SPECIFICATION

SITE SLECTION

1. LEVEL AT THE SITE : - The level at the site must be higher than that of its surrounding so as to provide good drainage.
2. CLIMATE CONDITION: - The intensity of the rainfall and sub soil water level should be low as to avoid dampness in the building.
3. SUB-SOIL CONDITION: - A hard strata should be available at a reasonable depth so as to construct the foundation of the building safely and economically.
4. AVAILABILITIES OF MODERN AMENITIES: - The site must be within municipal limits so that modern amenities like water supply, electricity, drainage, road etc. can be made available inner future if there is no provision at present.
5. AVAILABILITIES OF OTHER FACILITIES : - The site should provide as easy access from the nearest road and after sufficient light and air, these should be good and cheap transport facilities available near the site, it is always better if public services like fire brigade, police station etc.
6. SURROUNDINGS:-

The situation and surrounding of the site must as to suit the purpose for which the building it to be constructed.

SPECIFICATIONS:-

BUILDING:-

Any structure constructed of what so ever material and used for residential, business education or other purposes is called building. Types of the building :-

* 1. Based on occupancy
  2. Based on type of construction

BASED ON OCCUPANCY

Residential buildings: - The building in which sleeping accommodation is provided for normal residential purposes are called residential buildings.

Educational / institutional buildings: - The building used for school, college or day care purposes are called education / institutional building.

Assembly Buildings : - The buildings which are constructed for the purposes to gathering of the people for their respective purposes i.e. social, religious, civil, political is called assembly buildings.

Business Buildings: - The buildings used for transaction of business, for the keeping of accounts and records and other similar purposes called business buildings. Mercantile Buildings: - The buildings used for display of merchandise, either wholesale or retail are called Mercantile Buildings.

Industrial buildings: - The buildings in which products or materials of all kinds and properties are fabricated, assembled or processed are called industrial buildings. Storage buildings: - The buildings used primary for the storage, handling or shattering of goods and wares or merchandise, vehicles and animals are called storage buildings. Hazardous buildings: -The buildings used for storage, handling manufacturing or processing of highly combustible or explosive material are called Hazardous buildings.

CLASSIFICATION BASED ON TYPE OF CONSTRUCTION

Building with type 1 construction: - In these building the design and material used const. are such that all structural components have about 4 hours fire resistance. Buildings with type 2 construction: - In these building the design any type of material used in their construction are such that all structural components have 3 hours fire resistance.

Buildings with type 3 construction: - In these building the design and types of the materials used in their construction are such that all structural components have 3 hours fire resistance.

Buildings with type 4 construction: - In these buildings the design and the type of material used in their construction are such that all structural components have 4 hours fire resistance. PARTS OF A BUILDING

A building can be divided into two parts: -

* + 1. Sub structure
    2. Super structure
       1. Sub structure: - The part of a building constructed beneath the ground level is known as Sub structure.
       2. Super structure: - The part of the building constructed above ground level is known as super structure. It is second part of a building. All the activities of the building construction take place after the making of sub-structure. Flooring, wall roofing are the example of super structure of a building.

COMPONENTS OF A BUILDING

* + - * 1. FOUNDATION: - It is the lowest part of a structure below the ground level which is direct contact with ground and transmitted all the dead, live and other loads to the soil on which the structure rests.
        2. PLINTH: - The portion of a building and the top of the floor immediately above the ground is known as plinth. The level of the surrounding ground is known as formation level of the ground floor of the building is known as plinth level.
        3. WALLS: - Walls are provided to enclose or divide the floor space n desired pattern in addition wall provided privacy security and give protection against sun, rain, cold and other undesired effect of the weather.
        4. COLUMN: - A column may be defined as an isolated load bearing member, the width of which is neither less than its thickness. It carries the axially compressive load.
        5. FLOORS: - Floors are flat supporting elements of a building. They divided a building into different levels. There by creating more accommodation on a given plot of land. The basic purpose of a floor is to provide a firm and other items like stores, furniture, equipment etc.
        6. DOORS, WINDOWS AND VENTILATORS: - A door may be defined as a barrier secured in an opening left in a wall to provide usual means of access to a building, room or passage. Windows and ventilators are provided for sun light, fresh air and ventilation purposes.
        7. ROOF: - It is the uppermost component of a building and its function is to cover the space below it of a room and protect it from rain, snow, sun, wind etc.
        8. BUILDING FINISHES: - A building is considered incomplete till such time the surface of its components is given appropriate treatment.

Building finishes include items like plastering, painting, pointing, white / colour washing, varnishes and distempering etc.

MATERIAL USED IN CONSTRUCTION

Following are the materials used for the construction of a building.

Bricks.

Sand.

Cement.

Stone.

Coarse Aggregate.

Fine Aggregate.

Timber.

Metal.

Floor Tiles.

Roof Tiles.

Reinforcement.

Plastic Materials.

Doors & Windows.

Asphalt Bitumen.

Coloring Material.

White Cement.

Paints & Varnishes.

Brick Ballast.

Sanitary Materials.

Water.

Finishing Tiles. Etc.

GENERAL SPECIFICATION

FOUNDATION AND PLINTH

Foundation and plinth should be of 1st class brick work in lime or cement mortar over a bed of lime or cement concrete. SUPER-STRUCTURE

Super-structure shall be of 1st class brick in lime or cement mortar. DAMP PROOF COARSE (D.P.C.)

D.P.C. shall be of minimum 40 mm (4cm) thick cement concrete (1:2:4) with two coat of

hot bitumen layer on it.

ROOFING

Roof shall be of R.C.C. slab with an insulator layer of lime or cement 8cm thick over it. The flooring cement pointed on the top height of the room shall not be less than 3.7 m. FLOORING

Terrazzo floor should be provided in drawing, dining, bath and w/c conglomerate polished floor 4 cm thick 1:2:4 should be provided in bed and other rooms. DOORS AND WINDOWS

Doors and windows shall be at least of wood of teak 4.5 mm thick paneled or glazed with additional wire gauges shutters. All fitting and fastenings should be good quality of brass or other materials. FINISHING

The inner and outer wall shall have 1.25 cm. thick cement plaster. Drawing, dining and bed room shall be distempered with two coats, other parts of the structure should be white washed with three coats and outside walls should be colored with snowcem of two coats over one coat of white washing.

PAINTING

All the windows, doors and other furniture used in building should be painted with two coats with good quality of colored enamel paints over one coat of primer.

MISCELLANEOUS

Building should be provided with first class sanitary and water supply fittings and electrical installation should be protected in the building by using good quality of electrical products.

DETAILED SPECIFICATION

The detailed specification is a detailed description and expresses the requirements. The detailed specification of an item of work specifies the quality and quantities of materials the proportion of mortar. Workmanship. The method of preparation of work and excavation and the method of measurement the detailed specification of different items of work are prepared separately and describe what the works should be and how they shall be executed. Detailed specifications are written to express the requirement clearly in a consince from avoiding repetition and ambiguity the detailed specification are arranged as per order as the work is carried out the detailed specification of prepared properly are very helpful for the execution of work. The detailed specification form an important part of contract document.

Every engg. Department prepared, the detailed specifications on various items of work and get them printed in order book from under the name. Detailed specification when the work or a structure or project is taken up instead of waiting detailed specification every time the printed detailed specifications are referred. The detailed specifications of various item of work are as follows: -

EATH WORK IN EXCAVATION OF FOUNDATION:

EXCAVATION : - Foundation trenches shall be dug out to the exact width of foundation concrete and the sides shall be vertical. If the soil is not good and does not permit vertical sides the side should be sloped back or protected with timber sharing excavated earth shall not be placed within 1 m. of the edge of the trench.

FINISH OF TRENCH : - The bottom of foundation trenches shall be perfectly leveled both longitudinally and treaverrly and sides of the trench shall be dressed perfectly vertical from bottom up to the least thickness of loose one so that concrete may be laid to the exact width as per design the bed of the trench shall be lightly watered and well lamed. Excessive digging if done trough mistake shall be filled with concrete or with stabilized soil. If rocks are found during excavation, these should be removed and the bed of trenches should be leveled and made hard by consolidation the earth. Foundation conc. And approval of the trench by the engg. In charge.

FINDS : - Any treasure and valuables or materials founds during the excavation shall be property of Govt.

WATER IN FOUNDATION : - Water if any accumulated in the trenches, should be bailed or pumped out without any extra payment and necessary precautions shall be taken to prevent surface water enter the trench.

TRENCH FILLING: - After the conc. Has been laid, masonry has been constructed the remaining portion of the trenches shall be filled up with earth in layers of 15cm and watered and well rammed. The earth filling shall be free from rubbish and refuse mater. All clouds shall be broken before filling surplus earth not required shall be removed and disposed and site shall be leveled and dressed.

MEASUREMENT : - The measurement of excavation shall be in cum as per for rectangular trench width of the conc., multiplied by vertical depth of foundation from ground level and multiplied by the length of trench even though the contractor might have excavated with sloping side for his convenience rate shall be for complete work for 3m. Lead and lift including all tools and plants required for the completion of work. For every extra, lead 30 m and every extra left 1.5m separate extra rate is provided.

EXCAVATION IN SATURATED SOIL : - Excavation in saturated soil or below sub soil water level shall be taken under a pressure item and shall be carried out in same manner as above pumping or bailing out of water and removal of slush shall be included in item. Timbering of the sides of trenches if required shall be taken under a separate item and paid separately.

LIME CONC. IN FOUNDATION : - All the material shall be as per standard specification. Coarse agg. Shall be hard, over brunt brick ballast of 40 mm gauge. It shall be deep cherry red or copper color and shall be cleaned, free from dust and other foreign matters. It shall e homogeneous in texture and cubical. In shape. Ballast which appears porous or snow sign shall not be used. Brick ballast shall pass through square mesh of 52.5 mm and not more than 20% shall pass through a mesh of 25 mm. Any rejected material shall be removed from site of work with in 24 hrs. Find agg. Shall be of surkhi or sand as specified and clean and free from dust, durt and foreign matter surkhi shall be made of well burnt bricks or brick bats and shall pass through a sieve of 2.5 meshes per sq. cm. (144 meshes per sq. m) Surkhi is preferable for better concrete.

Lime shall be white fat lime and shall be freshly burnt and free from ashes and other foreign matters lime shall be sleacked at site of work and screened through a sieve of 3 meshes to a cm ( 8 meshes to an inch)

PROPORTION : - The conc. Shall consists of 1 cum of brick ballast, 0.32 cum of surkhi and 0.16 cum of white lime in the proportion of 100:32:16 by volume. Mixing shall be done on a clean water tight measuring platform of sufficient size. Brick ballast shall be stretched in a rectangular layer of uniform thickness usually 30 cm (12")

high and well soaked with clean water for a well soaked with clean water for a period of at least three hours.

Lime and surkhi shall be measured with wooden box in the proportion 1:2 and mixed thoroughly dry to have uniform colour. The dry mix of lime and surkhi shall be spread over the stacked ballast to the required thickness to give the specified proportions. The materials shall be than mixed dry turning at least three times clear water shall then be added slowly and gradually by water consists the required glading while mixing and the materials mixed thoroughly by turning at least three times so that whole surface of earth each ballast gets coated with mortar and the mix becomes plastic of uniform colour of workable consistency and should be such that the ballast do not separate from the mortar. Concrete shall be used for big work the mixing shall be done by machine. In this case aggregate and used mortar shall be powdered in the drum . While it is revolving. The water shall be added slowly to the required quality and the mixing shall be continued for at least one minute till a mix of uniform colour and workable consistency is obtained and should be such that the ballast do not separate from the mortar.

LAYING AND COMPACTING : - Bed of foundation trench shall be lightly spriualed with water before concrete is laid. Concrete shall be laid slowly and gently in layers of not more than 20 cm and thoroughly consolidated to 15 cm with 6 kg. iron rammers. During consolidation conc should be kept from earth , dust leaves and other foreign matters. The consolidation shall be checked by water test by digging a rate of about 7.5 cm. dia and 7.5 cm. deep in the conc. And filling water. The water level of should not sink more than 1.25cm. in 15 minutes is concrete has been well consolidated.

JOINT AND CONSECUTIVE LAYERS : - When joint in a layer of concrete are of concrete are unavoidable, the end shall be sloped at angle of 300 and junctions of different layers shall break joints. In laying upper layer of concrete the lower surface shall be made rough and cleaned and watered before upper layer is laid.

CURING : - After about two hours laying when concrete has begun to harden, it shall be kept damp by covering with wet gunny bag or wet sand for 24 hours and then covered by flooding with water making mud walls 7.5 cam (3") high or by covering with wet sand or earth and kept damp continuously for 15 days.

REINFORCEMENT CEMENT CONCRETE : - Steel : Steel reinforcing bars shall be of mild steel or deformed steel of standard specifications and shall be free from corrosion , loose rust scales, oil, grease, paint etc. The steel bar shall be round, and capable of being bent accurately and placed in position as per design and drawing and bound together tight with 20 S.W.G. anneled steel wire at their point of intersection . bars shall be bent cold by applying gradual and even motion of 40 mm(11/2" ) diameter and above may be bent by heating to dull red and allowed to cool slowly without immersing in water or quectings. Joints in the bar should be avoided as far as possible , when joint's have to be made an overlap of 40 times diameters of the bar shall given with proper hooks at ends and joints should be staggered.

CENTERING AND SHUTTERING : - Centering and shuttering shall be made with timber or steel plate close and tight to prevent leakage or mortar with necessary props, bracing and wedges, sufficiently strong and stable and should not yield on laying concrete and made in such a way that they can be stacked and removed gradually without disturbing the concrete. No plastering should be made on the concrete surface. A coat of oil washing should be applied over the shuttering or paper should be spread to have a smooth and finished surface and to prevent adherence of concrete.

PROPORTION OF CEMENT CONCRETE : - Cement concrete shall be 1:2:4 proportion by volume for slabs, beams and linlets and 1:1^:3 proportion for columns under otherwise specified.

MATERIAL FOR CONCRETE : - Cement, sand and coarse aggregate shall be same as for cement concrete. The stone aggregate shall be usually 20mm to 6mm ( %" to %") gauge unless otherwise specified.

MIXING : - Mixing shall be done one a clean water tight, masonary plot form of sufficient size bricks, Ballast shall be starched in a rectangular layer of uniform thickness usually 30 cm ( 12") high and well soaked with clean water for a w ell soaked with clean water for a period of at least three hours.

LAYING : - Before laying the concrete, the shuttering shall be clean free from dust and other foreign matters. The concrete shall be deposited ( not dropped) in its final position. If case of columns and usually it is desirable to place concrete in full height if practical so as to avoid construction joints but the progress of concreting in the vertical direction shall be restricted to one meter per hour. Care should be taken that the time between mixing and placing of concrete shall not exceed 20 minutes so that the initial setting process is not interfered with .

Concrete shall be compacted by mechanical vibrating machine until a dense concrete is obtained. The vibration shall continue during the entire period of placing concrete.

CURING : - After about two hours laying when concrete begun to harden it shall be kept dump by covering with wet gummy bag or wet sand for 24 hours and then curved by flooding with water making mud walls 3.5cm (3") high, or by covering with wet sand or earth and kept damp continuously for 15 days.

FINISHING : - If specified the exposed surface shall be plastered with 1:3 cement mortar not exceeding 6mm thickness and the plastering shall be applied immediately after removal of conc.

MEASUREMENT : - Measurement shall be taken in cu. M ( cuft.) for the finished work and no deduction shall be made for the volume of steal. Steal reinforcement shall be measured under a separate item in quintal . Plastering if any shall not be included in the measurement. The rate for R.C.C. work shall be for the complete work excluding steel but including centering and shuttering and all tools and plants.

DAMP PROOF COURSE : -

MATERIALS : - Damp proof course shall consists of cement coarse sand and stone aggregate of 1:1% :3 proportion with 2% of impermo or cam seal or ACCO proof by weight of cement or other standard water proofing compound. (1Kg. per bag of cement) . The damp proof course shall be applied at the plinth level in a horizontal layer of 2.5 cm thickness. The cement shall be fresh, Portland cement of standard specification. The sand shall be clean, coarse of 5 mm size and down and the stone aggregate shall be hard and tough of 20 mm size well glade and free from dust and dirt, compo seal, puldo, cico and other standard water proofing compound may be used, and the quantity shall be used as per instructions of the manufacturers.

MIXING : - Mixing shall be done in a masonry platform or in a short iron tray in the proportion of 1:1%:3 by measuring with messing boxes. The cement is first mixed thoroughly with the water proofing compound to the required quantity and then mixed dry with the sand in the proportion of 1:1.5

LYING : - The level of the surface of the plinth shall be checked longitudinally and transversely. The top of walls at damp proof cause should be lard with fears of the best downward. Aside from shuttering of strong wooden bottom of 2.5cm thickness shall' be fixed properly and formally a both sides to confine the concrete so that the shuttering does not get disturbed during compaction and mortal does not leak through. Thinner edges of the shuttering shall be or led toprevout condate abhesing.

PAINTING : - with Asphalt: - Two coats of asphalt painting may be applied on the upper surface of damp proof cause of, specified. The first coat of hot asphalt uniformly on the surface when the concrete is dry and the painted surface is blinded immediately with coursed and the surface is tamped lightly the second coat of hot asphalt at/kg per sq. mt. (10kg % sq ft). Should then be applied uniformly and the surface is ambling with cause sand and tamped lightly.

2cm damp proof ceases: - the damp proof cease maybe of (%') thick layer of 1:2 cement. Coarse sand mortar with standard. Water proofing compound at the rate of 1kg per bag of cement.

BRICK WORK 1st CLASS

BRICKS : - All brick shall be first class of standard specification made of good brick earth through brunt. And shall be of deep cheesy led or copper color. Brick shall be regular in a shape and their edge. Should be Sharpe and shall emit clear. Ringing sound on being struck and shall be free from cracks chops. Flaw and lumping of any kind bricks shall not absorb water more then one sixth by ompreesing in water. Bricks shall have a min crushing strength of 105kg.per sum

MORTAR : - Mortar shall be specified and material of mortar shall be of standard specification. Sand be shall be sharp. Clean and free from organic forge in matter for rich mortar coarse or medium sand should be used and free from area mortar local fine sand may be used. proration of cement sand may be lime surki mortar of specified shall be mixed in the specie field proportion by grinding in mortar for at least three hours as same day of use. Lime shall be fresh and slaked and screened at site of work fresh mixed mortar within 24 hours shall be used old and state mortar should not be used for small work hand work mixing may be allowed in same manner as for cement motor described above.

SOAKING OF BRICKS : - Buck shall be fully soaked in clean water by submerging in a tank for a period of 12hourns immediately before use. Soaking shall be continued till air bubbling a caused.

LAYING : - Bricks stall be well bonded and laid in England bond unless otherwise specified. Every course shall be trendy horizontal and wall shall be tendly in plumb. Vertical joint of commiserative course shall be not trendy in plumb. vertical joint of conservative coarse shall be not came directly over come one another vertical joints in alternate coarse shall came directly over one another . Not damaged or broken bricks shall be used. Closer shall be cut out bricks and shall be placed near and the walls but not at the other edge selected best shaped bricks shall be used for face work. Mortar joints shall not exceed 6mm in thickness and joints shall be fully filled with mortar bricks shall be lad with finger. all the joints should be lacked and faced upward cleaned at the end of each day's working.

CURING : - The brickwork shall be kept wet for a period of at least 10 days after laying. At the end of day's work. The top of walls shall e flooded with water by matter small weak mortar edging to contain at least 2-5 deep.

PROTECTION : - The brick shall be protected from the effect of sun saint feast etc during the construction and up to such time at is green and likely to be damaged.

SCAFFOLDING : - Necessary and suitable scaffolding shall be sound and sports and member sufficiently strong so as to withstand. All loads likely to come upon them.

MEASUREMENT : - Brickwork shall be measured in cu m (cu it) different kind of brickwork with different mortar shall be taken under separate items. The thickness of wall shall be taken under. multiple of half brick as half brick 10cm , 1 brick 20cm ,1% brick 30cm and 50, the rate shall be for the complete work molding scaffolding and all the tools and plants

BRICK WORK 2nd CLASS AND 3rd CLASS :- For 2nd class brickwork brick shall be of sec class and mortal be as specified may be canker lime or white lime and surki of 1:2 to 1:3 proportion. Mortal joint shall be not exceeding 10mm % in thickness. Brick shall be soaked in water for at last three holus immediately before use other details are some as for item above. For 3rd class brickwork shall be as specified and mortar joints shall not of water before use.

BRICK WORK IN MUD MORTAR : - Brick work shall be specified, may be 2nd class of 3rd. the mud should be made of selected earth of tenacious nature so that it stick and binds bricks the earth should be soaked in water at least. One day before and then worked up with water by least. One day before and then worked up with water by laborer treading it. Until at is perfect free from lumps and from a thick plastic mix. Joints should exceed % 12mm thickness soaking of English bond note more than 6cm 2 height of brick work shall cause shall be truly horizontal other details of laying, protection, scaffolding and measurement.

REINFORCED BRICK WORKS : -

MATERIALS : - Brick shall be strictly of first class quality and selected first class brick shall be used mortar shall be fresh Portland cement. Sand shall be cause and free from foreign matter. Steel reinforcement cement shall be of standard specification as described in items.

CENTERING AND SHUTTERING :- The cantering and shuttering shall be made with planking or sheeting of bombed pocked together at the required level supported on runner of beans and covered with a thin layer about 2.5cm thick of earth finish off with a light sprinkle of sand. The cantering shall be simple in const. so that it could be easily removed without disturbing the structure. The planting shall be kept clear of the bearing of slab. And will rest on class beams only. Planks shall not blond too closed to tender them liable to jam. Closes beam shall be carried on the walls supported intervals by ballies or temporary dry brick piles. The top surface of centering shall be given a camper of 2mm for every 30cm. of span, up to a max of 4cm of lintels.

MIXING OF MORTAR : - Mortar of cement and sand shall be thoroughly mixed in the proportion of 1:3. First by fixing dye and them and added water slowly and gradually and mixing by turning at least three to get uniform plastic mix of workable consistency so that the motor may be packed. Sound the rein for cement. Quantity of water shall not exceed 25ltr / bag of cement motor shall be mixed just before it is actually required. And shall within 30min. state mortar shall never be used.

LAYING :- All bricks shall be thoroughly soaked with water for not less than hours immediately before use brick shall laced frogs downward over the cantering in straight line II to the direction of the rein force meant bass leaving the required. Gap for mortar joint. No vertical joint should. Come along the inner edge of the wall. The gap for mortar joint in which reinforcement has to be placed shall not be less than four times the diameter of bar so as to provide a cover of 12 mm % an all sides of the steal bass, usually mortar joint shall be 32 mm to 40 mm (1% to 1%) other joints where these will not be any bar be 6mm to 10mm ( % to 3.8) thick.

CURING :- After about two hours laying when concrete has begun to harden it shall be kept. Damp by covering with wet gunny by or wet sand for 24 hours and thin corned by finding with water making mud walls 7.5cm 1/3 high or by covering with wet sand or earth and kept damp continuously for 15 days.

MEASUREMENT :- Measurement shall be taken in cu mt (as ft) for the finished work and as deduction shall be made for the volume of steel. Steal reinforcement shall be measured. Under a separate item in quintal. Plastering if any shall not include in the measurement. The rate for R.C.C. work shall be for the complete work excluding steel. But including cantering and shuttering a dell tools and plants.

PLASTERING CEMENT MORTAR OR LIME MORTAR: - The joint of the brick work shall be raked out to depth of 18mm. (3/4) and the surface of the wall shall be washed. And kept wet for two days plastering. The materials of mortar, cement and sand as lime and surki or sand, or kanker lime as specified should be of standard specification. The materials or mortar shall be first dry mixed by measuring with boxes to have the required proportion and then water added slowly and gradually and mixed thoroughly. The thickness of plasters shall be as specified. Usually 12mm ( % ) applied in two or three Coats. To ensure uniform thickness of plaster patches of 15 X 15 (6") strip 1m (3) apart or 10 cm 4 uncle plasters shall be applied first at about 2m (6) apart. To act as a guide first mortar shall be dashed and pressed over the surface and then brought to a true smooth and uniform surface by means of float and trader. External plastering shall be started from top and worked down. Towards floors. Internal plastering shall be started wherever the building frame is ready and cauering of the roof slabs have been removed. Cooling plastering shall be edges shall be sounded. The plastered surface shall be kept wet for 10 days. The surface should be protected from rain sun, frost etc. Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered. The plaster shall be kept wet for at least 10 days. Any defective plaster shall be cut in rectangular shape and replace. Note:- Different proportion of mortar which may be used for plastering Cement sand mortar:- 1:3, 1:4, 1:5, 1:6 cement, lime, sand mortar 1:1:6 C:L:S. lime surkhi or sand mortar:- 1:1, 1:2, kankar lime mortar kankar lime stone for ceiling plastering 1:3 cement mortar coarse sand & generally used cement, lime sand mortar is slow setting and has better workability than cement sand mortar.

PAINTING (CEMENT OR LIME MORTAR) : - The joint of the brick shall be raked out to depth of 20cm % and surface of the wall washed and cleaned and kept for two days before painting , the material of motor shall be first dymiored by measuring with bares to have the request proportion of the specified the material of motor shall be first dry mix by measuring with boxes to have the required proportion of specified the kanker lime and soda for the matter of adding water slowly and gradually thoroughly mix. Mortar shall than be applied in the joined slightly in the excess and pressed by the proper tool of the required shape hectometer of any is removed and the surface finished. Br8icks shall b e cleanly defined to give a neat appurtenance after painting the surface shall be for seven days.

FLUSH PAINTING : - The mortar shall be pressed into the trea6 into the sacked cleaned and wet joints and level with the edges of the bricks to give a smooth appearance the edge shall be neatly teemed with a trawl and straight edge.

RULLED PAINTING : - The mortar shall be pressed into the sacked cleaned be formed the wet joints and a groove of the shape and size of 5 o 6 mm deep shall be formed ramming a forming tool of steel along the center line of the joints . the vertical joints also be finished in a similar way at the right angle to the horizontal lines . the finished work shall be give a neat and clean appearance with straight edge.

WEATHER OF TRUCK PAINTING : - The mortar shall be applied another sacked clean and wet joints and the horizontal joints and the horizontal jobs shall be slapped so that the jobs is sloping framing to bottom . the vertical shall be finished as rule foaming

RAISED OF TRUCKED PAINTING : - The mortar shall be applied in racked cleaned and wet joints in the excess to foam raised . the mortar shall be pressed and run with the wiper tool raised to the bands of 6 mm out of 10mm with directed

MEASUREMENTS : - Measurement shall be taken in a cu mm be fished and no deduction shall be made for volume of steel informant shall be measured under a separate atom in quite plastering of shall be measured of all may be shall not be included in the measurements . The rate for the rockwork shall be before excluding steel but including tool and plants

LIME PAINTING :- While all lime and shell be slacked of rile of work and mixed in the proportion of 3 of lime and shell lime and they have thought mixed with the frequently mixed with sufficient quantity under the drum . The mixture shell them be screened thoroughly a course cloth into another and allowed to settle down for few days which are in clear water shall be dictated and the cream like a paste of lime shall be taken from leaving reduce of the bottom for the places application. those should be cleaned in the applied coarse soda send lime and prepped lime paste of the proper triply the viewed in the uniform to 3 mm (1/8") thickness by wood this should be handle with the help of cement and rubbing with the steel trawl to ahead the surface of thru smoothness of the kept mist for seven days after ruining shall be applied plastered surface when the plaster are hardened.

2.5 cm (1") CEMENT

CONCRETE FLOOR : - The cement concrete floor shall be proportion 1:2:4 or 1: 2 j- : 3 ^as the specified . Cement shall be fresh port cement of standard specification. The coarse aqgg. shall be hard and tought of 20 mm ( -") and free from dust etc. The sand shall be coarse of shall be 5 mm max size and down well gladded, clean free from dust, dirt and organic mattar.

The floor shall be leveled and driver into panel of size not exceeding 1 mater in is smaller dimension and 2meter in large dimension. Glass or AL ads 3mm thick and depth equal to the thickness of floor shall be fixed on the base given in the floor for drawing wash water.

COLORED FLOOR: - For colored finish the surface shall be finished with colored cement floor the thickness of the two layer shall be 19mm and 6mm for polished floor thaw thickness of the two layer shall be 2.5mm to allow for getting and polishing. BASE :- In ground floor the cement concrete floor is shall be7.5 base of lime came or weak cement concrete as per standard specification. If the bases consist of cement concrete it shall be allowed o set for about 7day in case the base in of weak cement concrete the flooring shall commenter within 48 hours of laying the base. The thickness of c.c. floor for office building, school, in upper floor should be 4cm 11/2. MOSAIC OR TERRAZZO FLOOR : - The mosaic floor consists of two layers the bottom layer 2 cm to 2.5 cm cement concrete 1:2:4 or 1: 2 j : 3 ^ as specified and the upper layer 6mm thick consisting of a mix of marble clops and cement in the of one plat vow cement and pelt of cement and part of marble chips. The top layer is laid on the following day. It shall be laid more than the specified thickness in order to get the specified thickness after cutting and finishing cement shall be of standard specification the sand shall be cause well graded, clean and free from don't and .the stone gilt shall be hard and tough of 12 mm gauge well graded clean and free from dust and dist. The marble chip be of 3mm gauge having max size max size 3mm and min size 5mm large of marble chip limited 6mm in use of floor and big room cement concerti shall be prepared for mixing the interred dry by measuring with box and shall be mixed dry and .this dry mixed but shall be mixed with stone chip dry and then mixed by adding water slowly and then start uniformly mixed with water and cement washed then they came in the led by glass A strips and leveled with wooden floods

The marble chip cement are measuring with require proportion 1st dry mixed and than throuthtly vaguely to have uniform plastic mix. Within 2hours of laying bottom layer cement concerti in the upper layer of chips and they shall be lead and the surface temped slightly and finished perfectly in the level of strife edge and they shall be covered with wet bag and covered desirable for 2 days. the surface shall be cut or ground by rubbing with sand stone blocks and all the cement in the surface remove a need cement wash shall than big be given in the surface and left undesirably for 6 days with cop. Stone of different grade starting with coarse and finer ones by rubbing cont. with a uniform ground paper the surface should be kept after final rubbing with clean water

Mosaic or terrazzo file floor: - precast manufactured mosaic or tear file are used. brick on edge or brick flooring over 7.5cm lime

CONCRETE : - Surface removes a need cement wash shall than big be given in the surface and left undesirably for 6 days with cop. Stone of different grade starting. The surface of base lime mixed and than throuthtly is mixed dry and. plastic mix. Within 2hours of laying bottom layer cement concerti in the upper layer of chips and they shall be lead and the surface temped slightly and finished perfectly in the level of strife edges specified with the water plastic mix. within 2hours of laying bottom layer cement concerti in the upper layer of chips and they shall be lead and the surface temped slightly and finished perfectly in the level of strife edge the e surface should the bricks cement motor as specified.

WHITE WASHING : - Fresh white lime slacked as the site of work should be act as the marking of the quality required with the help of clean water screened through a coarse clothes cloth and gun in the proportion are in the dry type of the work and they shall applied of flushing the four few days which are in clear water shall be dictated and the cream like a paste of lime shall be taken from leaving reduce of the bottom for the places application. those should be cleaned in the applied coarse soda send lime and prepped lime paste of the proper triply the viewed in the uniform to 30mm thickness by wood this should be handle with the help of cement and rubbing with the steel trawl to ahead the surface of thru smoothness of the kept mist for seven days Cloud washing: - cloud are shall be propped with fresh started in the cloud pigment with the required quantity with day of wash shall be applied for one or specified the method of the applications are for white washing The materials or mortar shall be first dry mixed by measuring with boxes to have the required proportion and then water added slowly and gradually and mixed thoroughly.

DISTEMPERING :- The distempering shall be of best quantity and closured the distemper should be mixed and wat6er added as laid power and shirred through and the part past is allowed to sand for a new minute . The past is then turn with water too have a thin cream if the surface is rough it should be smooth with sand paper. The surface must be perfectly dry before distempering is command. In the new cement plaster the surface shall be washed over with the selection of zinc sulphate one 1kg in 10 ltr of water and then closed today in old surface shall be prepared with water. Plaster of Paris where required & then whole surface sand prepared & washed &allowed to dry. The number of coats shall be two or as specified. The distemper shall be kept well surred in containers & shall be applied with broad brushes. First horizontally &immediately crossed vertically. Brushing should not be continued too long to avoid brush marks .The second shall be applied after the first coats is dried up. After each

day's work the brushes will be washed kept dry distempering should be done during dry weather but not during the hot weather Nor wet weather.

OIL DISTEMPER :- Oils distemper is similar to ordinary dry distemper in powder form in oil distemper compound oil is mixed by manufacturer while manufacture for application of oil distemper is mixed with the required quantity of water & then applied on surface. This method of preparation & application are similar as described above.

SNOWCEM WASHING:-

GENERAL: - Snowcem consists of a base of white cement mixed with finely powdered coloring pigment to have the desired color and with addition of small quantities of ingredients. It gives a water proof surface snowcem is solid by manufacturer in 50kg drums. 25 kg drums & 5kg of various colors. The snowcem of desired color may be chosen.

MIXING : - Only fresh snowcem should be used .Hard or set snowcem should not be used .The content should be made loose by rolling and shaking the container before opening the container. First a paste shall be prepared by mixing 2 parts of snowcem powder with one part of water by volume &immediately this should be thinned by adding one another part of water to have a uniform solution of consistency of paint

APLLICATION : - The surface should be cleaned to remove the dust by use of soft wire brush. The surface shall than be wetted by sprinkling the water &water should allow running off. The fresh mixed snowcem should be applied with good quality brush .The first coat shall be well brushed into the surface to form a good bond. Snowcem should be used within the hour of mixing & should be kept stirred during the application. At the end of day each application of snowcem the surface should be wetted with fine water spray for curing.

After a day second coat of snowcem of similar preparation should be applied on wetted surface & second coat should be applied carefully to give uniform &good finished appearance. Covering capacity of 50kg of snowcem for two coats of on plastered surface is 100sq.m

DECORATIVE CEMENT COLOUR WASHING> For decorative as well as water

repellent washing on the external surface of building white cement mixed with color(pigment) other ingredient may be used the quantity(proportion) of the different ingredient in percentage basis as well as per bag of cement are give below:-

INGREDIANTS

White cement Slaked lime Powered glue Alum

Aluminum Stearate Plaster of Paris

PERCENTAGE

75% 10% 10% 2% 1.5% 2.5%

PER BAG OF CEMENT

50 kg 6.5 kg 6.5 kg 1.3 kg 0.33 kg 1.63 kg

To get the desired color and shade powdered metallic color should be mixed with white cement to extent of 5% to 10% of white cement by weight (2.5kg to 5kg per bag of cement).

MIXING AND PREPRATION : - Slaked lime should be dissolved in cold water &powered alum should be dissolved in hot water in separate container the solution should be thin & should be screamed through a piece of cloth and prepared & kept ready in advance of application

At the time of application white cement plaster of Paris, aluminum sterate and color should be mixed intimately in the above mentioned proportion &the mixer added to slaked lime solution & stirred continuously .The alum &glue solution should be added & stirred continued .Fresh water should be added to bring the solution to consistency of cream similar to oil paint. The final mixed solution should consist of all ingredients in

proportion mentioned above .The mixing should by batches of about one fourth bag cement at a time with other ingredients in same proportion. A uniform consistency should be maintained for all batches of mix .Only so much quantity as can be used within half an hour should be prepared &mixed at a time.

APPLICATION OF WASH : - Before the wash is applied, the surface should be lubbed & cleaned off all loose dust &dirt and wash with water .The mixed cement should be applied event with bead distemper brushes second should be applied after 4 hours &during this period the surface should be kept most.

CURING: - After application of cement the surface should be kept moist for at least 2days by frequent light sprinkling of water .Surface should be protected from Hudson& drying winds by hanging hersiancloth on the scaff of day & periodically wetting with water.

COVERING CAPACITY: - One bag of white cement (50 kg) mixed with other gradients will cover an area of 80sq m to 100sq m for two coats over plastered surface. One expert washer (white washer))& one by can coolie can wash 30sq m to 40sq m per day for first coat and 40sq m to 50 sq m per day for second .

PAINTING: - The brand of paint shall be specified & readymade paint of required color should be used .if thinner is required, pure turpentine may be added to required extent. The surface should make perfectly smooth by rubbing with sandpaper of different grades first with coarse one and successively with fine sand papers. All holes & open joints should be filled with strong putty or with a mixture of glue & plaster of Paris and smoothened by rubbing with sand paper.

The number of coats shall be as specified in new work one priming coat & then two coat of paint shall be applied with brushes evently & smoothly by closing & laying off in the direction of grains of wood work and no brush mark should be visible . Each coat shall be perfectly by before the next is applied. Before the next coat is applied the surface shall be rubbed with sand paper to give smooth & glazed surface .the paint should be stirred in container immediately before use. Brush should be cleaned and washed with turpentine at the end of days work and kept dry. If stiff paint is used it should be first prepared by mixing with double boiled with linseed oil &turpentine to thin cream. For measurement of painting a different work .we done above if old paint is to be removed it may be removed with washing with soda water or with caustic soda. The surface should be dried and rubbed with sand paper before the paint is applied .In old painted surface of paint is not required to be removed .but required repainting the surface should be washed with soap water and then paint shall be applied .In steel work exposed to weather the painting should be done either with red oxide paint or with aluminum paint.

VARNISHING : - Knots, holes, cracks etc. shall be filled and covered with putty made of whitening and linseed oil. The wood work shall be rubbed down with sand sufficiently smooth to remove any grains marks and shall be cleaned beforehand. Two coat of boiled linseed oil or two thin coat of glue as specified shall be applied and each such coat shall be allowed to dry up and rubbed down smooth with a fine sand paper .The varnish shall be applied

To dry up and rubbed down smooth with a fine sand paper. The varnish shall be applied with brush using strong firm of brushes and spread evenly...the brush should be of good quality and perfectly cleaned. In the case sand paper shall be rubbed across the gain which may cause the finest marks on the finished surface. Specified quality of copal varnish shall be laid on the prepared surface in thin coats unless any other is mentioned. For new wood work a second coat shall be applied after the first coat of varnish has thoroughly dried up. Varnishing shall be done during dry weather and should not to allow to be undertaken in rainy days.

PAINTING STEEL AND IRON WORK : - All rust scales, dirt, supplier delivery marks, oil, grease, etc shall be removed by rubbing with sand paper before painting .Special care shall be taken for cleaning of corners .All structural steel work shall be painted with red lead before erecting except the surface which will be in contact with conc. Where corrosive effects is likelihood from sea ,atmosphere ,a coat of raw linseed oil shall be applied on surface immediately after cleaning and before the first coat of red lead is applied .Two to three coats of approved ready manufactured paint or ready mixed paint shall be applied at right angles to each other after erection

Of the structural member .Each coat shall be allowed to dry up perfectly before the final caot is applied .Painting shall be done in dry weather.

FRENCH SPIRIT POLISHING

POLISH : - Pure shellac. varying from pale orange to lemon yellow color free from resin,dirt,etc shall be dissolved in methylate spirit at the rate of 0.15kg of shellac to 1 liter of spirit .Suitable pigment shall be added to get the required shade.

PREPARATION OF SURFACE: - The surface of timber shall be cleaned and rubbed down smooth with sand paper Knots if visible shall be covered with a preparation of lead and glue laid on. While hot holes and indentation on surface shall be filled with putty & smoothened .The surface shall be then be given a coat of filler made by mixing whiting in methyl ate spirit at the rate of 1.5kg of whitening per liter of spirit .The surface shall be rubbed down perfectly smooth with glass paper and wiped clean APPLICATION : - A pad of woolen cloth covered by a fine cloth shall be used apply the polish. The pad shall be moistened with the polish & rubbed hard on the wood in series of over lapping circles applying the polish sparingly but uniformly over the entire surface to give uniform surface.No. of coats shall be as specified .The second coat shall be applied after the first is dried, in the same way for first coat...

WOOD WORKS : - All wood work of which the scantling exceeds 20sqm section & which is not specially molded or curved .This include all timber work in check hates of doors and windows in roof work as beams, struts, ties , etc. Timber shall as specified may be teak , sheesham , Sal , deodar , etc .The timber should be of best quality well seasoned angle free from shap ,knot , works , cracks or any other defect .The scantling shall be sawn in direction of grains .All wood work shall be planed and neatly and truly finished to exact dimension .All joints shall be neat &strong , truly &accurately fitted and coat with white lead , before fitting together all portion of timber of built into or containing masonry or conc. shall be given two coats of solignum or tar or other approved preservation 7exposed surface of timber shall be painted with two coats of approved paint over a coat priming .

All beams shall be bedded on plates with a minimum bearing of 25cm and 6cm clear air space shall be left on each side .No wood work shall be fixed within 60cm of any fire work place.

Measurement of wood work shall be taken in cum for the finished work fixed in position including sawing; planning, jointing, etc. painting of wood work shall be measured under separate item.

DOORS AND WINDOW : - Timber shall be of kind as specified may be of teak, shisham, Sal deodar. Timber shall be of best quality well seasoned The timber should be of best quality well seasoned angle free from shap, knot, works, cracks or any other defect .The scantling shall be sawn in direction of grains .All wood work shall be planed and neatly and truly finished to exact dimension .All joints shall be neat &strong, truly &accurately fitted and coat with white lead, before fitting together.

CHOUKHATS : - The choukhats shall be properly framed and joined by mortise and tension joint with hard wooden pins and the joints shall be coated with white lead before being fitted together. The choukhats shall be of section as per drawing may be 7.5\*10cm or similar shall be painted with two coats of soligum and the other faces shall be painted with a prime coat before fixing in position.

SHUTTERS OR LEAVES : - The shutters may be paneled, glazed and palt glazed, battened, or ventilation As specified .The thickness of shutter shall be 3 to 5cm. The styles rails and panels shall be planned and neatly and truly finished to exact dimension .The styles and rails shall be framed properly and accurately with mortise and tonon joint fixed with wooden pins Panels shall be one piece without any joint and shall be fixed with 12m insertion into the rails and styles provided with moldings as per design. The thickness of panel shall be 12 to 25mm .All rail over 15cm in width shall have double tenon. No tenon shall exceed one fourth of thickness of plank for glazed windows sash bars shall not be less than 40\*40 mm and glass shall be fixed with nays and putty or with wooden beddings over felt as specified .All joint shall be glued before being fitted.

FITTINGS: - All doors shall be provided with handle on both sides and all windows with handle on inner side .One of doors of each room shall be provided with sliding bolts on outer side for locking, lower bolts, hook bolts, stops for keeping the leaves open and also wooden block to prevent leaves striking the jambs of wall etc. shall be provided. The fittings may be of iron , brass or oxidizing as specified of approved quality of screws shall be of suitable length and correct dia and shall be fixed with screw driver and not hammering.

PAINTING : - The surface of shutters and choukhats shall be painted with two coats of approved paint over a coat of priming. Faces of choukhatin contact with masonry shall be painted with two coats of soligum preservative before fixing. A prime coat of painting with primer paint shall be applied on remaining surface before fixing in position.

MEASURMENT : - The rate shall be for complete work including hanging &fixing in position .The choukhat shall be measured in cum under wood work for the finished work &the length of tenons shall be added to right length .The measurement of shutters shall be taken in sq m for finished work in closed position of overlap of two shutters shall not be measured .The painting shall be measured separately under a separate item in sq m. The cost of fitting may be excluded if specified &fitting supplied by department or owner but the fixing of fitting or hanging in position shall be included in late.

GLAZING : - Glass shall be of the best quality and free from the bubbles, scratches, and other defects. The thickness of glass may be 3mm or specified. The glass panels shall be fixed in 15mm rebate the wooden frame leaving 1.5mm clear gap all around for allowing the expansion. The rebate shall be painted before glass is fixed. Putty shall be of best quality made of fine

Powdered whitening and linseed oil, kneaded into a thick paste. First a thin layer of putty shall be applied on the rebate then glass shall be fixed in position by a few small nails &then putty shall be applied and pressed in position and finished of neatly and in such a manner that no putty project beyond the rebate . The putty then shall be applied with a coat of paint. In case of large glass panels these should be fixed in rivets by molded. Wooden fillets all rounds with brass or nickel screws inserting a strip of felt or rubber in rebates under the glass to act as a cushion .The wooden fillets should be fixed with painting.

CENTERING AND SHUTTERING / - Shuttering shall be either of hard wooden planking 30mm thick .The shuttering shall be supported on battens , beams , props , and wedges and properly across placed together so as to make the form work sufficiently rigid strong and actable to support the wet conc. Work and should not yield on working and laying conc. .Beams for centering shall be carried and supported on the walls with double wedges under neath and supported at intervals with props. Props shall consist of ballies or brick pillars in mud mortar. Ballie props shall rest on double wedge placed over wooden planks of 40mm thickness so as to facilitate tightening and causing of centering and shuttering. In case of brick pillars &double wedges inserted in between the sole plank and the beam of the centering and shuttering.

The shuttering shall be kept clear of wall bearing and made to rest on cross beams or battens. The shuttering shall have smooth and even surface and its joint shall be closed tight and shall not permit leakage of cement mortar if required the joints shall be lined with craft paper or other approved material . Inner face of shuttering shall be applied with a wash of molded oil raw linseed oil or other approved material to prevent adherence of conc. For slabs &beams small chamber shall be given in shuttering. Camber of 1cm per 2.50m or .5" per 10feet with a max 4cm.

Centering and shuttering shall not be removed before 14 days in general.Centering and shuttering shall be removed slowly and Carefully without any shock or vibration by slackening and removing the wedges gradually in such a manner that no. part of conc. And shuttering shall be measured in sqm and the surface area in contact with conc. shall be measured.

MUD PUSHKA TARRACING WITH TILE BRICK PAVING / - Mud phuska terracing will be suitable in hot dry region where the rainfall doesn't exceed 130 per annum and externally hot temperature occurs during summers.

MUD MORTARMUD MORTAR : - Mud mortar shall be prepared from good brick earth free from grass, root, gravel, kankar, etc. The earth shall be reduced to a fine powered state and mixed bhusa at 8kg per cu m of mortar and then mixed with sufficient water in a pit. The mix shall be worked up with spades and feet daily for at least 4 days so as to get a homogenous mass...

\*Laying: - The mud mortar shall be laid on terrace the request thickness 75 cm to 10 cm and a minimum moisture condition. The surface shall be checked with straight edge and spirite level and corrected where necessary with the same mortar. The surface shall be checked with straight edges and spirit level and if any cracks appear these shall be filled with liquid cow dung.

MUD GOBRI PLASTER / - The surface shall then be given a coat of 12mm plaster of mud gobri mortar 3:1 cow dung free from grass, stew seeds and other impurities shall be soaked in water and powdered earth shall be added in ratio of 3:1 and mixed thoroughly adding water to have homogeneous mix of workable consistency. The mortar shall than be applied to a uniform thickness of 12mm.

PAVING WITH BRICK : -First class flat tiles 4cm thick well made of good brick earth be used. The tiles shall be level dry on the mud gobri plaster before it dries up completely with open joints not more than 6mm wide. Tile should be mastered by parapet wall by 4cm. The open joints shall than be grouted with cement mortar 1:3 care should be taken to see that no joints remain unfilled or partially filled. The joints than shall be finished flush with surface. The tile paving shall be cured by covering with wet bags or wet sand for at least seven days and during this period the surface shall be protected from damage.

MEASURMENT: - The rate shall be for complete work of mud layer of articulated thickness, mud gobri plaster and the tile paving. The measurement shall be taken for finished work over the tiled surface in sq m no deduction shall be made for opening or rises up to 0.4sq m.

Mud terracing may be over R.C.C. slab or two layers of tiles or one layer of brick or one player of stone slab or wooden planks supported on battens or beams of R.C.C. steel of timber.

One coat or two coat of asphalt may be applied on base or concrete before laying the mud mortar if specified.



DESIGN OF SLAB ( ONE- WAY SLAB)

Room = 2.8. x 4.8.m Assume 1 m width of slab.

acbc = 7 N/mm2 ast = 230 N/mm2

M = 13.33 K = 0.23 J = 0.90 Q = 0.91 N/mm2

Assuming 2800 =25 d

d =112.00 mm D = 112+20+10 =137, Say 140 mm 2

Assuming bearing of slab = 300 mm Eff. span = 2.8+0.3 = 3.1 m LOADING :-

self wt. of slab =0.140x 0.1x 25000 = 3500 N/m Live load = 2000x1 = 2000 N/m wt. of sand filling = 0.06x 1x 15.5x103 wt. of tile tlooring = 0.04x1x11000= 440 N/m Total wt. = 6870 N/m

Max. B.M = WL2 8

= 6870X 3.12 = 82525 N-m 8

= 8252580 N-mm. Eff.depth of slab required. d = M

Qb

= 8252580 = 95mm 0.91x1000

= 95 < 162 - 0.k.

Area of steel per meter witdh of slab

Ast = M ast.j.d

= 8252580 = 35509

230x .90x 112

Area of one 10 mm / bar = II x102 78.54 mm 2

4

C/c spacing of to mm / bar =

= area of one bar x 1000/ total area of steel =78.54 x 1000/ 355.9= 220.7 mm2 say 220 mm2

which is less than 3d

= 3 x 112 =336 or 300 mm

Hence OK.

Actual Ast , = 1000 x 78.54 =357 mm2

( provided)

CHECK FOR EFF. DEPTH OF SLAB FROM DEFLECTION

CONSIDEATION

Pt = 100 Ast

bd

= 100 x 357 =0031 100x112

Fs = 0.58 fy (Ast ( req. ) Ast ( prov.) = 0.58 x 415 x 355.9

= 23909 N/mm2

For Pt = 0.31 % an Fs = 240 N/mm2 Kt. = 1.46. (l/d) = 20 Kt.

max.

( 3100 ) = 20 x 1.46

112 max.

27.7 = 29.2 Hence O.K.

DISTRIBUTION STEEL :-

Area of distribution st. = 0.12 % of Total cross - section area.

=0.12x bd/100 = (0.12 x 1000 x 1400)/ 100=168 mm2 = 168 mm2

using 8 mm ^ bar as distribution to

Area of one 8 mm ^ bar =k x 82 = 50.26 mm2

4

: spacing of 8 mm ^ bar = 50.26 x 1000

168

= 299 say 300 C/c

which is less than 5 d or 450, Hence O.K.

CHECK FOR SHEAR :-

Max S.F.V = W L = 6870 x 208 /2 2

= 9618N

Nominal shear stress xv = V/ bd

=9618/1000x112 = 0.09 N/ mm2

for M 20 conc. & p =0.31 %

Tc = 0.22 + {0.30-0.22} x( 0.31-0.25) (0.50-0.25)

xc = 0.24 n/mm2

from table, for solid slab k = 1.30

.'. permissible shear stress for slabs,

xc = 0.24 x 1.30 = 0.31 N/mm2 .'. xv < xc

Hence no shear reinforcement is required. CHECK FOR DEVELOPEMENT LENGTH :-

set alternate 10 mm Q bar bend up at a distance l/7

= 3.11 x 1000 = 443 mm 7

from centre of sopports

or 445 - 300 = 295mm from support 2

Ast avavible at support = 1/2 x 356

= 178 mm2

Ml = ( ast. Ast. j.d)

= 230 x 178 x 0.90 x 112

= 4126752 N- mm

Suppose the bar are given 90 . bend at cetnre of support, its anchorage value.

Lo = 8^ = 8 x 10 = 80 mm M1 /V + Lo = 4126752 + 80

9618

= 509 mm

Ld =4>ast = 100 x 230 = 449.2 mm 4 xbd 4 x1.28

Since M1 + Lo > Ld

v

Hence code requirement is satisfied. ok

SLAB DESIGN OF ALL ROOM SIZE = 3.2 m x 4.8 m

Assume 1 m width of slab.

a cbc = 7 N/mm2 ast = 230 N/mm2

m = 280 = 13.33 36cbc

k = 0.29 j = 0.90

Q = o.91 N/mm2

Assuring span = 25 D

3.2 = 25 D

d = 3200 = 128 say 130 mm 25

D = 130 + 20 + 10/2 = 155 mm = 130+ 20 + 10 = 155 mm.

Assuming bearing of slab = 300 mm.

Eff. span = 3.2 + 0.3 = 3.5 m

LOADING :-

Self wt. = 0.155 x 1x 25000 = 3875 N/m.

live load = 2000 x 1 = 2000 N/m

Wt. of sand filling = 0.06 x 1 x 1505 x 103

= 930 N/m

Wt. of tile flooring = 0.04 x 1 x 11000

= 440 N/m

Total load = 724 N/m

Max. B.M = wl2 = 72 45 x 3 082 = 11094 N-m 8 8

= 11094000 N-mm Eff. Depth, d = M

Qb

= 11094000 = 110< 130 = Hence Ok O.91 x 1000

Adopt eff. depth of slab = d = 130 mm

Area of stoper m width of slab

Ast. = M = 11094000

ast.j.d 230 x 0.9 x 130

= 412 mm2

Area of one 14 mm ^ bar = k x 102 = 153.5 mm2

4

c/c spacing of 10 mm ^ bar = Area of one bar x 1000.

412

= 190 mm c/c Which is less than 3 d or 300 mm

Hence ok

Actval asc provided = 1000 x 78.54 = 413mm2

CHECK EFF. DEPTH OF SLAB FROM DEFLECTION CONSIDER ATION :-

Pt. = 100 Ast bd

= 100 x 413 = 0.32% 1000x130

Fs = 0.58 fy [ Ast (required) ] Ast (provided)

= 0.58 x 415 [ 412] = 240N/mm2 413

Pt. = 0.32 & fs = 240 N/mm2

kt = 1.46

( L ) = 20 kt d

= 20 X 1.46 = 29.1

( l/d )max. = 3800 = 26.9 < 29.1 130

Hence Ok

DISTRUBUTION STEEL :-

Area of distribution steel = 0.12 % of total cross sectional area

= 0.12 x bd = 0.12 x 1000 x 155 100 100

= 186 mm2

using 8mm ^ bar as distribution steel

Area of one bar 8mm o = \_II x 82 = 50.26 mm2

4

= 270 mm clc

which is less than 5 d or 450

.Hence ok

CHEAR FOR SHEAR :-

Max Shear force, V = wl = 7248 x 302

2 2 =11592N

Nauinal shear stress=Tv =V/ bd

= 11592 =0.09 N/mm2

1000x130

p = 0.32 %

Tc = 0.22+ {0.30-0.22} x {.32-025} 0.50-0.25

= 0.25 N/mm2

v c

hence no shear reinforcement is required.

CHECK FOR DEVELOPMENT LENGTH AT SUPPORT

let alternate gent up bar at distance l/7

= 3.5 x 1000 = 500 mm from centre of supports 7

.'. Ast avavilable att support = 1/2 x 413 = 206.5mm2

M1 = ast. j.d

= 230 x 206.5 x 0.9 x 130 = 5556915 N- mm

V = 11592N

suppot the bar are given 90' bend at the centre of support, its encharege

value

for 8mm ^ Lo = 8 x 10 = 80mm M1/V + Lo = 556915

= 559.38 mm.

Ld\_=4> ast = 100 x 230

4 I 4 x 1.28

bd

Since

M1+Lo < Ld, Hence the code required is satisfied. V

SLAB DESIGN (ONE- WAY):-

Lobby size 1.8m x 51.1m

acbc = 7 N/mm2, ast = 230 N/mm2

m =13.33

k =0.29

j =0.90

Q =0.91 N/ mm2

Asuming span =25 d

=1800 =25 d

d= 72 mm

D= 72 + 20 + 8/2 = 96 mm

Effective span:-

c/c bearing = 1.8 + 0.3 = 2.1 m.

LOADING :-

Self wt. of slab = 0.1x 0.1x 25000 = 2500 N/m live load = 2000x 1 =2000 N/m wt of sand filling = 0.06x 1x 15.5x1000 = 930 N/mm wt of tile flooring = 0.04x 1x 11000 = 440 N/m Total load =5870 N/m

CHECK FOR EFF.DEPTH OF SLAB FROM DEFLECTION CONSIDERATION :-

Pt =100 Ast

= 100 x 218 =0.30 % bd

= (100 x 218) /1000 x 72 = 0.30 %

Fs =0.58 fy { Ast ( req.) } Ast ( pro)

= 0.58 x 415 { 217.5 } 218

= 240 N /mm2 for pt = 0.30 % & fs = 240 N/mm2

Kt. = 1.47

(l/d)max. = 20 Kt

1500/ 72 = 20 x 1.47

25 > 29.4 Hence O.k.

Check for shear :-

Max S.F., V = WL =5870 x 1.8 2 2

= 5283 N

Nominal shear stress, xv = V/bd

=5283=6.073 n/mm2 1000x 72

for m 20 conc. and p = 0.31 %

Tc =0.22+ {0.30-0.22 } x {.30 -0.25 }

0.50- 0.25 = 0.24 %

.'. xv-xc, hence no shear reinforcement is required.

CHECK FOR DEVELOPEMENT LENGTH AT SUPPORTS :-

let alternate 10 mmf bar be bent-up at a distance l/7

= 2.1 x 1000 7

=300mm from centre of support

Ast avavilable at support = 1/2 x 218 =109 mm2

M1 =ast. Ast. j.d

= 230 x 109 x 0.9 x 72 = 1624536 N-mm V =5283 N

suppose the bar are given at 90' bend at the centre of support,

its enchroge value

8x 10 =

80 mm.

Lo = 8^ =

M1 + Lo = 1624536 + 80 v 5283

= 388 mm

Ld =^ ast 4 xbd

= 18 x 230 = 359.3 mm 4 x 1028

M1 + Lo > hence code required. is satisfied.

v

BEAM DESIGN at corner having L= 4.8m :-

acbc. = 7 N/mm2

ast. = 230 N/mm2

m = 13.33 k = 0.29 j = 0.90

Q = 0.91 N/mm2 (use M20 conc.& Fe 415 steel) Clear span of beam = 4.8 m

let eff. depth of beam of = 1 of span

10

.-. D = 480 + 40 = 520 mm ( assuming eff. cover 40 mm )

let wodth of beam = b = 300 mm

.'. Size of assuming scetion of beam = 300 x 520 mm eff. span of bean will be least of following :- Distance b/w centre of support = 4.8 +0 0.3 = 5.1m .'. Eff. Span of beam, l = 5.1m

Self wt. of beam = 0.30 x 0.52 x 25000 = 3900 N/m

Slab load = 6870 = 6870 N/m 2

Total load an beam = 7335 N/m

Max. B.M = wl2 = 7335 x 6.32 = 36390.7N-m 8 8

=36390000N-mm

Assume section is balanced

Qbd2 = M

D = m = 36390000 Qb 0.91 x 300

= 365 mm

Which is less than that assumed in working out load for calculation B.M. . Adopt overall depth of beam D = 520

Avavilable eff. depth assuming 14 mm ^ main bar,

d = 520- 20- 8- 14\_ = 486 mm

2

Ast. of steel req. Ast. = .M

6st. j.d

= 36390000 = 363.2mm2 230 x 0.90 x 486

Area of one bar of 14 mm ^ = %/4 x 142 = 153.5 mm2

No. of bar req. = 363.2/ 153.5 = 2.55 say

3 bar

( Ast provided = 3 x 153.5 = 460.5 mm2)

CHECK FOR MINIMUM RAINFORCEMENT :-

As = 0.85 bd = 0.85 x 300 x 8484 fy 415

= 297.4 mm2

provide steel is more than min. required. Hence sefe.

CHECK FOR DEPTH OF BEAM FOR DEFLECTION CONSIDERATION

p = 100 Ast = 100 x 460 = 0.32% bd 300 x 484

fs = 0.58 fy [ Ast. ( req.) ]

Ast. (prov.)

= 0.58 x 415 x [ 363] = 190 N/m 460

Kt = 1.81

(l/d)max. = 20 kt

= 20 x 1.8 = 36

5100/ 484 = 10.6

= 10.6 < 36 Hence ok

CHEK FOR SHEAR :-

Nominal shear stress xv = \_v\_ = 17604 = 0.12 N/mm2

bd 300x 484

Max permissible share stress for M20 = 1.8 N/mm2

Since xv < xc max. Hence ok.

Assuming one bar to be bent up at 45'

p = 100 As = 100x 2x 153.5 = 0.21% bd 300x 484

for p = 0.21% & M20

xc = 0.20 N/mm

xv > tc, shear raintorcemeant is required.

Shear force for shear reinforcement Vs = V- xcbd

= 17604-0.20 x 300 x 484 = 5410n

shear taken by bent-up bar = asv x Asv x sind where Asc = 1 x ii x 142 = 153.9 mm2

4

.'. shear taken by bent up bar = 230 x 1539 x sin 45

= 24777.9 N

shear taken by bent up bar to Vs

2

=540/2 =2705<24777.9 n

.'. Net shear to be resited by vertical stirrups,

Vs = 5410-2705 =2705 N

using 8mm ^ 2 legged stirrups

Asv =2 x ILx 82 =100.53 mm2 4

spacing , Sv = asv x Asv x d

= (140 x 100.53 x 484)/ 2704

= 2519 mm max. spacing as per min. shear reinforcement.

Sv = 0.87 Asv fy/0.4b

= 0.87x 100.53 x 250/ 0.4 x300

= 182 or 180 mm c/c spacing should not exceed the least of following :

1. 0.75 d = 0.75 x 484 = 363 mm
2. 300 mm

provide 8 mm ^ 2 legged strrups @ 180 c/c throughout the length the of beam

CHECK FOR DEVELOPEMENT LENGTH (end enchorage) :-

M = ast. Ast.j.d Ast = 2 x 153.5 ( 2 bar are at supports) = 307.8 mm2

M1 = 230 x 307 x 0.90 x 484

= 30837866.4 N-mm V =17604N

Suppose the bar given 90' bend at the centre of support, its inchorage

Lo = 84> = 8 x 16 = 128 mm

.'. M1/ V + Lo = 30837866.4/ 17604 + 128

= 1879.9 mm Ld = ast/ 4 xbd

= 16 x 230/ 4x 1.28 = 719 mm

Since M1/ V+ Lo > Ld, Hence code is safe.

SUMMARY :-

Size of beam = 300 x 520 mm

Main steel. = 3 bar of 16 mmf ( one bar bent-up)

value

Stirrups = 8mm ^ 2 legged @ 180mm c/c.

BEAM DESIGN :-

acbc = 7 N/mm2 ast. = 230 N/mm2

m= 13.33

k = 0.29

j = 0.90

Q = 0.91 N/mm2

(use M20 grade conc.& Fe 415 steel)

clear span of beam = L= 4.8 m

let eff. depth of beam =d = 1/10 of span

= 1/10 x 4800 =480 mm

D = 480 + 40=520mm let width of beam =b= 300 mm .'. size of assumed scetion of beam = 300 x 520 mm i) Distance b/w centre of support = 4.8+0.3= 5.1m .'. eff. span =5.1 m

LOADING :-

self wt. of beam = 0.3 x 0.52 x 25000 =3900 N/m

Slab load =6870 N/m

Total Load = 10770 N/m

Max. B.N =wl2 =10770 x 5.12 8 8

=35615.9 N-m

=35015900 N-mm.

Assume scetion is balanced

Q bd 2 = M

d = =358 mm

d = M/ Qb = 35015900/ 0.91 x 300 = 358 mm 358 < 480 mm

.'. Adopt overall depth of beam. D = 520

Avavilable eff. depth assuming 14 mm 0 bar

d = 520 - 20 - 8 - 14/2 = 484 mm

Ast of steel required = Ast = M

ast. j.d

Area of one bar of 14 mm 0 = rc/4 x 142 = 153.9mm2

.'. No. of bar required = 345 = 2.5 say 3 bar.

153

Ast provided = 3 x 153.9 = 460 mm2

CHECK FOR MIN. REINFORCEMENT :-

As = 0.85 bd = 0.85 x 300x 484 fy 415

= 297.4 mm

min. Ast < Ast provided

Provide st. is more than min required. Hence safe.

CHECK FOR DEPTH OF BEAM FROM DEFLECTION CONSIDERATION :-

p = 100 Ast = 100 x 460 = 0.32% bd 300 x 484

Fs = 0.58 fy [ Ast (req.) ] Ast (pro.)

= 0.58 x 415 x( 345/ 460)

= 180 N/mm

for pt = 0.32% & fs = 180 N/mm

kt = 1.8

( l) = 20 kt d max.

= 20 x 1.48 = 29.6

5100 = 10 < 29.6 Hence ok.

484

CHECK FOR SHEAR :-

v = wl = 10770 x 4.8 = 25848 N 2 2

Nominal shear stress , xv = v

bd

= 25848 = 0.17 N/mm2 300x484

max. ( xv) = 1.8 N/mm2

Since xv < xc max Hence ok.

Assuming one bar to be bent up at 45'near the support.

p = 100As = 100 x 2 x 153.5/ 300x 484 = 0.25 N/mm2 For p = 0.21% (M20 grade concrete)

xc = 0.18 + [ 0.22 - 0.18 ] x ( 0.21 - 0.15) 0.25 - 0.15 = 0.204 N/mm2

xv < xc Hence no Shear reinforcement in required.

Provide 8 mmf legged stirrups @ 300 mm clc . thought the

provide 2-12 mm0 anchor bar for holding stirrops.

CHECK FOR DEVELOPEMENT LENGTH ( end enchroge) at support :-

M1 = ast Ast j.d

Ast = 2 x 153.5 = 307 mm2

M1 = 230 x 307 x 0.9 x 484 = 30757716 N-mm

suppose the bar are given 90' at the centre of support Lo = 80 = 8 x10 = 80 mm

M1 + Lo = 30757716 + 80 = 1269.9mm v 25848

ld = \_0st = 16 x 230 = 719 47 bd 4x 1.28

M1+ Lo > Lo Hence code is safisty.

length

v

BEAM DESIGN :-

acbc = 7 N/mm2, ast = 230 N/mm2

m = 13.33 ( from steel table..)

k= 0.29 j = 0.90 Q = 0.91 N/mm2

( use M20grade conc. & Fe 415 steel)

Clear span of beam L = 3.2 m

let eff. depth of beam = d= J\_ of span

10

= 3200 = 320mm 10

D = 320 +20 = 360

let eff. width of beam = 300 mm

. Size of assumed section of bean = 300 x 360 mm

. Distance b/w centre of support 3.2 + 0.3 = 3.5 m

.'. eff. span = 3.5 m

LODING :-

Self wl.of beam = 0.3x 0.35 x 25000 = 2625 N/mm

Slab load = 7245 = 3623 N/m 2

+2935 = 6558 N/m Total load = 9183 N/m.

Max. B.M .= wl2 = 9183 x 3.52 = 14061.5 N-m 8 8

= 14061500 N-mm

Assume section us balanced

Qbd2 = B.M

d = \_M\_\_ = 14061500 Qb 0.91 x 300

= 227 mm < 320 mm

.'. Adopt overal depth of beam, D = 360mm

Avavilable eff. depth assuming 12mm 0 main bars.

d = 360 - 20- 08 - 12 = 326 2

( For mild exposure conditions nominal cover) of using 8 mm 0

Ast req. Ast. = M = 14061500

ast.j.d 230 x 0.9 x 320

= 212.3 mm2

Area of one bar of 12 mm 0 = II\_x 122 113.09 mm2

4

.-. No of bar req. = 212.3 = 1.9 Say 2 bar

113.09

Ast provided = 2 x 11.3.09 = 226 mm2

CHECK FOR MIN RAINGORCEMENT: -

As = 0.85bd = 0.85 x 300 x 320 fy 415

= 196.6 mm2

Provided steel is more than min req Hence safe.

CHECK FOR DEPTH OF BEAM FROM DEFLECTION CONSIDERATION :-

pt = 100ast = 100 x 226 bd 300 x 320

= 0.26 %

fs = 0.58 fy [ Ast (req.) ] = 216 N/mm2 Ast(Provi)

For Pt = 0.27% of fs = 216 N/mm2 Kt= 1.5

(l) max = 20 Kt d

20x 1.5 = 30

30500 = 10.9 < 30 Hence ok. 320

CHECK FOR SHEAR :-

V = wL = 9183 x 302 = 14892.8 N 2 2

Shear stress xv = V = 14692 = 0.15N/mm2 bd 300x320

xc max > xv Hence ok .

No shear reinforcement req .

using 8 mm 0 2 legged stirrups

Asv = 2 x n x 82 = 100.53 mm3 4

Max spacing as per min shear rainforce us .

Sv = 0.87 Asv fy = 0.87 x 100.53 x 250 = 180 mm 0.4b 0.4 x30

.'. Provide 8mm 0 mm 2 legged stirrups @ 180 mm c/c throughout length Provide 2-12mm 0 anchor bar for holding stirrups . CHECK FOR DEVELOPEMENT LENGTH :- M1 = st Ast jd

Ast = 2 x 113.09 = 226 mm2 M1 = 230x 226 x 0.9x 320 = 14970240 N-mm

V = 14692 N

Suppose the bars are given a 900 bend at center of support ,Its anchorage

value

L =8 0 = 8x12=96mm

o

M+L =14970240 + 96 = 1115mm

1 o

V 14692

L = 0 st = 12 x 230 = 539mm d

4 xM 4 x 1.28

bd

Since M+ L > L.

1 o d

V Hence Safe.

acbc = 7 N/mm2 ast = 230 N/mm2

m = 13.83 k = 0.29 j = 0.90 Q = 0.91N/mm2

Clear span of beam l = 2.8 m

let eff. depth of beam d = 1 x span

10

= 1/10 x 2.8 m = 280 mm D = 280 + 40 = 320 mm Let eff width of beam = 300 mm .'. Size of assumed section of beam = 300 x 320 mm .'. Distance b/w centre of support = 2.8 + .3 = 3.1 m .'. Eff span = 3.1 m LOADING :-

Self wt. of beam = 0.3 x 0.31 x 25000 = 2325 N/mm2 Slab load = 7245/2 = 3623 + 2935 = 6558 N/m Total load = 8883 N/m2

Max. B.m. = wl2/8 = 88 83 x 2.82/8 = 87 05.34N-m =8705340 N-mm Assume section is balanced Qbd2 = m d = M/Qb = 178.6mm 178.6 < 280 mm Adopt overall depth of beam, D = 320mm .'. Avavilable eff. depth assuming 12 0 bar main bars d= 320 - 20 - 08 -12/2 = 286 mm

Ast. req. = m/ ast.j.d = 8705340/ 230 x 0.9 x 280 = 150 mm2 Area of one bar of 12 mm = rc/4 x 122 = 113.5 mm2 No. of bar req = 150/113 = 1.33 say 2 bars Ast provided = 2 x 113.5 = 226 mm2 CHECK FOR MIN RAINFORCEMENT :- Ast. = 0.58bd/ fy = 0.58 x 300 x 280/ 415 = 117.4 mm2

pro

Provided Ast. is more than the req. Ast Hence safe

CHECK FOR DEPTH OF BEAM FROM DEFLECTION CONSIDERATION

pt = 100 Ast./ bd = 100 x 226/ 300x 230 = 0.27

fs = 0.58 fy ( Ast. seq.

Ast. pro.

= 160 N/mm2 for pt. = 0.27 & fs = 160 N/mm2 kt. = 2.0

(l/ d) = 20 kt. = 20 x 20 = 40

v 7 max.

3100 = 11 < 40 HENCE OK

280

CHECK FOR SHEAR :-

V = WL = 8883 X 2.8 2 2

= 12436.2 N

Shear srtess = xv = V/ bd = 0.15

xc max. = xv . Hence ok

No shear reinforcement is required.

Using 8 mm ^ 2 legged stirrups...

Asv. = 2x n x 82 = 100.50 mm2 2

max. spacing as per min. shear reinforcement

Sv = 0.87 Asv fy = 0.87 x 100.53 x 250 = 180 mm 0.4 b 0.4 x 300

.'. Provide 8 mm ^ 2 legged stirrups @ 180 c/c throught the length. Provide 2- 12 mm ^ anchor bar for holding stirrups.

CHECK FOR DEVELOPEMENT LENGTH ( END ANCHOR BAR AT SUP PORT) :-

M1 = ast. Ast.j.d

Ast. = 230 x 113.09 = 226 mm2 M1 = 230 X 226 X 0.90 X 280 = 13098960 N-mm

* = 12436.2 N

Suppose the bar are given a 90' bend at the centre of support , its enchorage value

Lo = 8 x 4> = 12 x 8 = 96 mm

M1+ Lo = 13098960 + 96 = 1149 mm

* 12436.2

Ld = 4> ast = 12 x 230 = 539 mm

4 xM 4 x 1.28

bd

M + Lo > L Hence OK

1 d

V

COLUMN DESIGN at corner :-

Load on coloum=3667.5+4442+(self load )

= 3667.5+4442+7650+550 K-N =565759 N/m acc = 5 N/mm2

asc = 190 N/mm2

Actual length of column l = 3.4 m

Eff. length of column l = 3.4 mm = 3400 mm

Longitudnal steel in column varies from 0.8 - 6 %

Assume 2% of steel

Asc=2/100 xAg =0.02Ag Ac = Ag -Asc = Ag -0.02Ag = 0.98 Ag P = ccAc = scAsc 566Kn =5 x .98Ag +190 x 0.02Ag 566000 = 8.7Ag Ag=65057.47 mm2

Assuming the coloum to be square

Side of square coloum req. = 66057 =255

Hence Adopt sige of column =260 x 260 mm

.-. Ag (Provided) =260 x 260 = 67600 mm2

Check whether the coloum is long or short.

leff./b = 3400 /260 = 13.1 >12

. It is a long coloum.

Reducation co- efficient, C =1.25 -l eff.

' r

4

= 1.25 -3400/48 x 260 = 0.98

Safe load, P = Cr ( acc Ac + ascAsc)

= Cr ( acc (Ag - Asc) + accAsc)

566 x 103 = 0.98 x(5(67600 -Asc) +190Asc ) 234760 = .98 x(338000 -5Asc +190Asc

234760 = 181.3 Asc .'. Asc =1295mm2

Min. St. req. = 0.8% of Ag

=0.8 x 67600 =540.8 . Provide Asc = 1285 mm2 Assuming 20 mm 0 bar to be used as longitudinal steel Area of one 8 mm 0 = II/4 x202 =314.5mm2 •. no. of bar req. = 1295/314.5 =4.12 Say 4 bar

Provide 4 bar of 20 0 mm

(Actual area of st. Provided ) =4 x 314 = 1256 mm2

DESIGN OF LINKS :-

a) Dia. of lateral tiesshould be greater than :- 6 mm :- 1/4 x 2 = 5mm

COLUMN DESIGN :-

Load on column = 5885 + 4442 + 4442 + 550000 + 7650 = 572419N/m acc = 5 N/mm2 asc = 190 N/mm2

Actual length column = 3.4m

eff. length of column = eff. = L = 3.4 m = 3400 mm

Longitudinal steel in column varies from 0.6% - 6%

Assume 1% of steel

Asc = 1/100 of Ag = 0.01 Ag

Ac = Ag - Asc = Ag - 0.0 1 Ag = 0.99 Ag

p = acc Ac + asc Asc

573 x 103 = 5x 0.99Ag + 190 x 0.01Ag

573 x 103 = 6.85 Ag

Ag = 83043.5

Assume the column to be square

side of column square = 83044 = 288 say = 290 mm

Hence Adopt size of column = 290 x 290mm

.'. Ag (Provided) = 290 x 290 = 84100mm2

Check whether the column is long or short

l eff./b = 3400/290 = 11.72 < 12

safe load an column = P = acc ac + asc Asc

= 5 x ( Ag - Asc ) = sc Asc

573 x 103 = 5(84 1 00 - Asc ) + 190 Asc

573 x103 = 420500 - 5 Asc + 190 Asc

152500 = 185 Asc

Asc = 821.6 mm2

Min. steel req. of column = 0.8% of Ag

= 0.8/100 x 84100 = 673mm2 .'. Provide Asc = 821.6mm2

Assuming 18 mm0 bars to be used as longitudinal steel Area of one 180 number = II/4x 182 = 254.5 mm2 .-. No. of bar req. = 820/ 254.5 = 3.25 say = 4 bar .'. Provide 4 bass of 18 mm 0

(Actual area of steel provided = 4 x 254.5 = 1018mm2

DESIGN OF LINKS :-

1. Dia of lateral ties should be greater than
   1. 6mm
   2. 1/4 x 18 = 4.5mm

. Privide 6mm0 lateral ties

1. Spaving or pitch of lateral ties should be the least of tououring :-
   1. Least lateral diminision of column = 290 mm
   2. 16 x18 = 288 mm

.'. Provide 6 mm0 lateral ties @ 290 mm C/c

SUMMARY OF DESIGN :-

Size of column = 290mm x 290 mm Main steel = 4 bars of 18 mm ^ Links = 6mm0 @ 290 mm c/c

Bearing capacity of soil = po = 200 KN/m2 = 200 x 103 N/m2

b= 260mm = 0.26m acbc = 7N/mm2, fck = 20 N/mm2 ast = 230 N/mm2

Design constant :- m= 13.13 k=0.29 j= 0.90

Q=0.91 N/mm2 SIZE OF FOOTING :- Load of column = 566 KN + 56.6 (10% of column) = 622.6KN wt .of footing of back fill, W1 = 622.6 x 10/100 = 62.3KN

(Assume w1 as 10% of w)

Area of footing = W + w1

Bearing capacity of soil

= 622.6 x 103 +62.3 x 103 = 3.4 m2 200 x 103 let B = one side of square footing

B x B = 3.4 m2

B = 3.4 = 1.85 say 1.9 m

Adopt size of fotting = 1.9m x 1.9m Net up ward soil Pressure ( p) Net upward soil pr. p) = W

B xB

= 622.6 x 103 = 172465.4 N/m2 1.9 x 1.9

DEPTH OF FOOTING :- xv < K x

c

where k = 0.5 + pc ( pc = 260/260 = 1)

= 0.5 + 1 = 1.5 >1 K = 1

xv =xc = 0.72 N/mm2 = 720000 N/mm2 CASE - 1 ( one - way action of fotting ) Shear force at critical section = p x B x [ 1/2(B-b)-d]

= 172465.4 x 1.9 x [ 1/2 x ( 1.9 -.26) -d] i)

Shear force resisted by conc. = xc x B x d

= 720000 x 1.9 x d ii)

Eqvating i) of ii)

172465.4 x 1.9 x [ 1/2 x ( 1.9 - .26 ) -d ] = 720000 x 1.9 x d 141421.6 = 1509421.6 d d = 0.1 m

CASE -II

The criticar scetion of two- way action of footing ( punching shear )

us

considered at a distance of d/2 from the periphery of the face of

column.

shear force at the crical scetion = P { B2 - ( b+d)2 )}

= 172465.4 { 1.92 - ( o.26+d )2 } iii)

shear force resisted by conc.= Ic x 4 ( b+d ) x d

= 720000 x 4 ( 0.26+d ) x d iv)

Equating equation iii) & iv) and we get..

172465.4 {1.92 - (0.76 +d )2 }=720000 x 4 ( 0.26+d ) xd

3.6- ( 0.26+d )2 = 16.7 (0.26+ d) xd

3.6- (0.07 +d2+0.52d) =4.3 d + 16.7 d2

3.43-d2 - 0.52d = 4.3d + 16.7d2

17.7d2 + 4.82d - 3.43 = 0

d2+0.27d-0.2=0

d = -0.27+ [(.27)2-4 x ( 0.2 ) 2 x 1

= -0.27+0.9= 0.33m

(neglect - sign)

Depth of footing shall be greater of case I & II

d=0.33 m= 330mm.

CHECK OF BENDING MOMENT for depth of footing

Critical scetion for B.M. is considered at the face of column.

B.M. = p x B/8 x (B-b)2

=172445 x 17\_x ( 1.9- 0.26)2 8

=110167 N-m = 110167000 N-mm v)

Moment of resistance = Qbd2

=0.91 x 1.9 x 1000 xd2 vi)

Equating equation. v) & vi) we get.. 110167 x 103 = 0.91x 1.9 x 1000x d2

d = 252.4 mm < 330mm (provided value) .'. This is all right STEEL REQUIRED :-

Ast. in each direction = B.M./ ast. j.d

= 110167 x 1000/ 230x 0.90x 330 = 1612 mm

Hence provide 11 bar of 14 mm ^ bar ( HYSD) uniformly spaced in the width of 1.9 m in each direction at right angle to each other.

CHECK FOR DEVELOPE MENT LENGTH :-

Developement length = Ld = ^ ast./ 4 xbd

= 539 mm

providing side cover of 50 mm

Avavilable length = 1/2 ( 1900 - 260) -50

= 770 mm

Which is more than Ld, ... Hence safe.

SUMMARY OF DESIGN :-

D = d +^/2 + clear cover

= 330 + 14/2 + 50 = 386 mm

say 390 mm

steel 11bar of 14 ^ both- way.

COLUMN FOOTING DESIGN: -

Let bearing capacity of soil po = 200 KN/m2

= 200x 103 N/m2

b = 290 mm acbc = 7 N/mm2& fck = 20 N/m2 a st = 280 N/mm2

1. DESIGN CONSTANT :- m= 13.13

k= 0.29 j = 0.90 Q= 0.91 N/mm2

1. SIZE OF FOOTING :-

Load on column = 572 KN + 85.8 (15% of column) = 658 KN Wt. of footing of back fill w1 = 658 x 10/100 = 65.8 KN

Area of footing = w + w1

bearing capacity of soil

= 658 x103 + 65.8 x 103 = 3.6

200 x 103 Let B one side of square footing

.-. B x B = 3.6 m2

B = 1.9024 say 1.9 m

.'. Adopt size of footing = 1.9 m x 1.9 mm

Net upward soil pressure (p)

P = w/BxB = 65 8 x103/1.9 x 1.9 = 182271.5 N/m2

3) DEPTH OF FOOTING = xv < k xc

where k = 0.5 + pc ( p = 290 = 1 )

290

= 0.5 +1 + 1.5 = 1

k = 1

xc = 0.16 fck = 0.16 x 20 = 0.72 N/mm2 xv = xc = 0.72 N/mm2 = 720000N/m2 CASE :- I

Shear force at critical section = p x B x [ 1/2(B-b) -d]

=182271.5 x 2.9 x[ 1/2x [ 11-0.29) -d ] i)

Shear force resisted by conc. =0 x B x d

= 720000 x 1.9.x d (ii)

Equating (i) & (ii) we get 182271.5 x R.9 x { ^ x ( 1.9-0.29 ) -d = 720000 x 1.0 x d

0.805 -d = 3.9d d = 0.164 m

CASE - II

Shear force aty critical section = [ b2- ( (b+d )]

= 182271.5 ( 1.92 - (.29+d2) - (iii)

Shear force sestid by conc.= 0 x4 ( b+d ) xd

= 720000 x 4 (0.29+d ) xd - (iv)

Eequating equ. ( iii) & iv )

182271.5 [1.92 - ( .29+d)2] = 720000 x4x ( 0.29 +d ) xd

3.6- ( 0.29+d)2 ] = 15.8 ( 0.29+d ) xd

3.6 (0.084+d2+58d ) 4.7d+ 15.8d2

3.5 -d2- 0.58d = 4.7 d + 15.8d2

16.8d2 + 4.12 - 3.5 = 0

d2 + 0.25- 0.21 = 0

d= 0.25 + 252 -4 x ( 0.25 )

d = 0.7 m = 0.35 2

Depth of footing shell be greeter of CASE :- I & II d= 0.35= 350 mm

CHECK FOR BENDING MOMENT FOR DEPTH FOOTING :-

B.M.= P x B\_( B-b)2 8

=182271.5 xj.9 ( 0.9-0.29 )2 8

12210.7 N-m. =1122 1 0.7x 103 N/ mm2 Mommet of resistance , A Bd2 - v

= 0.91 x 1.9 x 1000 xd2 - vi)

Equatry v & vi

112210.7 x 103 = 0.91 x 1.9 x1000xd2 d= 254. < 350 mm (Provided value) :- This is all right

Steel req. =

Area of st. req. in each direction,

Ast = B.M./ 4> 6st.j.d

= 112210.7x103 =1548.8mm2 230x0.9x350

Providing 14 mm 0 bars Area of one bar of 14 mm 0 = 153.5mm2 No of bar reg. = 1538.8=10.08

153.5

say 10 bars

Hence provided 10 bars of 14 mm 0 bar HYSD Fe 415 ( assumed the width 1.9 m in each direction at right engle to each other

.'. CHECK FOR DEVELOPEMENT LENGTH :-

Development ength, Ld = 0st

4 i

= 539 mm

Providing side coner of 50 mm Avavilable ength = 1/2 ( 1900-1290)-50

.Hence safe.

=755 mm Hence, which us more than Ld,

SUMMARY DESIGN :-

D = d+ 0/2 + clear cover = say 410mm

steel 10 bar of 14 mm 0 bath way

DESIGN OF LINTEL OVER DOOR :- Clear span = L = 1200 mm Bearing = 200 both side eff. l = 1200 + 200 = 1400mm Assume D= l/ 10 = 1400/ 10 = 140 mm D= 140 mm LOAD :-

self wt. of lintel

w1 = 0.14 x 0.3 x 25000 = 1050 N/ m Load of masonary

w2 = 0.30 x 0.7 x 19200 = 4032 N/ m

Total load :

W = w1 + w2

=1050 +4032 = 5082 N/m

B.M. = wl /8 = 1245 N-m

= 1245 x 10 N-m

M = Qbd

d = m/ Qb = 1245 x 1000/ 0.91 x 300

= 67.5 mm < 140 Hence safe.

D = 140mm

d = 140 - 20 - 8 - 10/2 = 109 mm

or say d = 110mm

Assumed d > calculated d

Hence safe.

Ast. = M/ ast = 1245 x 1000/ 230 x 0.9 x 110

= 54.68 mm

Assume 8 mm ^ bar = n /4 x (8x 8) = 50.24 mm

No. of bar = 54.68/ 50.24 = 1.2

= say 2 bar 8 mm ^

Ast. = 2x 50.74 = 102 mm CHECK MIN. REINFORCEMENT :-

Min. Ast. = 0.85 x b x d/ fy = 0.85 x 300 x 110/ 415

= 67.6 mm < 102 mm Hence safe

CHECK FOR DEPTH :-

pt = 100 Ast/ b x d

= 100 x 102/ 300 x 110 = 0.31

pt = 0.31 %

fs = 0.58 fy ( Ast req./ Ast pro.) = 0.58 x 415 ( 54.6/ 102) = 128.8

from table kt = 1.2

(l/ d)max. > (l/d) provided

20 kt > 1400/ 110

20 x 1.2 > 12

24 > 12 Hence safe.

CHECK FOR SHEAR :-

V = wl/2 = 5080 x 1.2/2= 3048 N iv = V/ bd = 3048/ 300 x 110 = 0.1 cmax. = 1.8 N/mm pt. = 1.47 % & M-20 ic = 0.28

iv > ic < icmax. Design safe.



BAR BENDING SCHEDULE OF BEAM (5.1 x 0.3):-

Main steel bar 16 mm ^ Main bent up bar 16 mm ^ Anchor bar 12 mm ^ Stirrups 8 mm ^

1. Length of main steel bar 16mm ^ No. of bar = 2

Length of bar , L = Clear span + bearing

= 4.8 + 0.3 = 5.1 m

Total length of bar = L + 2 hooks (2x9 D) = 5.1 + (18 x 0.016) = 5.088 m

1. Main bent up bar 16 mm ^

No. of bar = 1

Length of bar = L = Clear span + bearing = 5.1 m

Total length of bar = L + 2 hooks + 0.84 for two- bent up = 5.1 + (18x 0.016) + (0.84x 0.10) = 5.472 m

1. Anchor bar 12 mm ^

No. of bar = 2 Length of bar = L = 5.1m Total length of bar = L + 2 hooks

= 5.1+ (2(9) x 0.012) = 5.316 m

1. Stirrups 8 mm ^ @ 180 c/c

L = 5.1 m

No. of stirrups at 5 cm c/c at end = 2 No. No. of stirrups at 18 cm c/c in b/w = 510-10/18 = 28 99 | Page

Total No. of stirrups = 2 + 28= 30

Length of one stirrups = 2(44+ 22) + 30 = 162 cm

= 1.62 m

Schedule of Bars (R.C.C. Beam).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. no. | Description | Shape | Length | No. | Total length (m) | Wt./m length | Total wt. (kg) |
| 1. | Main steel bar 16mm ^ |  | 5.39 | 2 | 10.78 | 1.58 | 17.0 |
| 2. | Main bent up bar 16mm ^ |  | 5.5 | 1 | 5.50 | 1.58 | 8.7 |
| 3 | Anchor bar 12mm ^ |  | 5.32 | 2 | 10.64 | 0.89 | 9.4 |
| 4. | Stirrups 8 mm^ | \* | 1.6 | 30 | 48 | 0.4 | 19.2 |
| Total 54.30 kg | | | | | | | |

BAR BENDING SCHEDULE FOR BEAM (3.1 x 0.30):-

Main steel bar 12 mm ^ Anchor bar 12 mm ^ Stirrups 8 mm ^

* 1. Length of main steel bar 12mm ^

No. of bar = 2

Length of bar , L = Clear span + bearing = 2.8 + 0.3 = 3.1 m Total length of bar = L + 2 hooks (2x9 D) = 3.1 + (18 x 0.012) = 3.32 m

* 1. Anchor bar 12 mm ^

No. of bar = 2 Length of bar = L = 3.1m Total length of bar = L + 2 hooks

= 3.1+ (2(9) x 0.012) = 3.32 m

3. Stirrups 8 mm ^ @ 180 c/c L = 3.1 m

No. of stirrups at 5 cm c/c at end = 2 No. No. of stirrups at 18 cm c/c in b/w = 300-10/18 = 16 Total No. of stirrups = 2 + 16 = 18 Length of stirrups = 2 (27 cm + 25 cm) + 30 extra 101 | Page

= 134 cm = 1.34 m So total length of 16 nos. stirrups each.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. no. | Description | Shape | Length | No. | Total length (m) | Wt./m length | Total wt. (kg) |
| 1. | Main steel bar12 mm  l |  | 3.32 | 2 | 6.64 | 0.89 | 5.91 |
| 2. | Anchor bar 12mm | |  | 3.32 | 2 | 6.64 | 0.89 | 5.91 |
| 3. | Stirrups 8 mm| | \* | 1.34 | 16 | 21.44 | 0.4 | 8.6 |
| Total 20.4 kg | | | | | | | |

BAR BENDING SCHEDULE FOR COLUMN (0.3x 0.3)

* + 1. 14 mm | bar in base footing
    2. 18 mm | bar vertical
    3. 6 mm | ties @ 290 mm c/c

1. 11 bar 14 mm |

C/c spacing = 1900/11 = 172 mm

Total No. of bar = 11+ 11 = 22 no. Total length of bar = 1.6 + 2 hooks

= ( 1.6 + ( 18 x 0.014) = 1.85 m

Total bar length = 22x 1.85 = 40.7 m

2. 16 mm 18 ^ vertical bar No. of bar = 4 no. Total length of bar = 3+ 0.4 + 0.20 + 12d +0.20 = 4 m

3. 6 mm ^ tie bar @ 290 C/c

No. of tie = (300+ 40)/2+ 1 = 12.7 4(250) + 24 x 0.08 = = say 13 no.

Length = 4 C + 24 D = 1001.9 mm = 1.01 m

Schedule of Bars (R.C.C. square column)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. no. | Description | Shape | | Length | No. | Total length (m) | Wt./m length | Total wt. (kg) |
| 1. | 14 mm ^ bar |  | | 1.85 | 22 | 40.7 | 1.2 | 49 |
| 2. | 18 mm ^ vertical bar |  |  | 4 | 4 | 16 | 1.58 | 25.3 |
| 3. | 6 mm ^ tie @ 29 cm c/c |  | > | 1.01 | 13 | 13.13 | 0.22 | 2.9 |

BAR BENDING SCHEDULE FOR SLAB (51.1x 12.6)

1. Main bar of 10 mm ^ @ 190 mm c/c L = Length - 2 cover = 12.6 - 2x 0.04 = 12.52 m Total length of main bar = 12.52 + 2 hooks = 12.52 + ( 18x 0.010) = 12.7 m

No. of bar = (51.1/.38) + 1 = (51100/ 380) + 1 = 135.4 no. say 136 no.

2. Bent -up bar of 10 mm ^ @ 190 mm c/c

= 12.6 + bearing - 2 cover + 2 bent-up + 2 hooks

= 12.6 + 0.20 - (2x 0.04) + ( 2 x.0.42 x 0.06) + (2 x 0.010) = 12.8 m

No. of bent-up bar = 51.1/ .38 = 134.4 say 135 no.

3. Distribution bar 8 mm ^ @ 270 mm c/c

Length of straight bar = 51.1 - 2 end cover + 2 hooks = 51.1 - 0.08 + ( 18 x 0.008) = 51.2 m

No. of bars = 12.6/ .27 = 1260 / 270

= 46.6 say 47 no.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. no. | Description | Shape | Length | No. | Total length (m) | Wt./m length | Total wt. (kg) |
| 1. | Main bar 10 mm 4> @ 190  mm c/c |  | 12.7 | 1 3 6 | 1727.2 | 0.62 | 1107.1 |
| 2. | Main bent- up bar10 mm  4> @ 190 c/c |  | 12.8 | 1 3 5 | 1728 | 0.62 | 1072.1 |
| 3. | Distribution bars 8 mm 4> @ 270 mm c/c |  | 51.2 | 47 | 358.4 | 0.39 | 139.8 |
| Total 2318 kg = 23.18 quintal | | | | | | | |

BAR BENDING SCHEDULE FOR LINTEL

Main straight bar 8 mm | Anchor bar 8 mm | Stirrups 6 mm | @ 150 mm c/c

1. Main straight bar of 8 mm |

No. of bars = 2

Length of bar = L + bearing - end cover

= 1.2 + 0.20 - 0.08 = 0.92 m

= 92 cm

Total length of bar = L + 2 hooks

= 0.92 + (18 x 0.082) = 1.06 m = 106 cm So total length of main bar 8 mm | = 1.14 m each

1. Anchor bar 8 mm |

No. of bars = 2

Length of bar L= 0.92 m

Total length of bar = 106 cm

1. Stirrups 6 mm | @ 150 c/c

No. of stirrups at 5 cm c/c at the end = 2 no.

No. of stirrups at 8 cm in b/w = 92 - 10 ^ 8 = 8.25 say 9

Total no. of stirrups = 2+9 = 11 no.

Length of one stirrups = 2(22+90) + 30 extra

= 72 cm = 0.72 m Total length of 11 no. stirrups 6 mm ^ = 0.72 each

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. no. | Description | Shape | Length | No. | Total length (m) | Wt./m length | Total wt. (kg) |
| 1. | Main st. bar 8 mm ^ |  | 1.06 | 2 | 2.12 | 0.4 | 0.85 |
| 2. | Anchor bar 8 mm ^ |  | 1.06 | 2 | 2.12 | 0.4 | 0.85 |
| 3. | Stirrups 6 mm ^ |  | 0.72 | 11 | 7.92 | 0.4 | 3.2 |
| Total 4.9 kg | | | | | | | |



ABSTRACT OF QUANTITY

1. CONC. in foundation

Total = 54.1 m3 Ratio = 1:6:18 Sum = 1+6+18 = 23

Total dry mortar for 34.1 m3 c.conc. = 1.54 x 54.1 =83.3 m3

Cement = 1/ 23 x 83.3 = 3.62 m3

= 3.62/ 0.03472 = 104.4 bags = say 105 bags

Sand = 6/23 x 83.3 = 21.7 m3 Aggregates = 18/ 23 x 83.3 = 65.2 m3

* 1. P.C.

Total = 80.7 m2 = 80.7 x 0.04 = 3.2 m3

Total dry mortar for 3.2 m3 c.conc = 3.2 X 1.54 = 5.0m3

Cemant = 1/ 7 x 5.0 = 0.71 m3 = 20.4 bags,

Say 21 bags

Sand = 2/ 7 x 5.0 = 1.43 m3 Aggregate = 6/ 7 x 5.0 = 4.3 m3

Lintel

Total = 4.8 m3

Total dry mortar for 4.8 m3 c.conc = 4.8 X 1.54 = 7.4m3

Cemant = 1/ 7 x 7.4 = 1.1 m3 = 30.4 bags,

Say 31 bags

Sand = 2/ 7 x 7.4 = 2.1m3 Aggregate = 6/ 7 x 7.4 = 6.3 m3

COLUMN

Total = 136.6 m3 c.conc.

Ratio = 1:2:4 Sum = 1+2+4 = 7

Total dry mortar for 136.6 m3 c.conc. = 1.54 x 136.6 = 210.4 m3

Cement = 1/ 7 x 210.4 = 30.2 m3 = 866.7 bags Say 867 bags

Sand = 2/ 7 x 210.4 = 60.1 m3

Aggregate = 6/ 7 x 210.4 = 180.3 m3

BEAM

Total = 124.2 m3

Ratio = 1:2:4 Sum = 1+2+4 = 7

Total dry mortar for 124.2 m3 c. conc. = 1.54 x 124.2 = 191.3 m3

Cement = 1/ 7 x 191.2 = 27.3 m3 = 786.7bags = 787 bags

Sand = 2/ 7 x 191.3 = 54.7 m3

Aggregate = 6/ 7 x 191.3 = 163.9 m3

SLAB

Total = 172.3 m3 Ratio = 1:2:4 Sum = 1+2+4 = 7

Total dry mortar for 172.3 m3 c. conc. = 1.54 x 172.3 = 265.3 m3

Cement = 1/ 7 x 265.3 = 37.9 m3 112 |Page

= 1092.3bags = 1093 bags

Sand = 2/ 7 x 265.3 = 75.8 m3

Aggregate = 6/ 7 x 265.3 = 227.3 m3

BRICK WORK

Total B.W. in foundation = 96.5 m3

Bricks for 1 m3 = 500 nos.

Bricks for 96.5 m3 = 96.5 x 500 = 48250 nos.

Total B.W. in super structure = 439 m3

Bricks for 1 m3 = 500 nos.

Bricks for 439 m3 = 439 x 500 = 219500 nos.

FINISHING

Total finishing inside (1:6) = 1897.5 m2

Quantity of wet mortar = surface area x thickness = 1897.5 x 0.12 = 21.9 say 22 m3

Quantity of dry mortar = 22 x 1.2 = 26.4 m3

Ratio = 1:6 Sum = 1+6= 7

Cement = 1/ 7 x 26.4 = 3.8 m3

Say 109 bags Sand = 6/ 7 x 26.4 = 22.6 m3

Total finishing otside (1:5) = 781.5 m2

Quantity of wet mortar = surface area x thickness = 781.5 x 0.012

= 9.4 say 10 m3

Quantity of dry mortar = 10 x 1.2 = 12.0 m3

Ratio = 1:5 Sum = 1+ 5 = 6

Cement = 1/ 6 x 12.0 = 2.0 m3 Say 58 bags Sand = 5/ 6 x 12.0 = 10 m3

Lime for White Washing

Total quantity = 3034 m2 Th. = 2.5 mm

Volume = 3034 x 0.0025 = 7.5 m3

Waste = 25 % = 7.5 + 7.5/ 100 = 7.8 m3

Total dry volume = 7.8 x 20/100 + 7.8 = 9.36 m3

Paint

Total quantity = 334 m2 Paint 1.5 lit. for 10 m2 @

Steel bar

Total Steel in Beam (5.1 x 0.3):- Steel in one beam = 54.30 kg No. of beam = 68

Total steel in beam = 54.30 x 68 = 3692.4 kg = 36.92 quintal

Total steel in beam (3.1 x 0.3):- Steel in one beam = 20.4 kg No. of beam = 128

Total steel in beam = 20.4 x 128 = 2611.2 kg = 26.11 quintal 116 |Page

Total steel in slab (51.1 x 12.6):- = 2320 kg = 23.20 quintal

Total steel in column (0.3 x 0.3):-

Steel in one column = 72.5 kg

No. of column = 136

Total steel in column = 72.5 x 136 = 9860 kg = 98.60 quintal



ABSTRACT OF COST:-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S. No. | Particulars | Quantity | Rates Rs. P. | Amount Rs. P. |
| 1. | Cement bags | 3071 no. | 250.0/ bag | 7,67,750/- |
| 2. | Sand | 205 m3 | 500.0/ m3 | 1,02,500/- |
| 3. | Aggregate | 635 m3 | 650.0/ m3 | 4,12,750/- |
| 4. | Bricks | 2,67,750 no. | 3.2/ brick | 8,56,800/- |
| 5. | Lime for washing | 3034 m2 | 100 m2 / 50 kg @ 2250/ quintal | 34,132/- |
| 6. | White washing | 3034 m2 | 10.0/ ft.2 | 3,26,600/- |
| 7. | Tiles | 14294 no. | 3.5/ Tile | 50,028/- |
| 8. | Wood works Door | 36 no. | 3000.00/ piece | 1,08,000/- |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Window | 56 no. | 2500.00/ piece | 1,40,000/- |
|  | Ventilator | 07 no. | 1000.00/ piece | 7,000/- |
| 9. | Steel bars |  |  |  |
|  | Bar 18 mm 0 | 34.40 quintal | 3400.0/ quintal | 1,16,960/- |
|  | Bar 16 mm 0 | 17.50 quintal | 3450.0/ quintal | 60,375/- |
|  | Bar 14 mm 0 | 33.32 quintal | 3500.0/ quintal | 1,17,320/- |
|  | Bar 12 mm 0 | 21.50 quintal | 3550.0/ quintal | 76,325/- |
|  | Bar 10 mm 0 | 21.80 quintal | 3600.0/ quintal | 78,480/- |
|  | Bar 08 mm 0 | 27.02 quintal | 3900.0/ quintal | 1,05,378/- |
|  | Bar 06 mm 0 | 07.86 quintal | 4000.0/ quintal | 31,440/- |
| Total |  |  | 33,91,838/- |  |
| Architectural Design & Drawing @ 15% of total cost | | | 5,08,780/- | |
| Water Supply & Sanitary installation & 10 % of total cost | | | 3,39,184/- | |
| Electricity installation @ 12 % of total cost | | | 4,07,020/- | |
| Other services @ 6 % of total cost | |  | 2,03,510/- | |
| Total |  |  | 48,50,332/- |  |
| Add contingencies 5 % overall | |  | 2,42,520/- | |
| Supervision charge3 % overall | |  | 1,45,510/- | |



