dressed & thickness of mortar joint doesn't exceed 10mm, it is known as coursed rubble masonry.

→ This type of masonry is used for residential building.

(Random rubble masonry)

(iv) Dry Rubble masonry :-

→ This is just similar in construction to the coursed rubble masonry it sort except that no mortar is used in the joints.

→ This type of construction is the cheapest but it requires more skill in construction.

(v) Polygonal Rubble masonry :-

→ Polygonal Rubble masonry In this type of rubble masonry the stones are hammer-dressed & the stones selected for fair work are dressed in an irregular polygonal shape

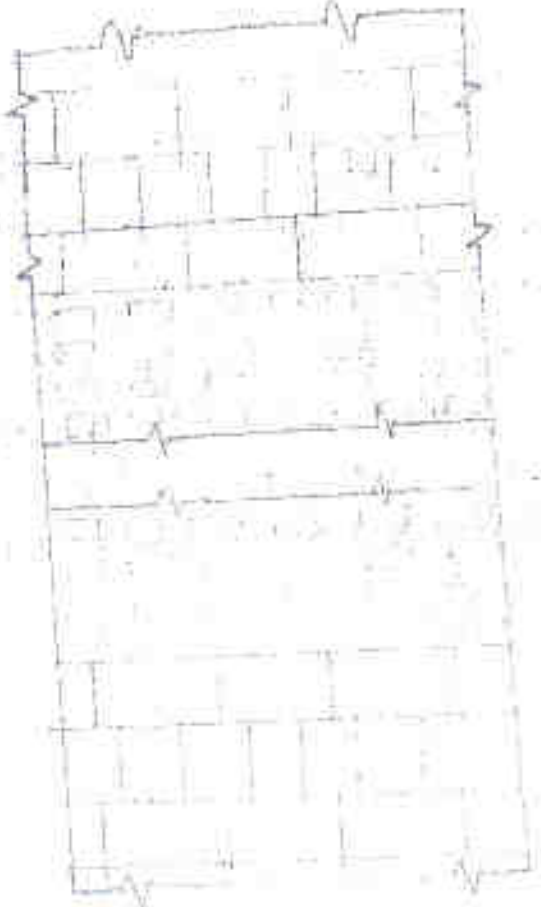
→ In this type of construction more skill is required as the stones are irregular sh It is difficult to adjust them with heyend to stability.

(Polygonal rubble masonry)

23 Nov 2020

Flint rubble masonry :-

- In this type of rubble masonry the stones used are flints which are irregularly shaped nodules of silica. The width & thickness vary from 80 m.m. to 150 m.m. & the length varies from 150 m.m. to 300 m.m.
- The stones are extremly hard but they are brittle & therefore they break easily.
- The face arrangement may be either coursed or uncoursed.
- This type of masonry used at places where the flints are available readily.



(Flint Rubble masonry)

(5) Ashlar masonry :-

→ In this type of construction, the square or rectangular blocks of stones are used.

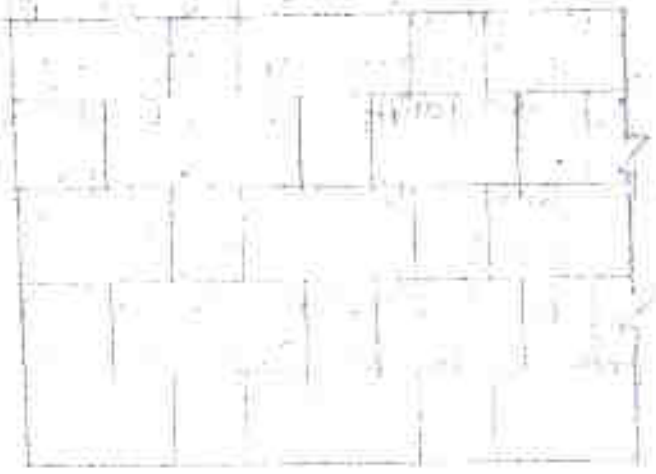
→ The courses are not necessarily of the same height. The height of stone varies from 250 m.m. to 300 m.m.

→ The length of stone should not exceed three times the height.

Following are the different type of Ashlar masonry

(1) Ashlar fine masonry :-

In this type of Ashlar masonry the beds, sides and faces are finely chisel-dressed. The stones are arranged in proper bond & the thickness of the mortar joints doesn't exceed 3 m.m. This type of construction gives perfectly smooth appearance but it is costly in construction.



(Ashlar fine masonry)

(II) Ashlar rough tooled masonry

⇒ In this type of ashlar masonry, the beds and sides are finely chisel dressed But the face is made rough by means of tools. The thickness of mortar joint doesn't exceed 6 m.m.

⇒ This type of work is also known as the bastard ashlar.

(III) Ashlar Rock or quarry faced masonry :-

⇒ In this type of ashlar masonry a strip about 25 m.m. wide & made by means of chisel is provided around the perimeter of every stone. But the remaining portion of the face is left in the same form as received from quarry.

(IV) Ashlar chamfered masonry :-

⇒ In this type of ashlar masonry the strip is provided as above. But it is chamfered or beveled at an angle of 45° by means of chisel for a depth of about 25 m.m.

⇒ Another strip 12 m.m. wide is then provided on the remaining exposed face of the stone & the surface inside this strip is left in the same form as received from quarry.

(iv) Ashlar block in Course masonry :-

⇒ This type of ashlar masonry occupies an intermidiate position between the rubble masonry & the ashlar masonry.

⇒ The faces of stones are generally hammer dressed and the thickness of mortar joint doesn't exceed 6 m.m.

⇒ The depth of course varies from 200 m.m. to 300 m.m.

⇒ This type of construction is used for heavy engineering works.

25 Nov 2020 New Chapter

Doors, Windows & ventilations

Doors :- A door may be defind as an openable barrier secured in an opening in a wall for the purpose of providing access to the users of the structure.

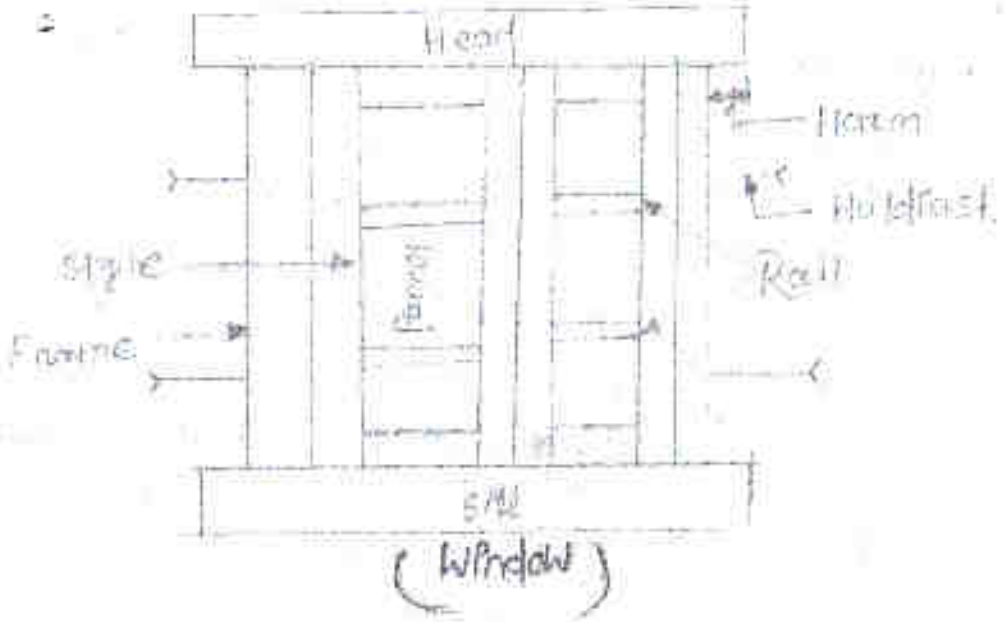
⇒ The door shutter It basically consist of two parts, namely frame & shutter.

⇒ The door shutter is held in position by the door frame which in turn is fixed in the opening of the wall by some suitable means.

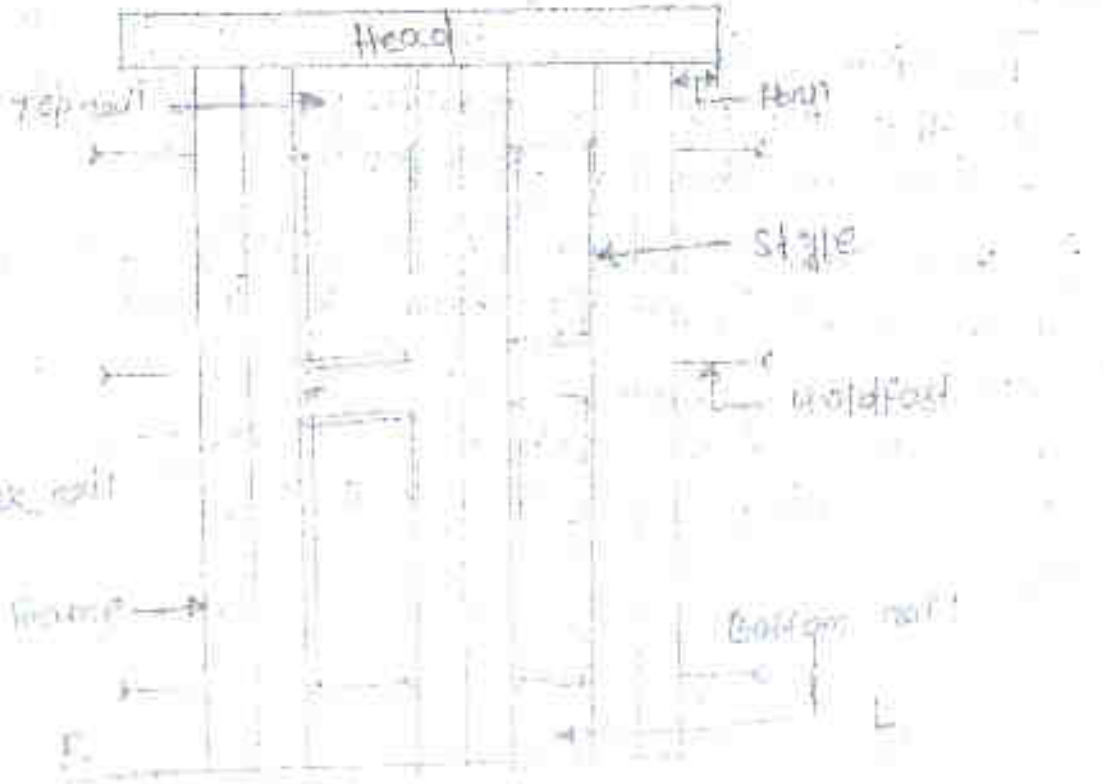
Window :- A window may be defined as an opening made in a wall for the purpose of providing day light, vision & ventilation.

> It also consist of two parts i.e frame & ~~shutter~~ shutter.

> The window frame is suitably fixed in the opening of the wall and the window shutter is held in position by the window frame.



(Window)



Technical terms :-

Frame :- This consists of a group of members which form a support for a door or window.

Style :- This is the outside vertical member of the shutter of a door or window

Head :- The top or uppermost horizontal part of a frame is known as head.

Sill :- The lower most or bottom horizontal part of a window frame is known as the sile. The frames are usually not provided with the sills.

Top rail :- This is the topmost horizontal member of the shutter.

Lock rail :- This is the middle horizental member of the shutter where the locking arrangement is provided.

Intermediate or Cross rail :-

The additional horizental rails fixed between the top & bottom rails of a shutter is known as intermediate or cross rail.

Panel This is the area of shutter enclosed between the adjacent rails.

Hold fast :- This is generally in the form of a mild steel. The 3 nos of hold fast are provided on each side of door frame.

② Dec 2020

Shutter

⇒ The entire assembly ~~type~~ of ~~frame~~ made style, panels of ~~light~~ sections and rails is known as shutter.

Sash :- This is a special type of frame made of light section and designed to carry glow. A sash consist of two vertical styles a top rail & a bottom rail a sash can be divided vertically horizontally by providing bars. This bars are known as Sash bar or glazing bars.

✓ Types of doors :-

⇒ Depending upon the type of material arrange-ment of different components method of construction etc. the common types of doors used in the buildings can be grouped as follows.

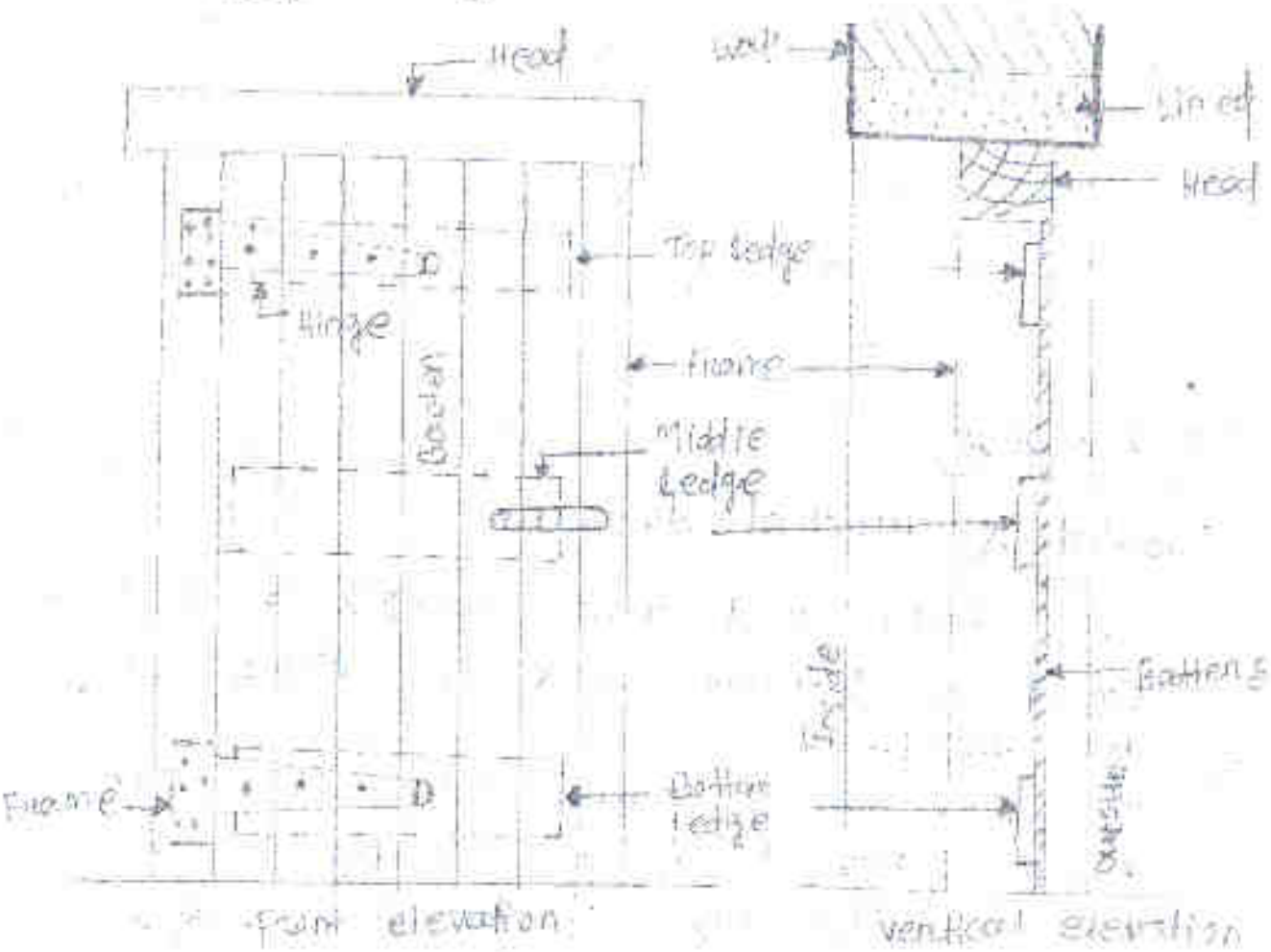
(i) Ledged doors
(ii) Leged & braced doors
(iii) Leged & framed doors
(iv) Leged, framed & braced doors.
(v) framed & panelled doors
(vi) Glazed or sash doors
(vii) Flush doors
(viii) Revolving doors
(ix) Rolling steel doors
(x) sliding steel doors
(xi) swing doors

Ledged doors :-

⇒ A ledged door is formed of the vertical boards known as the battens, which are secured by horizontal supports known as the ledges.

⇒ The battens are 100 m.m. - 150 m.m. wide & 20 m.m. - 30 m.m. thick.

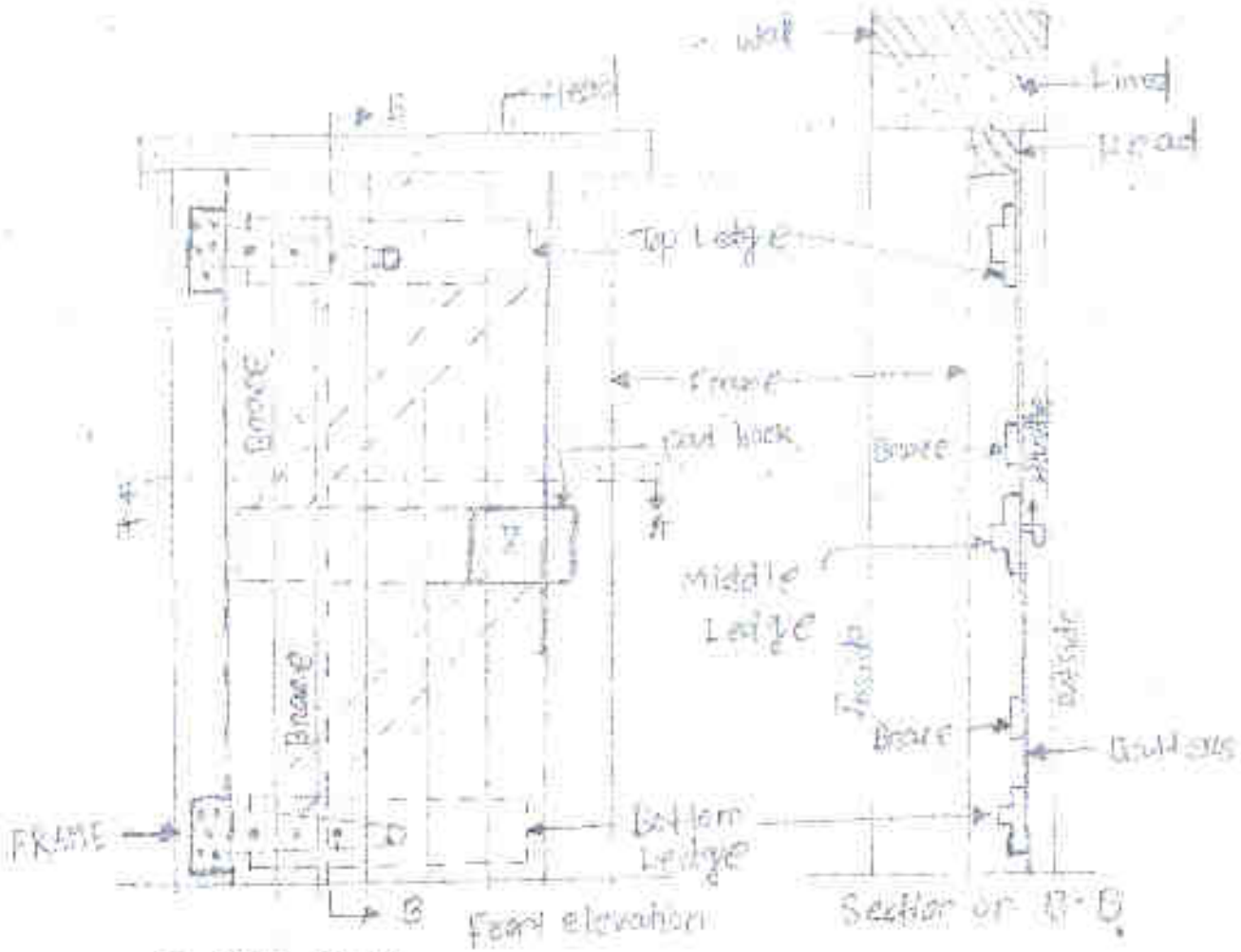
⇒ This is the simplest form of door. It is used where strength & appearance not important.



(ii) Ledged & braced doors :-

⇒ These are similar to the ledged doors except that the diagonal members, known as the braces.

⇒ The braces are generally 100 m.m. - 150 m.m. wide & 30 m.m. thick. The braces gives rigidity to the door & hence the doors of this type are useful wide openings.



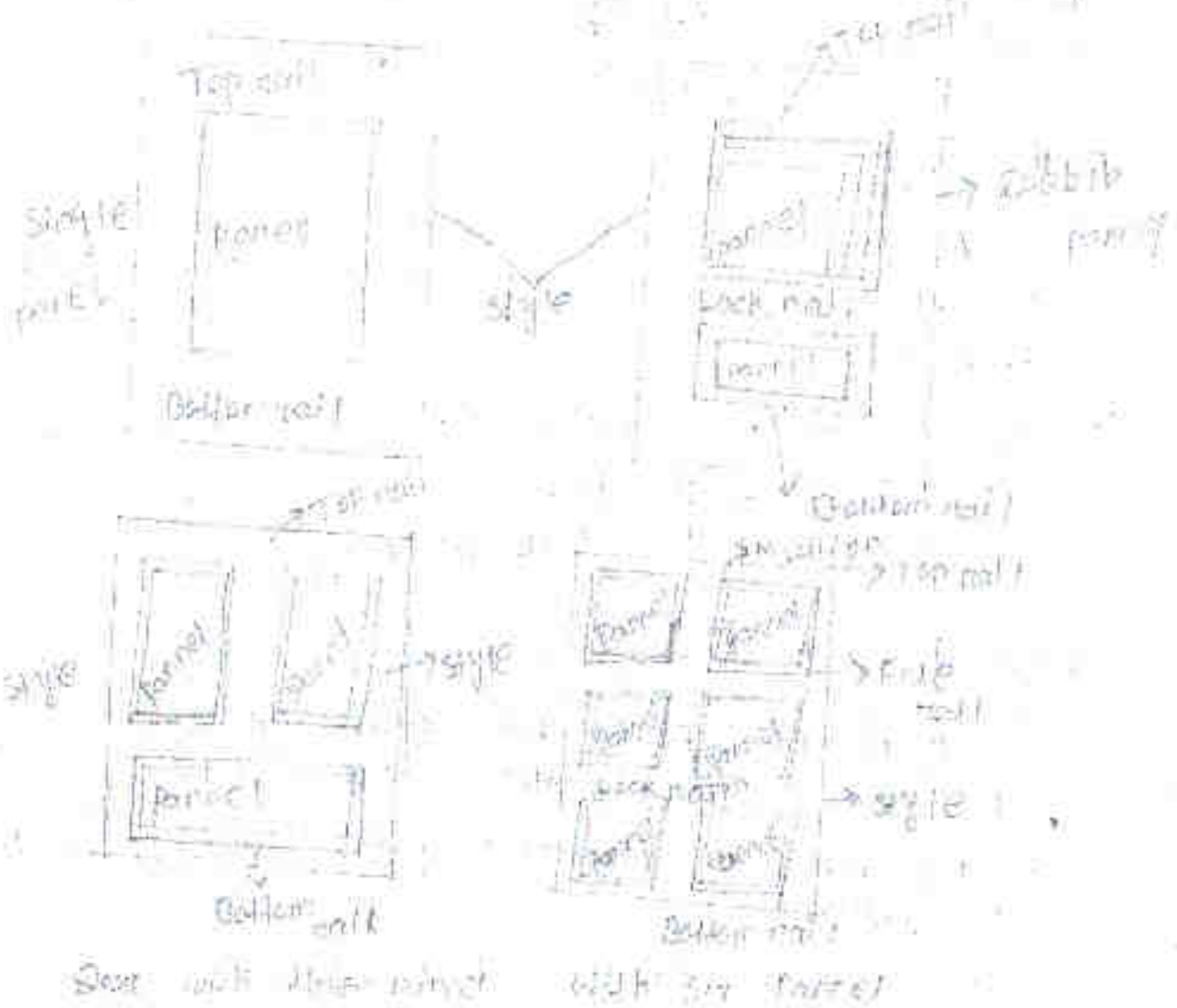
3 Dec 2020

Framed & panelled doors

⇒ This is the most usual variety of doors it consist of a frame work in which Panel are fitted.

⇒ The thickness of panel is about 20 m.m. The panel secured in position by grooves made inside edge of the frame work.

⇒ The numbers & size of panells depend upon the architect's design or owemian's desine But the number varies from one to sine. panels are moulded to add to the beauty of the door.



⇒ For small openings, the shutter are of single leaf while double leaf shutter are used for large openings.

Glazed or Sash doors

In order to admit more light in addition to that remming from the windows, the fully glazed or partly paneled or partly glazed doors are used.

⇒ The glazed or sash doors are useful for hospital, office, library, showroom, bank etc.

4 Dec 2020

Flush Door :-

A flush door consist of a frame work of rails & styles & it is covered with plywood or hard board.

⇒ There are two varities of flush door.

(i) a framed flush door
(ii) a laminated flush door

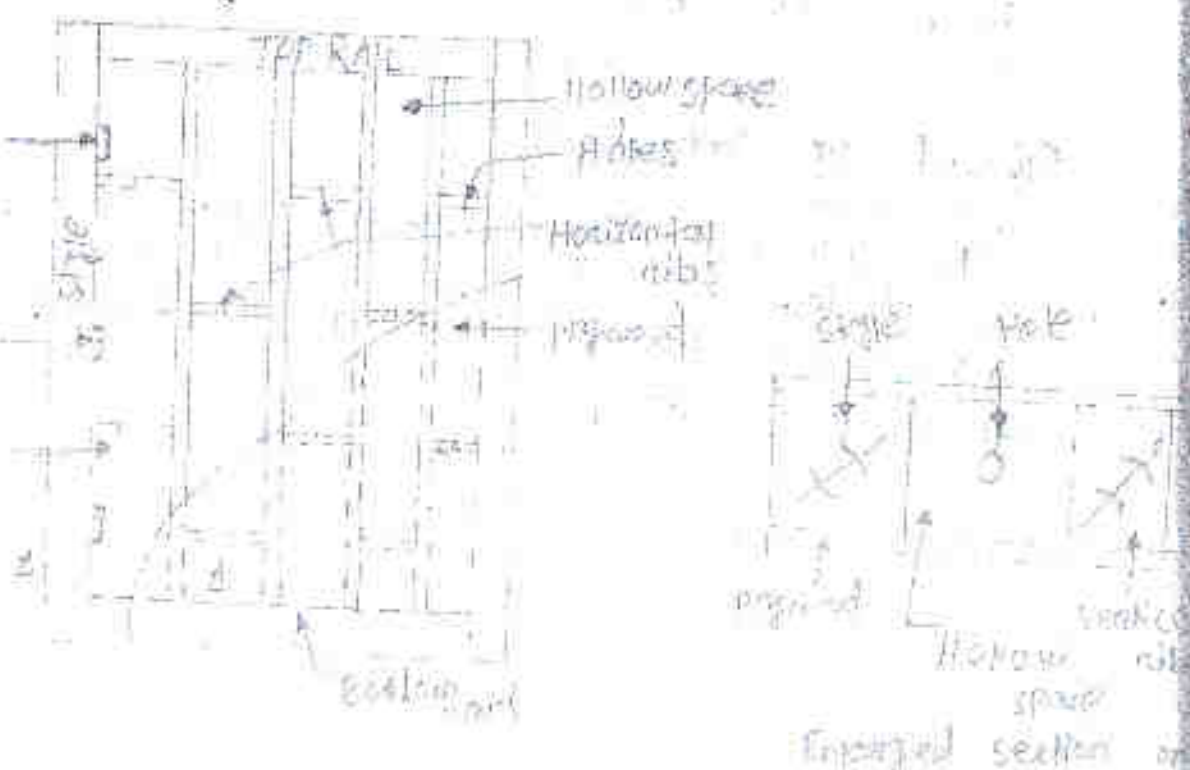
Framed flush door :-

A framed flush door consist of style rails, horizental ribs, vertical ribs and Plywood.

⇒ The holes in horizental ribs are provided for ventilation.

⇒ The vertical ribs rest on rails.

⇒ The flush doors, with hollow space are light in weight & cheap. But as they are weak.



(Framed flush door)

Laminated flush door :-

A laminated flush door consist of styles, rails, laminated core & plywood The laminate of wood are glued together under great pressure.

⇒ The plywood sheets on either side are also glued together to the laminated core under great pressure. Thus a laminated flush door is heavy & required more material for construction.

(Laminated flush door)

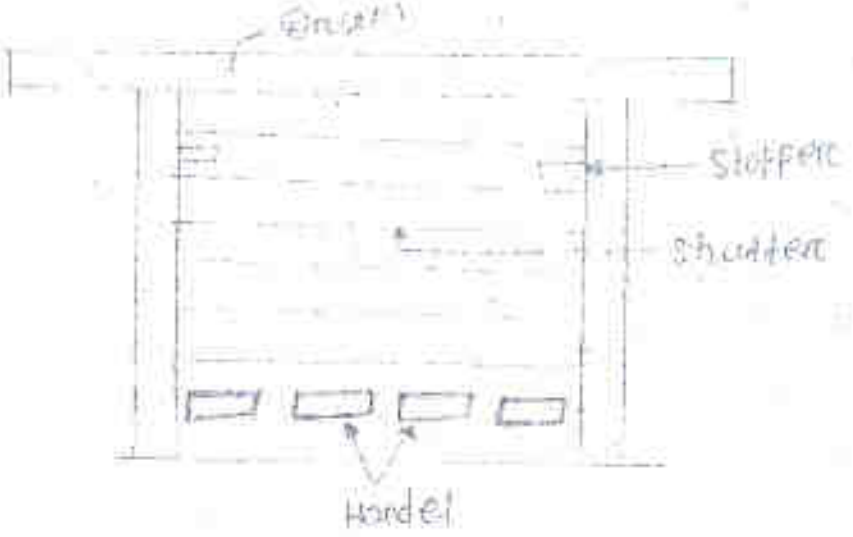
Revolving doors :- A revolving door essentially consist of a centrally placed mullion or pivot in a circular opening.

⇒ The revolving shutter or leaves which are four in number are radially attached pivot.

Rolling steel doors :- A rolling steel door consist of a frame, a drum and a shutter of thin steel plates or iron sheets of thickness about 1mm.

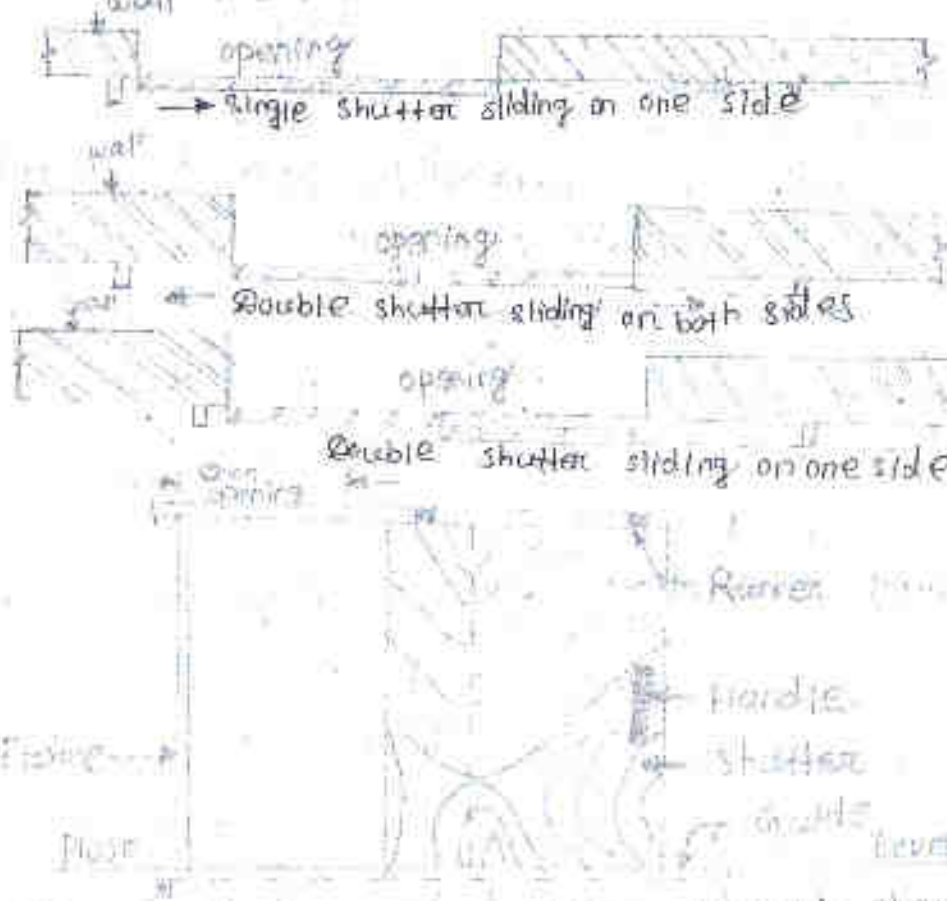
⇒ The grooves of about 75 mm. thickness are left in the frame.

-> A horizental shaft & springs are provided in the drum at the top. The diameter of drum is about 200m.m. to 300m.m. The shutters usually rolls in turns. Thus a slight pull or push will close or open the shutter.



Sliding doors :- In this type of doors the shutte slides on the side with the help of runne & guide.

-> The shutters may be one or several leves & can slide on one side or both sides.



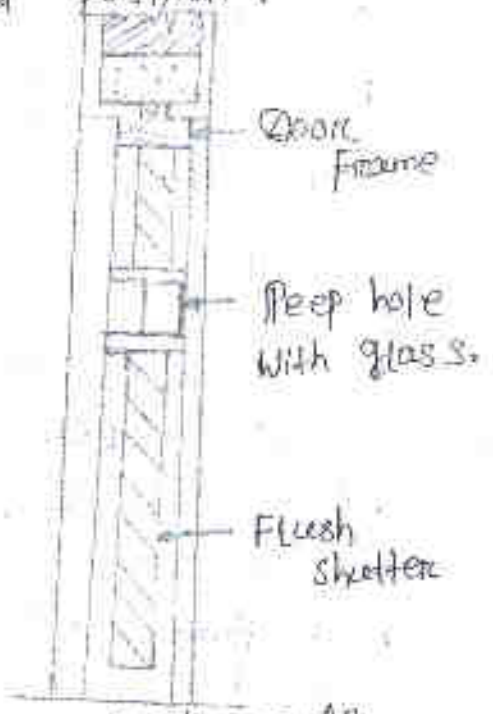
Front view of sliding door with single shutter

Swing doors :-

A swing door is provided with special hinges known as the double action spring hinges & thus the shutters of the door are held in closed position, when the door is not used.

⇒ The shutter may be of one or several leaves. when a door is to be used, a light push is made the action of spring brings the shutters in closed position.

Elevation



Section on AB

(Swing doors)

The action of spring brings the shutters in closed position.

✓ Types of windows :-

Depending upon the manner of fixing materials used for construction, nature of operational movement of shutters, etc the common types of window are follows.

① Casement windows

② Double - hung windows

③ pivoted windows

④ sliding windows

⑤ Sash or glazed windows

⑥ metal windows

⑦ Corridor windows

⑧ Corner windows

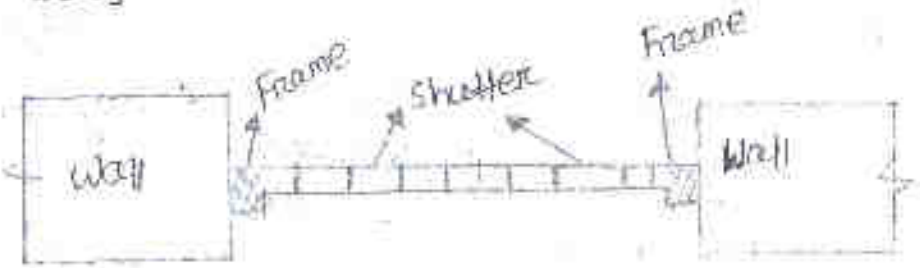
⑨ Gable windows

⑩ skylights.

① Casement windows :-

⇒ These are the windows the shutters of which open like doors.

⇒ The construction of casement window is similar to the door construction & it consists of a frame, styles, rails, verticals horizontal sash bars



(Wooden casement Windows)

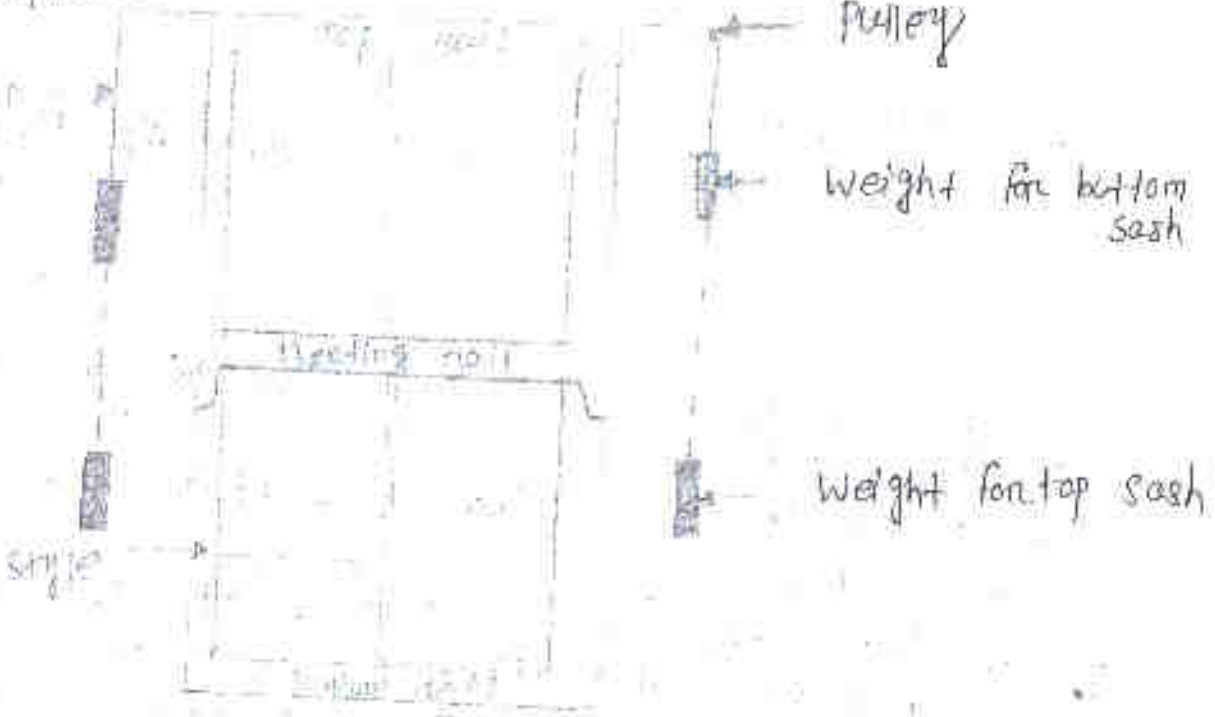
② Double - hung windows

These windows consist of a pair of shutters which can slide with in the grooves provided for each sash.

⇒ It is so arranged a pair of metal

connected by cord.

⇒ It is so arranged that the upper sash moves in the downward direction thus opening at the top, and the lower sash moves in the upward direction thus opening at the bottom.



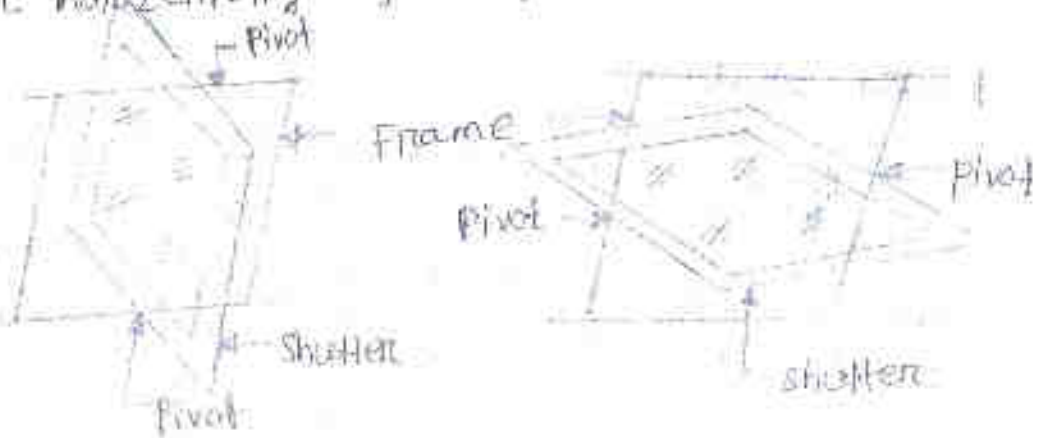
(Double-hung window)

2) Pivoted windows -

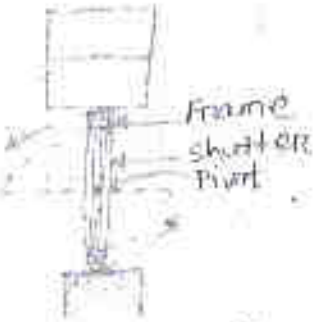
⇒ In this type of windows, the shutters are allowed to swing round the pivots.

⇒ The frame of a pivoted windows just similar to casement windows except that no rebates are provided.

⇒ The windows may be vertically pivoted or horizontally pivoted.



Vertically Pivoted Windows



Horizontally Pivoted Windows

Sliding windows

Sliding windows are similar to the sliding door & the shutters move on the roller bearings either horizontally or vertically.

⇒ Suitable openings are provided in the walls to receive the shutter when windows are opened out. Such windows are provided in trains, buses, bank counter etc.

③ Sash or glazed Window :-

These are fully glazed casement windows. The sashes are rebated to receive glass panels. The width & depth of rebate are about 15 mm & 5 mm respectively.

⇒ The glass is secured in position either by putty or by small fillets known as glazing beads.

④ Metal Windows

These are now-a days widely used especially for public buildings. The metal used in construction may be mild steel, bronze or other alloys.

→ The steel windows are manufactured in standard sizes & are widely used metal windows.

(c) Circular windows :-

These are pivoted windows of circular shape. They are useful for factories, workshop etc.

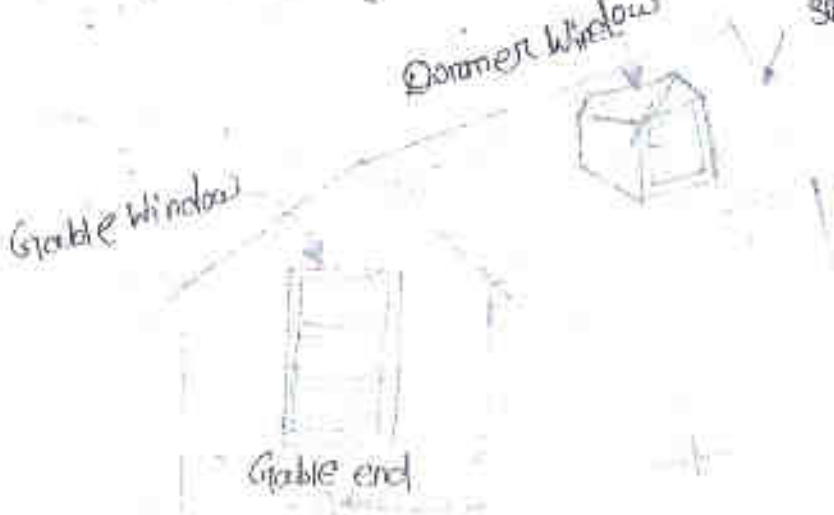
(d) Corner windows :-

These windows are provided at the corner of a room. They are placed at the corner of room & there they have two faces in two perpendicular direction.

(Corner Window)

(e) Gable windows :-

These are the windows which are provided in the gable ends of a roof.



(Gable Window and Corner Window)

Dormer windows

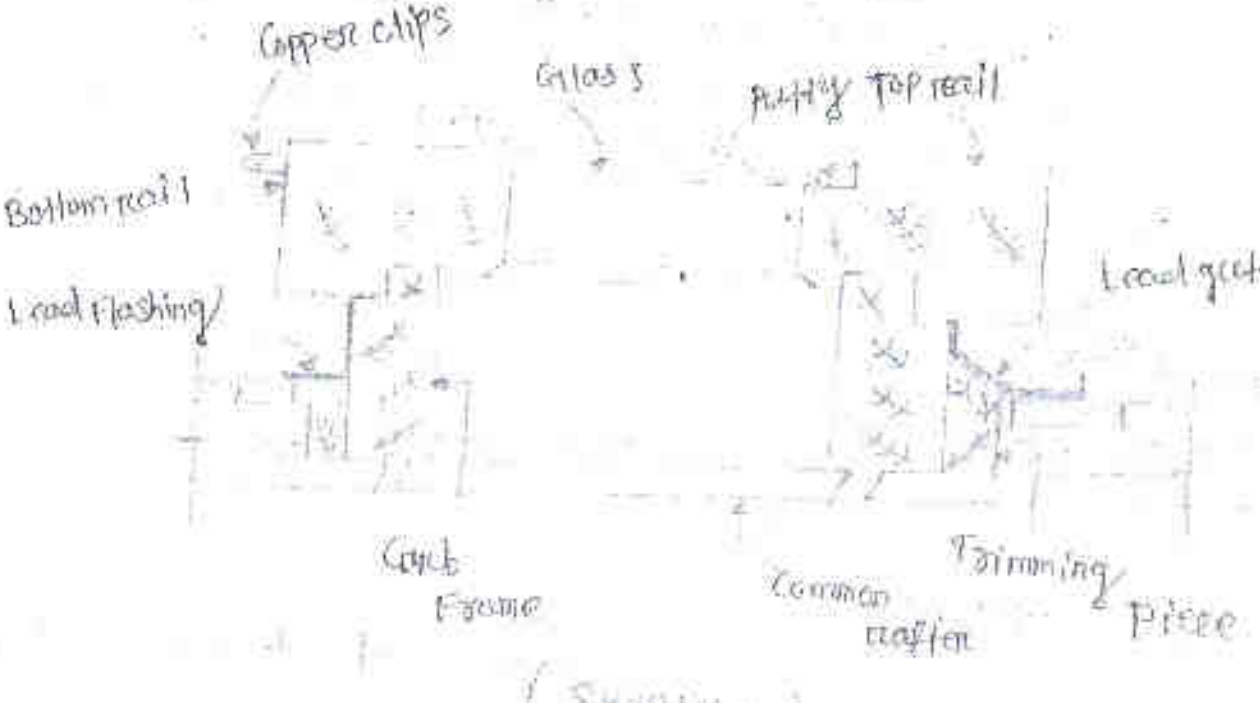
These are the windows provided sloping roofs.

⇒ The main purpose of providing dormer windows is to admit light & air to rooms which are constructed with in or below the roof slopes.

Skylight :- These are the windows which are provided on the sloping surface of a pitched roof. The common rafter are suitably trimmed and the skylight is erected on a crumb frame.

⇒ As skylights are ~~may be~~ mainly meant for light, they are usually provided with the fixed glass panels.

⇒ The opening of skylight is properly treated by lead flashing to make water-proof the roof ~~area~~ surrounded the openings.



(Skylight)

Nitin Chapter

FLOOR

In order to sub-divide the portion between the plinth level or basement level & roof level level, the solid construction are carried out. These construction are known as floor & the expose top surfaces of floors are termed as flooring.

⑤ Types of floor -

The floors are classified in to two catagories.

① Timber floor (Timber only use)

② Composite floor (1 or more material use)

Timber floor :- In this type of floors only timber is used as material. Following are the types of timber floor.

① Basement or ground floor of timber

② Single joist timber floors

③ Double joist timber floors

④ Framed or tripple joist timber floor

① Basement or ground floor of timber :-

In auditorium, to carry out dances or dramas, the timber floors are constructed on the ground floor.

: 16 December 2020 :

(Basement or ground floor of timber)

(2) Single joist timber floors :-

⇒ These floors consist of single joist which are placed below the floor boards. The joist are usually placed at a c/c distance of 300 m.m. to 450 m.m.

⇒ The joist are supported on wall plates at their ends.

⇒ The single joist timber floor can be adopted for a maximum span about 3.60 mt.

Details At C

Herring bone Strutting

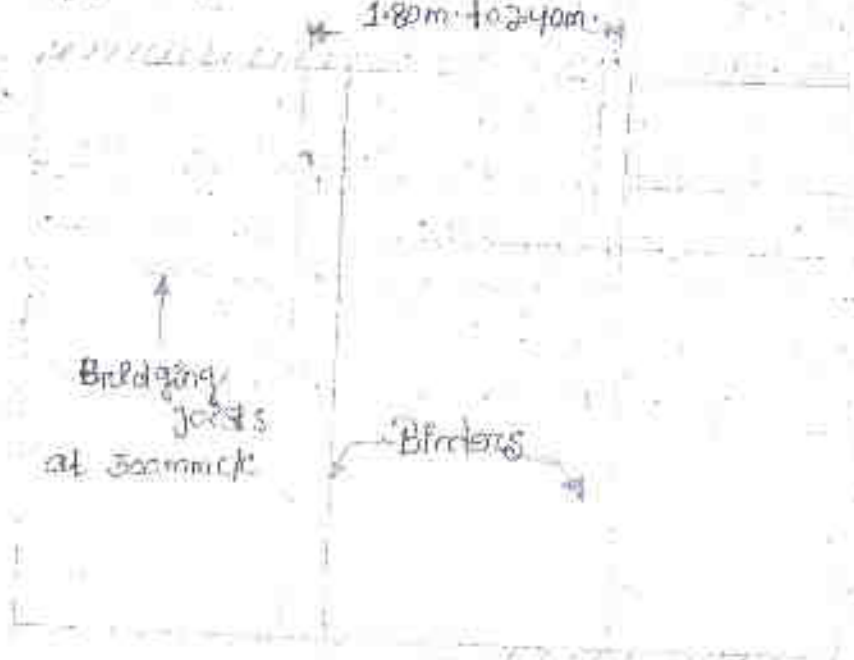
(Details of single joist timber section on AB)

(2) Double joist timber floors :- Floors

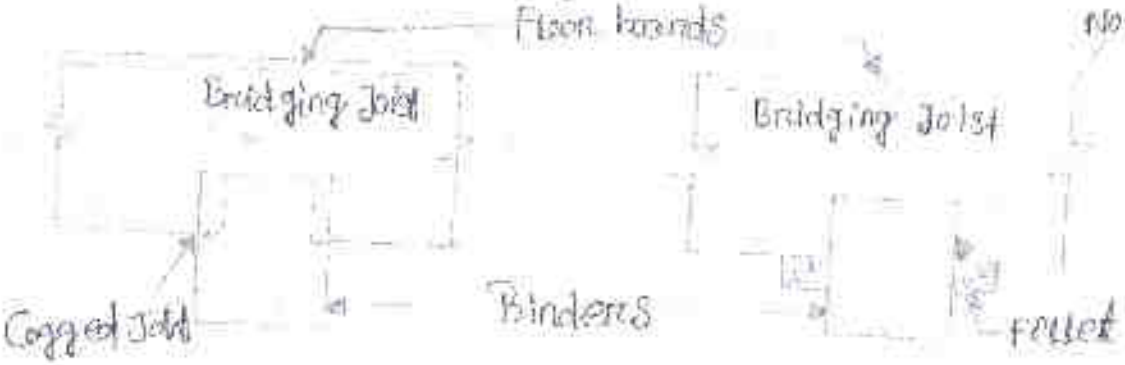
⇒ In this type of floors, the intermediate supports non as the binders, are provided for the bridging joist. The binders are generally placed at c-to-c distance of 1.80 mt to 2.40 mt.

⇒ The ends of binders rest on wooden or stone blocks.

⇒ The double joist timber floors are stronger than the single joist timber floors.



(plan of double joist timber floor)



(Methods of fixing binders with joists

(4) Framed or triple joist timber floor :-

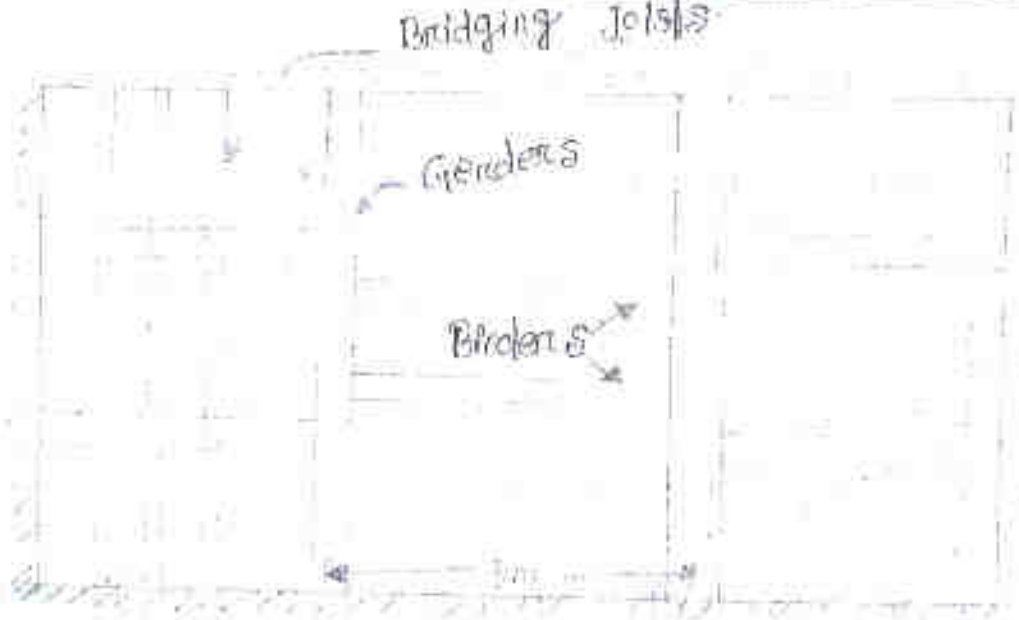
⇒ In this type of floors the intermediate supports, known as the girders, are provided for the binders.

⇒ Thus, this type of floor consist of girders, binders, bridging joists and floor boards.

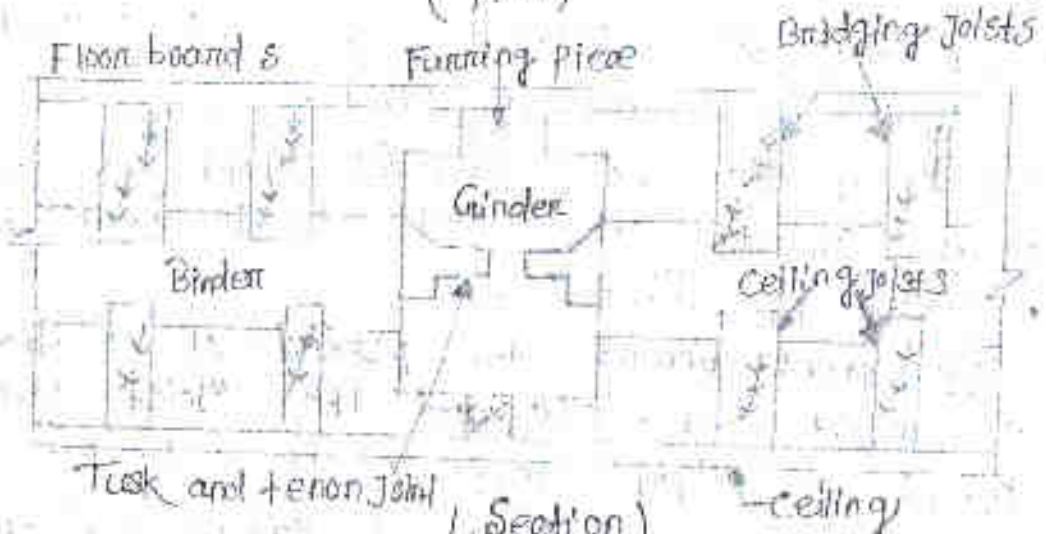
⇒ The girders are generally placed at a c/c distance of 3mt.

⇒ The binders are staggered and connected to the girder by tusk & tension joint. Alternatively the ends of binders are supported on the iron stirrup which are fixed to the girders.

⇒ This type of timber floors is suitable for span greater than 7.50 mt.



(Plan)



(Section)

(Details of framed timber floors)

23 Dec 2020

(5) Composite Floors :-

The floors composed of more than one material are known as the composite floor and they are found to posses the following advantages over the timber floors.

① The composite floor resist fire in a better way & they are more sound proof than timber floor.

② The composite floors can be easily cleaned and hence they possess better hygienic properties than the timber floors.

Following are the types of composite floor :-

(i) Double flag stone floor
(ii) Filler joist floor
(iii) Jack arch floor
(iv) Rcc floor

(i) Double flag stone floor

> In this type of floors the flag ston are used in the two layer's.
> If the span is about 3mt, only rolled steel joist are provided.
> But if the span exceeds 4 m.t. a fra work consist of rolled steel beam & joist is formed.
> The steel beams are placed at a dista of about 3mt. c/c and the joist are placed at right angle to the beame.
> The flag stones of about 40 m.m. thickn and of suitable width are fixed on the flange & upper flange.
> The joists of top layer of flag stones finished in a better way to give a ni appearance.
> The filling of selected earth or concret is done in the space betn the two of flag stone.

(Double flagstone floor)

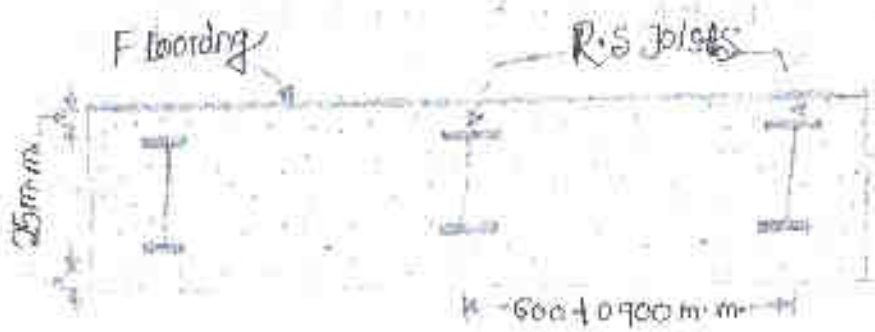
(11) Filler Joist Floor

In this type of floors, the small sections of rolled steel joists are placed in concrete.

⇒ The joist may either rest on wall or on steel beams.

⇒ The joist act as a reinforcement & are spaced at a c/c distance of 600mm to 900m.m.

⇒ The concrete should completely surround the rolled steel joist & became with a minimum cover of 25 m.m. over the Filler Joist.



(Filler Joist floor)

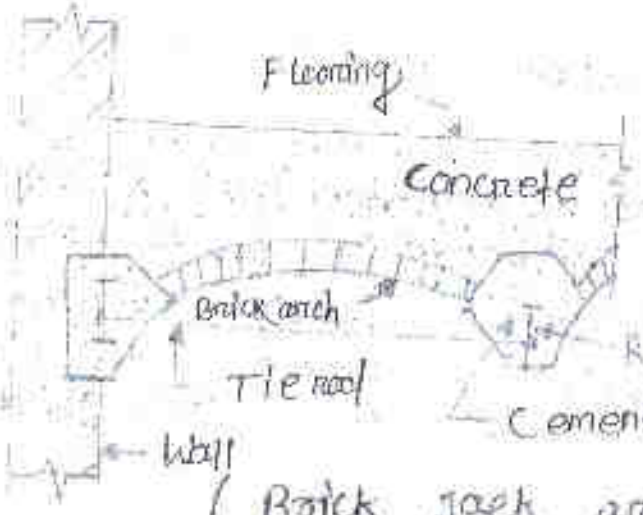
24 Dec 2020

(iii) Jack arch floor :-

> In this type of floors, the brick arches or cement concrete arches are constructed and these arches rest on steel joist. The Joist

> The Joist are placed at a distance of 800m.m. to 1200m.m. c/c distance.

> The only disadvantages of this type of floor is that it doesn't give a plain ceiling surface.



(Brick jack arch floor)

Stair

> A stair is defined as a sequence of steps & it is provided to affored the means of ascent & descent between the floors or landings.

> The apartment or room of a building in which the stair is located is known as a stair case & the opening or space occupied by the stair is known as stair way.

F.M.P

Technical Terms :-

Baluster :- This is the vertical member which is fixed between string and handrail to give support to handrail.

Balustrade or banister :-

The combined frame work of handrail and baluster is known as balustrade.

Flight :- This is defined as an unbroken series of steps between the landings.

Going :- This is the horizontal distance between the faces of two consecutive risers.

28 Dec 2020

Handrail :-

The inclined rail over the string is known as a handrail.

Head Room :- The vertical distance bet
the nosings of one flight & the
of flight immediately above it, know
the headroom.

Landing :- The horizental platform between
flights of a stair is known as the l
> A landing facilitates changes in direction
provides an opportunity for taking re
the use of a stair.

Nosing :- The projecting part of the tre
beyond the face of riser is known
nosing.

Rise :- This is the vertical distance bet
two successive treads is known as rise

Tread :- The horizental upper portion of a
step is known as a tread

Riser :- The vertical or front member of
step which is connected to the tread is
known as Riser.

24 Dec 2020

Newel post :- This is the vertical member which is placed ends of flight to connect the ends of string & handrails.

Run :- The total length of a stair in a horizontal plane is known as the run.

Scotia :- This is an additional finish or moulding provided to the nosing or tread to improve the elevation of step & to provide strength to the nosing.

Soffit :- The under surface of stair is known as the soffit.

Types of stairs :-

The stairs are classified as follows

(i) Straight stairs
(ii) Turning stairs
(iii) Circular or helical or spiral stair
(iv) Geometrical stair

(i) Straight stairs :- In case of straight stair all steps lead in one direction only.
> This type of stair may consist of one or more flights & they are used when the space available for stair case is long both narrow width.

(Straight stair)

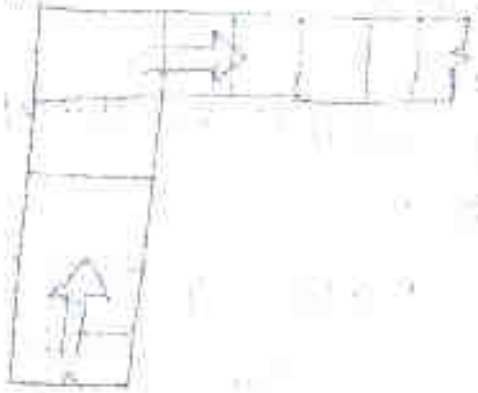
Turning stair :- In case of turning stair, the flights take turn. The usual types of turning stair as follows.

① Quarter-turn stair

> A stair turning through one right angle is known as a quarter-turn stair.

> If a quarter-turn stair is branched in two flights at a landing is known a bifurcated stair.

> This type of stair is commonly used in public building near their entran half.



(Quarter-turn stair)

(Bifurcated stair)

② Half-turn stair :-

> A stair turning through two right angles is known as a half-t stair.

> A half-turn stair may be dog-legg type or open newel type.

4 January 2021

> In case of dog legged stair the flights run in opposite direction.

> These stairs are useful where total width of space available for the stair case is equal to twice the width of steps.

> In case of an open newel stair there is a well or hole or opening between the flights.

> This well may be rectangular or of any geometrical shape.

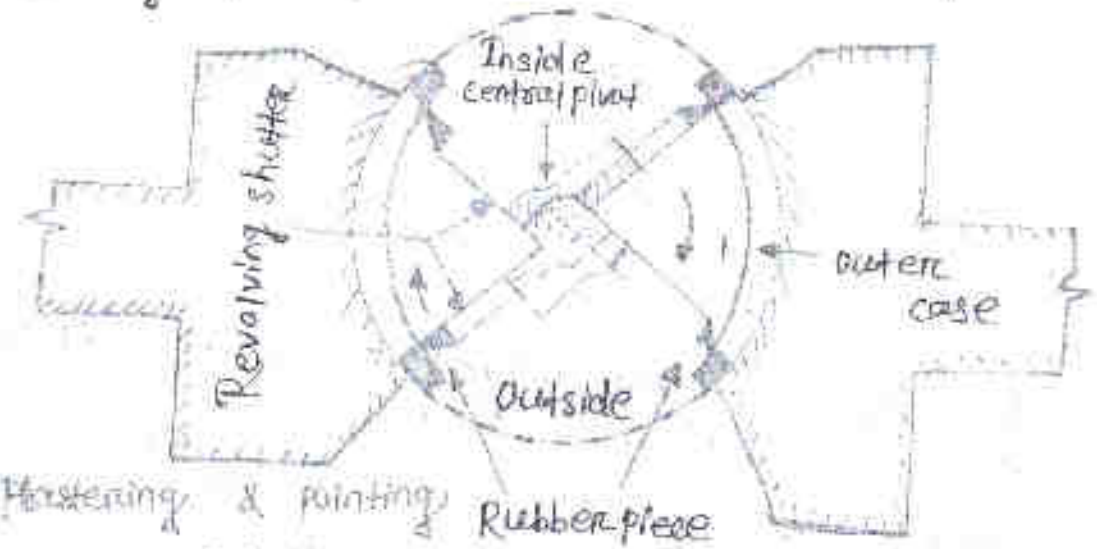
Three-quarter turn stair :-

> Turning through 3 right angles is known as three-quarter turn stair.

> This type of stair is used when the length of the staircase is limited.

Circular or helical or spiral stair :-

> In this type of stair the steps radiate the center & they donot have either any landing & any intermediate newel post.



Plastering :- The term plastering is used to describe the thin plastic covering that is applied on the surface of walls & ceili

> The plastering remove the unevenness of t surfaced & some times the plastering i used to develope decorative effects.

Requirement of good plaster :-

> Following are the qualities of plastering material so as to turn good plaster.

(i) It should adhere to the back groun & should remain adhered during all variations of the climatic changes.
(ii) It should be cheap & economical.
(iii) It should be hard & durable.
(iv) It should be possible to apply it dur all weather conditions.
(v) It should posses good work-ability.

Type of plastering :-

(i) Lime mortar

(ii) Cement mortar

(iii) Water - proof mortar

(iii) Water - proof mortar :-

This mortar is water-proof & it prepared by mixing one part of cement & two part of sand and powdered at the rate of 120 N Im^3 of sand. In the water to be used 0.75 N of soft soap is dissolved per me litre of litre of water & this soap water is added to the dry miel.

6 Jan 2021

Types of plaster finishes :-

There are various forms of external finishes as follows :-

(i) Lime mortar :- The lime mortar consists of equal volumes of lime and sand and these two materials are carefully ground in a mortar mill. The fat lime is recommended for plaster work because the fat lime contains 75% of CaO and it combines with CO_2 of atmosphere and gives $CaCO_3$ quickly. Thus, the lime sets quickly, but it imparts low strength and hence, it can be used only for plaster work. The hydraulic lime contains particles which slake slowly as they come in contact with atmosphere. This results in blisters on the surface known as the blowing. The sand to be used for preparing lime mortar for plastering work should be clean, coarse and [illegible] impurities.

In order to improve the binding properties of mortar a kind of fragrant gum gugal is added to the lime mortar. The quantity of gugal is about 16 N per m^3 of mortar. The gugal is boiled with enough quantity of fresh water before it is mixed with the lime mortar. In order to improve the adhesive and tensile properties of the lime mortar, the hump (fibress of rope) is added to the lime mortar. The quantity of hump is about 10 N per m^3 of mortar. The mortar thus prepared is kept for 2 days before use and it is turned once in a day to make the mortar of uniform nature.

(ii) Cement mortar :-

The cement mortar consists of one part of cement to four parts of clean, coarse and angular river sand by volume. The materials are thoroughly mixed in dry condition before water is added to them. The mixing of materials is done on a watertight platform and mortar of one cement bag only is prepared at a time and this quantity of mortar is consumed within 30 minutes after adding water.

6 June 2024

Types of plaster finishes :-

xox

There are various forms of external finishes as follows.

(i) Sand-faced finish
(ii) Pebble-dash / dry-dash finish
(iii) Rough-cast finish
(iv) Smooth cast finish
(v) Acoustic plaster

(vi)

(1) Sand - faced finish :-

The first coat of sand-faced cement plaster is in cement mortar of proportion 1:4 i.e. one part of cement to four parts of coarse & angular river sand by volume. The thickness of first coat is now kept less than 12 m.m. The first coat is to be well-watered for at least 7 days. The first coat is provided with zigzag lines such that the first coat adheres well with the second coat.

The second coat of sand-faced cement plaster is carried out in proportion 1:1 the thickness of second coat is 8 m.m. The second coat is to be applied on the coat of 7 days after completion of first coat. The sand to be used in the mortar for the second coat is to be perfectly screened so that sand of uniform size appears on the surface. The sponge is used in the second coat and it is applied when the surface coat is wet and it is so worked that the density of sand grains appearing on the surface is equal and uniform. After completion of the second coat the surface is kept wet watered at least for 15 days.

(2) Pebble dash or dry dash finish :-

In this type of finish, the finishing coat is made 12 m.m. thick and clean pebbles of size varying from 10 m.m. to 20 m.m. are dashed against the surface so that they are held in position by the mortar already applied. The pebbles may be lightly pressed into the mortar with the help of wooden float.

Rough cast finish or spatter dash finish :-

The mortar contains coarse-grained sand and the usual proportion is 1:3 i.e. one part of cement to three parts of sand by

volume. The mortar is dashed against the surface by means of large trowel and is roughly finished by the right surface is roughly finished by the right movements of a wooden float.

(4) Smooth-Cast finish:

This finish is just similar to the rough-cast finish except that the fine-grained sand is used instead of coarse-grained sand.

Depster finish:- This is just another form of rough-cast finish. The rendering coat of 12 m.m. thickness is prepared as in case of pebble-dash finish and while the coat is wet, the pieces of gravel or flint are pressed with hand on the surface. It is possible to have beautified patterns and ornamental designs on the surface. It is the possible to have beautified patterns and ornamental designs on the surface by selecting materials of different colours.

Scrapped finish:- In this type of finish, the final coat of 6 m.m. to 12 m.m. thickness is applied and it is allowed to become stiff for few hours. The surface in the Scrapped in patterns for a depth of 3 m.m. by suitable tool such as steel straight edge or old saw blade. The scrapped finish is less liable to the cracks.

Acoustic plaster:- This surface is prepared when it is desired to give acoustical treatment to the hall or room. The plastered surface is provided with minute openings which absorb the sound. The plaster is usually applied in two coats, each having a

thickness of 6mm. The finishes of the surface should be carried out in such a way that it results in the formation of a uniform porous surface. For finishing work, it is preferable to use wooden floats in place of steel floats.

7 June 2021

Pointing :-

The term pointing is used to denote the finishing of mortar's joints of either stone masonry or brick and plas masonry.

Purpose of pointing / object of pointing & plastering

(i) To improve the appearance of the structure as a whole & to give smooth surface.
(ii) To protect the exposed surfaces from the effect of atmospheric action.
(iii) To rectify the defective work man ship

Types of pointing :-

The pointing can be carried out in a number of shapes following are the usual types of pointing.

(1) Beaded pointing :-

This type of pointing is formed by a steel or iron rod with a concave edge. Beaded pointing is good in appearance. But it is difficult to maintain as it can be easily damaged.

Flush pointing :-

This type of pointing is formed by removing the excess mortar from the joint. The joint is made flush

not give good appearance. But it is durable as it does not provide any space for collecting of dust, water, etc.

Recessed pointing: In this type of pointing the face of the pointing is kept vertical and it is pressed inside the wall surface by a suitable tool.

Rubbed or keyed or grooved pointing:-

In this type of pointing, a groove is formed by a pointer as shown. This type of pointing gives better appearance and is generally adopted.

Struck pointing:- In this type of pointing the face of pointing is kept inclined, as shown. The upper edge of joint is about 10 mm inside the face of masonry. This joint disposes water easily. If the lower edge of joint is kept inside the face of masonry, it is known as overhand struck pointing. But it will not form a satisfactory joint as water will be collected in the joint.

Tuck pointing: In this type of pointing, a groove is formed at the centre of joint. The width and depth of groove are 5 mm and 3 mm respectively. The groove is then filled up by white lime putty with a projection of 3 mm. If projection is done in the mortar, it is called bastard pointing or half-tuck pointing.

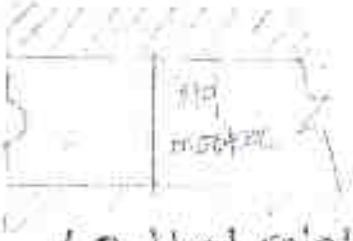
Weathered pointing

In this type of pointing the projection in the form of a vee shape is formed as shown.

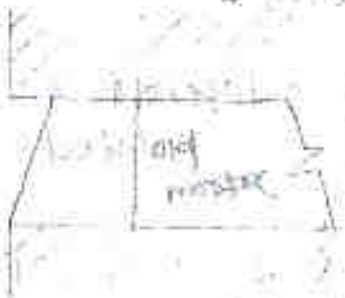
(Beaded pointing)

(Flush pointing)

(Recessed pointing)



(Rubbed pointing)



(Struck pointing)

(Tuck pointing)

(Vee-pointing)

(Weathered pointing)

Painting :-

The paints are coatings of fluid materials and they are applied over the surfaces of timeber and metal.

objects of painting :-

Following are the objects of painting

(i) To protect the surface from weathering effects of the atomosphere & action by other liquids, fumes and gases.

(ii) It prevents decay of wood & corrosion in metal

(iii) It is used to give good apearance to the surface.

(iv) It provides good surface for easy cleaning.

Painting on different surfaces :-

The process of painting depends on the nature of the surface to be painted.

(i) New woodwork :- Normally four coats of paint are required for new woodwork. The process of painting is carried out as follows.

(i) The surface of woodwork is prepared to receive the paint. for satisfactory working. it is necessary that the woodwork is sufficien thy seasoned and it does surface not contain more than 15 percent moisture at the time of painting. The surface of woodwork is thoughly cleaned and the heads of nails are punched to a depth of 3 m.m. below the surface.

(iii) The surface of the woodwork is then knotted.

(iii) The priming coat is then applied on the surface of new woodwork. Generally the priming coat is applied before the woodwork is placed in position.

(iv) The process of stopping is then carried out.

(v) The subsequent coats of paint, namely, under coats and finishing coats, are then applied on the surface. The extreme care should be taken to see that the finishing coat presents smooth and even surface and that no brush marks are seen on the finished work.

(2) Repainting old woodwork :-

If the paint on the old woodwork has cracked or has developed blisters; it is to be removed. If the surface has become greasy, it should be cleaned by rubbing down sand-paper or fine pumice stone. The old paint can also be removed by applying any one of the following three paints solvents :-

(i) A solution containing 2 oz of caustic soda to a litre of water is prepared and used to wash the surface. The paint dissolved and the surface has become entirely clean.

(ii) A mixture consisting of one part of soft soap and two part of potash is applied on the surface in a hot state and allowed to stay for about 24 hours. The surface is then washed with hot water.

(iii) A mixture consisting of equal part of washing soda and quicklime is brought to a paste form by adding requirred quantity of water. It is applied on the surface and kept for about an hour. The surface is then washed with water.

After removing old paint from the surface, the woodwork is painted as in case of painting on new wood work.

(3) New Iron-work and Steelwork :- The surface of iron or steel to receive the paint should be free from rust, grease, dirt, etc. The suitable equipment such as wirebrushes, scrapers, etc. are used to remove all loose scales, marks etc. from the surface. The water with caustic soda or lime is used to remove grease. The cleaned surface is provided with a film of phosphoric acid. This film protects the surface from rust and also facilitates the adhesion of paint. The coats of paint are then applied.

The paint suitable to iron and steel surface should be selected for each coat. The finishing coat should present a smooth finish and precaution should be taken to avoid the presence of brush marks on the final painted surface.

Method of painting :-

Brush :- It is necessary to have good brushes for painting. The brushes show be composed of bristles and not of horse hairs. The bristle brushes are elastic and they can be

possess good paint-holding capacity. The bristles have split at ends and in this respect they can be distinguished from horse hairs.

It is preferable to use a round brush in painting. The new brushes should of soaked in water up to level of bristles for a period of about two hours and then the should be allowed to dry for a period of about one hour. During painting, the brush should be immersed in paint upto about one-third length of the bristle and the excess paint in the brush is removed by gently pressing the bristles against the inside surface of the pot. After the work is over, the brushes should be cleaned at once with kerosene.

(2) Paints:- The ready-mixed paints of different make and various brand are available in the market. They are available in different tints and can be applied in the same for as received. The ready-mixed paints are normally expensive and they are to be used soon after opening the sealed container because of the fact that volatisation of the vehicle and solvent will take place when exposed to the atmosphere oxygen. If the ready-mixed paint is kept exposed to air for a long duration, the solidification of the base and the pigment occurs.

The procedure for preparing paint from stiff paint in as follows:-

(i) The sufficient stiff paint is taken in a pot
The remaining stiff paint is to be covered a
left with a layer of linseed oil.

(ii) The linseed oil which may either be raw or
boiled or pale is then mixed with stiff

(iii) The other ingredients of paint are then added.

(iv) If a colour is required, suitable pigment is added and thoroughly mixed.

(v) A second pot is taken and it is covered with a canvass which is tied tightly.

(vi) The mixed paint is then allowed to pass throughout the canvass of second pot. The brushes may be used for this purpose.

(vii) The paint is then ready for use. The mixed paint may be prevented from drying by maintaining a thin film of linseed oil or of water at top.

8 Jan 2021

Spray painting :-

Instead of the ordinary brushes a spraying pistol may be used for painting work.

-> The pistol work under compressed air and the paint thrown through the pistol on the surface forms a thin uniform layer of paint of the surface.

Following are the advantages of spray painting :-

(i) The speed of work increases

(ii) Give aesthetic appearance

(iii) Less labour required

(iv) The mechanical equipment is such that the paint remains always in a state of motion.

Distempering :-

The main object of applying distempen to the plastered surface is to creat a smooth surface.

> The distempers are available in the market under different trade name.

> They are cheaper than paint & varnishes & they present a neat appearance & they are available in a variety of colours.

White washing :- White washing is a process giving wash of slaked lime prepared with water to the plastered surface some other agents like gum rice water, fevicol etc. are also added to the base material of white wash is a fat lime or sheet lims.

11 June 2021

Colour washing :-

> This is prepared by adding the colouring pigment to the screened white wash It should be seen that the colouring pigment is not affected by the presence of lime.

> ordinarily the yellow earth is popular for colour washing

> Generally the walls are coloured wash & ceilings are white washed.

> The mixture is to be kept constantly stirring during use.

> The colour wash is applied in the same fashion as the white wash & satisfa wash doesn't give out power

when the finished surface is rubbed with fingers.

> The process of colourwashing imparts cleanliness & pleasant appearance surfaces which are treated.

Termite - proofing :-

Meaning of the term termite proofing :-

The termites are popularly known as white ants though they are in no way related to the ants

> The term termite-proofing is used to indicate the treatment which is given to a building so as to prevent or control the growth of termite in a building.

Method of termite - proofing :-

The methods of termite-proofing mention below The drywood termites can be effectively controlled by using preservative-treated timber. The methodes of termite proofing can broadly be classified in to the following are two group :-

① soil treatment with chemical

② structural barriers

13 June 2021

Damp-proof course (DPC)

Meaning of the term damp proofing

One of the basic requirements in case of all the buildings is that the structure remain dry as far as possible. If this condition is not satisfied, it is likely that the building may become uninhabitable and unsafe from structural point of view. Hence in order to prevent the entry of damp in to a building, the courses is known as the damp-proof course.

Materials used for damp proofing :-

Following are the materials which are commonly used for the damp-proofing :-

(1) Hot Bitumen :- This is a flexible material and is used on the bedding of concrete, or mortar. This material should be applied with a min^m thickness of 3mm.

Mastic asphalt :- This is a semi-rigid material and it forms an excellent impervious layer for damp-proofing. It can withstand only very slight distortion. The good ashphalt is a very durable & completely impervious material.

Bituminous felts :- This is a flexible material and is available in rolls of normal wall width. It is laid on layer of cement mortar.

④ Metal sheet :- The sheets of lead, copper and aluminium can be used as the member nanes of damp-proofing.

⑤ Combination of sheets & felts :-

A Lead foil is sandwiched b/n asphalt or bitominous felt. This is known as the Lead core & it is found to be economical & durable.

⑥ Stone :- 15 June 2021

The two courses of second and dense stone such as granites slate etc laid in cement mortar with vertical breaking joint can work as an effective damp-proofing course.
> The stone should entered for full width of wall, sometimes the stone can be fixed as in case of roof surfaces.

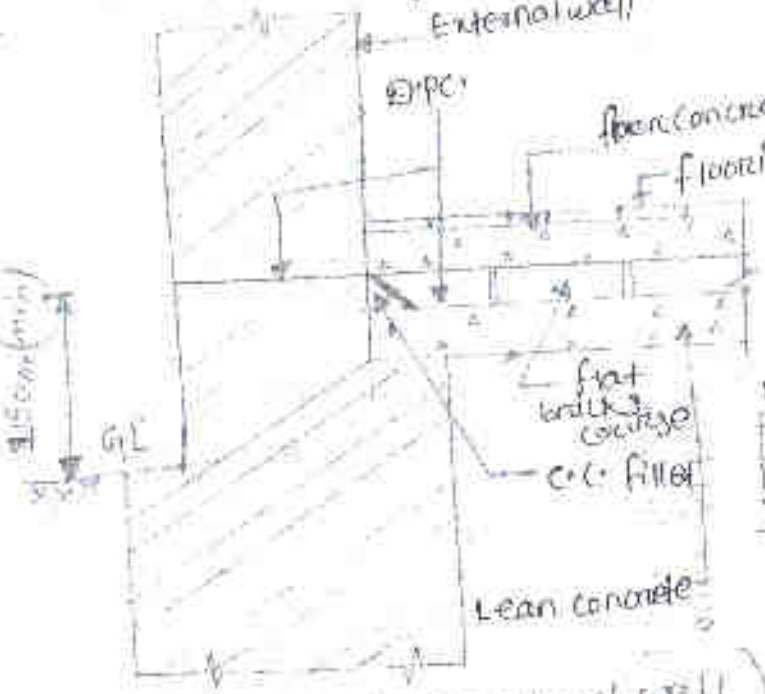
⑦ Bricks :- The dense bricks absorbing water less than 4.5% of their weight can be used for damp proofing at places where the damp is not excessive.
> The joints are kept open such bricks are widely used when a damp-proofing course is to be inserted in an existing wall

Methods of damp-proofing :-

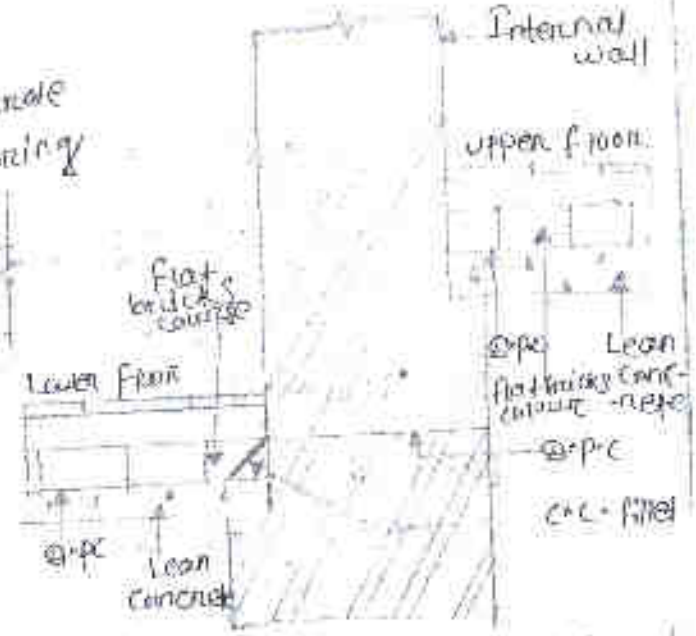
There are various methods of damp-proofing and depending upon the nature of surface situation of the structure and amount of dampness the proper method is selected

following are the methods or measures adopted to prevent entry of dampness

(i) If the level of the ground floor is in level with the ground surface or just above it the damp proofing course is provided as shown in fig. the material should be flexible and it should be stepped vertically through the wall to meet the damp proofing course of the solid floor.



(Damp proofing of an External wall)

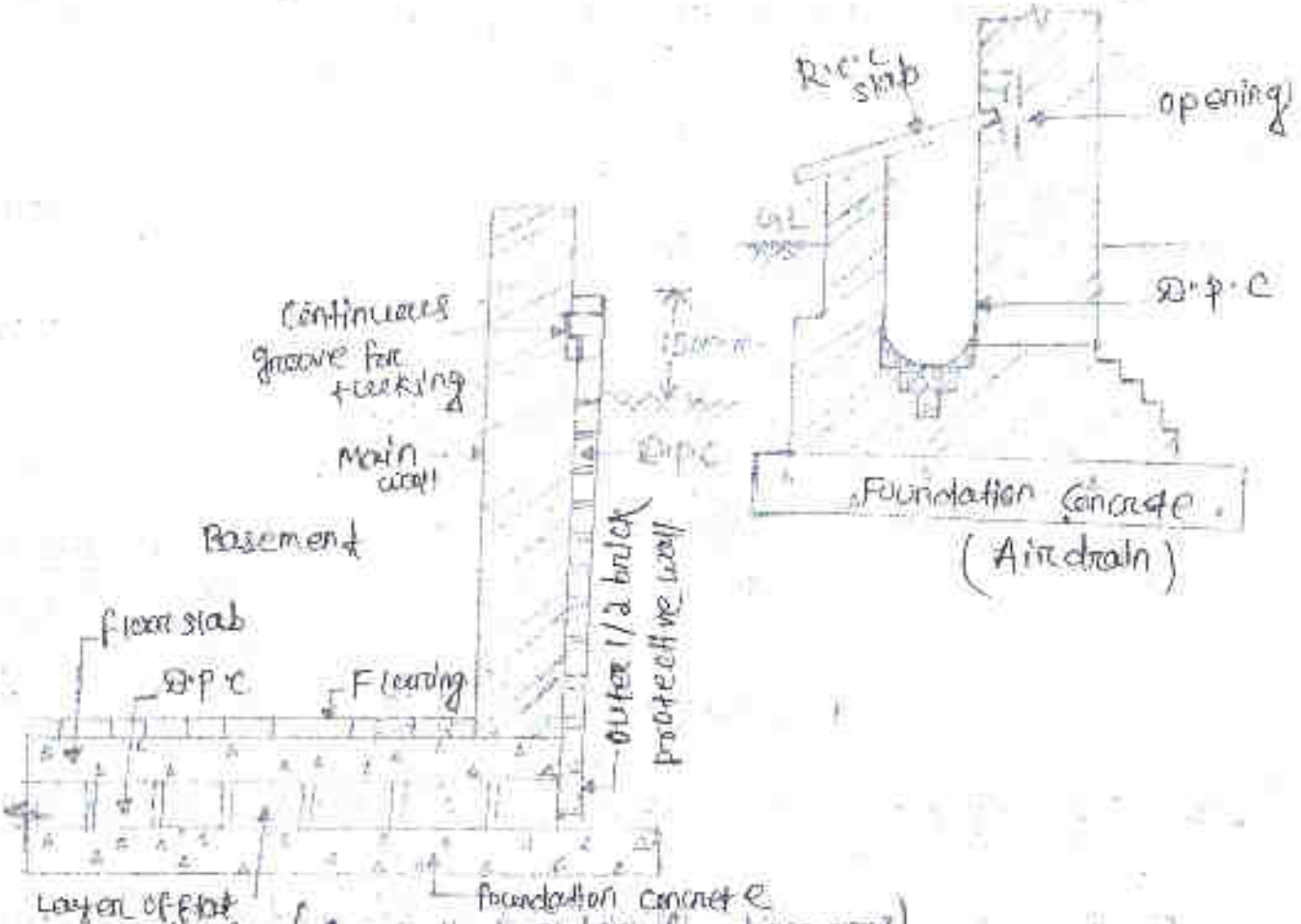


(Damp-proofing of an internal wall)

(ii) If two ground floors at different levels are connected by an internal wall, the damp-proofing course may be provided. It should be noted that the damp-proofing course on the internal wall is in level with the lower floor level.

(iii) In order to prevent the rising of moisture from the adjacent ground, the air drains may be provided. An air drain is a narrow hollow space which is constructed parallel to the external wall. The width of air drain is about 200 m.m. to 300 m.m. The openings with gratings are provided at required intervals for the passage of air. The

wall. Forming the air drain rests on the foundation Concrete of the main wall and is carried above 150 m.m. above the ground level. The top of air drain is covered either by an R.C.C slab for ex stone and necessary arrangements are provided for the inspection of the air drain. The vertical and horizontal damp proofing course are provided. as shown



(iv) In case of basements, the damp-proofing course should be properly provided otherwise the basements become useless except for the storage of material unaffected by damp. The usual practice is to provide asphalt flashing tanking.

The important points to be observed in case of asphalt tanking are as follow.

(a) The layer of asphalt should be continuous.

(b) The vertical and horizontal damp-proofing course if necessary. end of asphalt layer may

(c) The vertical dam-proofing course should be taken above ground level for a minimum distance of 150mm.

(d) The sequence of construction should be : inner wall, asphalt layer and, protective wall. The reverse sequence may also be adopted but with less success.

e) The thickness of horizontal asphalt layer at basement floor level is 30m.m. and it is laid in three coats. The thickness of vertical asphalt layer is 20m.m. and it is laid in three coats.

The treatment of asphalt tanking is adopted when the subsoil water table is not very high. It is possible that the vertical D.P.C A protective flooring of flat bricks is provided on the foundation concrete to protect the D.P.C from damage during the construction of floor slab.

(v) The rain water gutters in case of pitched roofs, may be constructed in cement concrete and standard rain water fitting may be used. Further the gutters may be lined with bituminous materials or burnt clay products.

(vi) The cement paints, when applied suitably, acts as effective vertical damp-proofing courses.

(vii) For cheaply constructed buildings, the dam-proofing course may be provided in the form of a layer of well burnt bricks which are dipped in hot tar and pitch.

(viii) In case of a sloping ground the damp-proofing course should be stepped such that it remains at a minimum vertical distance of 150m.m. above ground as shown the damp-proofing course may be of any suitable flexible material such as bituminous felt etc.

Sloping ground

(Stepped damp-proofing course)

(ix) The construction of cavity walls considerably prevents the entry of damp inside the building. Suitable damp-proofing courses may be provided on these walls.

(x) The provision of coping on a wall prevents considerably the entry of damp from the top surface of the walls.

(xi) The good workmanship and use of materials of better quality on face of the walls immensely help in preventing the entry of damp inside the buildings.

(xii) For providing damp-proof course in an existing wall, the following procedure is adopted.

(a) The level at which the damp-proof course is to be provided is carefully decided after considering the ground level and the floor level. It is usually kept about 150m.m. above the ground level or floor level whichever is higher.

(b) A special saw made of steel blades is used to make a cut at the corner of the wall.

(e) The loose bricks from the course just above the cut are carefully removed.

19 June 2021 — Green Building

Introduction

A green building is a building that in its design, construction or operation reduces or eliminates negative impacts and creates positive impacts (green impacts) and can create positive impacts on our climate & natural environment.

* A green building preserve precious natural resources and improve our quality of life

* There are number of features which can make a building green these include.

(i) Efficient use of energy water and other resources.
(ii) use of renewable energy, solar energy
(iii) pollution and waste reduction measures and the enabling of re-use & recycling
(iv) use of materials that are non-toxic, ethical & sustainable.

Concept of Green building :-

Green building promotes the efficiency of building with regular to the use of use of water, energy & materials while reducing the building impact on individuals health & the environment through better design, construction, operation.

-> Green building is one which uses less water optimises energy efficiency & provide healthier life.

=> Following are the advantages of green building.

=> protective health

=> Improving Employes productivity

=> Conservation of water, energy and natural resources.

=> Reduction in CO_2 gas

=> Reduction of pollution & global warming

=> use of non-toxic & Substainable material

=> Building which is suitable for all Condition.