



MAHA BARATHI ENGINEERING COLLEGE

NH-79, SALEM-CHENNAI HIGHWAY, A.VASUDEVANUR, CHINNASALEM (TK), KALLAKURICHI (DT) 606 201.
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DEPARTMENT OF CIVIL ENGINEERING

Academic year 2024-2025(ODD SEM)

LAB MANUAL

CE3611 BUILDING DRAWING AND DETAILING LABORATORY III YEAR / VI SEMESTER (Regulation 2021)



NAME	:
DEPARTMENT	:
SUBJECT CODE/NAME	:
YEAR	:
BATCH	:

PREPARED BY

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ASST.PROFESSOR / CIVIL**

VERIFIED BY

**Mr. P. ASHOK
HOD / CIVIL**

GENERAL INSTRUCTIONS

The following instructions should be strictly followed by students in the CAD Lab:

1. Students are advised to enter the CAD lab WITH FORMAL SHOES ONLY.
2. They are not supposed to move the systems and monitors.
3. Students are advised to complete their record work before the next class.
4. Students are asked to switch off the computers before leaving the lab.
5. Students can access the printers through lab technician.
6. Students have free access to use the computers and software available in the lab.
7. During the laboratory hours, accessing the internet is strictly prohibited.
8. Computer games are strictly prohibited in the CAD lab.

1. Syllabus

OBJECTIVES:

- To impart knowledge and skill relevant to Building drawing and Detailing lab using computer software

LIST OF EXPERIMENTS

1. Principles of planning and orientation.
2. Buildings with load bearing walls and RCC roof (Plan, section, elevation).
3. Buildings with sloping roof.
4. Buildings with Framed structures.
5. Building information modeling.
6. Reinforcement details of RCC structural elements (slab, beam and column).
7. Reinforcement details of footings (Isolated, stepped, combined footing).
8. Steel structures (Steel Connections detailing, beam to column connection, beam to beam connection – bolt & Weld, Roof truss & purlin).

COURSE OUTCOMES:

- On completion of the course, the student is expected to be able to
- CO1** Draft the plan, elevation and sectional view of the load bearing and framed buildings.
CO2 Draw the structural detailing of RCC elements.
CO3 Draw the structural detailing of RCC water tanks, footings and retaining walls.
CO4 Draw the structural detailing of steel structures.
CO5 Draft the structural detailing of Industrial structures.

TEXTBOOKS:

1. Sikka V.B., A Course in Civil Engineering Drawing, 4th Edition, S.K.Kataria and Sons, 2015.
2. George Omura, Mastering in Autocad 2005 and Autocad LT 2005– BPB Publications, 2008

REFERENCES:

1. V.B.Sikka, "A course in Civil Engineering Drawing" S.K.Kataria & Sons Publishers, Seventh Edition, 2015.
2. D.N.Ghose, "Civil Engineering Drawing and Design" CBS Publishers & Distributors Pvt.Ltd., 2nd Edition, 2010.
3. National Building Code of India 2016 (NBC 2016)
4. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design (Third Edition), Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2017.
5. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016.

2. STUDY EXERCISE – CONVENTIONS & SYMBOLS

Sl. No.	Term	Abbreviation
1.	Aggregate	Agg
2.	Approximate	Approx
3.	Asbestos cement	asb/cem
4.	At	@
5.	Air Conditioner	A/C
6.	Brick work	BWK
7.	Brick on edge	BOE
8.	Building	Bldg
9.	Bench mark	BM
10.	Cast-iron	CI
11.	Cement concrete	CC
12.	Centre to centre	c to c, c/c
13.	Cement mortar	CM
14.	Coarse rubble masonry	CR
15.	Random rubble masonry	RR

Sl. No.	Term	Abbreviation
16.	Column	COL
17.	Concrete	CONC
18.	Corrugated	CORR
19.	Cross-section	CS
20.	Cupboard	CB
21.	Collapsible gate	CG
22.	Door	D
23.	Damp proof course	DPC
24.	Diameter	dia,
25.	European water closet	EWC
26.	Figure	Fig.
27.	Finished floor level	FFL
28.	Floor trap	FT
29.	Flushing cistern	FC
30.	Fresh air inlet	FAI
31.	Full supply level	FSL




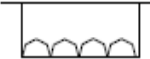






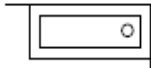
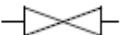
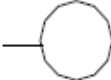


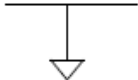
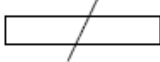



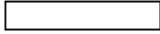

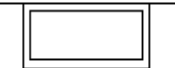







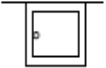



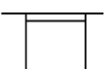





Sl. No.	Term	Abbreviation
32.	Full tank level	FTL
33.	First floor	FF
34.	Floor level	FL
35.	Flush out latrine	FOL
36.	Galvanized	Galv
37.	Galvanized iron	GI
38.	Grease trap	GRT
39.	Ground level	GL
40.	Grills	G
41.	Gully trap	GT
42.	Height	Ht
43.	Indian water closet	IWC
44.	Imperial (standard) wire gauge	SWG
45.	Inspection chamber	ICH, IC
46.	Intercepting trap	IT

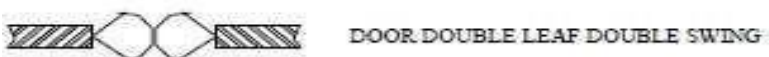
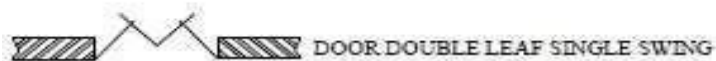
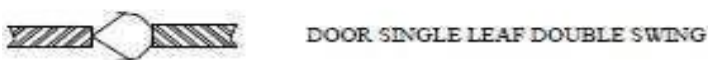
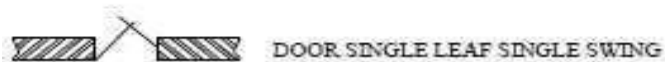
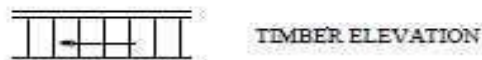
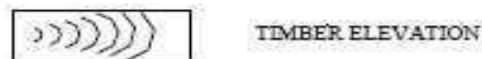
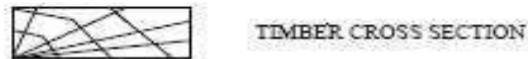
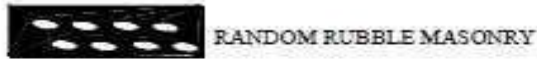
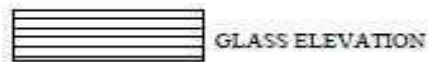
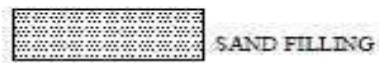
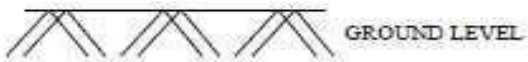
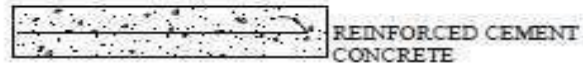
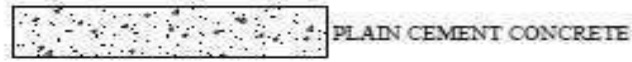
Sl. No.	Term	Abbreviation
47.	Joist	J
48.	Jolly work	JW
49.	Kilo	K
50.	Kilogram	KG
51.	Kilometer	KM
52.	Litre	LT.
53.	Level crossing	LC
54.	Low water level	LWL
55.	Lime mortar	LM
56.	Lime concrete	LC
57.	Maximum flood level	MFL
58.	Maximum water level	MWL
59.	Manhole	MH
60.	Maximum	Max
61.	Mild steel	MS
62.	Millimeter	mm

Sl. No.	Term	Abbreviation
63.	Minimum	MIN
64.	Not to scale	NTS
65.	Number	No.
66.	Overhead tank	OHT
67.	Plain cement concrete	PCC
68.	Plinth level	PL
69.	Prestressed concrete	PCONC
70.	Radius	Rad
71.	Rainwater pipe	RWP
72.	Rolled section / Rolling shutter	RS
73.	Rolled steel joist or I-section	RSJ OR I
74.	Reinforced Cement Concrete	RCC
75.	Ribbed tor steel	RTS
76.	Stone ware pipe	SWP
77.	Surki mortar	SM
78.	Sink	S

Sl.No.	Term	Abbreviation
79.	Soil pipe	SP
80.	Standard	Std
81.	Septic tank	ST
82.	Switch	Sw
83.	Ventilator	V
84.	Vent pipe	VP
85.	Wash basin	WB
86.	Water closet	WC
87.	Window	W
88.	Window cum ventilator	W/V
89.	Water level	WL

SYMBOLS

			
1. Light plug	11. Immersion heater	21. Exhaust fan	31. Urinal stall
			
2. Power plug	12. Bell point	22. Fan regulator	32. Indian type WC
			
3. Meter	13. Bell	23. Rectangular bath	33. Stop valve or sluice valve
			
4. Light bracket	14. Buzzer	24. Bidet	34. Fire extinguisher
			
5. Fluorescent light (single)	15. Telephone instrument point internal	25. Shower head	35. Fire hydrant
			
6. Fluorescent light (double)	16. Fire alarm push	26. Wall lavatory basin	36. Pump
			
7. One-way switch	17. Aerial	27. Corner lavatory basin	37. Gully
			
8. Two-way switch	18. Ceiling fan	28. Plain kitchen sink	38. Manhole or inspection chamber
			
9. Intermediate switch	19. Bracket fan	29. WC	39. Rainwater outlet
			
10. Electric unit heater	20. Tower rail	30. Urinal corner hung	40. Refrigerator



3. STUDY EXERCISE – AUTOCAD COMMANDS

ARC	Creates an arc
AREA	Calculates the area and perimeter of objects or of defined areas
ARRAY	Creates multiple copies of objects in a pattern
BHATCH	Fills an enclosed area or selected objects with a hatch pattern
BLOCK	Creates a block definition from objects you select
BOUNDARY	creates a region or a polyline from an enclosed area
BOX	Creates a three-dimensional solid box
BREAK	Erases parts of objects or splits an object in two
CAL	Evaluates mathematical and geometric expressions
CHAMFER	Bevels the edges of objects
CIRCLE	Creates a circle
COPY	Duplicates objects
DIST	Measures the distance and angle between two points
DIVIDE	Places evenly spaced point objects or blocks along the length or perimeter of an object
DONUT	Draws filled circles and rings
ELLIPSE	Creates an ellipse or an elliptical arc
ERASE	Removes objects from a drawing
EXPLODE	Breaks a compound object into its component objects
EXPORT	Saves objects to other file formats
EXTEND	Extends an object to meet another object
EXTRUDE	Creates unique solid primitives by extruding existing two-dimensional objects
FILLET	Rounds and fillets the edges of objects
GRID	Displays a dot grid in the current viewport
GROUP	Creates a named selection set of objects
HATCH	Fills a specified boundary with a pattern
HELP (F1)	Displays online help
ID	Displays the coordinate values of a location
IMPORT	Imports files in various formats into AutoCAD
INSERT	Places a named block or drawing into the current drawing
LEADER	Creates a line that connects annotation to a feature
LENGTHEN	Lengthens an object
LIMITS	Sets and controls the drawing boundaries and grid display
LINE	Creates straight line segments
LINETYPE	Creates, loads, and sets linetypes
LIST	Displays database information for selected objects
LTSCALE	Sets the line type scale factor
MLINE	Creates multiple parallel lines
MOVE	Displaces objects a specified distance in a specified direction
MTEXT	Creates multiline text
NEW	Creates a new drawing file

OFFSET	Creates concentric circles, parallel lines, and parallel curves 12
OPEN	Opens an existing drawing file
OPTIONS	Customizes the AutoCAD settings
ORTHO	Constrains cursor movement
OSNAP	Sets object snap modes
PEDIT	Edits polylines and three-dimensional polygon meshes
PLAN	Displays the plan view of a user coordinate system
PLINE	Creates two-dimensional polylines
PLOT	Plots a drawing to a plotting device or file
POINT	Creates a point object
POLYGON	Creates an equilateral closed polyline
QUIT	Exits AutoCAD
RECTANG	Draws a rectangular polyline
REDRAW	Refreshes the display in the current viewport
REGEN	Regenerates the drawing and refreshes the current viewport
REGION	Creates a region object from a selection set of existing objects
ROTATE	Moves objects about a base point
SAVE	Saves the drawing under the current file name or a specified name
SCALE	Enlarges or reduces selected objects equally in the X, Y, and Z directions
SKETCH	Creates a series of freehand line segments
SNAP	Restricts cursor movement to specified intervals
SPHERE	Creates a three-dimensional solid sphere
SPLINE	Creates a quadratic or cubic spline (NURBS) curve
SPLINEDIT	Edits a spline object
STRETCH	Moves or stretches objects
SUBTRACT	Creates a composite region or solid by subtraction
TEXT	Displays text on screen as it is entered
TIME	Displays the date and time statistics of a drawing
TORUS	Creates a donut-shaped solid
TRIM	Trims objects at a cutting edge defined by other objects
U	Reverses the most recent operation
UNDO	Reverses the effect of commands
UNION	Creates a composite region or solid by addition
UNITS	Controls coordinate and angle display formats and determines precision
XLINE	Creates an infinite line
XPLODE	Breaks a compound object into its component objects
ZOOM	Increases or decreases the apparent size of objects in the current viewport

Ex. No :

Date :

PRINCIPLES OF PLANNING AND ORIENTATION

Aim:

To understand the principle of planning and orientation of the building structures.

Plan aspect of residential building:

The planning of residential buildings requires careful considerations on the part of the architect.

The barest requirements for a family unit are living room, kitchen, bath and w.c. But for the purpose of discussion, the usual requirements of a normal residential unit can be mentioned as follows:

- (1) Bath and w.c.
- (2) Bed room
- (3) Dining room
- (4) Drawing room
- (5) Garage
- (6) Kitchen
- (7) Living room
- (8) Open chowk
- (9) Passages
- (10) Stair
- (11) Store
- (12) Verandah

Planning aspects of industrial structures:

Following are the factors which are to be considered while planning the industrial structures:

- (1) Functional aspect
- (2) Lighting
- (3) Materials of construction
- (4) Mechanical layout
- (5) Number of floors
- (6) Site conditions
- (7) Ventilation

Requirements of big industrial units:

The size of industrial unit is generally decided by the number of workers or labourers employed by the unit and accordingly, the industrial unit is required to provide various facilities for the smooth functioning of the industrial concern. Following are the requirements of big industrial units:

- (1) Canteen
- (2) Cloak-room
- (3) Drinking water
- (4) Entrance
- (5) Loading and unloading platforms
- (6) Medical aid
- (7) Office
- (8) Sanitary block
- (9) Storage

Principles underlying building bye-laws:

The broad principles to be observed while framing the building bye-laws.

(1) Permissible size of plots:

The minimum size of plot required for each family unit shall be as follows:

- 170m² for one family unit
- 300 m² for two semi-detached family units
- 670 m² for ownership flats.

(2) Margins:

The margins on road side and adjacent properties shall be respectively 4.50 m and 3.00 m. For plots having areas less than 300m², they shall be respectively 3.00m and 2.00 m.

(3) Area of rooms:

Table shows the minimum areas of various rooms.

Sl. No.	Use of room	Minimum area	Remarks
1.	Living room, Bed room, Drawing room, Sitting room, Ladies room, Dining room, Study room	9m ²	No side to be less than 2.40m
2.	Store room, Kitchen	5.40 m ²	No side to be less than 1.80m
3.	Bath room, Dressing room, Pump room, Water room, Coal room	Minimum 1.35 m ² and max. 4.50 m ²	No side to be less than 90cm.
4	W.C., Urinal	0.81m ²	No side to be less than 90cm.

(5) Plinth height:

It shall be 45cm above road level or plot level, whichever is higher.

(6) Height of floors:

The minimum heights shall be as follows:

2.10m: Bath room, w.c., pump room, coal room and water room.

2.70m: Floor height on each floor

The maximum height of floors shall not be more than 1.25 times the minimum height.

(7) Projections in margins:

Following projections in marginal spaces shall be permitted:

(i) Canopy of 3.00m width above 2.40m from ground level;

(ii) Gallery of maximum width 1.20 m at floor levels.

(iii) Stair attached to building and open to sky with minimum width of 90cm; and

(iv) Weather-shed of maximum width 50cm at lintel level

(8) Cellar:

The permission to construct cellar shall be granted with the following restrictions:

Height : 2.40m

Stair width : 90cm

Ventilation : One-tenth of floor area

Water and drainage connection: Not allowed

Use : For storage only

Maximum area : One-half of built-up area of G.F

(9) Loft:

The provision of loft shall be permitted in kitchen and store. The maximum width of loft shall be one-third the width in that direction. The maximum height above loft shall be 1.50m and bottom of loft shall be at a minimum height of 2.10m from floor level.

(10) Lift:

For buildings having more than three floors (exclusive of ground floor), lift shall be provided at the rate of one lift for 20 family units or part thereof. The lift shall be provided from ground floor and its minimum capacity shall be of 6 persons.

(11) Ventilation:

All rooms except coal room, water room, store room and garage shall have atleast one side adjacent to open space. Area of windows and ventilators excluding frames shall be atleast one-tenth of the floor area of room.

(12) Stair:

The minimum width of stair shall be 90 cm and it shall be made of fire-proof construction. The pitch of stair shall be within 30 to 45. The stair cabin shall not exceed 11m² in area.

(13) Recommended sizes of doors, windows and ventilators:

Doors	D	1.20 m x 2.10 m
	D1	1.00 m x 2.10 m
	D2	0.90 m x 2.10 m
Windows	W	1.80 m x 1.20 m
	W1	1.50 m x 1.20 m
	W2	1.20 m x 0.60 m
Ventilators	V	0.60 m x 0.60 m
	V1	0.60 m x 0.45 m
	V2	0.30 m x 0.30 m

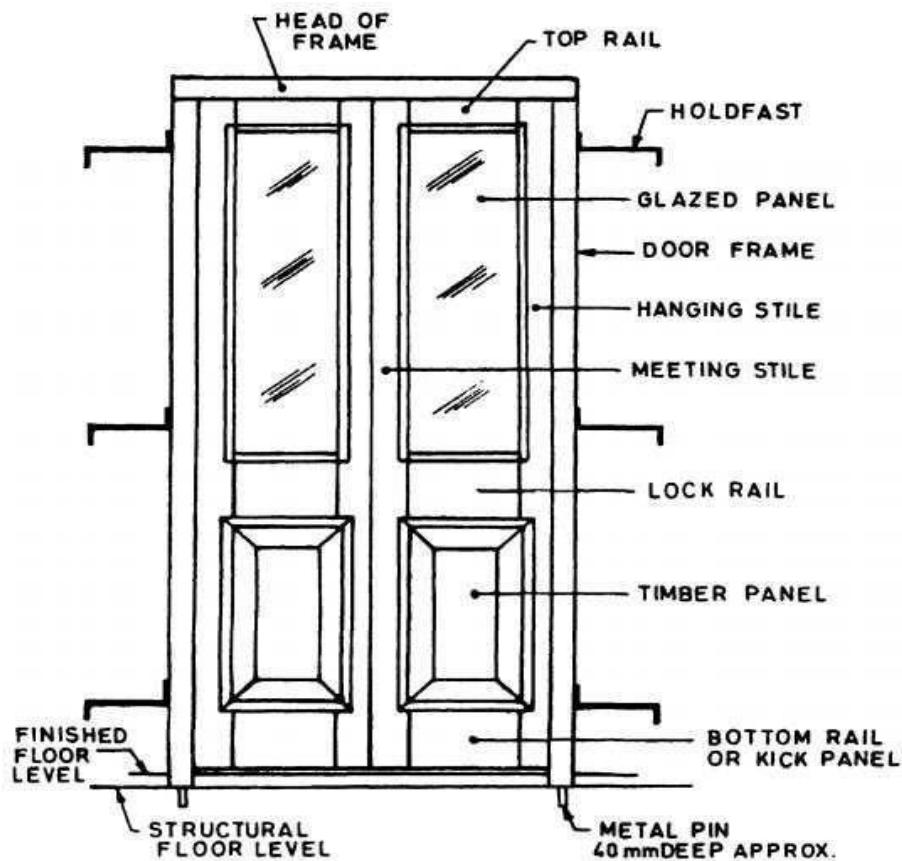
(14) Joinery Details

FIG. 1 TYPICAL ILLUSTRATION OF DOUBLE PANELLED DOOR WITH
TIMBER AND GLAZED PANELS

RESULT:

The principle of planning and orientation of the building structure has been discussed.

Ex. No :

Date :

BUILDING WITH LOAD BEARING WALLS AND RCC ROOF

(Plan, section, elevation)

Aim:

A building may be residential or public building. The plan, section along given vertical plane and elevation gives the details of building.

Plan:

Plan of building represents a horizontal section of building at given height seen from top. It is a general conventional to imagine that the building has been cut down by a horizontal plane at the sill level of the window and is seen from the top after removal of so cut part. The plan shows the arrangement of rooms, verandah or corridor, position of door, and window and other openings along with their respective sizes.

Section:

Section is also known as vertical section and sectional elevation or cross section. It is imagined that a finished buildings is cut vertically along a line so that the building is separated into two portions along the imagined vertical plane right from top of the building to the lowest part of foundation. The view that can be seen while travelling along this imaginary vertical plane when looking towards left is drawn to the same scale as that adopted for the plan. The line which is drawn on the plan to indicate the section is called sectional line and represented by A-B or X-X. The arrow heads shall be marked to indicate the way in which the sectional view is to be drawn. The necessity of the section is to indicate all the vertical dimensions like, foundation details, basement, details of flooring, height of the super structure, sizes of doors and windows, thickness of roofing, width and depth of parapet wall, lintels, sunshades, portico and other details.

Elevation:

Elevation or front view is the outward view of a completed building along any side of the building. When a building is seen by standing in front of it, the view that can be viewed is known as front elevation. Similarly backside view is called rear elevation or from any side of it which is known as side elevation.

Procedure:

1. Type „UN“ ◀↵ (enter) and set up the units in meters.
2. Type „L“ ◀↵ give the dimensions for line as 5.0 ◀↵ and indicate the direction of line if ortho is ON
3. Proceed the above procedure for all the walls.
4. By typing „O“ ◀↵ give offset distance as 3.0 ◀↵ for external walls and 0.15 ◀↵ for internal walls
5. Type „Tr“ double enter ◀↵ ◀↵ for trim command then trim the extra and unnecessary lines.
6. By typing A ◀↵ give arc command to indicate or give doors.
7. Type DLI ◀↵ to give the dimensions for the plan.
8. Type DT ◀↵ to give text in each part of the plan.

9. Using the above commands section and elevation is also drawn by following same procedure.
10. Type „H“ ◀↓ for batch command and indicate the cross section and indicate brick work, concrete and sand filling etc.,

Result:

The plan, section and elevation of the load bearing structure has been drawn using Autocad.

Ex. No :

Date :

BUILDING WITH SLOPE ROOF

Aim:

To draw a building with R.C.C slope roof using Auto CAD with suitable scale the following views with complete dimensions and details.

1. Plan at window sill level.
2. Section on AB.
3. Front elevation.

Specifications:

The following specifications correspond to the line plan of the reading room with R.C.C flat roof.

1. Foundation:

The foundation for all main walls will be in cement concrete 1:4:8, 600 wide and 200 thick laid at 600 below ground level. The masonry footing will be in RR masonry in CM 1:5, the first footing being 400x400 for all walls.

2. Basement:

The basement will be in RR masonry in CM 1:5, 200 wide 300 thick above G.L for all walls and is filled with clean sand to a depth of 150. A D.P.C in CM 1:3, 20 thick will be provided for all walls at basement level.

3. Super structure:

All walls will be in B.W in CM 1:5, using 1st class B.W, 200 thick. The height of all walls will be 3000 above F.L. All walls including basement will be plastered smooth and CM 1:4 externally and 1:6 internally for 12.5 thick. Parapet walls, 200 thick and 450 high will be provided all round.

4. Roofing:

The roofing will be of R.C.C 1:2:4 mix , 100 thick flat slab over the room. A weathering course in brick jelly lime concrete 1:5:9 mix plastered with combination mortar 75 thick over the slab.

5. Doors, windows :

D- Flush door : 1500 into 2100W-
Window paneled: 1200x1200

6. Lintel:

All internal wall openings will be provided with R.C.C lintels, 1:1.5:3 mix; 150 thick. All external openings will be provided with R.C.C lintel – cum-sunshade, 1:1.5:3 mix, 600 wide and 50 thick.

7. Flooring:

The flooring will be in CC 1:4:8, 130 thick and plastered smooth with CM 1:3, 20 thick.

8. Steps:

Steps will be in brick walk in CM 1:5 laid on a 1800 x450 x150 thick CC 1:4:8 footing. Rise 150, Tread 300.

Procedure:

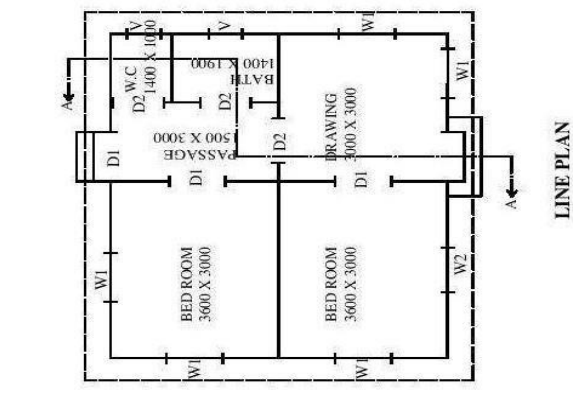
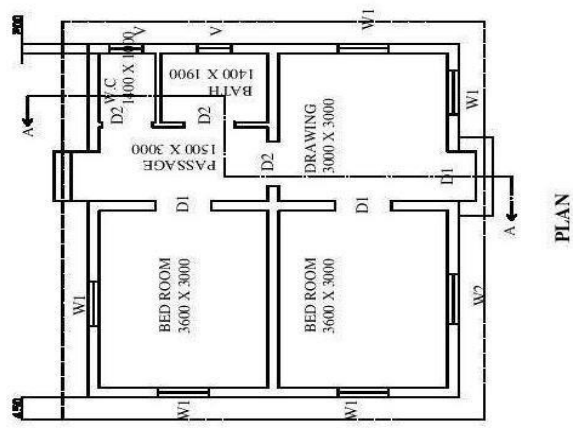
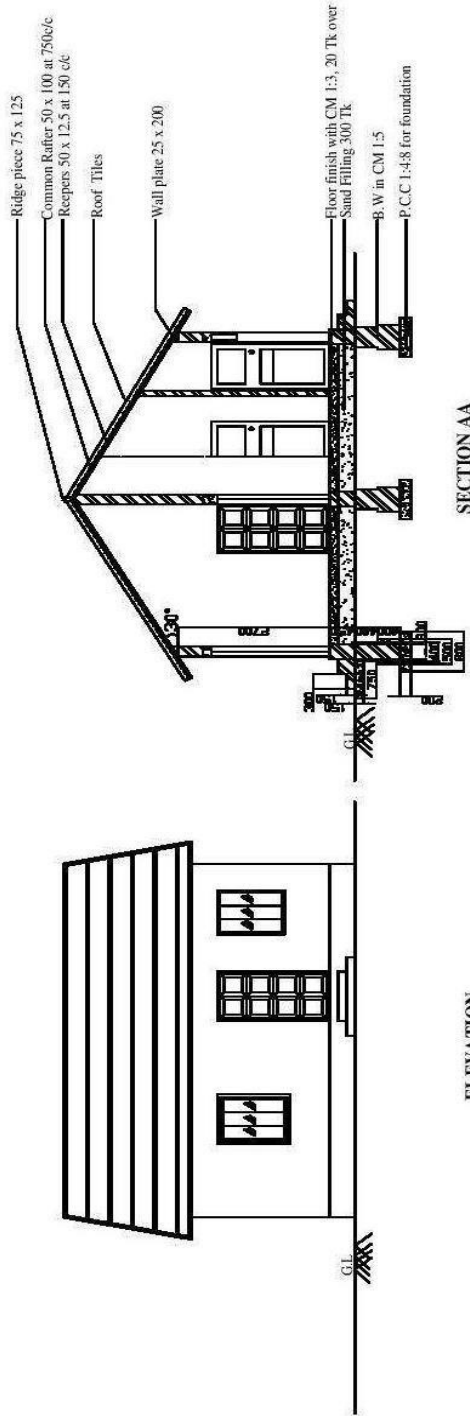
1. Type „UN“ ◀↵ (enter) and set up the units in meters.
2. Type „L“ ◀↵ give the dimensions for line as 5.0 ◀↵ and indicate the direction of line if ortho is ON
3. Proceed the above procedure for all the walls.
4. By typing „O“ ◀↵ give offset distance as 3.0 ◀↵ for external walls and 0.15 ◀↵ for internal walls
5. Type „Tr“ double enter ◀↵ ◀↵ for trim command then trim the extra and unnecessary lines.
6. By typing A ◀↵ give arc command to indicate or give doors.
7. Type DLI ◀↵ to give the dimensions for the plan.
8. Type DT ◀↵ to give text in each part of the plan.
9. Using the above commands section and elevation is also drawn by following same procedure.
10. Type „H“ ◀↵ for batch command and indicate the cross section and indicate brick work, concrete and sand filling etc.,

Note:

1. Any other dimensions found necessary may be assumed suitably making clear indications of the same.
2. All dimensions indicated are in millimeter.

Result:

The plan, section and elevation of the structure with slope roof has been drawn using Autocad.



REFERENCE

TYPE	DESCRIPTION	SIZE
D1	Panelled Door	1000x2100
D2	Panelled Door	900x2100
W1	Panelled Window	900x1300
W2	Glazed Window	1000x1200
V	Acumibar Latched	600x650
	Steps:	
	Rise	200
	Tread	300

ALL DIMENSIONS ARE IN mm

Ex. No:

Date :

BUILDINGS WITH FRAMED STRUCTURES

Aim:

To draw the following views with complete dimension for a residential building with single bed room (R.C.C flat roof)

1. Plan at window sill level.
2. Section on ABCD.
3. Front elevation.

Specifications:

The following specification correspond to the line plan of a house with single bed room and attached bathroom with R.C.C flat roof.

1. Foundation:

The foundation for all main walls and verandah retaining walls will be CC 1:4:8 mix, 1000 wide and 200 thick laid at 1100 below ground level. The masonry footing will be in BW in CM 1:6, the 1st footing being 700x400 and the 2nd being 400 x 500 for all walls and verandah retaining walls.

2. Basement:

The basement will be in BW in CM 1:6, 200 wide and 600 high above GL for all main walls and verandah retaining walls is filled with clean sand to a depth of 450. A D.P.C in CM 1:3, 20 thick will be provided for all walls at basement level.

3. Super structure:

All walls will be in B.W in CM 1:5, using 1st class B.W, 200 thick. The height of all walls will be 3000 above F.L. the height of roof at verandah portion will be 2700. The partition wall in WC and bath 100 thick in BW in CM 1:5 using country bricks and carried up to a height of 2100. One brick pillar 200x400 will be provided in the verandah. All walls including basement will be plastered smooth and CM 1:4 externally and 1:6 internally for 12.5 thick. Parapet walls, 200 thick and 600 high will be provided all round.

4. Roofing:

Theroofing will be of R.C.C 1:1.5:3 mix, 125 thick flat slab over the rooms and the verandah. A weathering course, 75 thick consists of two course of flat tiles set in CM 1:3 mixed with crude oil will be provided with slab.

5. Doors, windows,etc.,:

- D1-panelled door: 1100x 2100
- D2-panelled door: 900x 2100
- W1-panelled Window: 1200 x 1200
- W2-Glazed Window: 1500 x 1200
- V1-Ventilator glazed: 900 x 450
- V2-Ventilator glazed: 1500 x 450
- J – R.C. Jolly: 2400 x 1200

CB-cupboard: 300 depth
S-shelf: 200 depth

6. Lintel:

All internal wall openings will be provided with R.C.C lintels, 1:1.5:3 mix; 150 thick. All external openings will be provided with R.C.C lintel – cum-sunshade, 1:1.5:3 mix, 450 wide and 150 thick and 600 wide R.C.C lofts shall be provided in bed, kitchen and utility.

7. Flooring:

The flooring will be in CC 1:4:8, 130 thick and plastered smooth with CM 1:3, 20 thick.

8. Steps:

Steps will be in brick walk in CM 1:5 laid on 800 x150 thick CC 1:4:8 footing. Rise 200, Tread 300.

Procedure:

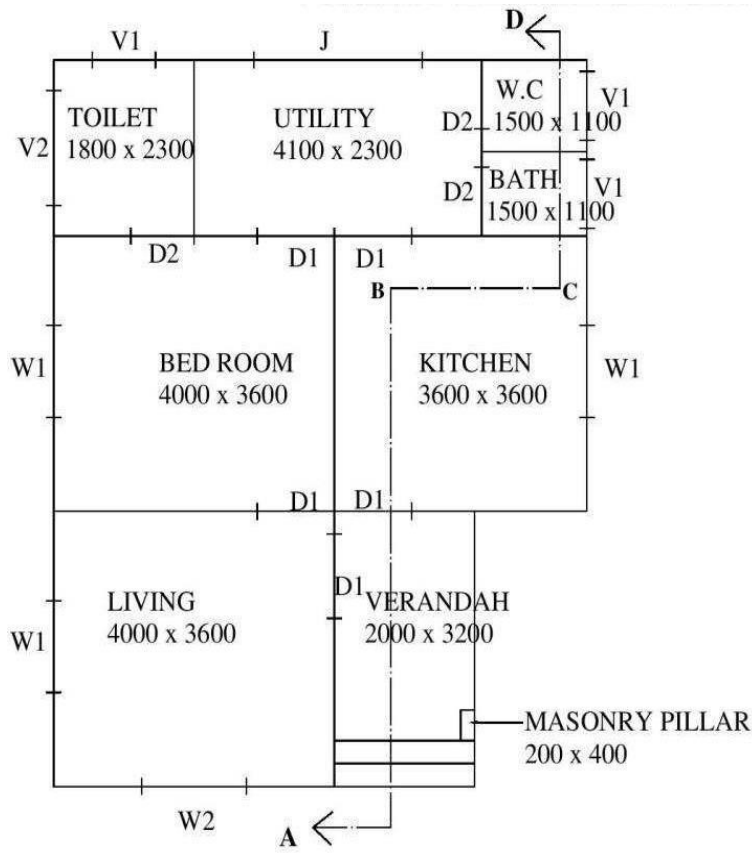
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2. Type „L“ ◀↵ give the dimensions for line as 5.0 ◀↵ and indicate the direction of line if ortho is ON
3. Proceed the above procedure for all the walls.
4. By typing „O“ ◀↵ give offset distance as 3.0 ◀↵ for external walls and 0.15 ◀↵ for internal walls
5. Type „Tr“ double enter ◀↵ ◀↵ for trim command then trim the extra and unnecessary lines.
6. By typing A ◀↵ give arc command to indicate or give doors.
7. Type DLI ◀↵ to give the dimensions for the plan.
8. Type DT ◀↵ to give text in each part of the plan.
9. Using the above commands section and elevation is also drawn by following same procedure.
10. Type „H“ ◀↵ for batch command and indicate the cross section and indicate brick work, concrete and sand filling etc.,

Note:

1. Any other dimensions found necessary may be assumed suitably making clear indications of the same.
2. All dimensions indicated are in millimeter.

Result:

The plan, section and elevation of the framed structure has been drawn using Autocad.



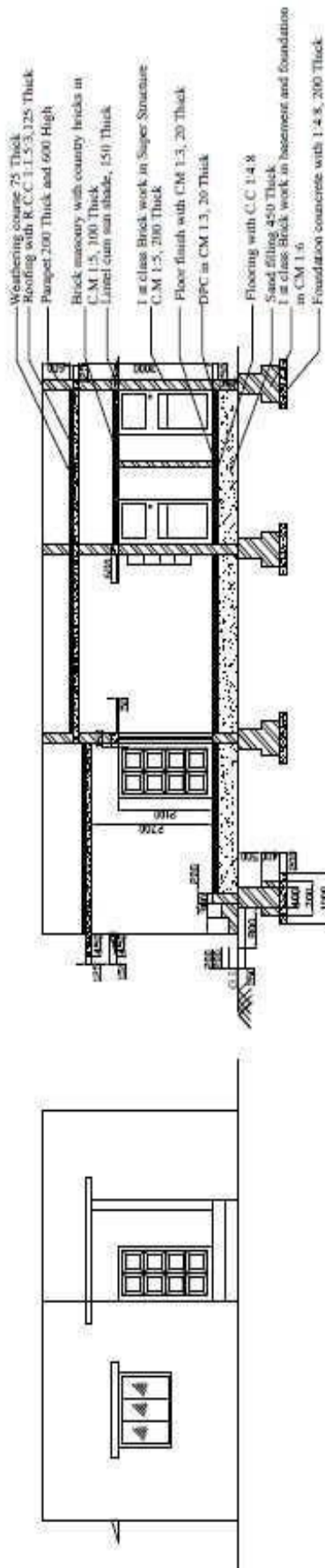
REFERENCE

TYPE	DESCRIPTION	SIZE
D1	Panelled Door	1100x2100
D2	Panelled Door	900x2100
W1	Panelled Window	1200x1200
W2	Glazed Window	1500X1200
V1	Ventilator (glazed)	900x450
V2	Ventilator (glazed)	1500x450
J	R.C.Jolly	2400x1200
CB	Cup Board	300 depth
S	Shelf	200 depth
Steps:		
	Rise	200
	Tread	300

LINE PLAN

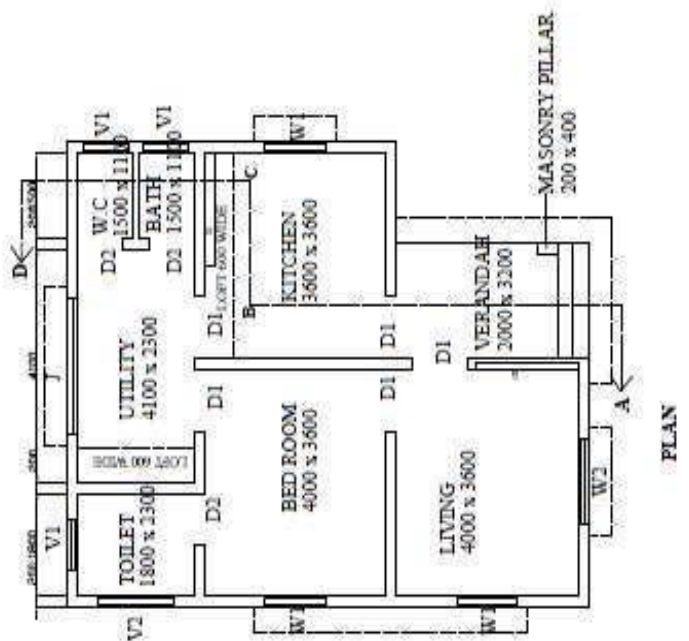
ALL DIMENSIONS ARE IN mm

A RESIDENTIAL BUILDING WITH SINGLE BED ROOM

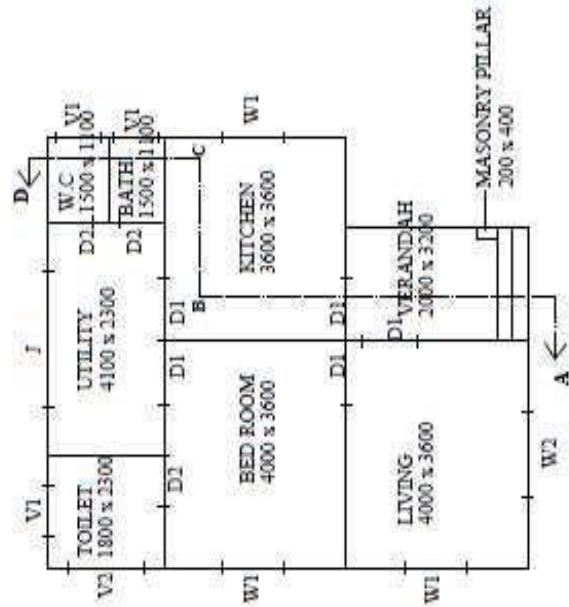


SECTION ABCD

ELEVATION



PLAN



LINE PLAN

ALL DIMENSIONS ARE IN mm

REFERENCE

TYPE	DESCRIPTION	CODE
D1	Double Door	1000/2100
D2	Double Door	800/2100
D3	Double Door	1000/1800
V1	Window (6 panes)	1500 x 1100
V2	Window (6 panes)	1500 x 1100
W1	Window (6 panes)	1500 x 1100
W2	Window (6 panes)	1500 x 1100
W3	Window (6 panes)	1500 x 1100
W4	Window (6 panes)	1500 x 1100
W5	Window (6 panes)	1500 x 1100
W6	Window (6 panes)	1500 x 1100
W7	Window (6 panes)	1500 x 1100
W8	Window (6 panes)	1500 x 1100
W9	Window (6 panes)	1500 x 1100
W10	Window (6 panes)	1500 x 1100
W11	Window (6 panes)	1500 x 1100
W12	Window (6 panes)	1500 x 1100
W13	Window (6 panes)	1500 x 1100
W14	Window (6 panes)	1500 x 1100
W15	Window (6 panes)	1500 x 1100
W16	Window (6 panes)	1500 x 1100
W17	Window (6 panes)	1500 x 1100
W18	Window (6 panes)	1500 x 1100
W19	Window (6 panes)	1500 x 1100
W20	Window (6 panes)	1500 x 1100

Ex. No:

Date :

REINFORCEMENT DETAILS OF RCC STRUCTURAL ELEMENTS (Slab, beam and column)

Aim:

To draw the Reinforcement details of RCC structural elements (slab, beam and column).

1. Foundation:

The foundation for all main walls will be in CC 1:4:8 mix, 900 wide and 300 thick, laid at 1000 below ground level. The masonry footing will be in BW in CM 1:6, the 1st footing being 700x300 and the 2nd being 400 x 400 for all main walls

2. Basement:

The basement will be in BW in CM 1:5, 200 wide and 600 high in rubble masonry above GL for all main walls. The basement will be filled with clean sand to a depth of 450. A D.P.C in CM 1:3, 20 thick will be provided for all walls at basement level.

3. Super structure:

All walls will be in BW in CM 1:5, using 1st class BW, 200 thick. The height of all walls will be 3600 above F.L. Pillars 300x300 are provided in the building. All walls including basement will be plastered smooth and CM 1:4 externally and 1:6 internally for 12.5 thick. Parapet walls, 200 thick and 450 high will be provided all round.

4. Roofing:

The roofing will be of R.C.C 1:1.5:3 mix 125 thick flat slab over the rooms. A weathering course, 75 thick will be provided over the slab.

5. Doors, windows:

D- Door: 1200x 2100

D1- Door: 900x 2100

W1- Window: 1500 x 1200

W2- Window: 1000 x 1200

6. Lintel:

All external openings will be provided with R.C.C lintel – cum-sunshade, 1:1.5:3 mix, 450 wide and 150 thick.

7. Flooring:

The flooring will be in CC 1:4:8, 150 thick and plastered smooth with CM 1:3, 20 thick.

8. Steps:

Steps will be in brick walk in CM 1:5 laid on 800 x 150 thick CC 1:4:8 footing. Rise 200, Tread 300.

Procedure:

1. Type „UN“ $\leftarrow \downarrow$ (enter) and set up the units in meters.
2. Type „L“ $\leftarrow \downarrow$ give the dimensions for line as 5.0 $\leftarrow \downarrow$ and indicate the direction of line if ortho is ON
3. Proceed the above procedure for all the walls.
4. By typing „O“ $\leftarrow \downarrow$ give offset distance as 3.0 $\leftarrow \downarrow$ for external walls and 0.15 $\leftarrow \downarrow$ for internal walls
5. Type „Tr“ double enter $\leftarrow \downarrow \leftarrow \downarrow$ for trim command then trim the extra and unnecessary lines.

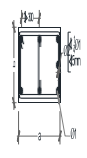
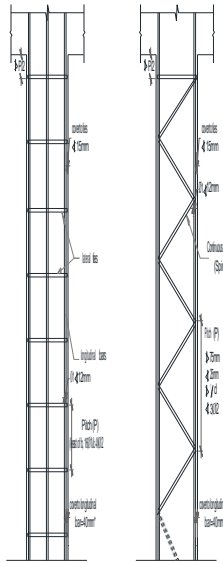
6. By typing A ◀↵ give arc command to indicate or give doors.
7. Type DLI ◀↵ to give the dimensions for the plan.
8. Type DT ◀↵ to give text in each part of the plan.
9. Using the above commands section and elevation is also drawn by following same procedure.
10. Type „H“ ◀↵ for hatch command and indicate the cross section and indicate brick work, concrete and sand filling etc.,

Note:

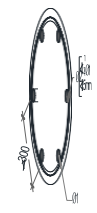
1. Any other dimensions found necessary may be assumed suitably making clear indications of the same.
2. All dimensions indicated are in millimeter.

Result:

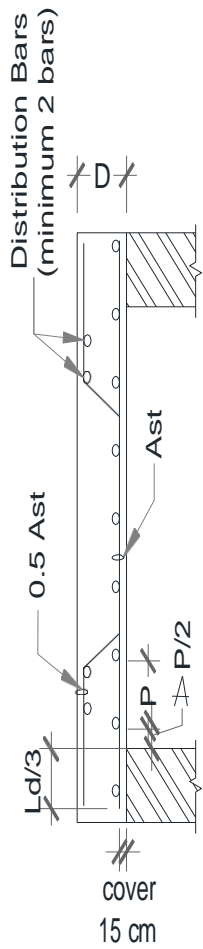
The reinforcement details of RCC structural elements has been drawn using Autocad.



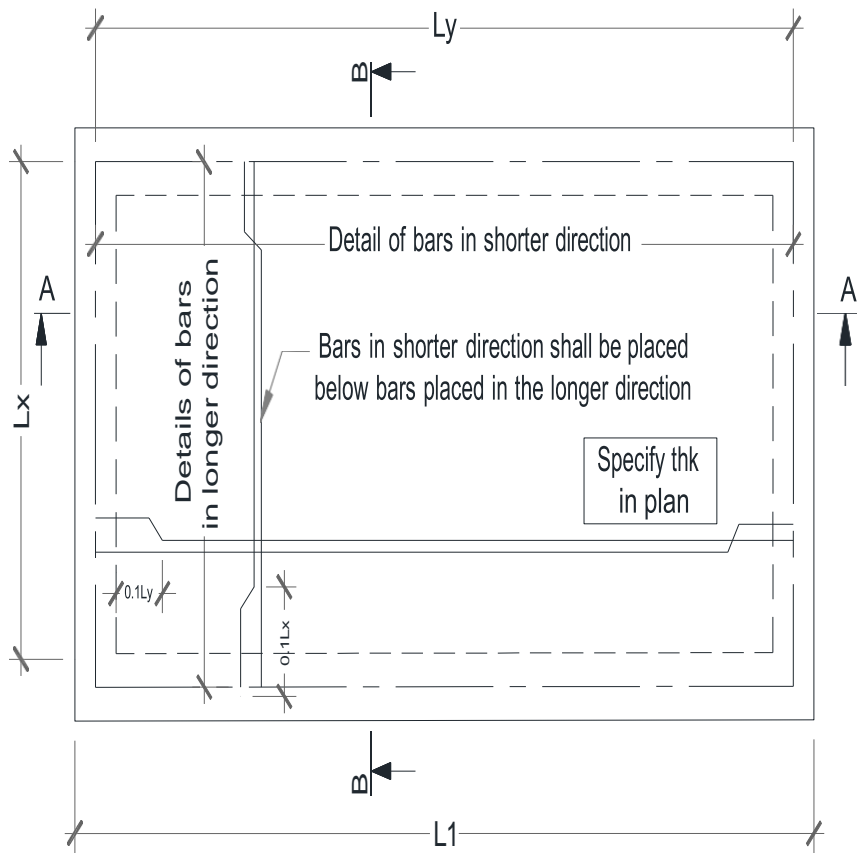
REKTANGULÄR
 Querschnitt 400
 nach DIN 1045-2



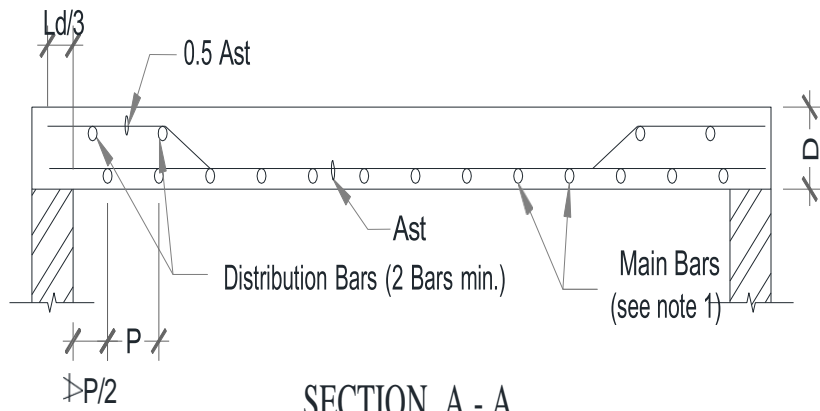
REKTANGULÄR
 Querschnitt 400
 nach DIN 1045-2



SECTION B - B

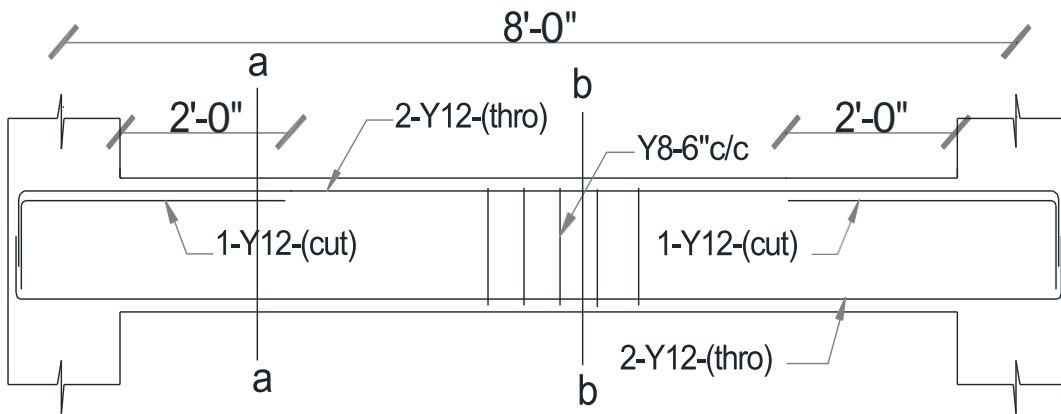


PLAN

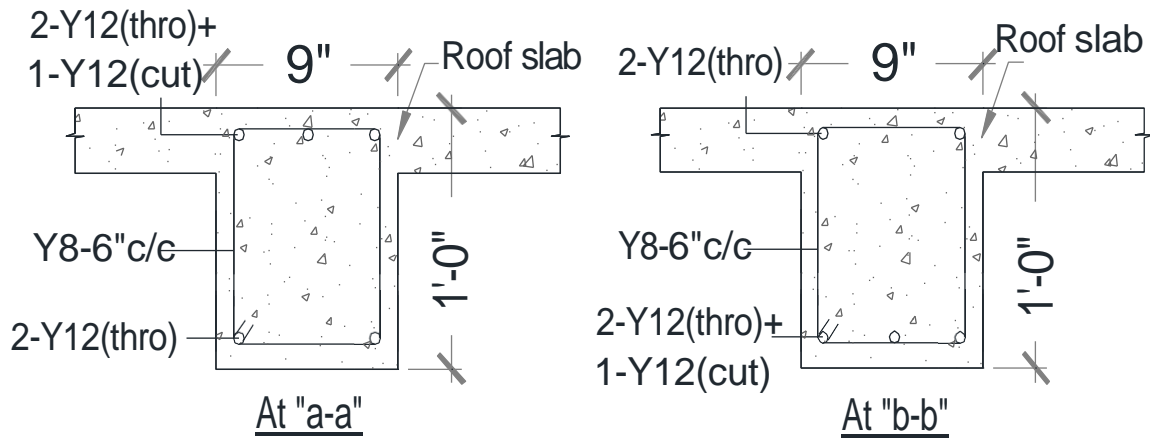


SECTION A - A

SLAB



Longitudinal section of typical Roof Beam



BEAM

Ex. No :

Date :

Reinforcement details of footings (Isolated, stepped, combined footing)

Aim:

To draw a reinforcement details of footings (Isolated, stepped, combined footing).

Specifications:

The following specifications correspond to a residential building.

1. Foundation:

The depth of foundation will be 750 mm below ground level. The concrete course at the base of the foundation will be 100 mm wide and 150 mm deep. The footings will be of brick masonry with 1st class brick in cement mortar (1:4). Width of 1st and 2nd footings will be 500 mm and 700 mm respectively and each having thickness of 300 mm.

2. Plinth:

The plinth height will be 450 mm, above ground level. Thickness of wall in plinth will be 300 mm. A D.P.C. will be provided 50 mm thick in C.M. 1:3.

3. Superstructure:

The wall in super structure will be 1st class brick in C.M. 1:6. Thickness of all walls will be 300 mm except the partition wall between W.C. and bath, which will be 200 mm thick. All exterior windows and the verandah opening will be having a chajja projection of 600 mm. The kitchen will be having shelves (as shown in the line sketch) in there tier. Projection of shelves will be 450 mm beyond the wall. A cooking platform of 750 mm width will be provided at a height of 750 mm from floor level. Width of the sink will be 450 mm. Size of the cupboard will be 1050 mm x 300 mm x 2100 m. The verandah opening will be 2250 mm. Height of wall for the court yard is 2300 mm.

4. Roofing:

Roofing will be of R.C.C. (1:2:4) 125 mm thick. Provide lime terrace of thickness 100 mm over the roof slab. The parapet height will be 450 mm. Copping will except for dinning space, kitchen, W.C. and bath which in turn will be having ceiling height of 3150 mm. Ceiling height for verandah will be 3000 mm.

5. Flooring:

Provide patent stone flooring of 25 mm thickness over 100 mm thick rammed khoa over sand filling.

6. Steps:

Rise 150 mm and Tread 200 mm. Door and window frame is 100 mm x 75 mm

7. Size of doors and window :

D - 1000 mm x 2100 mm

D1 - 750 mm x 2100 mm

D2 - 1100 mm x 2100 mm

D3 - 600 mm x 2100 mm

D4 - 1200 mm x 2100 mm

W - 1800 mm x 1200 mm

W1 - 1500 mm x 1200 mm

W2 - 900 mm x 1200 mm

W3 - 600 mm x 900 mm

Procedure:

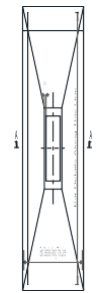
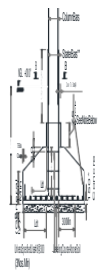
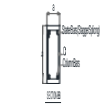
1. Type „UN“ ◀↵ (enter) and set up the units in meters.
2. Type „L“ ◀↵ give the dimensions for line as 5.0 ◀↵ and indicate the direction of line if ortho is ON
3. Proceed the above procedure for all the walls.
4. By typing „O“ ◀↵ give offset distance as 3.0 ◀↵ for external walls and 0.15 ◀↵ for internal walls
5. Type „Tr“ double enter ◀↵ ◀↵ for trim command then trim the extra and unnecessary lines.
6. By typing A ◀↵ give arc command to indicate or give doors.
7. Type DLI ◀↵ to give the dimensions for the plan.
8. Type DT ◀↵ to give text in each part of the plan.
9. Using the above commands section and elevation is also drawn by following same procedure.
10. Type „H“ ◀↵ for batch command and indicate the cross section and indicate brick work, concrete and sand filling etc.,

Note:

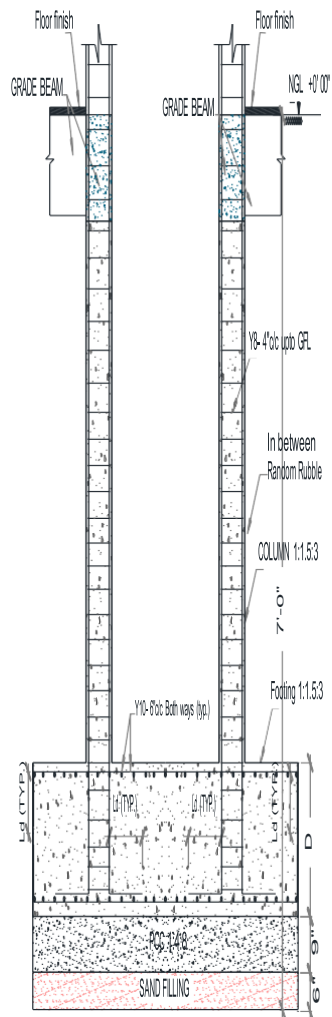
1. Any other dimensions found necessary may be assumed suitably making clear indications of the same.
2. All dimensions are in millimetres.

Result:

The reinforcement details of footings has been drawn using Autocad.



1/20
1/20
1/20
1/20



SECTIONAL ELEVATION
OF COLUMN & FOOTING (TYP.)

Ex.No :

Date :

**STEEL STRUCTURES (STEEL CONNECTIONS DETAILING,
BEAM TO BEAM CONNECTION – BOLT & WELD, ROOF TRUSS & PURLIN)**

Aim:

To draw to a steel connections detailing, beam to column connection, beam to beam connection – bolt & Weld, Roof truss & purlin.

Specifications:

The following specification correspond to the line plan of a fully tiled gabled house single bed room and attached bathroom with R.C.C flat roof.

1. Foundation:

The foundation for all main walls will be in PCC 1:4:8 mix, 800x200 laid at 1000 below ground level. The masonry footing will be in BW in CM 1:5, the 1st footing being 500x400 and the 2nd being 400 x 400 for all main walls.

2. Basement:

The basement will be in BW in CM 1:5, 300 x450 above GL for all walls and filled with clean sand to a depth of 300. A D.P.C in CM 1:3, 20 thick will be provided for all walls at basement level.

3. Super structure:

All walls will be in BW in CM 1:5, 200 thick. The height of all walls will be 2700 and raised to suit the slope of the roof. The thickness of partition walls in WC and bath are 100 and are raised to suit the roof. All walls including basement will be plastered smooth and CM 1:4 externally and 1:6 internally for 12.5 thick.

4. Roofing:

The roofing for all the rooms will be with couple roof covered by mangalore tiles laid on country wood reepers, 50x12.5, at 150 center to center. The reepers will be nailed to common rafters, 50x100 at 750 center to center. The slope of roof will be 30°. The lower end of common rafters will be resting on wall plates, 150x100. The end of common rafter will be fixed with eaves board, 25x200. The eaves projection will be 450 beyond the outer face of walls. Lime mortar borders (1:3), 200 wide and 50 thick will be provided with suitable spacing.

5. Doors, windows, etc.,:

D1-Flush door: 1000 x 2100

D2-panelled door: 900 x 2100 W1-

Glazed Window: 900 x 1200 W2-

Glazed Window: 1200 x 1200

V-Ventilator: 600 x 450

6. Flooring:

The flooring will be in CC 1:5:10 mix, 130 thick and finished smooth with cement plaster using CM 1:3, 20 thick for all the rooms.

7. Steps:

Steps will be in brick walk in CM 1:5mix laid on 100 thick CC 1:5:10 footing. Rise 150, Tread 300.

Procedure:

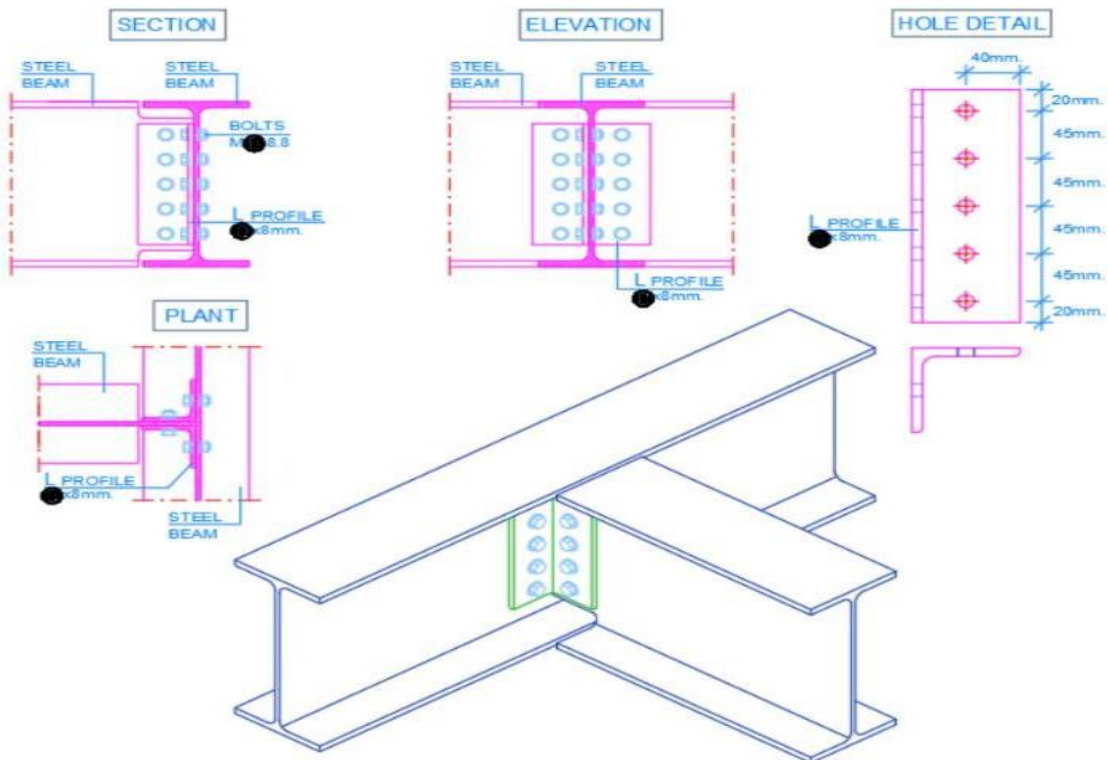
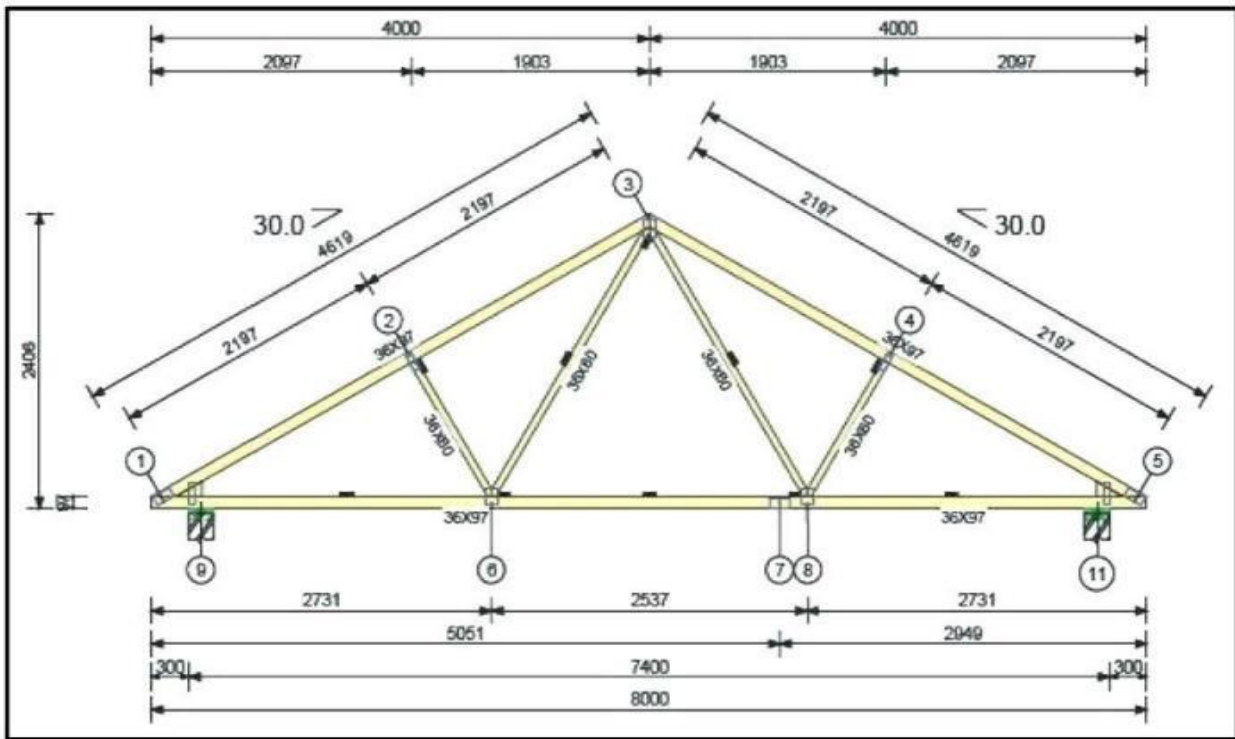
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3. Proceed the above procedure for all the walls.
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7. Type DLI ◀↵ to give the dimensions for the plan.
8. Type DT ◀↵ to give text in each part of the plan.
9. Using the above commands section and elevation is also drawn by following same procedure.
10. Type „H“ ◀↵ for batch command and indicate the cross section and indicate brick work, concrete and sand filling etc.,

Note:

1. Any other dimensions found necessary may be assumed suitably making clear indications of the same.
2. All dimensions indicated are in millimeter.

Result:

The steel connections detailing, beam to column connection, beam to beam connection – bolt & Weld, roof truss & purlin has been drawn using Autocad.



15. EXERCISE TO PRACTICE

1. Draw the plan, section and front elevation of a single storey residential building of plinth area not exceeding 300m²
2. Draw the plan, section and front elevation of a double storey hospital building of plinth area having 210m², The structure is RCC framed.
3. Draw the plan, section and front elevation of a double storey office building (load bearing structures) with the following facilities and plot to suitable scale by showing all dimensions

Office Room	15000 x 4000	
Office Room	2500 x 3000	
Reception	4000 x 3000	(all dimension are in mm)
Record Room	3500 x 4000	

Consider roof slab thickness 125mm, roof height 3000mm, plinth level 600mm

4. Draw the plan, section and front elevation for a industrial building with steel roof truss with the following facilities and plot to suitable scale by showing all dimensions
 - i. Work space 10000 x 15000
 - ii. Office room 4000 x 4000
 - iii. Dinning 4000 x 4000
 - iv. Concrete beam 450 x 220
 - v. Principle rafter ISA 75 x 50 x 6 (all dimension are in mm)
 - vi. Tie member ISA 100 x 75 x 6
 - vii. Strut ISA 75 x 50 x 6
 - viii. Purlins ISWB 500 x 100 x 6
5. Plan a RCC double storeyed framed structure having the following rooms
 - i. Porch
 - ii. Four bed rooms (two having attached toilet)
 - iii. Hall
 - iv. Verandah
 - v. Balcony
 - vi. kitchen

16. VIVA QUESTIONS

- 1) List out the types of building symbols.
- 2) What are all the basic kinds of building?
- 3) What kinds of doors are available in buildings?
- 4) What is footing?
- 5) Define PCC and RCC
- 6) How to fix scale for a building.
- 7) Mention the dimension of title block
- 8) Write the dimension of A1,A2,A3,A4 Drawing sheets
- 9) What is section plane?
- 10) What is plinth level?
- 11) Define roof level
- 12) What is the height of the roof level for a residential building?
- 13) Write the dimension of riser and thread
- 14) What is the purpose of providing sun shade?
- 15) Mention the roof thickness for normal building
- 16) List out the commands involved in modify tool bar.
- 17) Why do we use mirror ?
- 18) List out the commands involved arc tool bar.
- 19) Define plan of the building.
- 20) How to obtain section from plan?
- 21) How to obtain elevation?
- 22) How will you modify text command?
- 23) What is the purpose of using hatch command?.
- 24) What is the height of sill level?
- 25) What is load bearing structure?.
- 26) What are all the steps involved in site clearance?
- 27) How will you mark a site for setting out a foundation?
- 28) Define the term masonry.
- 29) Explain the sequence of operation in construction with an example.
- 30) What is composite masonry?
- 31) What are all the types of ashlar masonry?
- 32) Differentiate English bond and Flemish bond.
- 33) Write notes on zig-zag bond
- 34) Write notes on temporary shed
- 35) What are all the types of scaffolding?
- 36) Write notes on centring
- 37) Define dampness
- 38) What are all the causes of dampness?
- 39) What are all the types of damp proofing courses?
- 40) Write the fire protective requirement of the building
- 41) Explain the various types of foundation with neat sketches
- 42) Explain the various types of stone masonry with neat sketches
- 43) Make a comparison between stone masonry and brick masonry
- 44) What are all the different types of bonds in masonry
- 45) Explain the various types of flooring with neat sketches
- 46) Explain the various types of trusses with neat sketches
- 47) Explain the various types of roof finishes with neat sketches
- 48) Write notes on acoustic of the building
- 49) Write the step by step procedure of laying of brick.
- 50) What are all the various types of roof finishes?

1. State the components of a simple, single storeyed RCC building

The different components of simple RCC building are the following

- (i) Basement
- (ii) Foundation
- (iii) Flooring
- (iv) Superstructure
- (v) RCC roof
- (vi) Parapet
- (vii) Weathering Course

2. Define foundation for a simple building

The portion of the building that lies below the ground level is called foundation. It consist of

- (i) Cement concrete or lime concrete course of about 300mm thick and
- (ii) Two or three masonry footings

3. List the functions of foundation

- Foundation transmits the load of the structure including its own weight to the soil below
- It distributes the load uniformly over a large area so that the pressure on the soil is less than the safe bearing capacity of the soil
- Foundation provides stability to the building
- It provides a firm, level base for carrying out the building works systematically

4. What is the minimum depth of shallow foundation?

The minimum depth of shallow foundation below the natural ground level shall be 50cm.

5. What are the offsets given for brick work and concrete in foundation?

Offset for brick-work in foundation: 50mm on either side

Offset for the concrete in foundation: 150mm on either side

6. What basement is as applied to a simple building?

The part of the structure lying between the ground level and floor level is known as basement.

7. What is the purpose served by basement?

Basement provides a raised platform for the floor and serves as a base for lying thr floor. It supports the flooring

8. What is flooring?

Flooring forms part of basement. The top level of flooring called floor level coincides with the plinth level. Flooring is of cement concrete or lime concrete with crushed stone or brick ballast. It is plastered smooth at the top with cement mortar.

9. What is the purpose served by flooring?

Flooring provides a firm, level and smooth surface for the users

10. What is the different floor finishes adopted for a residential building?

The different floor finishes adopted for a residential building are

- (i) Mosaic flooring
- (ii) Marble flooring
- (iii) Terrazzo tile flooring
- (iv) Concrete tile flooring

11. What is superstructure?

Superstructure represents the portion of the structure above the foundation. For making clear distinction, superstructure is considered to represent the portion of the building from the plinth level to roof. Then superstructure includes the masonry wall from plinth level to roof, lintel, and sunshade, other projections like balcony, doors, windows and ventilators.

12. What are the functions of structure?

Superstructure transmits the load of the roof, parapet and self weight to the footing in the basement. It serves as an enclosure to the different rooms.

13. What are sunshades (or) Chajjas?

Sunshades are structural elements projecting horizontally from the lintel provided over the door and window openings in the external wall.

14. State the uses of sunshades

Sunshades prevent rain water from splashing into the rooms. Direct hit of sunshine into the rooms is also prevented by sunshades.

15. What is roof?

A horizontal reinforced cement concrete (RCC) slab spanning between the supporting walls or beams is known as roof.

16. State the purposes served by roof.

The roof protects the inmates from rain, snow, mist, sunshine and wind. It acts as a cover to the building and safeguards the building below it from the evil effects of rain, wind, sunshine and snow.

17. What is parapet? Why it is provided?

A short masonry wall built over the roof all round the building is called parapet. It serves as an enclosure and prevents anybody from falling from the roof of the building.

18. What is a lintel?

Lintel is a horizontal structural member that is used to bridge small openings left in the walls of doors, windows, ventilators, cup-boards, etc. Lintel may be of RCC, wood, brick, steel or stone.

19. What is plinth beam? What are its purposes?

Many times, a shallow beam of 100mm to 150mm thickness and width equal to the thickness of the wall is provided at the plinth level (just below DPC) of all main walls. This beam is called plinth beam. Plinth beam is of RCC 1:2:4. Plinth beam provides a level base to the wall above. It prevents or reduces unequal settlement of walls if any, since it is cast monolithically. It provides overall stability to the small building.

20. What is weathering course?

Weathering course is a layer provided on the top of RCC roof to protect the roof from the weathering agencies like rain, wind, sun and snow.

21. State the reasons for providing weathering course.

- (i) Weathering course prevents entry of rain water into the roof slab or terrace.
- (ii) It also arrest the penetration of heat into the room below the roof.

22. State the materials used for weathering course in roofing.

- (i) Lime concrete with broken brick aggregate.
- (ii) Two courses of flat tiles(or one course of pressed tiles) set in cement Mortar, 1:3 mixed with crude oil.

23. State the mix proportions recommended for the following:

- a.(i) R.C.C in roof (ii)Brick work in super structure (iii) Brick work in foundation (iv) Cement concrete for flooring (v) cement concrete in foundation (vi) damp Proof course.
- b. R.C.C roof -1:2:4(1cement,2 fine aggregate namely sand,4course aggregate namely gravel or crushed stone)
- c. Brickwork in super structure and parapet-1:6 (1 cement,6 sand).

24. What is meant by Damp Proof Course (D.P.C) ?

D.P.C means damp proof course. DPC is provided to arrest the movement of moisture. It is generally provided for all the main walls at the plinth level.

DPC is of cement mortar 1:3 laid to a thickness of 20mm.

25. Give the graphical conventions representing the following:

- (i) Brick work (ii) Concrete (iii) Stone masonry (iv) Wood

26. What is meant by head room?

Head room is the height of ceiling from the finished floor level.

27. What is the minimum head room for a residential building.

The minimum head room for a residential building is 2.75m.

28. What is the height of windows above the floor level ?

Windows are located at a height of 0.75m to 1.0m above the floor level. The windows in bath room and water closet are kept at a height of 1.75m above the floor level for privacy.

29. What is the minimum accommodation to be provided in a residential building.

- (i) Drawing cum living room
- (ii) Bed room
- (iii) Kitchen
- (iv) Bath room
- (v) Water closet (also called Toilet)

30. Define rise and tread in the case of steps. What is the normal rise and tread adopted

Rise is the height of steps. Tread is the horizontal depth of steps. A rise of 150mm and tread of 250mm are generally adopted.

31. What is 'line plan' of building ?

Line plan is the preliminary plan drawn without showing the thickness of walls. Different rooms are shown in the line plan with their international dimensions.

32. List the factors that decide the layout of a factory building.

Factors that decide the layout of a factory building are

- (i) Maximum quantity of products manufactured
- (ii) Minimum requirement of men materials and energy
- (iii) Optimum utilization of space machinery and personnel

33. What are the different components of a factory layout ?

The different components of a factory layout are.

- (i) Manufacturing area
- (ii) Ware housing
- (iii) Internal engineering
- (iv) External engineering
- (v) Administration and
- (vi) Employed facilities.

34. What is plinth level ?

The top level of plinth beam that coincides with the top level of basement is Known as plinth level.

35. What are the standard dimensions of door , window , ventilator and sunshade

Door	Width	-	700mm	to	1100mm
	Height	-	1945mm	to	2045mm
Window	Width	-	500mm	to	560mm
	Height	-	1100mm	to	1200mm
Ventilators	Width	-	500mm	to	1100mm
	Height	-	500mm		
Sunshade	Width	-	600mm		