BEARYS INSTITUTE OF TECHNOLOGY

Innoli, Boliyar Village, Mangalore-574153

DEPARTMENT OF CIVIL ENGINEERING

(As per syllabus prescribed by Visvesvaraya Technological University)

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COMPUTER AIDED BUILDING PLANNING AND DRAWING

LABORATORY MANUAL (BCV305)

NAME:___________________________________

USN:____________________________________

SEM:__________SECTION:_________ROLL NO.: _______

ACADEMICYEAR: 202_-202_BATCH: ______________

VISION&MISSION

VISION:

To be globally recognized for excellence in the teaching-learning process, research and innovation to create professional, socially ethical responsible civil engineers to develop a progressive and sustainable eco-friendly world.

MISSION:

1. To provide an environment for learning to meet the changing needs of the civil engineering fields.

2. To develop innovation and research traits in students through frequent interaction with people from the industry, research centres, internships, site visits and state-of-the-art laboratories.

3. To impart environmental awareness programs to educate society and instil values to develop a sustainable, eco-friendly world.

PROGRAM OUTCOMES (POs)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to 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 Solutions**: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods 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 professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

8. **Ethics :** Apply ethical principles and commit to professional ethics 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 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 :** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. To create structures with optimal design by using knowledge of strength of materials and codal provisions.

2. To develop alternate building materials by using industrial waste and C & D waste, strength is checked by experimental results and simulated by software. Learn to use BIM for efficient project management.

3. To implement effective solid waste management, rainwater harvesting with the knowledge of environmental engineering and to develop ground improvement techniques with the knowledge of geotechnical engineering.

INDEX SHEET

COMPUTER AIDED BUILDING PLANNING AND DRAWING		Semester	**3**
Course Code	**BCV305**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	100
Examination type (SEE)	practical		

Course objectives:

- Gain skill set to prepare Computer Aided Engineering Drawings using a software
- Understanding the details of construction of different building elements
- Visualize the completed form of the building and the intricacies of construction based on the engineering drawings
- Get familiarization of practices used in Industry.

Sl.NO	Experiments
1	**Drawing Basics:** Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS:962.
2	**Drawing Tools:** Lines Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet,
3	**Using Text:** Single line text, Multiline text, Spelling, Edit text
4	**Special Features:** View tools, Layers concept, Dimension tools, Hatching, Customizing Toolbars, Working with multiple drawings.
5	**Drawings of Different Building Elements:** Refer NBC before practice a> Footing/ Foundation – Foundation dimension for Isolated, combined footing, Standard dimension and cross section of footing b> Size stone Masonry – Size of single and double bond stone, Sections at wall foundation c> Brick Masonry – Size of standard Burnt Brick, Solid Cement Block, Hollow Cement block, Other bricks used in current practice
6	Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC.
7	Draw a building plan for single and double bed room accommodation for a given site dimension. Students have to go through Building Bye Laws and regulations
8	Prepare the centre line drawing for marking the single and double bedroom house as in in exercise 6
9	Prepare a complete sanction plan for the exercise 6 as per the bye law. Also study the requirements to plan Residential Building, School building, Hospital Building, Offices
10	Drawing of plan with electrical, plumbing and sanitary services using CAD software
11	Drawing standard sections for Lintel and chajja, RCC Slabs, Columns and beams.
12	Drawing different types of staircases – Dog legged, Open well – plan and section

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- Prepare, read and interpret the drawings in a professional set up.
- Know the procedures of submission of drawings and Develop working and submission drawings for building.
- Plan of residential or public building as per the given requirements..

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted

between the schedule mentioned in the academic calendar of the University.

- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing", Tata McGraw Hill Publishing co. Ltd, New Delhi.
- Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
- Malik RS and a Meo GS, "Civil Engineering Drawing", Asian Publishers/Computech Publication Pvt Ltd

1.DRAWING BASICS

1. Selection of Scales for various drawing

Drawings drawn to the scale enable dimensions to be "read-off" from the drawing. When the drawing is made to the same scale as that of actual object, it is called full scale (1:1). However, the building drawings are too large to be drawn to full size. Therefore, there must be reduced scales to fit the normal drawing sheets. Thus the main function of scale is to enable the designerto draw a building to a convenient size to enable the builder to think in relation to the actual size of the structures.

Sl. No. Drawing Scale

1 Large plot plans 1:200
2 Small plot plans 1:100
3 Floor plan 1:50
4 Detailed drawing 1:20, 1:10, 1:5

2. Thickness of Lines

Two thickness of lines are used. The Ratio of thick to the thin line shall not be less than 2:1

Line	Description	General Applications
A	Continuous thick	A1 Visible outlines A2 Visible edges
B	Continuous thin (straight or curved)	B1 Imaginary lines of intersection B2 Dimension lines B3 Projection lines B4 Leader lines B5 Hatching B6 Outlines of revolved sections in place B7 Short centre lines
C	Continuous thin freehand	C1 Limits of partial or interrupted views and sections, if the limit is not a chain thin line
D	Continuous thin† (straight) with zigzags	D1 Limits of partial or interrupted views and sections, if the limit is not a chain thin line
E	Dashed thick	E1 Hidden outlines* E2 Hidden edges*
F	Dashed thin	F1 Hidden outlines* F2 Hidden edges*
G	Chain thin	G1 Centre lines G2 Lines of symmetry G3 Trajectories
H	Chain thin, thick at ends and changes of direction	H1 Cutting planes
J	Chain thick	J1 Indication of lines or surfaces to which a special requirement applies
K	Chain thin double-dashed	K1 Outlines of adjacent parts K2 Alternative and extreme positions of movable parts K3 Centroidal lines K4 Initial outlines prior to forming K5 Parts situated in front of the cutting plane

3. Dimensioning

Projection lines (also called extension lines) and dimension lines shall be drawn as thin, continuous lines.

Starting a short distance (to avoid confusing with other lines on the drawing) from the outline, projection lines shall generally be drawn perpendicular to the associated dimension line, and shall extend slightly beyond them (Fig. 3).

Intersecting projection lines and dimension lines shall be avoided wherever possible. Otherwise they shall simply cross each other (no special designation at intersections).

Dimension lines shall generally be unbroken except, in certain cases, for the insertion of a size.

An axis, reference line or outline shall never be used as a dimension line, but may be used as a projection line.

Termination of Dimension Lines

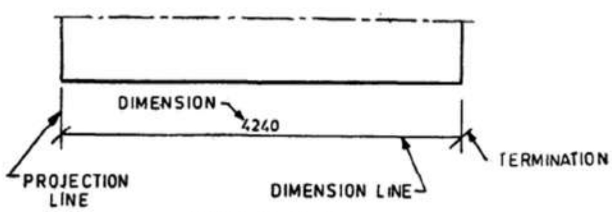
Single dimensions, chain dimensions and parallel dimensions The termination of dimension lines shall be represented by short oblique lines, drawn at 45”clockwise from the projection line (Fig. 4 and 5).

Superimposed running dimensions the common datum point of running dimensions shall be represented by a dot surrounded by a circle. The termination of dimension lines shall be represented by open 90’ arrowheads (Fig. 6 and 7).

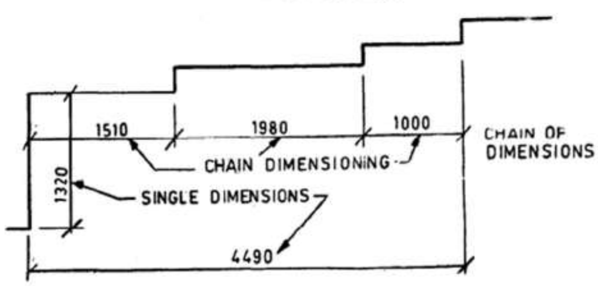
Inscription of Dimensions

Single dimensions, chain dimensions and parallel dimensions Dimensions shall be placed near the middle of, above and clear of the dimension line. The figures shall be oriented so that they can be read from the bottom or from the right of the drawing (Fig. 4 and 5).

Superimposed running dimensions Dimensions shall be placed near the arrowhead: a) in line with the projection line (Fig. 6), or b) where there is no risk of confusion, above and clear of the dimension line (Fig. 7).

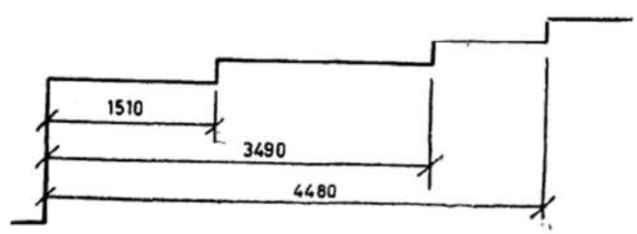


All dimensions in millimetres.
FIG. 3 SINGLE DIMENSION



All dimensions in millimetres.
FIG. 4 SINGLE DIMENSIONS AND CHAIN DIMENSIONING

8



All dimensions in millimetres.
FIG. 5 PARALLEL DIMENSIONING

All dimensions in millimetres.
FIG 6 SUPER-IMPOSED RUNNING DIMENSIONS a)

4. Abbreviations and Conventional representation as per IS: 962

12.1 Abbreviations are generally used in drawing for the sake of clarity. A systematic notation of architectural and building terms is necessary for uniformity, and for avoiding confusion and ambiguity. Abbreviations are the same in the singular and plural. Abbreviations and symbols recommended for use in general building drawings are listed in Table 6.

12.2 The word 'ditto' or its equivalent abbreviations shall not be used on drawings.

Table 6 Recommended Abbreviations with Symbols Where Applicable

(*Clause* 11.1)

Term	Abbreviation and/or Symbol
A	
Aggregate	AGG
Air-brick	AB
Alternating current	ac
Aluminium	Al
Ampere	amp or AMP
Approximate	APPROX
Arrange	ARNG
Asbestos	ASB
Asbestos cement	ASB/CME
Asphalt	ASPH
Assembly	ASSY
At	@, AT
B	
Beam (I Section)	I
Bench mark	BM
Bitumen	BIT
Brickwork	BWK
Brinell hardness number	BHN, HB
C	
Cast iron	ci or CI
Cast steel	CS
Cement	ct
Cement concrete	CC
Centi (10^{-2})	c
Centimetre	cm
Centre line	CL, C
Centre of gravity	CG
Centre to centre	C TO C, c/c
Chain	CH
Checked	CHKD
Circular pitch	CP
Circumference	⊙ce, CIRC
Coefficient	COEFF
Column	COL
Concentrate	CONC, conc
Concrete	CONC
Continued	Contd
Copper	Cu
Corrugated	CORR
Cosecant	cosec
Cosine	cos
Cotangent	cot
Countersunk	CTR/SNK, csk
Crossing	X-ING
Cross over	X-OVER
Cross-section	CS
Cubic centimetre	cm^3, (cc)
Cubic metre	cu/m, m^3
Cubic metre per second	(cumec) m^3/s
Cubic millimetre	mm^3 cu/mm
Cycles per second	CPS
Cylinder or cylindrical	CYL
Degree (angle)	deg, °
Degree Celsius	°C
Diameter	DIA, ϕ
Diametral pitch	DP
Dilute	DIL
Direct current	dc
Drawing	DRG
Drawn	DRN

E

Earth closet	EC
Elevation (View)	ELEV
Elevation	EL
Embankment	EMB
Enamelled	ENAM
Expanded metal	XPM
Extension	EXTN
Extra-high voltage	EHV
Engine	ENG

F

Figure	FIG
Finished floor level	FFL
Floor trap	FT
Flushing cistern	FC
Forced draught	FD
Forged steel	F/ST
Formation level	FL
Fresh air inlet	FAI
Full supply level	FSL
Full tank level	FTL

G

Galvanized	GALV
Galvanized iron	GI
Glazed Ware pipe	GWP
Gram	g
Grate area	GR/A
Greese trap	GRT
Ground level	GL
Ground sink	GS
Gully	G
Gully trap	GT
Gunmetal	G/MET

H

Hard drawn	H/DWN
Hardened and tempered	H & T
Heating surface	HS
Height	HT
Hertz	Hz
Hexagon or hexagonal	HEX
Hexagonalhead	HEX/HD
High flood level	HFL

High flood level, ordinary	OHFL
High flood level, maximum	MAX HFL
High tensile steel	HT/ST
High tensile welding steel	HTWS
High tension	HT
High voltage	HV
High water mark	HWM
Hour	h

High flood level, ordinary	OHFL
High flood level, maximum	MAX HFL
High tensile steel	HT/ST
High tensile welding steel	HTWS
High tension	HT
High voltage	HV
High water mark	HWM
Hour	h

I

India rubber	IR
Induced draught	I/D
Infinity	inf, ∞
Inside diameter	ID
Inspection chamber	ICH, IC
Insulated or insulation	INSUL
Intercepting trap	IT
Internal	INT
Internal combustion	IC
Intermediate pressure	IP

K

Kilo	k
Kilocycles per second	kc/s
Kilogram	kg
Kilogram per cubic metre	kg/m^3
Kilogram per square centimetre	kg/cm^2
Kilo hertz	KH$_z$
Kilolitre	Kl
Kilometre	km
Kilometre per hour	km/h
Kilovolt	kV
Kilovolt-ampere	kVA
Kilowatt	kW

L

Larger than	>
Larger than or equal to	≥, ≧
Latitude	LAT
Left hand	LH
Length	l
Level crossing	LC
Litre	l
Logarithm (common)	log
Logarithm (natural)	log$_e$
Longitudinal scale	LS
Longitudinal section	LSec
Low frequency	Lf
Low pressure	LP
Low tension	LT
Low voltage	LV
Lumen per watt	lm/W

M

Macadam	MAC
Malleable cast iron	MCI
Malleable iron	MI
Manganese steel	Mn S
Manhole	MH
Maximum	MAX
Maximum flood level	MFL
Maximum water level	MWL
Mean sea level	MSL
Mega (10^6)	M
Megawatt	MW
Metre	m
Mezzanine	MEZZ
Micro (10^{-6})	µ
Micro ampere	µA
Micro metre (or micron)	µm
Mild steel	MS
Milli (10^{-3})	m
Milliampere	mA
Milligram	mg
Millilitre	ml
Millimetre	mm
Minimum	MIN
Minute (time)	min
Much larger than	$\gg$
Much smaller than	$\ll$

N

Naval brass	N Br
Nickel chromium steel	Ni Cr S
Nickel steel	NiS/T
North	N
Not to scale	NTS
Number	No.

O

Ohm	OHM, Ω
Oil circuit breaker	OCB

P

Paper insulated	PI
Parts per million	ppm
Pattern number	PATT No.
Per	PER, /
Percent	PERCENT, %
Phase	ph
Phosphor bronze	PH BRZ
Pitch	P
Pitch circle	PC
Pitch circle diameter	PCD
Plate.	PL
Platinum	PLAT

Q

Quintal	q

R

Radian	rad
Radius	RAD
Railways	RLY
Rainwater outlet	RWO
Rainwater pipe	RWP
Reduced level	RL
Reference	REF
Reinforced cement concrete	RCC
Revolutions per minute	rev/min, rpm
Revolutions per sec	RPS
Right hand	RH
Rising main	RM
Rivet	RIV
Road level	Rd L
Rodding eye	RE
Rolled section	RS
Rolled steel joist or I section	RSJ or I
Round	RD
Round head	RH

S

Saturated	SATD
Screwed	SCR
Secant	sec
Second	s
Sheet (when preceding a material or sheet No.)	SH
Shower bath	SB
Sine	sin
Sink	SN
Sketch	SK
Sluice valve	SV
Smaller than	<
Smaller than or equal to	<, ≤
Soil and vent pipe	S & VP
Soil pipe	SP
South	S
Specification	SPEC
Specific gravity	sp-gr
Spigot and socket	S&S
Spot faced	SF
Square	SQ
Square centimetre	cm^2
Square kilometre	km^2
Square metre	m^2
Square millimetre	mm^2

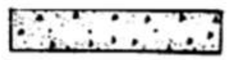
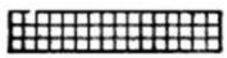
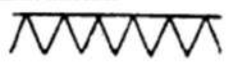
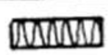
T	
Tangent	tan
Tee	T
Telegraph post	Tp
Temperature	temp
Tongued and grooved	T&G
Tonne	t
Traced	TCD
Trigonometrical station	Δ
Turns per centimetre	tpc
Turns per metre	tpm
V	
Vacuum	vac
Vapour density	vd
Vapour pressure	vp
Vent pipe	VP
Volt	V
Volume	vol
Vulcanized India rubber	VIR
W	
Waste and vent pipe	W&VP
Waste pipe	WP
Water closet	WC
Watt	W, WATT
Weight	wt
West	W
White metal	WM
Wrought iron	WI
Y	
Yard gully	YG
Year	yr

Conventional Representation of Materials in Section

Recommended methods of indicating materials by hatching or coloring are given in Table 2. Where any confusion is likely to occur in the interpretation of drawings, hatching or coloring shall be used.

Table 7 Symbols for Materials in Section

(*Clause* 13.1)

Material	Symbol		Colour
Brick			Vermilion
Concrete			Hookers green
Natural or reconstructed stone			Cobalt blue
Partition blocks			Paynes grey
Wood			Burnt sienna
Earth			Sepia
Hardcore			Yellow ochre or chrome yellow
Plaster and plaster products		Applicable to large scales only	Green
Glass			Blue
Fibre building board and insulation board			Sepia
Metal sections			Black

2. DRAWING TOOLS

It consists of set of commands that can be used to create new objects like line, arc, rectangle, polygon, circle, ellipse, polyline, hatch, etc.

1. LINE

Draw menu: Line
Command line: line
Short cut key: L
Line command creates one or series of straight-line segments; here each line segment is a separate object. There are various methods of giving inputs for creating a line.

- Point method by picking the first and last point
- Absolute method: In this system the point is specified using X & Y co-ordinates measured from origin.
- Relative Co-ordinate: In this system the point is specified using X & Y co-ordinate the distance of the next point is measured from a previous point.
- Direct Distance Entry: It is an alternative to entering polar or relative co-ordinates. This is an easy and fastest way to specify a length. Specify a point and move the cursor to indicate a direction and then enter the distance from the first point.

2. CIRCLE

Draw menu: Circle
Command line: circle
Short cut key: C
It creates a circle. The default method is to specify the center point and the radius. In addition,
there are other methods also.

- Centre and Radius: It draws a circle based on a center point and radius command circle.
- Centre and Diameter: Draws a circle based on a center point and diameter.
- Three points: Draws a circle based on three points on the circumference.
- Two points: Draws a circle based on a two end points of the diameter.
- Tangent, Tangent, Radius: Draws a circle with a specified radius and tangent to two selected objects.

3. ARC

Draw menu: Arc
Command line: arc
Short cut key: A
It creates an arc and is used to add curved segments to the drawing. There are many ways to give the data to draw arcs.

- Three-point arc: Draws an arc using three specified points on the circumference.
- Start, centre, end point: Draws an arc using start point, centre of arc and end point of arc.
- Start, centre, angle
- Start centre length or chord
- Start, end, radius
- Start, end, starting direction
- Start, end, starting direction.

4. POLY LINE

Draw menu: Pline
Command line: pline
Shortcut key: pl
Polyline is a series of connected line and are segments created as one object, width of the object can also be controlled.

5. RECTANGLE

Draw menu: Rectangle
Command line: rectangle
Shortcut key: rec
It creates a rectangle and it acts as one entity. It can be drawn by picking two opposite corners
or by giving areas and dimensions.

6. POLYGON

Draw menu: Polygon
Command line: polygon
Shortcut key: pol
It creates a regular polygon with the given number of sides and side length.

7. SPLINE

Draw menu: Spline
Command line: spline
Shortcut key: spl
It creates a smooth curve passing through mid-points of segments of polyline.

8. ELLIPSE

Draw menu: Ellipse
Command line: ellipse
Shortcut key: el
Creates an ellipse or an elliptical arc.

MODIFY TOOL

It consists of set of commands that can be used to alter the existing objects.

1. ERASE

Modify menu: Erase
Command line: erase
Shortcut key: e
It deletes the selected objects from drawing.

2. COPY

Modify menu: Copy
Command line: copy
Shortcut key: co
It creates one or more number of copies of selected objects within the drawing.

3. MIRROR

Modify menu: Mirror
Command line: mirror
Shortcut key: MI
It creates mirror image of the selected object in selected direction. It helps to complete drawing faster if the object is symmetrical about any axis.

4. OFFSET

Modify menu: Offset
Command line: offset
Shortcut key: O
It creates a new object that is similar to a selected object at a specified distance from the original object.

5. ARRAY

Modify menu: Array
Command line: array
Shortcut key: ar
It creates multiple copies of object in given number of rows and columns or around an imaginary circle.

6. MOVE

Modify menu: Move
Command line: move
Shortcut key: m
Objects can be shifted from one place to another place within the drawing area.

7. ROTATE
Modify menu: Rotate
Command line: rotate
Shortcut key: ro
It rotates selected objects around given axis to the given angle or about a base point.

8. SCALE
Modify menu: Scale
Command line: scale
Shortcut key: sc
It is used to enlarge / reduce the size of the objects equally in the x and y directions as per the scale factor given.

9. STRETCH
Modify menu: Stretch
Command line: stretch
Shortcut key: str
It is used to change the snap and size of the object by pulling or pushing from one side and alsoto move objects from one place to another place.

10. LENGTHEN
Modify menu: Lengthen
Command line:Lengthen
Shortcut key:len
It is used to make an object lengthen, end point closed to the point of selection and specify a new endpoint.

11. TRIM
Modify menu: Trim
Command line: trim
Shortcut key: tr
It is used to cut off or erase an object or set of objects precisely at an edge defined by other objects. It can also be used to cut off part of the object in between two defined edges.

12. EXTEND
Modify menu: Extend
Command line: extend
Shortcut key: ex
It extends an object to meet another object.

13. BREAK
Modify menu: Break
Command line: break
Shortcut key: br
This method is used to cut an object into two parts at selected point or to remove part of the object in between two selected points.

14. CHAMFER

Modify menu: Chamfer
Command line: chamfer
Shortcut key: cha
It connects two non-parallel lines by extending them to intersect or to join with a bevelled line at specified distance from intersection.

15. FILLET

Modify menu: Fillet
Command line: fillet
Shortcut key: f
It used for filleting connects the two objects with a round arc of a specified radius.

3. USING TEXT

1. SINGLE LINE TEXT

For short, simple notes and labels, use single line text

1. Click Home tab ➤ Annotation panel ➤ Single Line Text.

2. Specify the insertion point.
3. If you press ENTER, the program inserts the new text immediately below the last text object you created, if any.

Enter a height or click to specify the height of the text.

Note: If a specific text height is set in the current text style, this prompt is skipped.

4. Enter an angle value or click to specify the rotation angle.

5. Enter the text.

Note: While typing, the text may be displayed horizontally and at a legible size.

6. To create another single-line text, do one of the following:

   - Press ENTER to start another line of text immediately below.
   - Click a location for the next text object.

7. Press ENTER on a blank line to end the command.

2. MULTILINE TEXT

1. Click Home tab ➤ Annotation panel ➤ Multiline Text.

2. Specify opposite corners of a bounding box to define the width of the multiline text object.
3. If the ribbon is active, the Text Editor contextual tab displays.

If the ribbon is not active, the Text Formatting toolbar displays.

Note: The MTEXTTOOLBAR system variable controls the display of the Text Formatting toolbar.

3. Specify the initial formatting.

   - To indent the first line of each paragraph, drag the first-line indent slider on the ruler. To indent the other lines of each paragraph, drag the hanging indent slider.
   - To set tabs, click the ruler where you want a tab stop.
   - To change the current text style, select the desired text style from the drop-down list.

4. Enter the text.

Note: While typing, the text may be displayed horizontally and at a legible size.

5. To change individual characters, words, or paragraphs, highlight the text and specify the formatting changes.

Note: SHX fonts do not support boldface or italics.

6. To save your changes and exit the editor, use one of the following methods:

- On the Text Editor Ribbon contextual tab, in the Close panel, click Close Text Editor.
- Click OK on the Text Formatting toolbar.
- Click in the drawing outside the editor.
- Press Ctrl+Enter.

Note: Press Esc to exit the editor without saving your changes

4. SPECIAL FEATURES

LAYERS CONCEPT

Layers are the primary method for organizing the objects in a drawing by function or purpose. Layers can reduce the visual complexity of a drawing and improve display performance by hiding information that you don't need to see at the moment.

Use the Layer Properties Manager to manage your layers. 

1. Create, rename, and remove layers
2. Set the current layer on which new objects are automatically created
3. Specify the default properties for objects on the layer
4. Set whether the objects on a layer are displayed or turned off
5. Control whether objects on a layer are plotted
6. Set whether a layer is locked against editin
7. Control the layer display properties for layout viewports
8. Sort, filter, and group layer names

DIMENSION TOOLS

Linear. The Linear dimension tool measures horizontal or vertical distances. ...

Aligned. The Aligned dimension tool measures the length along an object. ...

Angular. Angular dimensions measure the angle between two selected geometric objects or three points

Arc Length. Arc length dimensions measure the distance along an arc or polyline arc segment.

Radius. A radial dimension measures the radius or diameter of arcs and circles with an optional centerline or center mark.

Diameter. The Diameter dimension tool measures the diameter of an arc or circle.

Jogged. The Jogged dimension tool measures the radius of an arc or circle but places the leader line in an alternative place (inferred point) to the arc or circles center point

CUSTOMIZING TOOLBARS

The commands in the tool bars do the work of creating new objects and editing existing ones. The icons are grouped by action type. For example the Draw tool bar contains tools needed to create objects and Modify tool bar contains functions that modify the existing objects. To find out what a particular icon is meant, place the cursor on top of an icon and wait for a while, a tool tip including short cut key will flash along with the cursor. At the same time, notice the status bar. In place of the co-ordinates display, AutoCAD displays a brief help text narrating the function of the command along with the command name. The icon buttons in the tool bars display further options known as fly-outs (button with an arrow at right bottom corner), they open dialogue boxes and issue commands that require keyboard input.

5. DRAWINGS OF BUILDING COMPONENTS

The drawings of different components of a building are to be prepared for the data given using AutoCAD software.

a) FOOTING/FOUNDATION

5a(i)Rectangular isolated column footing

Q. A Rectangular R.C.C column 600mmx400mm is resting on a flat R.C.C Rectangular footing. The Depth of foundation is 1.5M below the ground level. The size of Footing is 3000x2000mm.

The Depth of footing 450mm.

The column reinforcement consist of 8 bars of 16mm dia with 2legged 8mm dia stirrups at 200mm c/c and the footing reinforcement consist of 12mm dia @ 120mm c/c of longer bars and 12mm dia @ 130mm c/c of shorter bars.

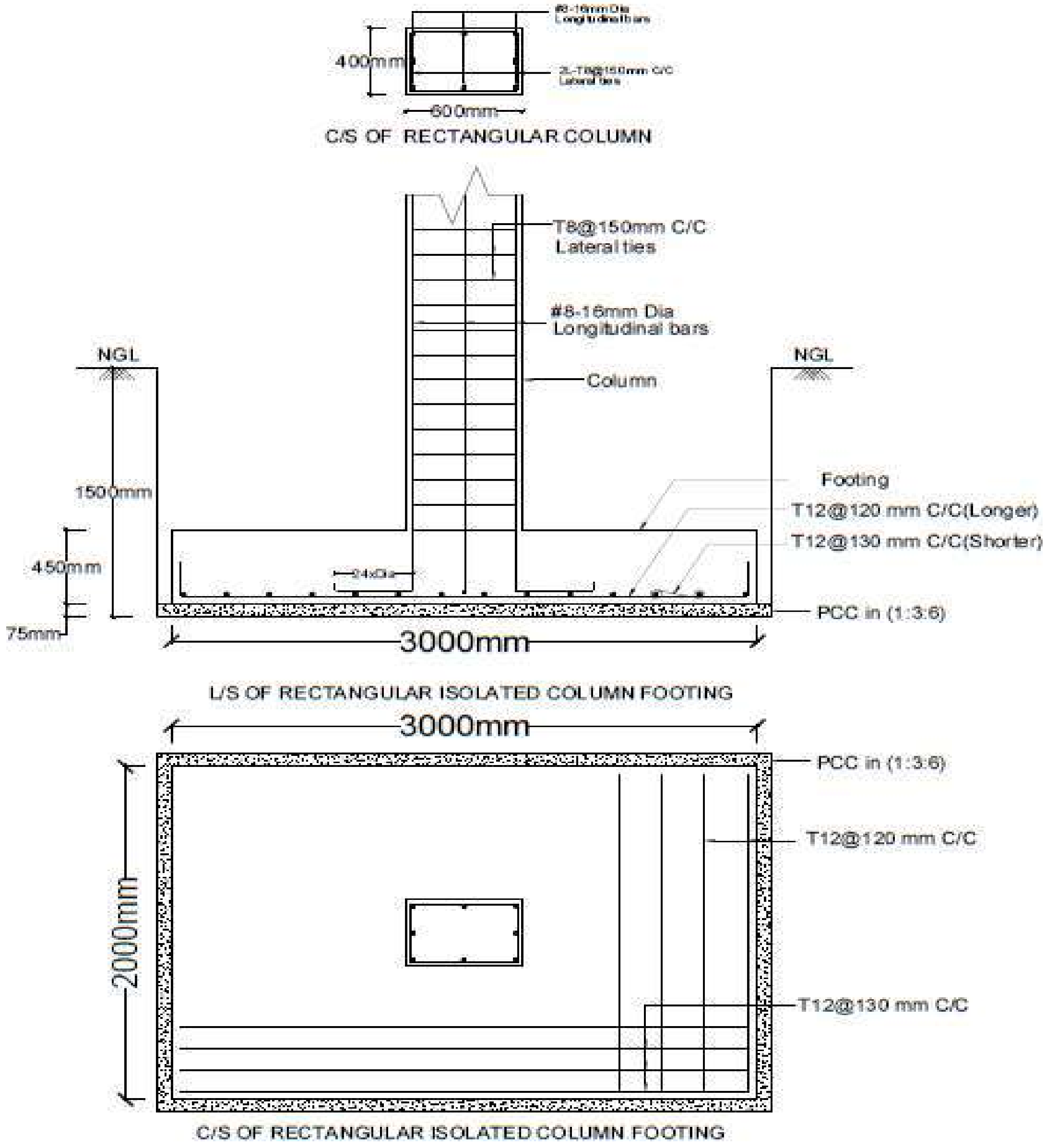
The footing is provided with P.C.C Bed in 1:3:6 of thickness 75mm .Draw to scale the following

a) Plan of footing showing the reinforcement

b) Vertical sction of the column with footing.

c) Cross section of column.

RECTANGULAR ISOLATED COLUMN FOOTING(Fig:2.4)



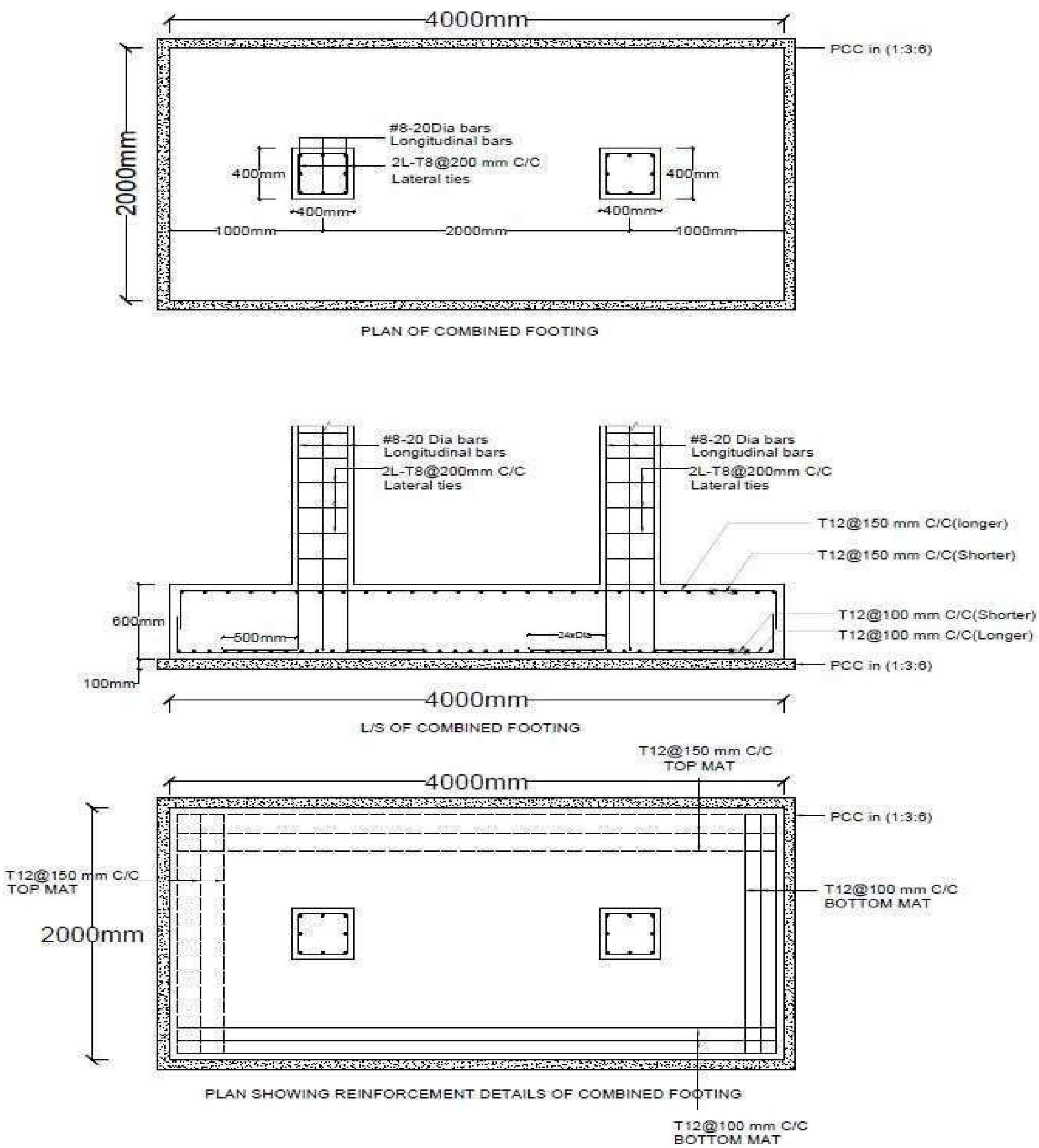
5a(ii)Combined footing

Q .Draw plan, sectional elevation and cross section of a slab type combined footing with the givendetails:

Size of columns = (400 x 400) mm, Depth of footing = 600mm, Size of footing =2m x 4m
Centre to centre distance between the columns = 2m, Thickness of PCC bed in 1:3:6 = 100mm, Column reinforcement details – longitudinal steel of #8 - 20ϕ with lateral ties of 2L - 8ϕ @ 200 c/c

Footing reinforcement details – bottom reinforcement of 12ϕ @ 100 c/c both ways and top reinforcement of 12ϕ @ 150 c/c both ways

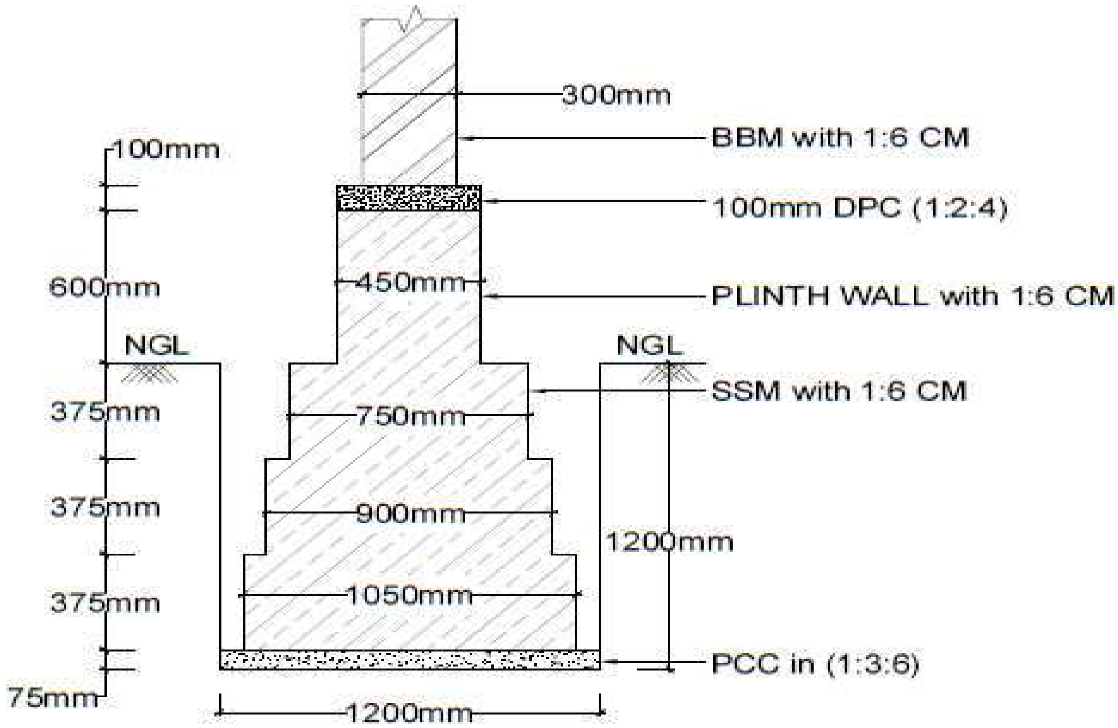
SLAB TYPE COMBINED FOOTING(Fig:2.5)



b) Cross section of masonry wall foundation

Q. Draw a cross section of a S.S. Masonry foundation to be provided for a load bearing wall 300mm thick in Burnt Brick Masonry in superstructure of a residential building. Use following data:

i. Width of foundation = 1.20m
ii. Depth of foundation below GL = 1.20m
iii. Width of PCC = 1.20m
iv. Thickness of PCC in 1:3:6 = 75mm.
v. Width of first footing above PCC = 1.05m
vi. Depth of first footing above PCC = 0.375m
vii. Width of second footing = 0.90m
viii. Depth of second footing = 0.375m
ix. Width of third footing = 0.75m
x. Depth of third footing = 0.375m
xi. Width of plinth wall = 0.45m
xii. Depth of plinth wall = 0.60m
xiii. Thickness of DPC in 1:2:4 = 100mm.



CROSS SECTION OF SIZE STONE MASONRY FOUNDATION FOR MAIN WALL (Fig:2.1)

6.PLANNING OF RESIDENTIAL BUILDING

Plan of a building is the assembling or grouping of arranging of its component parts in a systematic manner and proper order so as to form a meaningful wholesome and homogeneous body.

Planning of building depends on its;

_ Its functional object and requirements.
_ Its component parts, their sizes and the relationship between the different rooms.
_ Shape of the plot and topography
_ Climatic conditions of the place.
_ Its location and neighbourhood
_ Type of the buildings like single storied/ multi storied or detached/ semi- detached/ row houses.

The factors or principles which govern the theory of planning are Aspects, Prospect, Privacy, Furniture requirement, Grouping, Circulation, Sanitation, Flexibility, Elegance, Economy, Practical consideration.

Building Bye-laws

Minimum provisions designed from National Building Code by Town Planning Authorities, Urban Development Authorities and Municipalities. The building bye-laws and regulations should be enforced by proper authority to achieve following objectives.

1. They prohibit and prevent haphazard and irregular growth as ribbon development and permit disciplined and systematic growth of buildings along roads by clearly earmarking residential, commercial, industrial areas, etc.
2. They regulate the open space around the building, window area and head rooms, thereby creating conductive conditions for natural lighting and ventilation.
3. The standard dimensions for various structural members are specified which give strength and long life for the building.
4. The bye-laws regulate the planning, designing and execution of building elements.
5. The bye-laws enable the inmates to easily get access to utilities as piped water supply, electric power and connection to public sewer.
6. The growth of township is streamlined by maintaining uniform height of buildings, uniform frontage so that the abutting road is straight, gently sloping, free from blind corners and can be easily widened in future if required.

A residential building as the following places of activities

1. Living area
2. Sleeping area
3. Service area
4. others areas-depending upon the profession of the inhabitans or circulation area

1.Living area

Living or drawing rooms or lounges are the main places in a residential building where family and friends meet,sir,relax and entertain .such a room well ventilated ,lighted and located near the entrance.

Its area varies from 16 to 32 m². Following points are kept in mind while planning it.

(a) This area is provided near the main entrance with a verandah or porch.

(b) It is directly connected to the bed, bathrooms and W. C. by passages.

(c) It is near the dinning room or dining area may be a part of this area.

(d) It is spacious so that furniture can be properly placed leaving some area for circulation.

(e) It has sufficient windows so that surrounding landscape can be fully viewed and enjoyed.

2. Sleeping Area

This area is provided for sleeping and relaxing. Bedrooms of all types come under this area. These rooms have attached bath and W. C.s. Area of these rooms varies from 10 to 20 m². These rooms are large enough so as to allow space for beds, cupboards, writing table and a chair. Sometimes space is provided for dressing and make up. Windows are placed on North-West or South-West directions. These rooms are placed on
North or South-West directions so as to receive in direct sunlight

3. Service Area

This area is used for daily services like cooking, eating, cleaning, bathing etc. kitchens, dining-room, bathrooms, W. Cs. and toilets form this area. Spaces provided for boilers, washing and drying machines, air conditioning are also covered by service areas

Kitchen: It is the area where cooking is done. It preferably has Eastern or North-Eastren location. Windows are so placed that a housewife can see the main entrance and also supervise the playing children. Standing working areas in kitchen are preferred these days. Working shelves, washing sink and cooking ranges be placed at 700 to 800 mmn high from floor level. Walls, shelves and skirtings are provided with a glazed finish. Lofts are fixed on the walls for storage.

Dining: It has kitchen on one side and living area on the other. Kitchen activities should not be visible from this area. This area is made ventilated and airy. It is sufficiently big so that refrigerator, freezer, cupboard, crockery and cutlury drawers can be accommodated in addition to dining table and chairs. Service or hatch window is provided between this area and kitchen.

Bath and W. Cs.: These areas are attached to bedrooms with one wall preferably exposed to weather. The flooring and walls are given a glazy finish. High-level window or windows with grounded glasses are provided so as to maintain privacy. If needed an exhaust fan can also be provided in these areas.

4.Other Areas

Verandah, passages, galleries, corridors, foyers, porches, staircase lobby living space come under these areas. For freè circulation in the building these are placed. Prayer room, study or hobby room, garage and a storage place can also be covered under these areas. A public man, a lawyer, a doctor, a professor need a separate room in his residential place for carrying out his professional obligations.

The placing of these areas with respect to their utility and function is termed planning.The overallplacing of rooms, position of windows, ventilators and doors with respect to North-line is called ORIENTATION.

PRINCIPLES OF PLANNING OF RESIDENTIAL BUILDINGS

Before planning a residential building, the site is visited, local building by-laws are studied and a line plan is prepared. While preparing the line plan following principles of practical conveniences are followed

1 Orientation-aspects and prospects.
2. Privacy.
3. Grouping.
4. Circulation.
5 Sanitation.
6. Flexibility.
7. Elegance.
8. Landscaping and
9. Economy.

1. Orientation

Proper orientation means setting or placing of the rooms of the residential building which allow the inmates of the house to enjoy the utmost whatever is good and to avoid whatever is bad in respect of comforts in the elements of nature such as the sun, wind and rain. Good orientation means placements of rooms in relation to sun, wind, rain, topography and out look and at the same time providing a convenient access both to the courtyard, compound or street.In this country sun never goes overhead and it is always in the South of zenith, therefore to protect the main rooms from the effect of heat of the sun these should always be on East or North. Activities in a house take place at different times of the day thus one needs sun shine in the morning and cool afternoon in the kitchen. So a kitchen is planned with main windows fixed towards East. It is better to place the kitchen facing East. Living rooms have some windows towards East and a few towards North Bedrooms are placed in the North-West or South-West direction. Verandahs are provided towards East and West to protect rooms from the effect of intense heat of sun.

2. Privacy

Privacy is of two kinds:

(1) Privacy inside the house between different rooms. It can be achieved by proper placing of passages, doors and windows. Privacy is mainly desired in bedrooms, bathrooms, W. C.'s and toilets. Screens or raised windows can also help in achieving in door privacy.

(ii) Privacy of the whole house from the highways and streets. It is achieved by providing compound walls, tall trees, hedges, creepers and green foliage and high sill-level windows. OR raised plinths.

3. Grouping

Placing of rooms adjacent to each other with respect to their relative utility is called grouping. Bath, W. C.'s are close to bedrooms. Dining space may be close to a kitchen. Drawing, lounge or living room are preferably be near the entrance.

4. Circulation

Horizontal circulation is achieved by passages, lobbies, corridors, and lounges. Vertical circulation is achieved by stairs or stepped terracings or lifts or ramps.

5. Sanitation

Good sanitation means the proper drainage of sewage. To achieve this house is built on elevated grounds. A house should be free from stagnated waters. Windows, doors and ventilators are so placed that natural light and fresh air are available in all the rooms through out the day. Windows are placed on opposite walls to creat cross ventilation. Small-sized windows are normaly used in areas where hot and dry weather remains most of the time.

6. Flexibility

It is a provision which allows the same space to be used for some other purposes. Festive occassions demand large areas for congregation. Dining space attached to the drawing room and an additional verandah with large windows can allow these areas to be converted into a hall. Even a good terrace on a compact combination of different rooms can allow such congregations.

7. Elegance

The outward appealing look which allows the building to diffuse into the adjoining environment is termed elegance. Balconies, verandahs, sun-shades, porches, ralings, parapets, louvres, shape of windows etc. can enhance elegance if properly placed and planned. Colourerd washes can also help in achieving elegance. Circular or arched openings spanning the verandah, doors, and window openings have again come into use they add to the elegance and break the monotony of present-day stereo-typed buildings. See Fig. 16.13 and Fig. 16.14. Frills, sloping roof-slab projections, munty on staircases can help in increasing elegance. Surface finishing in c. mortar also render elegance.

8. Landscaping

The space around the building may be suitably covered with greenery and plants. Green foliage and shrubs provide an hygienic and healthy atmosphere in addition to keeping the place cool and refreshing.

9. Economy

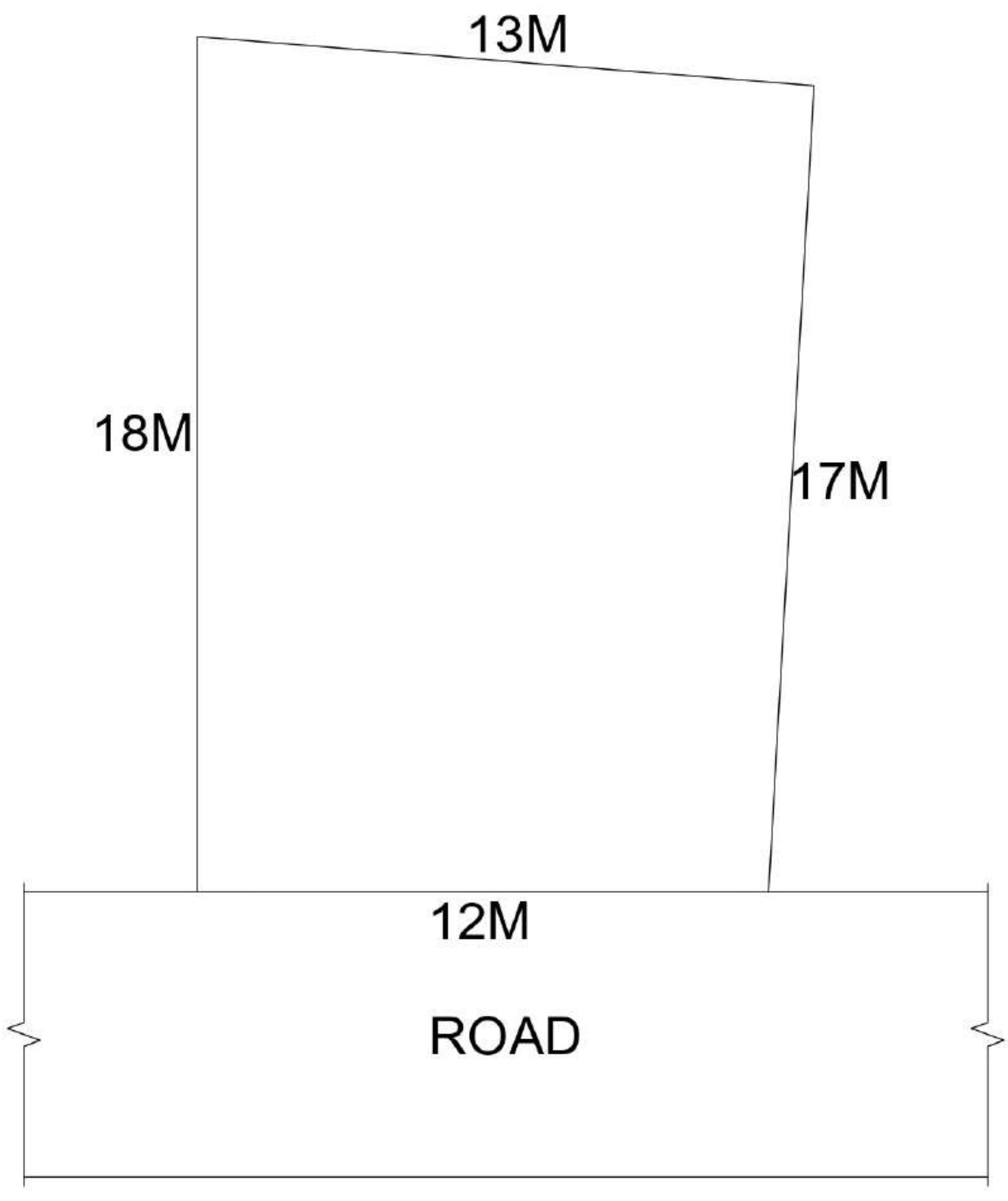
The cost of the building should be within the economical reach of its builder. It should be comparatively low-priced and within the allotted budget.

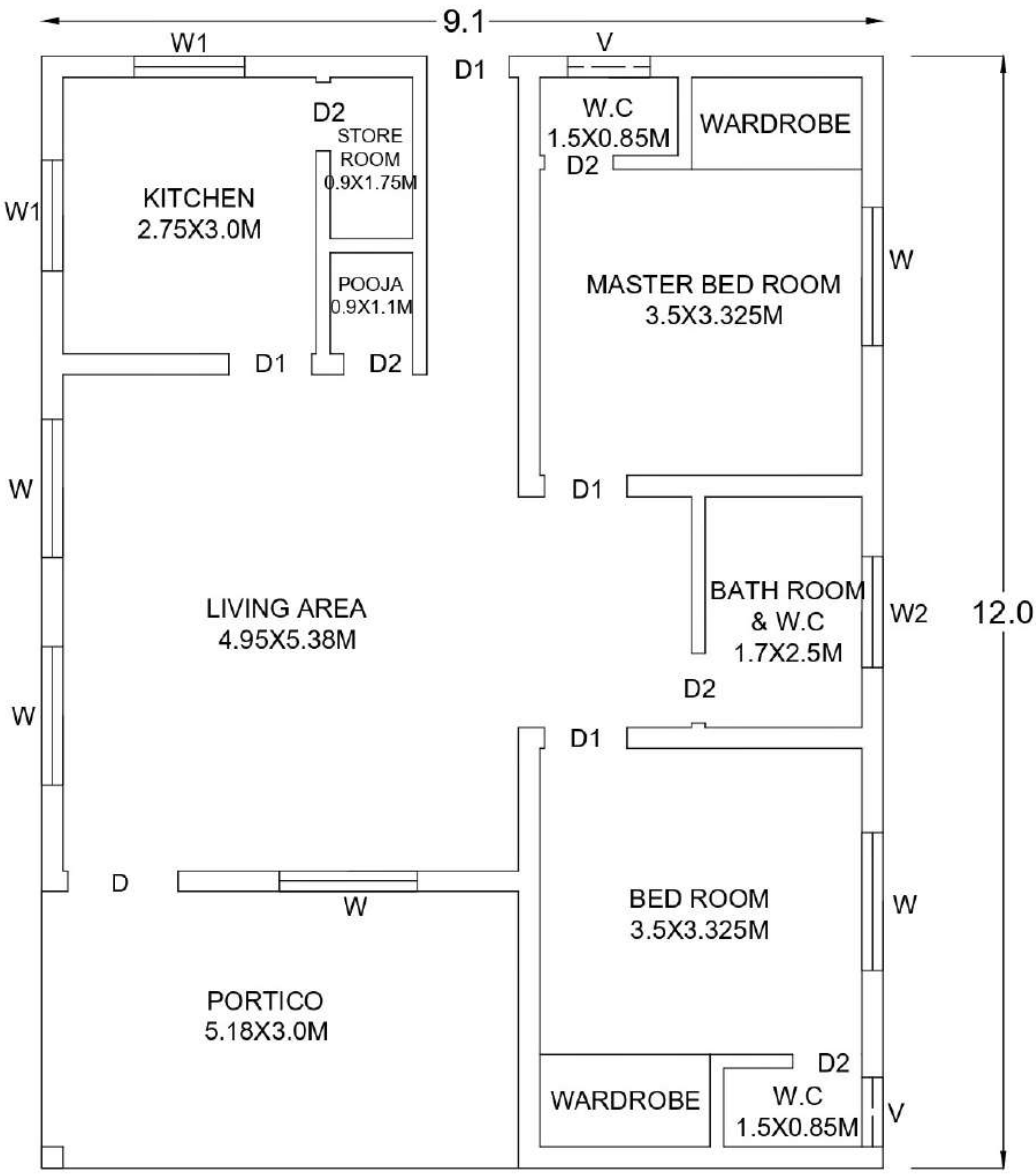
All spaces of activities are grouped together by means of passage, lobby staircase, etc. These areas should be minimum but purposeful and well ventilated. Planning is only an art but not a science and hence it needs proper utilization of many faculties of building. The basic criteria of Form Follows Function be adhered too.

The ideal conditions be chosen and local building by-laws, rules and regulation, customs and the needs of family be kept in mind while planning of a residential building.

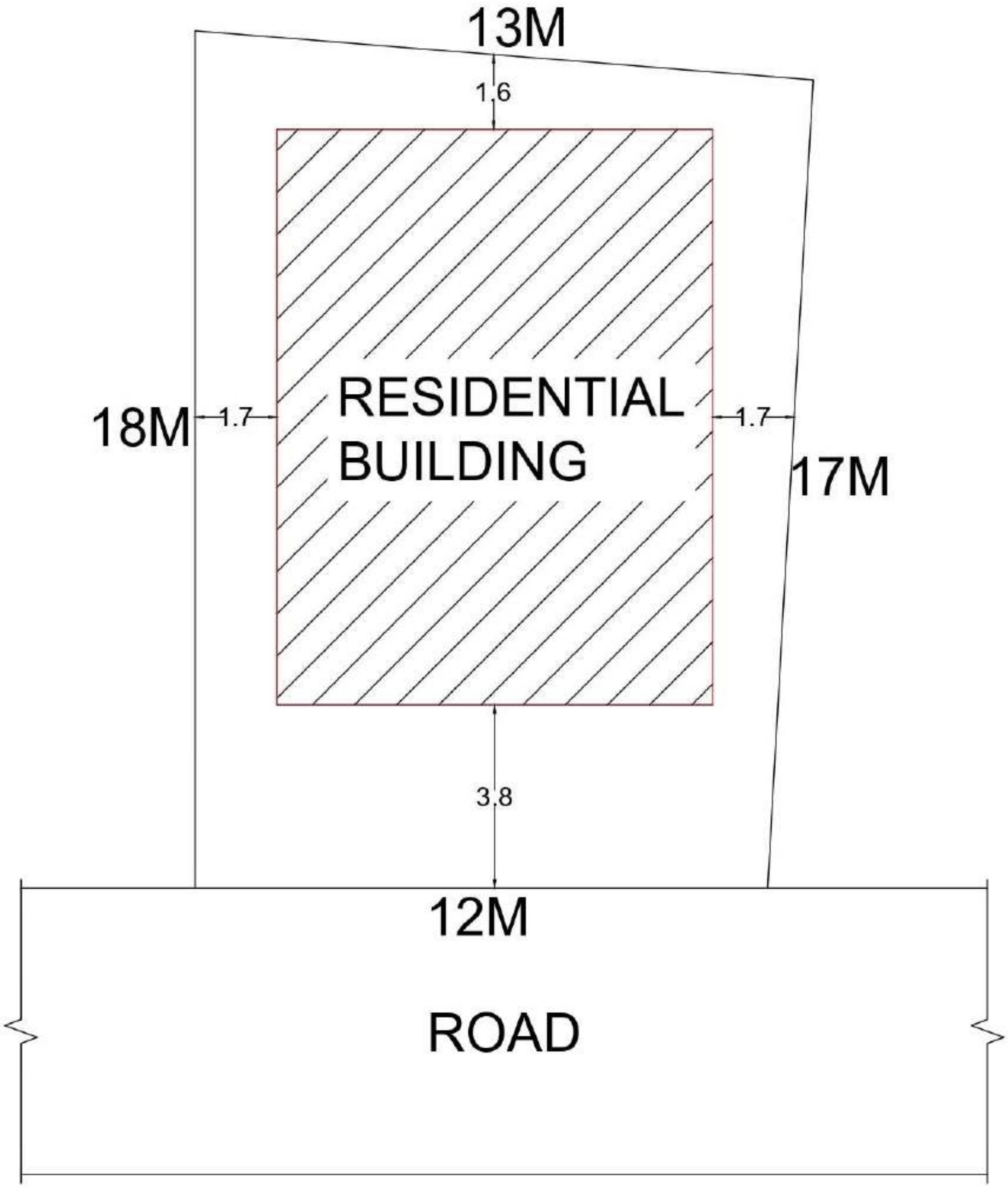
7. SETTING A BUILDING PLAN FOR GIVEN SITE DIMENSION

Q. Site dimensions of a plot is given in figure below. Draw a building plan for double bedroom accommodation using building by laws and regulations.




9.1
W1
V
D1
D2
STORE ROOM 0.9X1.75M
W.C 1.5X0.85M
WARDROBE
D2
W1
KITCHEN 2.75X3.0M
POOJA 0.9X1.1M
MASTER BED ROOM 3.5X3.325M
W
D1
D2
W
D1
LIVING AREA 4.95X5.38M
BATH ROOM & W.C 1.7X2.5M
W2
12.0
W
D2
D1
D
W
BED ROOM 3.5X3.325M
W
PORTICO 5.18X3.0M
D2
WARDROBE
W.C 1.5X0.85M
V

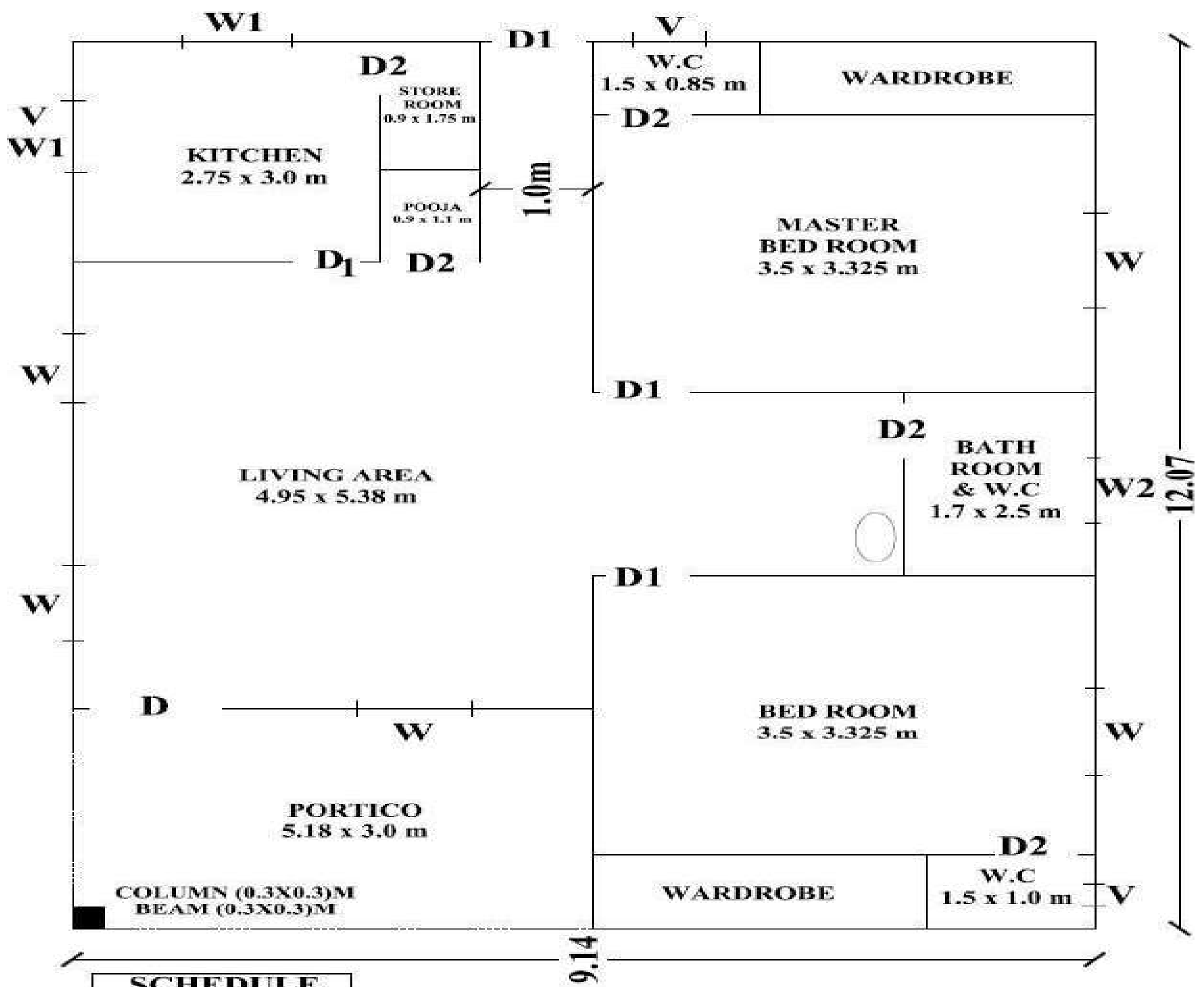
PLAN


13M
1.6
18M
1.7
RESIDENTIAL
BUILDING
1.7
17M
3.8
12M
ROAD

8. CENTRE LINE DRAWING FOR RESIDENTIAL BUILDING

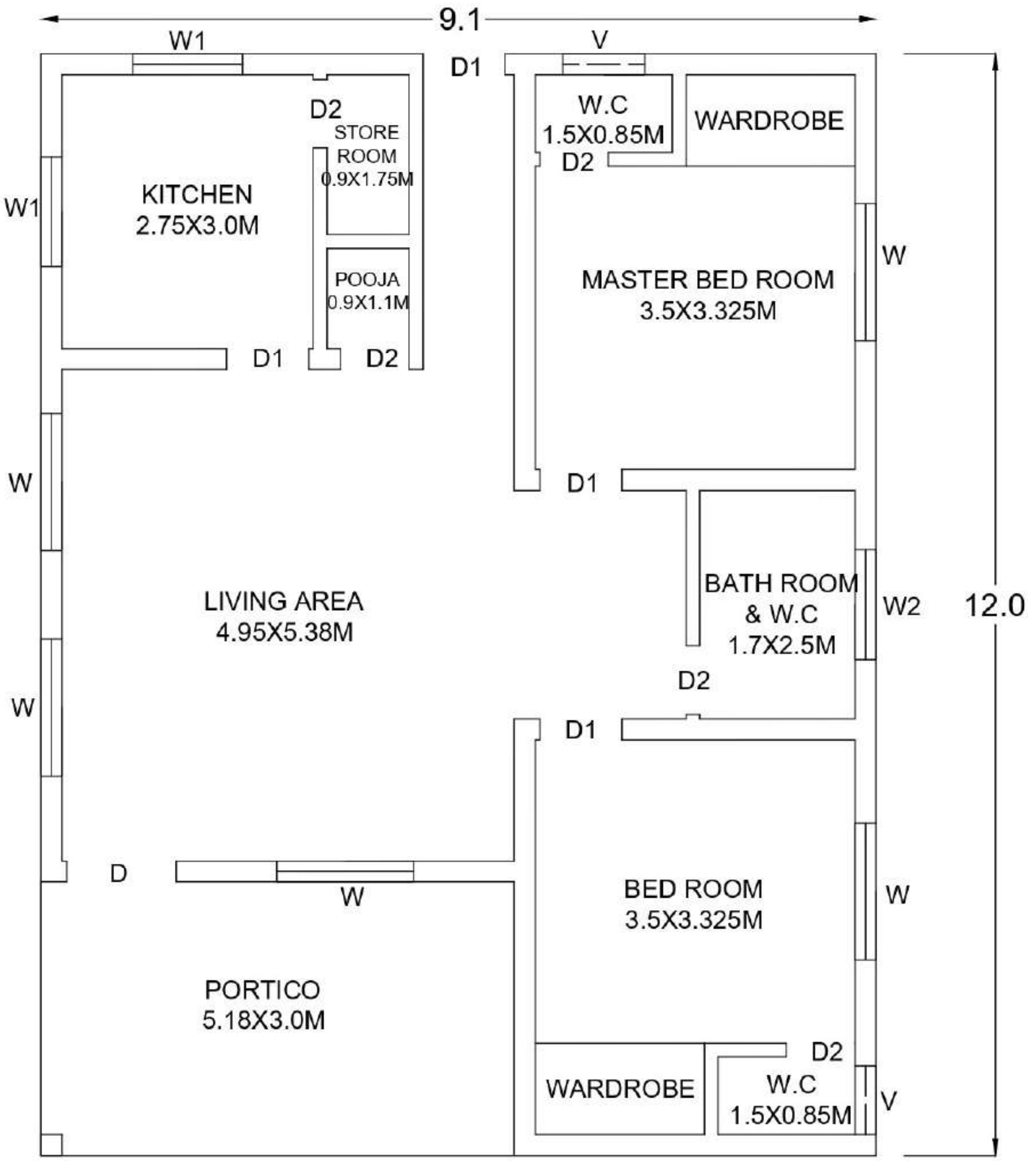
Q.Line diagram of single story residential building is given figure.Draw the centre line drawing.

Q.no.3.1:-LINE DIAGRAM OF SINGLE STOREY RESIDENTIAL BUILDING

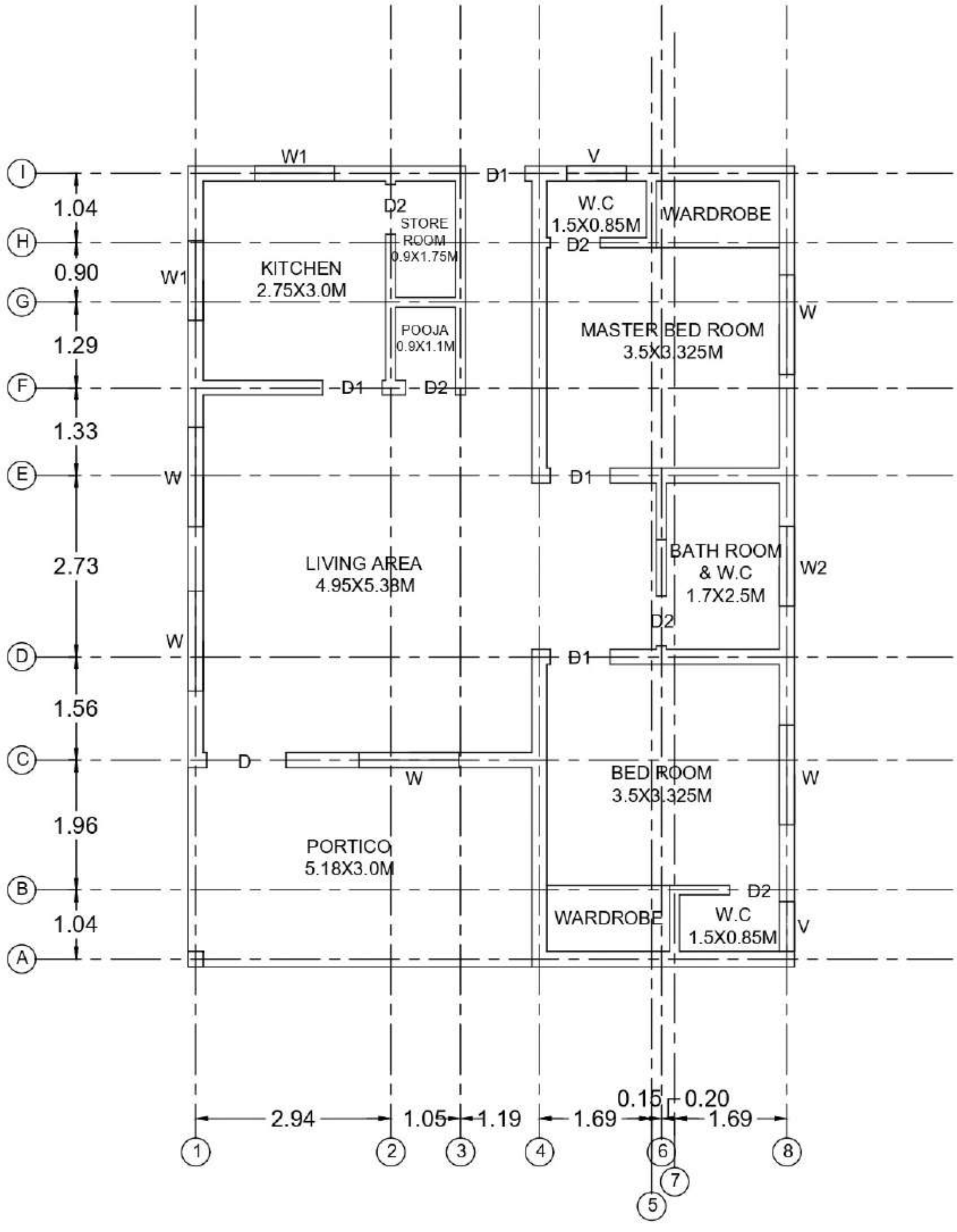


SCHEDULE
D = 1.2 x 2.1 m
D1 = 0.9 x 2.1 m
D2 = 0.75 x 2.1 m
W = 1.5 x 1.2 m
W1 = 1.2 x 0.75 m
W2 = 1.0 x 0.75 m
V = 0.9 x 0.9 m
V1 = 0.75 x 0.6 m

MAIN WALL = 0.23M
PARTITION WALL = 0.15M
FLOOR HEIGHT=3.0M


9.1
12.0
W1
V
D1
W.C
1.5X0.85M
WARDROBE
D2
STORE
ROOM
0.9X1.75M
KITCHEN
2.75X3.0M
POOJA
0.9X1.1M
D1
D2
MASTER BED ROOM
3.5X3.325M
W
D1
LIVING AREA
4.95X5.38M
BATH ROOM
& W.C
1.7X2.5M
W2
D2
D1
W
D
W
BED ROOM
3.5X3.325M
PORTICO
5.18X3.0M
D2
WARDROBE
W.C
1.5X0.85M
V

PLAN



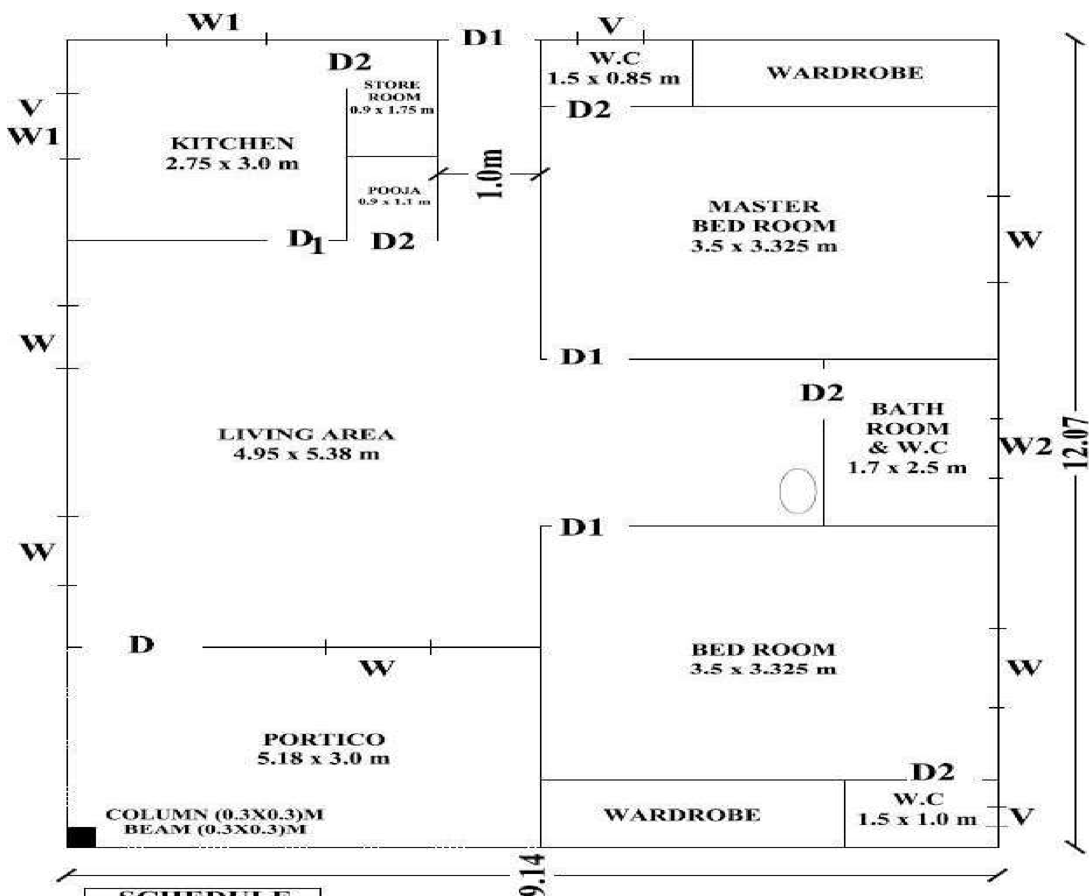
CENTRE LINE DRAWING

9. DIFFERENT TYPES OF BUILDING PLANS

a)Residential building

Q. Draw plan, elevation and sectional elevation for a given line diagram of single storey residential building shown in figure below.

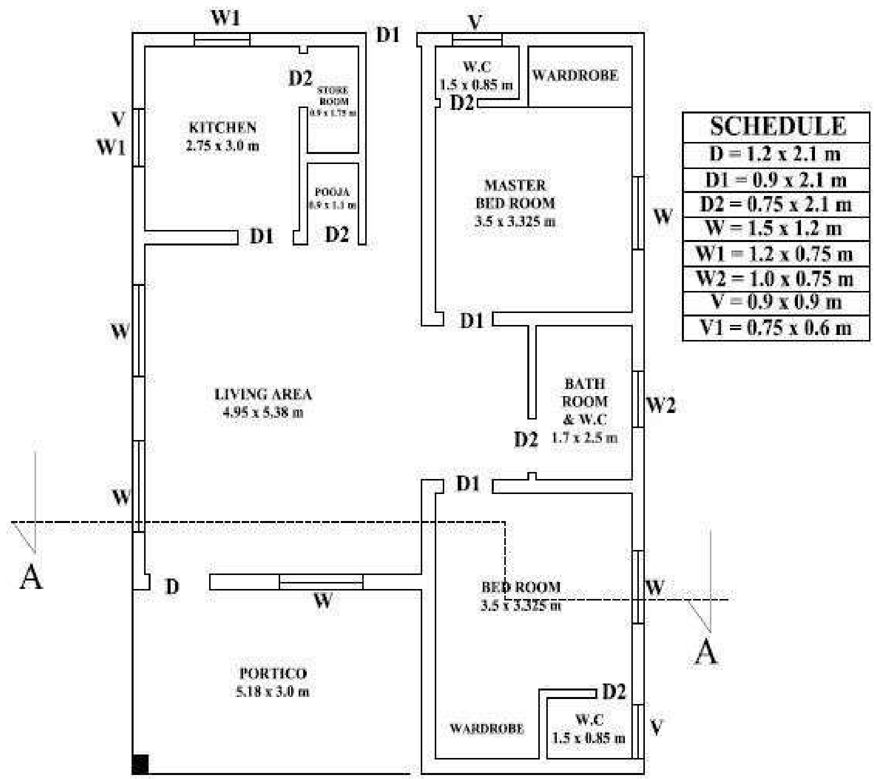
Q.no.3.1:-LINE DIAGRAM OF SINGLE STOREY RESIDENTIAL BUILDING



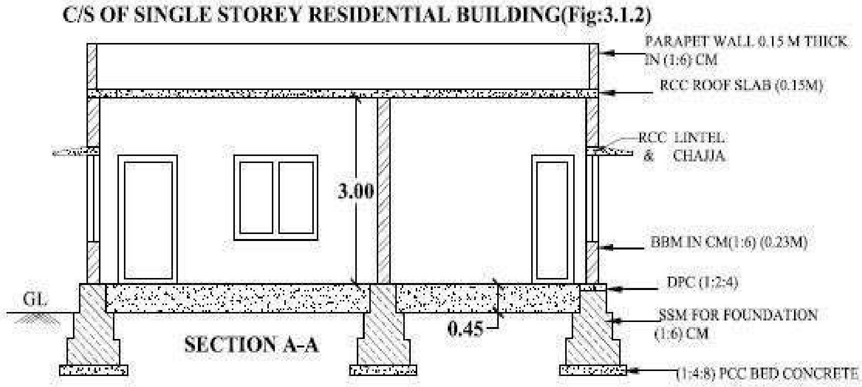
SCHEDULE
D = 1.2 x 2.1 m
D1 = 0.9 x 2.1 m
D2 = 0.75 x 2.1 m
W = 1.5 x 1.2 m
W1 = 1.2 x 0.75 m
W2 = 1.0 x 0.75 m
V = 0.9 x 0.9 m
V1 = 0.75 x 0.6 m

MAIN WALL = 0.23M
PARTITION WALL = 0.15M
FLOOR HEIGHT=3.0M

PLAN OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.1)



C/S OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.2)



ELEVATION OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.3)

b)School building

Q.Line diagram of school building is given in figure below.Draw to scale the follwing

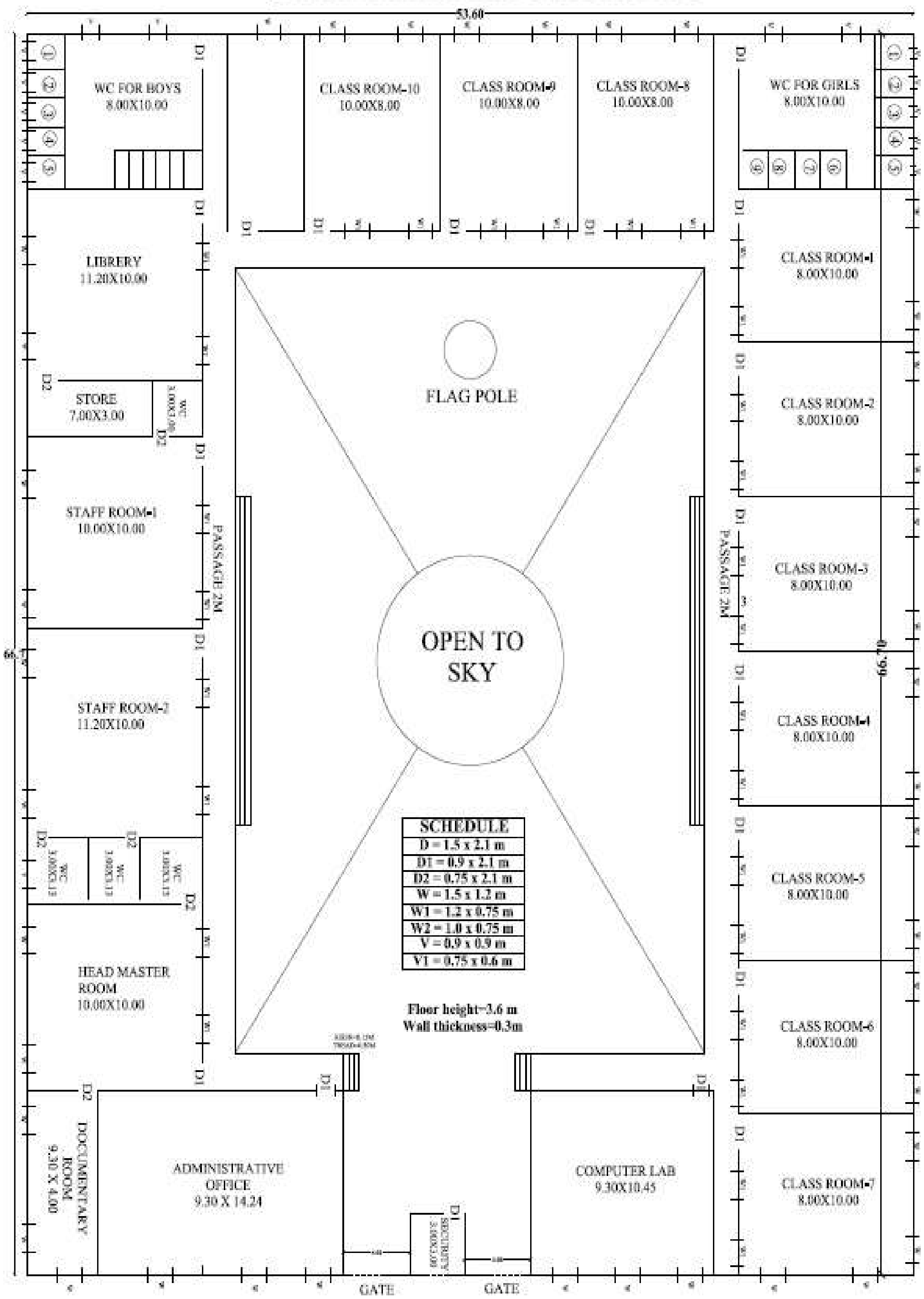
a) plan at sill

b) front elevation

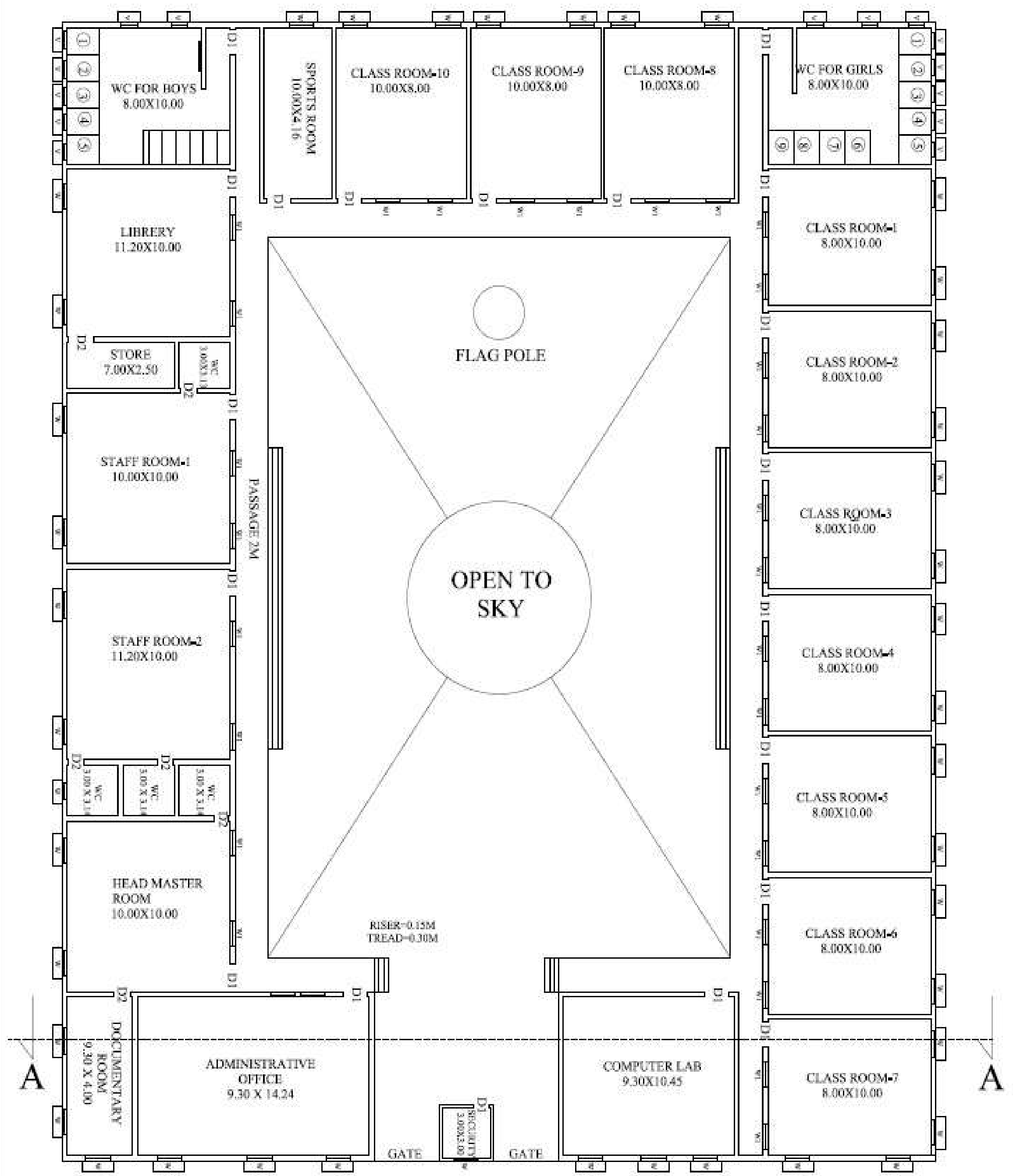
c) section along AA

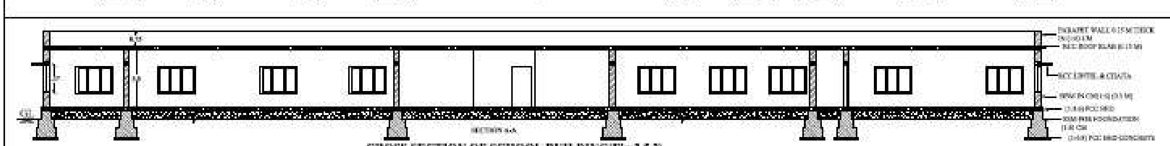
d) schedule of openings

Q.no.3.5:-LINE DIAGRAM OF SCHOOL BUILDING

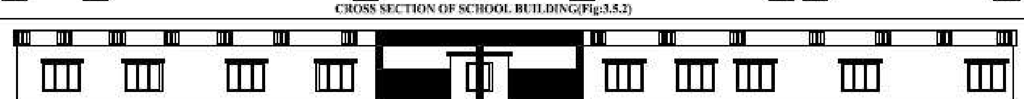


PLAN OF SCHOOL BUILDING(Fig:3.5.1)





CROSS SECTION OF SCHOOL BUILDING(Fig:3.5.2)



ELEVATION OF SCHOOL BUILDING(Fig:3.5.3)

c)Hospital Building

Q.Line diagram of hospital building is given in figure below.Draw to scale the follwing

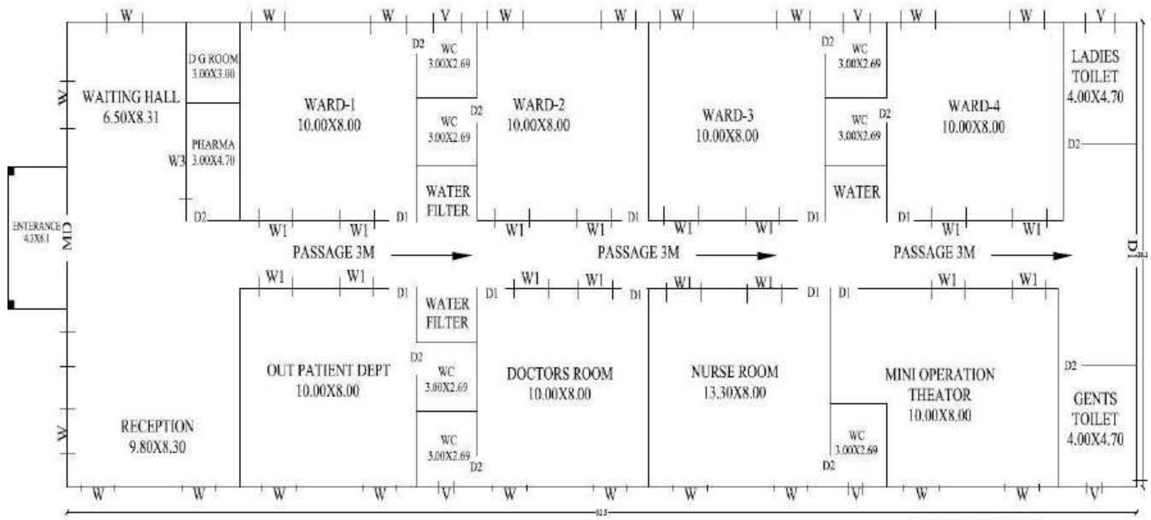
a) plan at sill

b) front elevation

c) section along AA

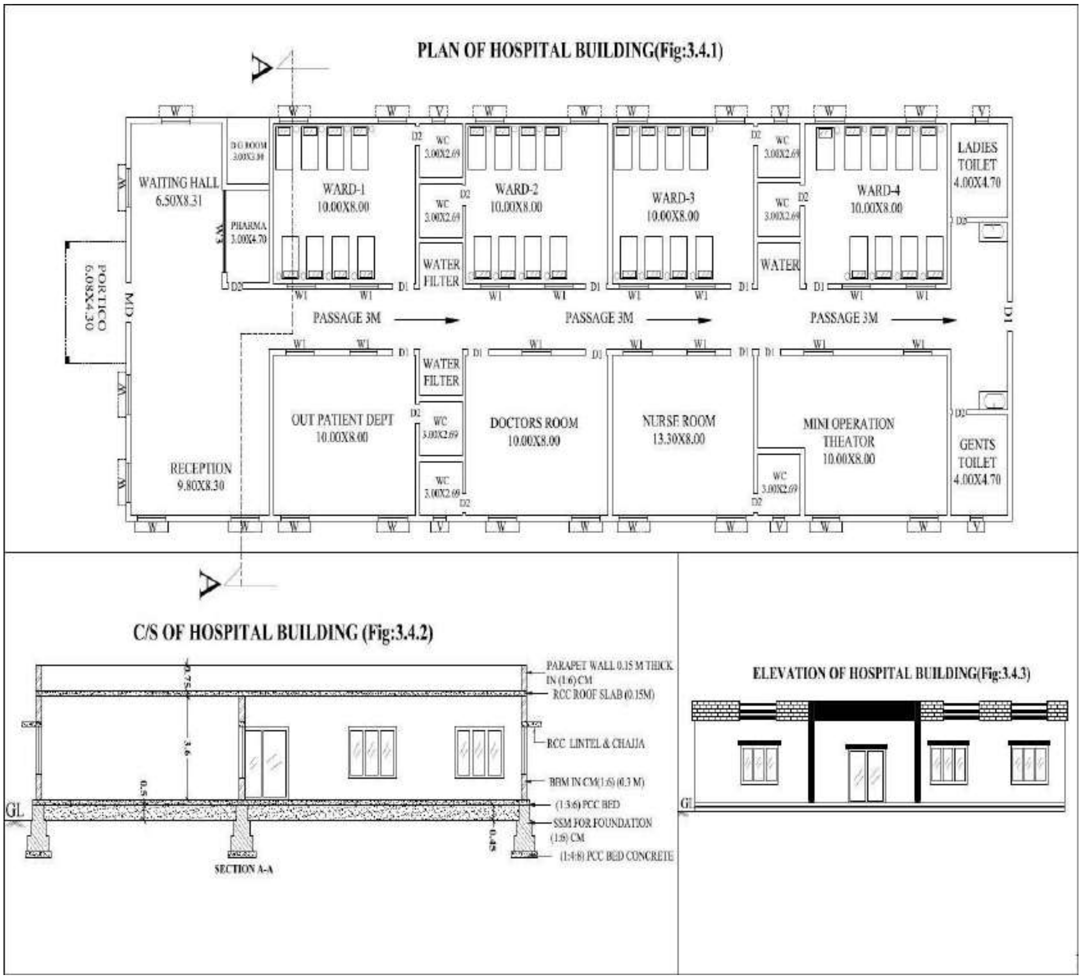
d) schedule of openings

Q.no.3.4:-LINE DIAGRAM OF HOSPITAL BUILDING



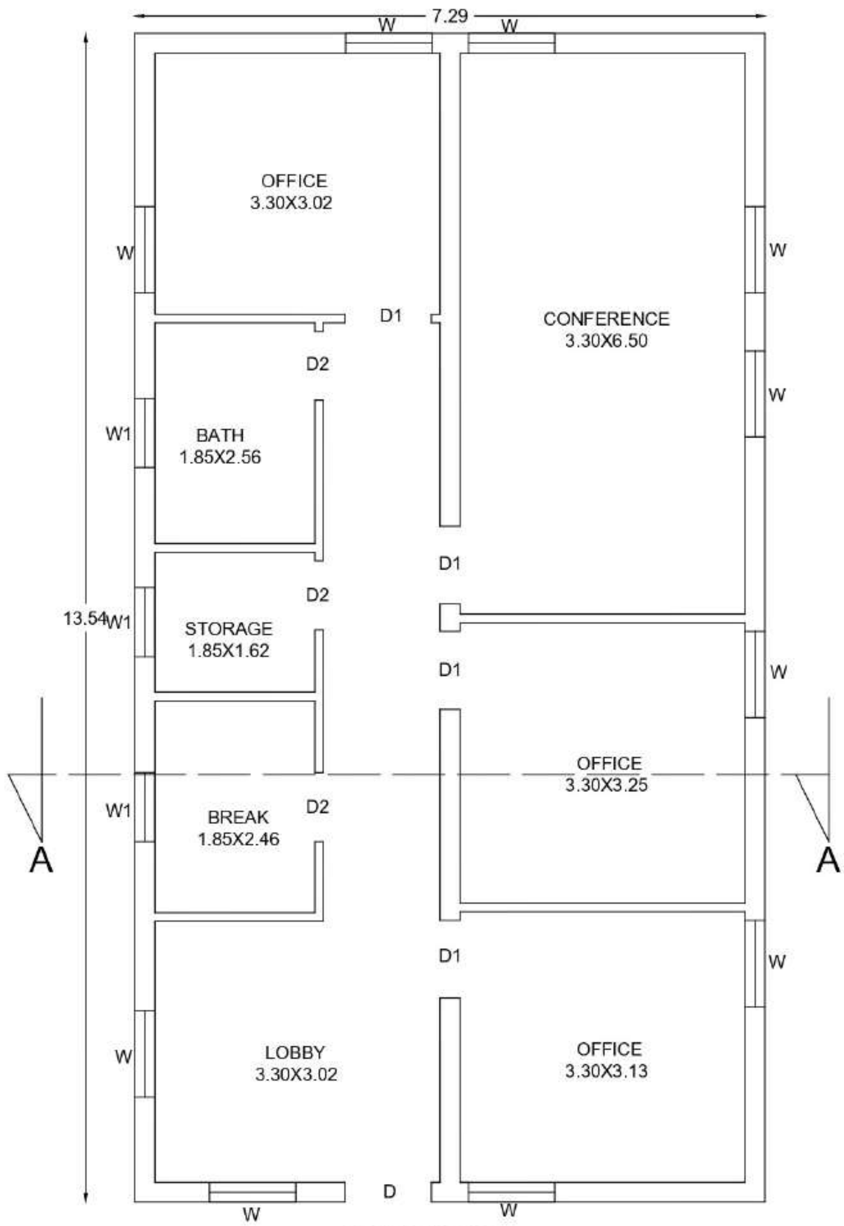
Floor height=3.6 m
Wall thickness=0.3m

SCHEDULE
D = 1.5 x 2.1 m
D1 = 0.9 x 2.1 m
D2 = 0.75 x 2.1 m
W = 1.5 x 1.2 m
W1 = 1.2 x 0.75 m
W2 = 1.0 x 0.75 m
W3 = 1.0 x 4.1 m
V = 0.9 x 0.9 m
V1 = 0.75 x 0.6 m

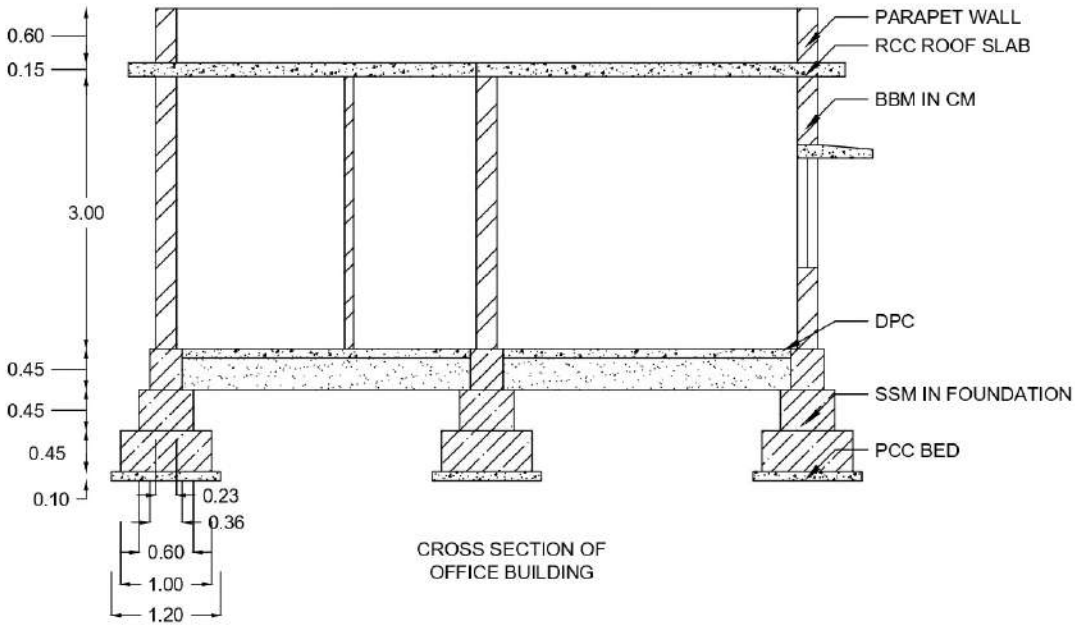

PLAN OF HOSPITAL BUILDING(Fig:3.4.1)
WAITING HALL
6.50X8.31
PHARMA
3.00X4.70
PORTICO
6.08X4.30
RECEPTION
9.80X8.30
WARD-1
10.00X8.00
WARD-2
10.00X8.00
WARD-3
10.00X8.00
WARD-4
10.00X8.00
WATER FILTER
WATER
LADIES TOILET
4.00X4.70
GENTS TOILET
4.00X4.70
PASSAGE 3M
OUT PATIENT DEPT
10.00X8.00
DOCTORS ROOM
10.00X8.00
NURSE ROOM
13.30X8.00
MINI OPERATION THEATOR
10.00X8.00
C/S OF HOSPITAL BUILDING (Fig:3.4.2)
PARAPET WALL 0.15 M THICK IN (1:6) CM
RCC ROOF SLAB (0.15M)
RCC LINTEL & CHAJJA
BBM IN CM(1:6) (0.3 M)
(1:3:6) PCC BED
SSM FOR FOUNDATION (1:6) CM
(1:4:8) PCC BED CONCRETE
GL
SECTION A-A
ELEVATION OF HOSPITAL BUILDING(Fig:3.4.3)

d)Office building

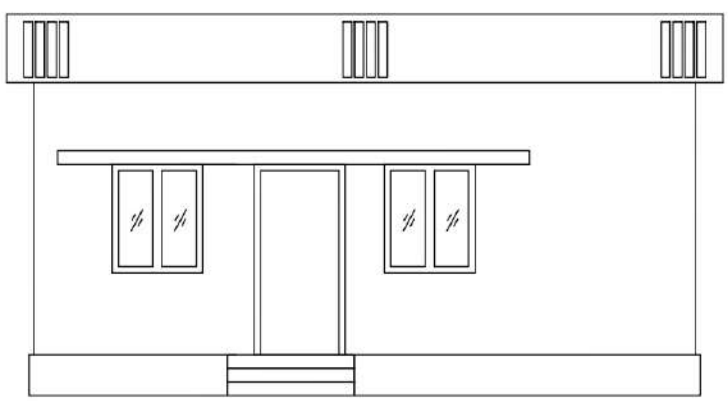
Q. Plan of the office building is given in figure below.Draw the elevation and section at AA



PLAN OF OFFICE BUILDING



CROSS SECTION OF
OFFICE BUILDING

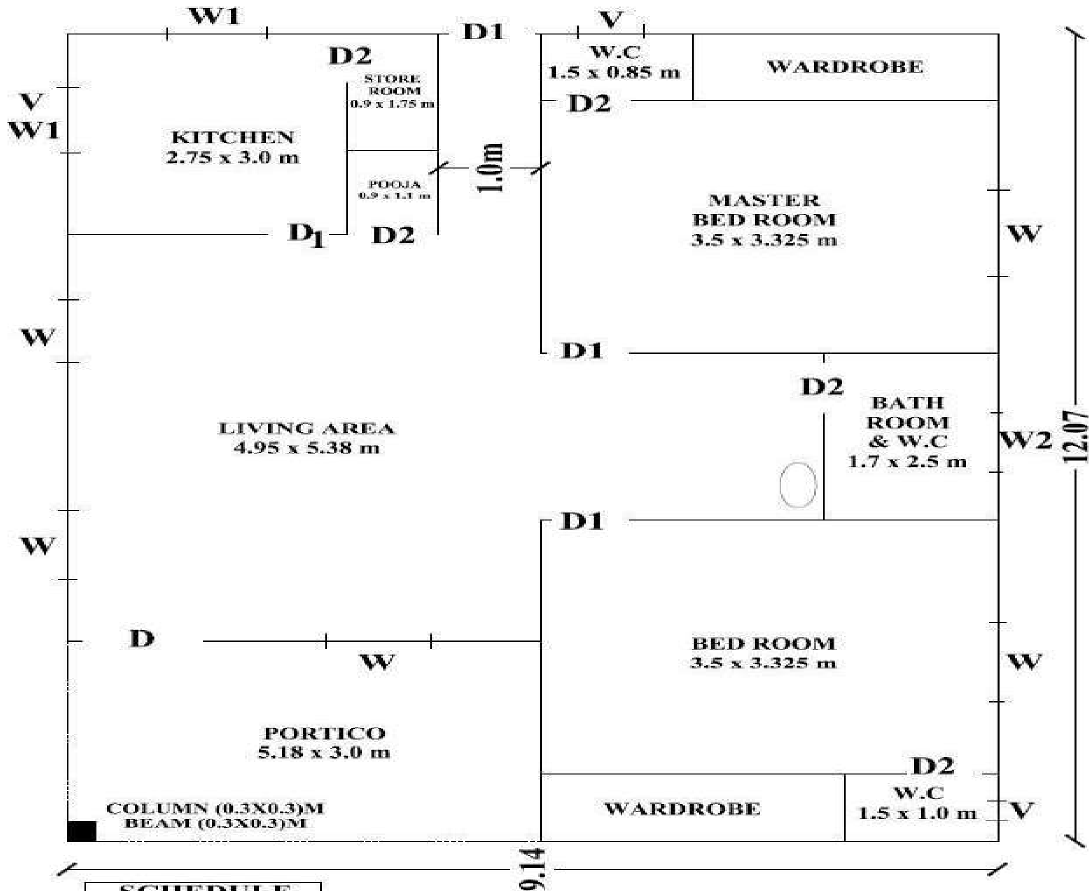


ELEVATION OF
OFFICE BUILDING

10. ELECTRICAL,PLUMBING AND SANITARY SERVICES DRAWING

Q. Line diagram of single storey residential building is given in figure below. Show all the details related to electrical ,plumbing and sanitary services.

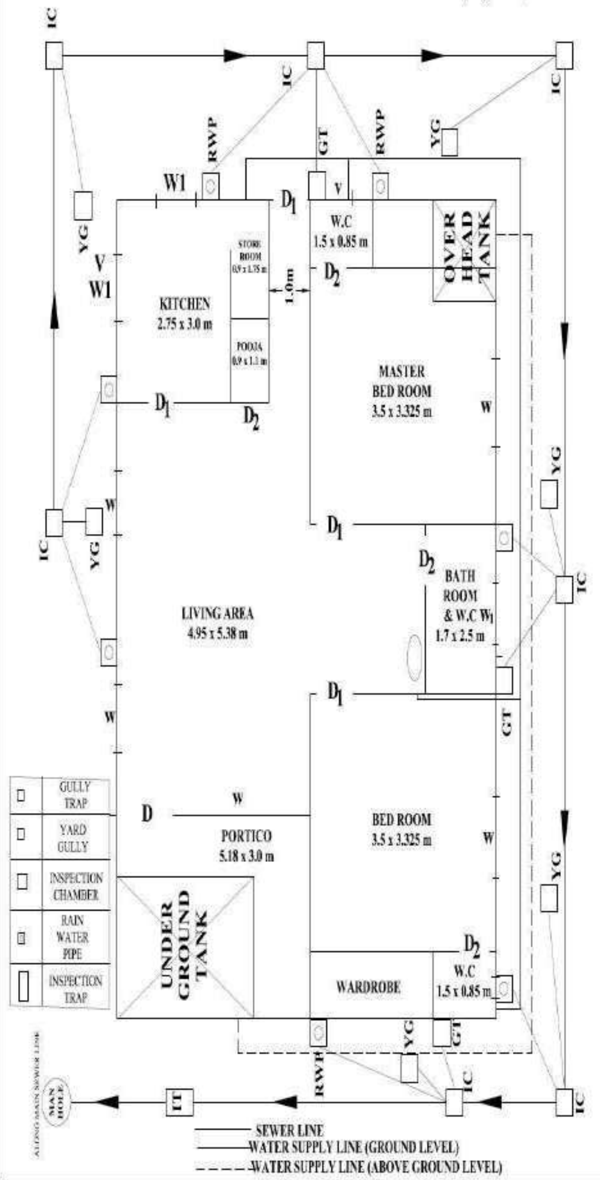
Q.no.3.1:-LINE DIAGRAM OF SINGLE STOREY RESIDENTIAL BUILDING



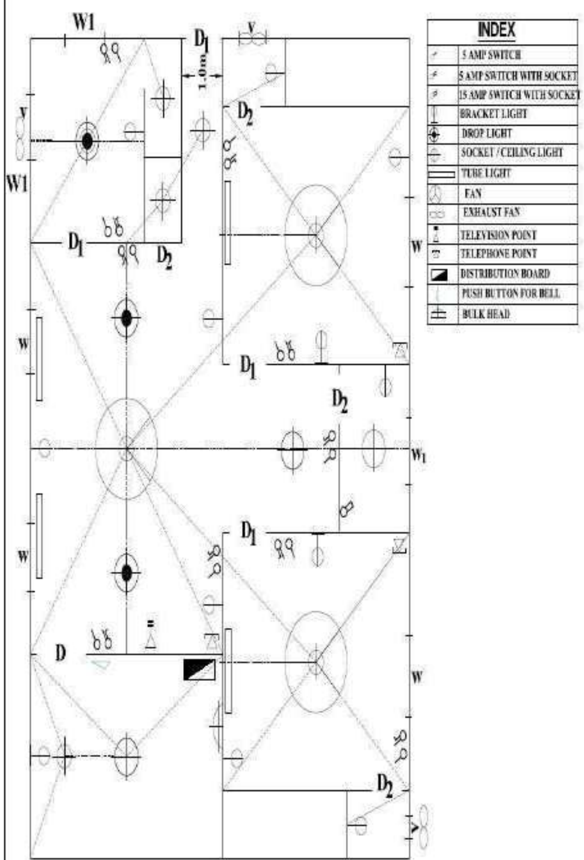
SCHEDULE
D = 1.2 x 2.1 m
D1 = 0.9 x 2.1 m
D2 = 0.75 x 2.1 m
W = 1.5 x 1.2 m
W1 = 1.2 x 0.75 m
W2 = 1.0 x 0.75 m
V = 0.9 x 0.9 m
V1 = 0.75 x 0.6 m

MAIN WALL = 0.23M
PARTITION WALL = 0.15M
FLOOR HEIGHT=3.0M

WATER SUPPLY AND SANITARY CONNECTION FOR SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.4)



ELECTRICAL LAYOUT FOR SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.5)



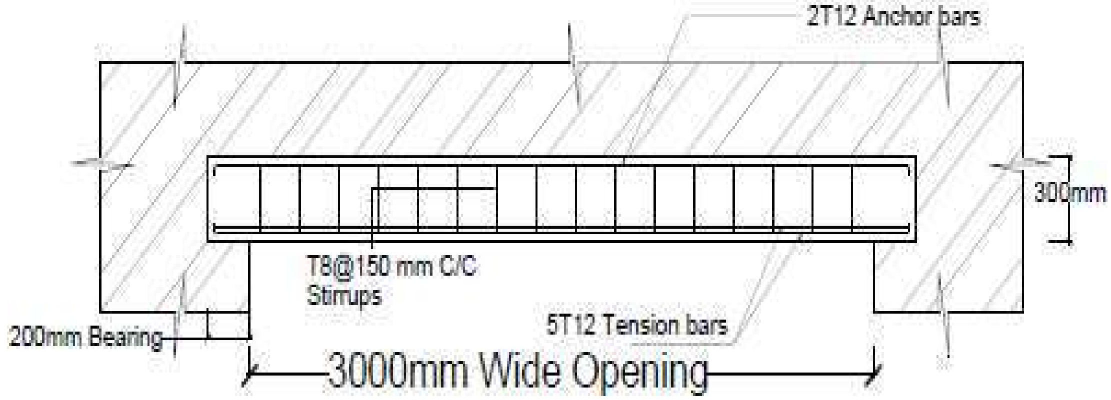
11. DIFFERNT PARTS OF A BUILDING

a)Lintel and chejja

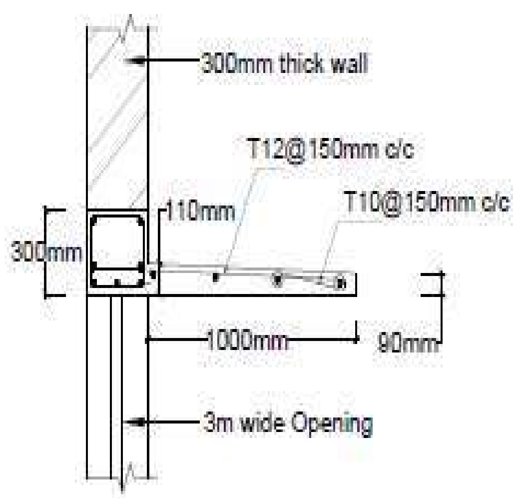
Q. Sketch the reinforcement details for the lintel beam with chejja for 3m wide opening. Size of lintel beam (300x300) mm. Lintel is provided with #5 of 12ϕ bars in tension zone and 2 legged vertical stirrups of 8ϕ at 150 c/c.

Chejja details: projection- 1m; thickness at supports- 110mm and at end- 90mm; main steel provided is 12ϕ @ 150 c/c and distribution steel 10ϕ @ 150 c/c.

LINTEL AND CHEJJA (Fig:2.13)



L/S OF LINTEL



C/S OF LINTEL AND CHEJJA

b)RCC Slab

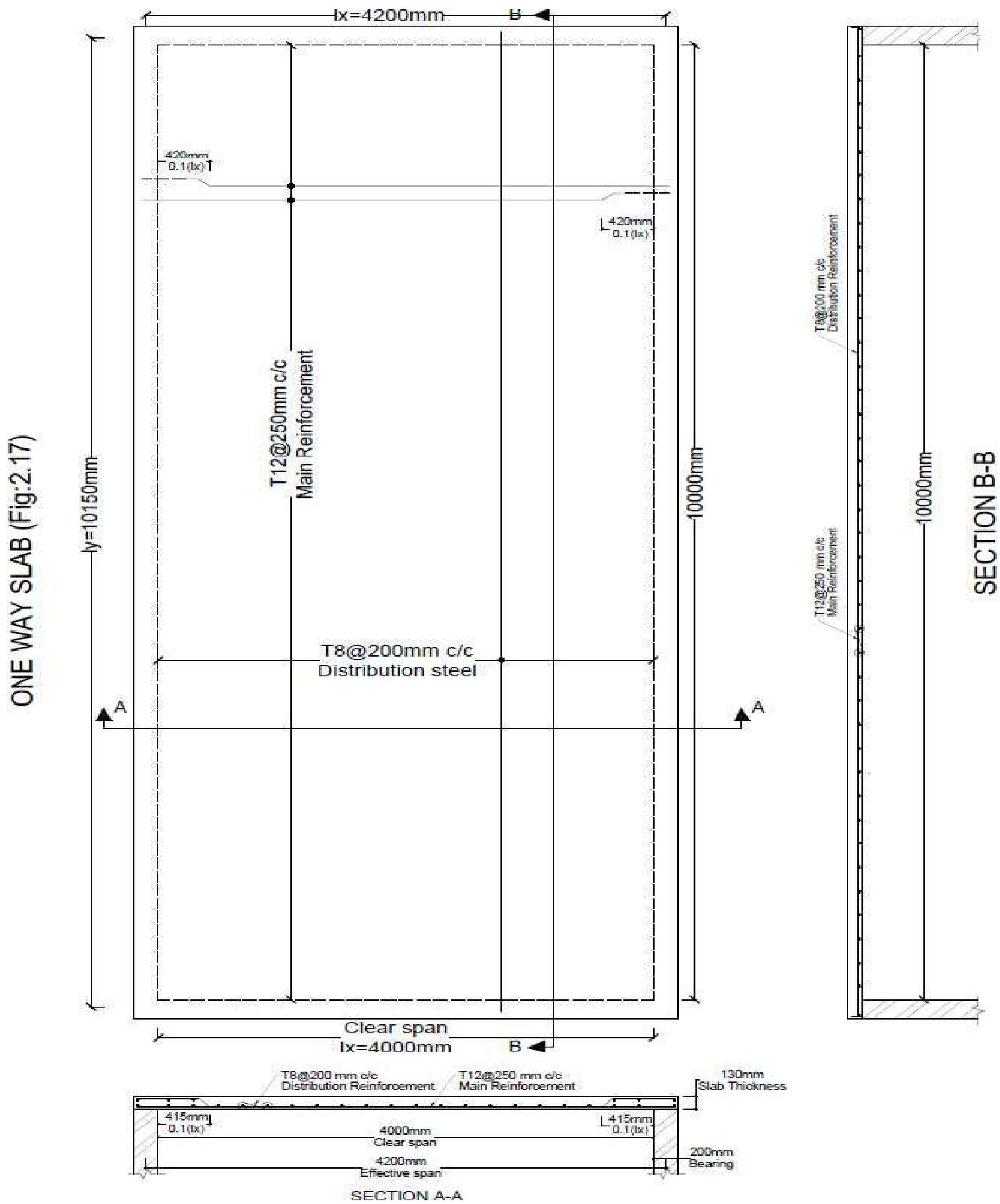
Q.Draw cross section and plan of one-way roof slab showing the details of reinforcement for thefollowing data:

Clear span = 4m, Length of slab = 10m

Thickness of slab = 130mm, Bearing wall = 200mm

Main reinforcement: 12ϕ @ 250 c/c with alternate bars bent up.

Distribution reinforcement: 8ϕ @ 200 c/c.



c)Column and Beam

Q.Draw longitudinal section and cross section of a cantilever beam from the following data:Clear projection from the face of RCC column = 2500mm

Size of column = 300mm x 300mm

Size of beam at fixed end = 300mm x 300mm

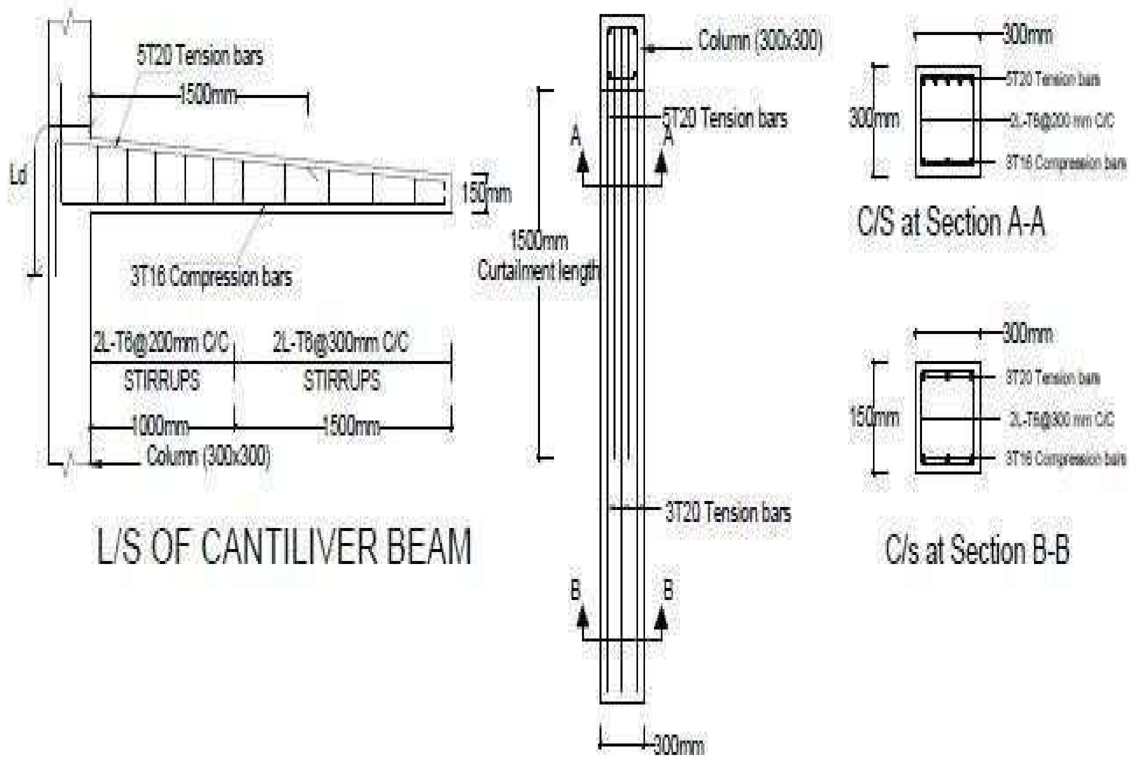
Size of beam at free end = 300mm x 150mm

Reinforcement main bars: #5 - 20ϕ with 2 bars curtailed at 1500mm from the support and show the curtailment plan.

Compression bars: #3 - 16ϕ

Stirrups: 2L - 6ϕ @ 200 c/c up to 1000mm from support and @ 300 c/c in remaining length.

CANTILEVER BEAM (Fig:2.16)



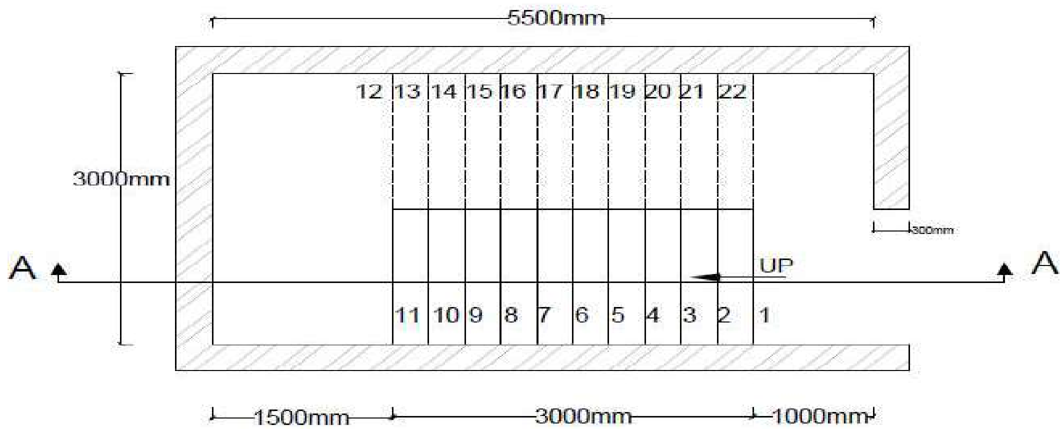
PLAN SHOWING CURTAILMENT DETAILS

12. STAIRCASES

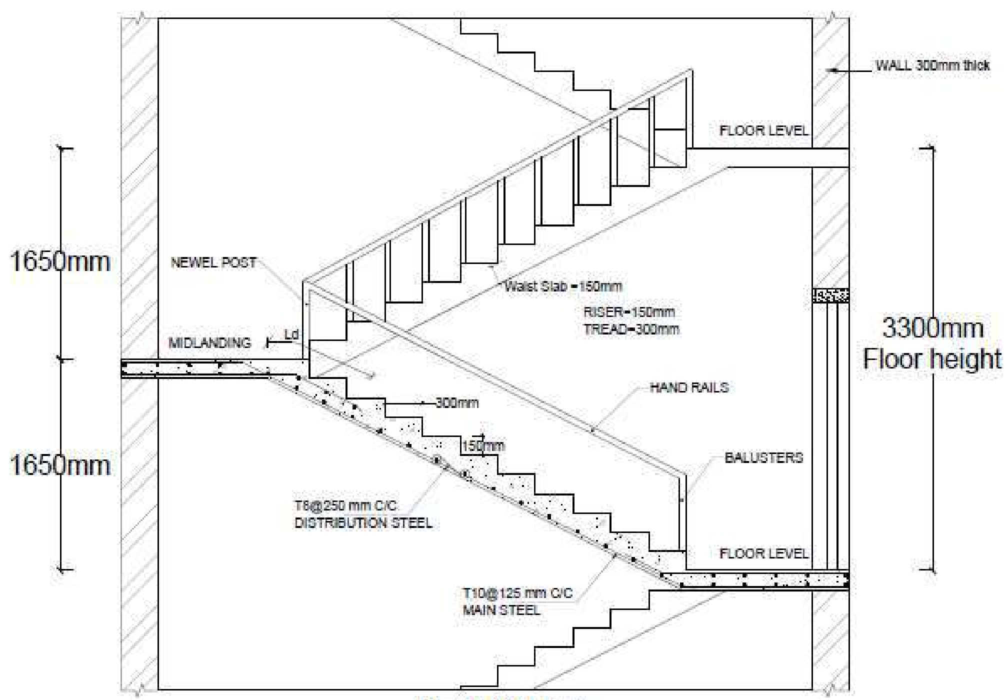
a)Dog legged staircase

Q.Draw plan and sectional elevation of RCC dog legged staircase for an office building which measures 3m x 5.5m. The vertical distance between the floors is 3.3m (including landing). Thickness of the floor slab is 150mm. Provide steps with tread of 300mm and rise of 150mm. Thickness of waist slab and landing slab is 150mm. Width of stair is 1.5m. Reinforcement details: main steel: 10ϕ @125 c/c spacing and distribution: 8ϕ @ 250 c/c spacing.

DOGLEGGED STAIR CASE (Fig:2.10)



PLAN OF DOGLEGGED STAIRCASE



SECTION A-A
SECTIONAL ELEVATION OF DOGLEGGED STAIRCASE

b)Open well staircase

Q.Draw plan and sectional elevation of an open newel stair with a rectangular well for an officebuilding with the following data:

Inside dimensions of staircase = 4.5m x 5.4m.

Height between the floors is 3.6m.

Thickness of the floor slab and landing slab is 150mm.

Width of landing=1.5m.

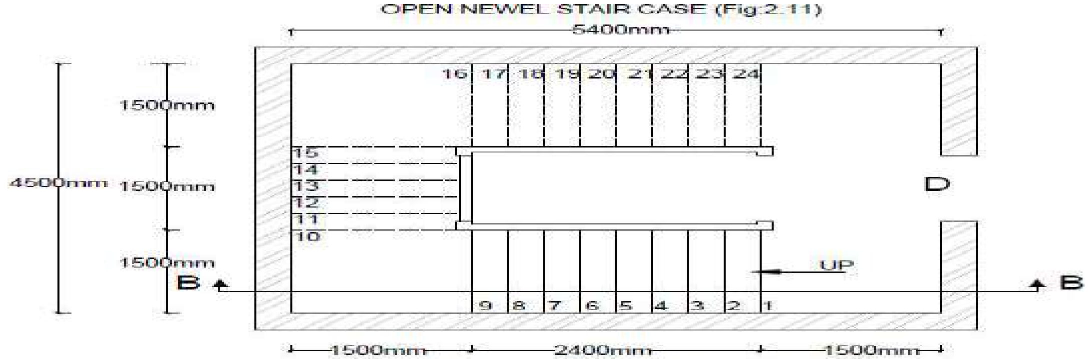
Width of stair = 1.5m.

Tread=300mm, riser=150mm.

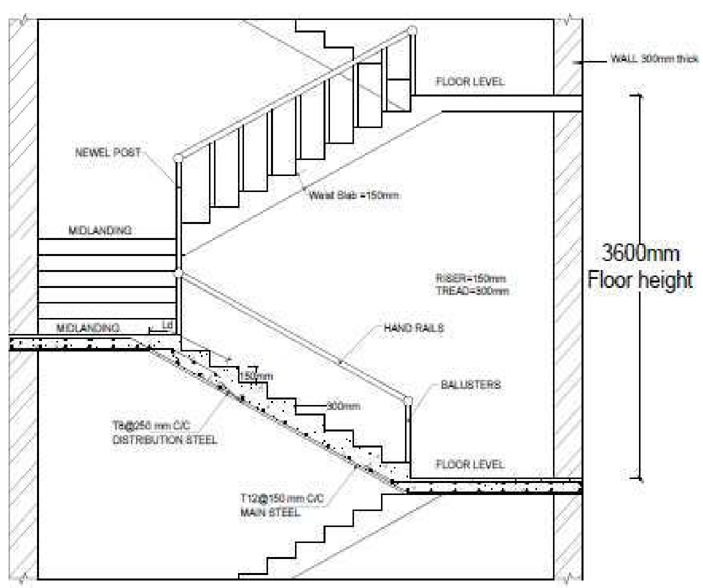
Waist slab thickness = 150mm.

Reinforcement details: Main steel: 12ϕ @150 c/c spacing and Distribution: 8ϕ @ 250 c/c spacing.

OPEN NEWEL STAIR CASE (Fig:2.11)



PLAN OF OPEN NEWELL STAIRCASE



SECTION B-B
SECTIONAL ELEVATION OF OPEN NEWELL STAIRCASE