

Third Semester B.E. Degree Examination, Aug./Sept.2020
Building Materials and Construction

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Write the requirements of good building stones. Explain the factors causing deterioration of stone work and preservation of stone work. (10 Marks)

b. Explain briefly the tests conducted on bricks. (10 Marks)

OR

2 a. Explain the importance of size, shape and texture of coarse aggregates. (10 Marks)

b. Explain bulking with reference to fine aggregates with its importance and how the test for bulking is done. (10 Marks)

Module-2

3 a. Explain briefly the essential requirement of good foundation. (10 Marks)

b. Explain with sketches the following types of foundation :
(i) Combined footing
(ii) Strap beam footing. (10 Marks)

OR

4 a. Explain with sketches the features of English bond and Flemish bond in brick masonry, with their merits and demerits. (10 Marks)

b. Explain briefly following types of walls:
(i) Load bearing wall
(ii) Partition wall
(iii) Cavity wall. (10 Marks)

Module-3

5 a. Explain various modes failures of an arch. (10 Marks)

b. Define Lintel. Draw a neat sketch of an R.C.C. lintel with chejja indicating the positions of reinforcements. (10 Marks)

OR

6 a. Explain the factors which contribute in selection of flooring materials. (10 Marks)

b. Draw a neat sketch of a kind post truss indicating various elements. (10 Marks)

Module-4

7 a. Explain briefly the guidelines to be followed while locating doors and windows. (10 Marks)

b. Explain with neat sketches the following :
(i) Corner window
(ii) Bay window (10 Marks)

OR

8 a. Plan a doglegged stair for a building in which vertical distance between the floors is 3.6m. The stair room measures 3m × 5m (internal dimensions). (10 Marks)

b. Write short notes on :
(i) Shoring
(ii) Under pinning (10 Marks)

Module-5

9 a. Mention the objectives of plastering? Explain the requirements of good plaster and defects in plastering. (10 Marks)

b. What are the causes of dampness? Explain any one method of damp proofing. (10 Marks)

OR

10 a. Mention the objectives of painting and point out the characteristics of an ideal paint. (10 Marks)

b. Explain the procedure for :
(i) Painting on new wood work
(ii) Painting on new iron work and steel work. (10 Marks)

BUILDING MATERIAL AND CONSTRUCTION.
Semester – III. (18CV34)
Faculty Name: Prof. Vijaylaxmi. V

Module-1

Q1. a. Write the requirements of good building stones. Explain the factors causing deterioration of stone work & Preservation of Good building stone work.

Ans. Requirements of good building stone are :-

1. Crushing strength - For a good structural stone, the crushing strength should be greater than 100 N/mm².
2. Appearance - The stone which are to be used for face work should be decent in appearance and they should be capable of preserving their colour uniformly for a long time. Prefer light coloured stones
3. Durability - A good building stone should be durable The various factors contributing to durability of a stone are its chemical composition, texture, resistance to atmospheric & other influences, location in structure etc.
4. Facility of dressing - The stones should be such that they can be easily carved, moulded, cut and dressed.
5. Fracture - For a good building stone, its fracture should be sharp, even, bright and clear with grains well cemented together. A dull, chalky and earthy fracture of a stone indicates sign of early future decay.

6. Hardness - Coefficient of Hardness, should be greater than 17 for a stone to be used in road work. If it is between 14 and 17 the stone is said to be of Medium hardness, If it is less than 14 the stone is said to be of poor Hardness and such stone should not be used in Road Work.

7. Percentage Wear - In attrition Test, if wear is more than 3%, the stone is not satisfactory If it is equal to 3% the stone is not tolerable For Good building stone. The Wear should be equal to or less than 3%.

8. Resistance to fire - The minerals composing Stone should be such that Shape of stone is preserved when a fire occurs. The free quartz suddenly expands at a temperature less than 600°c. lime Stone resists fire upto 800°c and it then split into CaO and CO_2

9. Seasoning - The stone should be well seasoned before putting into use. The stone obtained fresh from a quarry contain some moisture which is known as the quarry sap. The period of 6 to 12 months is considered to be sufficient for proper Seasoning. Hence the stone should be dried or seasoned before they are used in structural work.

10. Specific gravity - For a good building stone, its specific gravity Should be greater than 2.7 or more

For heavy works, stone used should be more compact and less porous and they are used for various engineering purpose.

11. Texture – A good building stone should be compact fine crystalline structure free from cavities cracks or patches of soft or loose material The stone having such type of texture are strong and durable.

12. Toughness index – In impact test, the toughness index values exceed 19 the stone is said to be high & tough in nature

13. Water absorption – For good building stone the percentage of absorption by weight after 24 hours should not exceed 0.60

14. Weathering – A good building stone should possess better weathering qualities. It should be capable of withstanding adverse effects of various atmospheric and external agencies such as rain, frost, wind etc.

Deterioration of stone –

The stone with exposed faces are acted by various atmospheric and external agencies. So as to cause deterioration. The cause for decay of stone :-

1. Alternate Wetness and drying – The stone are made wet by various agencies such as rain, frost etc. Stone subjected to such alternative wetness and drying wear out quickly.

2. Frost – In very cold places, the moisture present in the atmosphere is deposited in pores of stones. At freezing point, this moisture freezes and in doing so, it expands in volume and cause the splitting of stones.

3. Impurities in atmosphere – The atmosphere contain various impurities which have adverse effects on stone. These impurities act on carbonate of lime and cause the deterioration of stone.

4. Living organisms – Living organisms like worms and bacteria act upon stone and detoriate them. These organisms make holes in stones and thus weaken them. They are also secrete organic acids which have a corrosive action on stone minerals.

5. Movements of chemicals – Stone of different variety such as limestone and sandstone are used side by side in the same structure. The chemicals formed by the action of atmospheric agencies on one variety may move on the other and cause deterioration of that other.

6. Nature of Mortar – Nature of mortar used as binding material in stone masonry may be react chemically with one of the constituents of stone, and thus it may lead to the disintegration of stones.

7. Rain Water – The action of rain water on stone is two fold physical and chemical. The rain wets the surface of stone and it is dried by sunshine. Such alternate wetness and drying result in the ~~disting~~ disintegration of stone. This is the physical action of rain water. The rainwater, as it descends through the atmosphere to the surface of earth, absorbs Carbon dioxide hydrogen sulphide (H_2S) and other gases present in the atmosphere. These gases act adversely on stone and they cause decay of stones. This is the chemical action of Rainwater.

8. Temperature variations: The rise of temperature results in expansion of stone. The fall of temperature cause contraction of stone. This rise & fall of temperature are frequent. the stones are easily deteriorated because of the setting up of internal Stresses.

9. Vegetable growth – The creepers and certain trees develop on stone surface with their roots in joints between stones. Such roots attract moisture and keep

the stone surface damp, At the same time they try to expand. such action leads to decay of stones.

10. Wind — The Wind contains particles of dust., such particles will strike against the stone surface and stone will starts disintegrating and decay. The wind also allows rain water to enter Pores of stones with force. Such waters on freezing, expands and splits the stones.

Preservation of Stones

decay of building stones of inferior quality is to some can be prevented The preservatives are applied on the stone ~~stones~~. Surface. Depending upon the chemical composition of stones and their location in structure, a particular preservatives should be used. Following preservatives are commonly adopted to preserve the stones.

1) Coal tar — If Coal tar is applied on stone surface, it preserves stone. But the colour of Coal tar produces objectionable appearance and surface coated with Coal tar absorbs heat of the sun Hence this preservatives is not generally adopted because it spoils the beauty of stone.

2) Linseed oil — This prescervative may be used either as raw linseed oil or boiled linseed oil. The

raw linseed oil does not disturb the original shade of stone. But it requires frequent renewal, once in a year. The boiled linseed lasts for a long period, but it makes the stone surface dark.

4) Paint - An application of paint on stone surface serves as a preservative. The paint changes the original colour of the stone. It is applied under pressure, if deep penetration is required

5) Paraffin - This preservative may be used alone or it may be dissolved in neptha and then applied on stone surface. It changes the original colour of stone.

5) Solution of alum & soap - The alum and soft soap are taken in proportion of 0.75N and 0.50N respectively, they are dissolved in a litre of water. This solution when applied on stone surface, act as preservative.

6) Solution of barytes - The solution of barium hydroxide $Ba(OH)_2$ when applied on stone surface act as preservative. This preservative is used when the decay of stone is mainly due to calcium sulphate, ($CaSO_4$)

$$Ba(OH)_2 + CaSO_4 = BaSO_4 + Ca(OH)_2$$

The barium sulphate is insoluble and it is least affected by atmospheric agencies. The calcium hydroxide absorbs Carbon dioxide from

atmosphere and forms Calcium Carbonate $CaCO_3$ which adds to the strength of stone.

Q1. b. Explain briefly the tests conducted on bricks.

Soln- Bricks are subjected to following Test.

1) Absorption
2) Crushing strength
3) Hardness
4) Presence of Soluble salts
5) Shape and size
6) Soundness
7) Structure.

1) Absorption – A brick is taken and it is weighed dry. It is then immersed in water for a period of 24hrs. It is weighed again and the difference in weight indicates the amount of water absorbed by the brick. For good quality brick it should not exceed 20% of weight of dry brick

2) Crushing Strength – The crushing strength of a brick is found out by placing it in a Compression testing machine. It is placed till it breaks. As per BIS 1077-1957, the minimum crushing or compressive strength of a brick is 3.50 N/mm^2 The bricks with crushing strength of 7 to 14 N/mm^2 are graded as A and having above 14 N/mm^2 are graded as AA

3) Hardness – In this test, a scratch is made on brick surface with the help of a finger nail. If no impression is left on the surface, the brick is treated to be sufficiently hard.

4) Presence of Soluble salts – The Soluble salts

if present in bricks, will cause efflorescence on the surface of bricks. For finding out the presence of soluble salts in a brick, it is immersed in water for 24 hrs. It is then taken out and allowed to dry in shade. The absence of grey or white deposits on its surface indicates absence of soluble salts. If the white deposits cover 10% surface, the efflorescence is said to be slight. If it covers 50% of the surface, it is considered as moderate If it covers more than 50% of the surface, the efflorescence becomes heavy and treated as serious when such deposits are converted into powdery mass.

5) Shape and size - Standard size and its shape should be truly rectangular with sharp edges. For this 20 bricks are considered (190 x 90 x 90 mm) are selected at random, they are stacked lengthwise along with width and along the height

For good quality brick.

length	- 3680 mm	to	3920 mm
Width	1740 mm	to	1860 mm
Height	1740 mm	to	1860 mm

6) Soundness - In this test, the two bricks are taken and they are struck with each other, the brick should not break and a clear ringing should be produced.

7) Structure – A brick is broken and its structure is examined. It should be homogenous, compact and free from any defect such as holes, lumps etc.

Q2a. Explain the importance of Size, Shape and texture of coarse aggregate.

Ans. Size of coarse aggregate – 80mm size is the maximum size that could be used for concrete mixdesign Using the largest possible maximum size will result in reduction of cement content, reduction in water requirement, reduction of drying shrinkage Maximum size of aggregate that can be used in any given condition by the following consideration

1) Thickness of section
2) Spacing of reinforcement
3) Clear cover
4) Maxing, handling & placing Techniques.

Maximum size of aggregate should be large within the limit specified but not greater than 1/4th the minimum thickness of the member.

Size of aggregate bigger than 4.75mm is considered as coarse aggregate.

For heavily reinforced concrete members the nomial maximum size of aggregate should be restricted to 5mm less than the minimum clear distance between the main bars or 5mm less the minimum cover to the reinforcement whichever is smaller.

For Parctical considerations, for reinforced concrete work aggregate having amaximum size of 20mm.

Shape of aggregate - Shape of aggregate is an important characteristic, since it affects the workability of concrete. For agiven water cement ratio rounded aggregate are preferable to angular aggregate. Flat particles in concret have influence on the workability, cement requirement, Strength and durability. Flat aggregate makes very poor concrete. The Normal aggregate which are suitable for making the concrete have angulagity number from 0 to 11.

→ Angular aggregate exhibit abetter interlocking effect in concrete, which properly makes it superior in concrete used for road and parement By having greater surface area the angular aggregate may show higher bond strength than rounded aggregate.

Hence shape of the aggregate become all the most important in case of high strength and high performance concrete where very and low water/cement ratio is required to be used. In such case cubical shaped aggregate are required for better workability. to produce cubical shaped aggregate and reduce flaky aggregate.

Texture of aggregate - Surface Texture is the Property

the measure of which depends upon the relative degree to which particle surface are polished or dull, smooth or rough. Surface Texture depend on hardness, grain size, pore structure of the rock and the degree to which forces acting on the particle surface have smoothed or roughened it. Hard, dense, fine grained materials will generally have smooth fracture surface. Rough textured aggregate develops higher bond strength in tension than smooth textured aggregates.

Q2 b. Explain bulking with reference to fine aggregate with its importance and how the test for bulking is done?

Ans. The increase in the volume of a given mass of fine aggregate caused by the presence of water is known as bulking. The water forms a film over the fine aggregate particles exerts force of surface tension and pushes them apart increasing the volume. The extent of bulking depends upon the percentage of moisture present in the sand and its fineness. With ~~Organ~~ Ordinary sand bulking varies from 15–30%. It increase with moisture content upto the certain point (4–6%) reaches maximum the film of water on the sand surface breaks, and then its starts decreasing.

Importance:-

In preparing concrete mixes if sand is measured by volume and no allowance is made for bulking, the moist sand will occupy considerably larger volume than that prepared by the dry sand and consequently the mix will be richer Also there will be chances of segregation, honey combing and reduce yield of concrete.

Test on Bulking of Sand

1. Take 500 grams of fine aggregate ovendried at a temperature of 100 to 110 degree celsius for 24 hrs. This weight is measured as W_1
2. The cooled sand is taken in an air tight container. This weight is measured as W_2
3. The water content of the sample is calculated as $W_c = \left(\frac{W_1 - W_2}{W_1}\right) \times 100$.
4. In a pan, 250 grams of sand is taken
5. To this, 2% of weight of water is added. This is properly mixed
6. The mixture is poured into a 250ml cylinder. This is consolidated by shaking
7. The surface is leveled the reading is measured as Y_1
8. The Test is repeated for the remaining quantity of sand for 2% weight of water each time. The

reading are taken as Y_2 Y_3 ... until a decreasing reading of the volume is observed.

9. Test is continued after this level 4% water is added and the test is continued until the sample become fully saturated

10. To the standard sample in the measuring cylinder add about some water, stir the sample well

11. Note down the surface level of sand as Y_1

Percentage Bulking of Sand $\frac{(Y_1 - Y)}{Y} \times 100$.

Module 2

Q3a. Explain briefly the essential requirements of good foundation

Ans. Foundation should be constructed to satisfy the following requirements.

1) The foundation shall be constructed to sustain the dead and imposed loads and to transmit these to the subsoil in such a way that pressure on it will not cause settlement which would impair the stability of the building or adjoining structures.

2) Foundation should be rigid so that differential settlements are minimized for the case when super-imposed load are not evenly distributed

3) Foundation should be taken sufficiently deep to

guard the building against damage or distress caused by swelling or shrinkage of the soil (Subsoil)

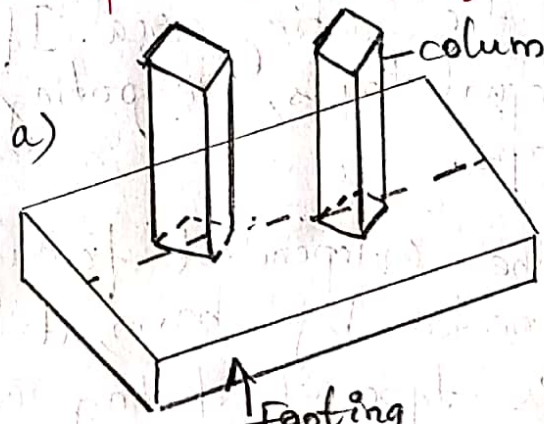
4) Foundation should be so located that its performance may not be affected due to any unexpected future influence.

Q3b. Explain with sketches the following types of foundation.

i) Combined foundation

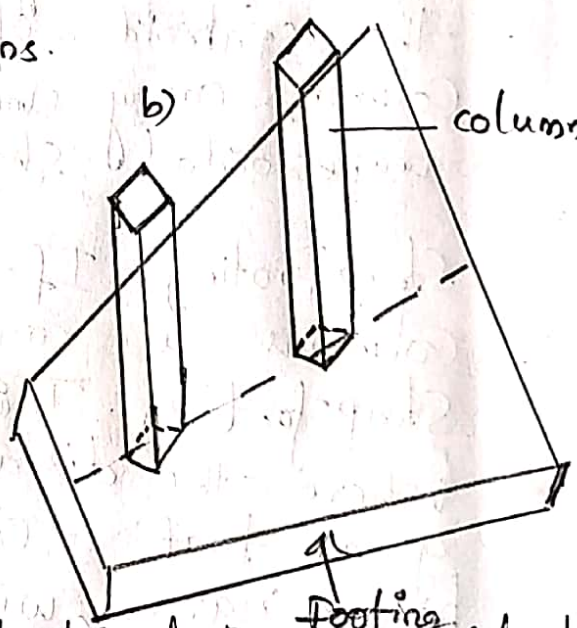
ii) Strap beam footing.

i) a)



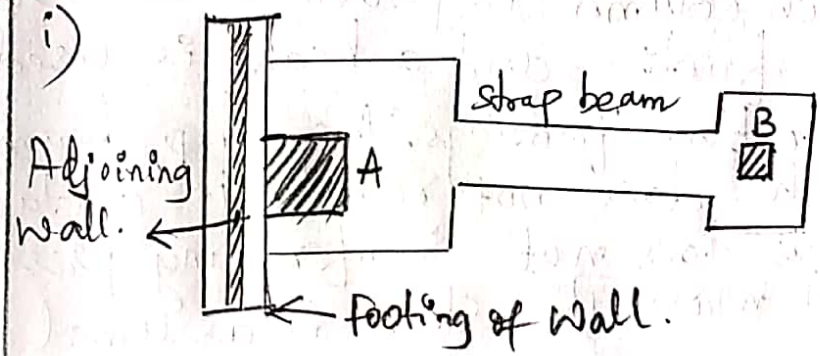
Combined Rectangular Footing

b)



Combined Trapezoidal footing

i)



Combined footing – A Spread footing which supports two or more columns is formed as combined footing. In combined footing there are two types

1) Rectangular Combined footing
2) Trapezoidal Combined footing.

Combined footings are invariably constructed of reinforced concrete.

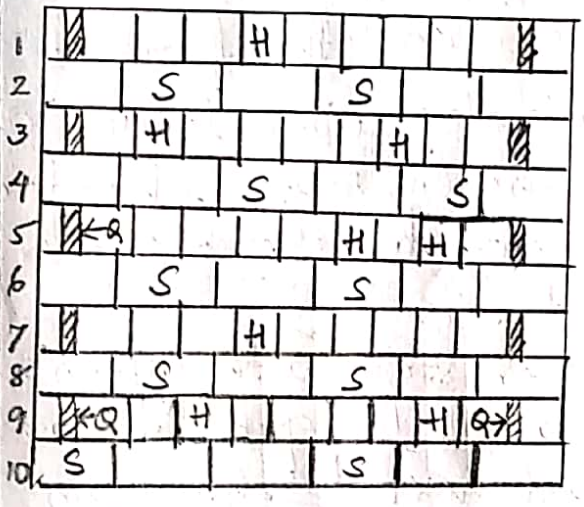
The combined footing for columns will be rectangular in shape if they carry equal loads. A design of rigid rectangular combined footing should be done in such a way that Centre of gravity of column loads coincide with the centroid of the footing area. If the columns carry unequal loads, the footing is of trapezoidal shape.

Strap footing – If the independent footing of two columns are connected by a beam, it is called Strap footing. This type of footing is used where the distance between the column is so great that a combined trapezoidal footing become narrow, with high bending moments. In such case, each column is provided with its independent footing and a beam is used to connect the two footings. The Strap beam is used which does not remain in contact with soil & thus does not transfer any pressure to the soil mass. The strap is assumed to be

Infinitely stiff, serves to transfer the column load on to the soil with equal and uniform soil pressure under both footings.

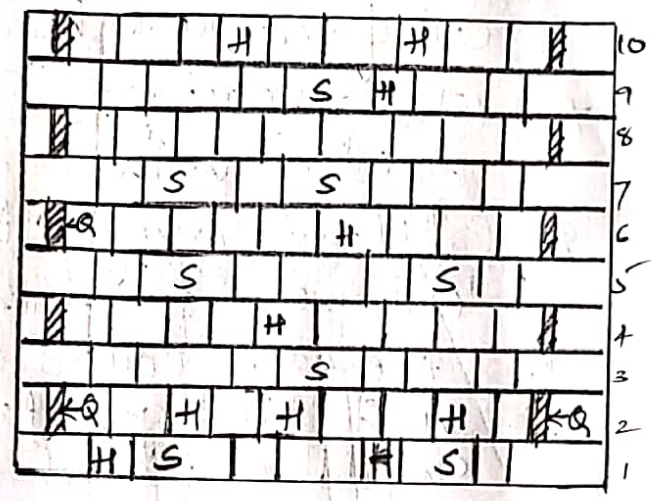
Q4 a. Explain with sketches the features of English bond and the Flamish bond in brick masonry, with the merits and demerits

Ans:



ENGLISH BOND.

S - Stretcher
H - Header
Q - Queen closer.



FLEMISH BOND.

S - Stretcher
H - Header
Q - Queen closer.

Essential features of English Bond:-

1. Alternative courses will show either headers or stretchers in elevation.
2. Every alternative header comes centrally over the joint between two stretchers in course below.
3. In the stretcher course, the stretchers have a minimum lap of $\frac{1}{4}^{th}$ their length over headers

4. There is no continuous Vertical joint
5. Walls of even multiple of half brick (i.e 1 brick thick wall, 2 brick thick wall, 3 bricks thick wall) present the same appear-ance on both faces. Thus a course showing stretchers on the front face will also show stretchers on the back face,
6. Walls of odd multiple of half bricks (1½ brick, 2½ brick thick) will show stretchers on one face and headers on other face.
7. The hearting (middle portion) of each of the thicker walls consists entirely of headers.
8. Atleast every alternate transverse joint is continuous from face to face.
9. A header course never start with queen's closer as it will get displaced. The queen's closer should be placed just next to the quoin header. Queen's closers are not required in stretcher courses.
10. Since the number of vertical joints in the header course are twice the number of vertical joints in the stretcher course. the joint in the header course are made thinner than the joints in the stretcher course.

Essential features of Flemish Bond:

1. In flemish bond, each course is comprised of alternate header and stretchers.

2. Every alternate course starts with a header at the corner (quoin header). Quoin closers are placed next to the quoin header in alternative courses to develop the face lap.
3. Every course consists of headers and stretchers placed alternately
4. The facing & backing of the wall, in each course, have the same appearance.
5. Quoin closers are used next to quoin headers in every alternate course
6. In walls having thickness equal to odd multiple of half bricks, half bats and three quarter bats are amply used.
7. For walls having thickness equal to even multiple of half bricks, no bats are required. A header or stretchers will come out as headers or stretchers on the same course in front as well as back faces.

b. Explain briefly the following types

i) load bearing wall :-

Wall is most essential component of a building. Load bearing wall are those which are designed to carry super imposed load (transferred through roofs etc) in addition to their

own weight (self weight). load bearing walls are subjected to variety of loads iz live load, dead load wind pressure, earthquake forces. Live load and dead load act in vertical direction. When the floor slab transferring the loads to the wall are not supported through the full width of the wall, the load act eccentrically causing moments in the walls.

Load bearing wall are structurally efficient when the load is uniformly distributed and when the structure is so planned that eccentricity of loading on the wall is as small as possible. The strength of wall is measured in terms of its resistance to the stresses set up in it by its own weight, by super imposed loads and by lateral pressure such as wind etc.

(ii) Partition Wall:

A partition wall is a thin internal wall which is constructed to divide the space with in the building into rooms or areas. A partition wall may be either Non load bearing or load bearing Partitions walls are non load bearing. A load bearing partition wall is called as internal wall. A partition wall separating two adjoining rooms must often provide a barrier to the passage of sound from one to another.

The partition wall should be strong enough to carry its own load. The wall should be strong enough to resist impact to which the occupation of the building is likely to subject them. The partition wall should have the capacity to support suitable decorative surface The wall should be stable & strong enough to support wall fixtures, wash basins etc. It should be light and thin as possible. And should act as sound barrier specially when it divides two rooms.

(iii) Cavity Wall.

A cavity wall or hallow wall is the one which consists of two seperate walls, called leaves or skins, with a cavity or gap in between. two leaves of a cavity wall may be of equal thickness if it is a non load bearing wall or the internal leaf may be thicker than the external leaf, to meet the structural requirements. The two walls (portions) may be connected togather by metal pins or bonding bricks at suitable interval. Cavity wall are often constructed by giving better insulation (thermal insulation) to the building. It also prevent dampness to enter and act as sound insulation The size of cavity varies from 4 to 10 cm. The inner and outer skins

should not be less than 10 cm each (half brick). They are cheaper and economical, loads on foundations are reduced because of lesser solid thickness.

Module -3

Q5 a. Explain various Modes of failures of Arches?

Ans. An arch may therefore fail in the following ways.

i) Crushing of the masonry
ii) Sliding of voussoirs
iii) Rotation of some joint about an edge
iv. Uneven Settlement of Adutment/Pier.

If the compressive stress or thrust exceeds the safe crushing strength of the material (i.e masonry unit & Mortar) the arch will fill in crushing. To safe guard against sliding of voussoirs past each other due to transverse shear, the voussoirs of greater height should be provided. Also the angle between the line of resistance of the arch and the normal to any point should be less than angle of internal friction. Rotation can be prevented if the line of resistance is kept with in intrados and extrados. Uneven settlement of abutment may cause secondary stresses in the arch hence the abutment which has

ultimately to bear all the loads transferred to it through the arch, should be strong enough. Also the arch should be symmentrical so that unequal settlements of the two abutments is minimized. Also Abutment should be strong enough to take the thrust

b. Define Lintel Draw a neat sketch of RCC lintel with chejja indicating the positions of reinforcements.

Ans. A lintel is a horizontal member which is placed across the opening. A lintel is thus a short beam, the width of which is equal to the width of the wall, and the end of which are built into the wall. The bearing of lintel should be minimum 10 cm, Height of lintel, 1/10th of or 1/12th of span of the lintel.

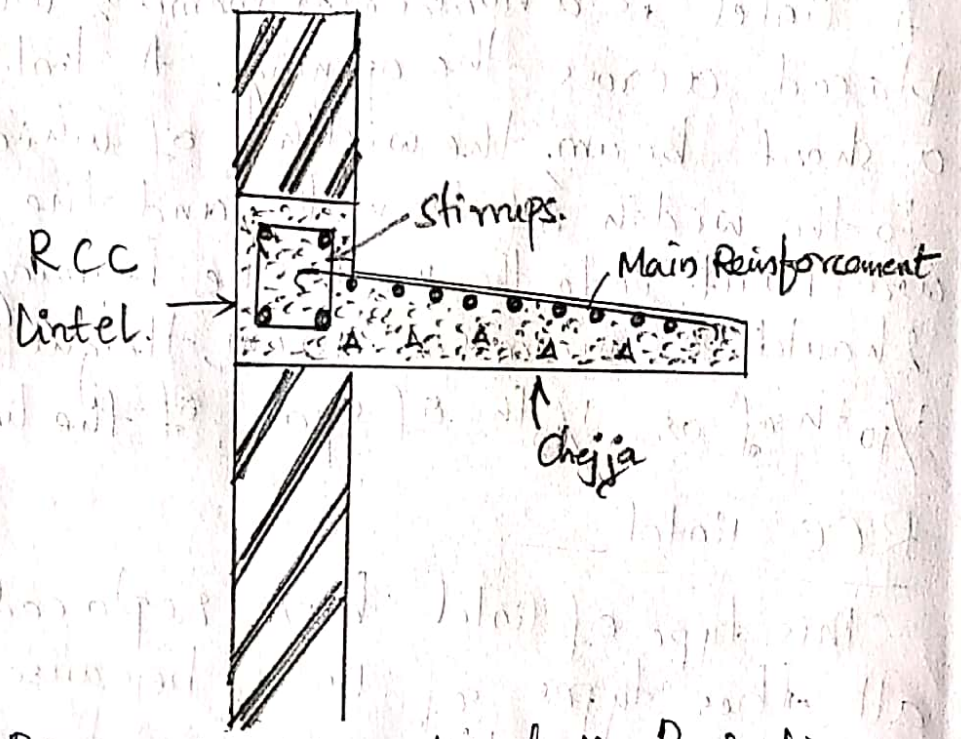
RCC lintel —

This type of lintel have replaced practially all other types of lintels because of their strength, rigidity, fire resistance, economy and ease in construction. These can be used on any span. ~~Its width of the wall. The~~ Its width is kept equal to the width of the wall. The depth of the RCC lintel and the reinforcement depends upon the loading and span. longitudinal reinforcement consists

of mild steel bars are provided near the bottom of lintel to take up tensile stresses. Half these bars are cranked up near the ends. Shear stirrups are provided to resist transverse shear.

RCC lintel over a window along with a chejja projection. RCC lintel are also available as precast units. For cast in situ units which are quite common, form work is required for construction.

Sketch:



RCC Lintel with chejja Projection

Q6 a Explain the factors which contribute in selection of flooring materials.

Ans Following factors affect the choice of a flooring Material

1. Initial Cost –
The cost of the material should be in conformity with the type of the building and its likely use. Floor coverings of Marble etc. are very costly and may be used only for residential buildings.

2. Appearance –
Covering should give pleasing appearance i.e it should produce a desired colour effect and architectural ~~beauty~~ beauty. Flooring of terrazzo, mosaic, tiles and marble will give good appearance.

3. Cleanliness –
The flooring should be capable of being cleaned easily and as it is non-absorbent. It should have effective resistance against absorption of oil, grease etc.

4. ~~Durability~~ Damp resistance –
The flooring should be capable of being cleaned easily and should be sufficient resistance against dampness so that healthy environment is obtained in the building. Flooring of concrete, terrazzo, mosaic etc are preferred for this purpose. while flooring of cork, wood, rubber, linoleum, bricket etc. are not suitable for damp Condition.

5. Durability -
The flooring should be sufficient resistance to wear, temperature Changes, disintegration with time and decay, so that long life is obtained. From this, Flooring of Marble, terrazzo, tiles, concrete, mosaic etc are considered to be of best type.

6. Sound Insulation -
Flooring should be insulate the noise. Also it should ~~be~~ not be such that noise is not produced for this purpose, Cork flooring, rubber and timber are good from this point of view

7. Thermal Insulation -
The flooring should provide good thermal insulation so that comfort is imparted to the residents the building. Floor Covering of wood, rubber, cork PVC tiles are better for this purpose.

8. Fire Resistance
This is more important for upper floors. Flooring material should offer sufficient fire resistance so that fire barriers are obtained between different levels of a building. Concrete, tiles, terrazzo, mosaic marble have good fire resistance.

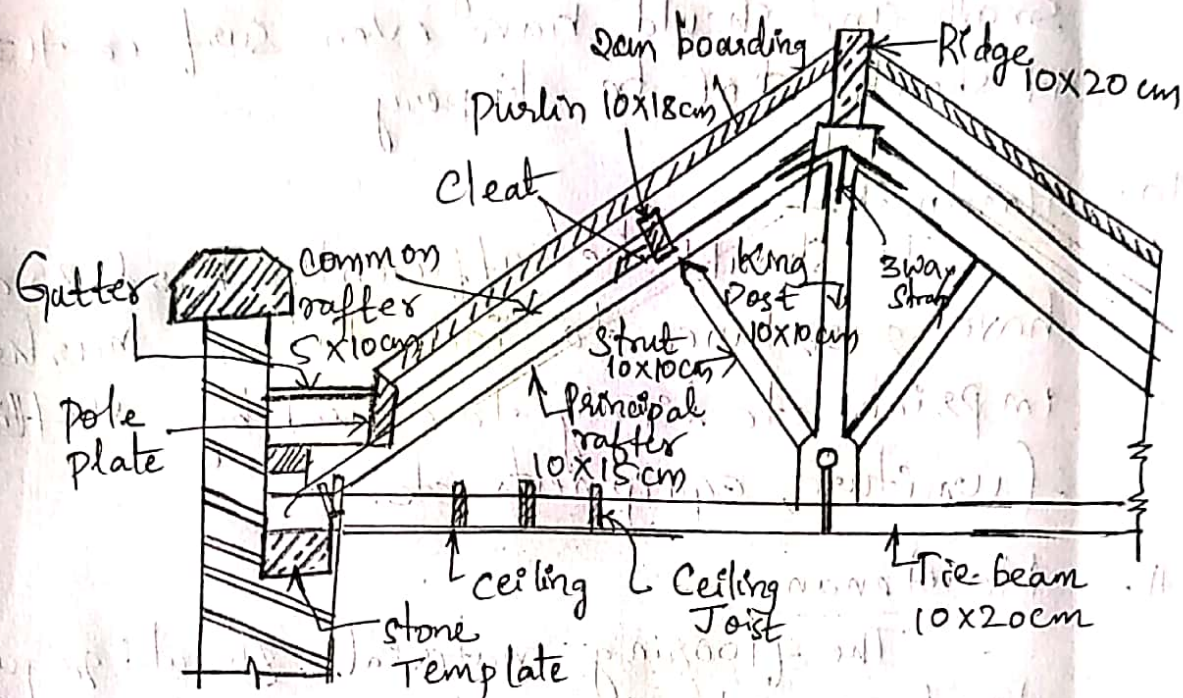
9. Smoothness - The flooring material should be smooth and should have even surface however it should not be slippery

10. Hardness —
It should be sufficiently hard so as to have resistance to indentation marks, imprints etc likely to caused by shifting of furniture, equipments etc.

11. Maintenance —
The flooring material should require least maintenance, however wherever repairs are required, it should be such that repairs can be done easily with least possible expend -iture. Hard coverings like tiles, marble, terrazzo, concrete etc require less maintance in comparison to materials like cork wood etc.

b. Draw a neat sketch of a King post truss indicating various elements

Sol:- A King post truss shown — it consists of
i) lower tie beam
ii) two inclined principal rafters
iii) two struts
iv) King Post.



Module-4

Q7 a: Explain briefly the guidelines to be followed while locating doors and windows

Sol:- The locating Doors and Windows.

1. The number of doors in a room should be kept minimum since larger number of doors cause obstruction and consume more area in circulation

2. The location of a door should meet funtional requirements of a room. It should not be located in the centre of the length of a wall. The door should preferably be located near the corner of the room nearly 20cm away from the corner.

3. If there are two doors in a room, the doors should preferably be located in opposite wall facing each other, so as to provide good ventilation and free-air circulation in the rooms.

4. The size and number of windows should be decided on the basis of important factors such as distribution of light, control of ventilation and privacy of the occupants

5 The location of a window should be also meet the functional requirements of rooms such as interior decoration, arrangement of furniture etc.

6. A window should be located in opposite wall facing a door or window so that cross ventilation is achieved.

7. From the fresh air, a window should be located on the northern side of a room.

8 Window should be located in the prevalent direction of wind.

9. The sill of a window should be located about 70 to 80 cm about floor level of the room

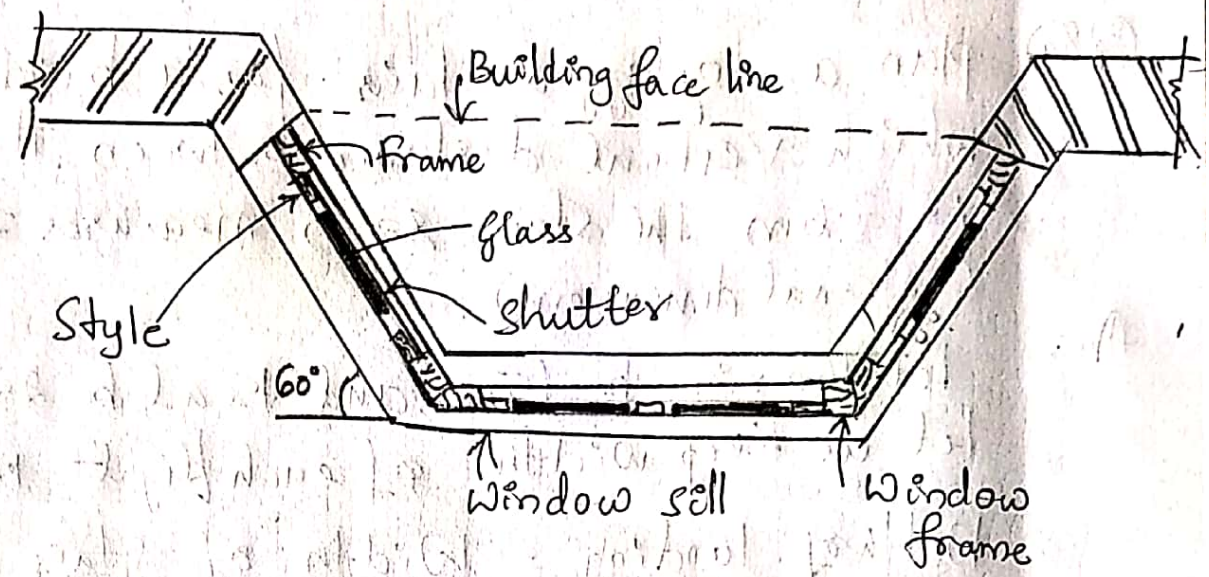
b. Explain with neat sketch the following —

i) Corner Window –

This is special type of window which is provided in the corner of a room. This window has two faces in two perpendicular directions. Due to this, light and air is admitted from two directions. Such a window very much improve the elevation of the building. Special lintel has to be cast over the window opening. The Jamb post of the window, at the corner is made of heavy section.

ii) Bay Window. –

Bay windows project outside the external wall of the room. This projection may be triangular, circular, rectangular or polygonal in plan. It is provided to get an increased area of opening for admitting greater light and air. They also provide light and air and provide extra space in the room and improve the overall appearance of the building.



fig(i) Bay Window.

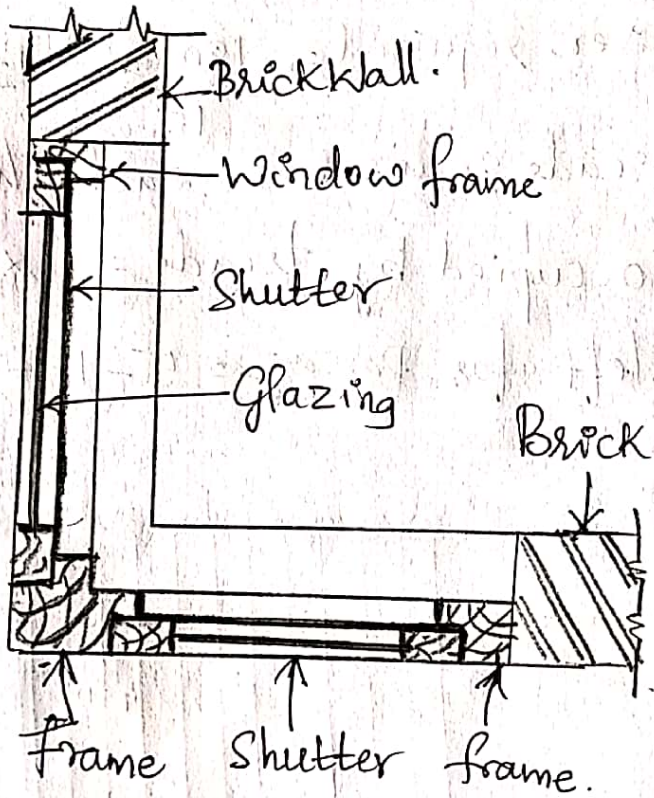


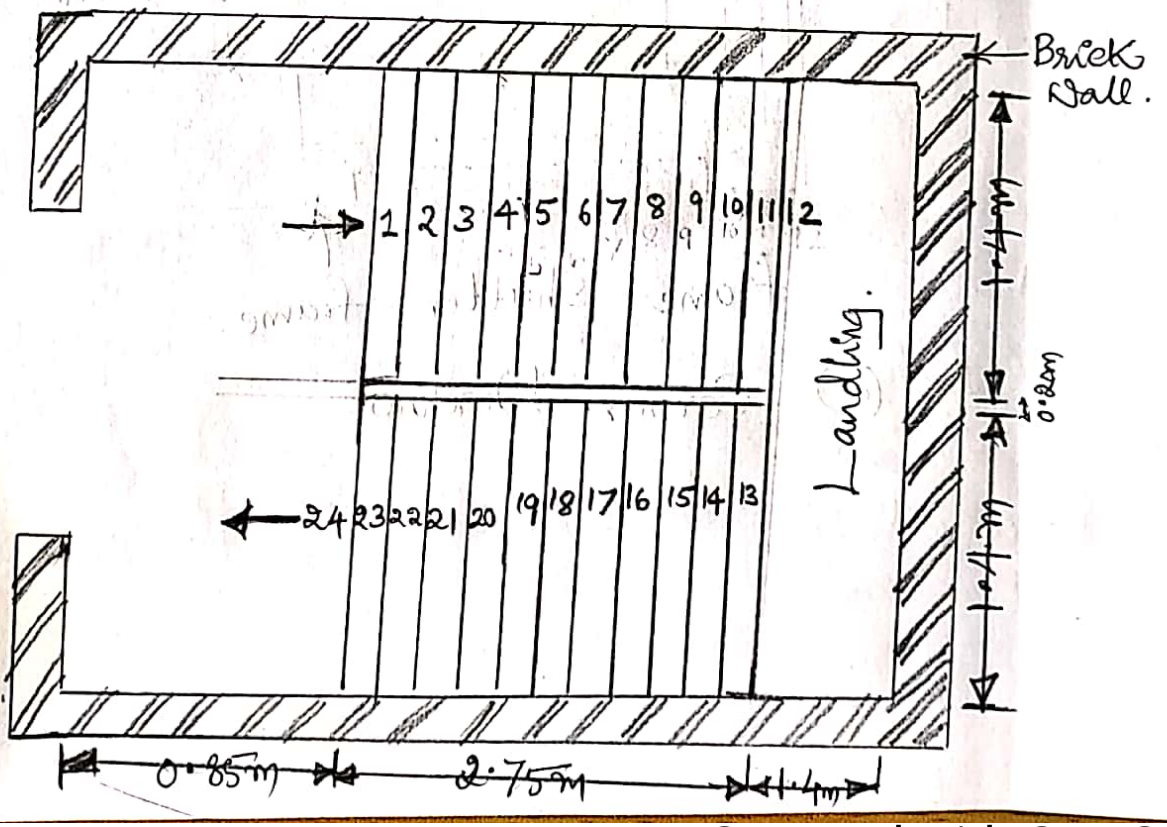
fig (ii) Corner Window.

(Q8a) Plan a dog legged stair for a building in which vertical distance between the floor is 3.6m The stair room measures 3m x 5m (internal dimensions).

Ans

Let the rise be 15cm, and tread be 25cm.
Let us keep width of each flight = 1.4m
Width of landing = Width of stair = 1.4m
Height of each flight $= \frac{3.6}{2} = 1.8m$

No. of risers required $= \frac{180\,cm}{15} = 12$ in each flight
No. of treads required in each flight = 12 - 1 = 11
∴ Space occupied by treads = 11 x 25 = 275 cm
∴ Space left for passage = 5 - 1.4 - 2.75 = 0.85m



b) Write short notes on

i) Shoring.

Shoring is the construction of a temporary structure to support temporarily an unsafe structure. These render lateral support to walls and are used under when a wall shows sign of bulging out due to bad workmanship, when a wall cracks due to unequal settlement of foundation and the cracked wall needs repair. when an adjacent structure is to be dismantled. when an opening are to be made or enlarged in the wall.

Shores are of following types-

i) Raking shores ii) Flying shores iii) Dead shores.

* In Raking shores inclined members called rakers are used to give lateral support to the wall. A Raking shore consists of the following components i) Rakers or inclined members, ii) wall plate iii) Needles iv) cleats v) bracing vi) Soleplate. Rakers should be inclined to the ground by 45° to make them more effective.

* In flying shore, these are used to give horizontal support to two adjacent, parallel party walls which have become unsafe due to removal or collapse of the intermediate building.

All types of arrangements of supporting the unsafe structures in which the shores do not reach the ground fall under this category. If the wall are quite near to each other (distance up to 9m) single flying shore can be constructed. It consists of wallplates, needles, cleats, struts horizontal shore, straining pieces and folding wedges. When the distance between the walls is more a compound or double flying shore is provided. Flying shores have the advantage that building operations of the ground are not obstructed.

* In Dead Shores, consists of vertical members known as dead shores supporting horizontal members known as needles. The needles transfer the load of the wall etc to the dead shores. to serve the following purpose -
  1) To rebuild the defective lower part of the wa
  2) To rebuild or deepen the existing foundation
  3) To make the large opening in the existing wall at lower levels.

Shores should be removed only when the new work has gained sufficient strength.

ii) Under Pinning

The process of placing a new foundation under an existing one or strengthening an existing foundation is called underpinning of the fondation

Underpinning is required to serve the purpose
1) To strengthen the shallow foundation of existing building when a building with deep foundation is to be constructed adjoining it
2) To strengthen existing foundation when has settled and caused cracks in the wall.
3) To deepen the existing foundation so as to rest it on deeper soil strata of higher bearing power.
4) To construct a basement in the existing building.

Underpinning can be done by following methods—
1) Pit method 2) Pile method.

→ In this method, the entire length of the foundation to be underpinned is divided into sections of 1.2 to 1.5 m length. one section is taken up at a time. For each section, a hole is made in the wall, above the plinth level and needle is inserted in the hole. Needles may be either of stout timber or steel section.

→ In Pile method, Piles are driven at regular interval along both the sides of the wall, bore hole Piles or under reamed piles may be used. The Piles are connected by concrete or steel needles penetrating through the wall.

These beams incidentally act as pile cap also. This method is very much useful in clayey soil and also in water logged areas, the existing foundation is very much relieved from the load.

Module-5

9a. Mention the objectives of plastering? Explain the requirements of good plaster and defects in plastering.

Ans Plastering is done to achieve to objectives such as:

1. To protect the external surfaces against penetration of rainwater and other atmospheric agencies
2. To give smooth surface in which dust and dirt cannot lodge.
3. To give decorative effect
4. To protect surfaces against vermit
5. To conceal inferior materials or defective workmanship.

Requirements of Good plaster

1. It should adhere to the background, and should remain adhered during all variations in seasons and other atmospheric conditions

2. It should be hard and durable
3. It should possess good workability
4. It should be possible to apply it during all weather conditions.
5. It should be cheap
6. It should effectively check penetration of moisture.

Defects in plastering –

1. Blistering of plastered surface – This is the formation formation of small patches of plaster swelling out beyond the plastered surface, arising out of late slaking of lime particles in the pla -ster.
2. Cracking – It consists of formation of cracks or fissures in the plaster work result for following reasons

* Imperfect preparation of background
* Structural defects in the building
* Discontinuity of surface.
* Movement in the background due to its thermal expansion or rapid drying
* Movement in the plaster surface itself, either due to expansion or shrinkage
* excessive shrinkage due to application of thick coat
* Faulty workmanship.

3. Crazing – It is the formation of a series of hair cracks on plastered surface, due to same reasons which cause cracking

4. Efflorescence – It is the whitish crystalline substance which appears on the surface due to presence of salts in plaster making materials as well as building materials.

5. Flaking – It is the formation of very loose mass of plastered surface, due to poor bond between successive coats.

6. Peeling – It is the complete dislocation of some portion of plastered surface resulting in the formation of patch. This also results from imperfect bond.

7. Popping – It is the formation of conical hole in the plastered surface due to presence of some particles which expand on setting

8. Rust stains – These are formed when plaster is applied on Metal laths.

9. Uneven surface This is obtained due to poor workmanship.

b. What are the causes of dampness? Explain any one Method of damp Proofing.

Ans. Causes for dampness are –

Moisture rising up the walls from ground
All the structures are founded on soil, and

Substructure is embedded into it, If the soil is pervious moisture constanly travel through it. Even in the case if impervious soil, lot of soil moisture may be present, this moisture may rise up into the wall and the floor through capaillary action. Ground water rise will also result in moisture entry in to the building through walls & floors.

2. Rain travel from wall tops -

If the Wall tops are not properly protected from rain penetration, rain will enter the wall and will travel down. leaking roofs will also permit water to enter

3. Rain beating against external Walls -

Heavy showers of rain may beat against the external faces of walls and if the Walls are not properly treated, moisture may enter the wall, causing dampness in the interior. If Balaconies and chajja projections do not have proper outward slope, water will accumulate on these and cause ultimately enter the walls, through their junction. This moisture travel would completely deface interior decoration of the wall.

4. Condensation -

Due to Condensation of atmospheric moisture, Water is deposited on the wall, floors

and ceilings. This moisture may cause dampness.

5. Miscellaneous cause –
   i) Poor drainage at the building site.
   ii) Imperfect orientation – Wall getting less sunlight and heavy showers may remain damp
   iii) Imperfect roof slope – in case of flat roof
   iv) Defective construction – Imperfect wall jointing joints in roof, defective throating
   v) Absorption of water – for defective rainwater pipes.

Methods of Damp Proofing

Membrane damp proofing – Use of DPC

This consists of introducing a water repellent membrane or damp proof course (DPC) between the source of dampness and the part of the building adjacent to it. DPC consists of flexible materials such as bitumen, mastic asphalt, bituminous felts, plastic or polythene sheets metal sheets, cement concrete etc. DPC may be provided either horizontally or vertically in floors, walls etc.

* DPC should cover the full thickness of wall excluding rendering.
* The mortar bed supporting DPC should be levelled and even, and should be free from projections so that DPC is not damaged.

* DPC should be laid that of a continuous projection is provided
* At junctions and corners of wall, the horizontal DPC should be laid continuous.
* When a horizontal DPC is continued to a vertical face (i.e the face of a floor), a cement concrete fillet of 7.5 cm radius should be provided at the junction.
* DPC should not be kept exposed on the wall surface otherwise it may get damaged during finishing work.

Q10, a Mention the objectives of Painting and point out the characteristics of an ideal paint

Ans. Calcareous surface, like lime and cement plastered surface, are highly alkaline in the initial stages, they retain large quantities of wetter during construction and it takes long time for the greater part of the water to evaporate when the atmospheric conditions are favourable. Therfore applying a paint system on the surface is essential to take cognisance of the stored up moisture and also the alkalinity of surface.

Characteristics of an ideal paint -

1. Paint should form hard and durable surface

2. It should give attractive appearance
3. It should be cheap and readily available
4. It should be such that it can be applied easily to the surface
5. It should have good spreading quality, so as to cover maximum area in minimum quantity
6. It should dry in reasonable time
7. It should not show hair cracks on drying
8. It should form film of uniform colour on drying
9. It should be stable for a longer period
10. It should not be affected by atmospheric agencies

b. Explain the procedure for —
i) Painting on new wood work.

Soln:- Painting on new wood work is done on the following steps. For good work, 4 coats of paints are required while for interior work, only 2 to 3 coats are applied.

1. Preparation of surface — The surface is dusted off thoroughly to remove dust, shavings

foreign matter etc. Heads of nails are punched to a depth 3mm below the surface to be painted. Greasy spots should be removed by rubbing with piece of clean white muslin soaked in benzine or terpentine allowed to dry and glass papered if necessary

2. Knotting - The process of covering or killing all knots in the wood work with a substance through which the resin cannot come out or exude. Knotting can be done by 3 methods. In first method Ordinary or Size Knotting, two coats are applied The first coat consists of grounding 15g of red lead in 2litres of water adding 225g of glue and heating the solution. This coat dries in 10 minutes and second is applied. Second coat consists of red lead ground in boiled linseed oil and thinned with turpentine oil. The second method is known as patent which consists of applying a coat of hot lime, leaving it for 24hrs scrapping off the surface and then carrying out ordinary or size knotting.

3. Priming – After knotting, the surface is rubbed smooth with a abrasive paper Priming consists of applying first coat of paint to fill all the pores. A layer or film which provides adhesion of the paint with the surface. The ingradients of the paint are kept the same as in subsequent coats through in varying proportion. The composition of primer for ordinary work may be composed of 3kg of red lead, 3 kg white lead, 3 lit of linseed oil or terpentine.

4. Stopping – It is the process of rubbing down the wood surface by means of pumice stone or glass paper after prime coat is applied and then filling up all cracks, all nail holes dents, open joints etc with putty. After putty dries up the surface is rubbed again with pumice stone or glass paper. The putty is made by mixing powdered Chalk in linseed oil to the consistency of a thick paste, for superior work hard stopping is restored to by using 1/3rd White lead and 2/3rd ordinary putty in place of ordinary putty.

5. Under Coating - After stopping second and successive coatings are applied. The first coat is the prime coat. The Under Coatings should be of the same shade as that of the finishing coat. Sufficient time should be allowed for each coat to dry before next coat is applied. For superior work, each coat is allowed to dry, rubbed down with Pumice Stone or glass paper then cleaned before next coat is applied

6. Finishing Coat - finishing coat is applied after the under-coat is perfectly dry. This Coat is applied by a skilled painter. So that finished surface is smooth, uniform and free from patches and bush marks.

(ii) Painting new iron

→ The surface is cleaned off scale and rust etc by scrapping or brushing with steel wire brushes. Oil, grease etc is removed by washing the surface with petrol benzene or lime water.

→ The cleaned surface is treated with a film of phosphoric acid. This film protects the surface from rusting and provides better adhesive surface for the paint

→ The prime coat or first coat is applied with a brush. The coat consists of dissolving 3kg of red lead in 1 litre of boiled linseed oil.

→ After the prime coat has dried, two or more under coats are applied either with a brush or with spray gun. Care should be taken to see that each successive coat is applied only after the previous coat has dried completely the under coat may consists of 3kg of red oxide dissolved in 5 litres off boiled linseed oil.

→ After the under coat has dried, the final coat of the desired type of paint is applied The finishing coat should present smooth finish

Staff sign
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Dead Academics.