K S School of Engineering & Management

Bengaluru

Department of Civil Engineering

COMPUTER AIDED BUILDING PLANNING AND DRAWING

BCV305

III Semester

Laboratory Manual

Name of the Student	**:**
Sem/Section	**:**
Branch	**:**
University Seat No	**:**
Batch	**:**

SYLLABUS

Computer Aided Building Planning & Drawing **Sub Code: BCV305**

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, Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, r 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

K S SCHOOL OF ENGINEERING AND MANAGEMENT

Holiday Village Road, Vajarahalli Village, Mallasandra, off, Kanakapura Rd,
Bengaluru, Karnataka 560109

VISION

To impart quality education in engineering and management to meet technological business and societal needs through holistic education and research.

MISSION

K. S. School Of Engineering and Management shall,

- Establish state-of-art infrastructure to facilitate effective dissemination of technical and managerial knowledge.
- Provide comprehensive educational experience through a combination of curricular and experiential learning, strengthened by industry-institute interaction.
- Pursue socially relevant research and disseminate knowledge.
- Inculcate leadership skills and foster entrepreneurial spirit among students.

DEPARTMENT OF CIVIL ENGINEERING

VISION

- To emerge as one of the leading Civil Engineering Department by producing competent and quality ethical engineers with strong foot hold in the areas of Infrastructure development and research.

MISSION

- Provide industry oriented academic training with strong fundamentals and applied skills.
- Engage in research activities in Civil Engineering and allied fields and inculcate the desired perception and value system in the students.
- Inculcate the desired perception and value system in the students.

CONTENT

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Introduction to AUTOCAD

Auto CAD: Automated Computer Aided Drafting

Auto CAD is the most widely used computer aided drawing, drafting package, Auto CAD was first created in the year 1982 by 'Auto Desk' in USA.

Auto CAD was a first significant CAD program to run on desktop computer. Auto CAD provides a common tool and GUI (Graphic User Interface) facilities the learner to make great use of windows environment.

Auto CAD is an engineer's indispensible tool which provides full freedom to arrange screen by clicking and dragging point components. It is simple to learn and use and also to draw as it provides multiple document opening facilities, so that the user can exchange data between different files and compare the files more easily.
Auto CAD is the standard tool for serious technical drawing because

- It uses open architecture, which means many of the files that auto CAD users playing text files (ASCTF) wherein we can easily customize our needs.
- It supports AUTO IS –P.
- It is the most flexible drafting program which is available and applicable in many fields and also supports the foreign language.

AUTO CAD is a computer aided drafting software program used to create blueprints for buildings, bridges and computer chips, among the other things. AUTOCAD had developed from a DOS based package to windows based applications.

ADVANTAGES OF AUTO CAD:

The following are the advantages of the AUTO CAD:

A. High accuracy of design
B. Easy way of modification
C. Variety of hardware options for printing and plotting
D. Increase in engineering productivity.
E. Better way of communications
F. Various option for a viewing CAD files

APPLICATIONS OF AUTOCAD

1. **AutoCAD as an architectural planning tool**: It comes with a user-interface with built-in design lay-outs. The lay-outs contain numerous templates specially designed for architectural planning and building construction. The latest versions of AutoCAD come with analytical tools. The tools can analyse the components of the building to troubleshoot stress and load levels of building supports. AutoCAD enables architects to design, plan, execute and analyse the strength of a building, at design stage level.

2.AutoCAD as an engineering drafting tool: You can use AutoCAD to draw accurate 2D drawings for any engineering domain and also use AutoCAD to render to 3D models to help in visualization of the end product. It is useful for Civil, Mechanical and Electrical systems. It helps engineers to design, analyse and solve design issues resulting in accurate designs.

3.AutoCAD as a graphic design tool: AutoCAD has innate features that enable users to plan and map out spaces and take advantage of the space available. It can be used simultaneously with 3D Max and various other application software including animation tools.

4.AutoCAD in 3D Printing: For a 3D print of an object, one has to choose the object, get a virtual 3D representation and then feed it to the 3D printer. A 3D print has its own advantages for designers and this is where AutoCAD helps them. It ensures file compatibility so that designs can be exported to various preferred formats.

5.AutoCAD in the fashion industry: Every pattern and design of jewellery does not come by chance; it is the result of careful planning and designing. AutoCAD has the tools necessary for planning intricate designs for manufacture of jewellery, toys and other delicate objects.

6.AutoCAD as industrial design tool: AutoCAD helps to reduce manufacturing costs as it saves time and efforts required for manual designing.

EXPERIMENT NO: 1

DRAWING BASICS

1.1 INTRODUCTION

The art of representing technical structures with the aid of drawing instruments on paper is known as working drawing. A working drawing if properly drawn can convey the details such as shape, size, materials used, location, placing and planning of different services; in short it conveys the whole form of the structure on the paper before the materialization of the structure. So these drawings are most prior thing in any civil engineering projects.

The building drawing office practices followed are based on certain basic principles as laid down by ISI. These principles are called "Code of Practice" and the guidelines for engineering drawing are as per IS: 962-"Code of Practice for Architectural and Building drawings" and IS: 10711. They include size of papers, layout of drawings, conventional representations, sizes of letters and numerals on drawings, graphical symbols and abbreviations. Following paragraph deals with the same.

An engineering drawing traditionally is prepared using drawing instruments but the accuracy of this drawing is dependent on the individual skill of the person drawing them. The modifications and repetition work of this drawing are cumbersome and time consuming. Hence the popular alternative for manual preparation of engineering drawing is the Computer Aided Design and Drafting System. One such most widely used drafting tool is AutoCAD.

1.1 SIZE OF DRAWINGS

Drawing sheets are cut from rolls and are made into different sizes so that each size can be worked upon. The table below gives the standard size of drawing sheets.

Sl.No.	Size Designation	Trimmed size of the drawing sheet in mm
1	A_0	841x1189
2	A_1	584x841
3	A_2	420x594
4	A_3	297x420
5	A_4	210x297

1.2 LAYOUT AND TITLE BLOCK

Border lines should be drawn all-round the drawing sheet leaving a margin of 25 mm or 30 mm on the left hand side and 10 mm on all the other sides. Title box is drawn at the right bottom corner of the sheet and remaining space is utilized for drawing.

A title block normally carries the following information.

(i) Title of the drawing

(ii) Name of the organization

(iii) Drawing number with revision number

(iv) Scale

(v) Date of the drawing

(vi) Signature of the concerned authorities

1.3 SCALES

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, t is called full scale (1:1). However the building drawings are too large to be drawn to full size. Therefore, they must be reduced scales to fit the normal drawing sheets. Thus the main function of scale is to enable the designer to 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 drawings	1:20,1:10,1:5

1.5 LINE WORK

All lines should be dense, clean and black to produce good prints. For details, reference shall be made to IS: 10714-1983.

1.6 LETTERING AND DIMENSIONING

The writing of details, references and naming of different views are done with the letters of uniform sizes.

Sl.No.	Purpose	Size of the letter's height in mm
1	Main title and Drawing No.	6,8,10 & 12
2	Sub-titles and Heading	3,4,5 & 6
3	Notes such as legends, schedules, materials and dimensioning	2,3,4 & 5

1.7 CONVENTIONAL SIZES AND SYMBOLS

Conventional signs are used on building drawings to represent various building materials and conventional symbols are the short notations which are used to represent the actual object in building drawings. These are also called as civil engineering symbols which give approximate shape of the object.

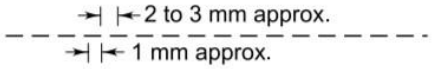
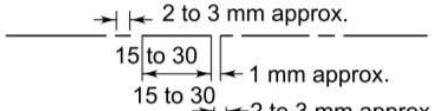
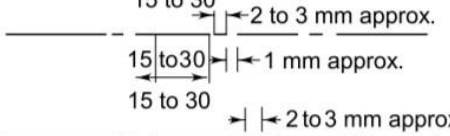
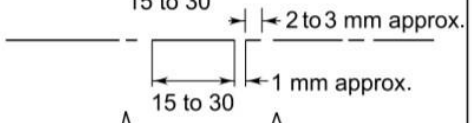
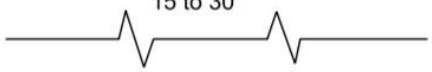
The conventional symbols represent the object at a particular location of sanitary fittings such as towel rail, water closet, sink, wash basin, shower, and electrical fittings such as switch, ceiling fan, exhaust fan and even furniture's like dining table, clothe cabinet, dressing table, etc. These are not drawn as per scale but drawn proportionately.

The Bureau of Indian Standards has recommended various types of conventional signs and symbols to fulfill the following objectives.

(i) To save time, labor, material and space on drawing sheet.
(ii) To avoid confusion and misunderstanding.
(iii) To achieve quick identification details.
(iv) To increase the speed in preparation of drawings.
(v) To save time in reading and understanding the drawing.
(vi) To avoid confusion in interpretation of details by the site-supervisor's etc.

1.8 THICKNESS OF LINES

The thickness of lines in engineering drawing has three groups such as thick, medium and thin. Thick line is 3 times thicker than a medium line and the medium line is 2 times thicker than the thin line. This is shown in the following table as per BIS SP: 46: 1988.

S. No.	Type of line	Illustration	Application
A	Continuous thick		Visible outlines
B	Continuous thin		Dimension lines, leader lines, extension lines, construction lines, outlines of adjacent parts, hatching and revolved section
C	Continuous thick wavy		Irregular boundary lines, short break lines
D	Short dashes medium		Hidden outlines and edges
E	Long chain thin		Centre lines, locus lines, extreme positions of the moveable parts, pitch circles and parts situated in front of the cutting planes
F	Long chain thick at ends & thin elsewhere		Cutting plane lines
G	Long chain thick		To indicate surfaces which are to receive additional treatment
H	Ruled line and short zigzag thick		Long break lines

1.9 DIMENSIONING, ABBREVATION AND CONVENTIONAL REPRESENTATION A S PER 962

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 are recommended for use in general building drawings.

1.9 STARTING of AutoCAD

We can start on Auto CAD session by double clicking the left mouse button on an Auto CAD icon or by clicking the start button choosing the program click on Auto CAD. Auto CAD opens loads the menu and display the start up dialogue box. Auto CAD creates a blank drawing sheet ready to use

Components of AUTO CAD editor screen:

Drawing Area:Center of Screen which is used for creating the drawing.

Command Lines: We can type command and execute it.

Menu Bar: Menu bar displays the basic command along with submenu to occur the general control and setting for the efficient handling of tools.

Standard tool Bar: Offer quick, single click occurs to the most commonly used Auto CAD features. Tool Bar tips: Appear just below the cursor which when the mouse point on the tool.

Draw tool Bar: Provides command for creating common object including line, arc, circle, text, etc.

Modify tool bar: Provides commands for editing object like trim, copy, move, etc….

Status Bar: Gives information or glance about drawing coordinates and status of grid, Ortho, osnap and model.

Object Properties:

Tool Bar: It displays commands for manipulating the properties of an object.

UCS Icon: User coordinate system Icon tells you orientation in drawing the error points to the positive direction X and Y axis. W indicates that you are in the world of coordinate system.

Working with Auto CAD commands:

Commands are important for execution. " Auto CAD" provides several ways to select and executing the commands using commands or command lines or command prompt type, the common name or short name and press enter or click right mouse button to execute.

Using Commands:

Using command with menu: Auto CAD's menus are parallel to those of other windows program commands can be selecting and executed from pull down menu.

Using dialogue box: It provides simple way to control Auto CAD without memorizing a lot of technical commands and options.

1.11 FUNCTION KEYS

AutoCAD provides function keys for quick access to certain setting commands.

Function Key	Function defined in AutoCAD
F1	Online help
F2	Command window on and off
F3	OSNAP on and off
F4	Tablet on and off
F5	Switches among isoplanes Top, Right and Left
F6	Co-ordinates on and off
F7	Grid on and off
F8	Ortho on and off
F9	SNAP on and off
F10	Polar Tracking on and off
F11	Object Snap Tracking on and off
F12	Dynamic Input on and off

1.12 COMMANDS

Auto CAD's menu are parallel to those of other windows programs, commands can be selected and executed from pull down menu.

Provides simple ways to control 'AutoCAD' without memorizing a lot of technical commands.

NEW COMMAND: It creates a new drawing file.

QUIT COMMAND: It access Auto Cad without saving.

SAVE COMMAND: It saves the drawing with current file name.

END COMMAND: It saves the drawing and exits Auto CAD

OPEN COMMAND: It opens on exiting drawing.

A. **UNITS COMMAND:** In Auto CAD drawing are down at full size the size is set at the time of printing but it is parable to select any unit system and precision "Auto CAD" by default uses decimal units. However unit style is to be changed if any other unit system if required.

COMMAND: UNITS (PRESS ENTER)

B. **LIMITS COMMAND:** It sets and constructs the drawing boundaries. It is the invisible boundary to fit the drawing. It should be large enough to contain the drawing and other related parts of it.

COMMAND: LIMITS (PRESS ENTER)

LOWER LEFT CORNER: Specify the lower left corner of the drawing limits. (Default lower limits is 0, 0)

UPPER RIGHT CORNER: Specify the upper right corner of the drawing limits. (Default upper limits is 420, 297)

C. **ZOOM COMMAND:** Used to enlarge and reduce the view of the object in different ways. Zooming does not change obsolete size of the view with in graphic data.

I. **ALL:** Zoom all displays the entire drawing even if they are outside the graphic area.

II. **CENTER:** Zoom displays a window by entering a center point then a magnification value or height.

III. **DYNAMIC:** The area for zooming can be selected dynamically by zoomed box.

IV. **EXTENTS:** Zoom to display the drawing extents.

V. **PREVIOUS:** Zoom to display the previous view and to previous views can be restarted.

VI. **SCALE:** Increase or decrease the size of the image by a given scale factor of the original size (1= full size) 1 enlarges the view (1 reduces view) ex: 2x, 5x.

COMMAND: ZOOM or Z. (press enter)

EXPERIMENT NO:2

DRAWING TOOLS

A. LINE COMMAND: It creates one or series of straight line segments here each line segment is separate object.

COMMAND: LINE or L (PRESS ENTER)
From point: 10, 10
To point: (Move the cursor horizontally to right with ortho ON) type 20, press enter.
To point: (Move the cursor horizontal, vertically up) type 20, press enter.
To point: (Move the cursor horizontally to left) type 20, press enter.
To point: c.

B. CIRCLE COMMAND: It creates a circle.

CENTER AND RADIUS: Draw a circle based on a center point and radius command circle.
CENTER AND DIAMETER: Draw a circle based on a center point and diameter. **THREE POINT (3P) CIRCLE:** Draw a circle based on 3point on circumference. **TWO POINT (2P) CIRCLE:** Draw a circle based on two points of a diameters.
TANGENT TANGENT RADIUS: Draw a circle tangent to existing object with specified radius.

COMMAND: CIRCLE or C.
3p/2p/TTR/ <enter point>; pick center or circle enter co-ordinates from center.
Diameter/<radius>; D
Diameter; specify diameter.

COMMAND: CIRCLE or C.
3p/2p/TTR/ <enter point>; 3p
First point; pick first point. Second point; pick second point. Third point; pick third point.

COMMAND: CIRCLE or C.
3p/2p/TTR/<enter point>; 2p
First point of diameter; pick first point.
Second point of diameter; pick second point.

COMMAND: CIRCLE or C.

3p/ 2p/ TTR/ <enter point>; TTR
Enter tangent specification; pick first tangential object.
Enter second tangent specification; pick second tangential object.
Radius; enter radius of circle.

C.ARC COMMAND: It creates an arc and is used to add curved segments to the drawing.
THREE POINT ARC: Draw's an arc using three specified points on the circumference.

COMMAND: ARC or A. centre / <start point>; specify a point enter C.

COMMAND: ARC or A.
Center/<start point>; 100, 100.
Center/ end/<second point>; 50, 150.
End point; 100, 100.
or pick first point, 2nd point and 3rd point using mouse.

COMMAND: ARC or A.
Center/<start point>; 100, 100.
Center; 20, 40.
Angle /l length off the cord / < end point >; 20, 60.
or pick start point, center of arc and end point of arc using mouse.

D.PLINE COMMAND (POLY LINE): Poly line is a series of connected line and are segments created as one object width of the object can be controlled.

COMMAND: PLINE or PL.
From point; specify a point.
Specify a point (2) or enter an option.
End point of line; Draw a line segment,
Arc; changes P LINE to ARC mode.
Close; close a poly line
Half width; specify width from center of a wide poly line segment to one of its edges.
Length; draw a line segment of a specified length.
Undo; removes the most recent line segment.
Width; specify width of the next line segment.

E.MLINE COMMAND: It is used to create a set of parallel lines with different properties in a single go.

COMMAND: MLINE or ml.

F.POLYGON COMMAND: It creates a regular polygon with the given number of sides and side length.

COMMAND: POLYGON or pol.

RECTANGLE COMMAND: It creates a rectangle. This rectangle acts as one object.

COMMAND: RECTANGLE or rec.
Chamfer/ Elevation/ Fillet/ Thickness/ Width/ <first corner>; pick first corner.
Other corner; pick opposite corner.

G.SPLINE COMMAND: It is used to draw smooth curves that possess through the fit points.
COMMAND: SPLINE or spl.

H.ELLIPSE COMMAND: It is used to an ellipse by selecting three points.
COMMAND: ELLIPSE or el.

1.12 MODIFY TOOLS

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

I.ERASE COMMAND: It deletes the selected objects from drawing.

COMMAND: ERASE or e.

J.COPY COMMAND: It creates one or more number of copies of selected objects within the drawing.

COMMAND: COPY or co.

K.MIRROR COMMAND: 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.

COMMAND: MIRROR or MI
Select object; pick objects to mirror. First point of mirror line; pick a point. Second point; pick second point.
Delete old objects? <N>; enter Y for yes or N for no. If y is entered deletes the original objects.

L.OFFSET COMMAND: It creates a new object that which is similar to a selected object at a distance from the original object.

COMMAND: OFFSET or O.
Offset distance or through <current>; specify a distance or enter 'T' press enter.
Select object to offset; select an object, side of object, specify a side to which object is to be created. If 'T' is entered.
Select object to offset; select one object.
Through point; pick a point where offset object is required.

M. ARRAY COMMAND: It creates multiple copies of objects in given number of rows and columns or around an imaginary circle.

COMMAND: ARRAY or ar.

N.MOVE COMMAND: Objects can be shifted from one place to another place within the drawing area.

COMMAND: MOVE or M
Select object: select objects to move and press enter.
Base point or displacement: specify a base point 1.
Second point or displacement: specify a second point
2.

O.ROTATE COMMAND: Rotates selected object around given axis to the given angle or about a base point.

COMMAND: ROTATE or RO
Select object: select object to rotate.
Base point: select appoint on which object rotates.
<Rotate angel>/reference: specify a scale factor or type 'R'
Reference length <L>; specify a distance or press enter.
New length; specify a distance or pick point.

P. SCALE COMMAND: It enlarges or reduces the size of the objects equal in x, y, z. Directions according to the scale factor given. If scale factor is greater than 1, objects are enlarged and if it is less than 1 object is reduced.

COMMAND: SCALE or SC.
Select objects; select an object to be scaled, press enter.
Base point; specify a point on object.
<Scale factor>/ reference; specify a scale factor or type 'R'.
Reference length; specify the distance or press enter.
New length; specify a distance or pick a point.

Q.STRETCH COMMAND: To change the snap and size of the object by pulling or pushing from one side and also to move objects from one place to another place.

COMMAND: STRETCH.
Select objects; select objects by making crossing windows only, press
enter. Base point or displacement; specify a point.
Second point of displacement; specify a point.
Line to be stretched.

R.TRIM COMMAND: To cutoff or erase an object precisely at an edge defined by other objects. It can also be used in.

COMMAND: TRIM or TR.
Select object: select the boundary edges for trimming.
<Select object to trim >/project/edges/ undo; select object to be trim or enter option.
Project; used in 3D space.

Edge; determine whether the object is trimmed to another object.
Extend; extends the cutting edge along its natural path and cuts the objects.
No extend; cuts the object only when the cutting edge physically intersects with the object to be trimmed.

Undo; reverse the most recent change made by trim.

S. EXTEND COMMAND: It extends an object to meet another object

COMMAND: EXTEND or EX.
Select object; select object until another object is to be extended, press enter.
< Select object to extend>/project/ edge/ undo; select object to be extended or enter option.
Project; used in 3D space.
Edge; determine whether the object is extended to another object. Extend/ No extend < current >; enter option.
Extend; extends the ends even though the boundary is not externally intersecting with it after extending. No extend; object will not extend.
Undo; reverse the most recent modes changes by extend.

T.BREAK COMMAND: 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.

COMMAND: BREAK or BR.
Select object; select an object or specify the first break point of an object.
Enter second point; specify the second break point.

U.CHAMFER COMMAND: Connects two non-parallel lines by extending them to intersect or to join with a beveled line at specified distance from intersection.

COMMAND: Chamfer or CHA.
Enter first chamfer distance <current>; specify a distance or press enter.
Enter second chamfer distance current>; specify a distance or press enter.

COMMAND: FILLET.
Polyline/ radius/ trim/ <select first object >; select the first object or press enter.
Select second object; select second object, if 'R' is entered.
Enter fillet radius < current >; enter radius required for round arc.
Polyline; insert fillet arc at each corner of 2D objects where two line segment meet.
Trim: controls whether auto cad trims the selected edges to fillet.
No trim; does not trim the selected edge.

V.FILLET COMMAND: Filleting connects two objects with a round arc of a specified radius.

EXPERIMENT 3

TEXTING TOOLS

TEXTING TOOLS:

Single line text:
Create 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.

   If you press ENTER, the program inserts the new text immediately below the last text object you created, if any.
3. nter 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.

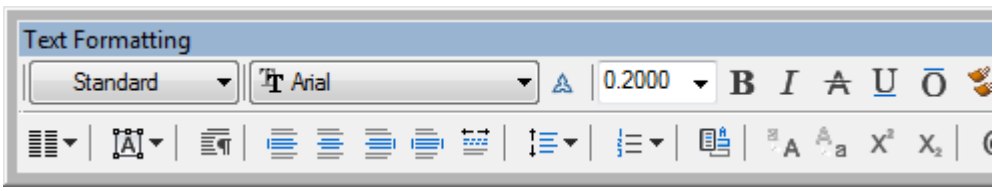
   Note: While typing, the text may be displayed horizontally and at a legible size.
6. To create another single-line text, do one of the following:
   1. Press ENTER to start another line of text immediately below.
   2. Click a location for the next text object.
7. Press ENTER on a blank line to end the command.

2. Multi Line Text: For longer notes and labels with internal formatting, use 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.

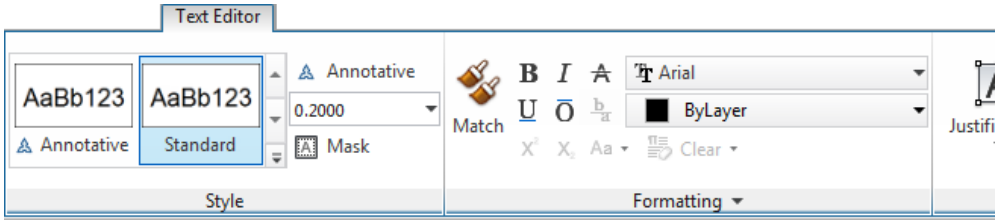
   If the ribbon is active, the Text Editor contextual tab displays.

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

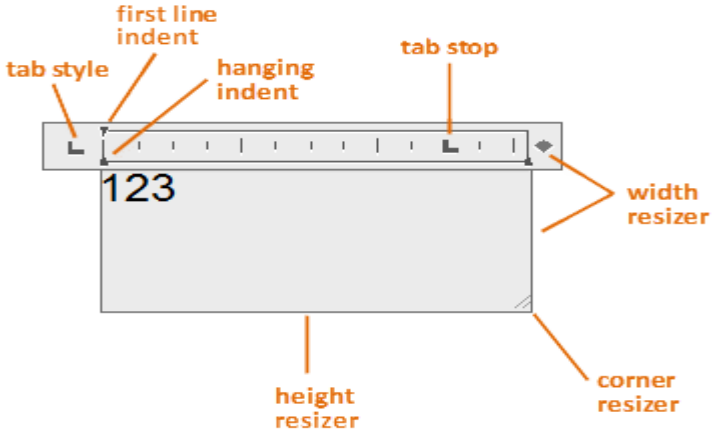


   Note: The MTEXTTOOLBAR system variable controls the display of the Text Formatting toolbar.
3. Specify the initial formatting.
   1. To indent the first line of each paragraph, drag the first-line indent slider on the ruler. To indent the other lines of each paragraph, drag the hanging indent slider.

2. To set tabs, click the ruler where you want a tab stop.
3. To change the current text style,



4. 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.

3. Edit Single-line Text

1. Double-click a single-line text object.
2. In the In-Place Text Editor, enter the new text.
3. Press ENTER.

EXPERIMENT 4

SPECIAL FEATURES

SPECIAL FEATURES:

View Tools:

You can change the magnification of a view by zooming in and out, which is similar to zooming in and out with a camera. Using ZOOM does not change the absolute size of objects in the drawing. It changes only the magnification of the view.

In a perspective view, ZOOM displays the 3DZOOM

prompts. The following prompts are displayed.

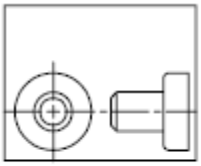
Corner of window

Specify one corner of the area to be zoomed into.

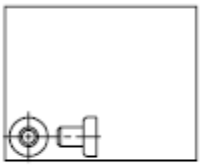
- **Opposite corner.** Specify the opposite corner of the zoom area.

All

Zooms to display all visible objects and visual aids. Adjusts the magnification of the drawing area to accommodate the extents of all visible objects in the drawing, or visual aids such as the grid limits (the LIMITS command), whichever is larger.



before ZOOM All



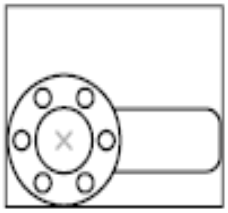
after ZOOM All

In the illustration on the right, the grid limits are set to a larger area than the extents of the drawing.

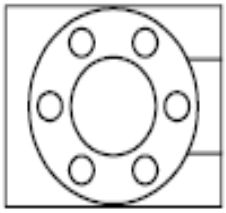
Because it always regenerates the drawing, you cannot use ZOOM All transparently.

Center

Zooms to display a view defined by a center point and a magnification value or a height. A smaller value for the height increases the magnification. A larger value decreases the magnification. Not available in perspective projection.



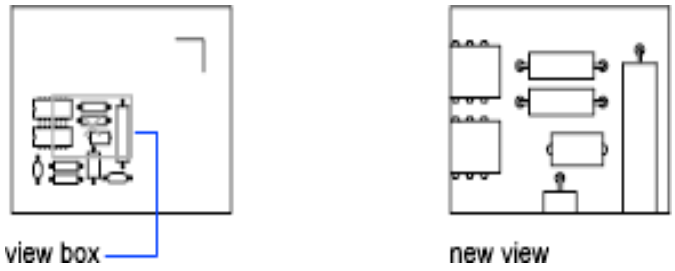
before ZOOM center



after ZOOM center, magnification increased

Dynamic

Pans and zooms using a rectangular view box. The view box represents your view, which you can shrink or enlarge and move around the drawing. Positioning and sizing the view box pans or zooms to fill the viewport with the view inside the view box. Not available in perspective projection.



- To change the size of the view box, click, resize it, and click again to accept the new size of the view box.
- To pan with the view box, drag it to the location you want and press Enter.

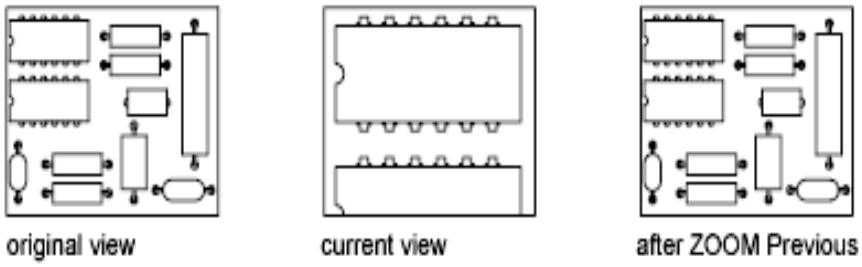
Extents

Zooms to display the maximum extents of all objects.

The extents of each object in the model are calculated and used to determine how the model should fill the window.

Previous

Zooms to display the previous view. You can restore up to 10 previous views.



Scale / Scale factor

Zooms to change the magnification of a view using a scale factor.

- Enter a value followed by **x** to specify the scale relative to the current view.

- Enter a value followed by **xp** to specify the scale relative to paper space units.

For example, entering. 5x causes each object to be displayed at half its current size on the screen**.**

ZOOM .5x

Entering **.5xp** displays model space at half the scale of paper space units. You can create a layout with each viewport displaying objects at a different scale.

Enter a value to specify the scale relative to the grid limits of the drawing. (This option is rarely used.) For example, entering **2**displays objects at twice the size they would appear if you were zoomed to the limits of the drawing.

ZOOM 2

Window: Zooms to display an area specified by a rectangular window.

With the cursor, you can define an area of the model to fill the entire window.

before ZOOM Window after ZOOM Window

Object: Zooms to display one or more selected objects as large as possible and in the center of the view. You can select objects before or after you start the ZOOM command.

Real Time: Zooms interactively to change the magnification of the view.

The cursor changes to a magnifying glass with plus (+) and minus (-) signs. See Zoom Shortcut Menu for a description of the options that are available while zooming in real time.

Holding down the pick button at the midpoint of the window and moving vertically to the top of the window zooms in to 100%. Conversely, holding the pick button down at the midpoint of the window and moving vertically to the bottom of the window zooms out by 100%.

When you reach the zoom-in limit, the plus sign in the cursor disappears, indicating that you can no longer zoom in. When you reach the zoom-out limit, the minus sign in the cursor disappears, indicating that you can no longer zoom out.

When you release the pick button, zooming stops. You can release the pick button, move the cursor to another location in the drawing, and then press the pick button again and continue to zoom the display from that location.

PAN: Shifts the view without changing the viewing direction or magnification.

Find

Position the cursor at the start location and press the left mouse button down. Drag the cursor to the new location. You can also press the mouse scroll wheel or middle button down and drag the cursor to pan.

Layer Concepts:

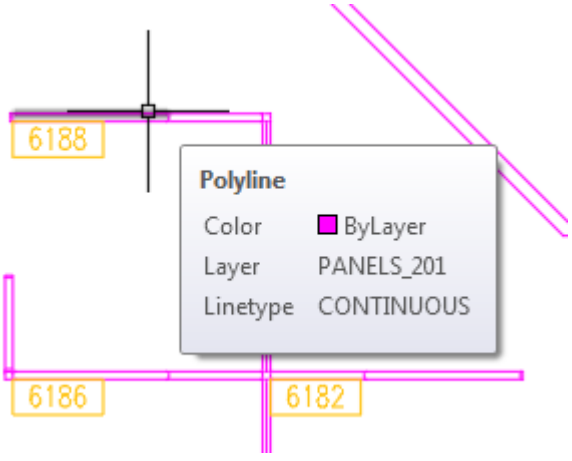
One drawing can have many layers. And depends on the complexity of the drawing, you may have a few to dozens of layers.

You can use each layer to draw a specific object type. For example, you can use *Wall* layer to draw walls on it. *Furniture* layer to draw furniture on it, and so on. AutoCAD supports tens of thousands layers in a single drawing, which is virtually unlimited. Changing active layer regularly to draw objects might seem tedious and takes longer to complete a drawing. However, you will find it very useful during the design process and the drawing presentation.

The layering system is an essential drawing management in AutoCAD, and you should use layers in every drawing. The common usage of layers is to draw objects on a layer based on their function. Create all dimensions on a specific layer. Create walls, doors, windows on separate layers, and so on.

If you follow a particular CAD layering standard, you can use the standard layer names.

Layer useful: First, because you draw objects on separate layers, it is easier for you to understand the drawing. You can quickly know an object type by checking the layer. AutoCAD drawings are just lines and arcs. Using layers can make the drawing easier to understand.



Second, you don't have to set properties for each object. You only need to set the properties for the layers. When you draw an object on a particular layer, it will have the same line weight, color, line type, and the other properties. It gives you a better control to plot your drawing.

Third, you can hide/show or lock/unlock a layer. It means you can have greater control of your drawing. You can lock several layers to prevent they are accidentally modified. You can hide objects when the drawing becomes too complicated.

Fourth, using layers adds a better control to select and modify objects. Let's say you want to select all partition walls in your drawing and copy them to the next typical floor. AutoCAD doesn't understand which lines are partition walls. However, we can tell AutoCAD to select lines on the *Partition Wall* layer.

DIMENSIONING

Create Horizontal, Vertical, or Aligned Dimensions

1. Click Annotate tab ➤ Dimensions panel ➤ Dimension.  Find
2. Select a line or specify the first and second extension line origin points.
3. Move your pointing device to the desired position and orientation of the dimension.
4. Before specifying the dimension line location, you can edit or rotate the text.
5. Click to place the dimension line.
6. Repeat steps to continue dimensioning or press Enter to end dimensioning.

Continued, baseline, and ordinate dimensions can be created using the options in this command.

Create a Linear Dimension with Angled Extension Lines

1. Click Annotate tab ➤ Dimensions panel ➤ Linear.  Find
2. Specify the first and second extension line origin.
3. At the prompt, enter r (Rotated).
4. Enter an angle for the dimension line.
5. Click to place the dimension line.

Create a Continued or Chain Dimension

1. Click Annotate tab ➤ Dimensions panel ➤ Continue.  Find
2. If prompted, select the dimension to continue.

   Note: This prompt is skipped if the first extension line origin can be assumed from the origin of the second extension line of the last created linear or angular dimension.
3. Use object snaps to specify additional extension line origins.
4. Press Enter twice to end the command.

Create a Baseline Dimension

1. Click Annotate tab ➤ Dimensions panel ➤ Baseline.  Find
2. If prompted, select the base dimension.

   Note: This prompt is skipped if the first extension line origin can be assumed from the last created linear or angular dimension.
3. Use an object snap to select the second extension line origin, or press Enter to select any dimension as the base dimension.

   The second dimension line is automatically located at the distance specified by the Baseline Spacing option in the Dimension Style Manager, Lines tab.
4. Use an object snap to specify the next extension line origin.
5. Continue to select extension line origins as needed.
6. Press Enter twice to end the command.

Modify a Dimension to Specify Oblique Extension Lines

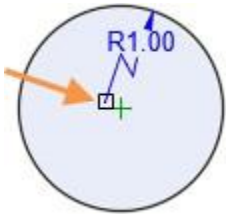
1. Click Annotate tab ➤ Dimensions panel ➤ Oblique.  Find
2. Select a linear dimension.
3. Enter a value for the angle of obliqueness, or specify two points.

Create a Radius or Diameter Dimension

1. Click Annotate tab ➤ Dimensions panel ➤ Dimension.  Find
2. Select an arc or a circle.
3. At the prompt, enter r (Radius) or enter d (Diameter).
4. Before specifying the dimension line location, you can edit or rotate the text.
5. Click to place the dimension line.
6. Repeat steps to continue dimensioning or press Enter to end dimensioning.

Create a Jogged Radius Dimension

1. Click Annotate tab ➤ Dimensions panel ➤ Dimension.  Find
2. Hover over an arc or a circle.
3. At the prompt, enter j (Jogged).
4. Select the arc or circle.
5. Click to specify a point for the false-center dimension origin, called the *center location override.*



6. Click to specify a point for the dimension line angle.
7. Click to specify the location of the dimension jog.
8. Repeat steps to continue dimensioning or press Enter to end dimensioning.

To create Angular Dimension:

1. Click Annotate tab ➤ Dimensions panel ➤ Dimension.  Find
2. At the prompt, enter a (Angular).
3. Select one of the following:
   1. An arc
   2. A circle and two points
   3. Two nonparallel lines
   4. A vertex and two points
4. Before specifying the dimension line location, you can edit or rotate the text.
5. Click to place the dimension line.
6. Repeat steps to continue dimensioning or press Enter to end dimensioning.

To create Arc Dimension:

1. Click Annotate tab ➤ Dimensions panel ➤ Dimension.  Find
2. Hover over an arc or an arc segment in a polyline.
3. At the prompt, enter L (Arc Length).
4. Select the arc or the arc segment in a polyline.
5. Click to place the dimension line.
6. Repeat steps to continue dimensioning or press Enter to end dimensioning.

HATCHING: It fills an area with a pattern.

1. Click Home tab ➤ Draw panel ➤ Hatch.  Find
2. On the Properties panel ➤ Hatch Type list, select the type of hatch that you want to use.
3. On the Pattern panel, click a hatch pattern or fill.
4. On the Boundaries panel, specify the how the pattern boundary is selected:

5. **Pick Points.** Inserts the hatch or fill within a closed area that is bounded by one or more objects. With this method, you click within the boundaries to specify the area.
6. **Select Boundary Objects.** Inserts the hatch or fill within a closed object, such as a circle, closed polyline, or a set of objects with endpoints that touch and enclose an area.

The selection method is retained until you change it.

6. Click an area or object to be hatched.
7. On the ribbon, make any adjustments as needed:

1. On the Properties panel, you can change the hatch type and colors or modify the transparency level, angle, or scale for the hatch.
2. On the expanded Options panel, you can change the draw order to specify whether the hatch and its boundary are displayed in front of or behind other objects.

8. Press Enter to apply the hatch and exit the command.

Note: Enclosed areas can be hatched only if they are in a plane parallel to the *XY* plane of the current UCS.

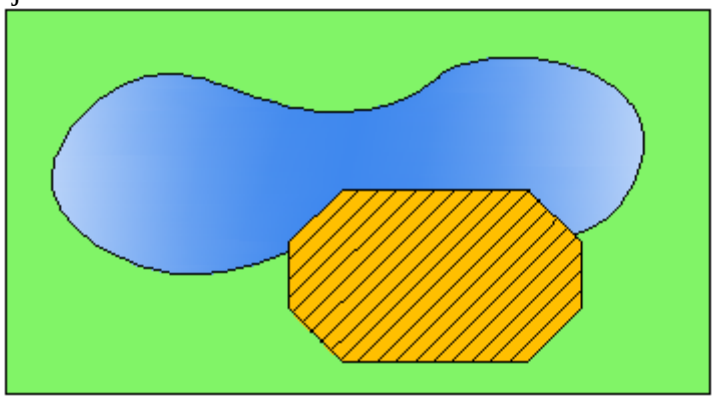
To Hatch or Fill a Large Number of Closed Objects

1. Use a window, crossing, or fence selection method to select all the closed objects to hatch or fill. Alternatively, select a closed object, right-click, and choose Select Similar from the shortcut menu.
2. Start the Hatch (or -Hatch) command and choose any options or settings.
3. If necessary, specify the Select Objects option.
4. At the prompt, enter **p** (Previous) and press Enter.

The objects in the previous selection set are hatched or filled.

Hatching patterns and fills:

You can fill existing objects or enclosed areas with hatch patterns, solid color fills, or gradients, or you can create new hatch objects.



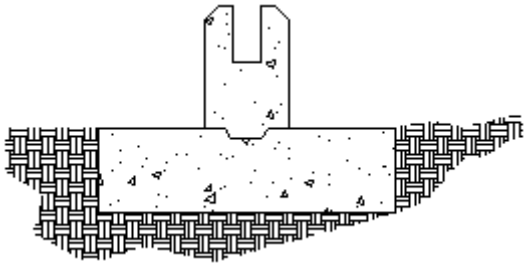
Choose from:

- **Predefined hatch patterns.** Choose from over 70 ANSI, ISO, and other industry-standard hatch patterns, or add hatch pattern libraries supplied by other companies.
- **User-defined hatch patterns.** Define your own hatch patterns based on the current line type, with spacing, angle, color, and other properties you specify.
- **Custom hatch patterns.** Hatch patterns are defined in the *acad.pat* and *acadiso.pat* (*acadlt.pat* and *acadltiso.pat* for AutoCAD LT) files. You can add custom hatch pattern definitions to these files.
- **Solid fill.** Fill an area with a solid color.
- **Gradient fill.** Fill an enclosed area with a color gradient. A gradient fill can be displayed as a *tint* (a color mixed with white), a *shade* (a color mixed with black), or a smooth transition between two colors.

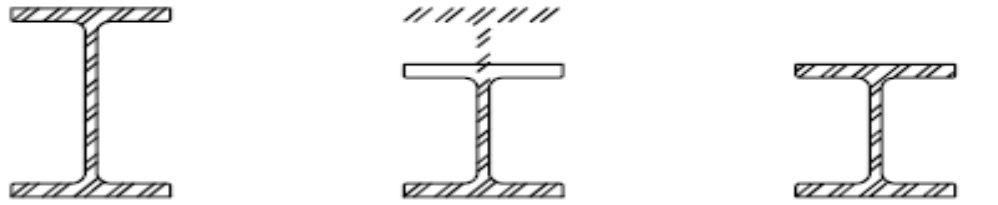
Gradients that mimic colors displayed on a cylinder, a sphere, or other shapes are available.

Hatch Boundaries and Associativity

In the following illustration, the concrete hatches are *bounded*, while the earth hatches are *unbounded*.



By default, bounded hatches are *associative*, which means that the hatch object is associated with the hatch boundary objects: changes to the boundary objects are automatically applied to the hatch.



Non associative hatches are not updated when their original boundary is changed.

Hatch associativity is turned on by default and is controlled by the HPASSOC system variable. You can change hatch associativity using the Associate button on the Options palette, the Properties palette, or the Hatch Edit dialog box.

Note: The OSOPTIONS system variable controls how object snaps work with hatch objects.

Customizing the Tools:

1. Click Manage tab ➤ Customization panel ➤ Tool Palettes.  Find
2. Drag a command from a toolbar to the tool palette. The horizontal line indicates the location of the tool.
3. On the tool palette, right-click the tool and select Properties.
4. In the Tool Properties dialog box, enter a name and description.
5. Under Command, in the Command String box, enter a string of commands or a script.

Working with multiple drawings

You can create multiple drawing views from Inventor linked models, within the same command session.

Note: Inventor Link is available only on 64-bit systems, and it is not installed by default.

1. In the Browser, choose the Drawing tab.
   Note: If the Mechanical Browser is not visible turn it on using the AMBROWSER command.
2. Double-click a Layout to make it the active layout.
3. Right-click the Layout icon, and then choose New View.
4. In the Create Drawing View dialog box,
   1. View Type: Multiple
   2. Data Set: Select
   3. Choose OK.
5. Select the location of the projected view.
6. Continue placing as many views as desired.
7. Press ENTER to exit the command.

EXPERIMENT: 5

DRAWINGS OF BUILDING COMPONENTS

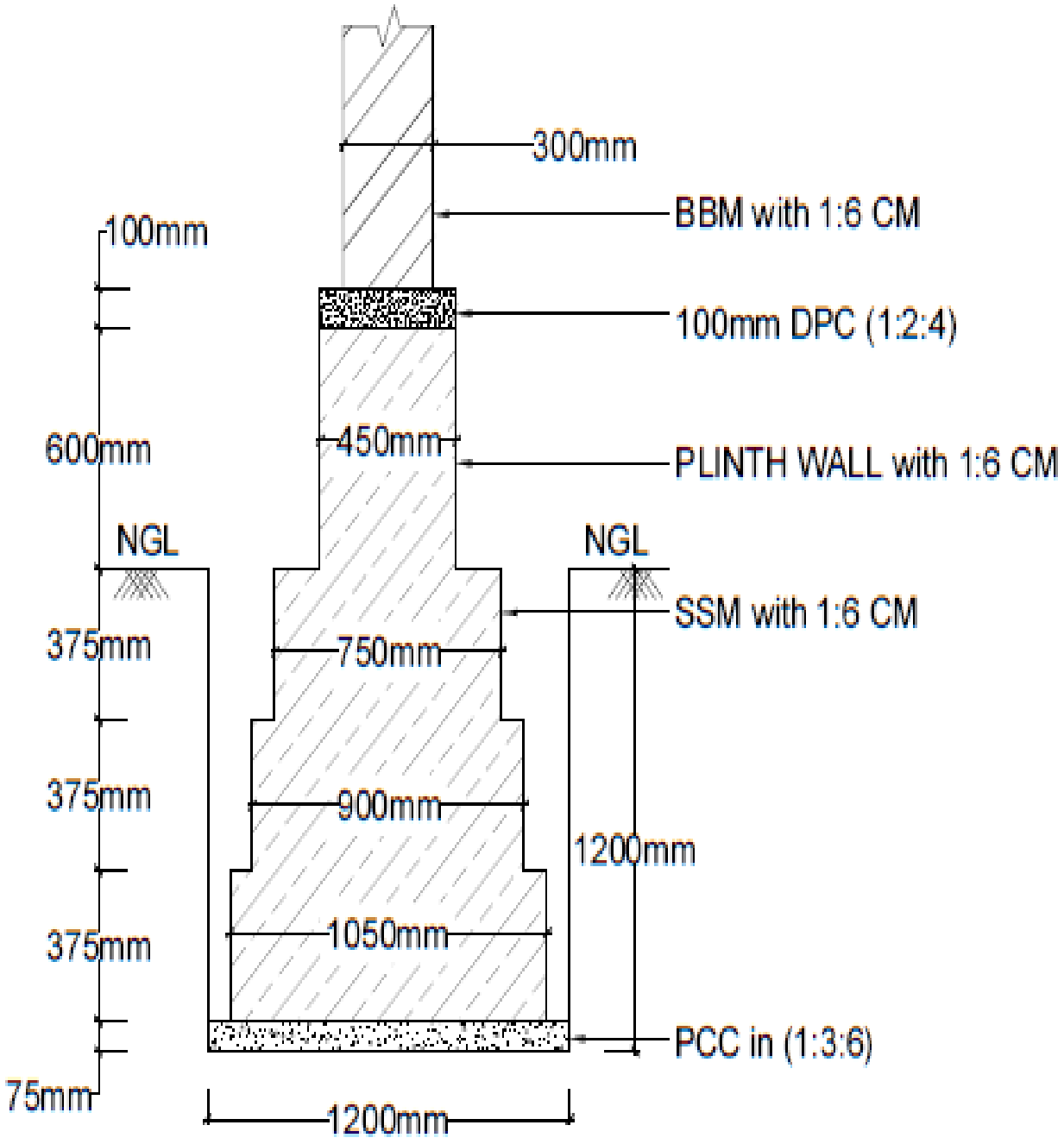
The drawings of different components of a building are to be prepared for the data given using AutoCAD software.

A. CROSS SECTION OF MASONRY WALL FOUNDATION, RCC COLUMNS WITH ISOLATED AND COMBINED FOOTINGS

Exercise 5.1

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:

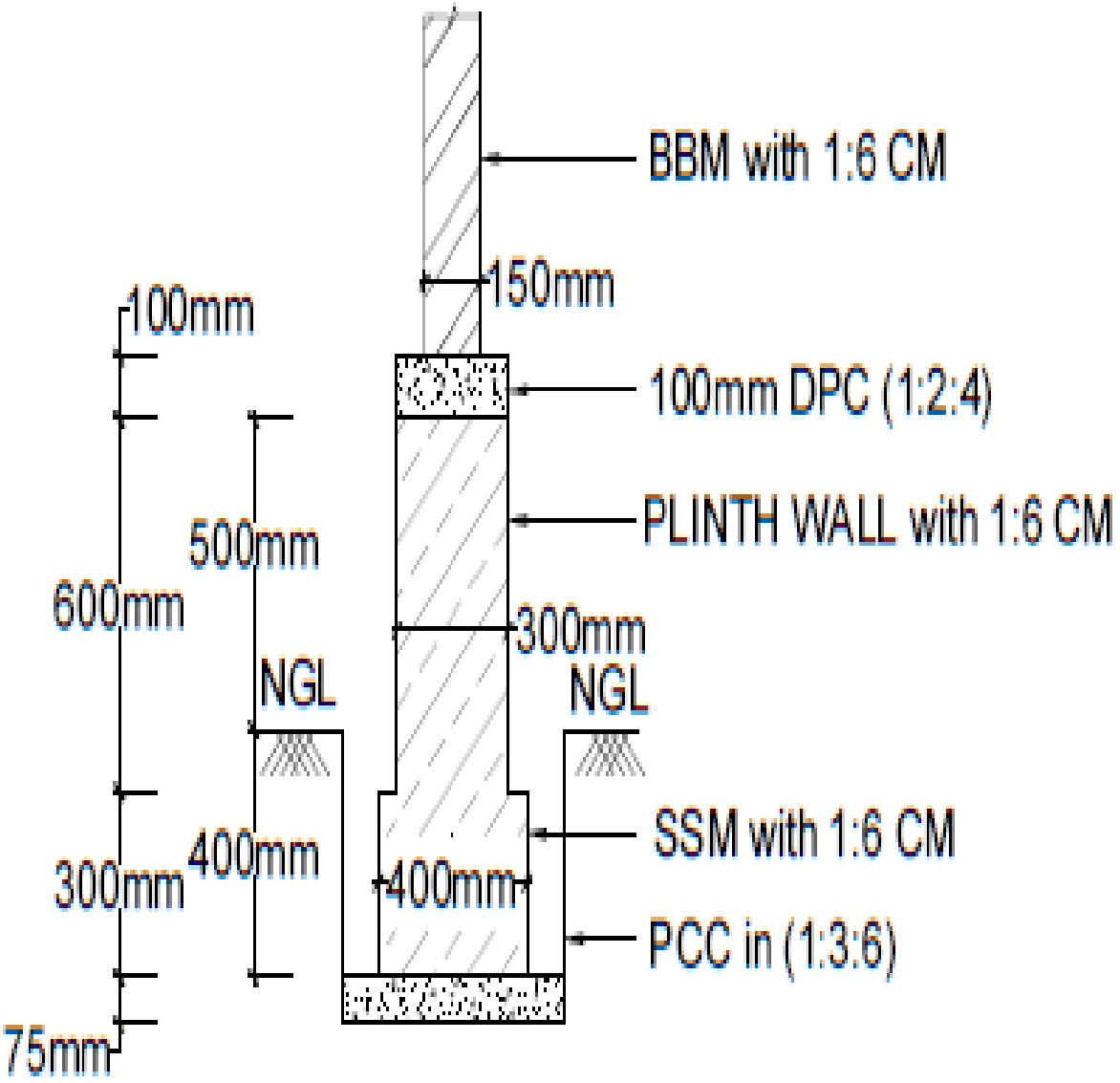
a. Width of foundation = 1.20m
b. Depth of foundation below GL = 1.20m
c. Width of PCC = 1.20m
d. Thickness of PCC in 1:3:6 = 75mm.
vii. Width of second footing = 0.90m
viii. Depth of second footing = 0.375m
ix. Width of third footing = 0.75m
x. Depth of third footing = 0.375m
e. Width of first footing above PCC = 1.05m
f. Depth of first footing above PCC = 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)

Exercise 5.2

Draw a cross section of a S.S. Masonry foundation to be provided for a partition wall 150mm thick in Burnt Brick Masonry in superstructure of a residential building



CROSS SECTION OF SIZE STONE MASONRY FOUNDATION FOR PARTITION WALL (Fig:2.2)

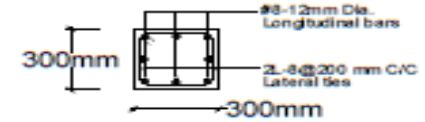
Exercise 5.3

Prepare a working drawing for an isolated column footing (RCC) for a column size 300mm x 300mm reinforced with #8 of 12mm HYSD- steel as main bars together with 2 legged 8ϕ stirrups at 200c/c.

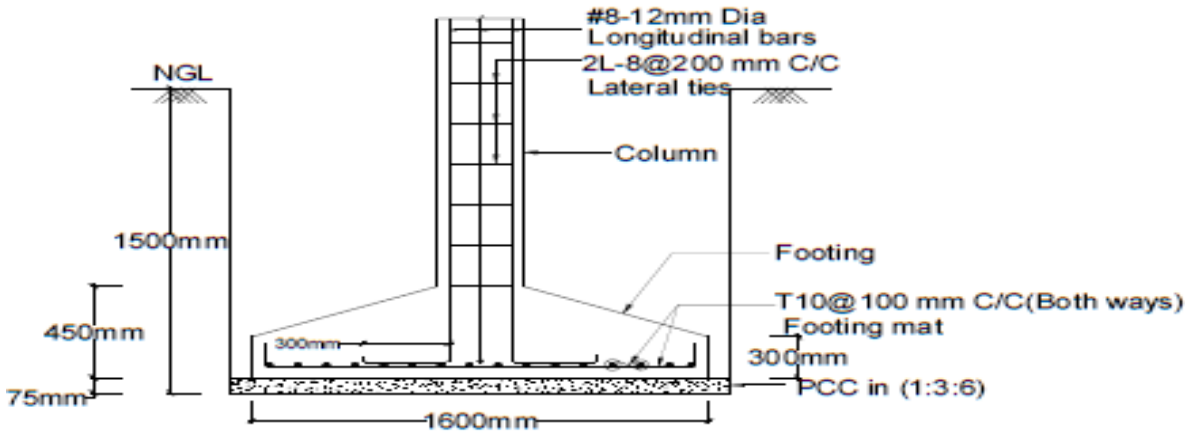
Details of footing: Size of footing is 1.6m x 1.6m and the thickness of the footing at the face of the column is 450mm which reduces to 300mm at the edge of footing. The mat comprises of 10ϕ TOR- steel at 100 c/c both ways. The footing is provided with PCC bed in 1:3:6 of thickness 75mm.Depth of foundation is1.5m from natural ground level.

Solution:

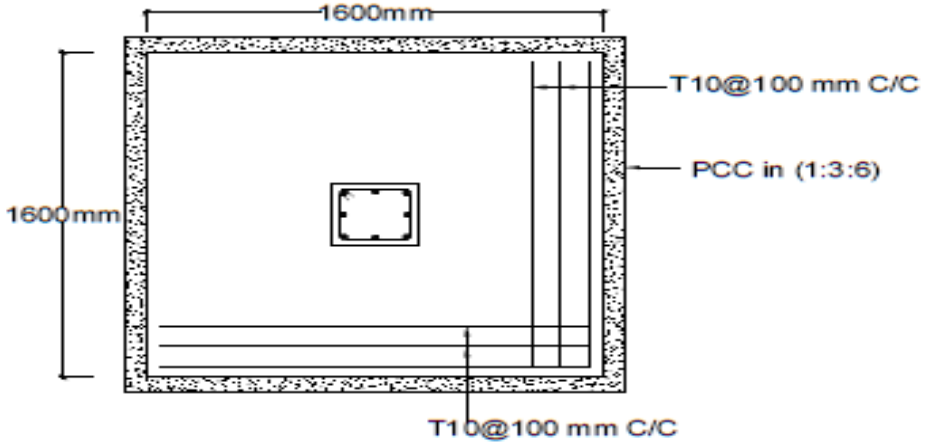
SQUARE ISOLATED COLUMN FOOTING(Fig:2.3)



C/S OF SQUARE COLUMN



L/S OF SQUARE ISOLATED COLUMN FOOTING



C/S OF SQUARE ISOLATED COLUMN FOOTING

Exercise 5.4

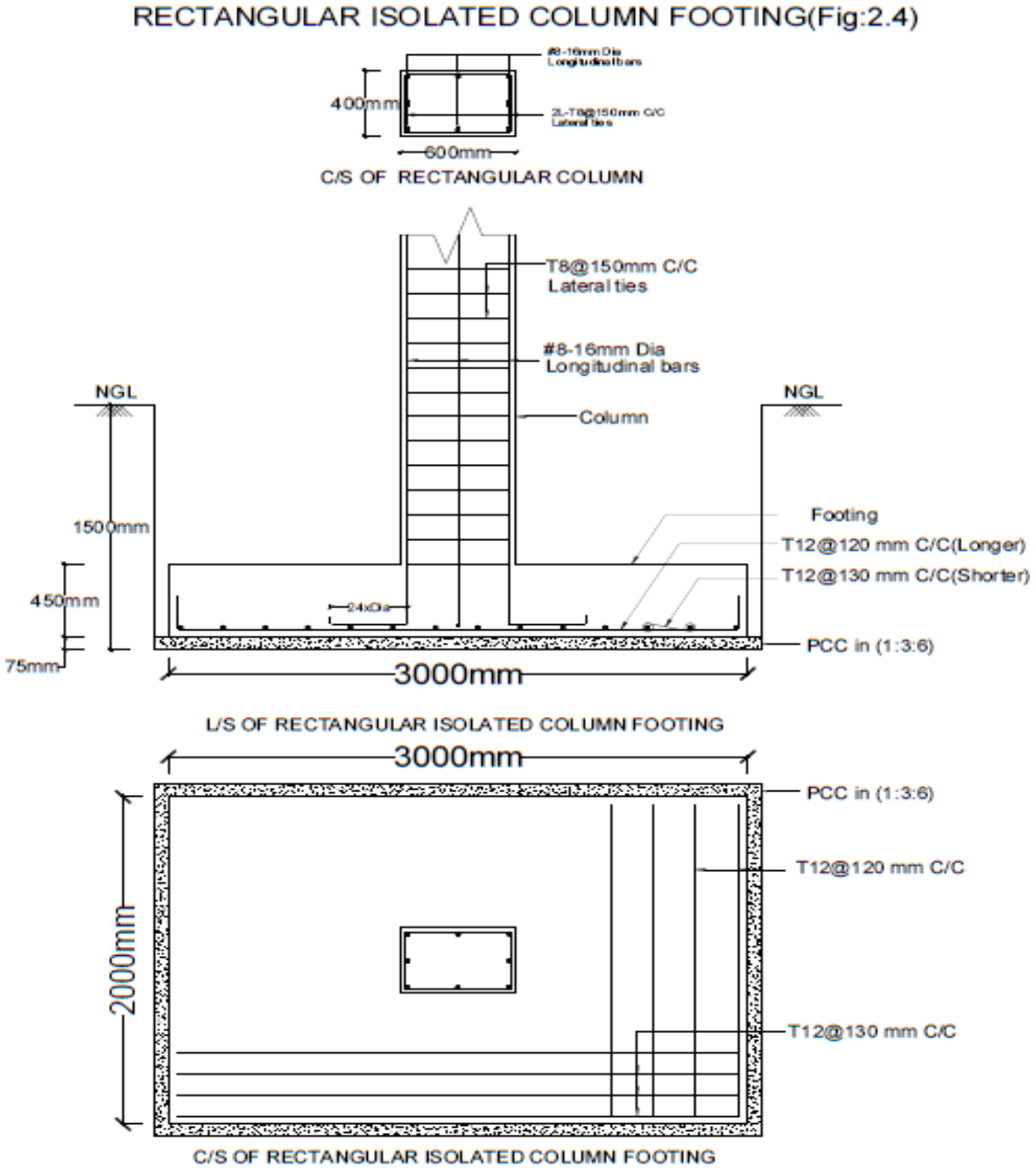
Prepare a working drawing for an isolated rectangular RCC column and footing has the following details:

Column size: (400 x 600) mm. Size of footing: 2m x 3m of uniform thickness 450mm. Depth of foundation below GL = 1.5m, Height of column to be shown above GL = 1.0m, Thickness of PCC bed in 1:3:6 = 75mm,

Details of reinforcement:

Column: #8 - 16ϕ as main bars with 2L - 8ϕ @ 150 c/c lateral ties, Footing: Longer direction steel - 12ϕ @ 130 c/c, Shorter direction steel - 12ϕ @ 220 c/c.

Solution:



Exercise 5.5

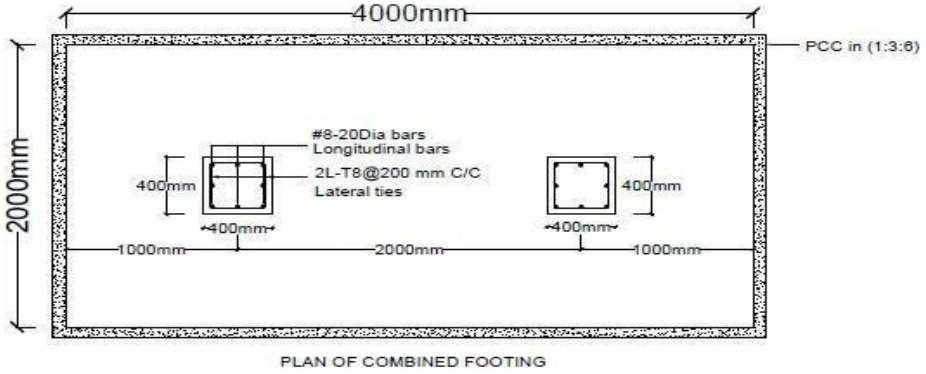
Draw plan, sectional elevation and cross section of a slab type combined footing with the given details:

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

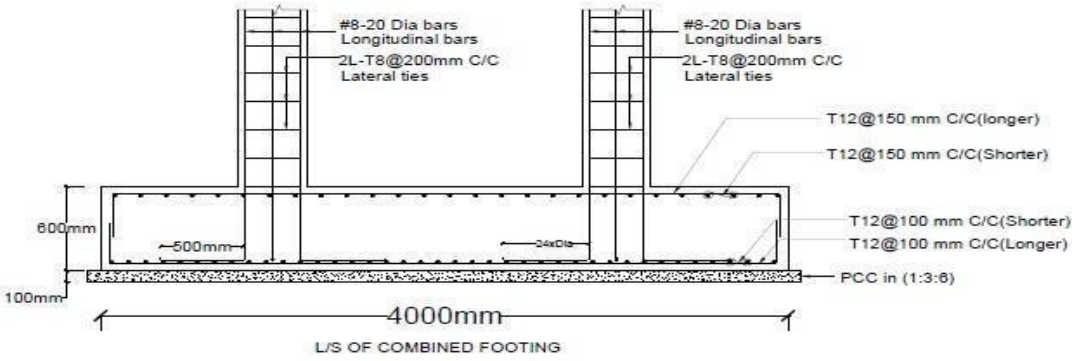
Footing reinforcement details – bottom reinforcement of 12ϕ @ 100 c/c both ways and top reinforcement of 12ϕ @ 150 c/c both ways

Solution:

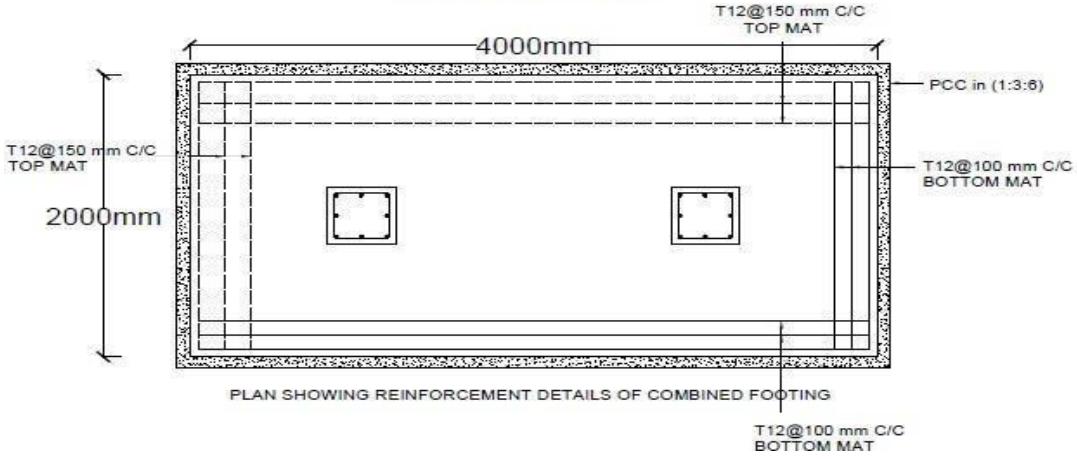
SLAB TYPE COMBINED FOOTING(Fig:2.5)



PLAN OF COMBINED FOOTING



L/S OF COMBINED FOOTING



PLAN SHOWING REINFORCEMENT DETAILS OF COMBINED FOOTING

B. DIFFERENT TYPES OF BONDS IN BRICK MASONRY

Exercise 5.6

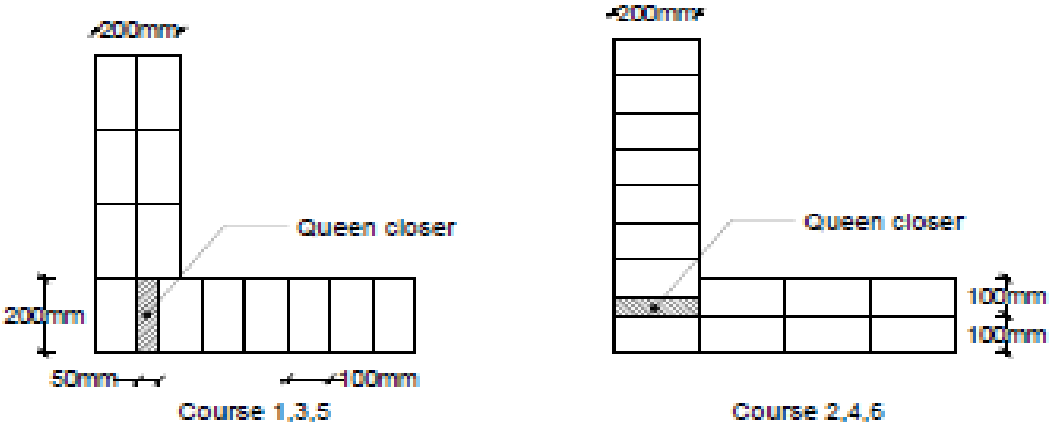
Draw two consecutive courses for corner joints of the following walls in English bond.

(a) One brick thick wall i.e., 200 x 200

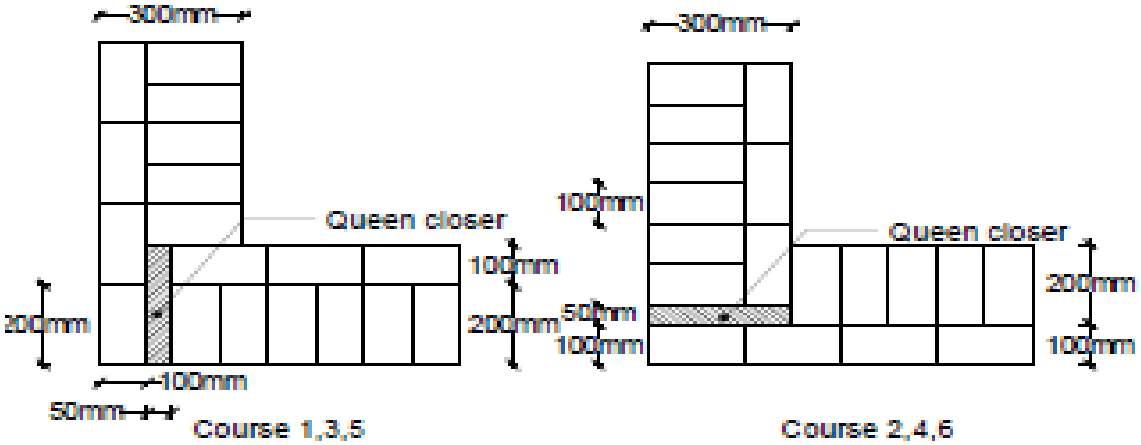
(b) One and half thick wall i.e., 300 x 300.

Solution: i) For one brick thick wall

ii) For one and half brick thick wall



ENGLISH BOND
ONE BRICK WALL 200X200(Fig:2.6a)



ENGLISH BOND
ONE AND HALF BRICK WALL 300X300(Fig:2.6b)

Exercise 5.7

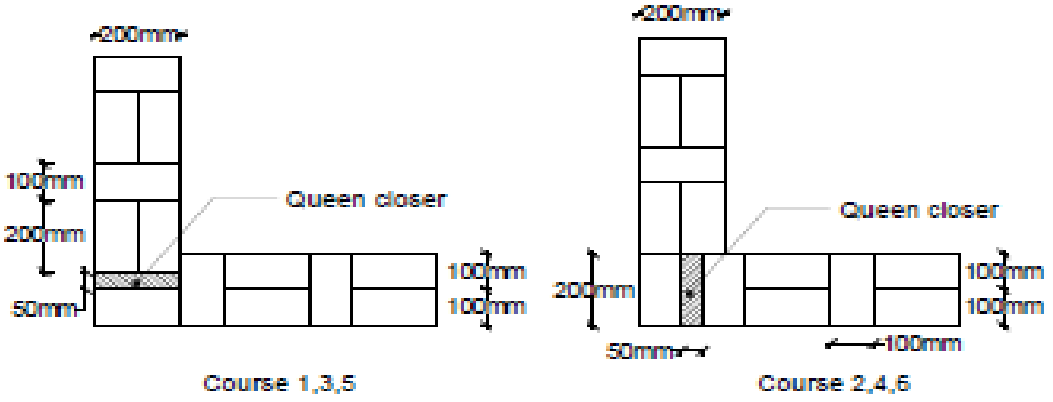
Draw plan of two consecutive courses for corner joints of the following walls in Double Flemish bond.

(a) One brick thick wall i.e., 200 x 200

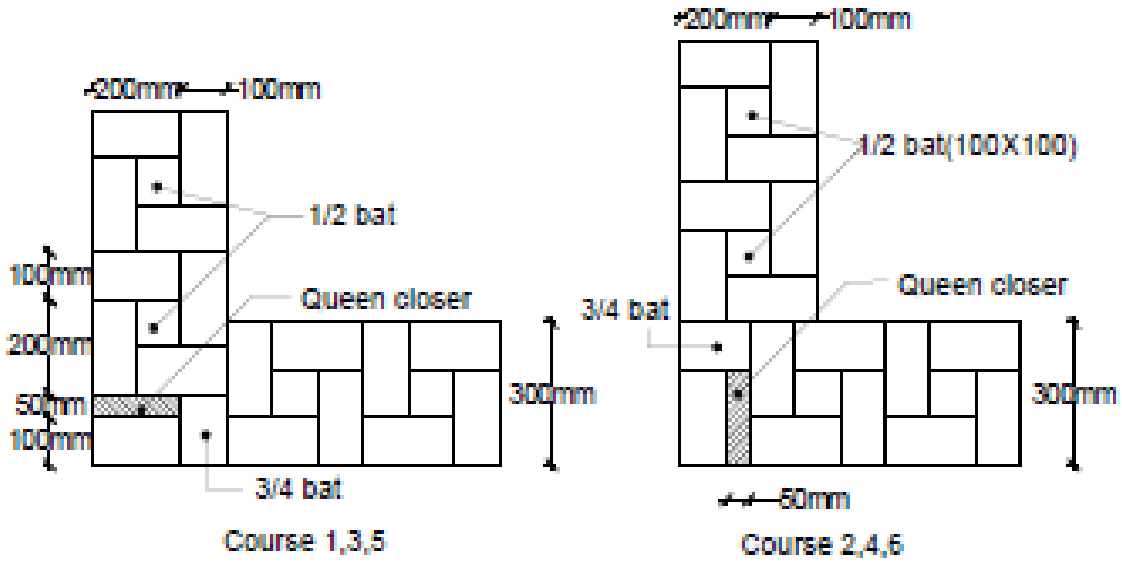
(b) One and half thick wall i.e., 300 x 300.

Solution: i) For one brick thick wall

ii)For one and half brick thick wall



DOUBLE FLEMISH BOND
ONE BRICK WALL 200X200(Fig:2.7a)

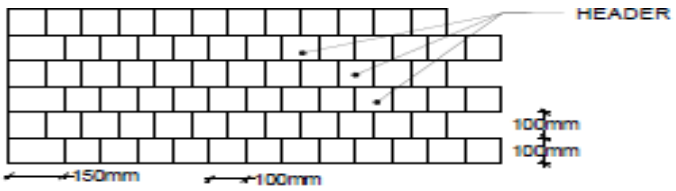


DOUBLE FLEMISH BOND
ONE AND HALF BRICK WALL 300X300(Fig:2.7b

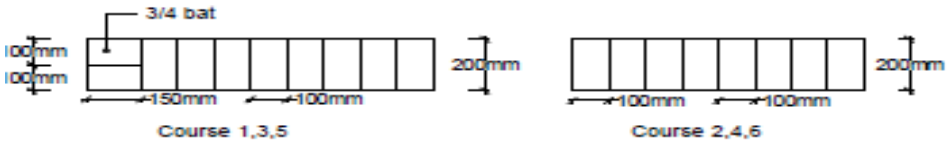
Exercise 5.8

Draw plan and elevation of two alternate courses of a one brick thick wall in Header bond.

Solution:



ELEVATION OF HEADER BOND

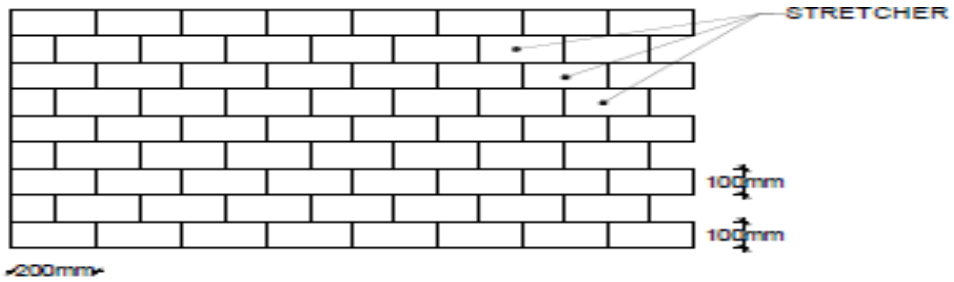


HEADER BOND
ONE BRICK WALL 200X200(Fig:2.8)

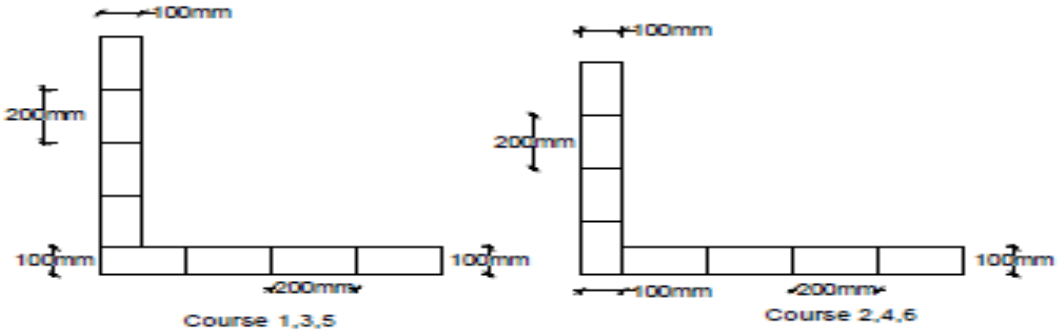
Exercise 5.9

Draw plan and elevation two alternate courses and elevation of a half brick thick wall in Stretcher bond.

Solution:



ELEVATION OF STRETCHER BOND



STRETCHER BOND
ONE BRICK WALL 200X200(Fig:2.9)

EXPERIMENT NO: 6

BUILDING PLANNING AND DRAWING

To understand about principles of building planning and building bye laws

- **Principles of Planning:**
  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 the building depends on its;
  1. Its functional object and requirements.
  2. Its components parts, their sizes and the relationship between the different rooms.
  3. Shape of the plot and topography.
  4. Climatic conditions of the place.
  5. Its location and neighborhood.
  6. 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 requirements, Grouping, Circulation, Sanitation, Flexibility, Elegance, Economy, Practical Examination.

NATIONAL BUILDING CODE OF INDIA

- Group A : Residential Buildings
- Group B : Educational Buildings
- Group C : Institutional Buildings
- Group D : Assembly Buildings
- Group E : Business Buildings
- Group F : Mercantile Buildings
- Group G : Industrial Buildings
- Group H : Storage Buildings
- Group I : Hazardous Buildings
-

CLASSIFICATIONS OF MULTI STOREY BUILDINGS:

Depending on the height, need and various other factors, multi storey buildings are classified into following.

1. Low Rise building: A low rise multi storey building has few storeys (typically less than four), with the usage of elevators and stairs for vertical circulation.

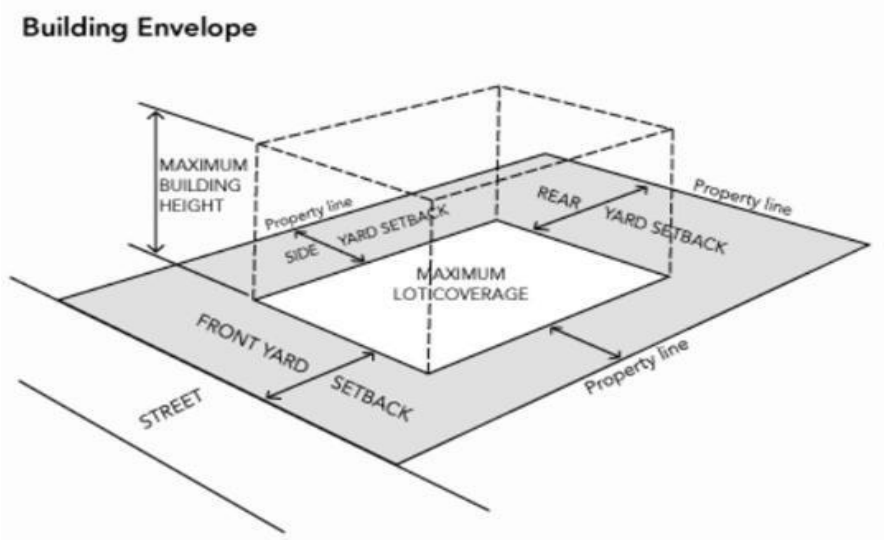
2. Mid Rise building: A Mid Rise building has number of storeys ranging from 4 to 12.

3. High Rise building: A High Rise building has number of storeys ranging from 12 to 40, with usage of lifts and stairs.

4. Skyscraper building: A tall and habitable steel building having storeys more than 40 but height less than 300m is considered as Sky Scrapper Multi storey building.

5. Super tall building: Super tall building is the steel building with its height exceeding 300m are Super tall Multi storey building.

6. Mega tall building: Super tall building is the steel building with its height exceeding 600m are Super tall Multi storey building.



Minimum Plot Size and Building Frontage

Different types of residential Building, plot size and their frontages		
Types of Residential Building	**Plot size in m^2**	**Frontage in m**
Detached Building	Above 250	Above 12
Semi Detached Building	125-250	8-12
Row type Building	50-125	4.5-8

Note: Minimum frontage on any street 6m, for row housing it may be 5.5m

Minimum Front open space to be provided

Width of street in front of plot in m	Front open space minimum in m
Up to 7.5m	1.5
7.5 to 18	3.0
18 to 30	4.5
Above 30	6.0

Permissible Plinth Area (Covered area) in Residential Plots

Area of Plot	Max. Permissible covered area
< 200 m^2	66.66% of plot area
201 to 500 m^2	50% of the plot area
501 to 1000 m^2	40% of the plot area
> 1000 m^2	33.33% of the plot area

Minimum Rear open space to be provided (upto 10m height): Average width = 3m but not less than 1.8m

Minimum side open space to be provided (upto 10m height)

- Detached building: 3m on both sides
- Semidetached building: 3m on one side only

Floor Area Ratio:

- Floor area ratio (FAR) = Total covered area of all floors / plot area
- FAR : 1 to 2 depending on type of construction
- Maximum building height = (1.5 x width of abuting road) + front open space

EXPERIMENT NO: 7

Exercise: 7.1

Draw plan, elevation and sectional elevation including electrical plumbing and sanitary services for a given line diagram of **single storey residential building**

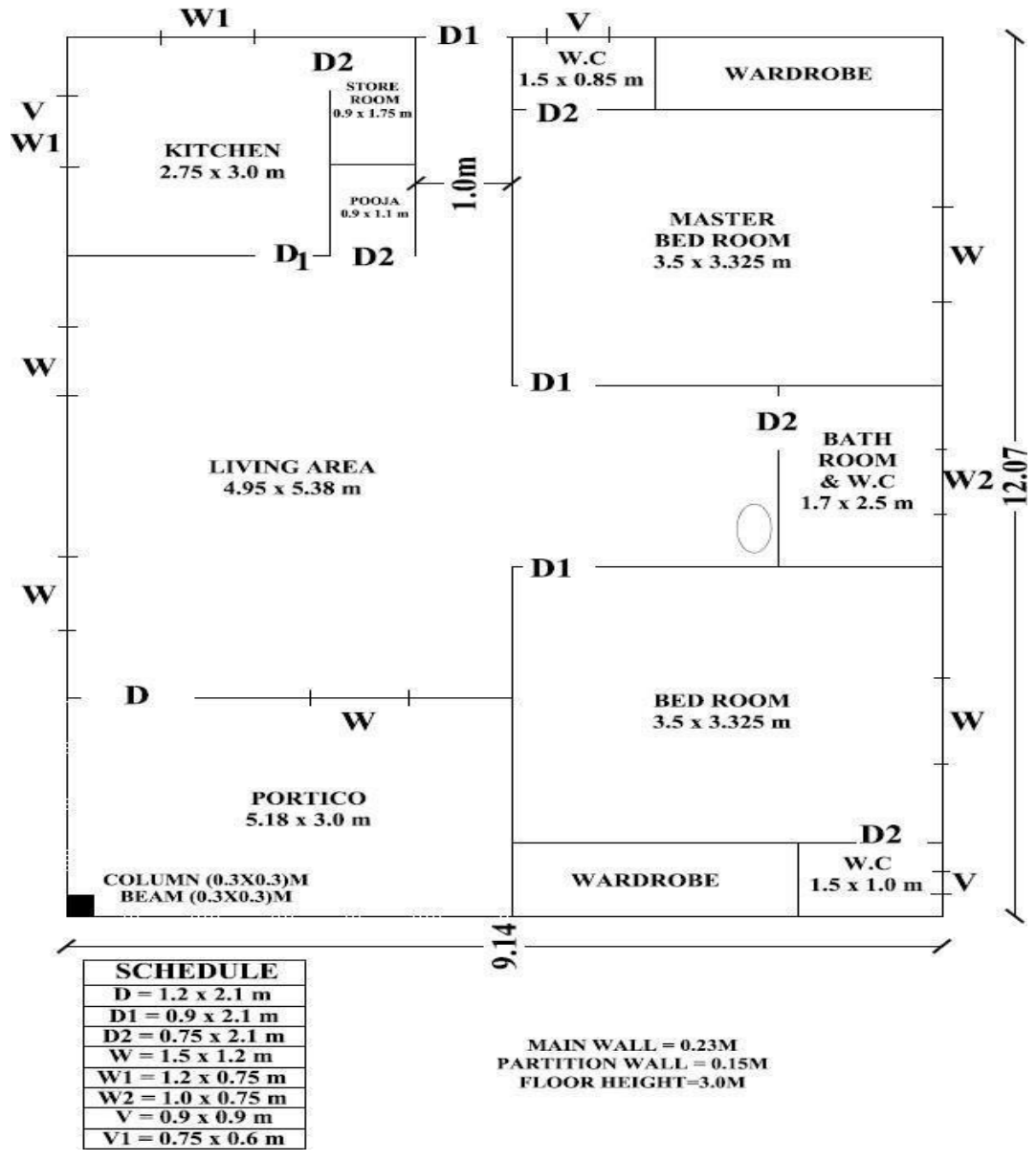
Solution:

Plan

Sectional elevation

Elevation

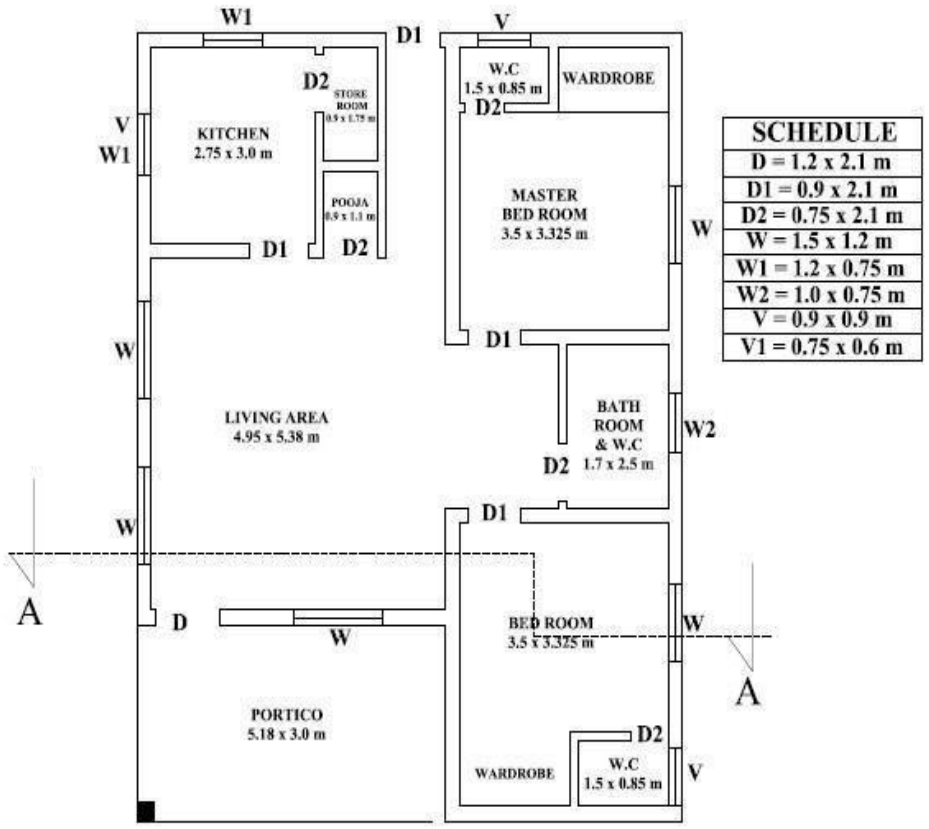
Q.no.3.1:-LINE DIAGRAM OF SINGLE STOREY RESIDENTIAL BUILDING



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

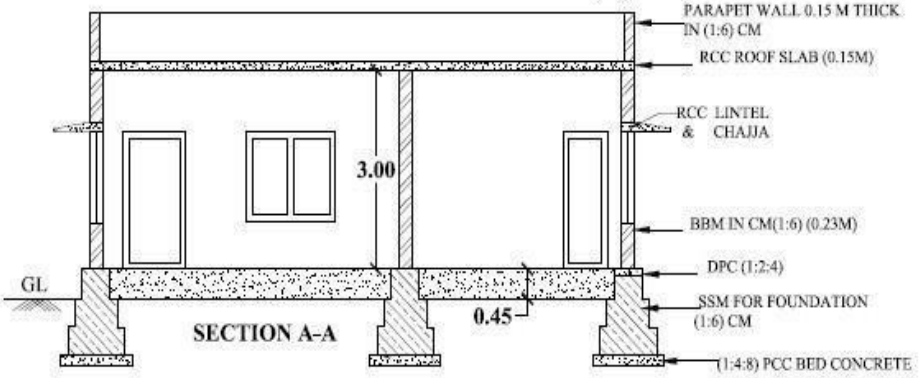
MAIN WALL = 0.23M
PARTITION WALL = 0.15M
FLOOR HEIGHT=3.0M

PLAN OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.1)

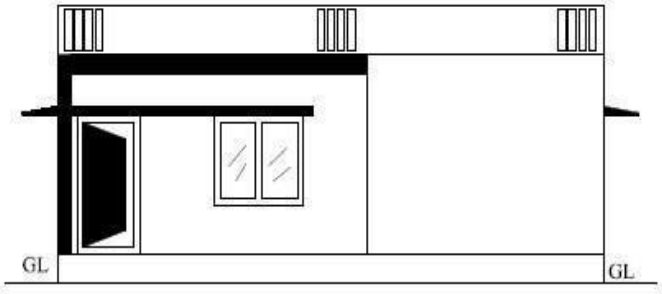


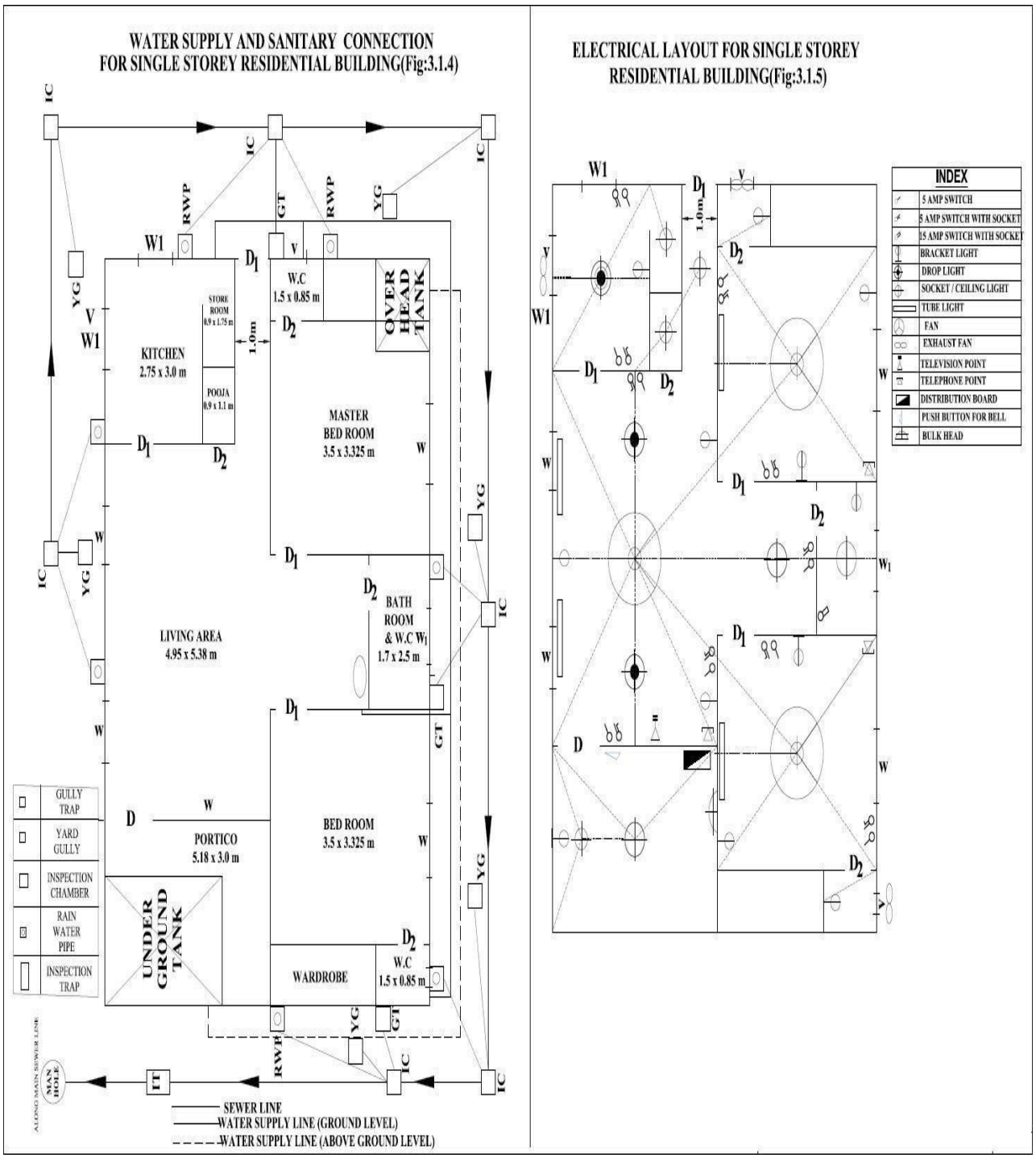
SCHEDULE
D = 1.2 x 2.1 m
D1 = 0.9 x 2.1 m
D2 = 0.75 x 2.1 m
W = 1.5 x 1.2 m
W1 = 1.2 x 0.75 m
W2 = 1.0 x 0.75 m
V = 0.9 x 0.9 m
V1 = 0.75 x 0.6 m

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

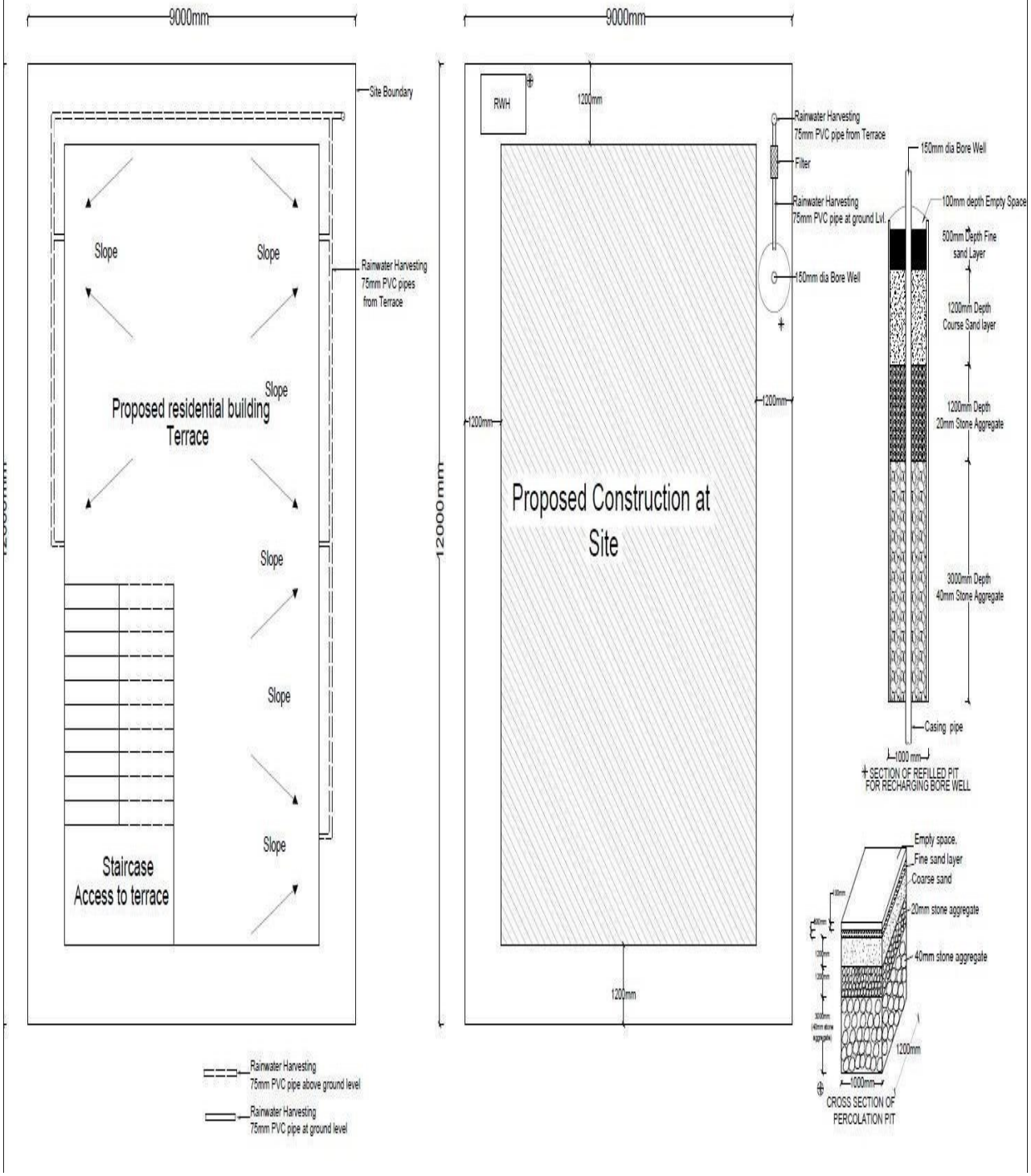


ELEVATION OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.3)



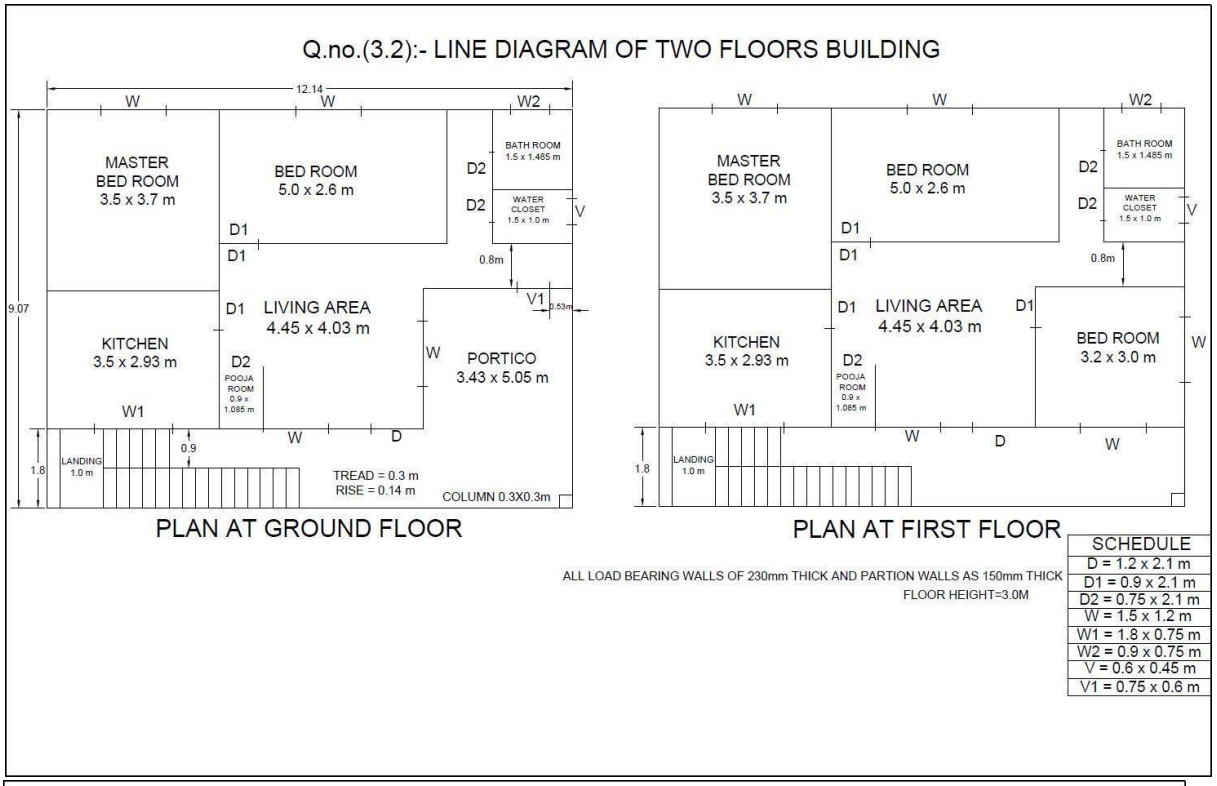

WATER SUPPLY AND SANITARY CONNECTION
FOR SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.4)
KITCHEN
2.75 x 3.0 m
STORE ROOM
0.9 x 1.75 m
POOJA
0.9 x 1.1 m
W.C
1.5 x 0.85 m
OVER HEAD TANK
MASTER BED ROOM
3.5 x 3.325 m
BATH ROOM & W.C
1.7 x 2.5 m
LIVING AREA
4.95 x 5.38 m
PORTICO
5.18 x 3.0 m
BED ROOM
3.5 x 3.325 m
UNDER GROUND TANK
WARDROBE
W.C
1.5 x 0.85 m
GULLY TRAP
YARD GULLY
INSPECTION CHAMBER
RAIN WATER PIPE
INSPECTION TRAP
MAN HOLE
SEWER LINE
WATER SUPPLY LINE (GROUND LEVEL)
WATER SUPPLY LINE (ABOVE GROUND LEVEL)
ELECTRICAL LAYOUT FOR SINGLE STOREY
RESIDENTIAL BUILDING(Fig:3.1.5)
INDEX
5 AMP SWITCH
5 AMP SWITCH WITH SOCKET
15 AMP SWITCH WITH SOCKET
BRACKET LIGHT
DROP LIGHT
SOCKET / CEILING LIGHT
TUBE LIGHT
FAN
EXHAUST FAN
TELEVISION POINT
TELEPHONE POINT
DISTRIBUTION BOARD
PUSH BUTTON FOR BELL
BULK HEAD

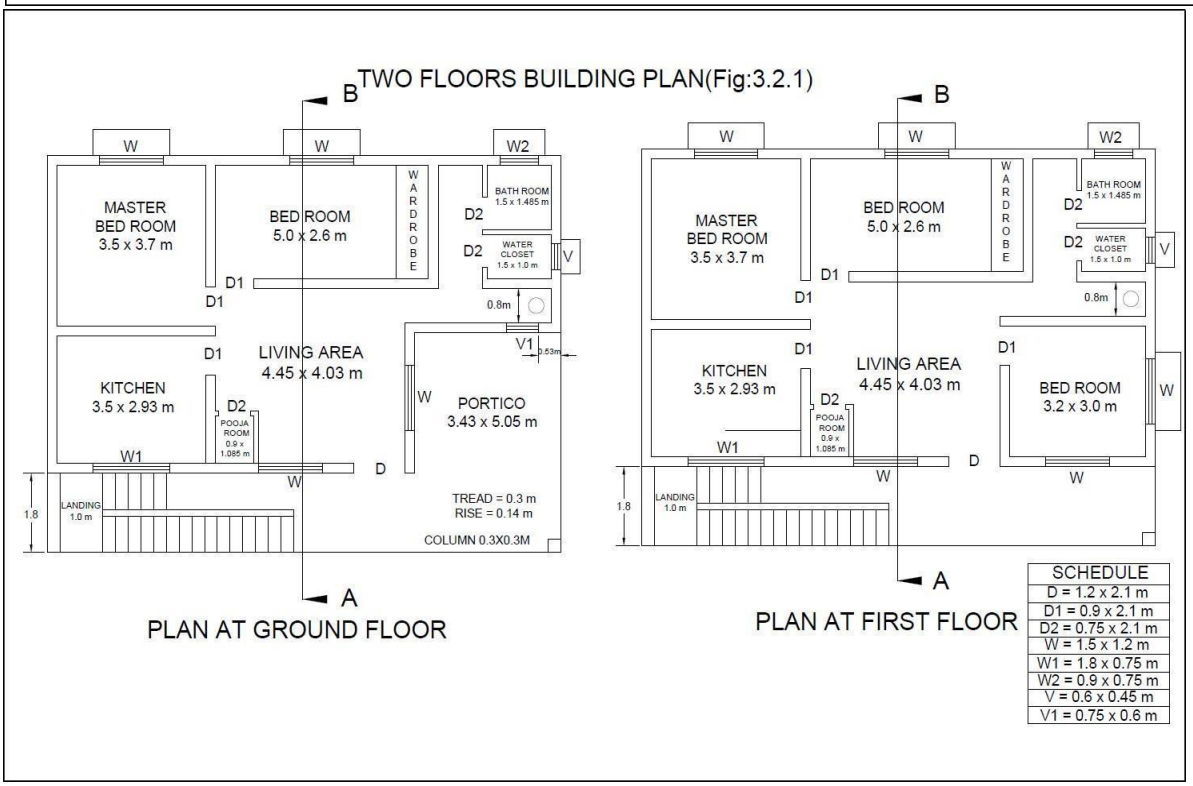
LAYOUT PLAN OF RAINWATER HARVESTING AND
RECHARGING SYSTEM FOR A RESIDENTIAL BUILDING (Fig:2.24)

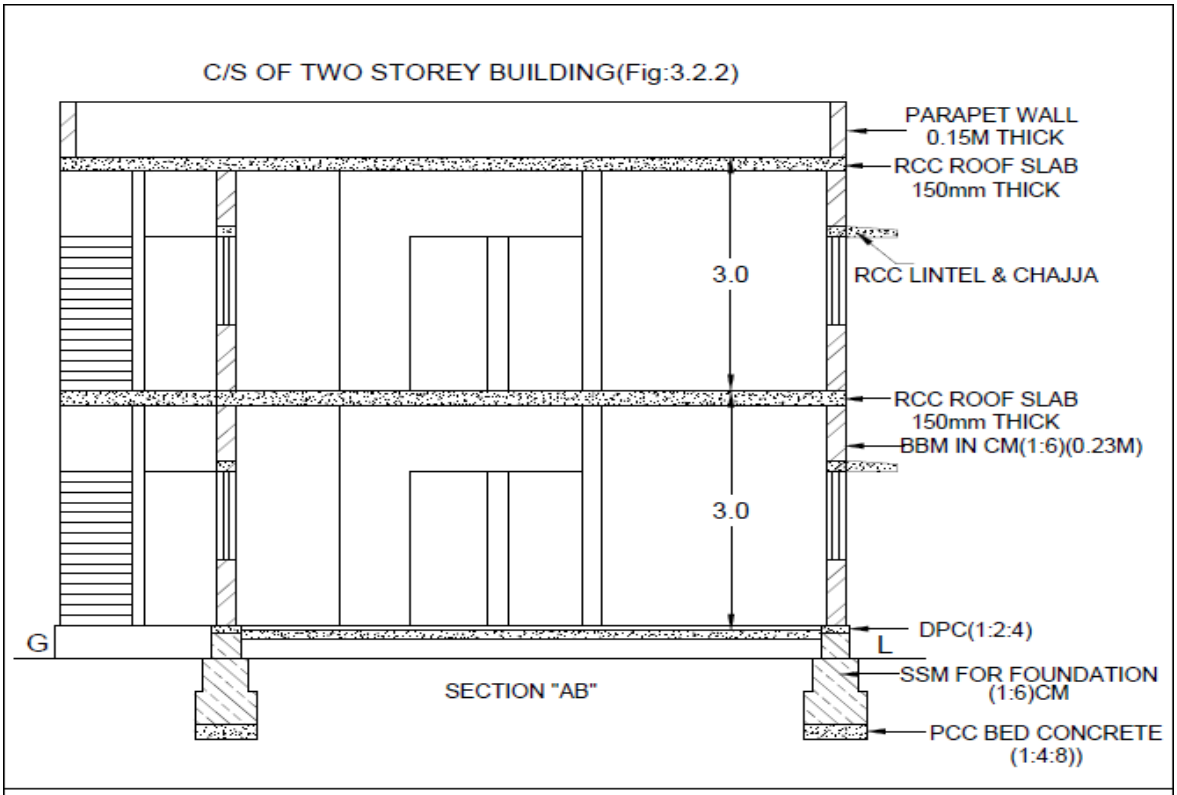


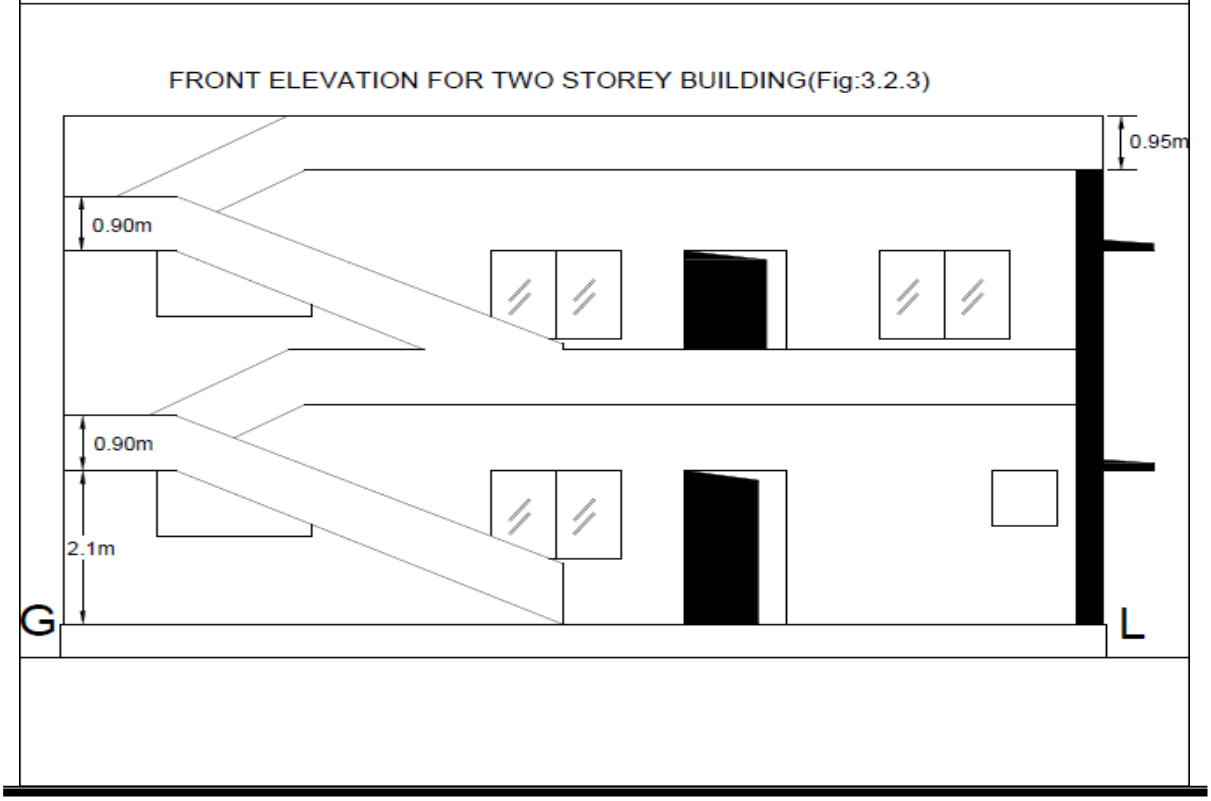
EXERCISE:7.2

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of two storey residential building

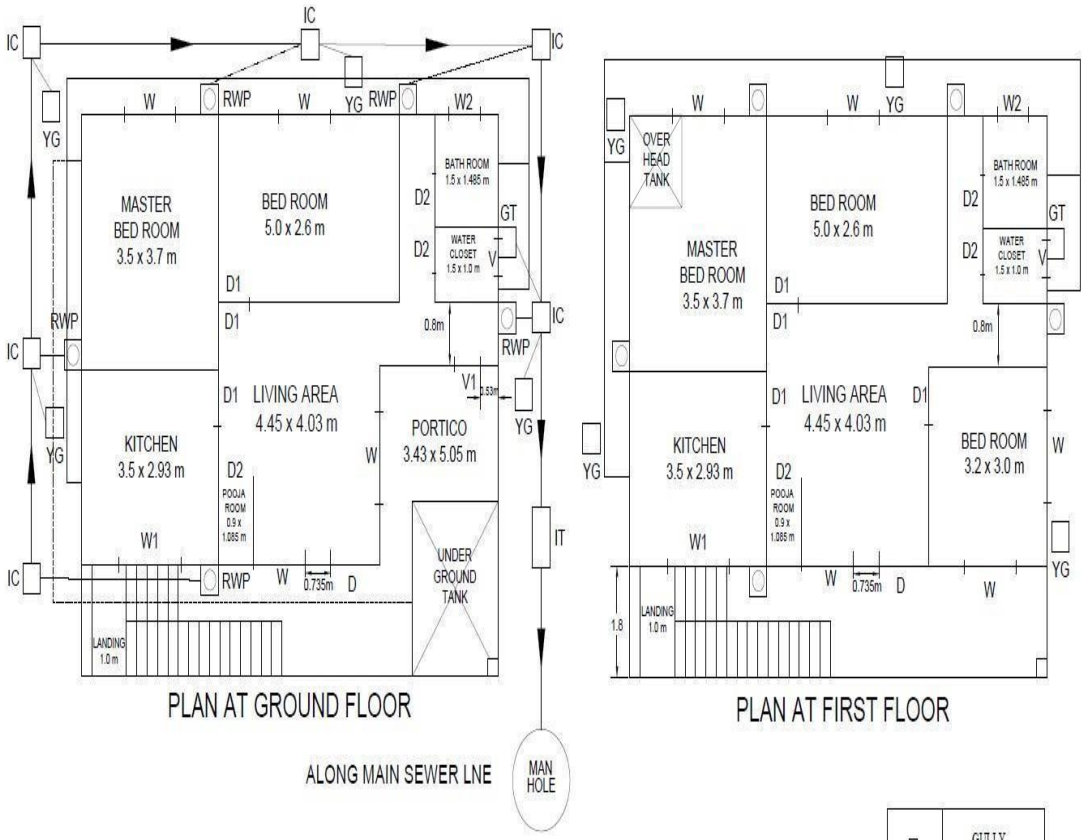




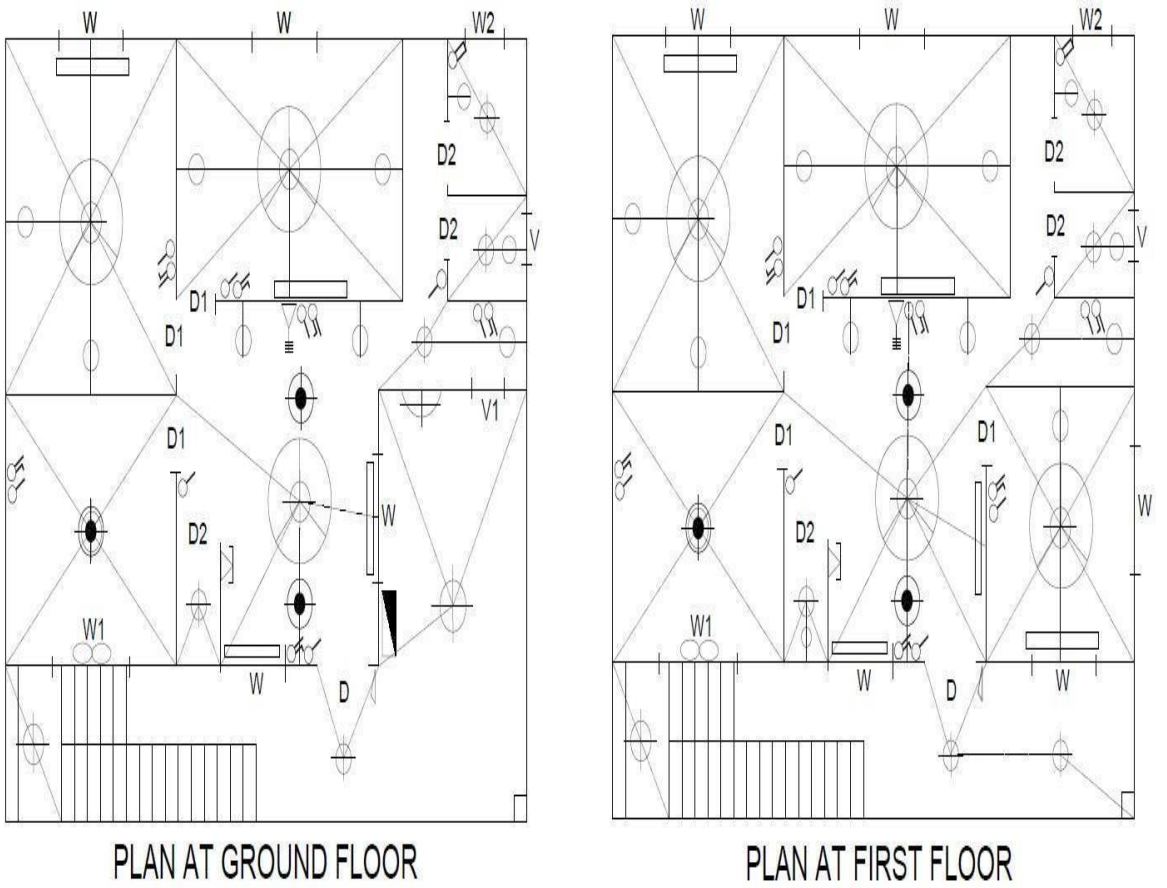

C/S OF TWO STOREY BUILDING(Fig:3.2.2)
PARAPET WALL
0.15M THICK
RCC ROOF SLAB
150mm THICK
RCC LINTEL & CHAJJA
3.0
RCC ROOF SLAB
150mm THICK
BBM IN CM(1:6)(0.23M)
3.0
DPC(1:2:4)
G
L
SSM FOR FOUNDATION
(1:6)CM
SECTION "AB"
PCC BED CONCRETE
(1:4:8))


FRONT ELEVATION FOR TWO STOREY BUILDING(Fig:3.2.3)
0.95m
0.90m
0.90m
2.1m
G
L

WATER SUPPLY AND SANITARY LAYOUT FOR TWO FLOORS BUILDING(Fig:3.2.4)



ELECTRICAL LAYOUT FOR TWO FLOORS BUILDING(Fig:3.2.5)



PLAN AT GROUND FLOOR

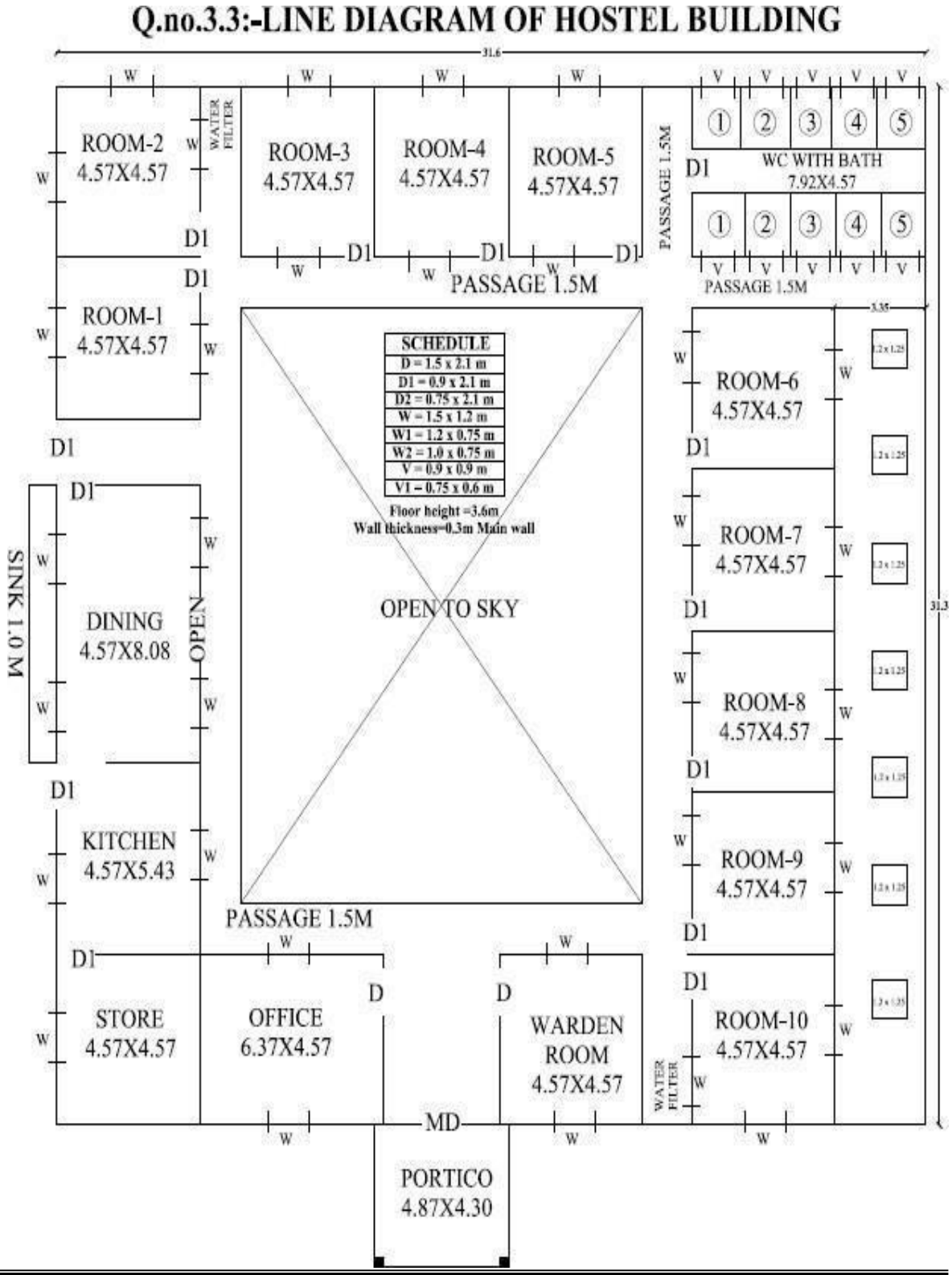
PLAN AT FIRST FLOOR

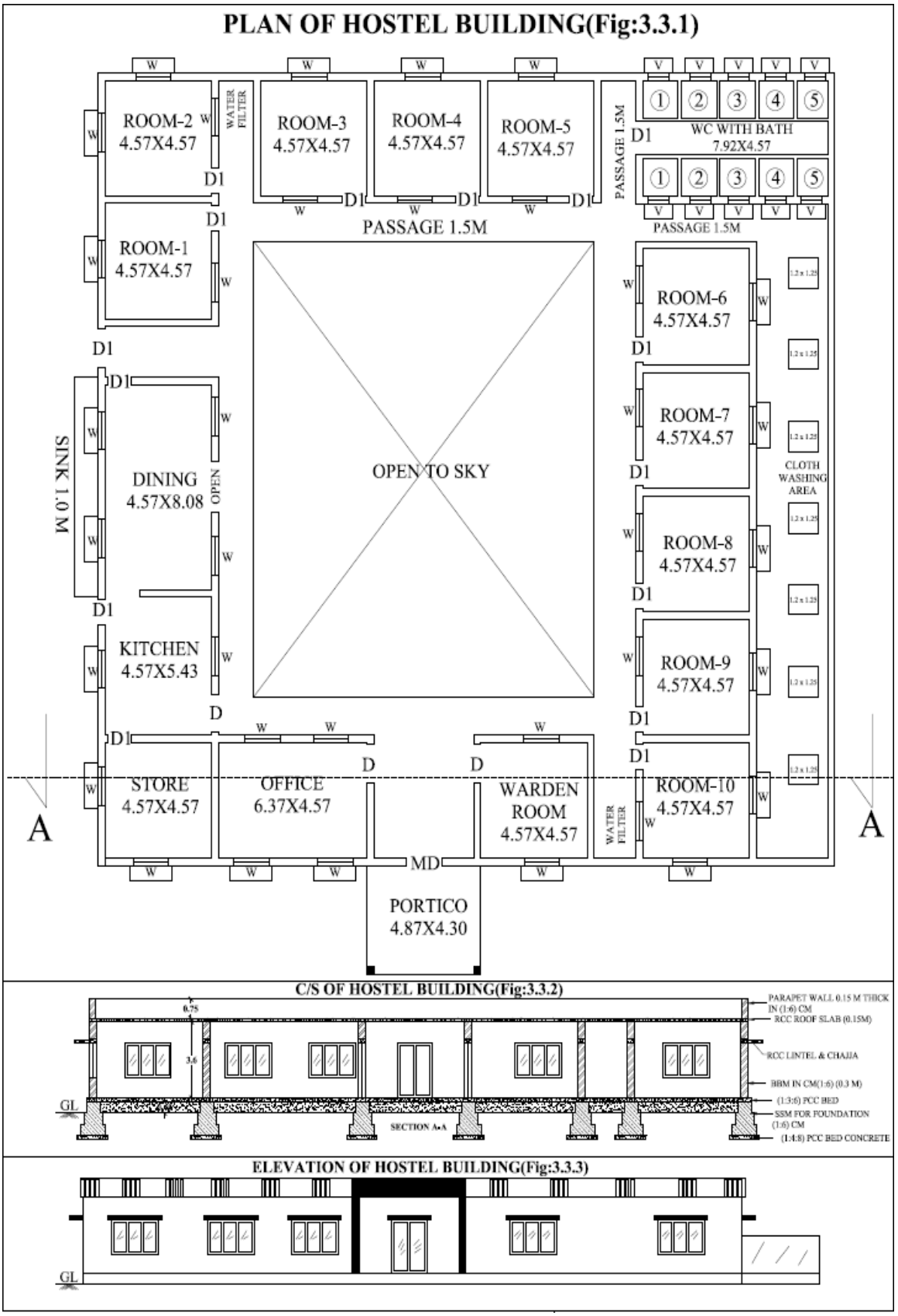
INDEX

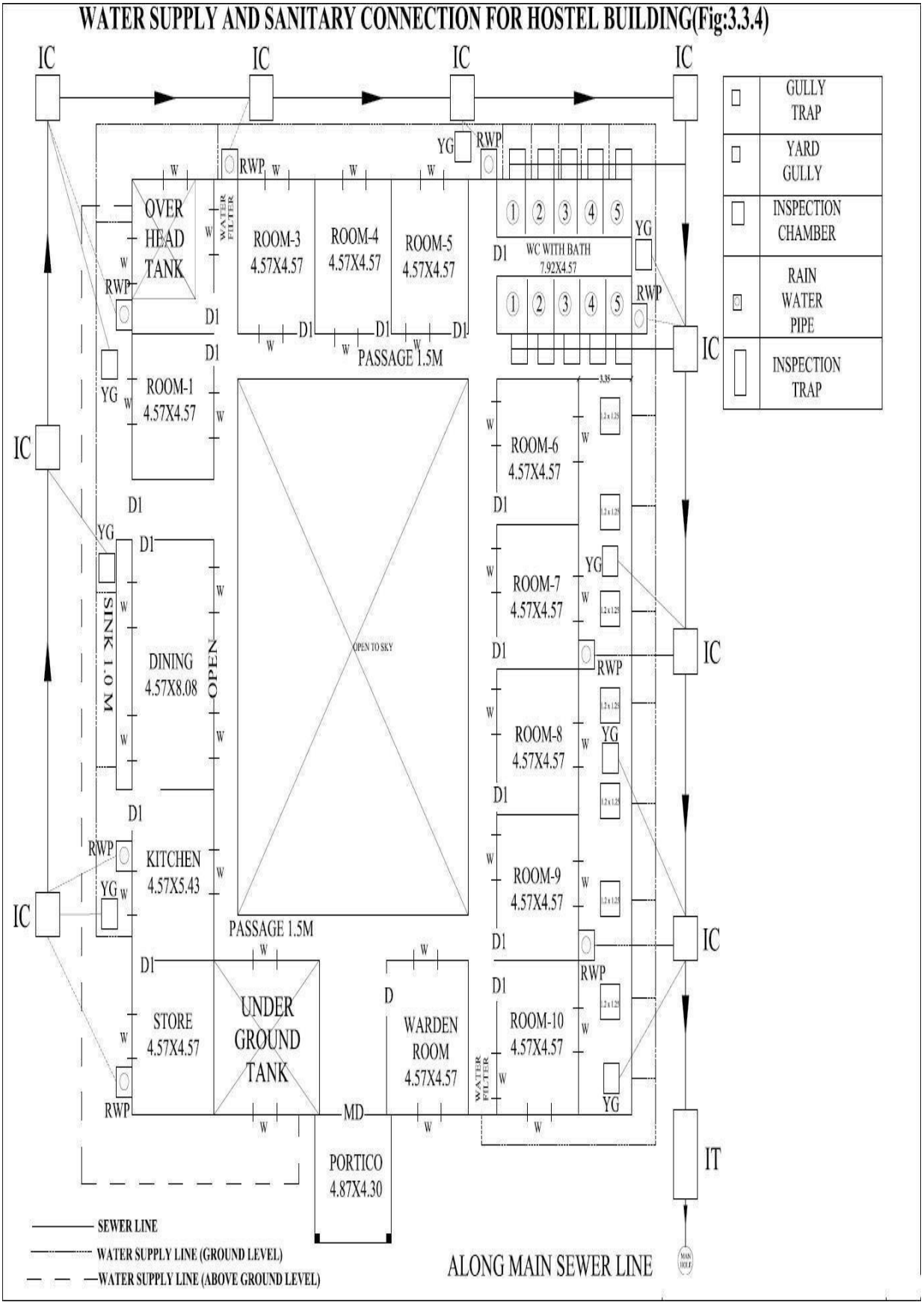
	5 AMP SWITCH		TUBE LIGHT
	5 AMP SWITCH WITH SOCKET		FAN
	15 AMP SWITCH WITH SOCKET		EXHAUST FAN
	BRACKET LIGHT		TELEVISION POINT
	DROP LIGHT		TELEPHONE POINT
	SOCKET / CEILING LIGHT		DISTRIBUTION BOARD
	BULK HEAD		PUSH BUTTON FOR BELL

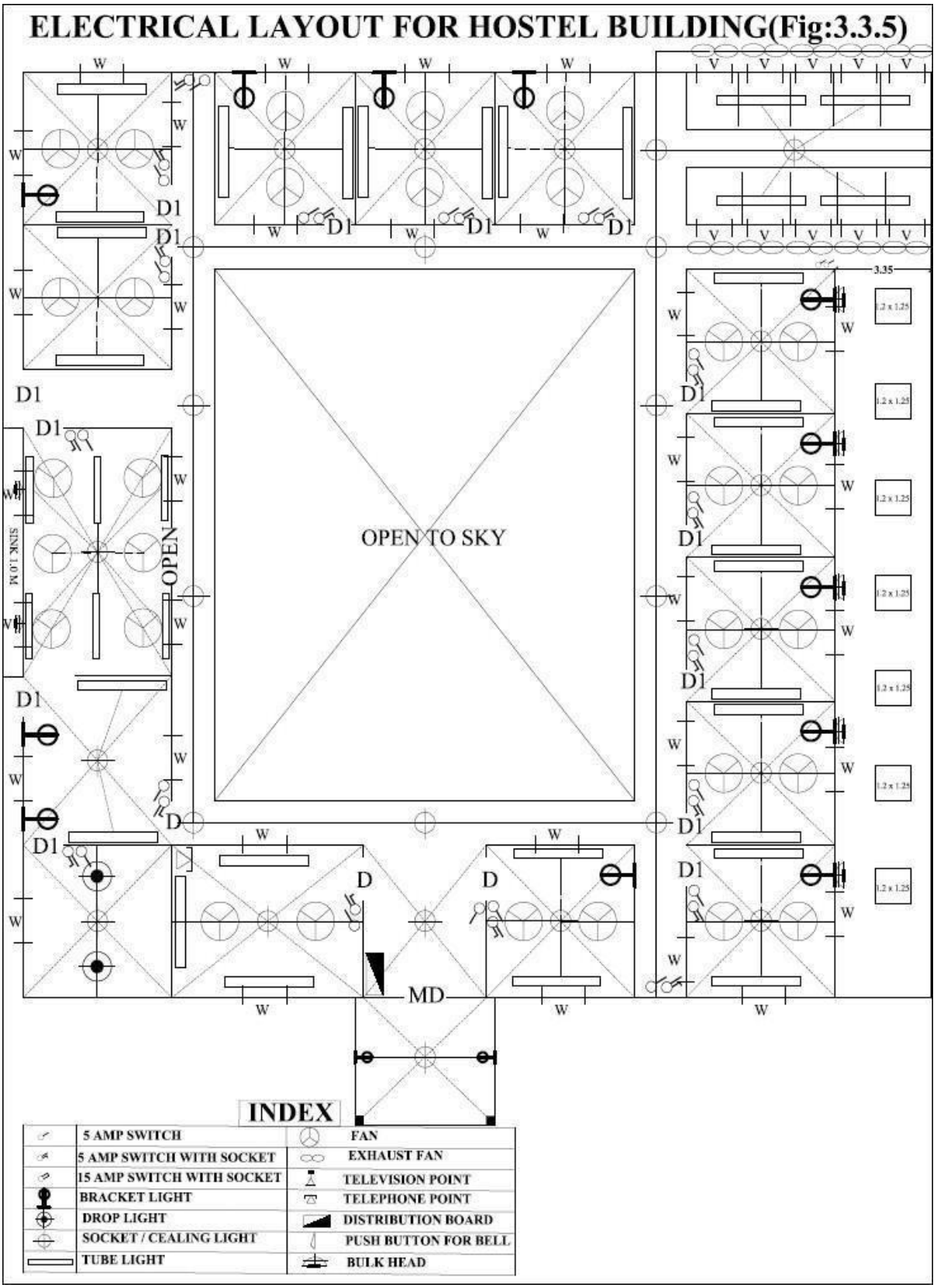
EXERCISE:7.3

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of Hostel building




PLAN OF HOSTEL BUILDING(Fig:3.3.1)
ROOM-2 4.57X4.57
WATER FILTER
ROOM-3 4.57X4.57
ROOM-4 4.57X4.57
ROOM-5 4.57X4.57
PASSAGE 1.5M
WC WITH BATH 7.92X4.57
PASSAGE 1.5M
ROOM-1 4.57X4.57
OPEN TO SKY
ROOM-6 4.57X4.57
ROOM-7 4.57X4.57
ROOM-8 4.57X4.57
ROOM-9 4.57X4.57
ROOM-10 4.57X4.57
CLOTH WASHING AREA
SINK 1.0 M
DINING 4.57X8.08
OPEN
KITCHEN 4.57X5.43
STORE 4.57X4.57
OFFICE 6.37X4.57
WARDEN ROOM 4.57X4.57
WATER FILTER
MD
PORTICO 4.87X4.30
A
A
C/S OF HOSTEL BUILDING(Fig:3.3.2)
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 HOSTEL BUILDING(Fig:3.3.3)
GL

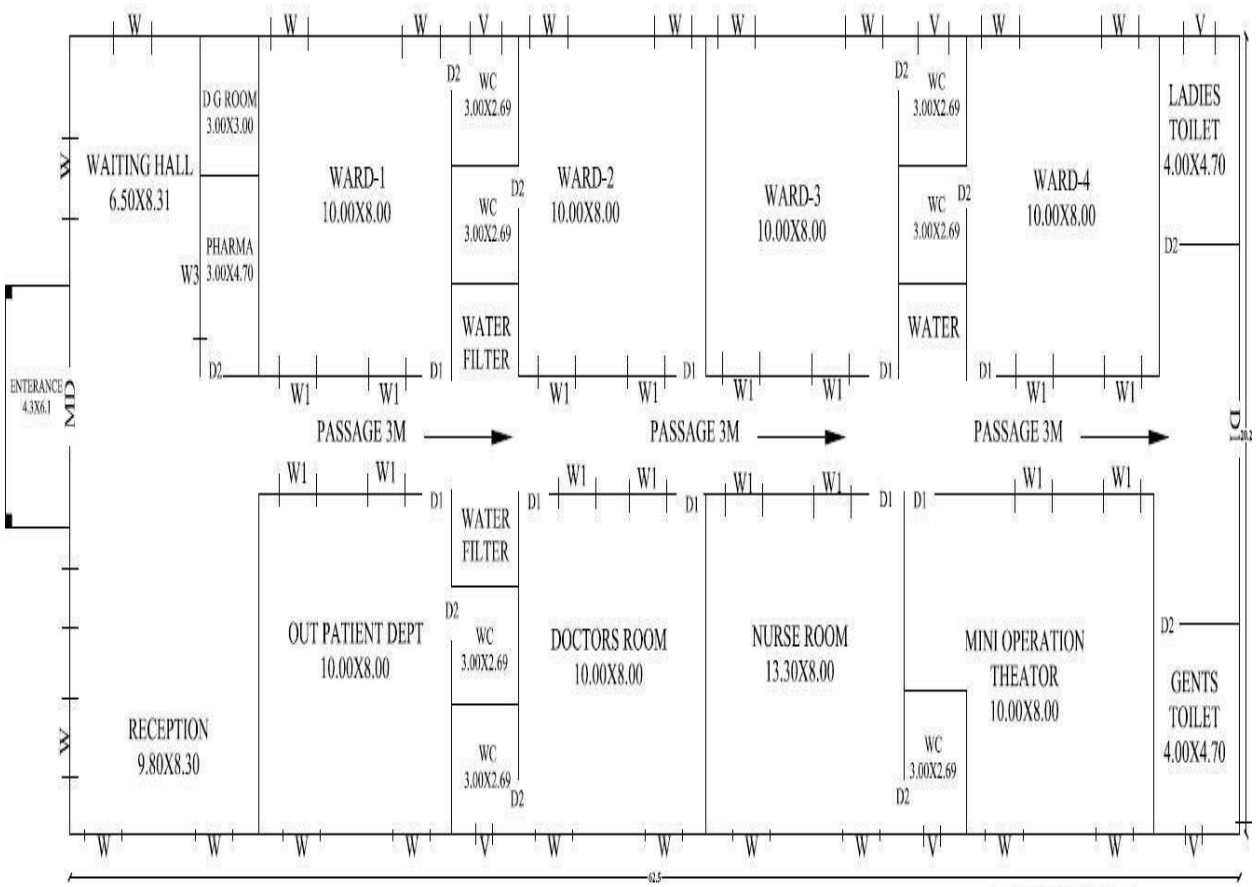

WATER SUPPLY AND SANITARY CONNECTION FOR HOSTEL BUILDING(Fig:3.3.4)
IC
IC
IC
IC
GULLY TRAP
YARD GULLY
INSPECTION CHAMBER
RAIN WATER PIPE
INSPECTION TRAP
OVER HEAD TANK
WATER FILTER
ROOM-3 4.57X4.57
ROOM-4 4.57X4.57
ROOM-5 4.57X4.57
WC WITH BATH 7.92X4.57
PASSAGE 1.5M
ROOM-1 4.57X4.57
ROOM-6 4.57X4.57
ROOM-7 4.57X4.57
ROOM-8 4.57X4.57
ROOM-9 4.57X4.57
ROOM-10 4.57X4.57
SINK 1.0 M
DINING 4.57X8.08
OPEN
OPEN TO SKY
KITCHEN 4.57X5.43
PASSAGE 1.5M
STORE 4.57X4.57
UNDER GROUND TANK
WARDEN ROOM 4.57X4.57
PORTICO 4.87X4.30
MD
IT
SEWER LINE
WATER SUPPLY LINE (GROUND LEVEL)
WATER SUPPLY LINE (ABOVE GROUND LEVEL)
ALONG MAIN SEWER LINE


ELECTRICAL LAYOUT FOR HOSTEL BUILDING(Fig:3.3.5)
OPEN TO SKY
OPEN
SINK 1.0 M
MD
INDEX
5 AMP SWITCH
5 AMP SWITCH WITH SOCKET
15 AMP SWITCH WITH SOCKET
BRACKET LIGHT
DROP LIGHT
SOCKET / CEALING LIGHT
TUBE LIGHT
FAN
EXHAUST FAN
TELEVISION POINT
TELEPHONE POINT
DISTRIBUTION BOARD
PUSH BUTTON FOR BELL
BULK HEAD

EXERCISE:7.4

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of Hospital building

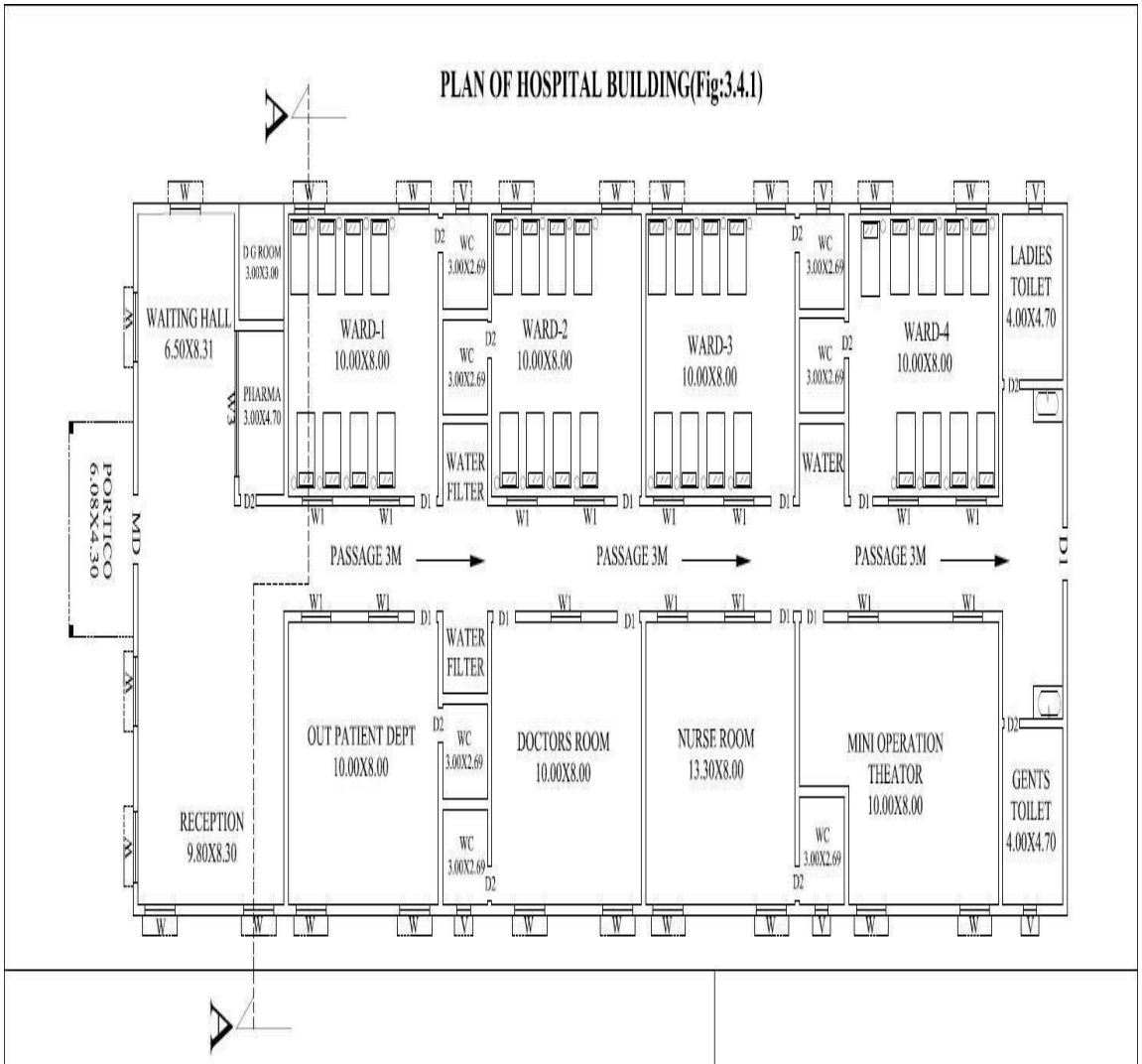
Q.no.3.4:-LINE DIAGRAM OF HOSPITAL BUILDING



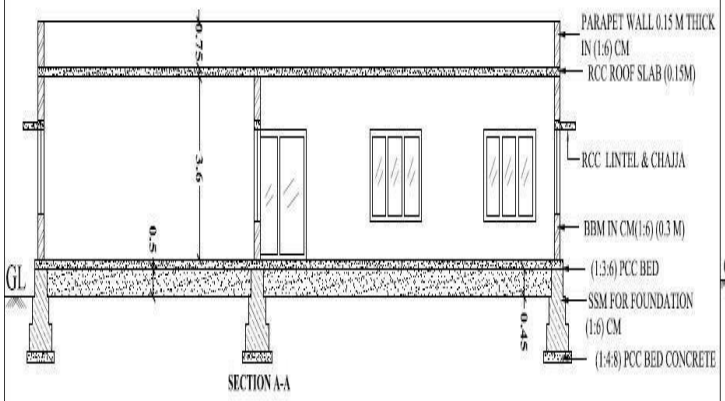
Floor height=3.6 m
Wall thickness=0.3m

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

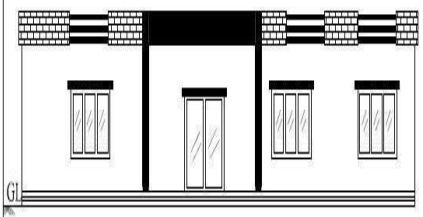
PLAN OF HOSPITAL BUILDING(Fig:3.4.1)



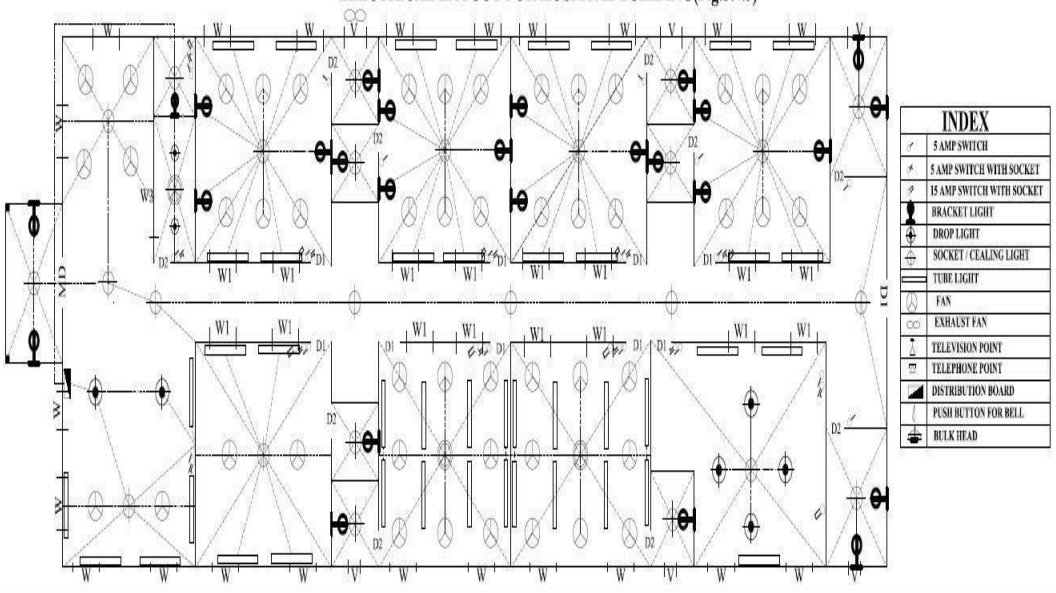
C/S OF HOSPITAL BUILDING (Fig:3.4.2)



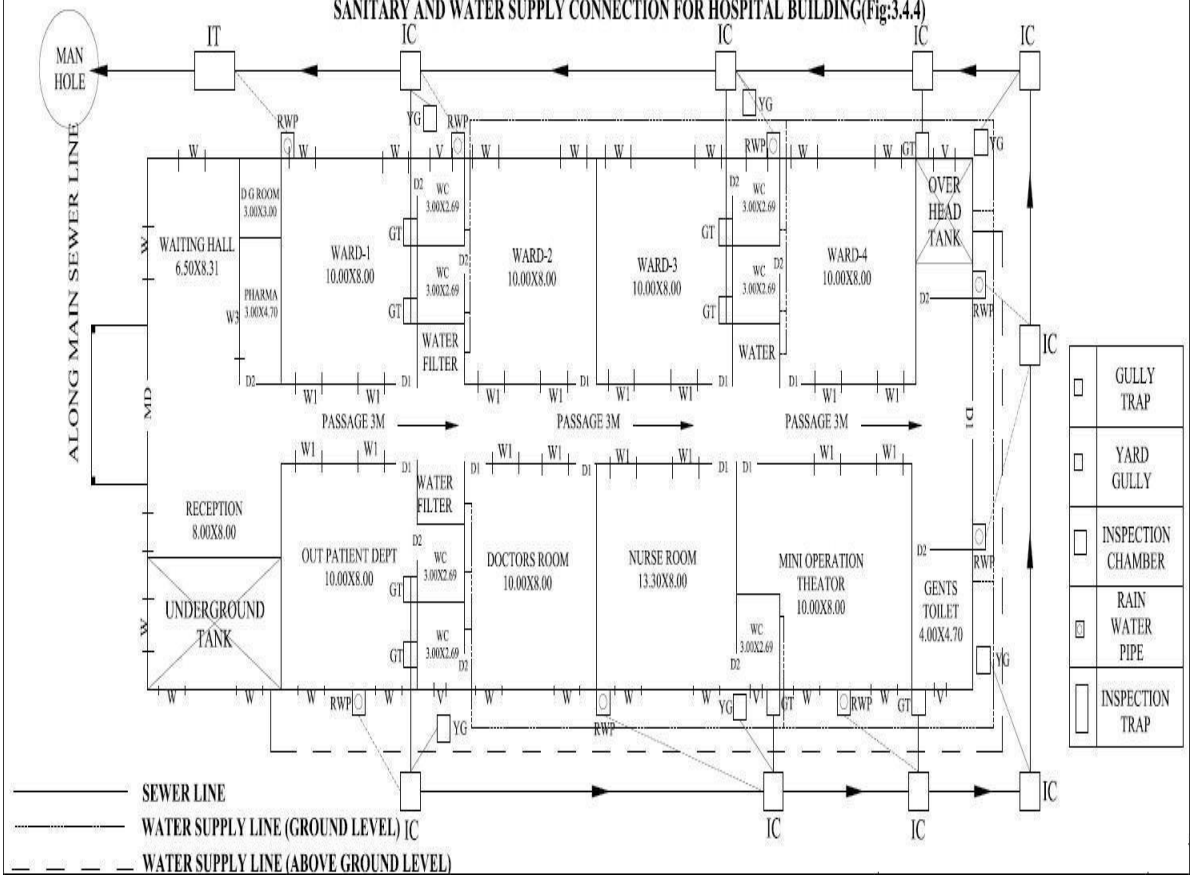
ELEVATION OF HOSPITAL BUILDING(Fig:3.4.3)



ELECTRICAL LAYOUT FOR HOSPITAL BUILDING(Fig:3.4.5)

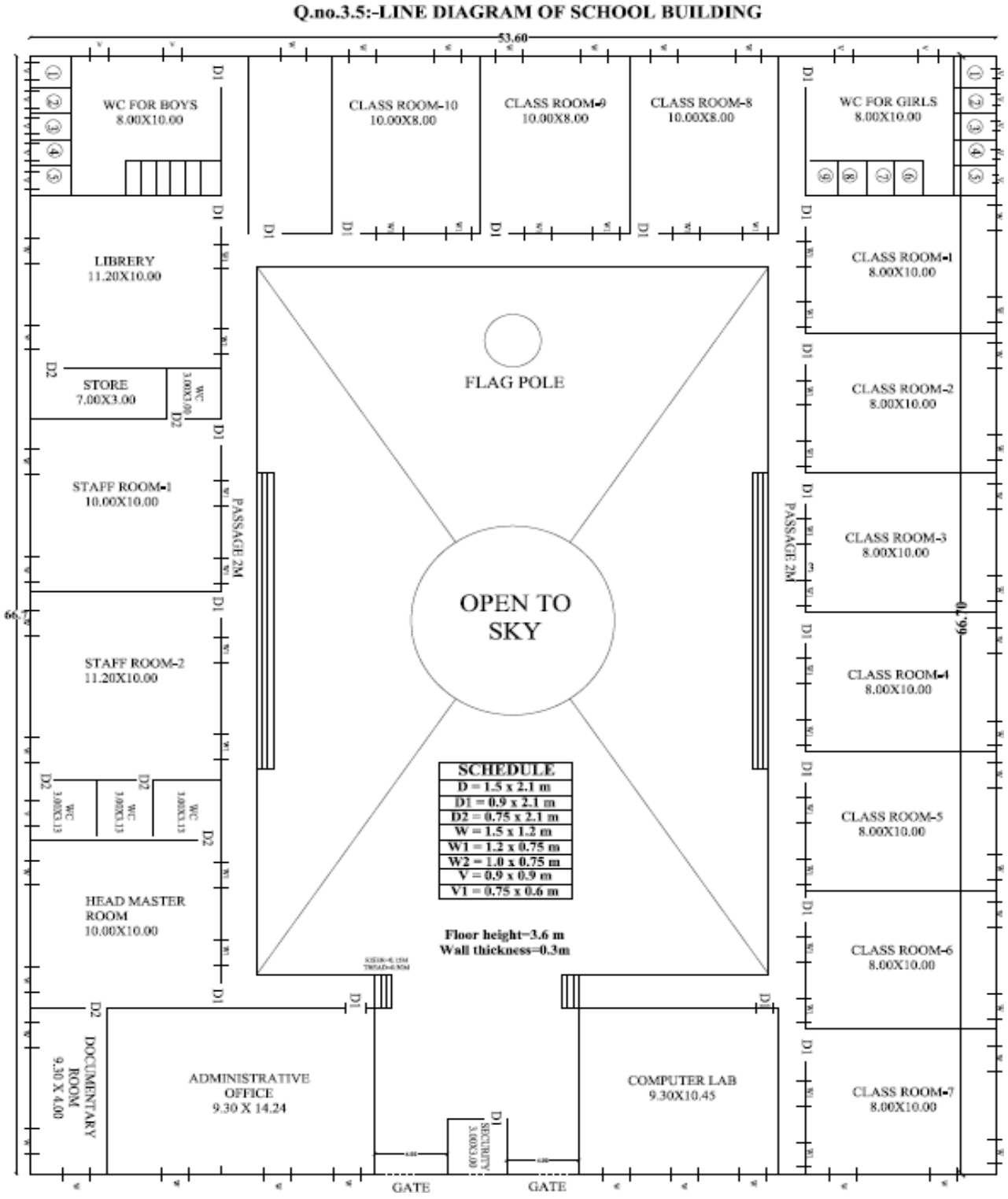


SANITARY AND WATER SUPPLY CONNECTION FOR HOSPITAL BUILDING(Fig:3.4.4)

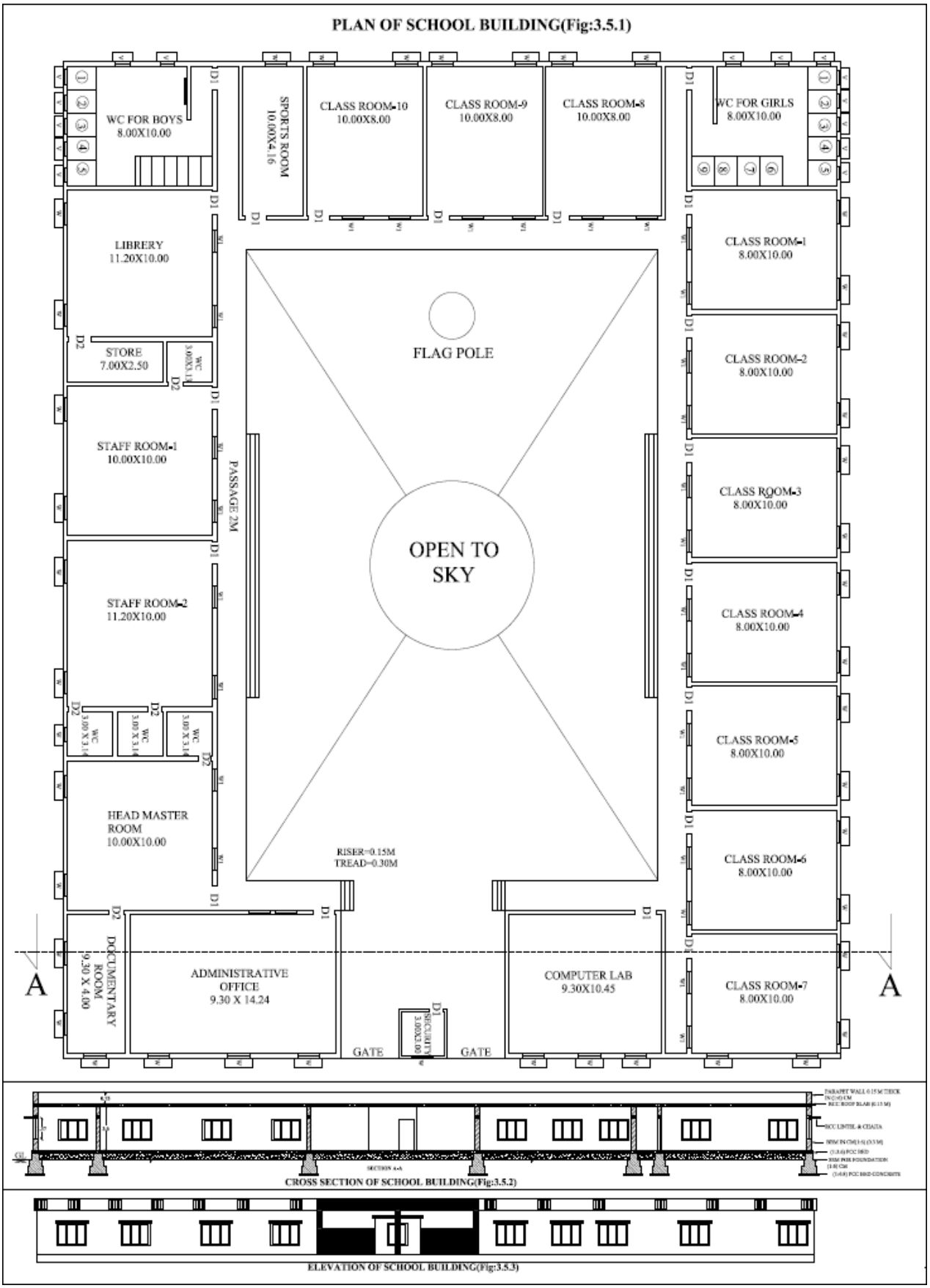


EXERCISE:7.5

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of school building

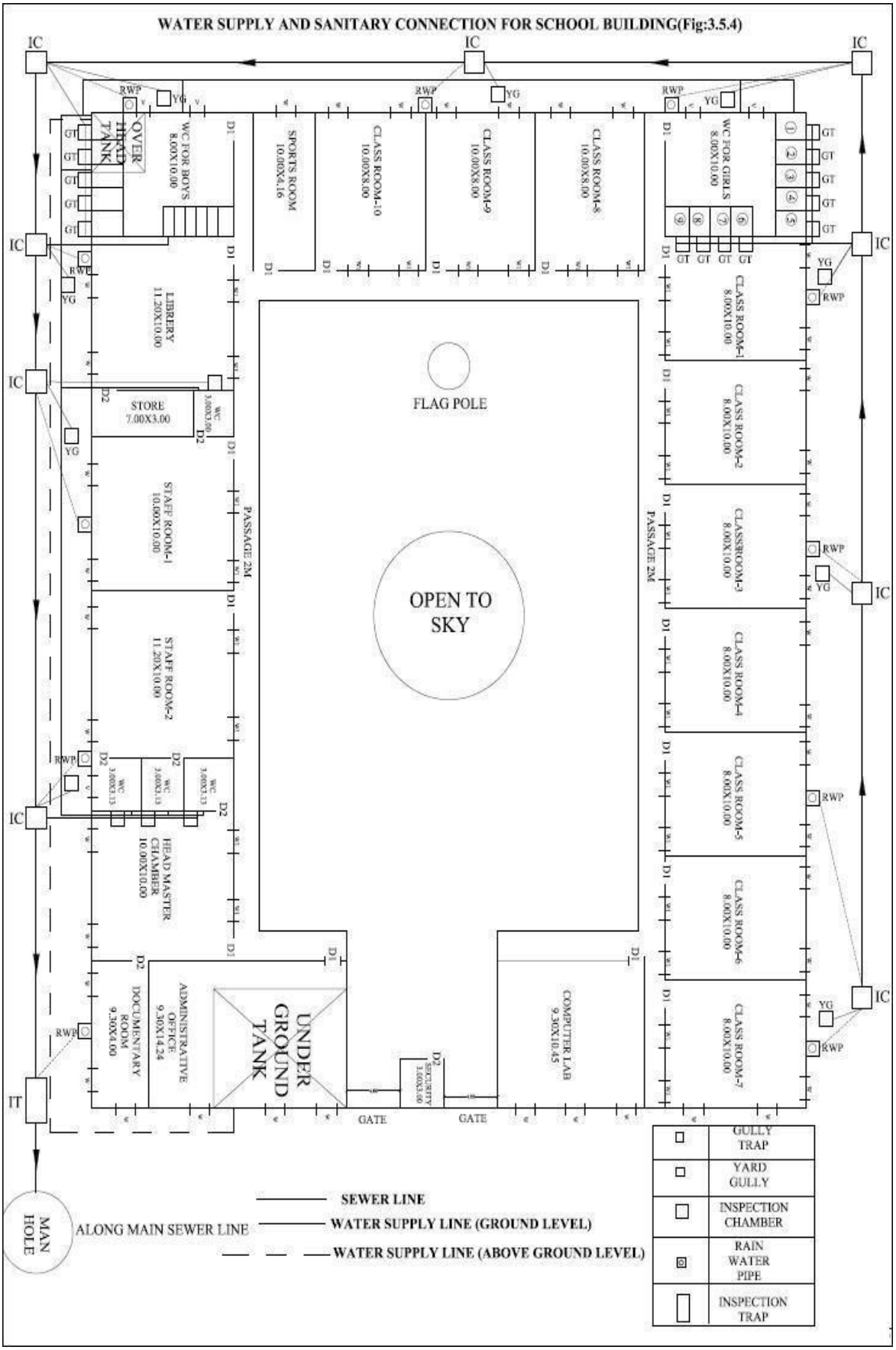


PLAN OF SCHOOL BUILDING(Fig:3.5.1)

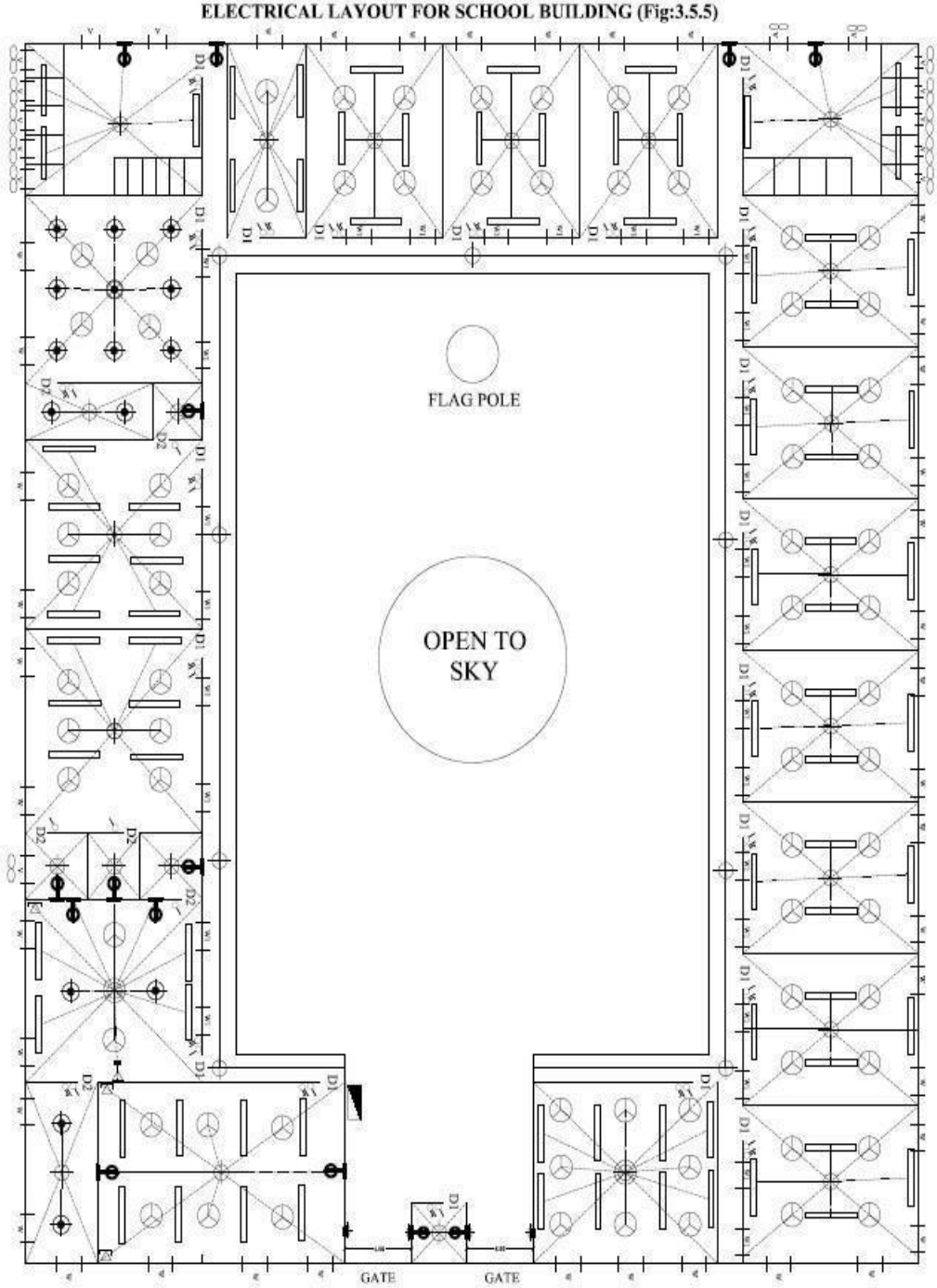


CROSS SECTION OF SCHOOL BUILDING(Fig:3.5.2)

ELEVATION OF SCHOOL BUILDING(Fig:3.5.3)


WATER SUPPLY AND SANITARY CONNECTION FOR SCHOOL BUILDING(Fig:3.5.4)
OVER HEAD TANK
WC FOR BOYS 8.00X10.00
SPORTS ROOM 10.00X4.16
CLASS ROOM-10 10.00X8.00
CLASS ROOM-9 10.00X8.00
CLASS ROOM-8 10.00X8.00
WC FOR GIRLS 8.00X10.00
LIBRERY 11.20X10.00
STORE 7.00X3.00
STAFF ROOM-1 10.00X10.00
STAFF ROOM-2 11.20X10.00
HEAD MASTER CHAMBER 10.00X10.00
ADMINISTRATIVE OFFICE 9.30X14.24
DOCUMENTARY ROOM 9.30X4.00
UNDER GROUND TANK
SECURITY 1.60X3.00
COMPUTER LAB 9.30X10.45
CLASS ROOM-7 8.00X10.00
CLASS ROOM-6 8.00X10.00
CLASS ROOM-5 8.00X10.00
CLASS ROOM-4 8.00X10.00
CLASSROOM-3 8.00X10.00
CLASS ROOM-2 8.00X10.00
CLASS ROOM-1 8.00X10.00
FLAG POLE
OPEN TO SKY
PASSAGE 2M
PASSAGE 2M
GATE
GATE
IC
RWP
YG
GT
D1
D2
WC
MAN HOLE
ALONG MAIN SEWER LINE
SEWER LINE
WATER SUPPLY LINE (GROUND LEVEL)
WATER SUPPLY LINE (ABOVE GROUND LEVEL)
GULLY TRAP
YARD GULLY
INSPECTION CHAMBER
RAIN WATER PIPE
INSPECTION TRAP

ELECTRICAL LAYOUT FOR SCHOOL BUILDING (Fig:3.5.5)



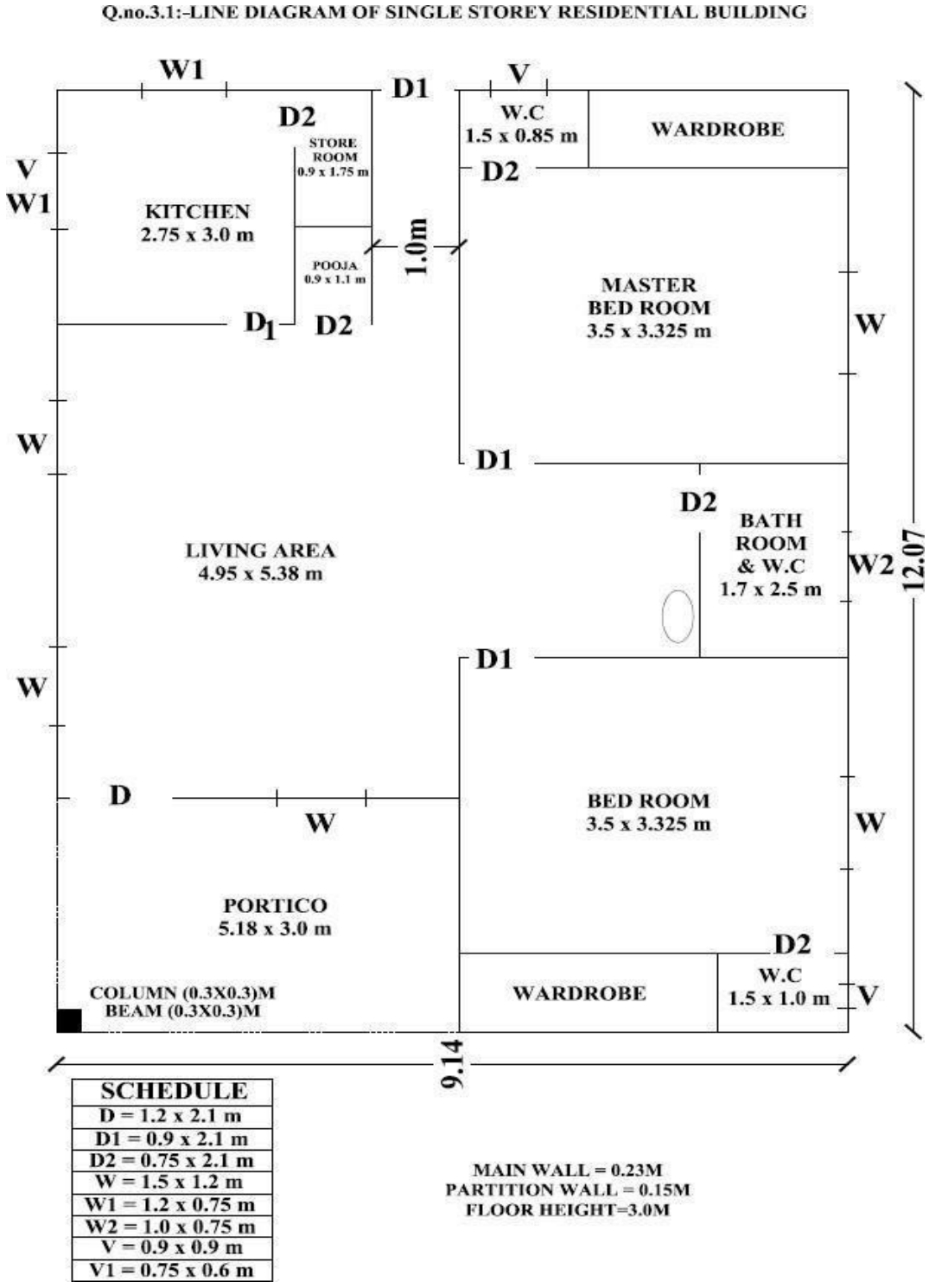
INDEX

	5 AMP SWITCH		TUBE LIGHT
	5 AMP SWITCH WITH SOCKET		FAN
	15 AMP SWITCH WITH SOCKET		EXHAUST FAN
	BRACKET LIGHT		TELEVISION POINT
	DROP LIGHT		TELEPHONE POINT
	SOCKET / CEALING LIGHT		DISTRIBUTION BOARD
	BULK HEAD		PUSH BUTTON FOR BELL

EXPERIMENT NO: 8

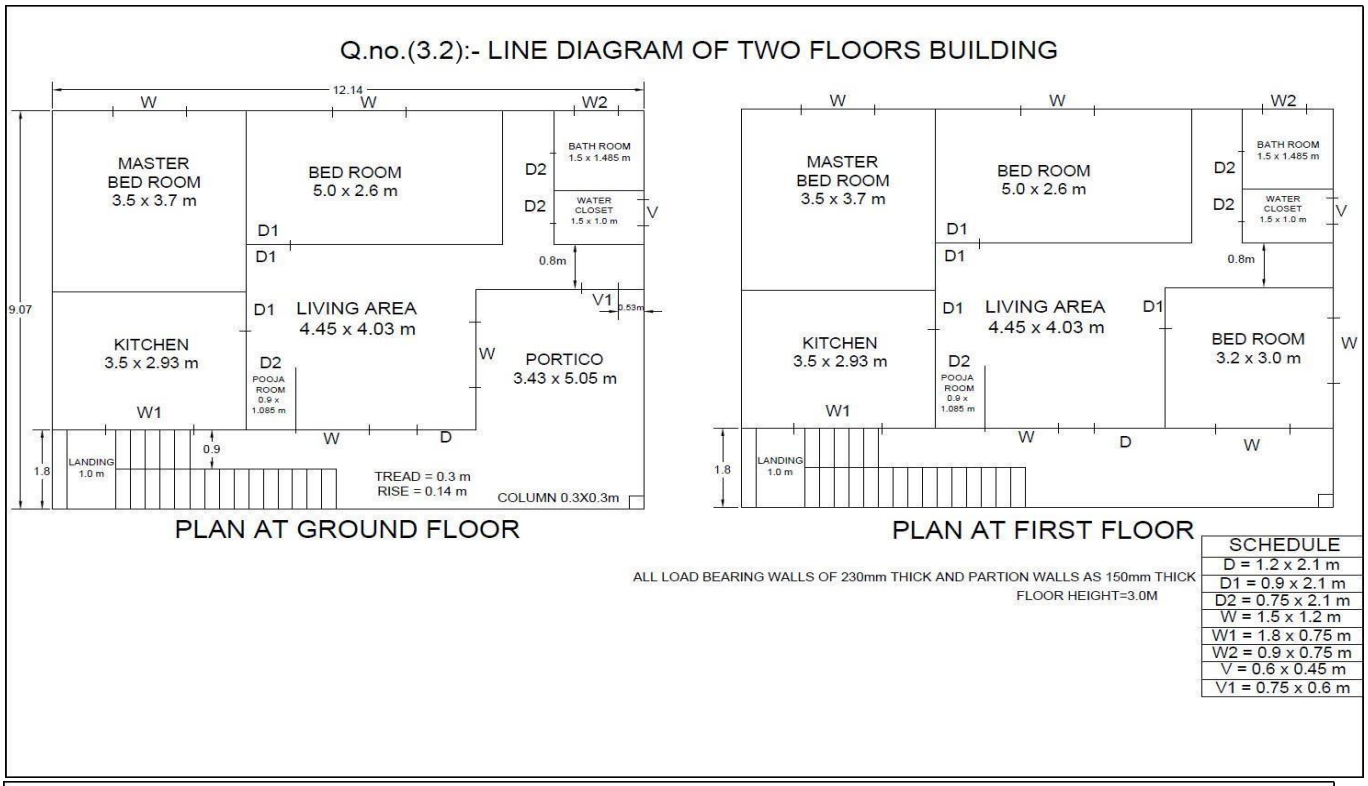
Exercise: 8.1

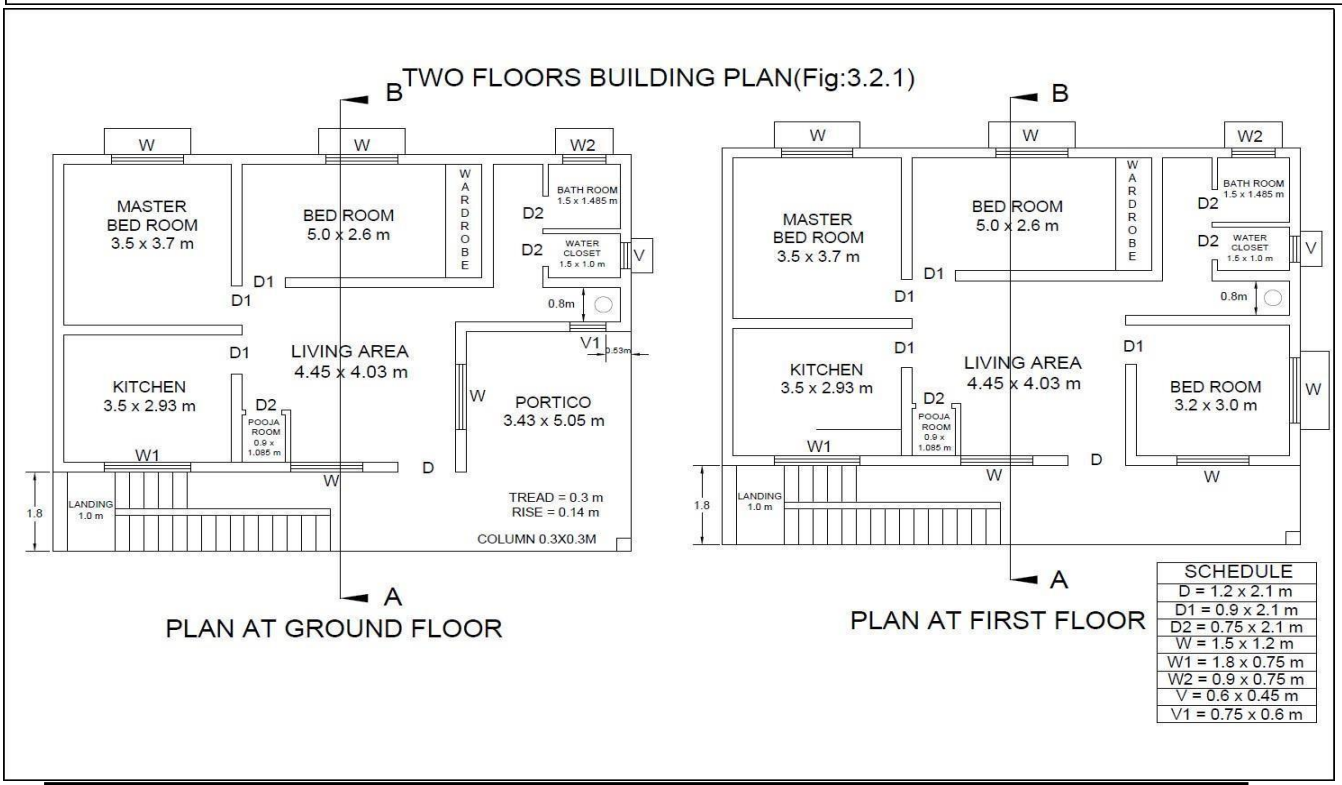
To draw the line diagram for Single storey building



Exercise: 8.2

To draw the line diagram for Two Storey building





EXPERIMENT NO: 9

Sanction drawing:

A working plan having the following additional drawings/ details is referred as Sanction Plan

1. Location map
2. Key plan
3. Details having ward no., corporation division, details of In-charge Engineer, owner's name and present address.
4. Details of Sanctioning Authority along with the space for seal and signature of approval.
5. Details of plot area, built up area, plinth area and FAR (approved and proposed).

Mandatory instructions:

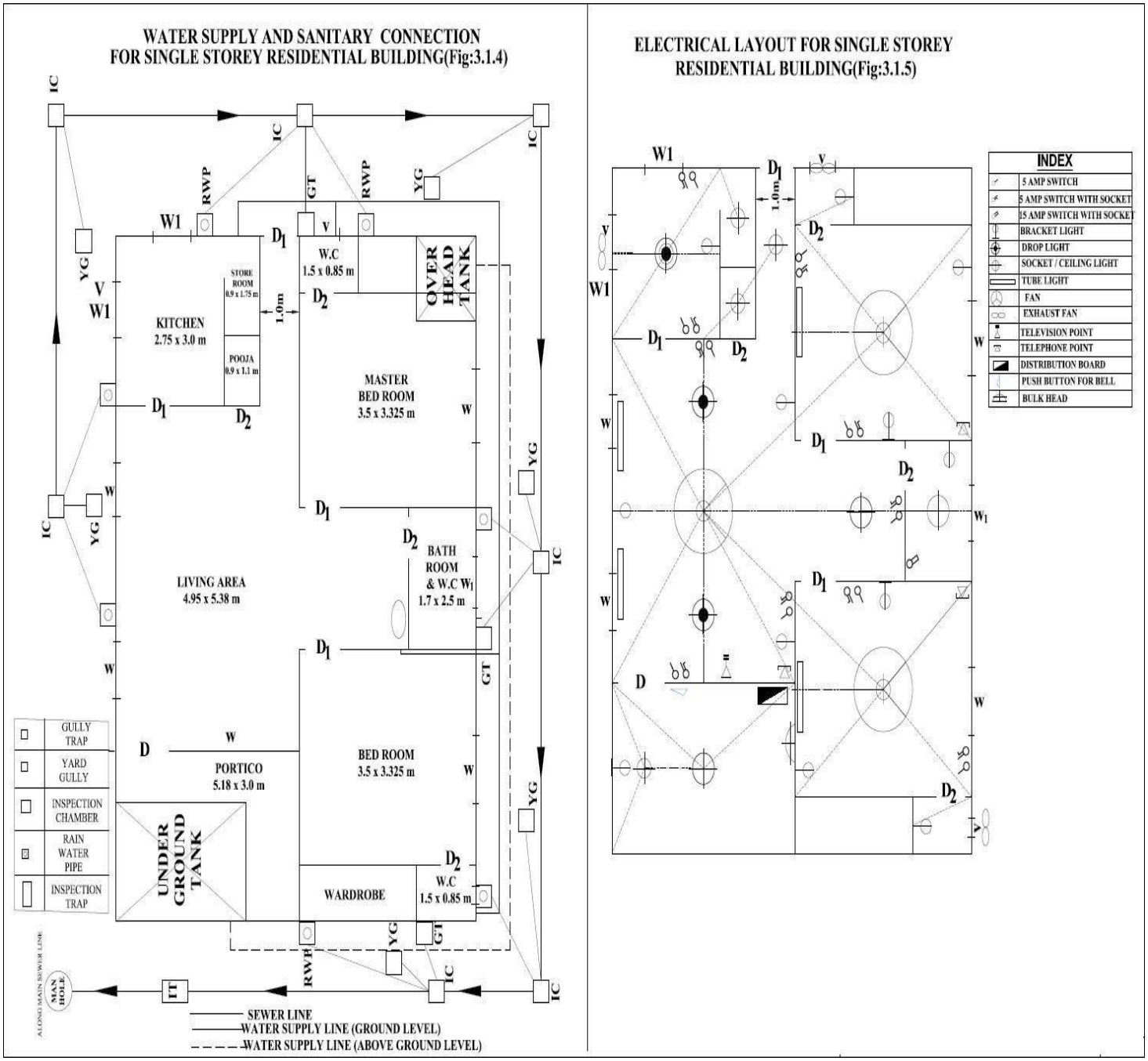
1. Basement/ Stilt floor/ GF and part of ground floor where car parking is shown is reserved for parking purpose only and shall not be converted to any other purpose.
2. Necessary ducts for telephone cables, cubicles at ground level for postal services and space for dumping garbage within the premises shall be provided.
3. Licence and approved plans shall be display in a conspicuous place of the licensed premises.
4. The applicant shall ensure that the Rainwater Harvesting Structures are provided and maintained in good condition for storage of water for non-potable purposes or recharge of ground water at all times having a minimum total capacity mentioned in the bye-laws 32(a).

Employment of child labour in the construction activities is strictly prohibited

EXPERIMENT NO: 10

Exercise: 10

PLAN WITH PLUMBING, ELECTRICAL & SANITARY SERVICES



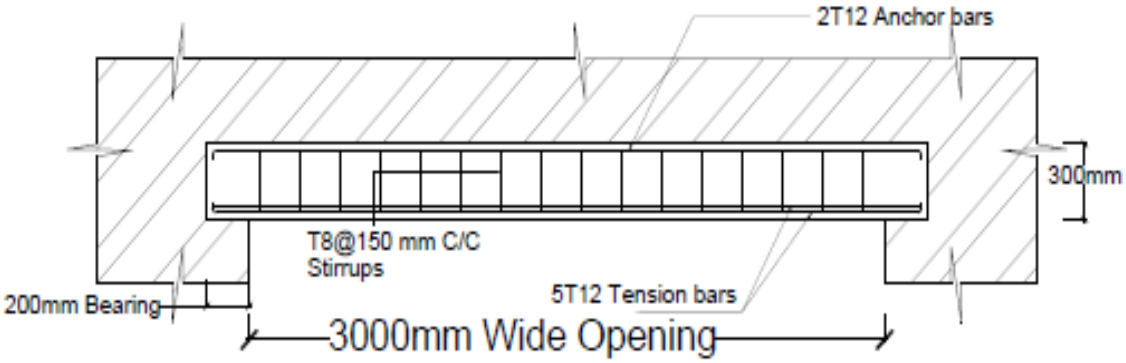
EXPERIMENT NO: 11

Exercise: 11.1

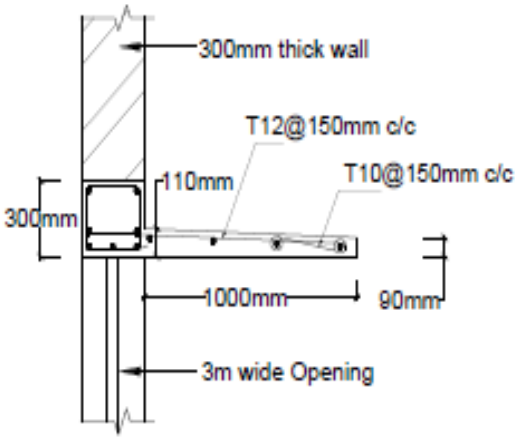
Drawing standard sections for Lintel and chajja.

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



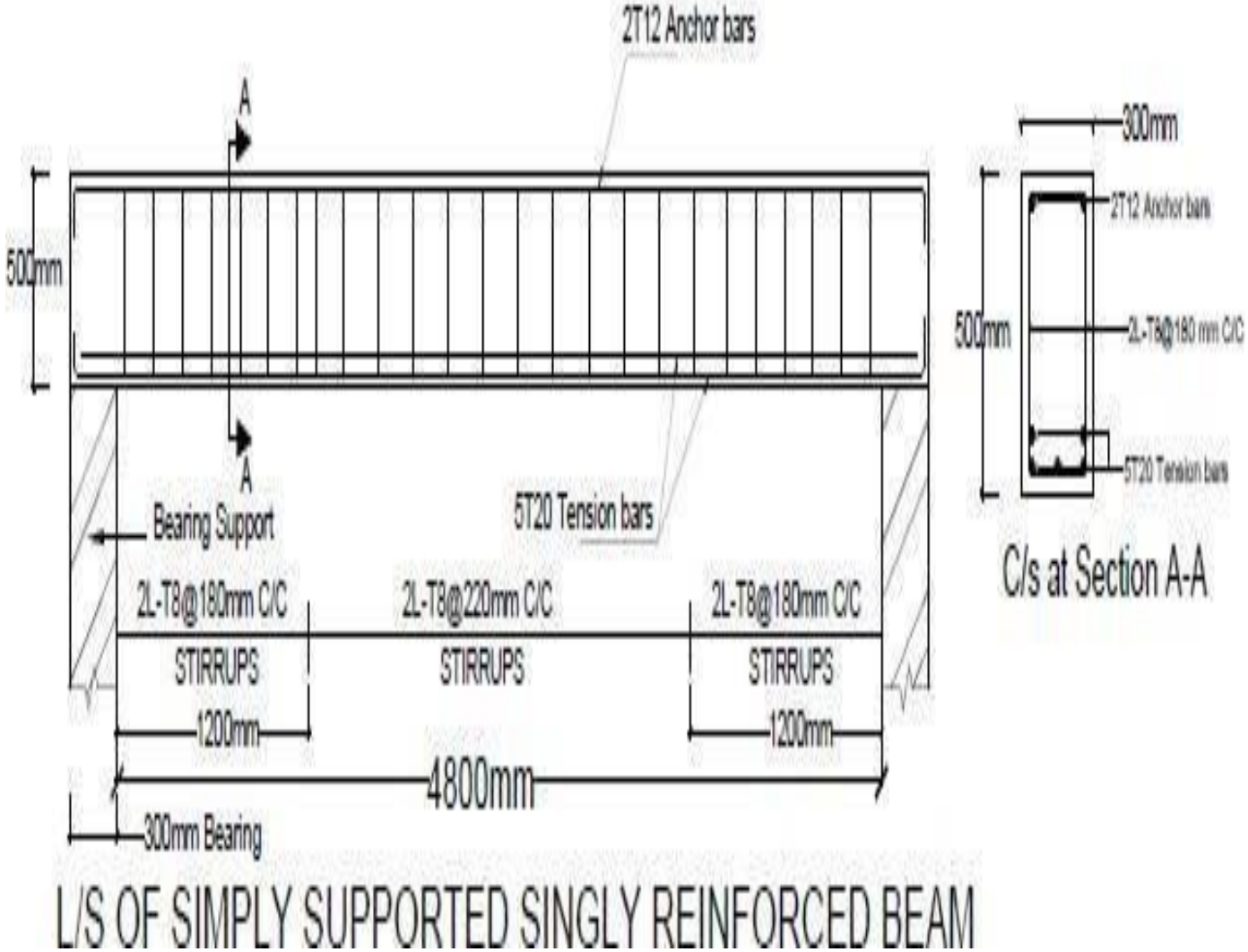
C/S OF LINTEL AND CHEJJA

Exercise: 11.2

Drawing standard sections for RCC BEAMS

Draw the longitudinal section and cross section of a rectangular RCC beam simply supported **Singly Reinforced Beam** with the following data:
Clear span = 4.8m, Bearing at the supports = 300mm, Width of beam = 300mm,
Overall depth of beam = 500mm.
Main reinforcement consists of #5 - 20ϕ bars in two layers, Provide #2 - 12ϕ as anchor bars. Stirrups: 2L 8ϕ @ 180 c/c near the supports up to 1.20m and @ 220 c/c in the remaining portion.

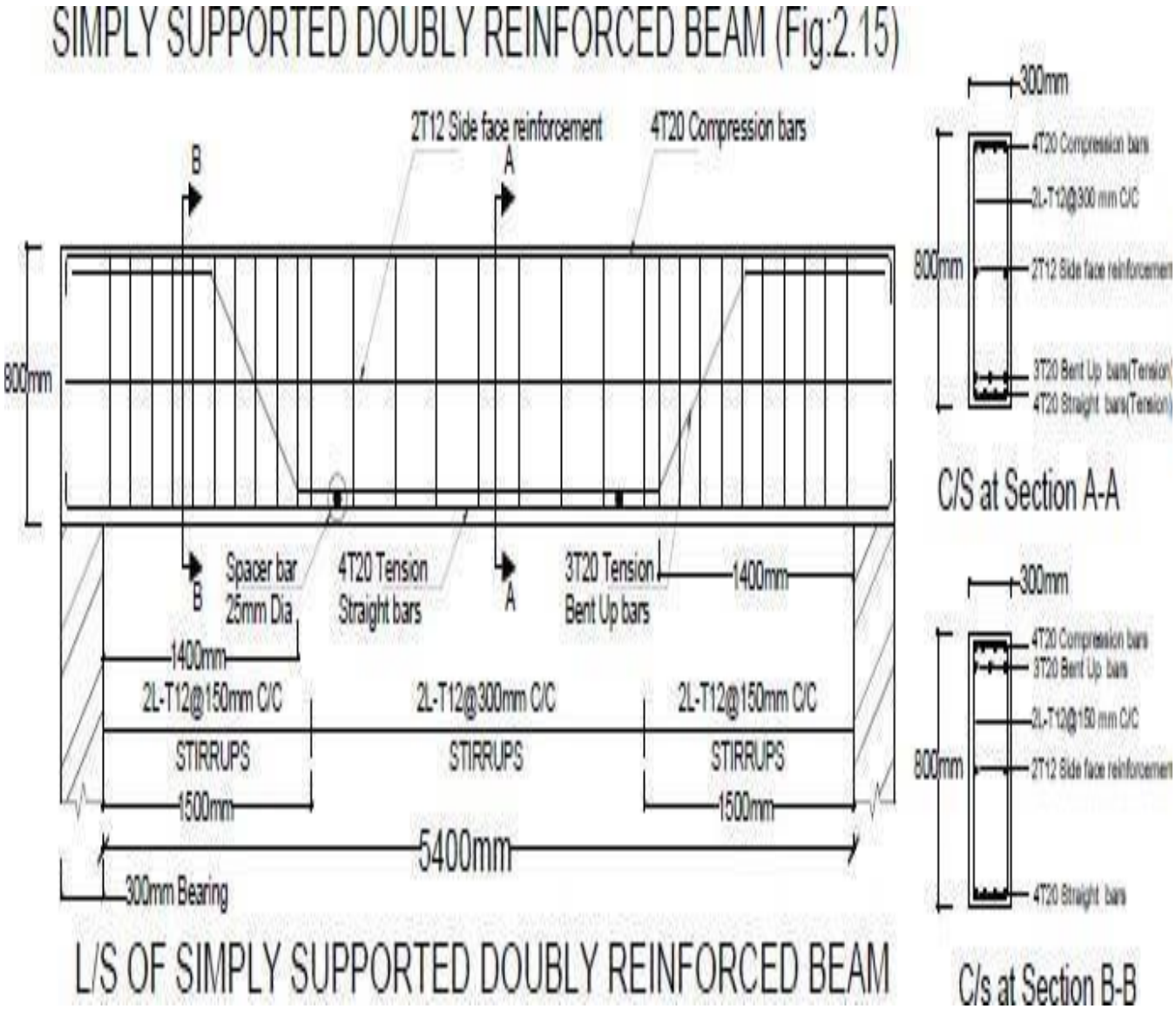
SIMPLY SUPPORTED SINGLY REINFORCED BEAM (Fig:2.14)



L/S OF SIMPLY SUPPORTED SINGLY REINFORCED BEAM

Exercise: 11.3

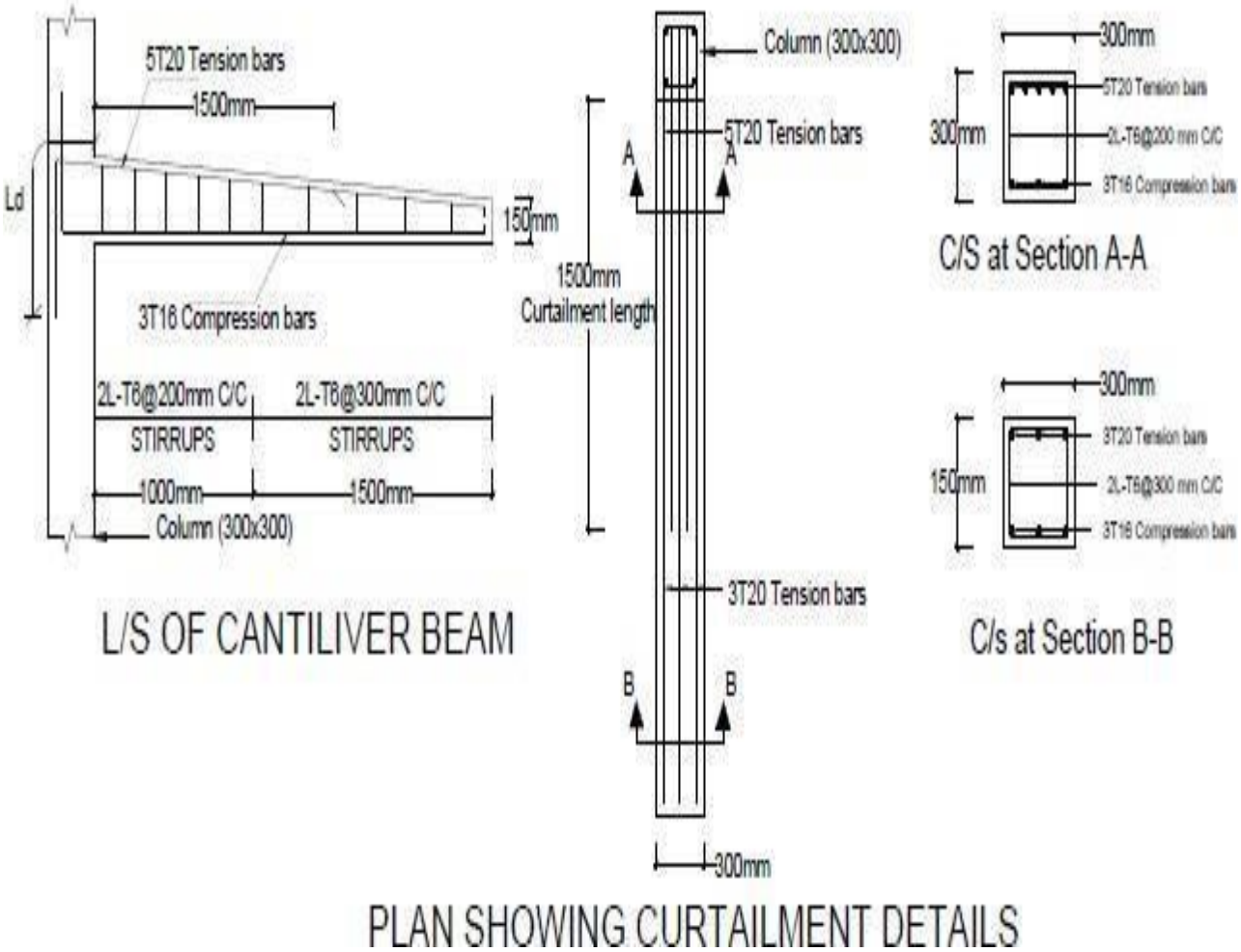
Draw a detailed longitudinal section, a cross section near the supports and a section at the middle of the span of a **Simply Supported Doubly Reinforced beam** for the following data: Clear span = 5.4m, Bearing over the supports = 300mm,
Size = 300 x 800 mm
Main reinforcement tensile: #7 - 25ϕ. 4 straight and 3 bent up @ 1400mm from support.
Compression reinforcement: #4 – 25ϕ.
Spacer bars=25 ϕ, Side face reinforcement=#2-12ϕ
Shear reinforcement: 2L - 12ϕ @ 150 c/c for a distance of 1.5m from the support and 2L - 12ϕ @ 300 c/c for remaining middle portion.



Exercise: 11.4

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 x150 mm
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.

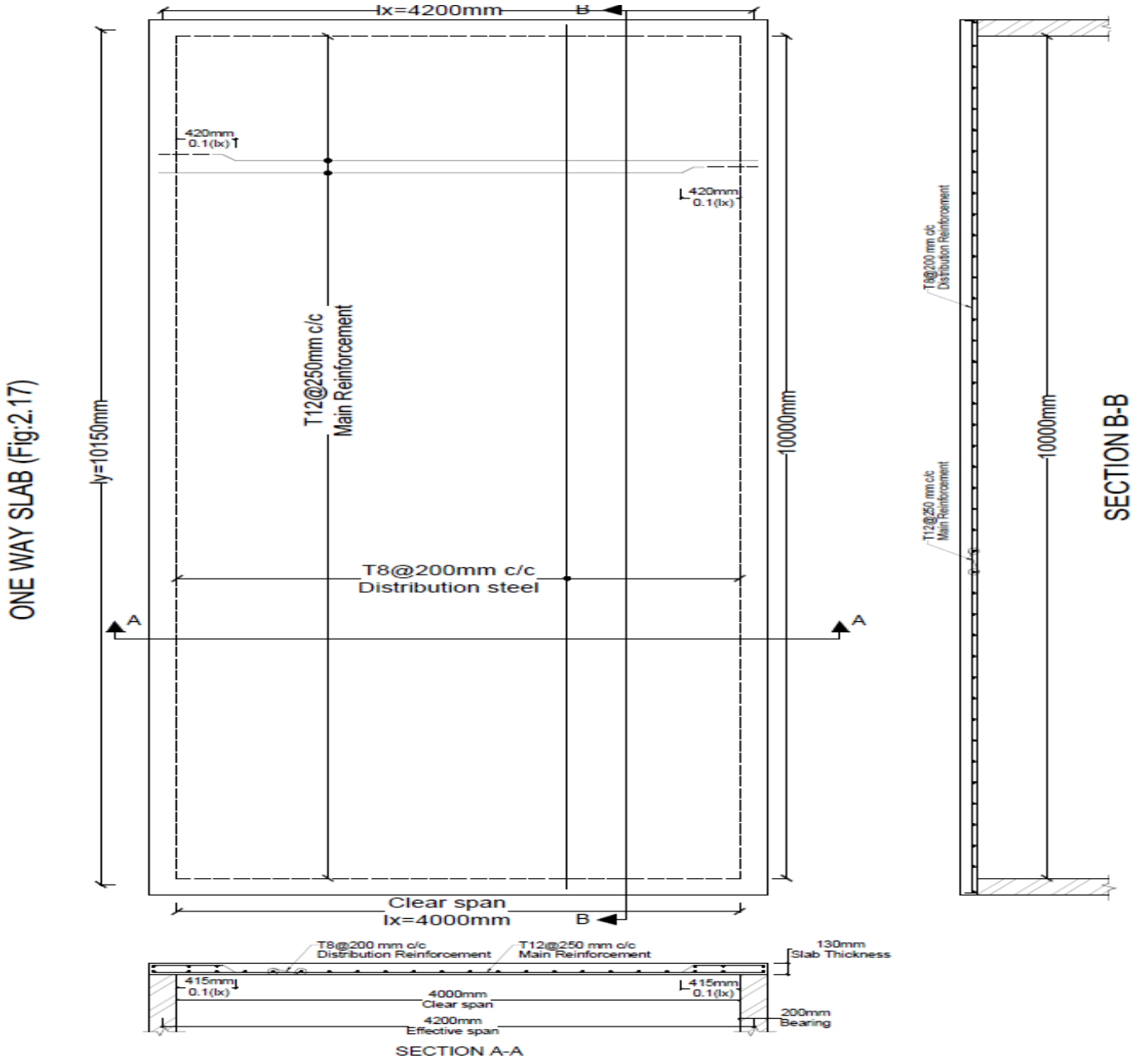
CANTILEVER BEAM (Fig:2.16)



Exercise: 11.5

Drawing standard sections for Slabs

Draw cross section and plan of **one-way roof slab** showing the details of reinforcement for the following 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.



Exercise: 11.6

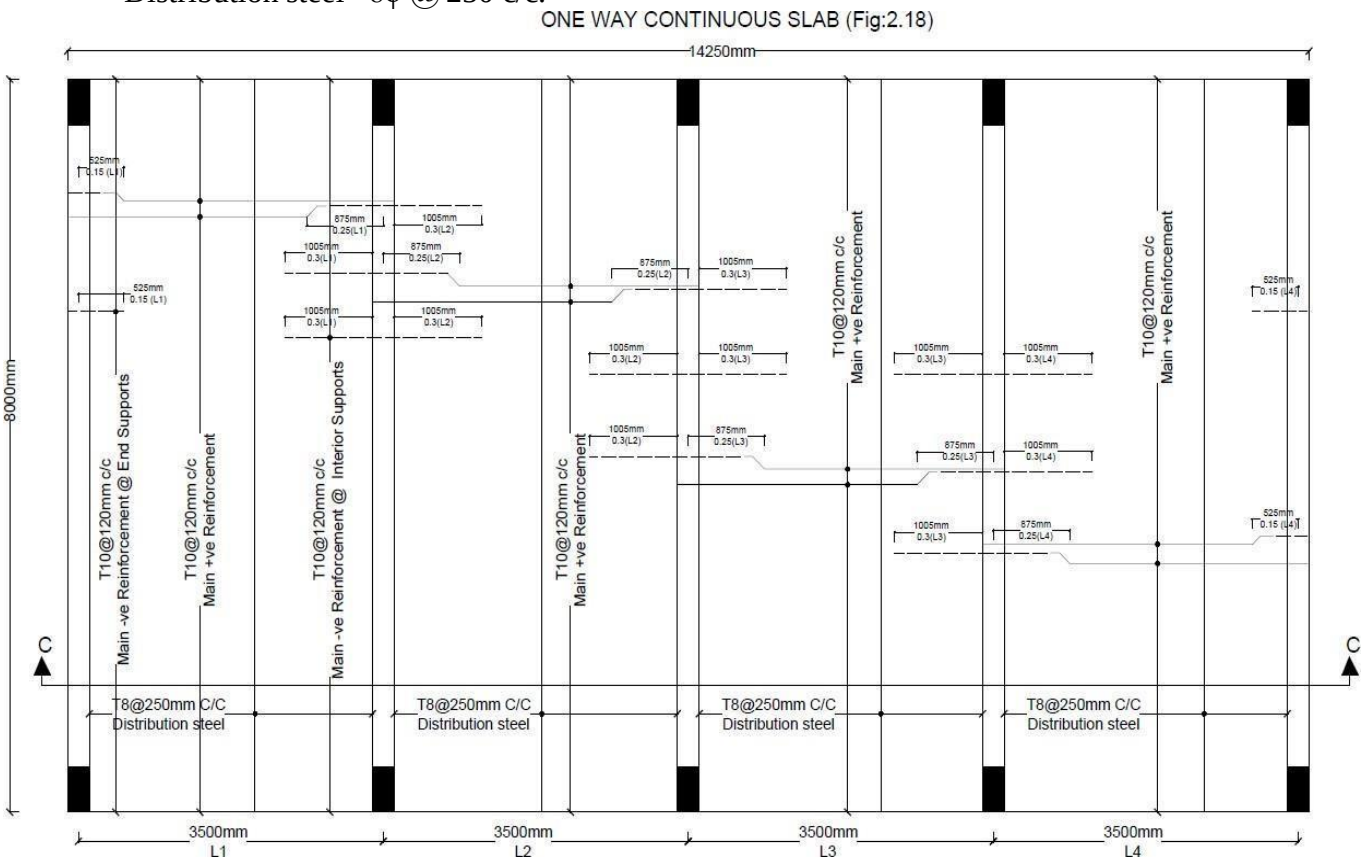
One-way continuous slab has been provided for a hall of clear dimensions 8mx14.25 m. the slab is supported on RCC beams. The following details are given.

C/C distance of supporting beams=3.5m, Column dimensions on which beam rest=250mmx500mm, C/s of beams=250mmx600mm, Slab thickness=150mm, Beam depth is inclusive of slab depth.

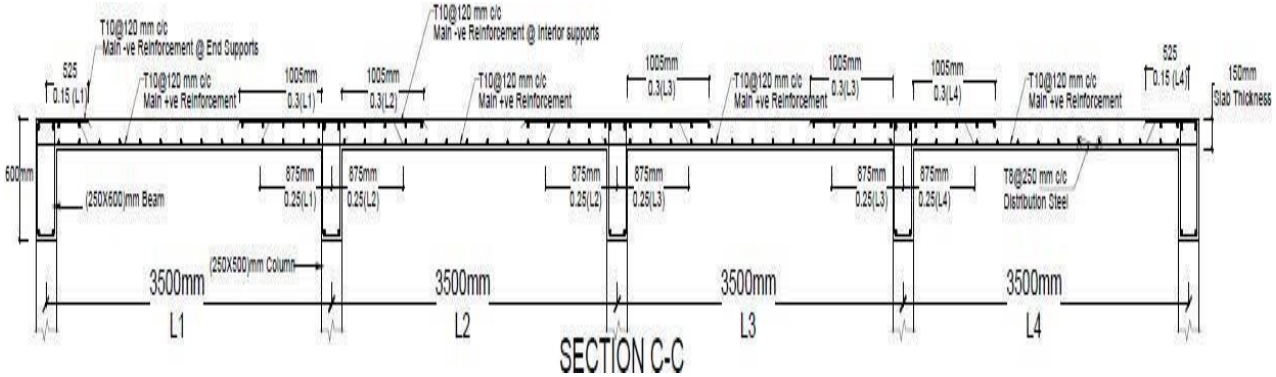
Main positive reinforcement at the end and interior panels=10ϕ @120 c/c

Main negative reinforcement at all supports= 10ϕ @120 c/c.

Distribution steel =8ϕ @ 250 c/c.



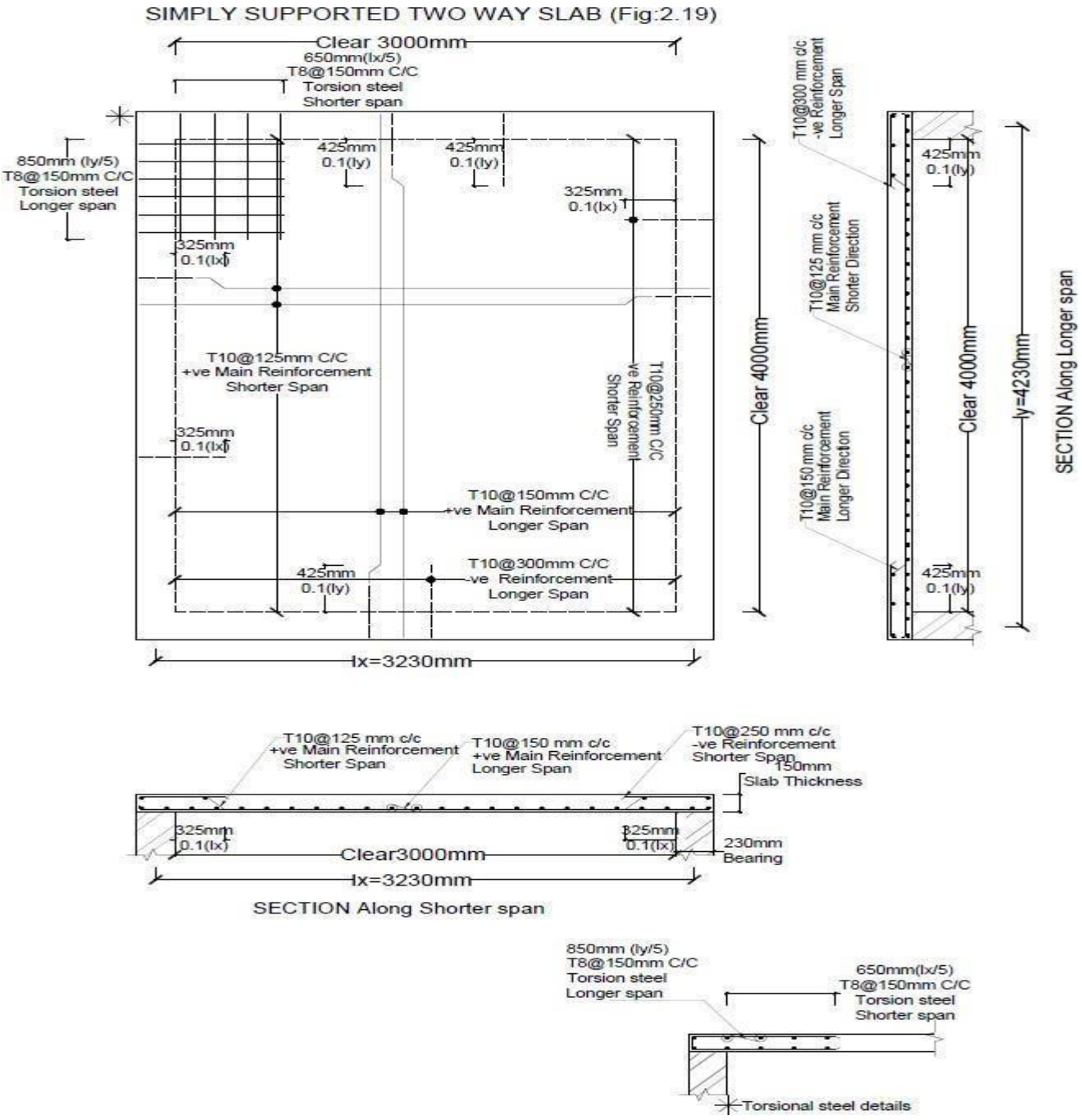
Draw cross section and plan showing the details of reinforcement (Bottom & top).



Exercise: 11.7

A **simply supported two way slab** is supported on all sides by using 230mm thick wall. The dimension of two-way slab is 3m x 4m (Clear). Following are the reinforcement details: Along shorter span: 10ϕ @125 c/c, Along longer span: 10ϕ @150 c/c, Negative steel for shorter span: 10ϕ @250 c/c, Negative steel for longer span: 10ϕ @300 c/c, Alternative bars are cranked, Corner mats are 8ϕ @150 c/c along shorter span and 8ϕ @200 c/c along long span, Thickness of slab is 150mm.

Draw plan showing reinforcement and cross section along longer & shorter span.



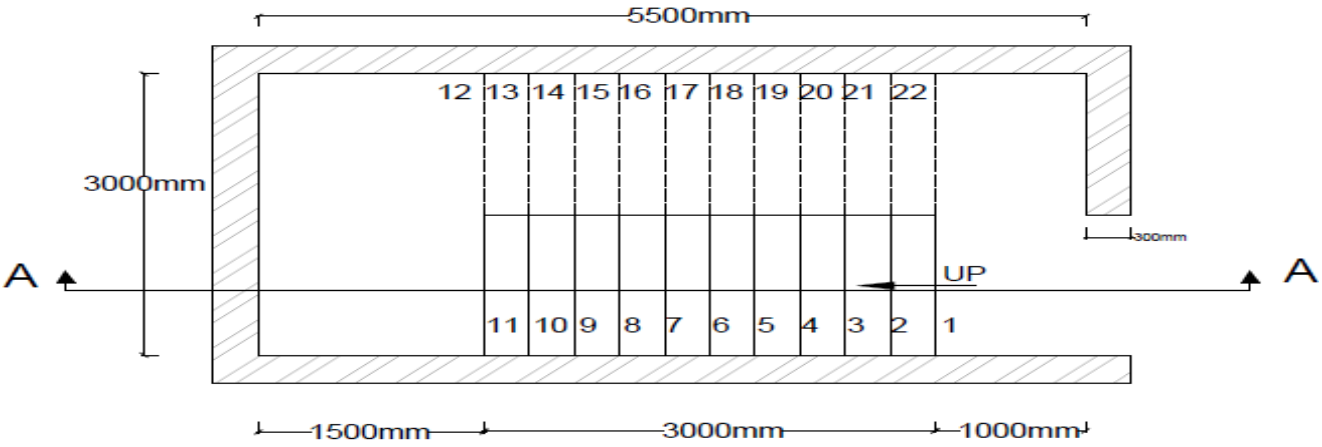
EXPERIMENT NO: 12

Exercise: 12.1

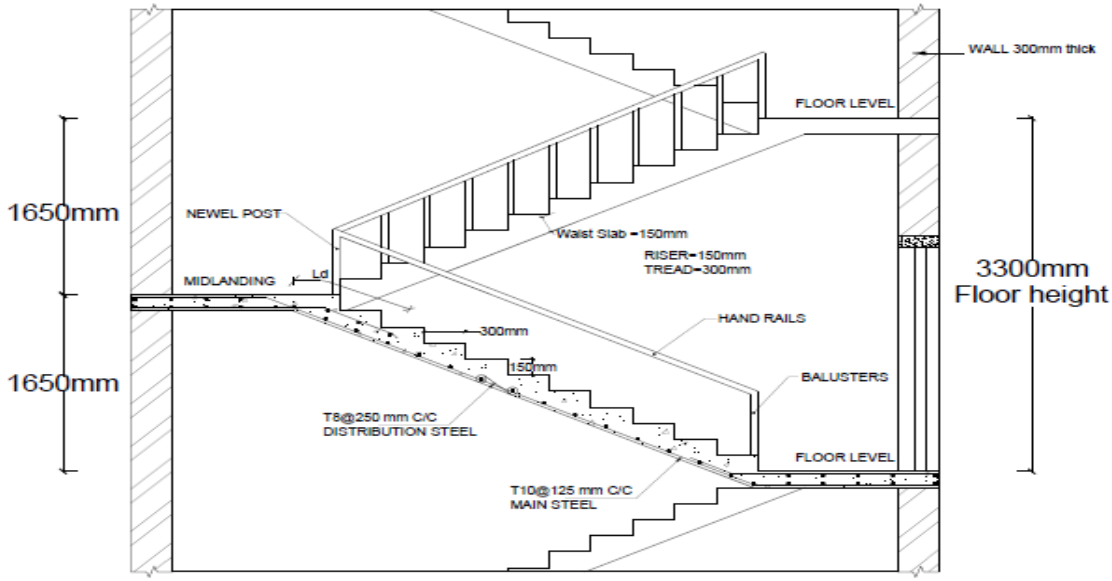
Drawing different types of staircases – Dog legged, Open well – plan and section

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 floor 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

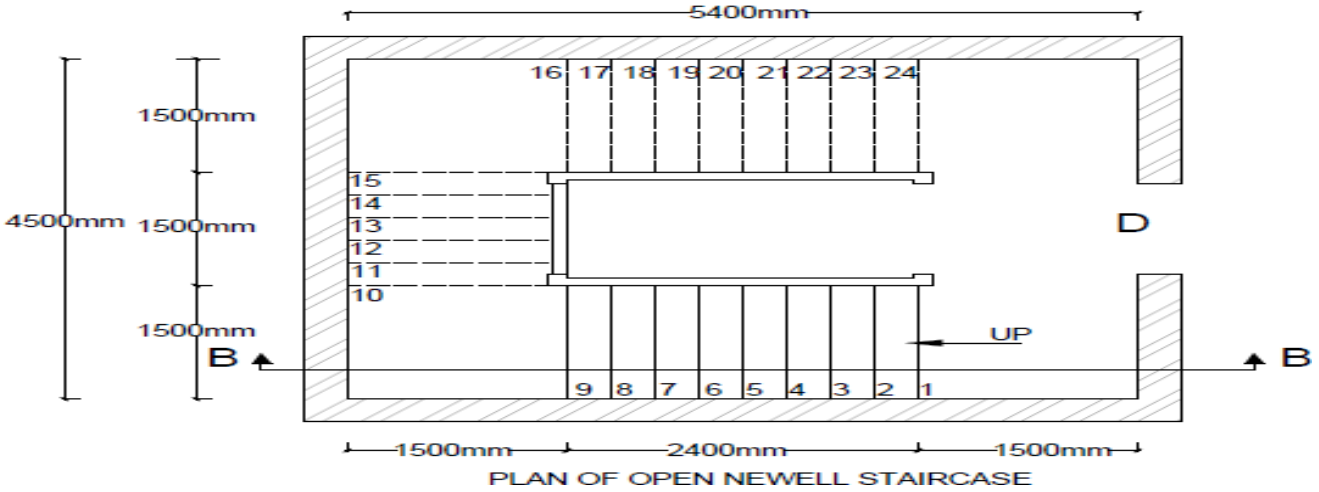


SECTION A-A
SECTIONAL ELEVATION OF DOGLEGGED STAIRCASE

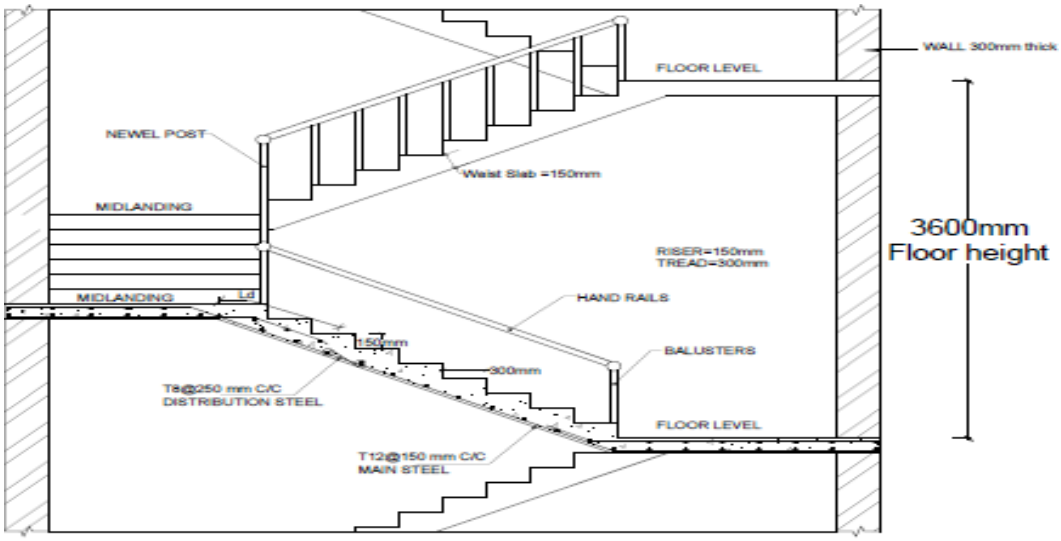
Exercise: 12.2

Draw plan and sectional elevation of an **open newel staircase** with a rectangular well for an office building 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