SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES-CHITTOOR
(AUTONOMOUS)
Approved by AICTE, New Delhi and Affiliated to JNTUA, Ananthapuramu

DEPARTMENT OF CIVIL ENGINEERING

LAB MANUAL

23CIV366L BUILDING INFORMATION MODELING LABORATORY

R23 Regulation

VI Semester B.E. Civil Engineering

LAB MANUAL

(2025-2026 ACADEMIC YEAR)

Prepared by,

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DEPARTMENT OF CIVIL ENGINEERING

GENERAL INSTRUCTIONS

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

- Students should wear lab coat in CAD lab.
- Students are advised to enter the CAD lab WITH FORMAL SHOES ONLY.
- They are not supposed to move the systems and monitors.
- They should enter in the login name and password assigned to each student.
- Students are advised to complete their record work before the next class.
- Students are asked to logout from their area and switch off the computers before leaving the lab.
- Students can access the printers through lab technician.
- Students have free access to use the computers and software available in the lab.
- During the laboratory hours, accessing the internet is strictly prohibited.
- Computer games are strictly prohibited in the CAD lab.

B.E. CIVIL ENGINEERING

REGULATIONS – R23

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

1. To produce graduates who can understand their ethical, environmental as well as professional responsibilities so that they appreciate the impact of the engineering solutions which have sustainability over society and the nation.
2. To develop the graduates who will exhibit strong technical ability to create & synthesize data using relevant tools and concepts, for providing sustainable solutions to civil engineering problems and projects.
3. To equip the graduates with suitable skills making them industry ready when theyleave the portals of the Institute and to become a competent distinguished Professional Civil Engineer.
4. To produce students who can exhibit attitude, professionalism, ability to communicate with team members and adapt to the latest technology by engagingthemselves in life-long learning

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, our Civil Engineering Graduates will exhibitability to:

PO	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of	Design solutions for complex engineering problems

	solutions	and design system components or processes thatmeet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7	Environment and sustainability	Understand the impact of the professionalengineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professionalethics and responsibilities and norms of the engineering practice
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-longlearning in the broadest context of technological Change

3. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Civil Engineering program the student will have following Program specific outcomes

1. Establish a Civil Engineering career in industry, government or academic field and achieve professional expertise as appropriate.
2. Execute innovation and excellence in Civil engineering problem solving and design in global and societal contexts.
3. Commit to lifelong learning and professional development in the Civil Engineering field tostay updated in technology, research topics and contemporary issues.
4. Understand the fundamentals of Civil Engineering in commercial contexts and in expediting construction projects.

4. PEO / PO Mapping:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
I	3	1	1	1	2	3	3	3	2	3	1	3	3	3	1	1
II	2	3	3	3	3	2	3	3	2	2	3	3	2	2	3	3
III	1	-	-	3	3	3	1	1	3	-	2	1	1	3	-	3
IV	3	-	-	1	3	3	3	-	3	3	2	3	3	3	-	1

Contribution: **1. Reasonable** **2. Significant** **3. Strong**

B.E. CIVIL ENGINEERING

Vision

To produce competent and quality engineers by imparting knowledge, excellence and global perspectives in Civil Engineering to our students and to make them ethically strong professional engineers to build our nation.

Mission

M1: To produce outstanding graduates with high technical knowledge to serve the nation.

M2: To impart value based education.

M3: To provide solution to the challenges in the field of Civil Engineering.

23CIV366L BUILDING DRAWING AND DETAILING LABORATORY

L T P C

0 0 3 1.5

OBJECTIVES:

- To learn plan, elevation and sectional view of the load bearing and framed buildings
- To learn the structural detailing of RCC elements
- To learn the structural detailing of RCC water tanks, footings and retaining walls
- To learn the structural detailing of steel structures
- To gain the knowledge of Draft the structural detailing of Industrial structures

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 Staircase (ordinary and doglegged)
7. Reinforcement details of RCC structural elements (slab, beam and column)
8. Reinforcement details of footings (Isolated, stepped, combined footing)

OUTCOMES:

- Draft the plan, elevation and sectional view of the load bearing and framed buildings.
- Draw the structural detailing of RCC elements.
- Draw the structural detailing of RCC water tanks, footings and retaining walls
- Draw the structural detailing of steel structures.
- Draft the structural detailing of Industrial structures.

REFERENCE BOOKS:

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.

23CIV366L	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	-	-	-	2	-	-	1	-	-	-	1	3	2		2
CO2	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2	1
CO3	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2	1
CO4	3	2	-	2	2	3	-	1	3	2	-	2	3	2	2	-
CO5	3	2	-	2	2	3	-	2	3	2	-	2	3	2	2	-
Average	3.0	2.0	0.0	2.0	2.0	3.0	0.0	1.6	3.0	2.0	0.0	1.8	3.0	2.0	2.0	1.3

EX.NO:01
DATE:

CAD INTRODUCTION

Computer Aided Drafting is a process of preparing a drawing of an object on the screen of acomputer. There are various types of drawings in different fields of engineering and sciences. In the fields of mechanical or aeronautical engineering, the drawings of machine componentsand the layouts of them are prepared. In the field of civil engineering, plans and layouts of the buildings are prepared. In the field of electrical engineering, the layouts of power distribution system are prepared. In all fields of engineering use of computer is made for drawing and drafting.

The use of CAD process provides enhanced graphics capabilities which allows any designerto

- Conceptualize his ideas
- Modify the design very easily
- Perform animation
- Make design calculations
- Use colors, fonts and other aesthetic features.

REASONS FOR IMPLEMENTING A CAD SYSTEM

1. **Increases the productivity of the designer**: CAD improves the productivity of the designer to visualize the product and its component, parts and reduces the time required in synthesizing, analyzing and documenting the design
2. **Improves the quality of the design**: CAD system improves the quality of the design. A CAD system permits a more detailed engineering analysis and a larger number of design alternatives can be investigated. The design errors are also reduced because of the greater accuracy provided by the system
3. **Improves communication:** It improves the communication in design. The use of a CAD system provides better engineering drawings, more standardization in the drawing, and better documentation of the design, few drawing errors and legibility.
4. **Create data base for manufacturing:** In the process of creating the documentation for these products, much of the required data base to manufacture the products is also created.
5. **Improves the efficiency of the design:** It improves the efficiency of the design process and the wastage at the design stage can be reduced.

APPLICATION OF CAD:

There are various processes which can be performed by use of computer in the drafting process.

Autoated drafting: This involves the creation of hard copy engineering drawings directly from CAD data base. Drafting also includes features like automatic dimensioning, generation of cross – hatched areas, scaling of the drawing and the capability to develop sectional views and enlarged views in detail. It has ability to perform transformations of images and prepare 3D drawings like isometric views, perspective views etc.,

Geometric modeling: concerned with the computer compatible mathematical description of the geometry of an object. The mathematical description allows the image of an object to be displayed and manipulated on a graphics terminal through signals from the CPU of the CAD system. The software that provides geometric modeling capabilities must be designed for efficient use both by computer and the human designer.

BENEFITS OF CAD:

The implementation of the CAD system provides variety of benefits to the industriesin design and production as given below:

- Improved productivity in drafting
- Shorter preparation time for drawing
- Reduced man power requirement
- Customer modifications in drawing are easier
- More efficient operation in drafting
- Low wastage in drafting
- Minimized transcription errors in drawing
- Improved accuracy of drawing
- Assistance in preparation of documentation
- Better designs can be evolved
- Revisions are possible
- Colours can be used to customize the product
- Production of orthographic projections with dimensions and tolerances
- Hatching of all sections with different filling patterns
- Preparation of assembly or sub assembly drawings

- Preparation of part list
- Machining and tolerance symbols at the required surfaces.
- Hydraulic and pneumatic circuit diagrams with symbols
- Printing can be done to any scale

LIMITATIONS OF CAD

- 32 – bit word computer is necessary because of large amount of computer memoryand time
- The size of the software package is large
- Skill and judgment are required to prepare the drawing
- Huge investment

CAD SOFTWARES

The software is an interpreter or translator which allows the user to perform specifictype of application or job related to CAD. The following softwares are available for drafting.

- AUTOCAD
- Pro – E
- CATIA
- MS OFFICE
- PAINT
- ANSYS
- MSc. NASTRAN
- IDEASSOLID WORKS
- HYPERMESH
- FLUENT – GAMBIT

The above software is used depending upon their application.

AUTO CAD

Auto CAD package is suitable for accurate and perfect drawings of engineering designs. The drawing of machine parts, isometric views and assembly drawings are possible in Auto CAD. The package is suitable for 2D and 3D drawings.

EX.NO:02
DATE:

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

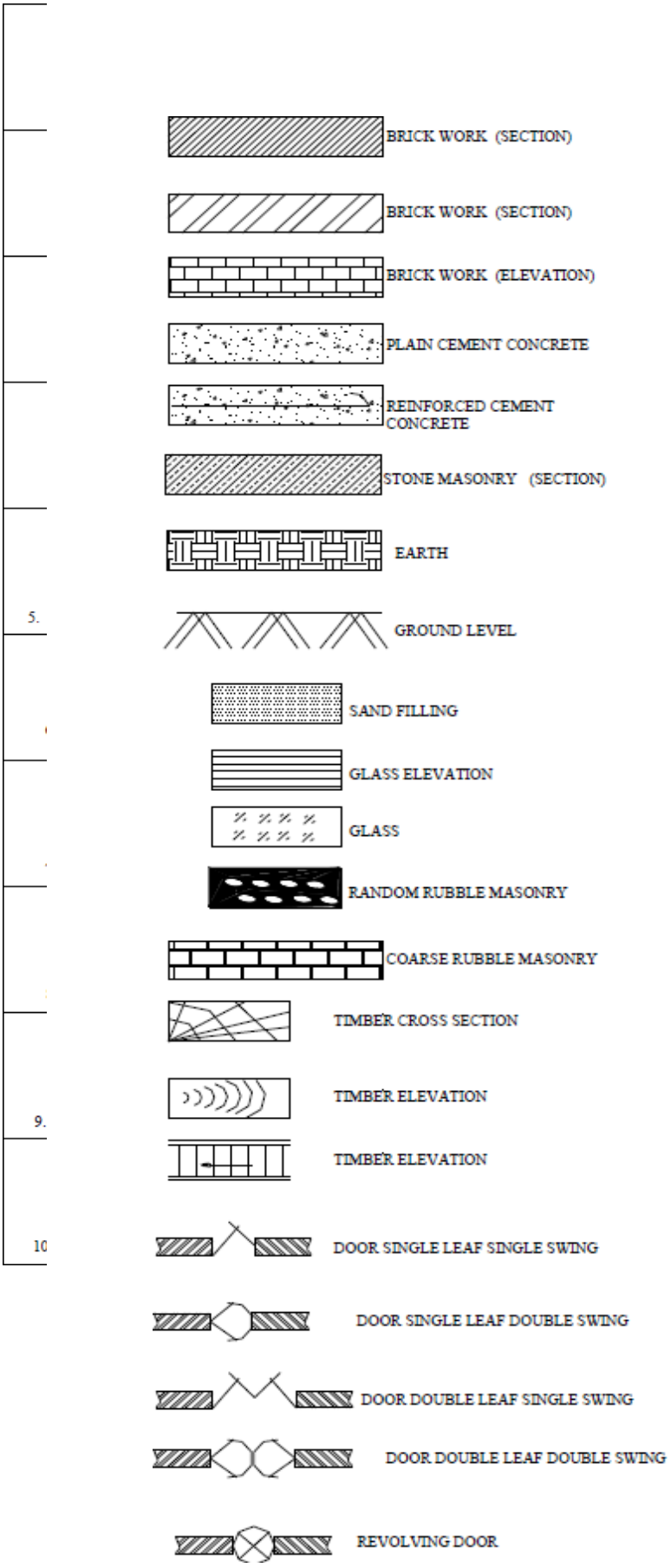
Sl. No.	**Term**	**Abbreviation**
32.	Full tank level	FTL
33.	First floor	FF
34.	Floor level	FL
35.	Flush out latrine	FOL
36.	Galvanized	Galv
37.	Galvanized iron	GI
38.	Grease trap	GRT
39.	Ground level	GL
40.	Grills	G
41.	Gully trap	GT
42.	Height	Ht
43.	Indian water closet	IWC
44.	Imperial (standard)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


BRICK WORK (SECTION)
BRICK WORK (SECTION)
BRICK WORK (ELEVATION)
PLAIN CEMENT CONCRETE
REINFORCED CEMENT CONCRETE
STONE MASONRY (SECTION)
EARTH
5.
GROUND LEVEL
SAND FILLING
GLASS ELEVATION
GLASS
RANDOM RUBBLE MASONRY
COARSE RUBBLE MASONRY
TIMBER CROSS SECTION
TIMBER ELEVATION
9.
TIMBER ELEVATION
10
DOOR SINGLE LEAF SINGLE SWING
DOOR SINGLE LEAF DOUBLE SWING
DOOR DOUBLE LEAF SINGLE SWING
DOOR DOUBLE LEAF DOUBLE SWING
REVOLVING DOOR

EX.NO:03
DATE:

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

Starting the drawing

The figures we do in engineering are fitted into a template. In ACAD we manually draw a template known as drawing sheet in two different formats.

The size of the drawing sheet is **ISO A4 210 X 297.**

Polar Array: In this, an object is arranged in a circular shape.

At the command prompt: type ARRAYPOLAR or select the option from MODIFY toolbar. Then select object to be arrayed. Then select the center point of array. By default, a six items array is created. The No. of items can be changed by selecting the Items option. Angle between the two items can also be changed.

Result:

Thus the Auto CADD Comments is studied successfully.

EX.NO:04
DATE:

A RESIDENTIAL BUILDING WITH SINGLE BED ROOM

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 ant 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:

The roofing 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:

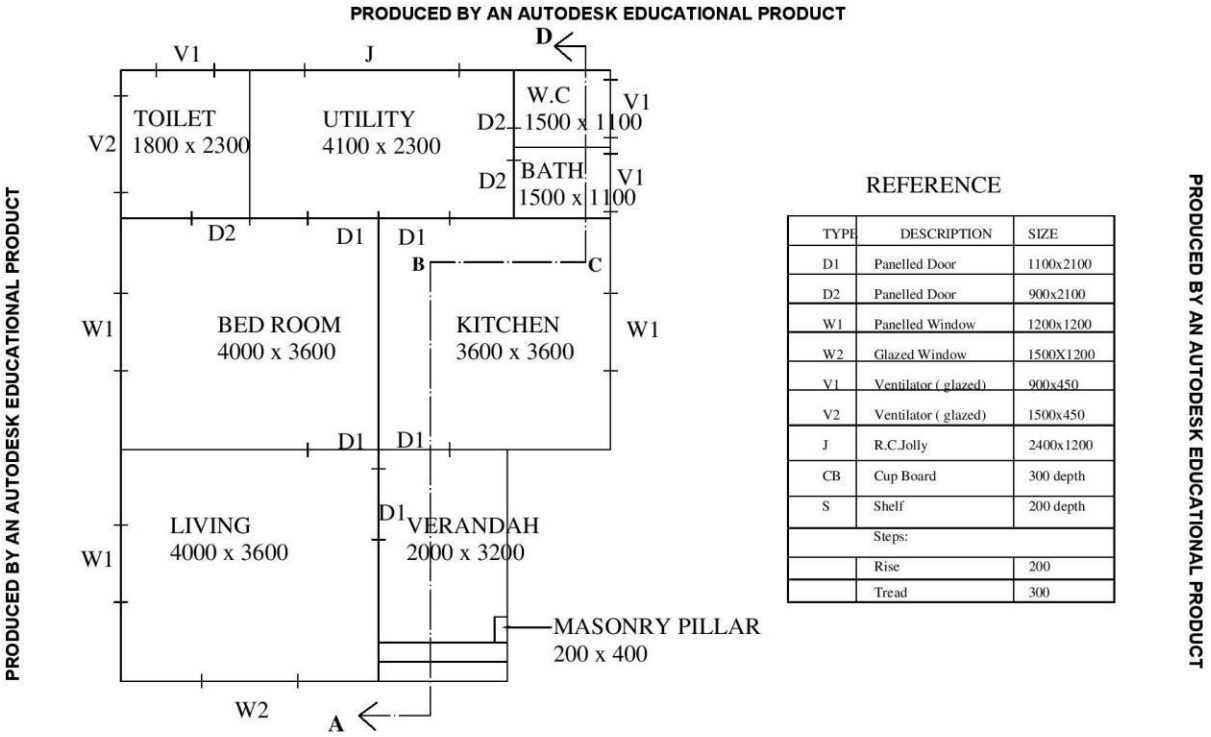
The flooring will be in CC 1:4:8, 130 thick and plastered smooth with CM 1:3, 20 thick.

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.

Note:

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

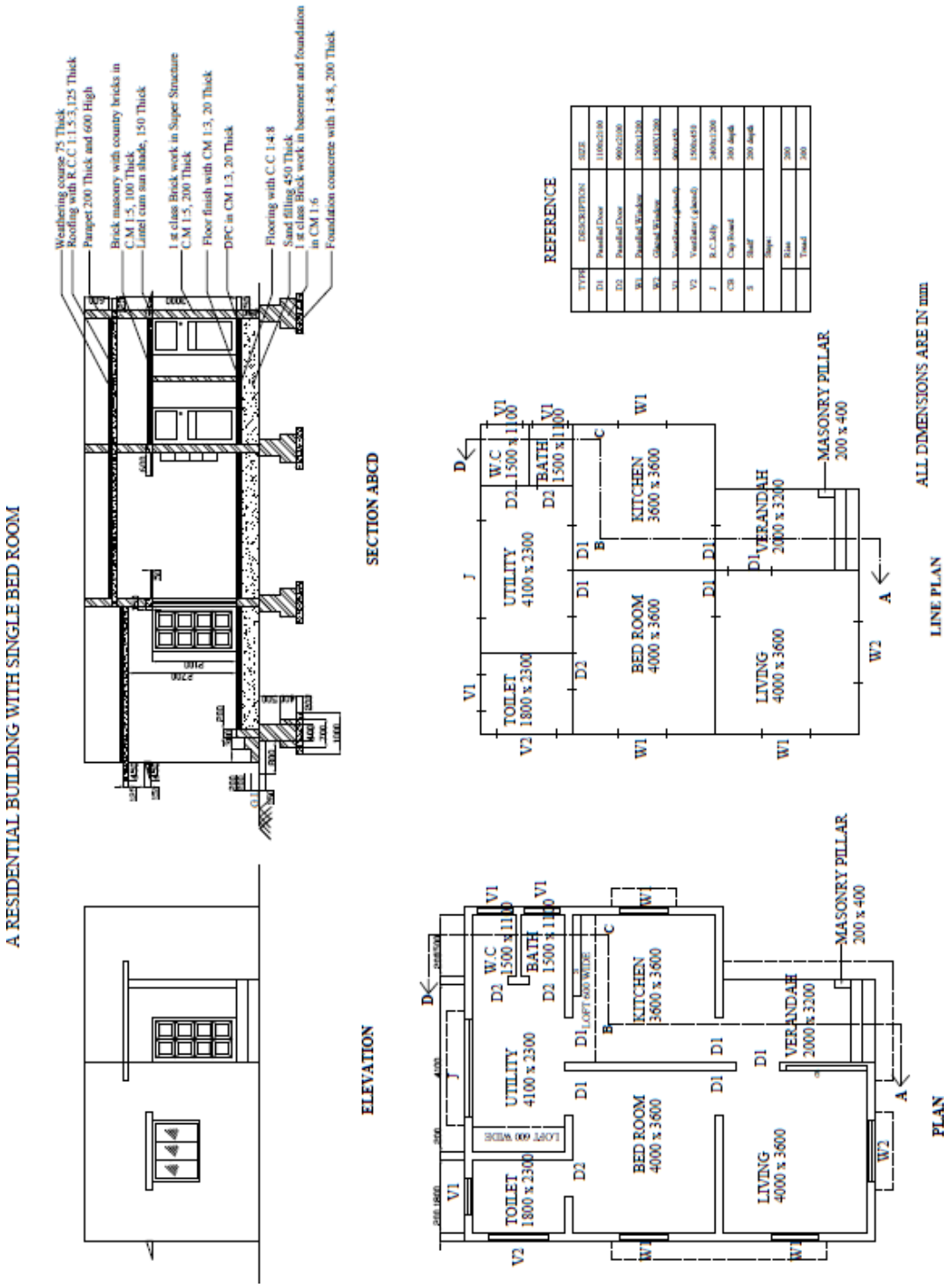


REFERENCE

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

ALL DIMENSIONS ARE IN mm

LINE PLAN



Results

Thus The Residential Building with Single Bed Room is Studied Successfully.

EX.NO:05
DATE:

RESIDENTIAL BUILDING WITH LOAD BEARING WALLS AND FLAT ROOF

Aim:

To draw to a suitable scale, the following views with complete dimensions and details for residential building (R.C.C flat roof)

1. Plan at window sill level.
2. Front elevation
3. Sectional elevation on EFGH
4. Section at EFGH.

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. Coping 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 :

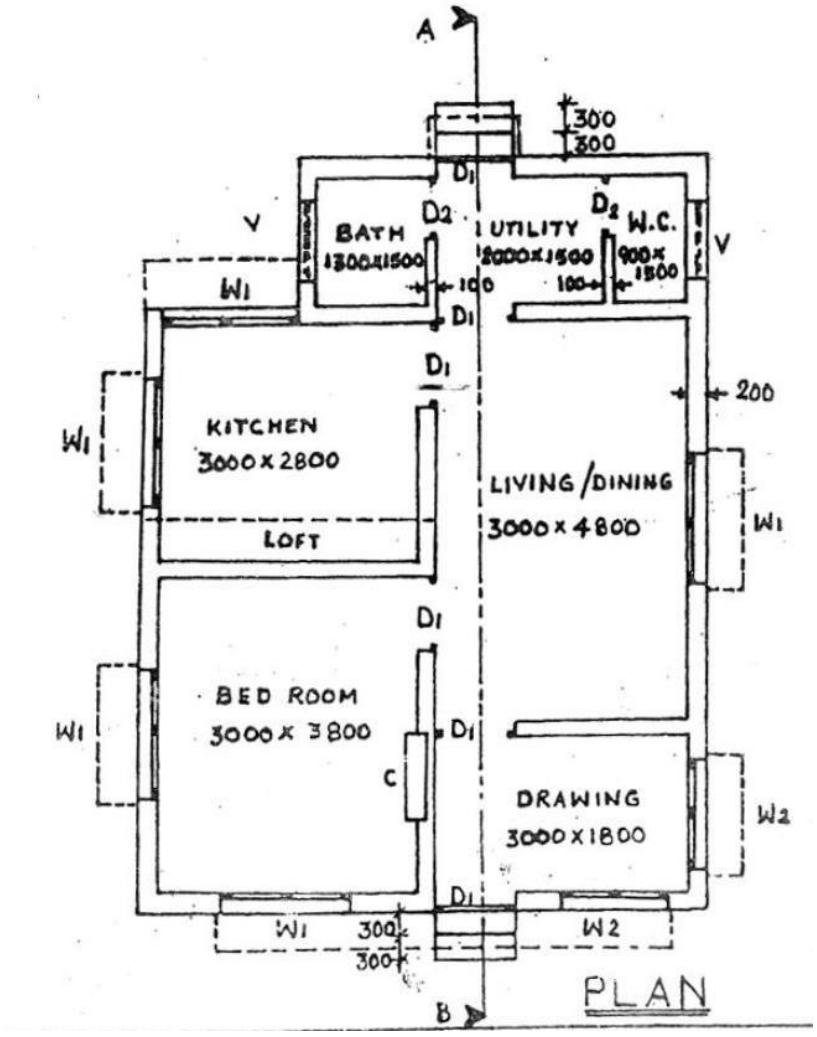
Rise 150 mm and Tread 200 mm. Door and window frame is 100 mm x 75 mm

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

Note:

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



EX.NO:06
DATE:

LIBRARY BUILDING WITH R.C.C FLAT ROOF

Aim:

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

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

Specifications:

The following specifications correspond to the line plan of a LIBRARY BUILDING.

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 ant 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,etc.,:**

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:

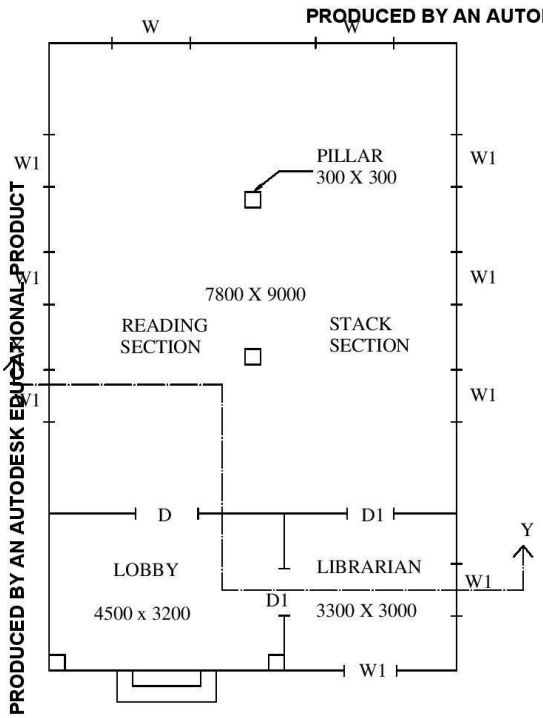
The flooring will be in CC 1:4:8, 150 thick and plastered smooth with CM 1:3, 20 thick.

8. Steps:

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

Note:

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



LINE PLAN

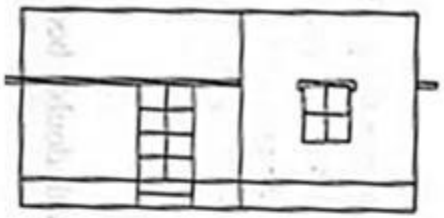
REFERENCE

Type	Description	Size
D	Door	1200 x 2100
W	Window	1500 x 1200
D1	Door	900 x 2100
W	Window	1000 x 1200
Steps		
	Rise	150
	Tread	300

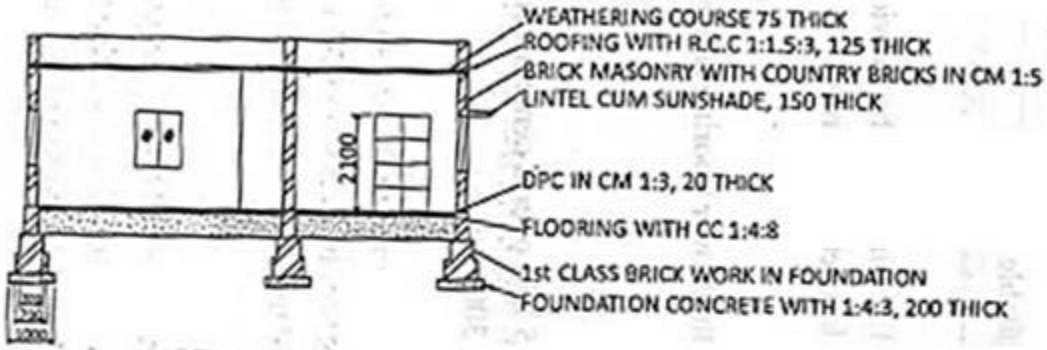
ALL DIMENSIONS ARE IN mm

Results

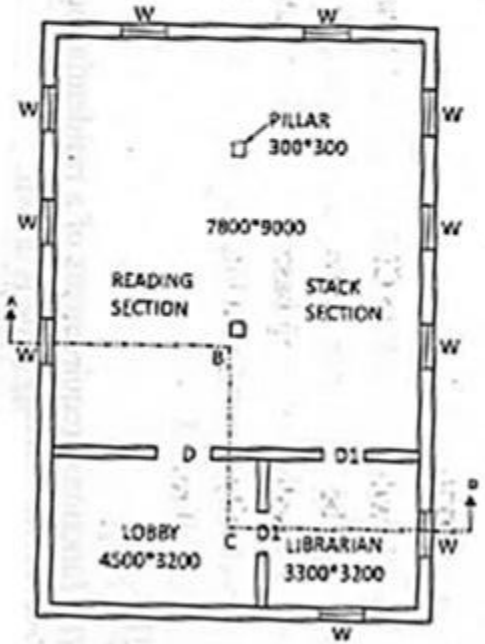
Thus The **Library Building With R.C.C Flat Roof** Is Studied Successfully.



ELEVATION



SECTION ABCD



PLAN

TYPE	DESCRIPTION	SIZE
D1	PANELLED DOOR	1100*2100
D2	PANELLED DOOR	900*2100
W1	PANELLED WINDOW	1200*1200
V1	VENTILATOR (PANELLED)	600*450
D	DOOR	1500*2100

EX.NO:07
DATE:

RESIDENTIAL BUILDING WITH LOAD BEARING WALLS AND PITCHED ROOF

Aim:

To draw the plan, section and elevation of a residential building had a pitched roof.

Specification:

1. Foundation:

For all main walls the foundation will be in cement concrete 1:4:8 mix, 900X300 laid at 1200 below the ground level. The masonry footing will be in brick work in cement mortar 1:5. The first footing being 600X450 and second footing being 500X450 for all main walls.

2. Basement:

The basement will be in brick work in cement mortar 1:5 400X450 above the ground level for all walls and inside filled with clean sand to a depth of 300. A damp proof course in cement mortar 1:3, 20 mm thick will be provided for all walls at basement level.

3. Super structure:

For all main walls super structure will be in brick work with cement mortar 1:5, 200 mm thick. The height of the walls will be 2800 and raised to the required height with the slope. All the walls including basement will be plastered with cement mortar 1:4 externally and 1:6 internally for 12.5 mm thick.

4. Roofing:

The slope of the roof will be 30^0. The roofing will be with couple roof covered by Mangalore tiles laid on country wood reepers of size 50 mm X 12.5 mm @150 mm c/c. the reepers are nailed to common rafter of size 50mmX 100 mm @750 mm c/c. the lower end of the common rafters will be resting on wall plates of size 150mmX100mm and the end of the end of common rafter will be fixed with eves board 25mm X200mm.

The eaves projection will be 450 mm beyond the outer face of walls. Mortar borders 200mm wide and 150 mm thick will be provided at suitable spacing.

5. Lintel:

For all opening RCC lintel 150 mm thick with 1:2:4 mix will be provided. Lofts 75mm thick and 450mm wide will be provided in the kitchen cum dining.

6. Flooring:

The flooring will be in cement mortar 1:3, 20 mm thick over flooring concrete 1:5:10 of 130 mm thick.

7. Steps:

Steps will be in brick work in cement mortar 1:5 laid over a cement concrete bed 1:5:10, 100mm thick. Rise will be 150 mm and tread 300 mm.

8. Doors and windows:

D – Paneled door – 1000X 2100

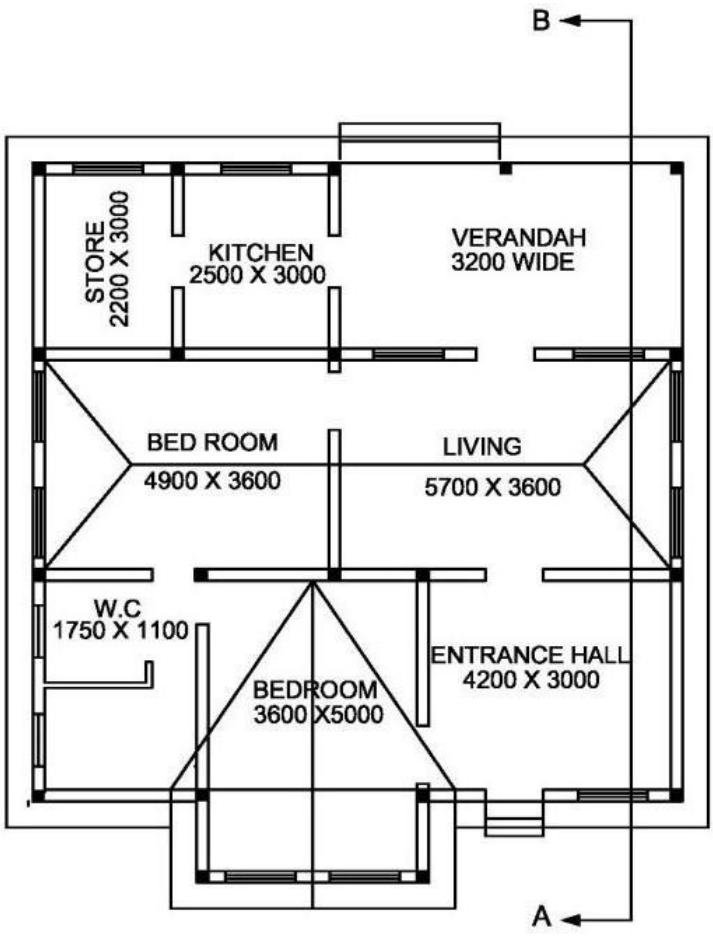
D1 – Paneled door – 900x2100

D2 – Paneled door – 750x2100

W – Glazed window – 1200 X1350

V – Ventilator – 900x600

RESIDENTIAL BUILDING WITH LOAD BEARING WALLS AND PITCHED ROOF



PLAN

Results

Thus The **Residential Building with Load Bearing Walls and Pitched Room i**s studied successfully.

EX.NO:08
DATE:

RESIDENTIAL BUILDING WITH RCC FRAMED STRUCTURE

Aim

To draw to a suitable scale the following views with complete dimensions and details for residential building with RCC framed structure

1. Plan at window sill level.
2. Front elevation
3. Sectional elevation

Specifications

The following specifications correspond to residential building with R.C.C. flat roof.

1. Foundation

The sloped isolated footing of size 1.2m x 1.2m x 500mm depth and the reinforce-ments of dia. 8@150c/c on both ways with a cc 1:2:4 are provided under all columns located at a depth of 1.2m below ground level.

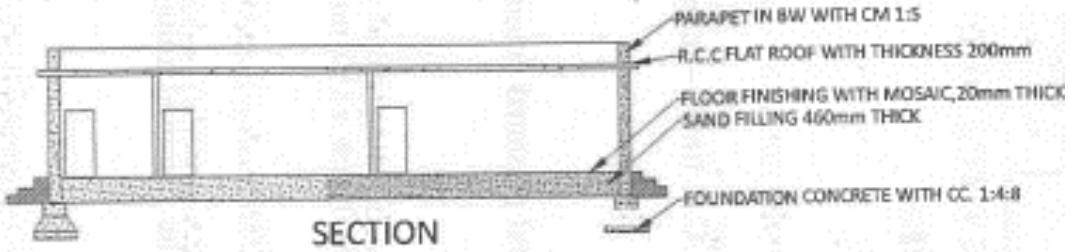
2. Plinth beam

The plinth beam of size 230mm x 450mm is connected at ground level all around the building.

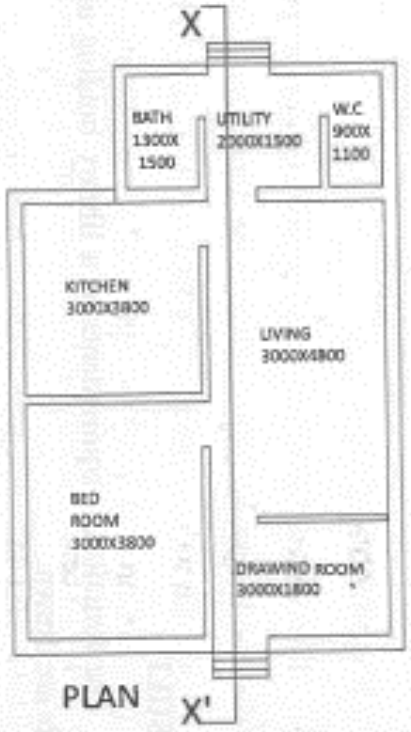
3. Super structure

All main walls will be in brick work in cement mortar 1:5 using country bricks, 230 thick. The height of main walls will be 3000 above floor level. The partition walls in w.c. and bath will be 100 thick in brick work in cement mortar 1:5, using country bricks and carried up to a height of 2000. All the walls including basement will be plastered smooth with cement mortar 1:4 externally and 1:6 internally for 12.5 thick. Parapet walls 200 thick and 450 high will be provided all-round.

ELEVATION



SECTION



PLAN

TYPE	DESCRIPTION	SIZE
D1	PANELLED DOOR	1100*2100
D2	PANELLED DOOR	900*2100
W1	PANELLED WINDOW	1200*1200
V1	VENTILATOR (PANELLED)	600*450
D	DOOR	1500*2100

All dimensions are in mm

4. Roofing

The roofing will be of R.C.C. 1:2:4 mix, 150 thick flat slab over all the rooms and verandah. A weathering course 75 thick, consists of two courses of flat tiles set in cement mortar 1:3 mixed with crude oil will be provided over the slab.

5. Doors and windows

D-Door panelled 1100 * 2100mm

D1-Door panelled 800 * 2100mm

W-Window panelled 1500 * 1350mm

V-Ventilator 800 * 400mm

C-Cup-board 900 * 1200mm

6. Lintel

All internal openings will be provided with R.C.C. lintel 1:2:4 mix, 150 thick and all external openings will be provided with R.C.C. lintel-cum-sunshade 1:2:4 mix, 150 thick.

7. Flooring

The flooring will be in cement concrete 1:4:8, 130 thick, plastered smooth with cement mortar 1:3, 20 thick for all the portions.

8. Steps

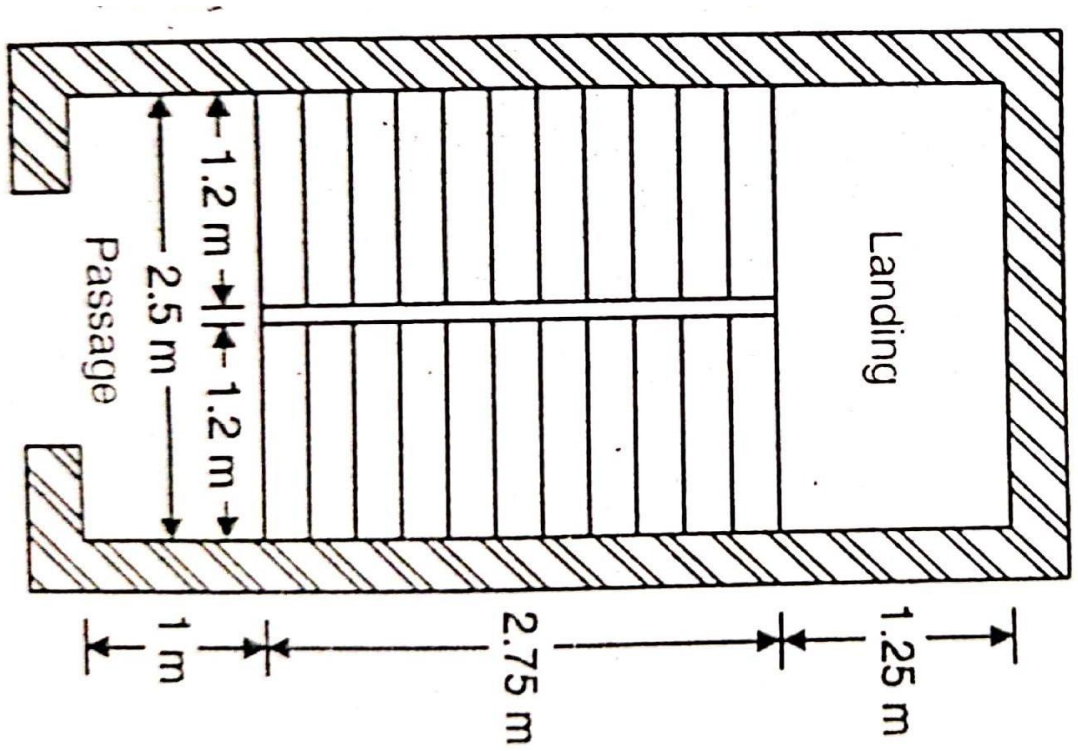
Steps will be in brick work in cement mortar 1:5 laid on a 800 * 150 cement concrete 1:4:8 footing. Rise 200, Tread 300.

Note

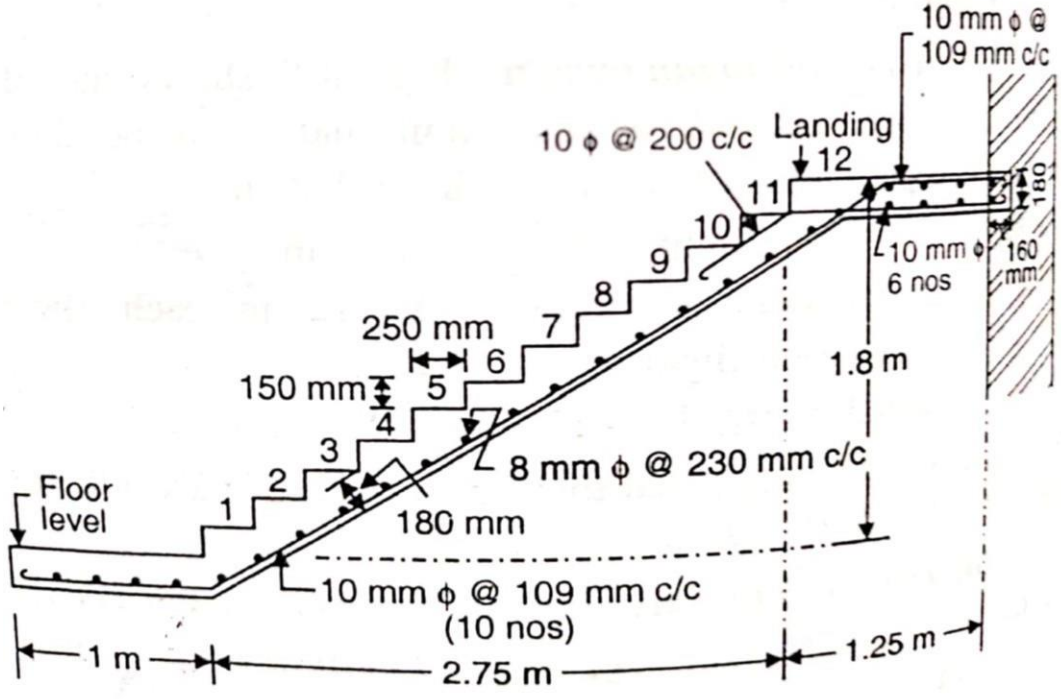
1. Any other dimensions found necessary may be assumed suitably making clear indications of the same.
2. All dimensions are in millimetres.

RESULT

The functional requirements of a residential building with RCC framed structure using Auto CAD with suitable scale is drawn.



Plan at top view of staircase



Cross section of the slab

EX.NO:09
DATE:

REINFORCEMENT DETAILING OF STAIRCASE

Aim: To design and draw the reinforcement detailing of dog legged staircase using Auto CAD software for given data.

Problem

Design a dog legged stair for a building in which the vertical distance between floors is 3.6 m. The stair hall measures 2.5 m x 5 m. The live load may be taken as 2500 N/m^2. Use M 20 Concrete and HYSD bars .

Design Procedure:

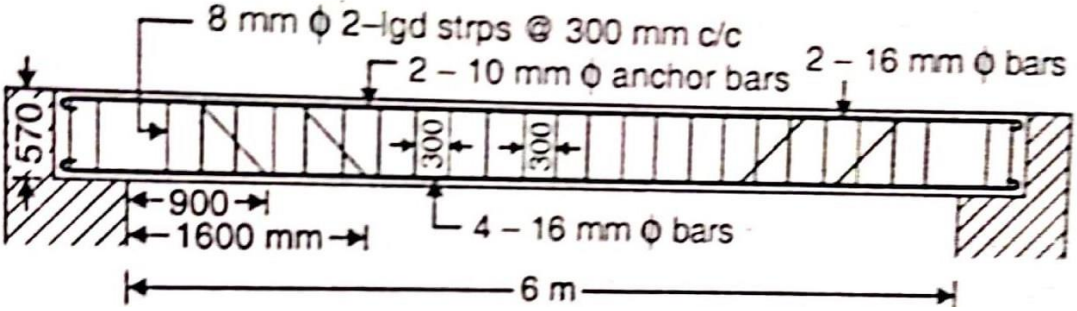
Step: 1 - General Details
Step: 2 - Design Constants
Step: 3 - Loading on each flight
Step: 4 - Design of waist slab
Step: 5 - Reinforcement detail

Drawing Procedure:

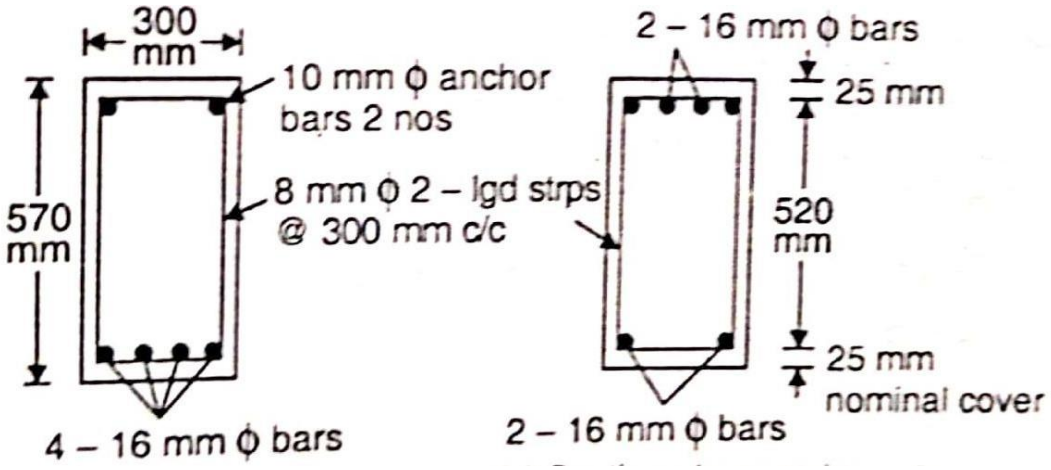
- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters.
- Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines.
- By using the line command, the outline of the required drawing is drawn.
- By using the trim command, the extra lines are trimmed.
- Lines are extended using extend command wherever necessary.
- Donut option is used to represent the c/s of reinforcements.
- Offset command is used to get lines at regular distance.
- Hatching is done using hatch command.
- Dimensions are provided and text command is also used for labeling the drawing.

Result

The required reinforcement detailing of dog legged staircase using Auto CAD software is done.



Sectional view of beam



Section at midspan **Section at supports**

EX.NO:10
DATE:

REINFORCEMENT DETAILING OF RCC BEAM

Aim: To design and draw the reinforcement detailing of RCC simply supported beam using Auto CAD software for given data.

Problem:

A reinforced concrete beam is supported on two walls 750 mm thick, spaced at clear distance of 6 metres. The beam carries a superimposed load of 9.8 kN/m. Using M 20 concrete, design the beam. Take the permissible tensile and shear stress in steel as 230 N/mm^2 for HYSD bars.

Design Procedure:

Step:1 – Calculation of design constants

Step:2 – Calculation of Bending Moment

Step:3 – Design of Section

Step:4 – Steel Reinforcement

Step:5 – Check for deflection

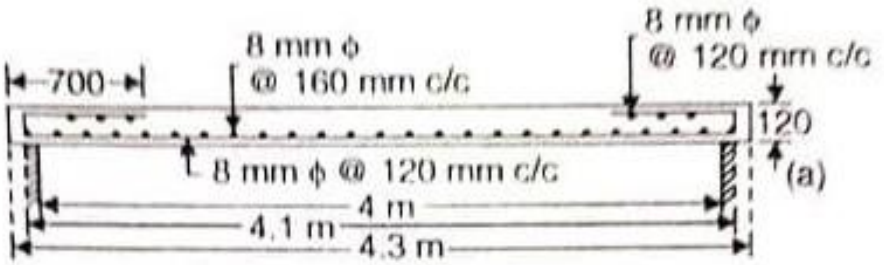
Step:6 – Check for development length at supports

Drawing Procedure:

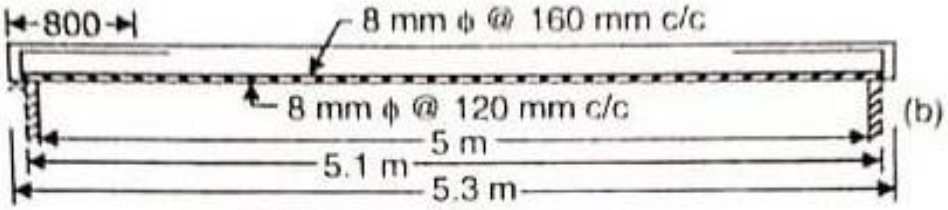
- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters.
- Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines.
- By using the line command, the outline of the required drawing is drawn.
- By using the trim command, the extra lines are trimmed.
- Lines are extended using extend command wherever necessary.
- Donut option is used to represent the c/s of reinforcements.
- Offset command is used to get lines at regular distance.
- Hatching is done using hatch command.
- Dimensions are provided and text command is also used for labeling the drawing.

Result:

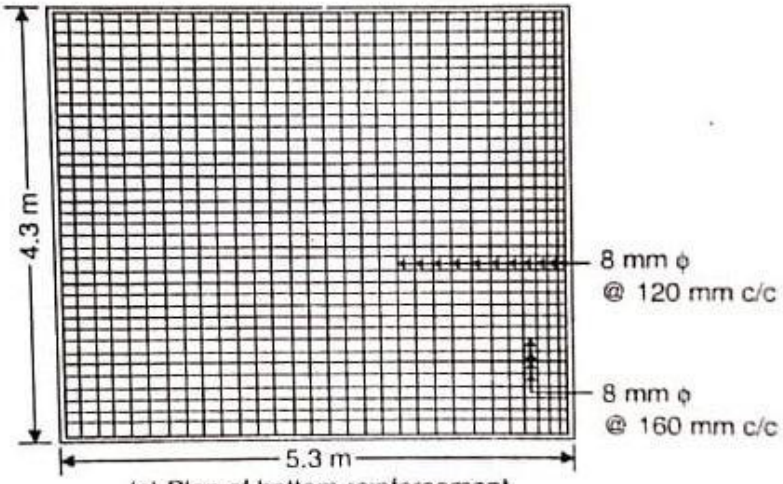
The required reinforcement detailing of simply supported beam using AutoCAD software is done



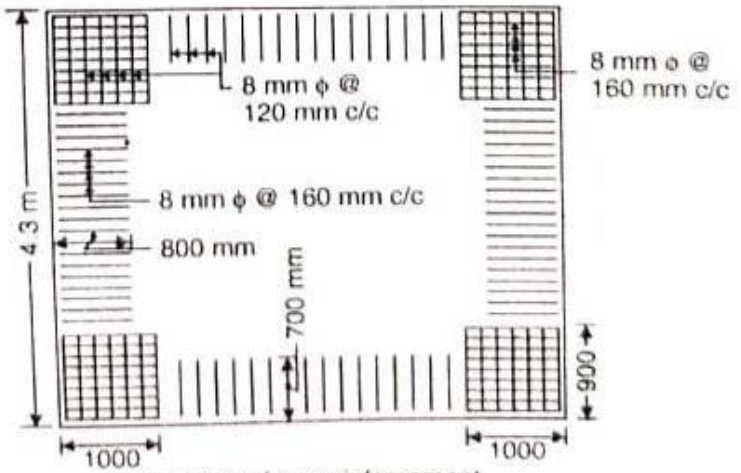
(a) Section along short span



(b) Section along long span



(c) Plan of bottom reinforcement



(d) Plan of top reinforcement

EX.NO:11
DATE:

REINFORCEMENT DETAILING OF TWO WAY ROOF SLAB

Aim: To design and draw the reinforcement detailing of RCC two-way roof slab using Auto CAD software for given data.

Problem:

Design a R.C. slab for a room measuring 4 m x 5 m from inside. The slab carries a live load of 2000 N/m^2, and finished with 20 mm thick granolithic topping. Take C = s_{cbc} = 5 N/mm^2, t = s_{st} = 140 N/mm^2 and m =19. The slab is simply supported at all the four edges, with corners are held down.

Design Procedure:

Step:1 – Calculation of design constants

Step:2 – Calculation of Bending Moment

Step:3 – Design of Section

Step:4 – Steel Reinforcement

Step:5 – Check for shear

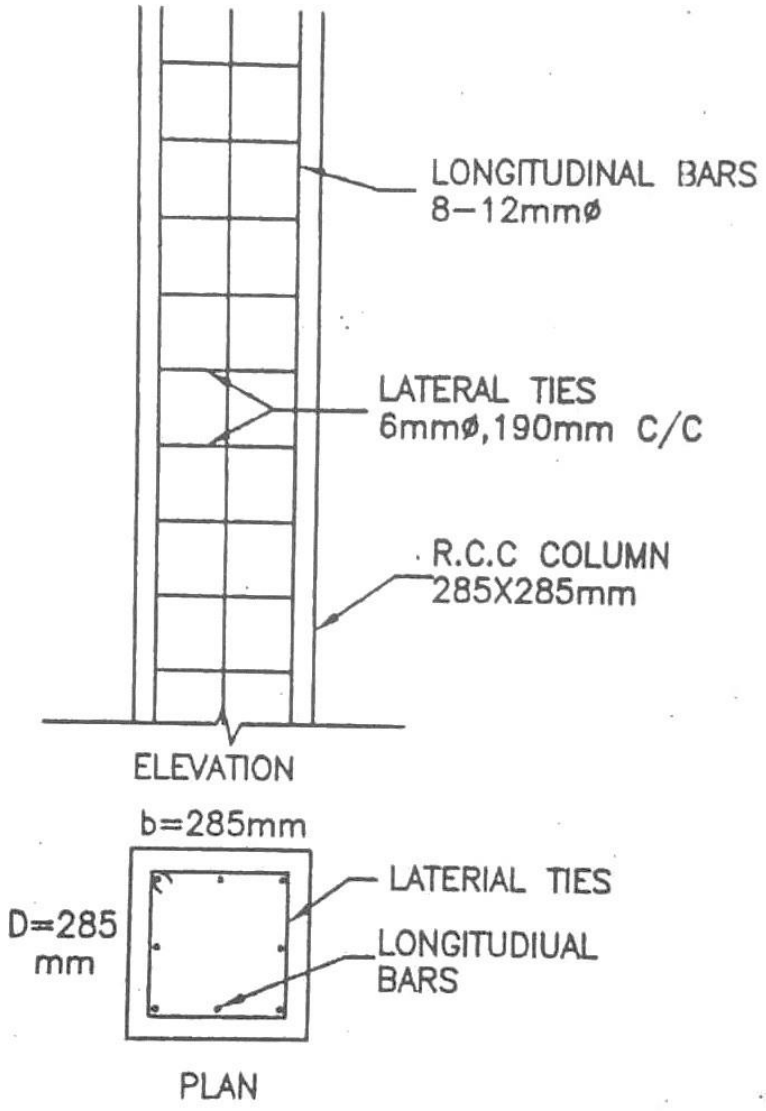
Step:6 – Check for development length at supports

Drawing Procedure:

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters.
- Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines.
- By using the line command, the outline of the required drawing is drawn.
- By using the trim command, the extra lines are trimmed.
- Lines are extended using extend command wherever necessary.
- Donut option is used to represent the c/s of reinforcements.
- Offset command is used to get lines at regular distance.
- Hatching is done using hatch command.
- *Dimensions are provided and text command is also used for labeling the drawing.

Result

The required reinforcement detailing of two-way roof slab using Auto CAD software is done


LONGITUDINAL BARS
8–12mmø
LATERAL TIES
6mmø,190mm C/C
R.C.C COLUMN
285X285mm
ELEVATION
b=285mm
D=285
mm
LATERIAL TIES
LONGITUDIUAL
BARS
PLAN

EX.NO:12
DATE:

REINFORCEMENT DETAILING OF RCC COLUMN

Aim: To design and draw the reinforcement detailing of RCC column using Auto CAD software for given data.

Problem:

Design a Short square column to carry an axial load of 600 kN. Use M25 Concrete and Fe415 steel.

Design Procedure:

Step:1 – Design of section

Step:2 – Longitudinal Reinforcement

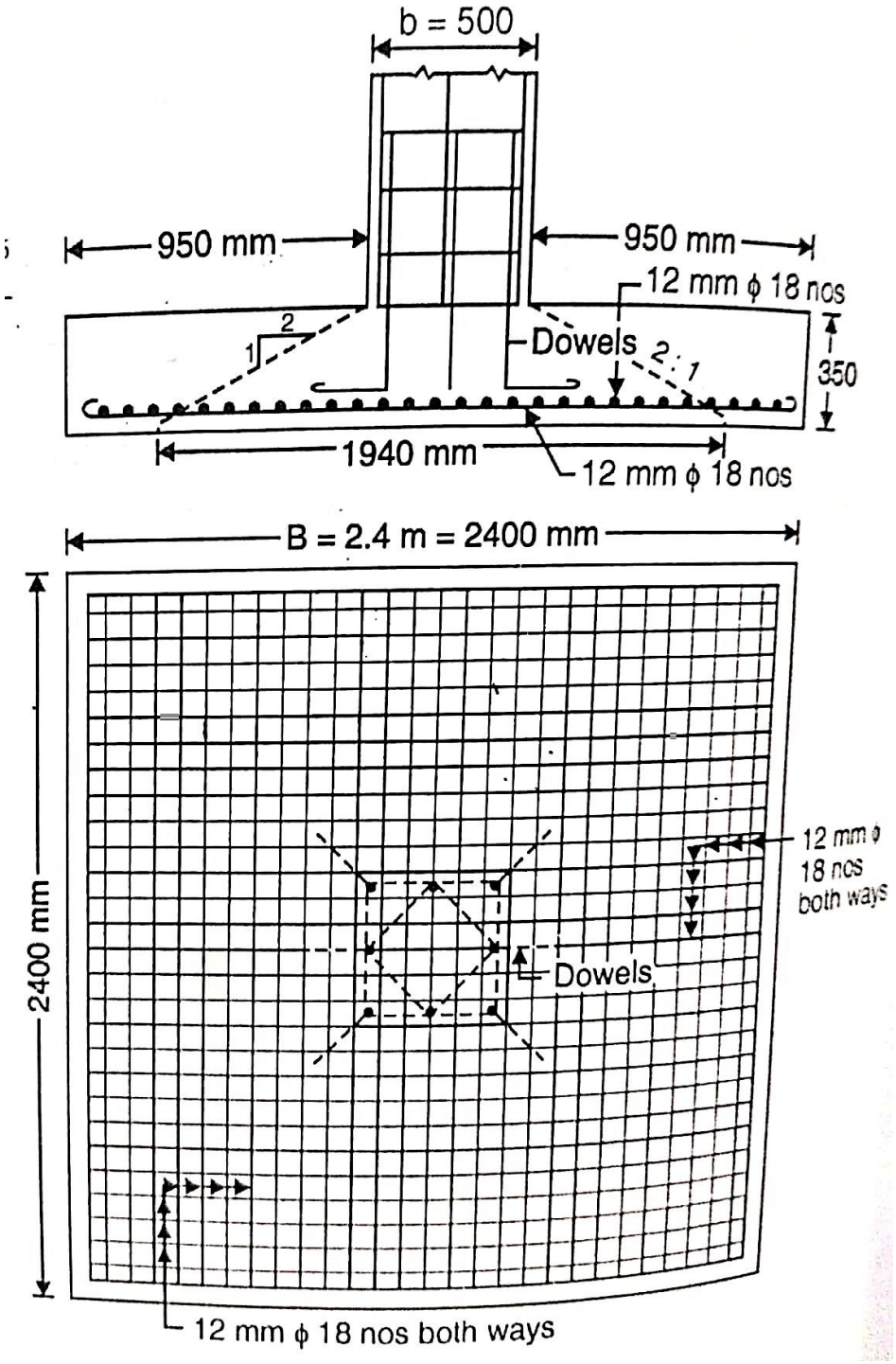
Step:3 – Design of ties

Drawing Procedure

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters.
- Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines.
- By using the line command, the outline of the required drawing is drawn.
- By using the trim command, the extra lines are trimmed.
- Lines are extended using extend command wherever necessary.
- Donut option is used to represent the c/s of reinforcements.
- Offset command is used to get lines at regular distance.
- Hatching is done using hatch command.
- Dimensions are provided and text command is also used for labeling the drawing.

Result

The required reinforcement detailing of RCC column using Auto CAD software is done



Plan of Reinforcement in footing

EX.NO:13
DATE:

REINFORCEMENT DETAILING OF ISOLATED FOOTING

Aim: To design and draw the reinforcement detailing of isolated footing using Auto CAD software for given data.

Problem:

Design an isolated footing of uniform thickness of a RC column bearing a vertical load of 600 kN and having a base of size 500 mm x 500 mm. The safe bearing capacity of soil may be taken as 120 kN/m^2. Use M 20 concrete and Fe415 steel.

Design Procedure:

Step:1 – Calculation of design constants

Step:2 – Size of footing

Step:3 – Design of Section

Step:4 – Check for shear

Step:5 – Steel Reinforcement

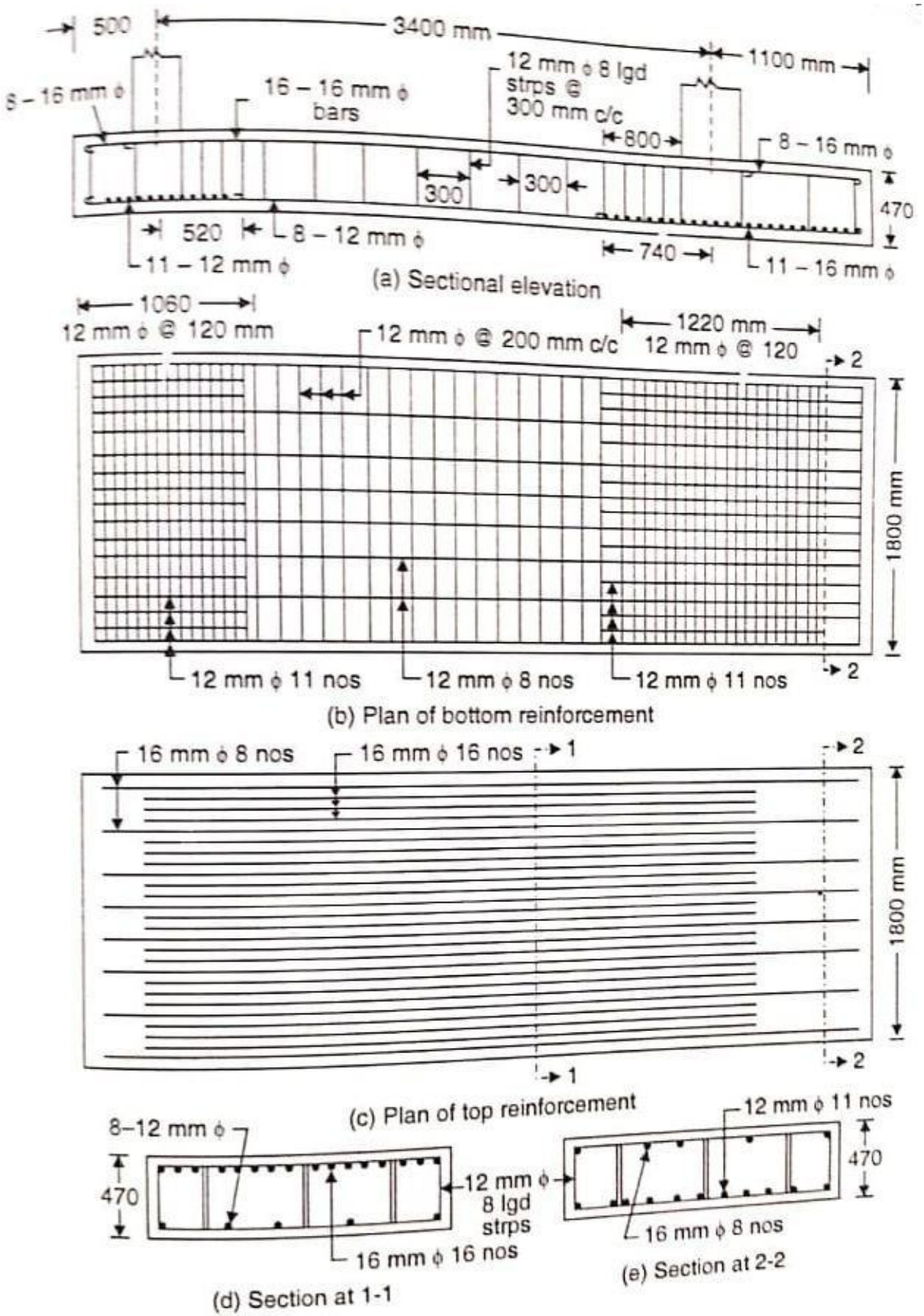
Step:6 – Check for development length at supports

Procedure:

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters.
- Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines.
- By using the line command, the outline of the required drawing is drawn.
- By using the trim command, the extra lines are trimmed.
- Lines are extended using extend command wherever necessary.
- Donut option is used to represent the c/s of reinforcements.
- Offset command is used to get lines at regular distance.
- Hatching is done using hatch command.
- Dimensions are provided and text command is also used for labeling the drawing.

Result:

The required reinforcement detailing of isolated footing using AutoCAD software is done


500
3400 mm
1100 mm
6 – 16 mm ϕ
16 – 16 mm ϕ bars
12 mm ϕ 8 lgd strps @ 300 mm c/c
800
8 – 16 mm ϕ
300
300
470
520
8 – 12 mm ϕ
740
11 – 12 mm ϕ
11 – 16 mm ϕ
(a) Sectional elevation
1060
12 mm ϕ @ 120 mm
12 mm ϕ @ 200 mm c/c
1220 mm
12 mm ϕ @ 120
2
1800 mm
12 mm ϕ 11 nos
12 mm ϕ 8 nos
12 mm ϕ 11 nos
2
(b) Plan of bottom reinforcement
16 mm ϕ 8 nos
16 mm ϕ 16 nos
1
2
1800 mm
2
1
(c) Plan of top reinforcement
8–12 mm ϕ
470
12 mm ϕ 8 lgd strps
16 mm ϕ 16 nos
(d) Section at 1-1
12 mm ϕ 11 nos
470
16 mm ϕ 8 nos
(e) Section at 2-2

EX.NO:14
DATE:

REINFORCEMENT DETAILING OF COMBINED FOOTING

Aim: To design and draw the reinforcement detailing of combined footing using Auto CAD software for given data.

Problem:

Design combined rectangular footing for two columns A and B, carrying loads of 500 and 700 kN respectively. Column A is 300 mm x 300 mm in size and column B is 400 mm x 400 mm in size. The centre to centre spacing of the columns is 3.4 metres. The safe bearing capacity of soil may be taken as 150 N/m^2. Use M 20 concrete and Fe 415 steel.

Design Procedure:

Step:1 – Calculation of design constants

Step:2 – Size of footing

Step:3 – Bending Moment and Shear force

Step:4 – Calculation of effective depth

Step:5 – Check for punching shear

Step:6 – Design for bending tension in longitudinal direction

Step:7 – Check for one way shear

Step: 8 – Transverse Reinforcement

Drawing Procedure:

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters.
- Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines.
- By using the line command, the outline of the required drawing is drawn.
- By using the trim command, the extra lines are trimmed.
- Lines are extended using extend command wherever necessary.
- Donut option is used to represent the c/s of reinforcements.
- Offset command is used to get lines at regular distance.
- Hatching is done using hatch command.
- Dimensions are provided and text command is also used for labeling the drawing.

Result:

The required reinforcement detailing of combined footing using AutoCAD software is done.

EX.NO:15
DATE:

STUDY OF BUILDING INFORMATION MODELLING

About BIM:

Building Information Modelling is an advanced technology that assists architects, engineers, and construction professions in planning, designing, constructing, and managing the development and building of infrastructure.

The main elements of BIM are,

- Information
- Technology
- People
- Processes
- Policies

Why BIM is important?

It helps coordinate, plan, design and construct with data that is precise and accurate. It helps project costs, feasibility, and schedules. BIM not only allows design and construction teams to work more efficiently, but it allows them to capture the data they create during the process to benefit operations and maintenance activities. This is why BIM mandates are increasing across the globe.

Process of BIM

- Plan
- Design
- Build
- Operate

BIM Workflows

BIM is a process for creating and managing all of the information on a project – before, during and after construction. The true value of BIM can only be realized when it is taken beyond the design team – to subcontractors, the owner and facility managers. Designing and building is a complex process that requires a tremendous amount of collaboration, dedication and hard work.

Using the BIM Process defined below, Project teams can benefit from BIM by utilizing models created by all members of the design and construction team to improve project coordination and scheduling while also improving overall quality while minimizing project risk.

General Requirement

The 3D models shall consist of 3D-Solids (not lines or wire frames) that represent the actual dimensions of the building elements and the equipment that will be installed on the project.

Existing Conditions

The Design Team shall model all existing conditions needed to explain the extent of the construction work for alterations and additions projects. The extent of modeling beyond the affected areas and the level information to be included will be determined based on project needs. These requirements may be stated in the project program or discussed during the project meeting.

Topographic and Property Line Surveying

Detailed requirements of what is to be included in surveying deliverables is managed by FIU staff in consultation with the Design Team on a project-by-project basis. Surveys shall be provided in electronic format and should include at minimum: 3D topographic information, paving and retaining walls. The file(s) shall be in a format that allows for importing into the Design Team's BIM authoring software.

Model Information Requests (MIR) / Request for Information (RFI)

Establishing a collaborative use of the BIMs during the design and construction process, the Designers, Contractors, and FIU can work proactively to resolve issues together and reduce the number of RFI's / MIR's generated. Project BIMs shall be used for model geometry and extract graphical information for generating Model Information Requests. Clash reports may also be issued by the General Contractor as background information for MIRs

The design and construction teams will be responsible for timely updates to their models based on MIR and RFI responses. The architect's BIM manager will work with their consulting engineers to incorporate changes or updates to their models and the General Contractors / Construction Managers BIM manager will update the Construction model(s).

Change Orders

It is the Construction Team's responsibility to ensure that Clash Detection and Coordination is used to the fullest extent in order to avoid any problems during installation. FIU will not accept change orders due to failed construction BIM coordination. Coordination shall be complete and the Construction Federated BIM shall show zero non-justified clashes between the Building components prior to construction and installation.

Spatial Coordination & Constructability Requirements

The Design Team is to use automated conflict checking software for this phase of the work and shall be outlined in the BIM. The collision report should show any outstanding coordination issues between the Design Team members.

Result:

Thus the concept of BIM and its element was studied.

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 commends involved in modify tool bar.
17) Why do we use mirror?
18) List out the commends 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?