**Channabasaveshwara Institute of Technology**
(Affiliated to VTU, Belgaum & Approved by AICTE, New Delhi)
(NAAC Accredited & ISO 9001:2015 Certified Institution)
NH 206 (B.H. Road), Gubbi, Tumkur – 572 216. Karnataka.

## Department of Civil Engineering

# Computer Aided Building Planning and Drawing

## BCV305

B.E - III Semester

Laboratory Manual 2024-25

**Name:** _____

**USN:** _____

**Batch:** _____ **Section:** _____

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# Computer Aided Building Planning and Drawing

## BCV305

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**SYLLABUS**
**COMPUTER AIDED BUILDING PLANNING AND DRAWING**

| | | | |
|---|---|---|---|
| **Course Code** | **BCV305** | **CIE Marks** | **50** |
| **Teaching Hours/Week(L:T:P)** | **(0:0:2)** | **SEE Marks** | **50** |
| **Credits** | **01** | **Exam Hours** | **03** |

| 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<br>• Footing/ Foundation – Foundation dimension for Isolated, combined footing, Standard dimension and cross section of footing<br>• Size stone Masonry – Size of single and double bond stone, Sections at wall foundation<br>• 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 |

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## Department of Civil Engineering

### COMPUTER AIDED BUILDING PLANNING AND DRAWING (BCV305)

## Course Objective:

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

## Course outcomes (Course Skill Set):

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

a) Prepare, read and interpret the drawings in a professional set up.
b) Know the procedures of submission of drawings and Develop working and submission drawings for building.
c) 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

# Index

# 1 DRAWING BASICS

## 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, graphic symbols and abbreviations. Following paragraphs deal with the same.

An engineering drawing traditionally is prepared using drawing instruments. But the accuracy of these drawing is dependent on the individual skill of the person drawing them. The modifications and repetition work of these drawings 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.

## 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 (mm) |
|---|---|---|
| 1 | A0 | 841 x 1189 |
| 2 | A1 | 584 x 841 |
| 3 | A2 | 420 x 594 |
| 4 | A3 | 297 x 420 |
| 5 | A4 | 210 x 297 |

## Layout and Title block

Border lines should be drawn all-round the drawing sheet leaving a margin of 25mm or 30mm on left hand side and 10mm on all other sides. Title block 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 organization
(iii) Drawing number with revision number
(iv) Scale
(v) Date of the drawing
(vi) Signature of the concerned authorities.

## 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, 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 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 drawing 1:20, 1:10, 1:5 |
| 5 | Large plot plans 1:200 |

## Line work

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

## 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 letters**
**Height in mm**

1 Main title and drawing number 6, 8, 10 & 12
2 Sub-titles and heading 3, 4, 5 & 6
3 Notes such as legends, schedules, materials and dimensions 2, 3, 4 & 5

## Conventional signs 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 like switch, ceiling fan, exhaust fan and even furniture as dining table, chairs, cloths cabinet, dressing table, T.V., etc. These are not drawn according to the scale but drawn proportionately. The Bureau of Indian Standards has recommended various types of conventional signs and symbols to fulfil the following objectives;

1. To save time, labour, material and space on drawing sheet.
2. To avoid confusion and misunderstanding.
3. To achieve quick identifications of details.
4. To increase the speed in preparation of drawings.
5. To save time in reading and understanding the drawing.
6. To avoid confusion in interpretation of details by the site supervisors, etc.

# 2 AUTOCAD - ESSENTIAL

## About AutoCAD

AutoCAD is most popular computer aided design and drafting software application from Autodesk, a leading US based company. Apart from AutoCAD, Autodesk has a spectrum of products for various fields such as Mechanical, AEC, GIS, R to V.

**Launching AutoCAD** is very simple: Just double click on the short cut icon of AutoCAD program or start the application by clicking,

Start > Program > Autodesk > AutoCAD > AutoCAD

After few moments, you could see the Graphical User Interface (GUI) of AutoCAD. The AutoCAD environment looks as in figure below. The AutoCAD GUI is very user friendly and comprehensive consisting of various Menus and tool bars. The arrangement of the Menu bar and Tool bars can be customized.

## Communicating with AutoCAD

AutoCAD is a servant, it does everything you tell it and no more. You can communicate with it using commands in the menu, screen menu, command line and buttons on the toolbars.

**Command:** A command is a single word instruction from the user to perform the required task. When you invoke a command, AutoCAD responds by presenting messages in the command prompt area or by displaying dialogue box. The messages in the command prompt are often tell you what to do next or they offer lot of options pertaining to the command. The commands can also be called by one or two letter short cut keys.

## The Menu

The menus are available on the menu bar offer a quicker way to access the commands and functions that are the heart of AutoCAD. The menu options issue a command that requires keyboard or drawing inputs. As you select the commands and options, AutoCAD flashes a single line help in the status bar.

1. **NEW**

**Menu:** File

**Command line:** new

It creates a new drawing file. The behaviour of the NEW command is determined by the startup setting on the System tab of the Options dialogue box.

Show the Start-up dialogue box: NEW displays the *Create New Drawing* dialogue box. Do Not Show the Start-up dialogue box: NEW displays the *Select Template* dialogue box. Create New Drawing dialogue box: Defines the settings for a new drawing. There are three main methods to create a new drawing.

Start from Scratch: Starts an empty drawing using default imperial or metric settings. Use of Template: Starts a new drawing file based on a drawing template file. Template drawings store all the settings for a drawing and may also include predefined layers, dimension styles and views. They are normally kept in a template directory and template drawings are distinguished from other drawing files by .dwt file extension. *Select a Template* lists all DWT files that currently exist in the drawing template file location.

*Browse*: Displays the Select Template dialogue box where you can access template files that are not available in the Select a Template list.

Use of Wizard: Set up a drawing using a step-by-step guide. There are two wizards.

A. Quick Setup Wizard: It deals through two steps for new drawing i.e. units and area.

**UNITS**

Menu: Format - Units

Command line: units

In auto cad, drawings are drawn at full size. The size is set at the time of printing. But it is possible 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 is required.

**LIMITS**

Menu: Format - Drawing limits

Command line: limits it sets and controls 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. Limits can be changed whenever required.

ON/OFF/ < Lower left corner ><0, 0>: Enter lower coordinate value and press enter, upper right corner <420, 297>; enter the co-ordinate value and press enter; when limits checking is ON. AUTO CAD rejects attempts to enter points outside the drawing limits.

OFF; Turns off limits checking.

LOWER LEFT CORNER: Specifies the lower left corner for the drawing limits, default lower limit is (0, 0).

UPPER RIGHT CORNER: Specifies the upper right corner for the drawing limits, default upper limit is (420, 297).

B. Advanced Wizard: It deals through seven steps;

1. Units
2. Angles
3. Angle measure
4. Angle Direction
5. Area
6. Title block
7. Layout.

**2. SAVE**

Command line: save

File menu: Qsave

It saves the drawing under a current file name. The Save Drawing dialogue box is displayed and drawing can be saved under the current file name or a different file name.

**3. SAVE AS**

Command line: save as

File menu: Save As

It saves a copy of current drawing under new file name.

**4. QNEW**

Command line: qnew

Starts a new drawing with the option of using a default drawing template file and folder path specified in the Options dialogue box on the Files tab. You can set the default drawing template file or to None.

**5. OPEN**

File menu: Open

Command line: open

It is used to open an existing drawing file. The Select File dialogue box is displayed. You can open and load a portion of drawing. In the Select File dialogue box, click the arrow next to Open button and choose Partial Open or Partial Open Read Only to display the Partial Open dialogue box.

**6. CLOSE**

File menu: Close

Command line: close

It closes the current drawing file. If you modified the drawing since it was last saved, AutoCAD prompts you to save or discard changes. You can close the file that has been opened in Read-only mode if you have made no changes or if you are willing to discard changes. To save the Read-only file, you must use the SAVEAS command.

**7. CLOSE ALL**

Window menu: Close All

Command line: close all

It closes all the open drawings. A message box is displayed for each unsaved drawing, in which you can save any changes to the drawing before closing it.

**8. QUIT**

File menu: Exit

Command line: quit

It is used to exit from AutoCAD. Quits the AutoCAD if there have been no changes since the drawing was last saved.

## Toolbars and Icons

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.

## Drafting settings

Drafting settings specifies the settings for a number of drafting aids to help you draw more quickly and precisely. Drafting Settings dialogue box will be displayed which include various tabs to make settings for Snap mode, Grid, Object snaps, polar and object snap tracking, input and selection settings.

**SNAP MODE**: Controls the invisible grid that restricts the cursor movement to specified intervals. It includes settings to specify Snap X Spacing, Snap Y Spacing, Angle, X Base, Y Base and polar spacing and in addition Snap Type and Style.

**GRID MODE**: Controls the display of the dot grid that helps to visualize distances. The limitsof the grids are controlled by LIMITS command. It includes settings for Grid X Spacing and Grid Y Spacing.

**OBJECT SNAP**: (OSNAP) Specifies the running object snap modes. When Object Snap modeis on, while in the command, the specified points of the object like Endpoint, Midpoint, Centre, Node, Quadrant, Intersection, Extension, Insertion, Perpendicular, Nearest, Tangent, etc will be indicated at the cursor.

**POLAR TRACKING**: Sets the angles for polar tracking.
**ORTHO**: It controls the cursor movement. If ortho mode is on, the cursor movement constrained to the horizontal - vertical directions.
In AutoCAD, its configurations can be customized using Options command and it is also available in the dropdown menu when right clicked in the drawing area. Options dialogue box is displayed and can make settings under different tabs; Files, Display, Open and Save, Plot and Publish, System, User Preferences, Drafting, Selection and Profiles.

## Function keys

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

**Function key Function defined in AutoCAD**

F1 Online help
F2 Toggles between command window on and off
F3 Toggles between OSNAP on and off
F4 Toggles between Tablet on and off
F5 Switches among Isoplanes Top, Right and Left
F6 Toggles between co-ordinates on and off
F7 Toggles between Grid on and off
F8 Toggles between Ortho on and off
F9 Toggles between Snap on and off
F10 Toggles between Polar Tracking on and off
F11 Toggles between Object Snap Tracking on and off
F12 Dynamic Input on and off

# 3. DRAWING TOOL COMMANDS

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 measuredfrom origin.
- Relative Co-ordinate: In this system the point is specified using X & Y co-ordinate thedistance 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 toindicate 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 centre point and the radius. In addition,
there are other methods also.

a. Centre and Radius: It draws a circle based on a centre point and radiuscommandcircle.
b. Centre and Diameter: Draws a circle based on a centre point and diameter.
c. Three points: Draws a circle based on three points on the circumference.
d. Two points: Draws a circle based on a two end points of the diameter.
e. Tangent, Tangent, Radius: Draws a circle with a specified radius and tangent totwoselected 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.

a. Three-point arc: Draws an arc using three specified points on the circumference.
b. 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. **POLYLINE**

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.

**9. X- LINE**

Draw menu: X-line
Command line: xline
Shortcut key: xl
It creates an infinite line, x lines are commonly used as construction lines.

**10. Hatch**

Draw menu: Hatch
Command line: hatch
Shortcut key: h
It fills an enclosed area with a pattern.

**MODIFY TOOL COMMANDS**

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

**11. ERASE**

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

**12. MOVE**

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

**13. COPY**

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

14. **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.

15. **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.

**16. 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.

**17. 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.

18. **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 also to move objects from one place to another place.

**19. 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.

**20. EXTEND**

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

**21. 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.

**22. 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.

**23. EXPLODE**

Modify menu: Explode
Command line: explode
Shortcut key: x
It converts polyline, blocks and hatch objects into discrete objects.

24. **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.

25. **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.

## NAVIGATING COMMANDS

**26. ZOOM**

View menu: Zoom
Command line: zoom
Shortcut key: z
It is used to enlarge and reduce the view of the object in different ways. Zooming does not change absolute size of the object but it changes the size of view with in graphic data.

**27. PAN**

View menu: Pan
Command line: pan
Shortcut key: p
It moves the drawing display from one place to another to option selected.

## Using text

Text plays an important role in drawing. It is used in title blocks, to give specifications or to make annotations in the drawing. Texts may be either Single line or Multiline text. Text style: the group of texts can be assigned a definite set of properties using named text styles.

## Dimensioning

Dimensioning plays a vital role in any drawing and is necessary to specify the dimensions of the objects in the drawing. Similar to text styles, dimension styles can also be created with specific set of properties like size and type of arrow head, text style, colour, units, precision and alignment of dimension text, etc. dimensions may be linear, aligned, angular, radius, diameter.

**Leader**: It is used to create an arrowed line that connects annotation to a feature. It is used tolabel the objects.

## Block

It is a group of objects associated together to form a single object. This block can be inserted, scaled and rotated whenever required. This single object can be saved it as a block by giving name to an object. Later this name can be used to insert block.

## Layer

When group of objects are created layer command is used to assign various line type colours to various objects. This group of objects can also be made visible and invisible.

Menu: Format

Layer Command: Layer or La

It will display a layer and line type dialog box.

**New**: Click on new button to create new layer. Enter name in the layer name box. To create more than one layer names separated by command don't use existing layer names. Again click new to choose new layer. Assign colour and line type to the layer.

**Current**: Click current button to make the selected layer the current layer.

**On and off:** ON is used to draw objects and they are visible OFF is used to make the drawn objects in that layer invisible.

**Freeze and thaw**: A thaw layer is invisible and excluded from regeneration and plotting. A thawed layer is visible and available for regeneration and plotting.

**Lock and unlock**; If the layer is locked. The objects drawn in the locked layer cannot be modified. If it is unlocked it can be modified.

**Colour:** It can be used to give suitable colour to the selected layer.

**Delete**: Removes selected layer from the list.

**Line type:** Select line type and displays a dialog box. In this box, different line types can be assigned to layer. It creates loads and sets line types to layer.

## Match Properties

It copies or matches the properties of one object to one or more object.

Modify: Match properties

Command: Match prop or painter

Select source object: Select the object whose properties are to be copied. Settings/<select destination objects(s)>: Enter settings or select one or more objects which are to be changed. Settings: displays a dialog box and specify t he properties to be copied.

# MODULE 2

## DRAWINGS OF BUILDING COMPONENTS

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

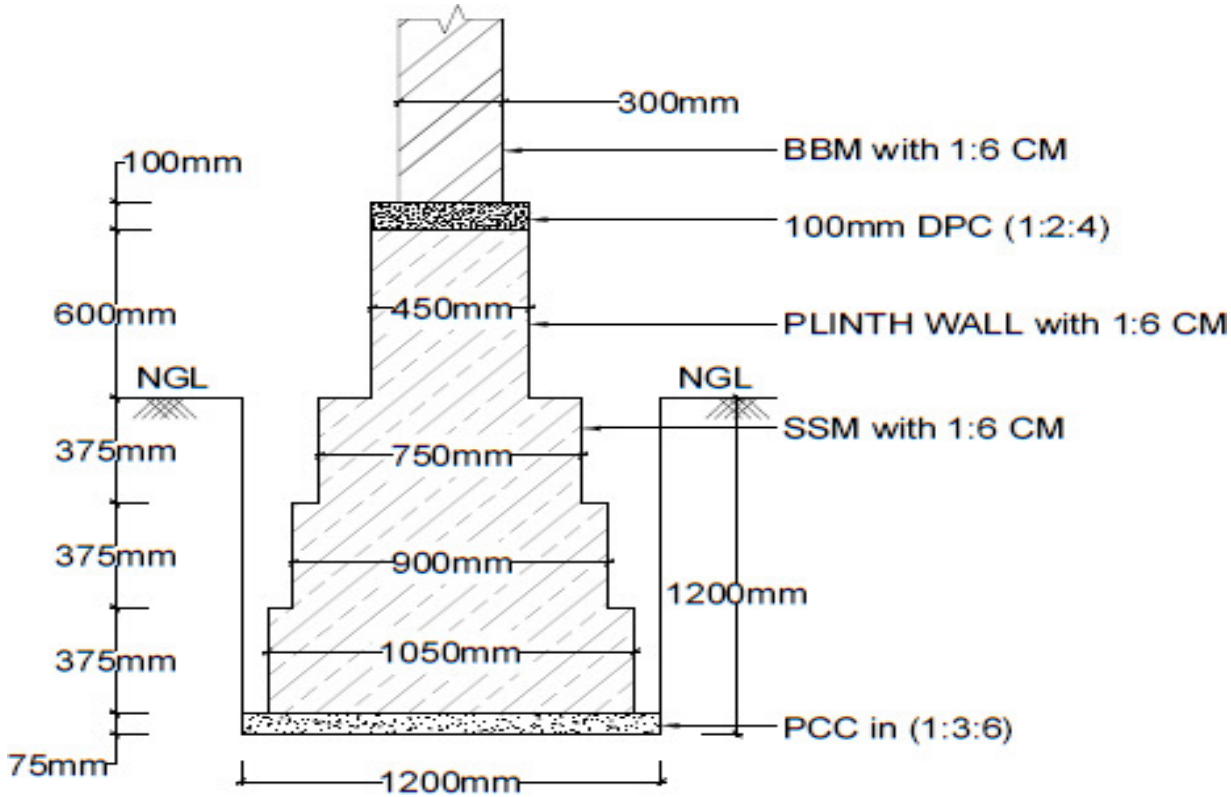
### A. CROSS SECTION OF MASONRY WALL FOUNDATION, RCC COLUMNS WITH ISOLATED AND COMBINED FOOTINGS

**Exercise 2.1**

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:

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.

***Solution: Refer Fig. 2.1***

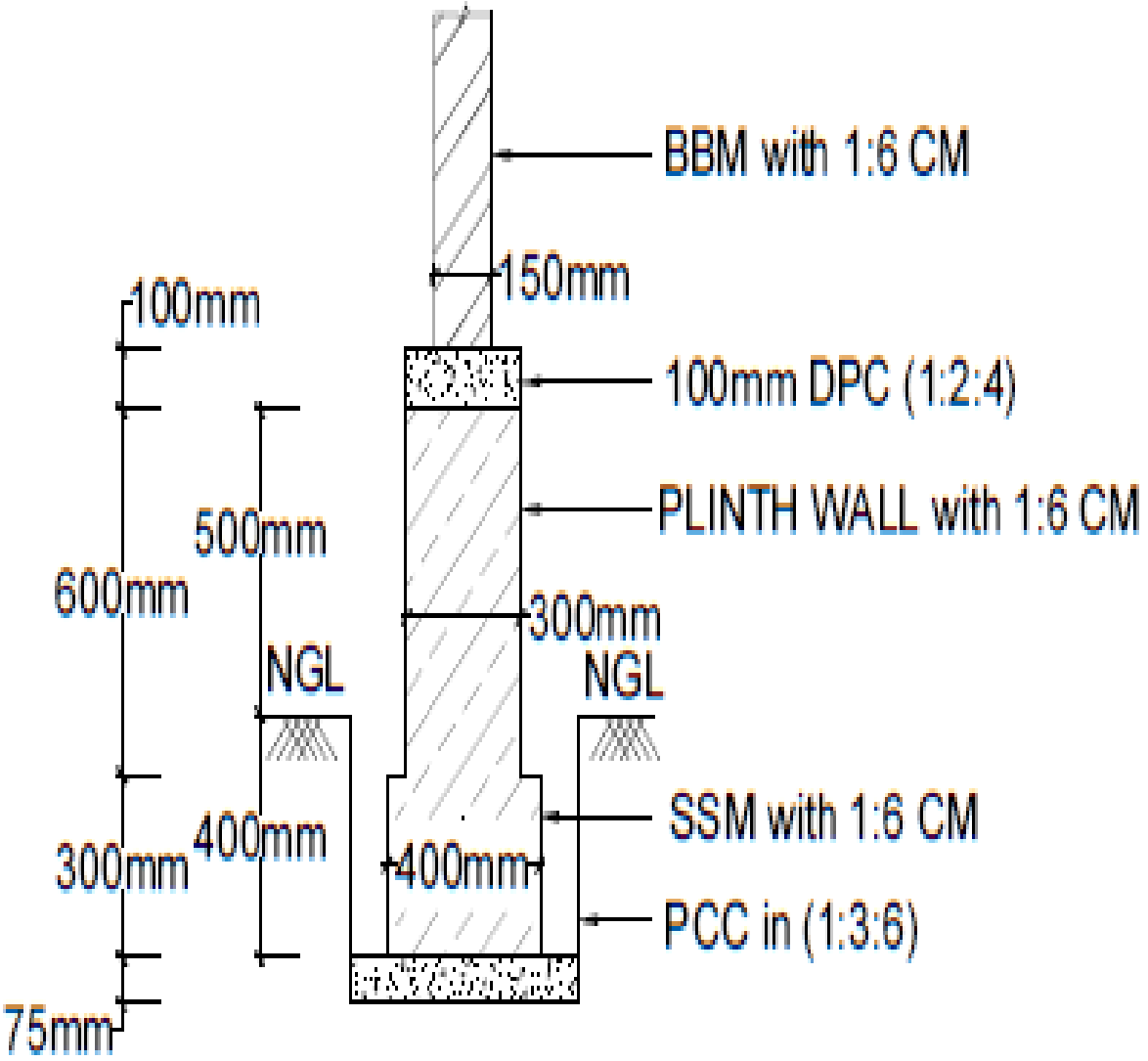



CROSS SECTION OF SIZE STONE MASONRY FOUNDATION FOR MAIN WALL (Fig:2.1)

**Exercise 2.2**

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.

**Solution: Refer Fig. 2.2**




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

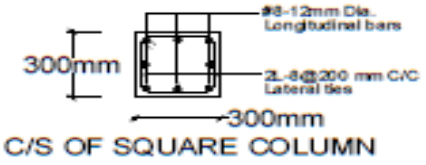
**Exercise 2.3**

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.

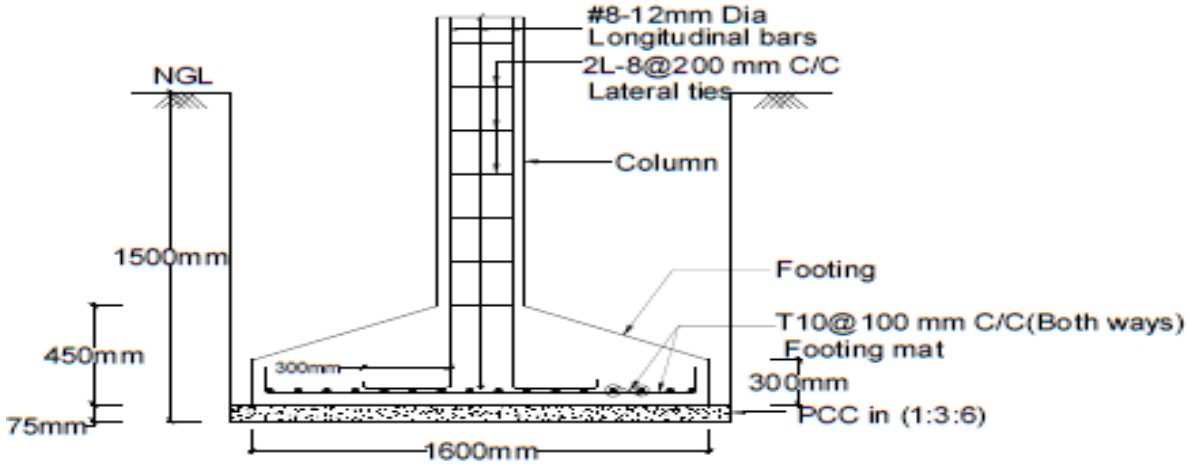
Details of footing: Size of footing is 1.6m x 1.6m and the thickness of the footing at the face of the column is 450mm which reduces to 300mm at the edge of footing. The mat comprises of 10ϕ TOR- steel at 100 c/c both ways. The footing is provided with PCC bed in 1:3:6 of thickness 75mm.Depth of foundation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

***Solution: Refer Fig. 2.3***

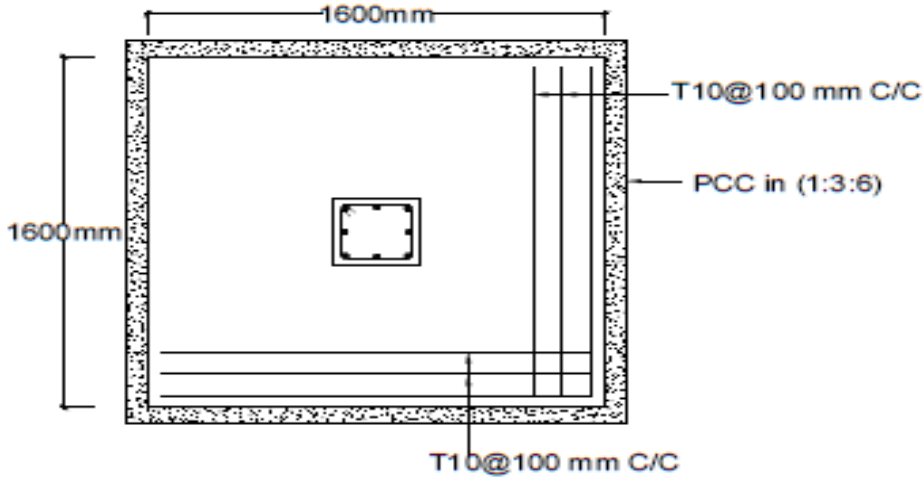
SQUARE ISOLATED COLUMN FOOTING(Fig:2.3)




C/S OF SQUARE COLUMN




L/S OF SQUARE ISOLATED COLUMN FOOTING




C/S OF SQUARE ISOLATED COLUMN FOOTING

**Exercise 2.4**

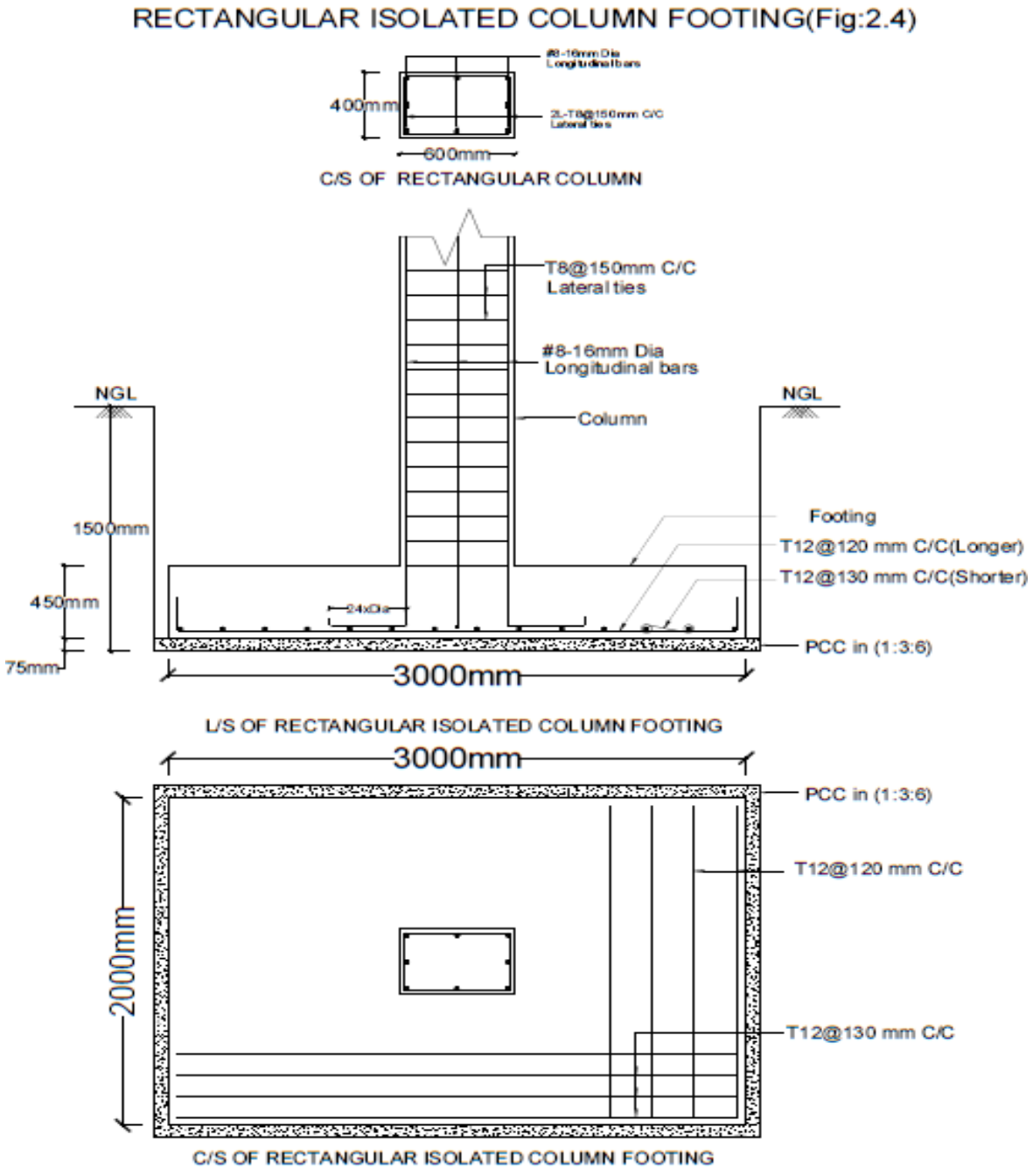
Prepare a working drawing for an isolated rectangular RCC column and footing has the following details:

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: Refer Fig. 2.4***



**Exercise 2.5**

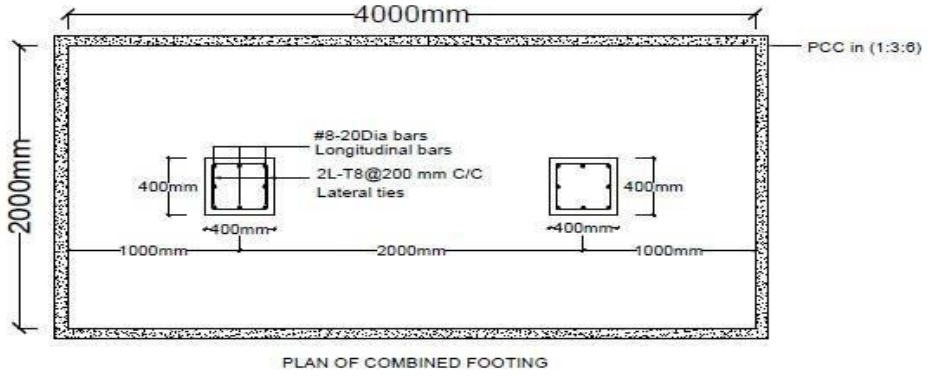
Draw plan, sectional elevation and cross section of a slab type combined footing with the given details:

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

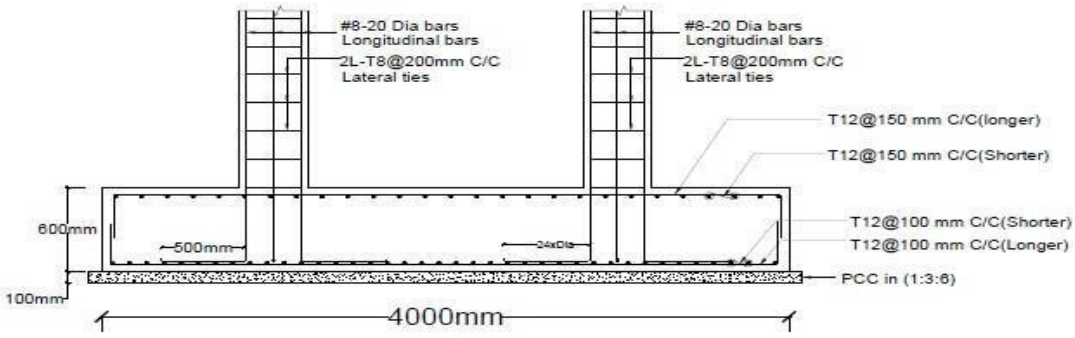
Footing reinforcement details – bottom reinforcement of 12ϕ @ 100 c/c both ways and top reinforcement of 12ϕ @ 150 c/c both ways

***Solution: Refer Fig. 2.5***

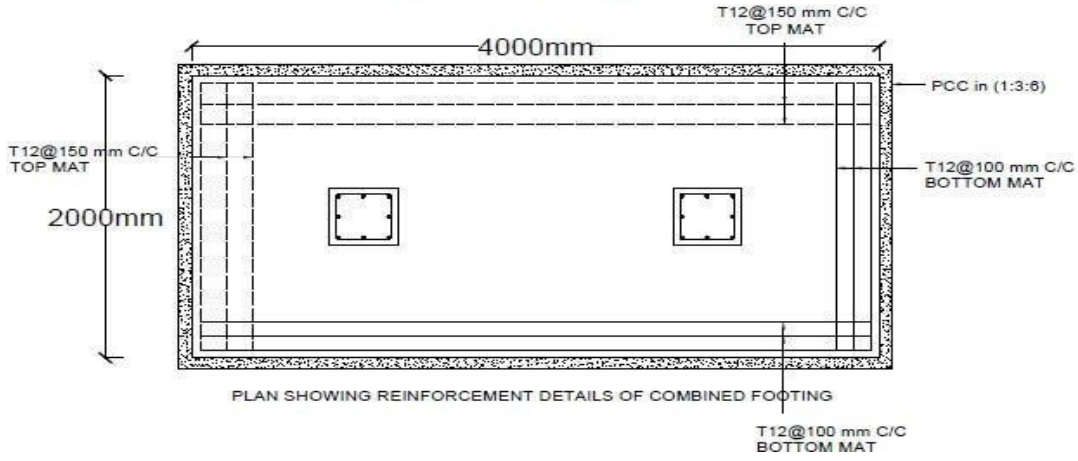
SLAB TYPE COMBINED FOOTING(Fig:2.5)




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 2.6**

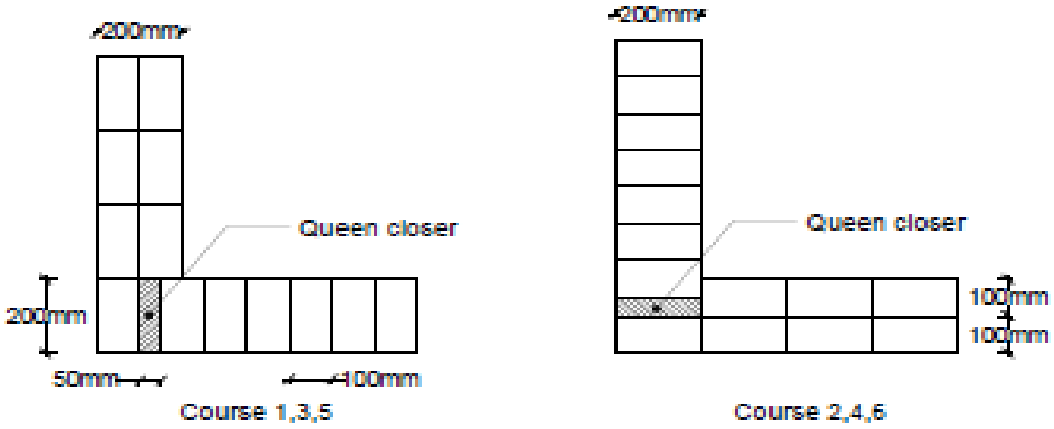
Draw two consecutive courses for corner joints of the following walls in English bond.

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

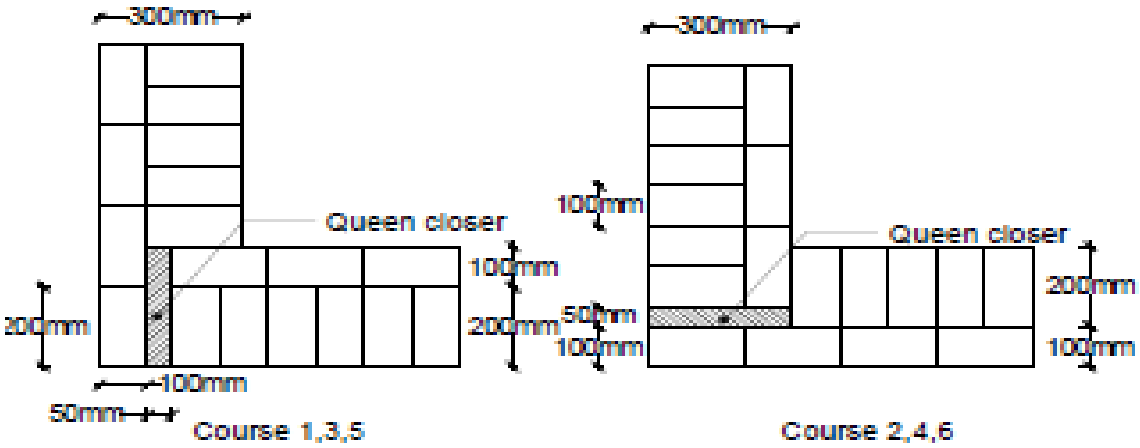
*(b)* One and half thick wall i.e., 300 x 300.

***Solution: Refer Fig. 2.6a for one brick thick wall***

***Refer Fig. 2.6b 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 2.7**

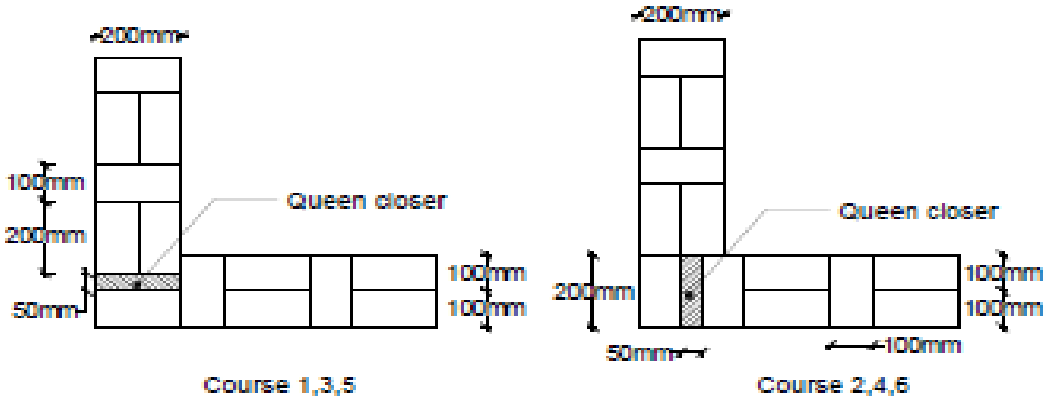
Draw plan of two consecutive courses for corner joints of the following walls in Double Flemish bond.

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

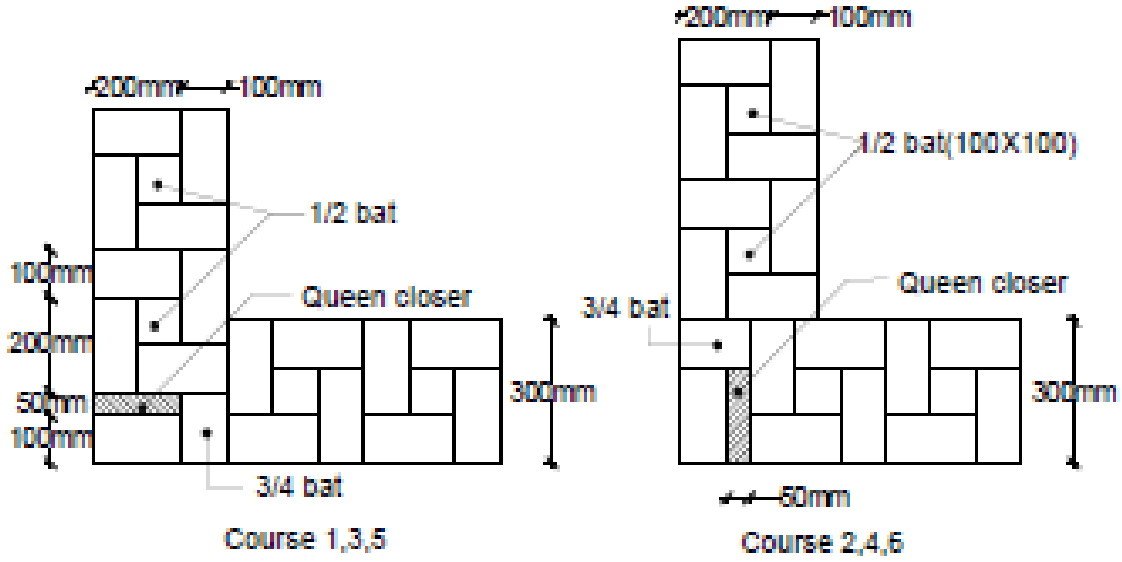
*(b)* One and half thick wall i.e., 300 x 300.

***Solution: Refer Fig. 2.7a for one brick thick wall***

***Refer Fig. 2.7b for one and half brick thick wall***




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

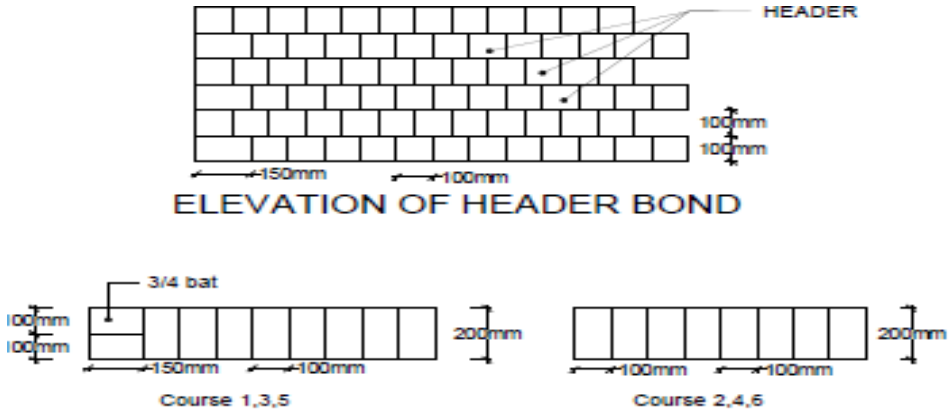



DOUBLE FLEMISH BOND
ONE AND HALF BRICK WALL 300X300(Fig:2.7b

**Exercise 2.8**

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

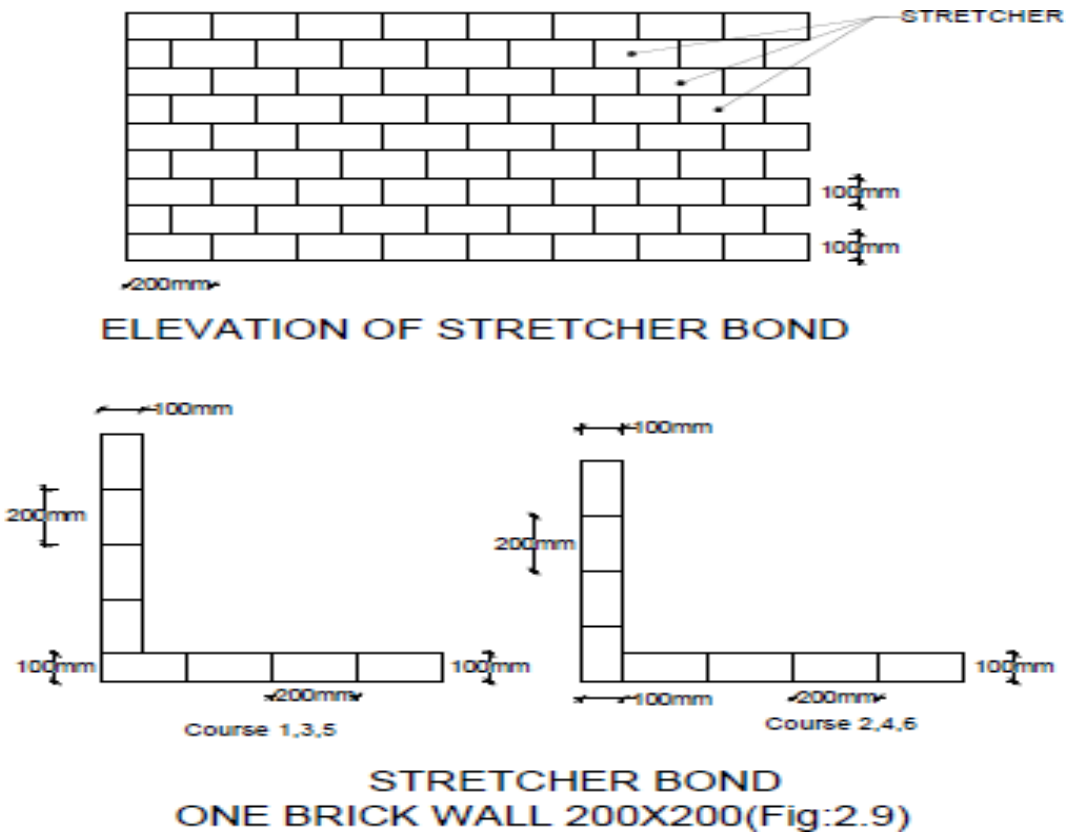
***Solution: Refer Fig. 2.8***




**Exercise 2.9**

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

***Solution: Refer Fig. 2.9***

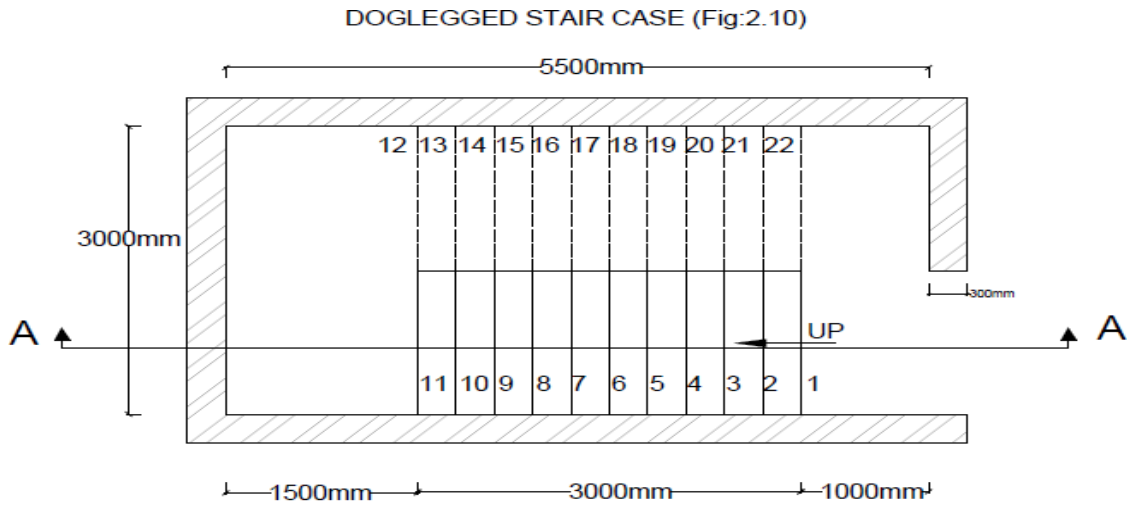


## C. DIFFERENT TYPES OF STAIRCASES

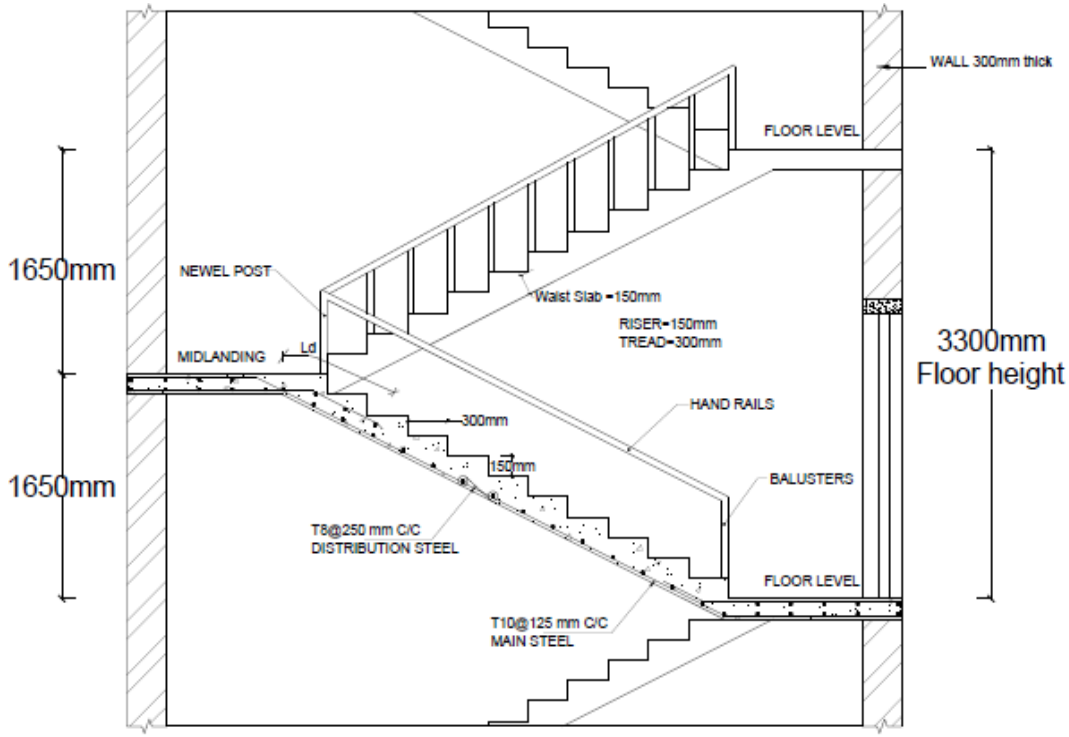
**Exercise 2.10**

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.

***Solution: Refer Fig. 2.10***




PLAN OF DOGLEGGED STAIRCASE




SECTION A-A

SECTIONAL ELEVATION OF DOGLEGGED STAIRCASE

**Exercise 2.11**

Draw plan and sectional elevation of an open newel stair 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.

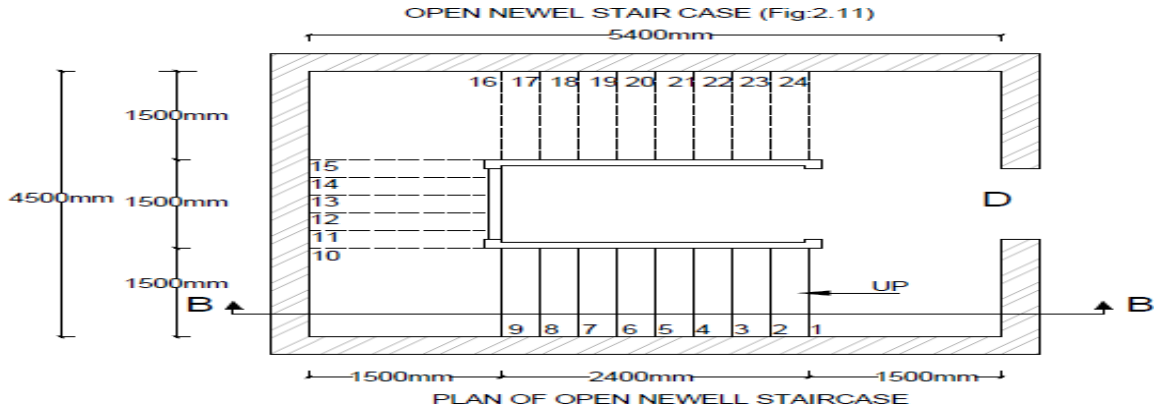
Width of stair = 1.5m.

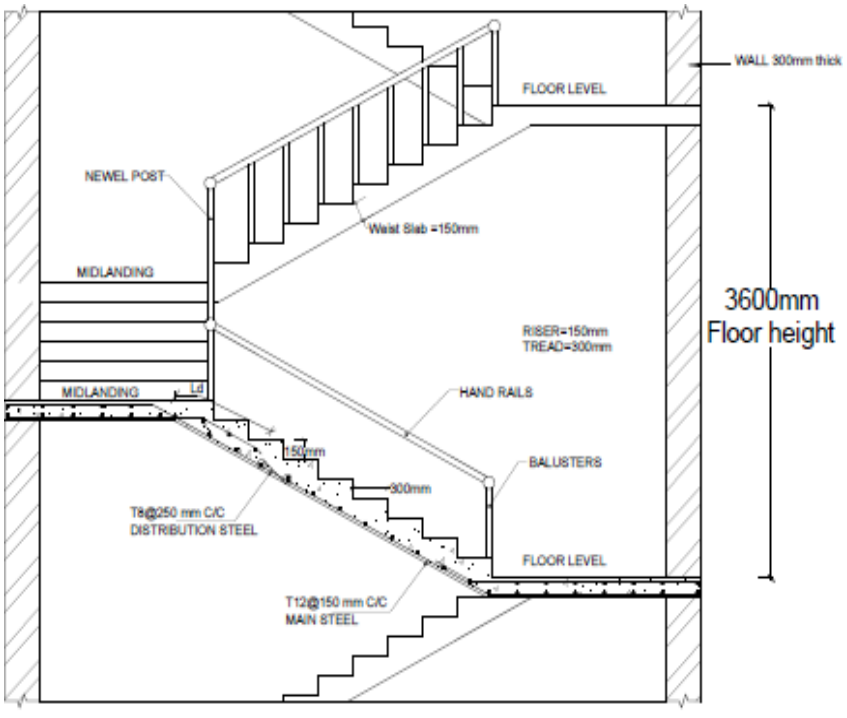
Tread=300mm, riser=150mm.

Waist slab thickness = 150mm.

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

***Solution: Refer Fig. 2.11***




SECTION B-B
SECTIONAL ELEVATION OF OPEN NEWELL STAIRCASE

## D. LINTEL AND CHEJJA

**Exercise 2.12**

Draw the longitudinal section and cross section of RCC lintel monolithically cast with sunshade from following data:

Projection of the sunshade from the face of the wall = 600mm

Thickness at fixed end = 150mm

Thickness at free end = 75mm

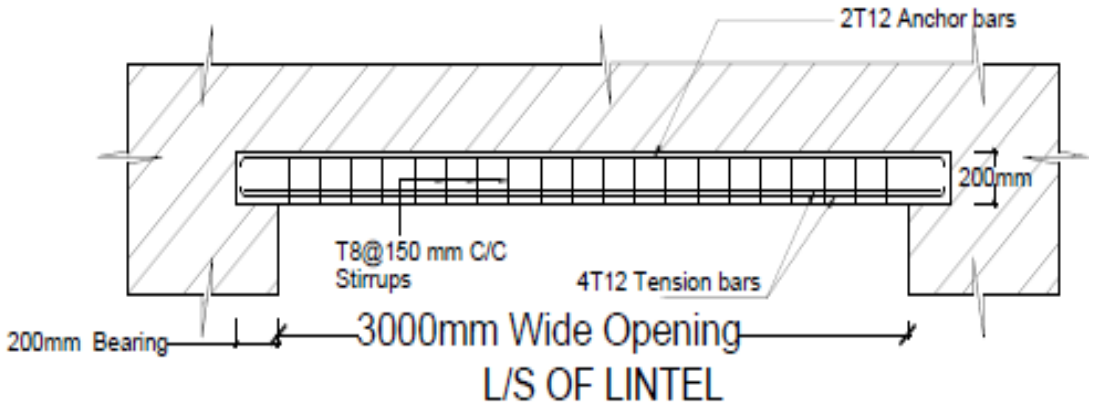
Main tensile bars: 8ϕ @ 150 c/c

Distribution bars: 8ϕ @ 200 c/c

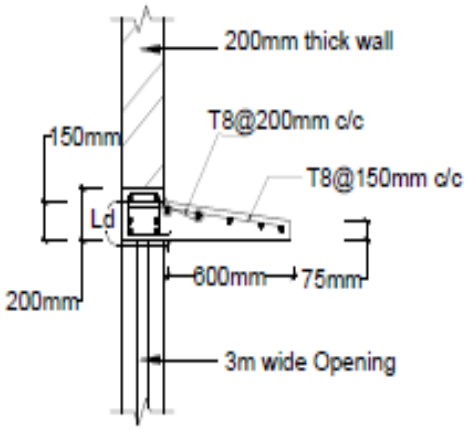
For RCC lintel (200 x 200) mm with #4 - 12ϕ at tension zone and stirrups of 2L - 8ϕ @ 150 c/c. The sunshade provided over a 3m wide window.

***Solution: Refer Fig. 2.12***

LINTEL AND SUNSHADE (Fig:2.12)




L/S OF LINTEL




C/S OF LINTEL AND SUNSHADE

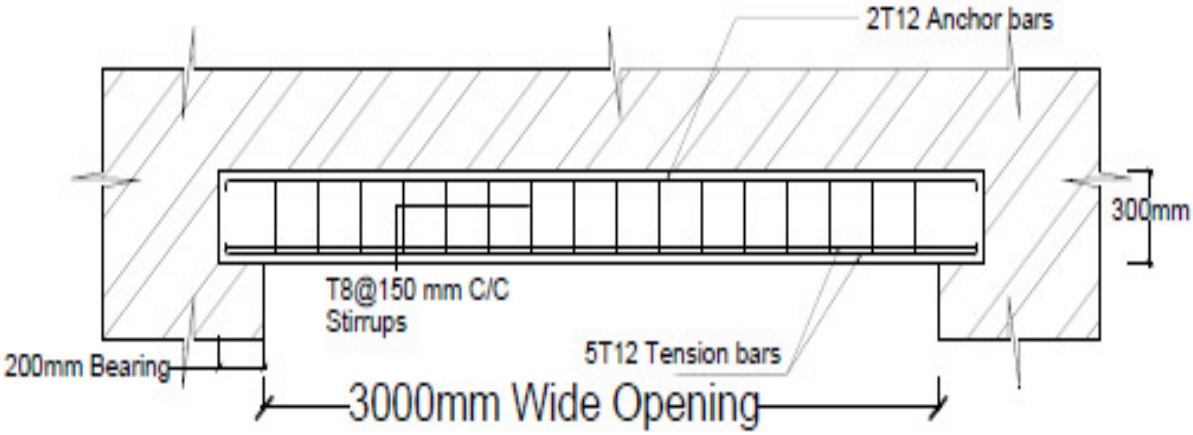
**Exercise 2.13**

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.

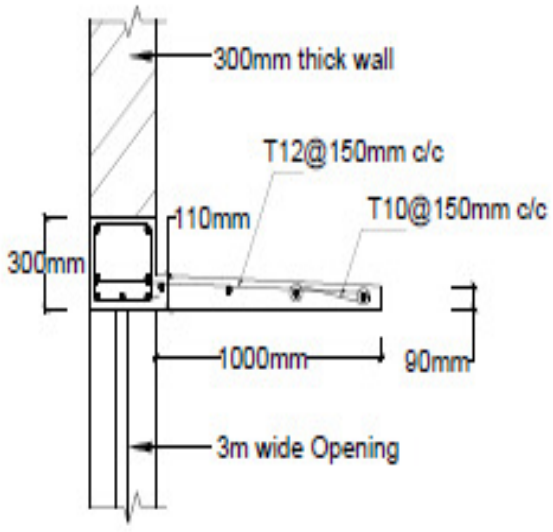
Chejja details: projection- 1m; thickness at supports- 110mm and at end- 90mm; main steel provided is 12ϕ @ 150 c/c and distribution steel 10ϕ @ 150 c/c.

***Solution: Refer Fig. 2.13***

LINTEL AND CHEJJA (Fig:2.13)




L/S OF LINTEL




C/S OF LINTEL AND CHEJJA

## E. RCC SLABS AND BEAMS

**Exercise 2.14**

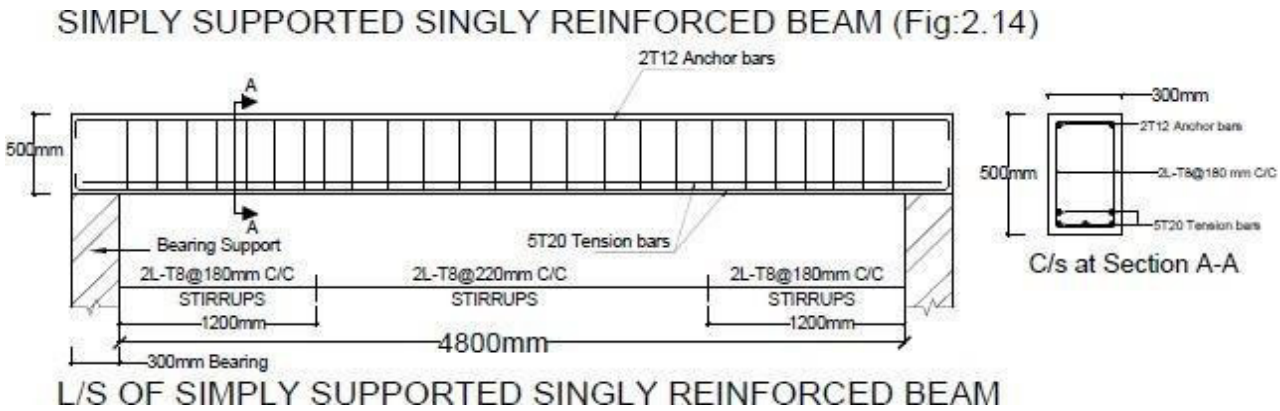
Draw the longitudinal section and cross section of a rectangular RCC beam simply supported with the following data:

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.

***Solution: Refer Fig. 2.14***




**Exercise 2.15**

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

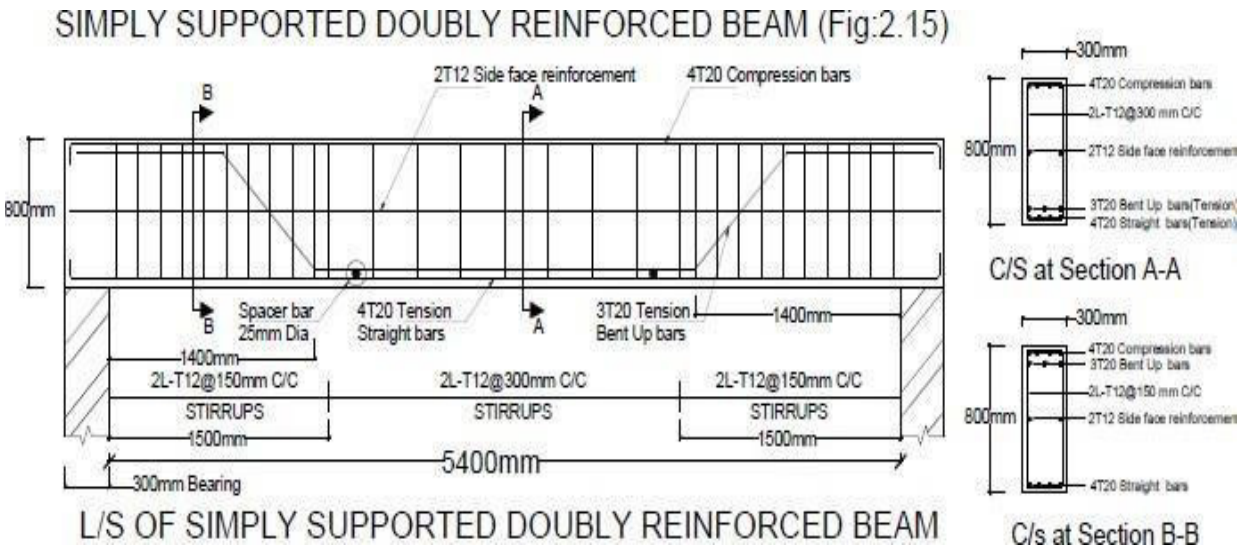
Main reinforcement tensile: #7 - 25ϕ. 4 straight and 3 bent up @ 1400mm from support.

Compression reinforcement: #4 – 25ϕ.

Spacer bars=25 ϕ, Side face reinforcement=#2-12ϕ

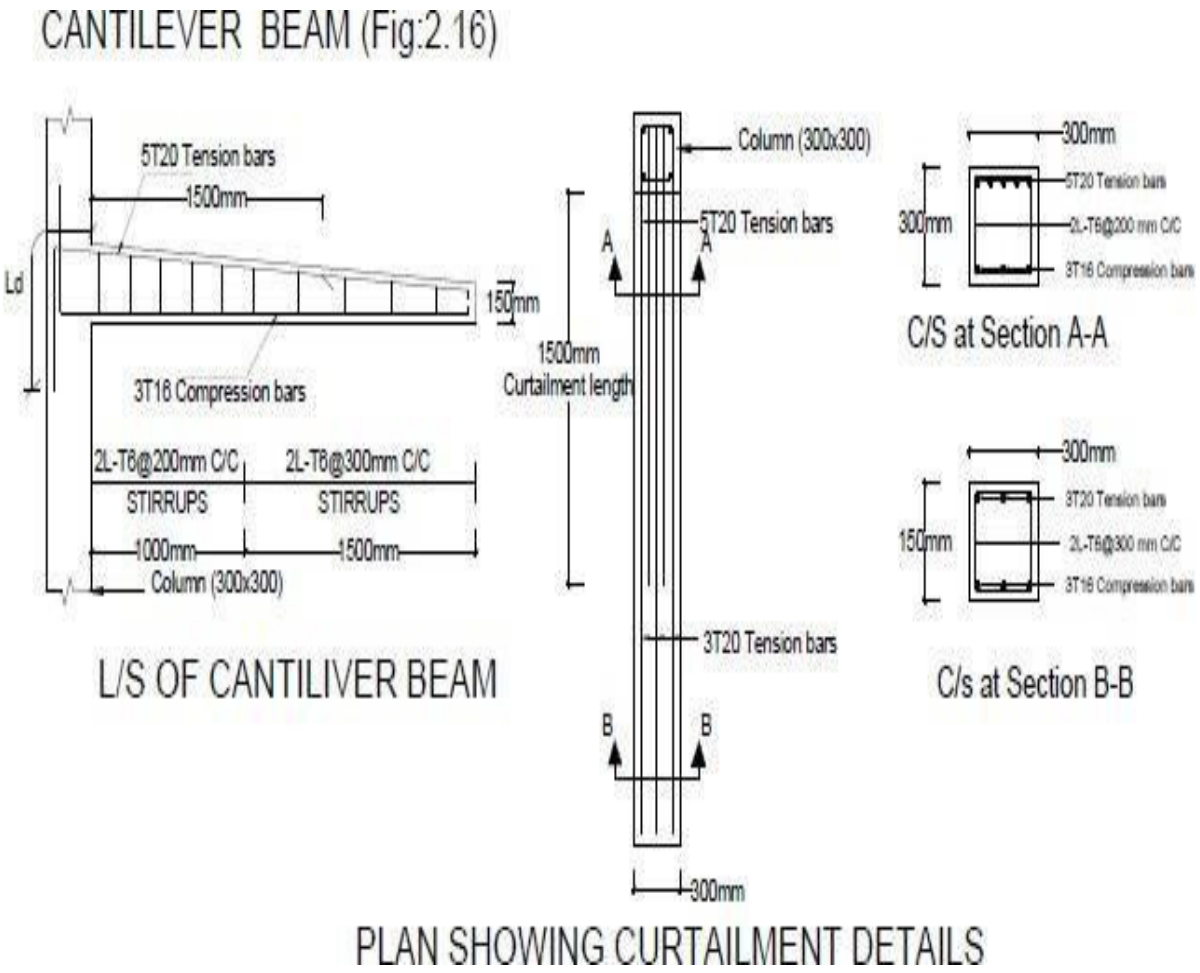
Shear reinforcement: 2L - 12ϕ @ 150 c/c for a distance of 1.5m from the support and 2L - 12ϕ @ 300 c/c for remaining middle portion.

***Solution: Refer Fig. 2.15***



**Exercise 2.16**

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.
***Solution: Refer Fig. 2.16***



**Exercise 2.17**

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

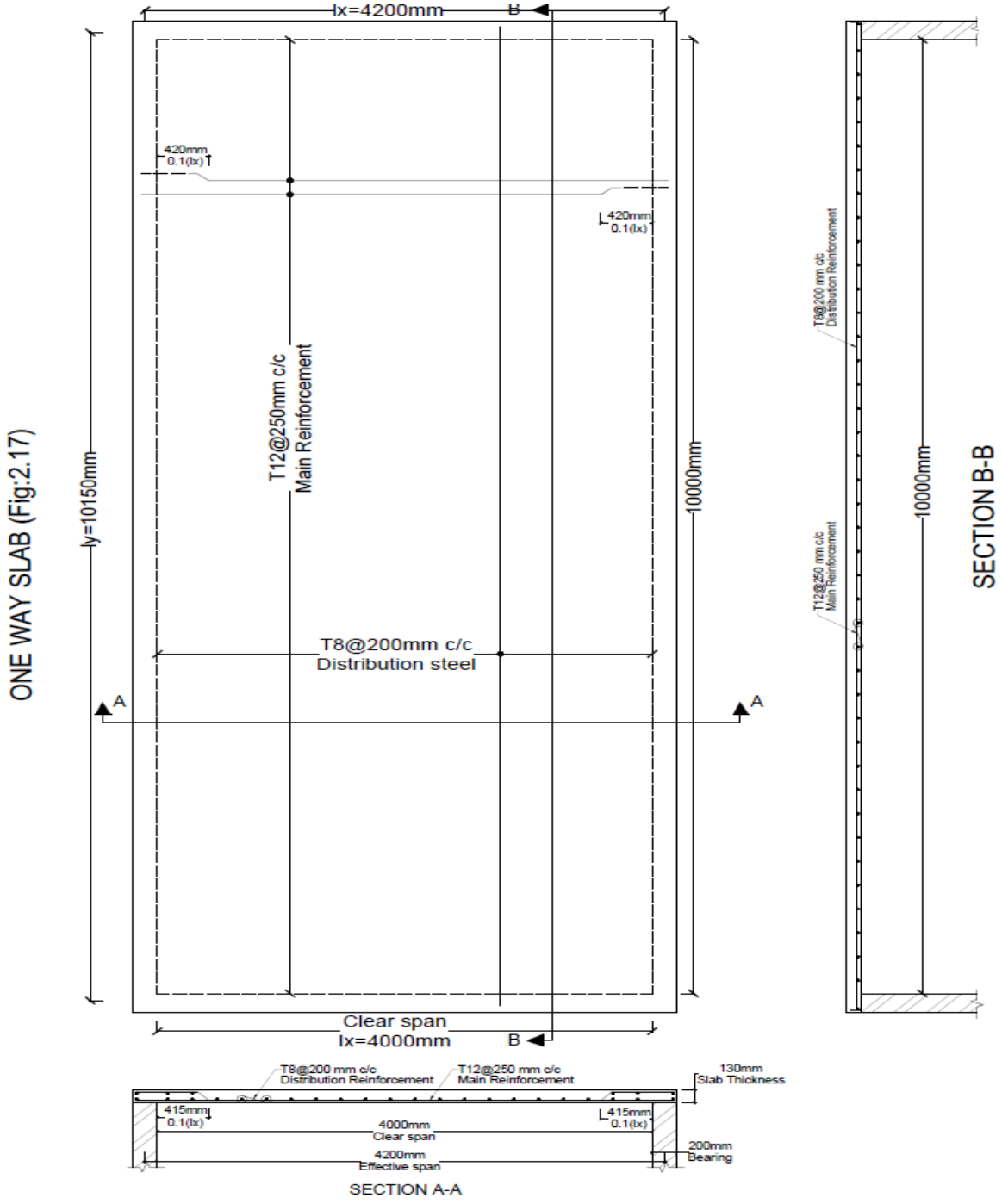
Clear span = 4m, Length of slab = 10m

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

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

Distribution reinforcement: 8ϕ @ 200 c/c.

***Solution: Refer Fig. 2.17***



**Exercise 2.29**

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.

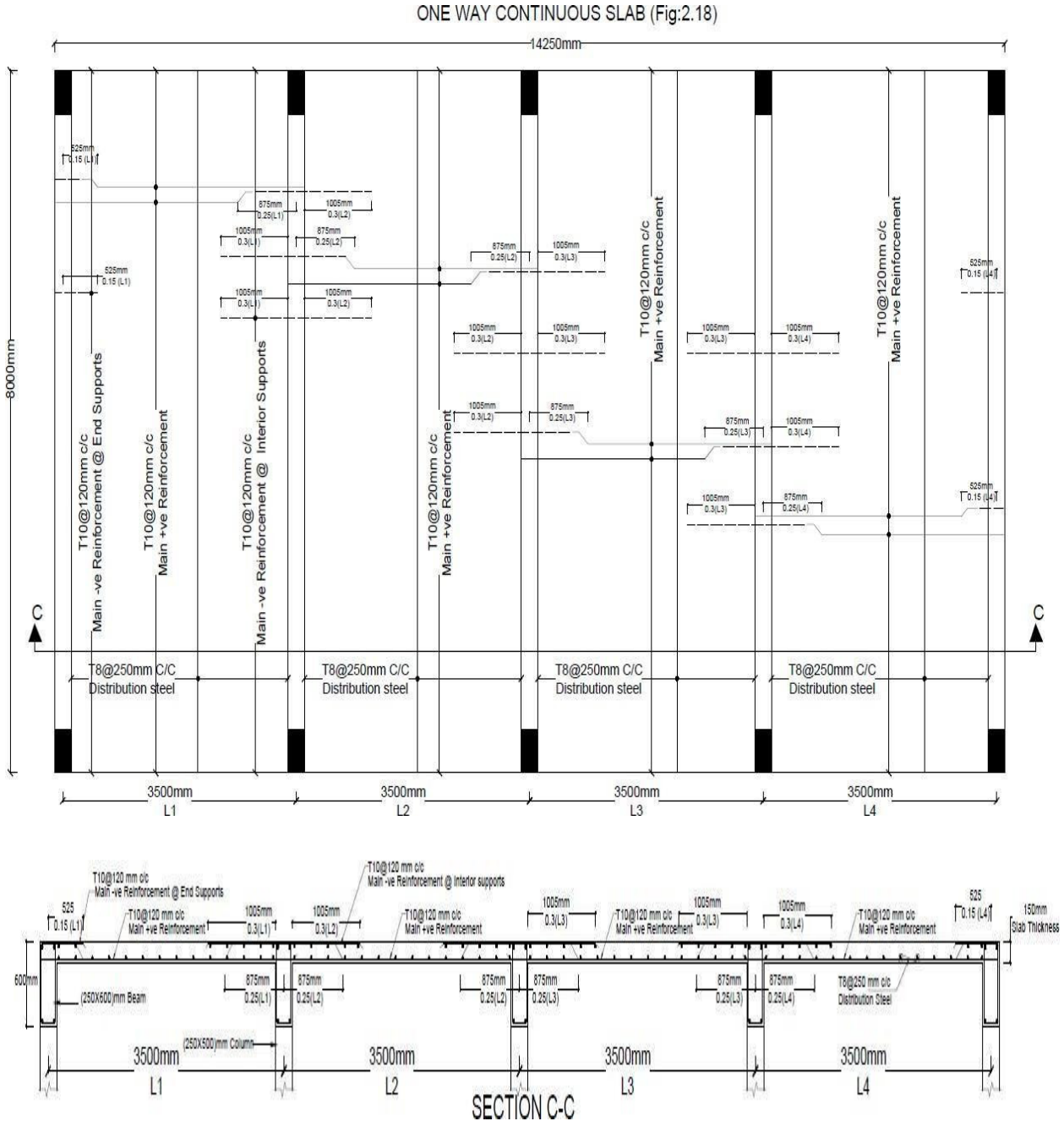
Main positive reinforcement at the end and interior panels=10ϕ @120 c/c

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).

***Solution: Refer Fig. 2.18***

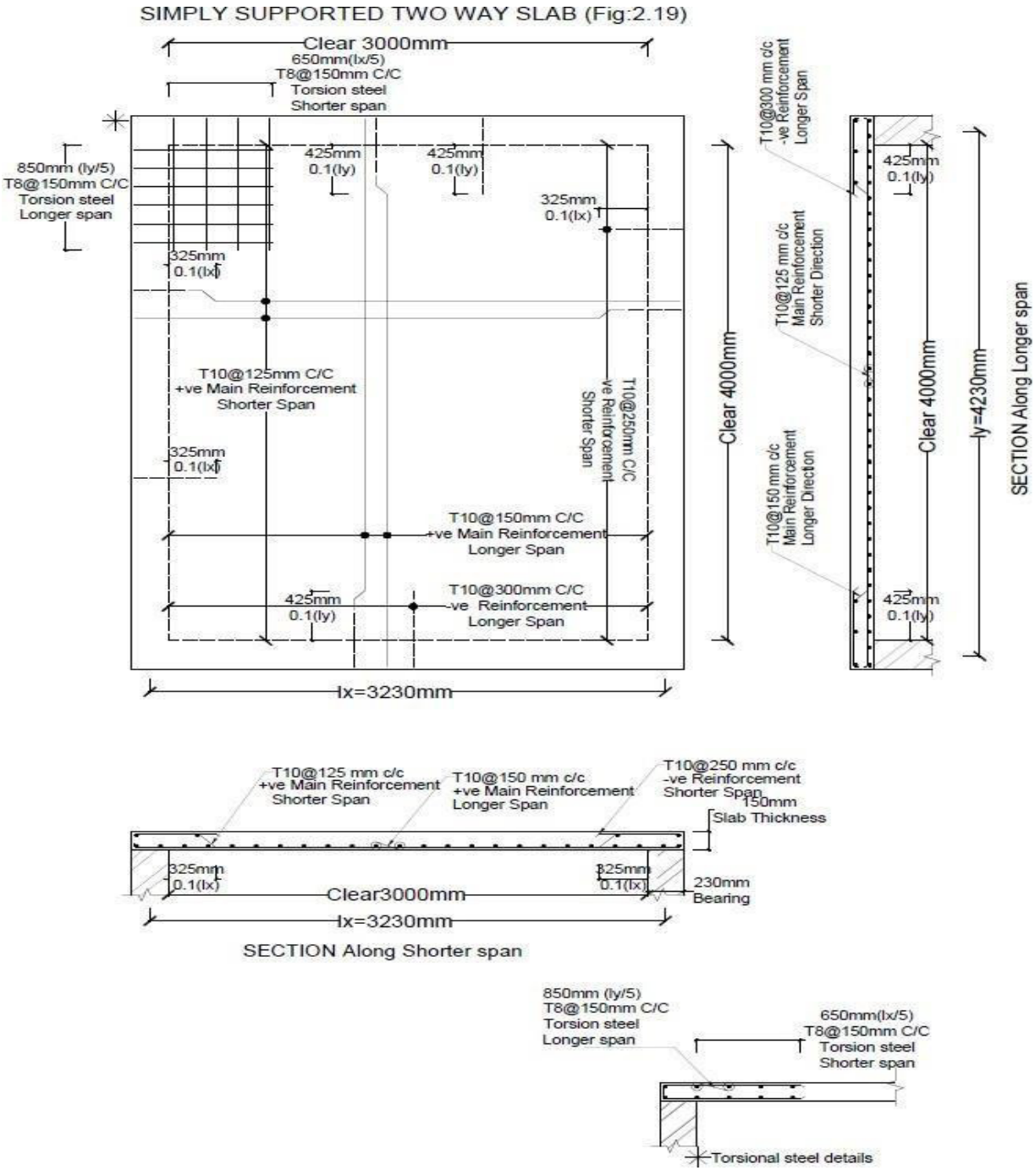


**Exercise 2.30**

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.

***Solution: Refer Fig. 2.19***



## MODULE 3

## BUILDING PLANNING AND DRAWING

### 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 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.

**Drawing of plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for following exercises:**

**Exercise 3.1**

Draw plan, elevation and sectional elevation including electrical plumbing and sanitary services for a given line diagram of single storey residential building in figure Q.no.3.1.

***Solution:***

Plan – Refer Fig. 3.1.1

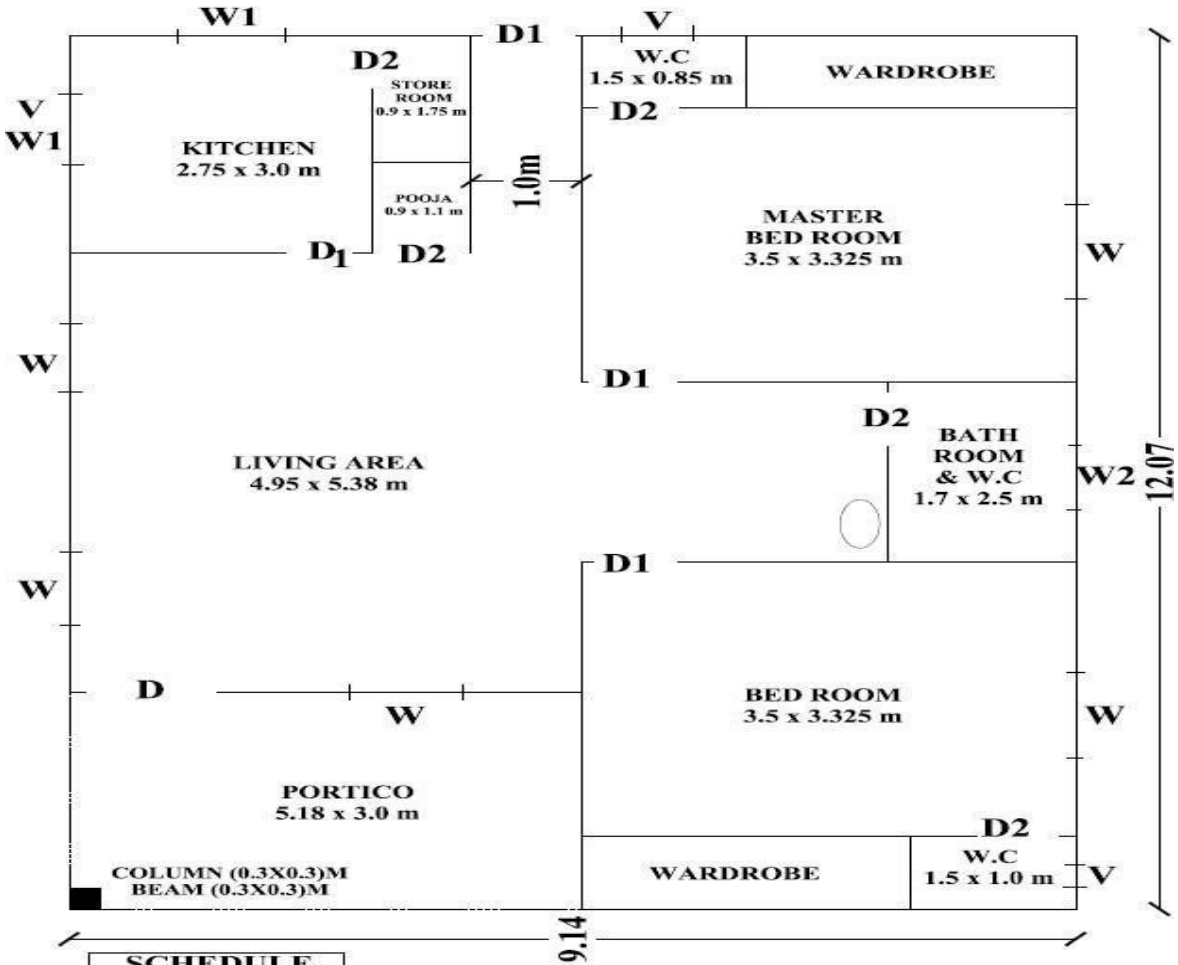
Sectional elevation - Refer Fig. 3.1.2

Elevation - Refer Fig. 3.1.3

Water supply and sanitary layout - Refer Fig. 3.1.4

Electrical layout - Refer Fig. 3.1.5

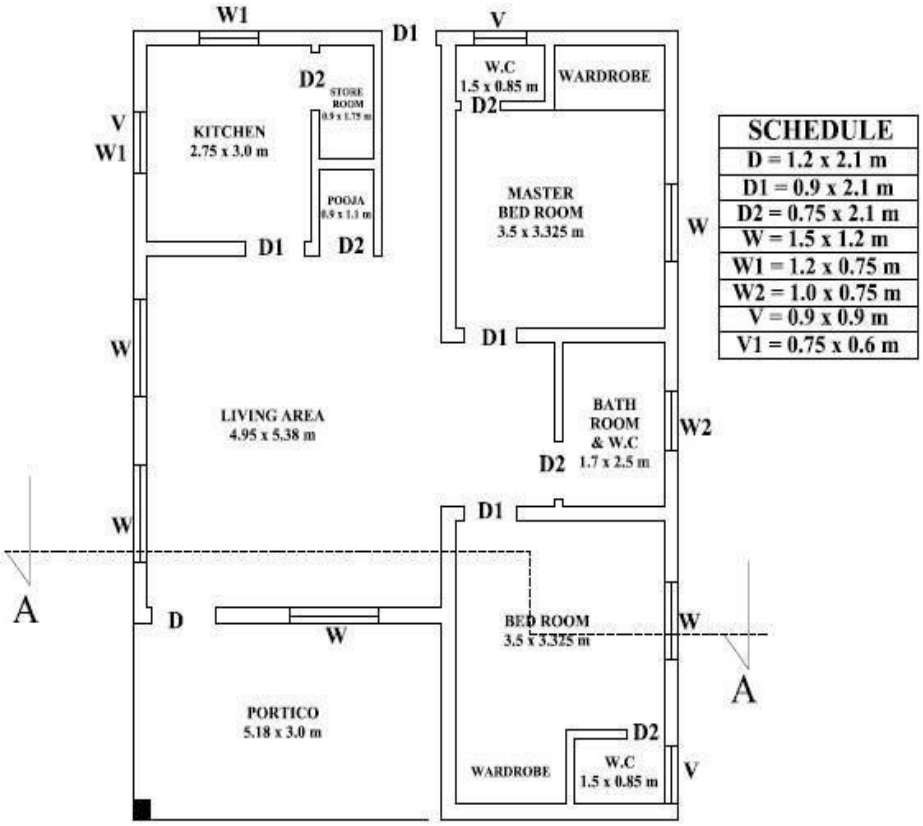
Q.no.3.1:-LINE DIAGRAM OF SINGLE STOREY RESIDENTIAL BUILDING



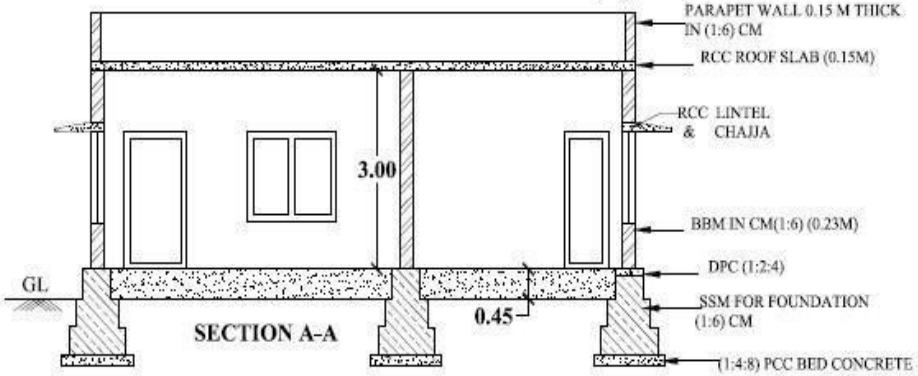

| SCHEDULE |
|---|
| D = 1.2 x 2.1 m |
| D1 = 0.9 x 2.1 m |
| D2 = 0.75 x 2.1 m |
| W = 1.5 x 1.2 m |
| W1 = 1.2 x 0.75 m |
| W2 = 1.0 x 0.75 m |
| V = 0.9 x 0.9 m |
| V1 = 0.75 x 0.6 m |

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

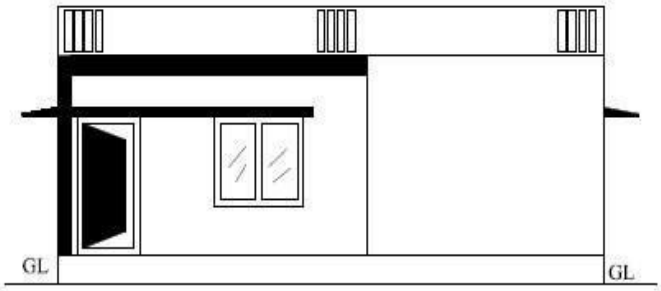
PLAN OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.1)

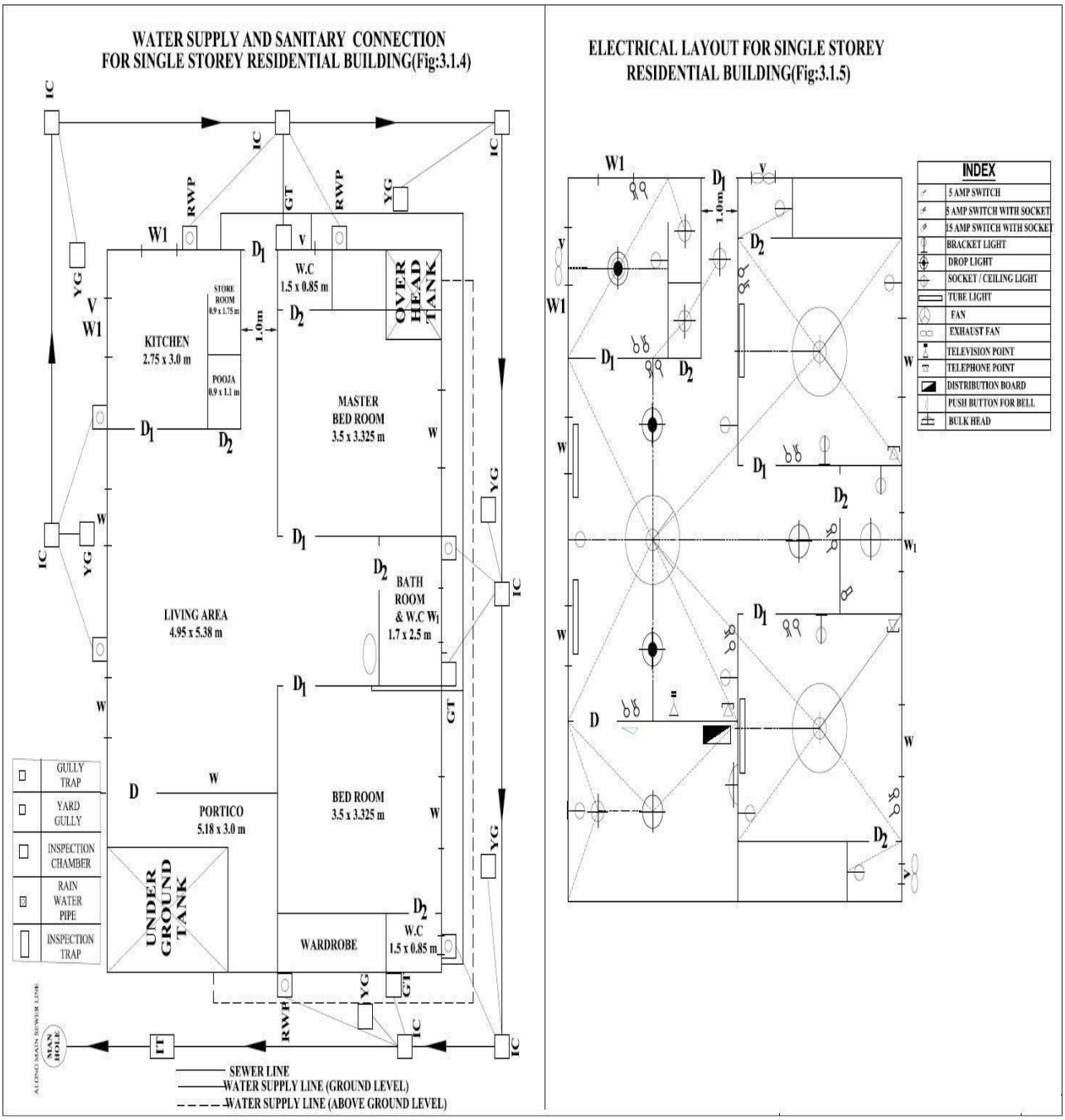



C/S OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.2)




ELEVATION OF SINGLE STOREY RESIDENTIAL BUILDING(Fig:3.1.3)






**Exercise 3.2**

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of two storey residential building in figure Q.no.3.2.

***Solution:***

Plan – Refer Fig. 3.2.1

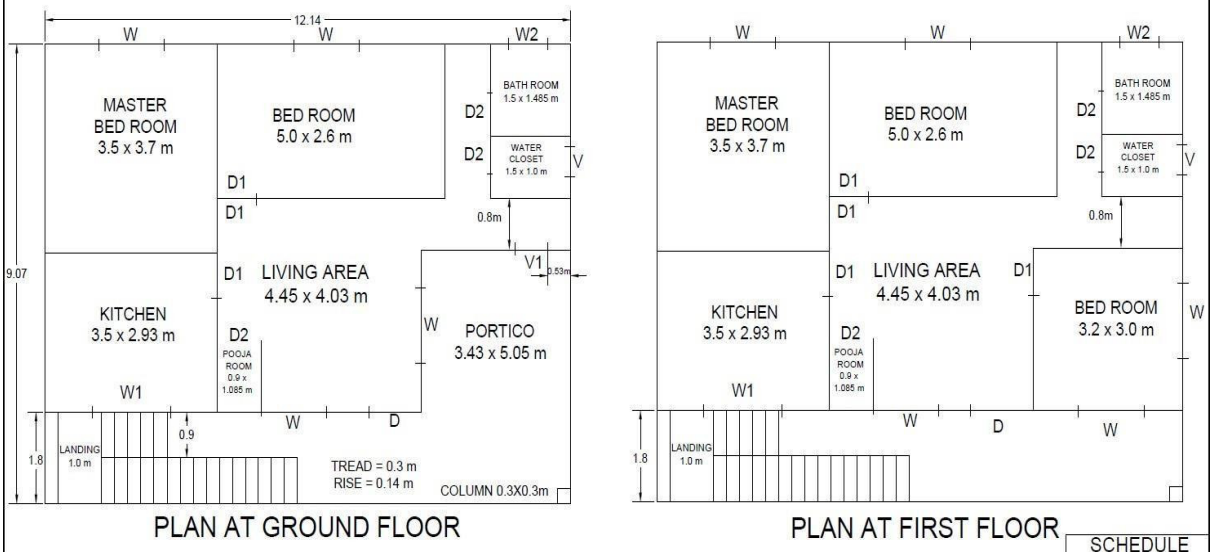
Sectional elevation - Refer Fig. 3.2.2

Elevation - Refer Fig. 3.2.3

Water supply and sanitary layout - Refer Fig. 3.2.4

Electrical layout - Refer Fig. 3.2.5

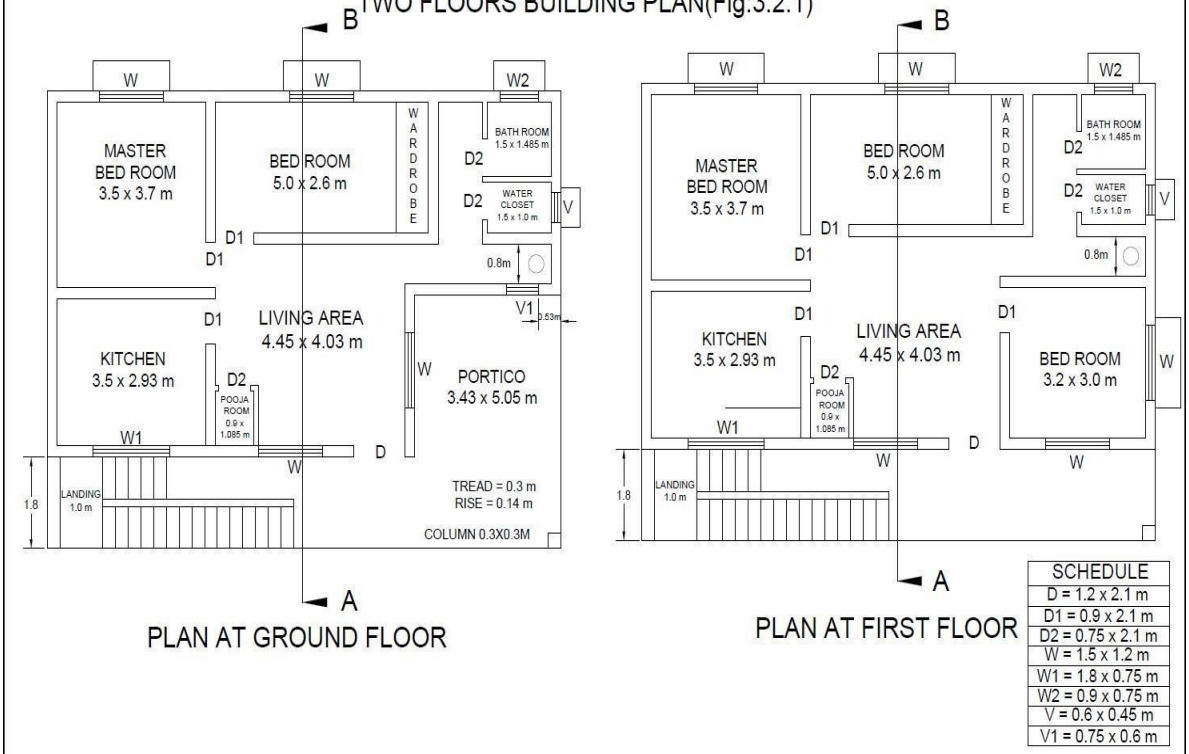
Q.no.(3.2):- LINE DIAGRAM OF TWO FLOORS BUILDING




ALL LOAD BEARING WALLS OF 230mm THICK AND PARTION WALLS AS 150mm THICK
FLOOR HEIGHT=3.0M

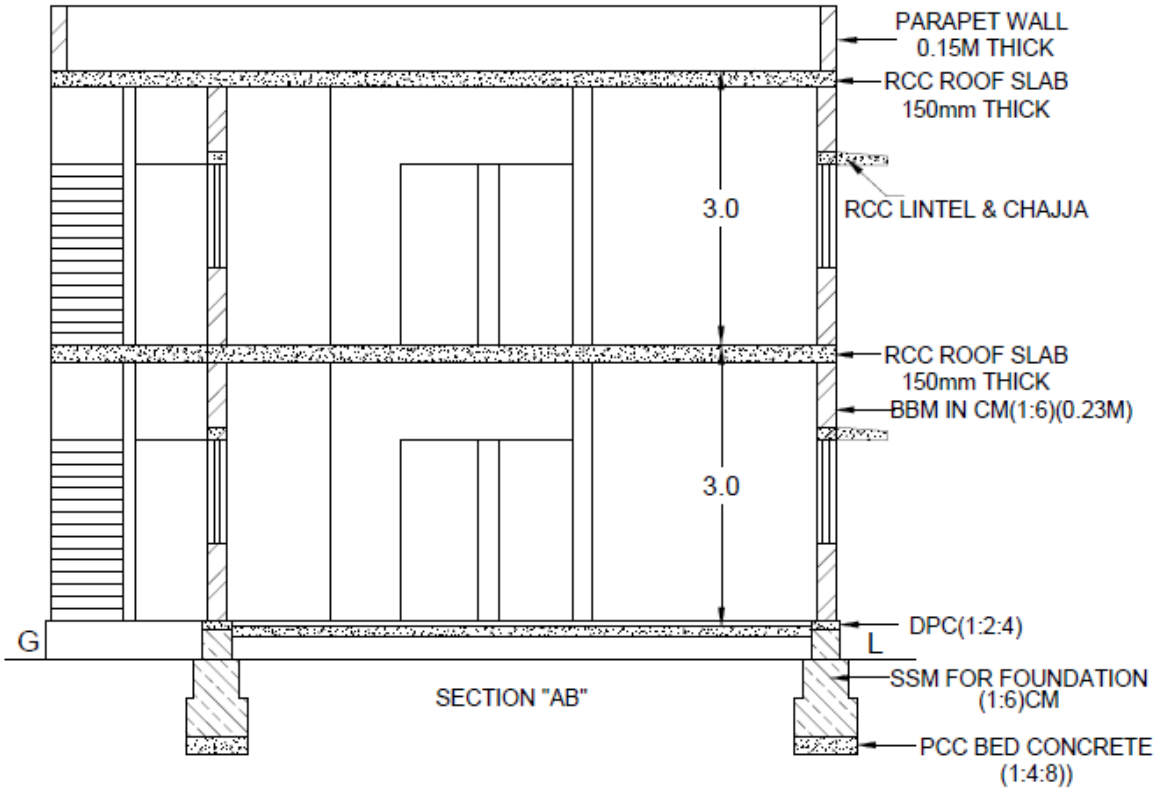
| SCHEDULE |
|---|
| D = 1.2 x 2.1 m |
| D1 = 0.9 x 2.1 m |
| D2 = 0.75 x 2.1 m |
| W = 1.5 x 1.2 m |
| W1 = 1.8 x 0.75 m |
| W2 = 0.9 x 0.75 m |
| V = 0.6 x 0.45 m |
| V1 = 0.75 x 0.6 m |

TWO FLOORS BUILDING PLAN(Fig:3.2.1)

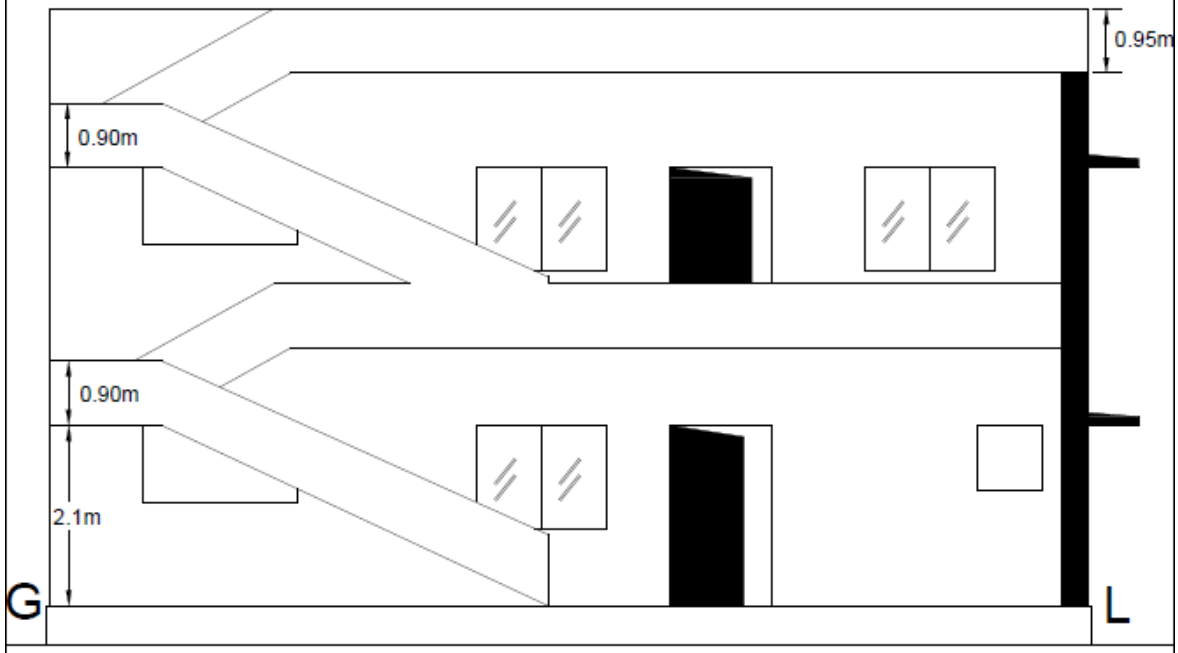



| SCHEDULE |
|---|
| D = 1.2 x 2.1 m |
| D1 = 0.9 x 2.1 m |
| D2 = 0.75 x 2.1 m |
| W = 1.5 x 1.2 m |
| W1 = 1.8 x 0.75 m |
| W2 = 0.9 x 0.75 m |
| V = 0.6 x 0.45 m |
| V1 = 0.75 x 0.6 m |

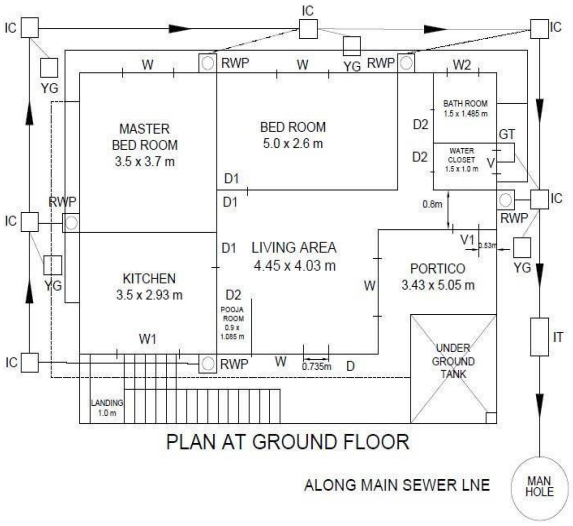
C/S OF TWO STOREY BUILDING(Fig:3.2.2)



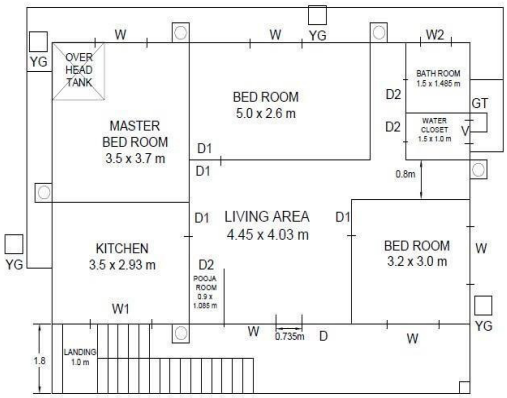

FRONT ELEVATION FOR TWO STOREY BUILDING(Fig:3.2.3)



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




PLAN AT GROUND FLOOR




PLAN AT FIRST FLOOR

ALONG MAIN SEWER LNE — MAN HOLE

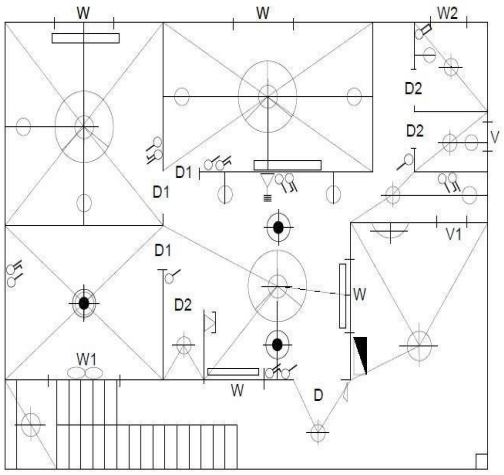
| | |
|---|---|
| □ | GULLY TRAP |
| □ | YARD GULLY |
| □ | INSPECTION CHAMBER |
| ▣ | RAIN WATER PIPE |
| ▯ | INSPECTION TRAP |

SEWER LINE

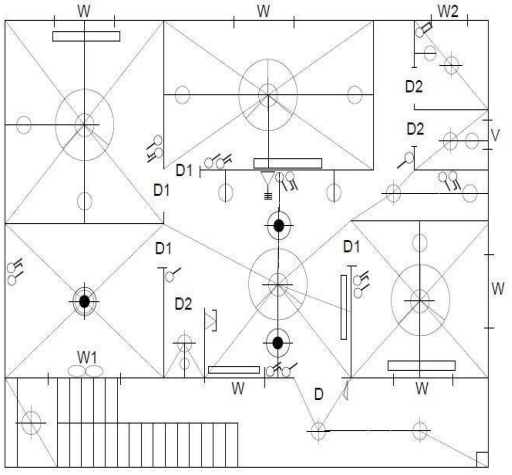
WATER SUPPLY LINE (GROUND LEVEL)

WATER SUPPLY LINE (ABOVE GROUND LEVEL)

ELECTRICAL LAYOUT FOR TWO FLOORS BUILDING(Fig:3.2.5)




PLAN AT GROUND FLOOR




PLAN AT FIRST FLOOR

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| | DROP LIGHT | | TELEPHONE POINT |
| | SOCKET / CEILING LIGHT | | DISTRIBUTION BOARD |
| | BULK HEAD | | PUSH BUTTON FOR BELL |

**Exercise 3.3**

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of Hostel building in figure Q.no.3.3.

***Solution:***

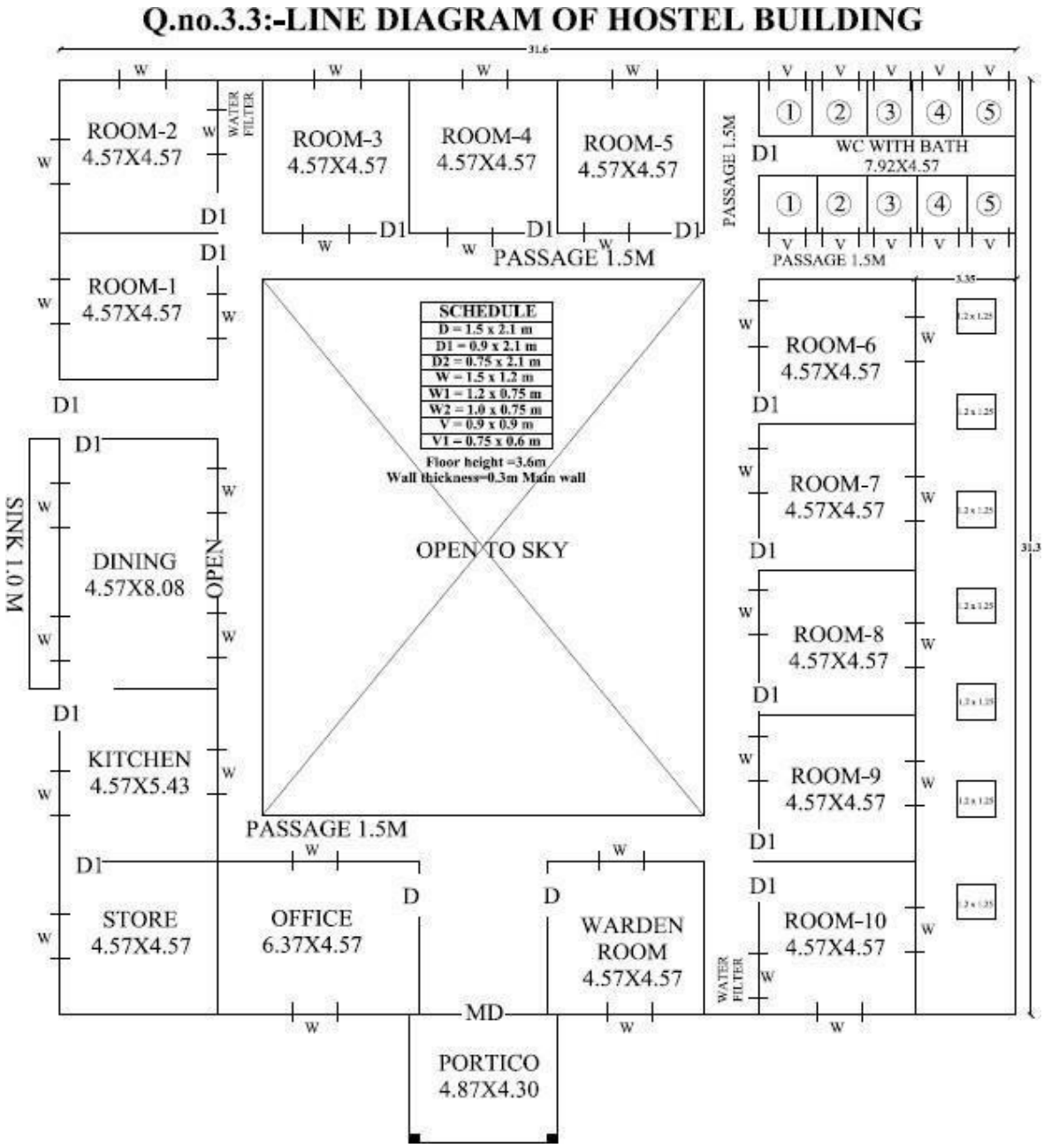
Plan – Refer Fig. 3.3.1

Sectional elevation - Refer Fig. 3.3.2

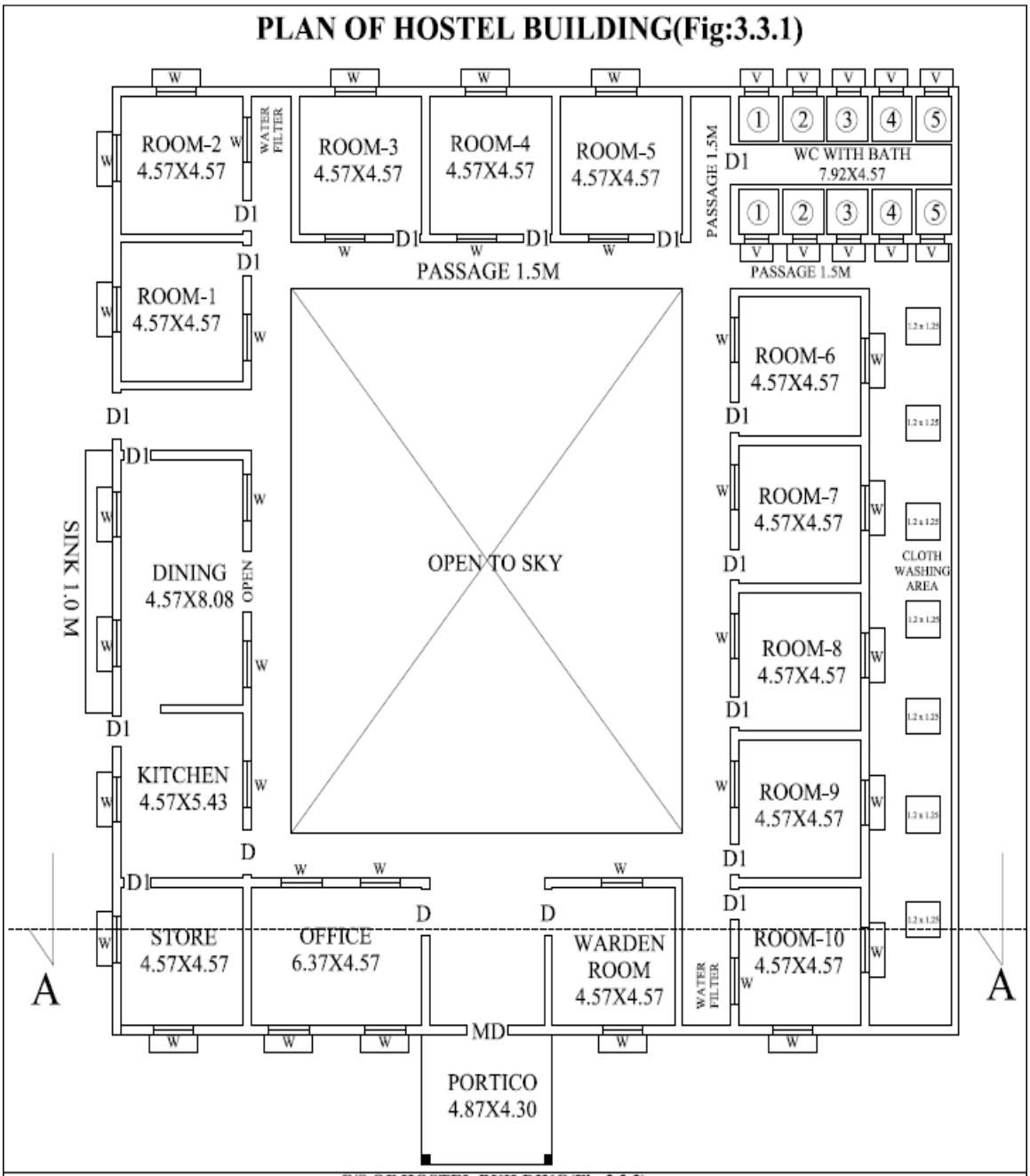
Elevation - Refer Fig. 3.3.3

Water supply and sanitary layout - Refer Fig. 3.3.4

Electrical layout - Refer Fig. 3.3.5



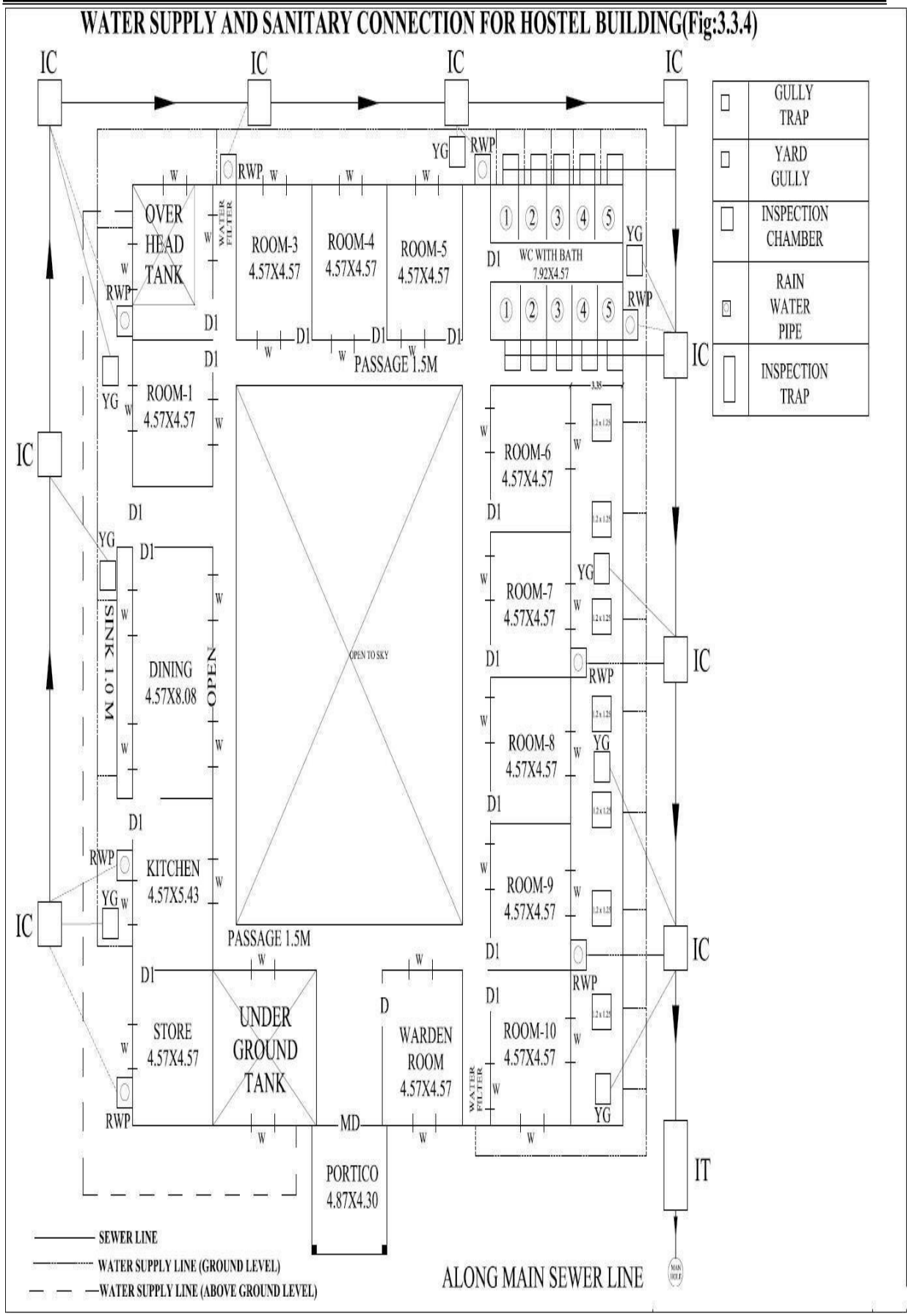
## PLAN OF HOSTEL BUILDING(Fig:3.3.1)

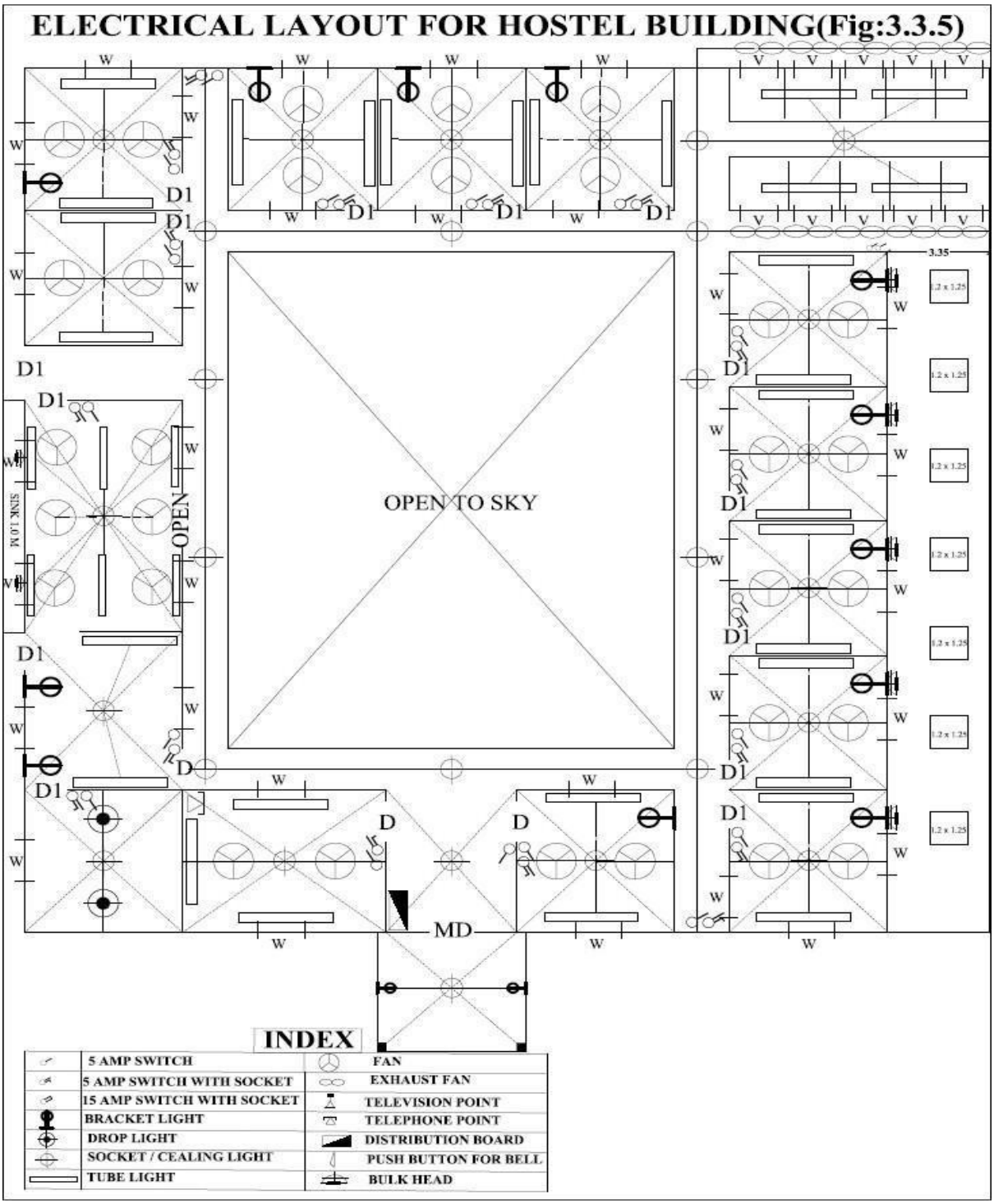



## C/S OF HOSTEL BUILDING(Fig:3.3.2)


## ELEVATION OF HOSTEL BUILDING(Fig:3.3.3)

## WATER SUPPLY AND SANITARY CONNECTION FOR HOSTEL BUILDING(Fig:3.3.4)






**Exercise 3.4**

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of Hospital building in figure Q.no.3.4.

***Solution:***

Plan – Refer Fig. 3.4.1

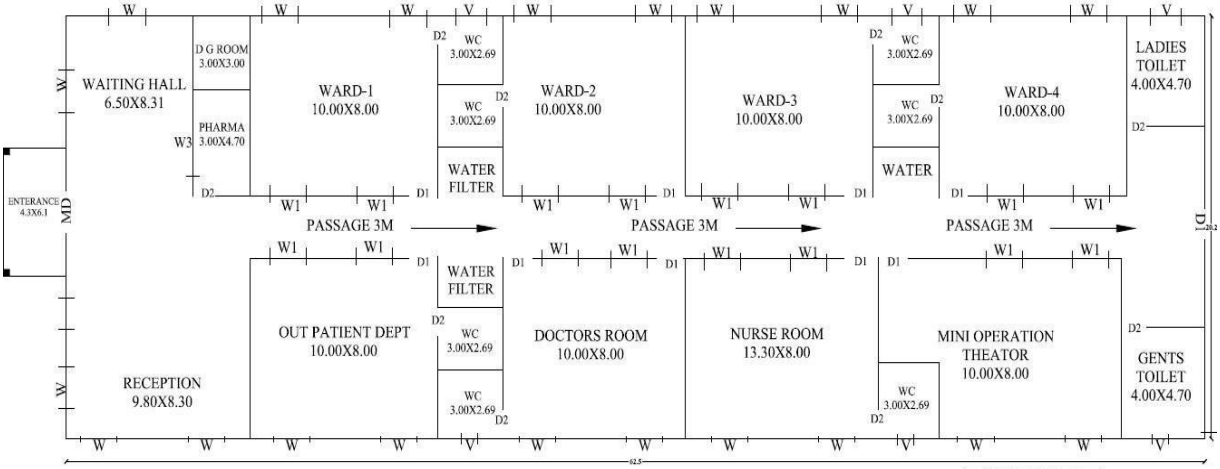
Sectional elevation - Refer Fig. 3.4.2

Elevation - Refer Fig. 3.4.3

Water supply and sanitary layout - Refer Fig. 3.4.4

Electrical layout - Refer Fig. 3.4.5

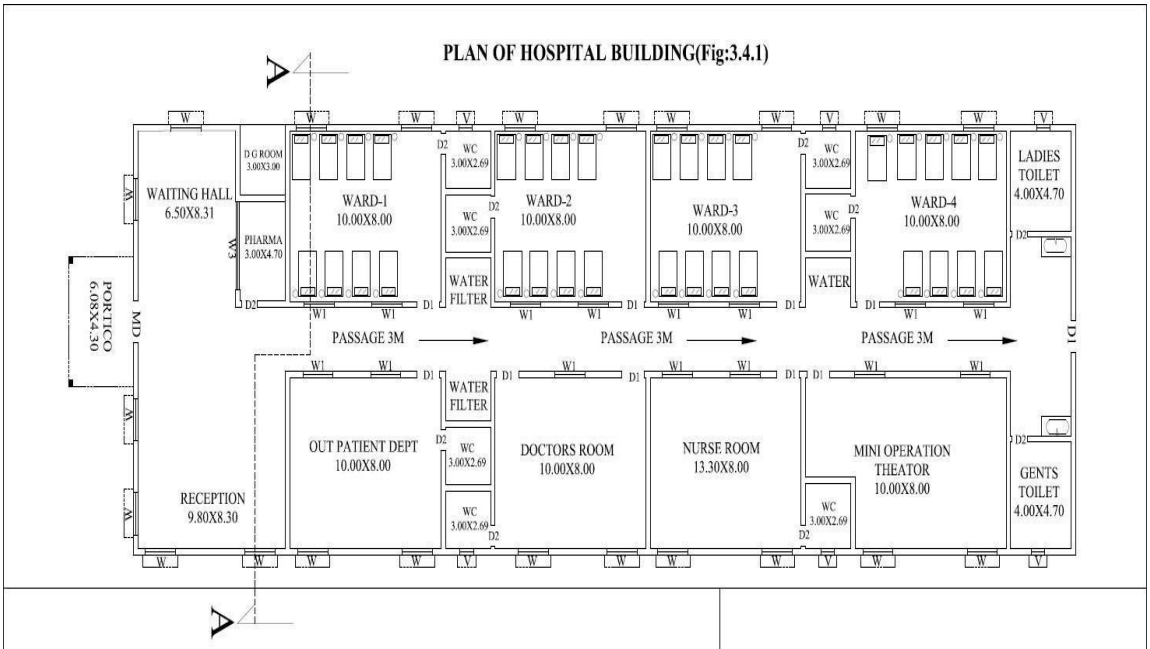
**Q.no.3.4:-LINE DIAGRAM OF HOSPITAL BUILDING**



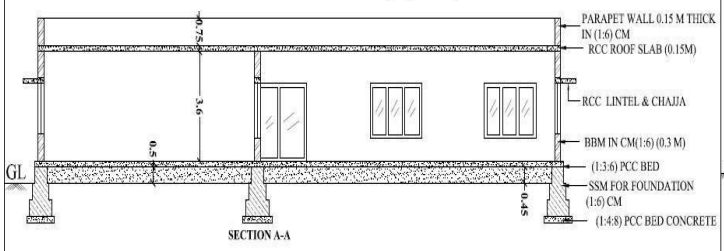

| SCHEDULE |
|---|
| D = 1.5 x 2.1 m |
| D1 = 0.9 x 2.1 m |
| D2 = 0.75 x 2.1 m |
| W = 1.5 x 1.2 m |
| W1 = 1.2 x 0.75 m |
| W2 = 1.0 x 0.75 m |
| W3 = 1.0 x 4.1 m |
| V = 0.9 x 0.9 m |
| V1 = 0.75 x 0.6 m |

Floor height=3.6 m
Wall thickness=0.3m

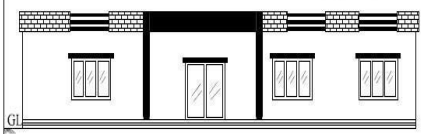
**PLAN OF HOSPITAL BUILDING(Fig:3.4.1)**

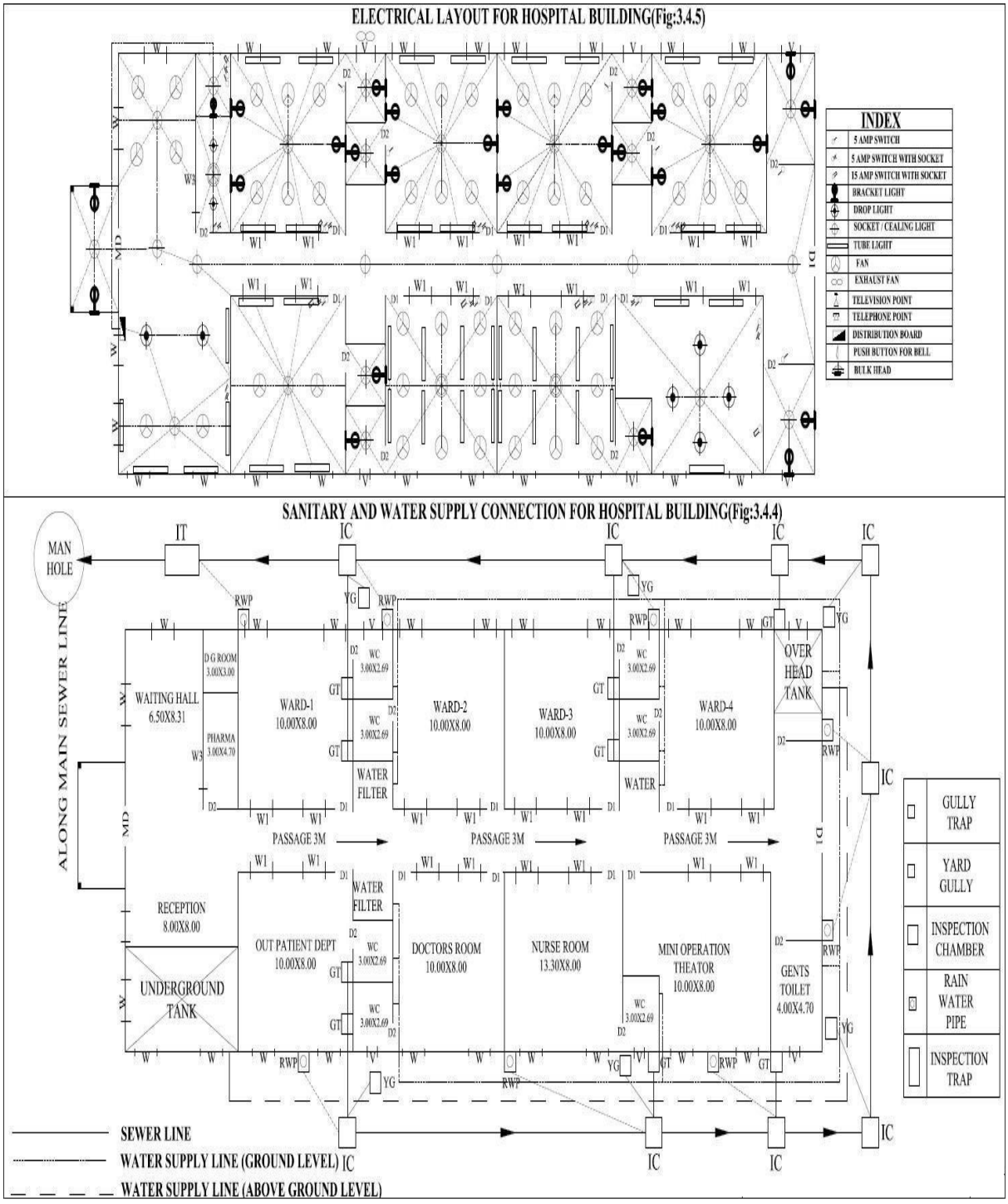



**C/S OF HOSPITAL BUILDING (Fig:3.4.2)**




**ELEVATION OF HOSPITAL BUILDING(Fig:3.4.3)**






**Exercise 3.5**

Draw plan, elevation and sectional elevation including electrical, plumbing and sanitary services for a given line diagram of school building in figure Q.no.3.5.

***Solution:***

Plan – Refer Fig. 3.5.1

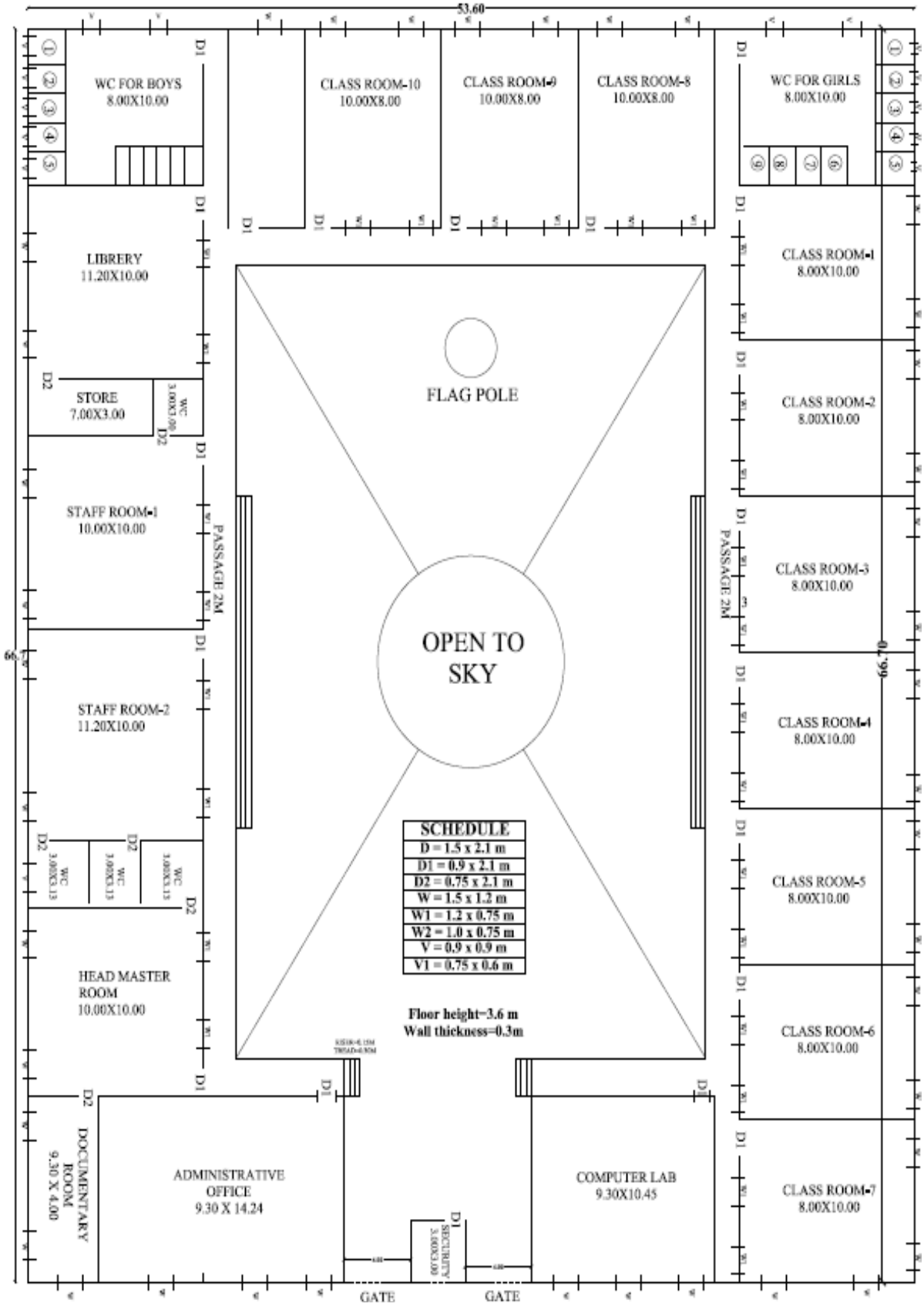
Sectional elevation - Refer Fig. 3.5.2

Elevation - Refer Fig. 3.5.3

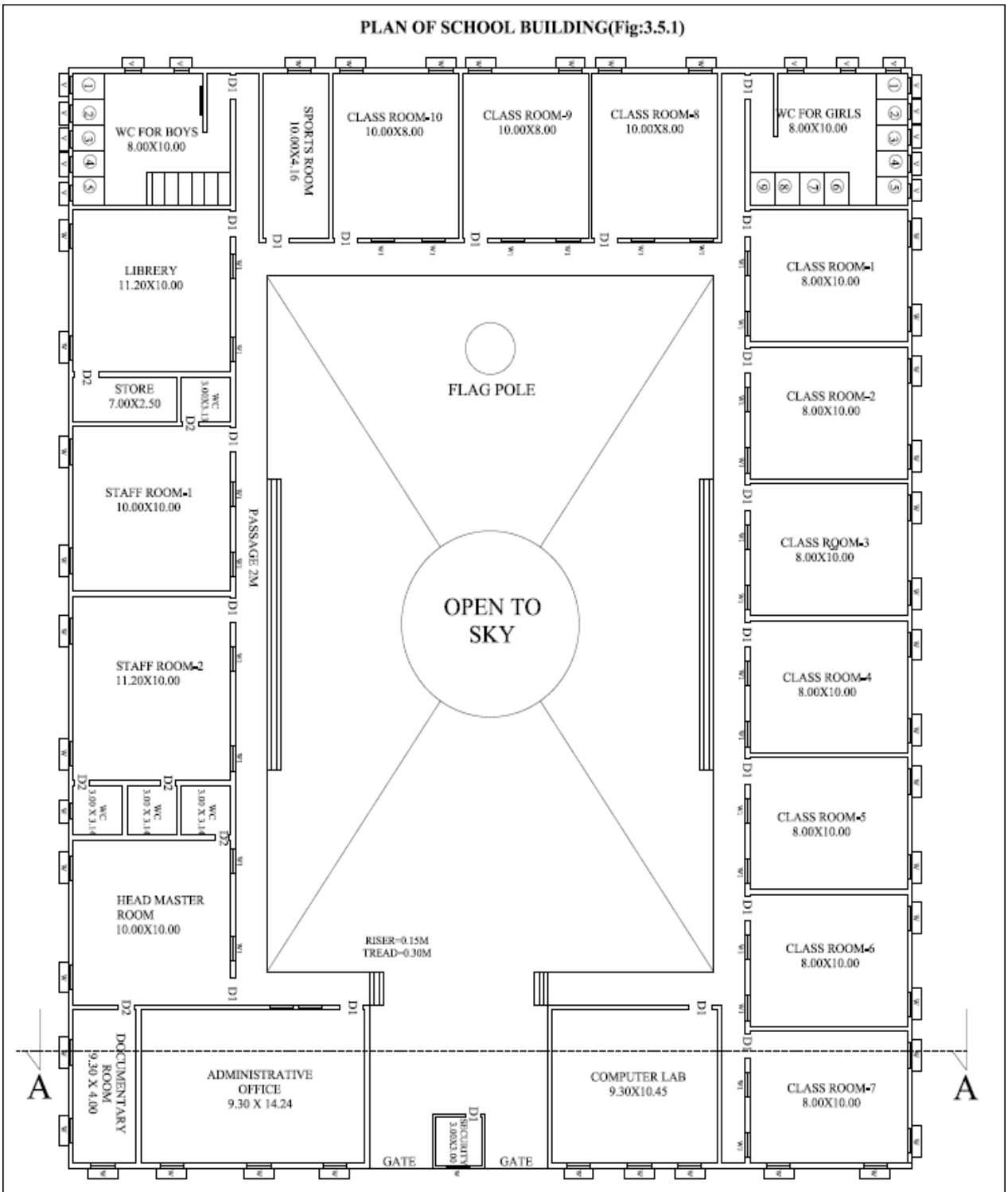
Water supply and sanitary layout - Refer Fig. 3.5.4

Electrical layout - Refer Fig. 3.5.5

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

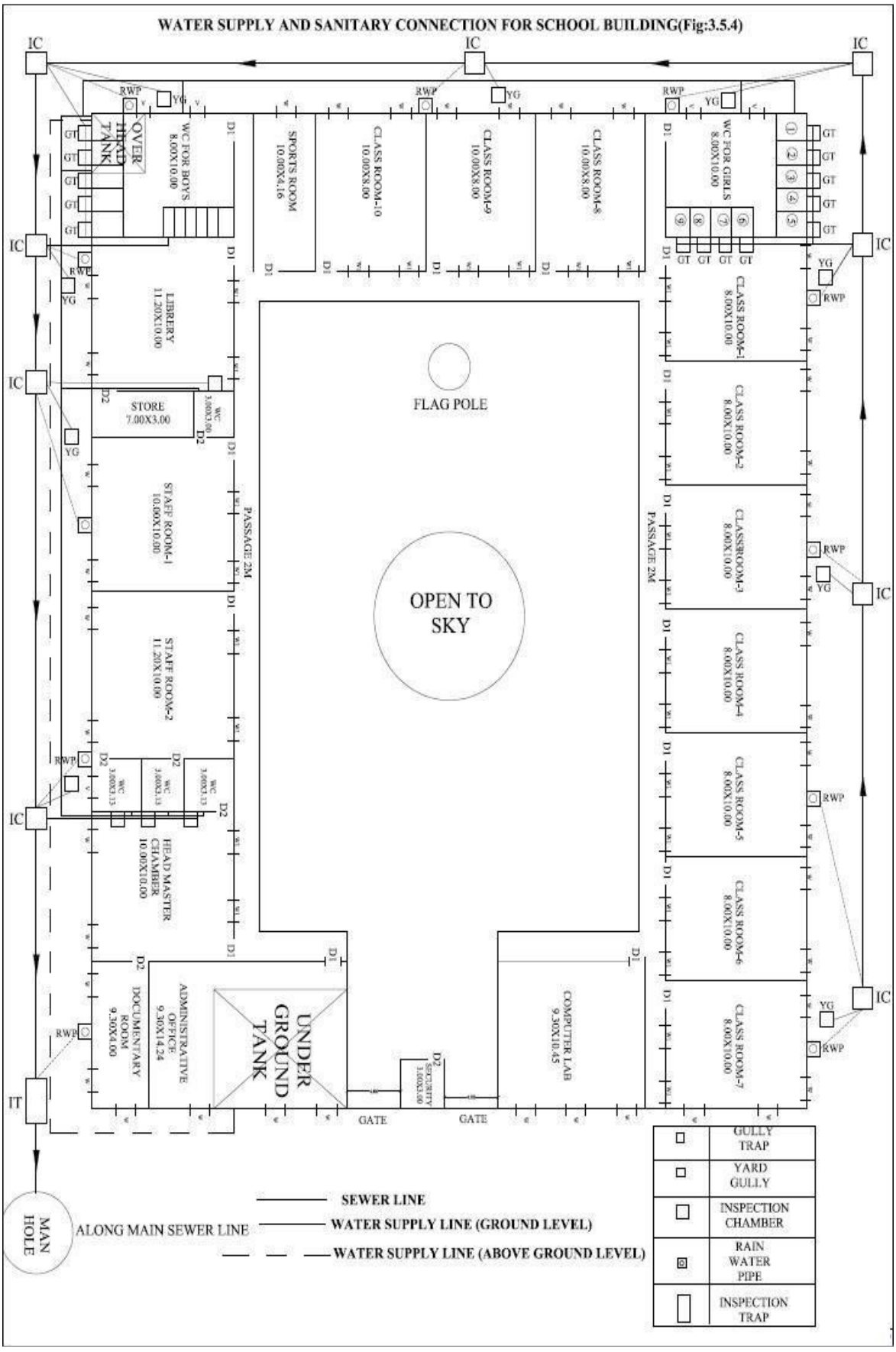


PLAN OF SCHOOL BUILDING(Fig:3.5.1)

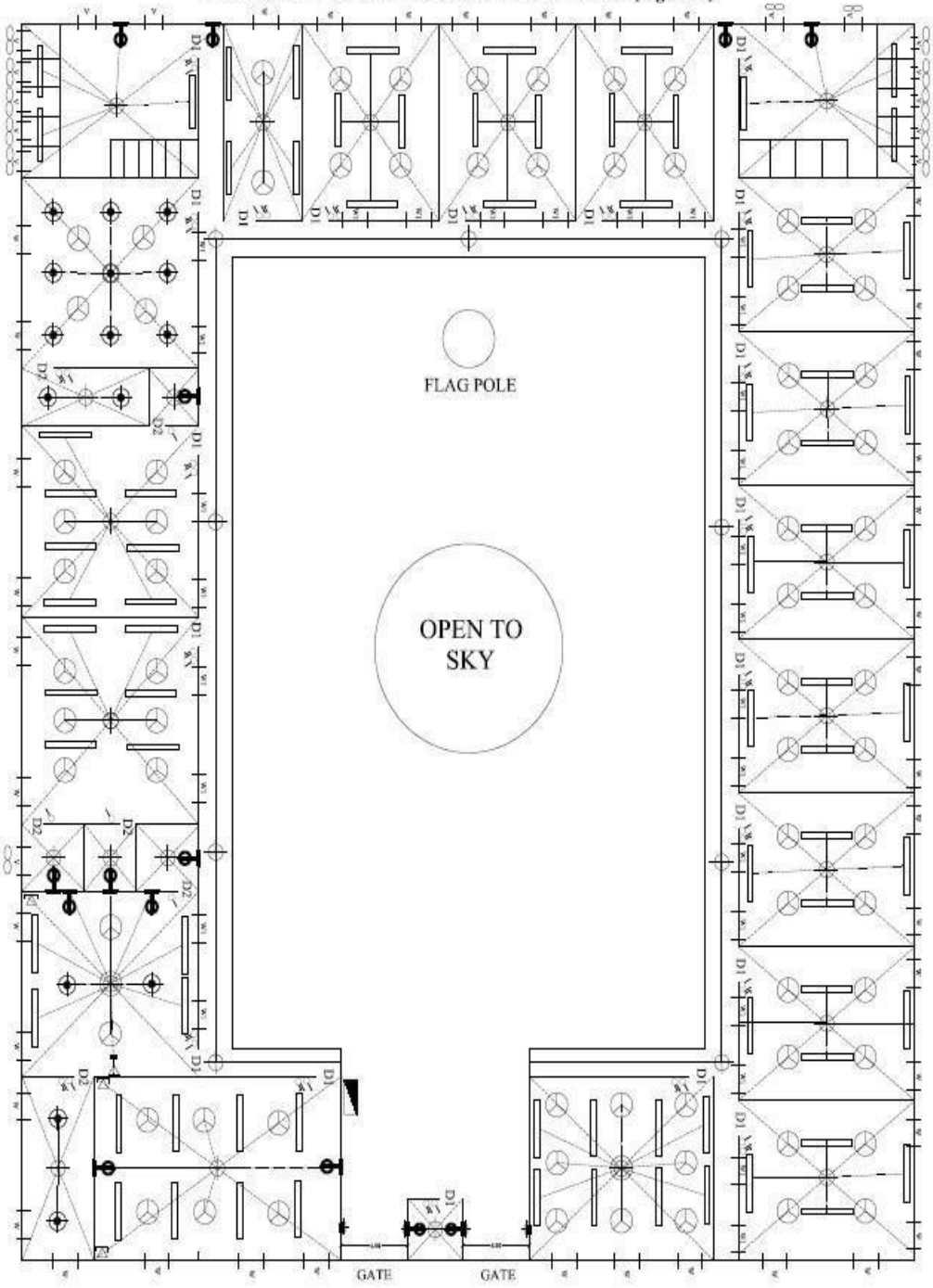



CROSS SECTION OF SCHOOL BUILDING(Fig:3.5.2)

ELEVATION OF SCHOOL BUILDING(Fig:3.5.3)


WATER SUPPLY AND SANITARY CONNECTION FOR SCHOOL BUILDING(Fig:3.5.4)
IC
RWP
YG
GT
D1
D2
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
WC 3.60X3.00
STAFF ROOM-1 10.00X10.00
STAFF ROOM-2 11.20X10.00
WC 3.60X3.15
HEAD MASTER CHAMBER 10.00X10.00
PASSAGE 2M
FLAG POLE
OPEN TO SKY
CLASS ROOM-1 8.00X10.00
CLASS ROOM-2 8.00X10.00
CLASSROOM-3 8.00X10.00
CLASS ROOM-4 8.00X10.00
CLASS ROOM-5 8.00X10.00
CLASS ROOM-6 8.00X10.00
CLASS ROOM-7 8.00X10.00
IT
DOCUMENTARY ROOM 9.30X4.00
ADMINISTRATIVE OFFICE 9.30X14.24
UNDER GROUND TANK
SECURITY 3.60X3.00
COMPUTER LAB 9.30X10.45
GATE
GATE
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)

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| | DROP LIGHT | | TELEPHONE POINT |
| | SOCKET / CEALING LIGHT | | DISTRIBUTION BOARD |
| | BULK HEAD | | PUSH BUTTON FOR BELL |

**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).

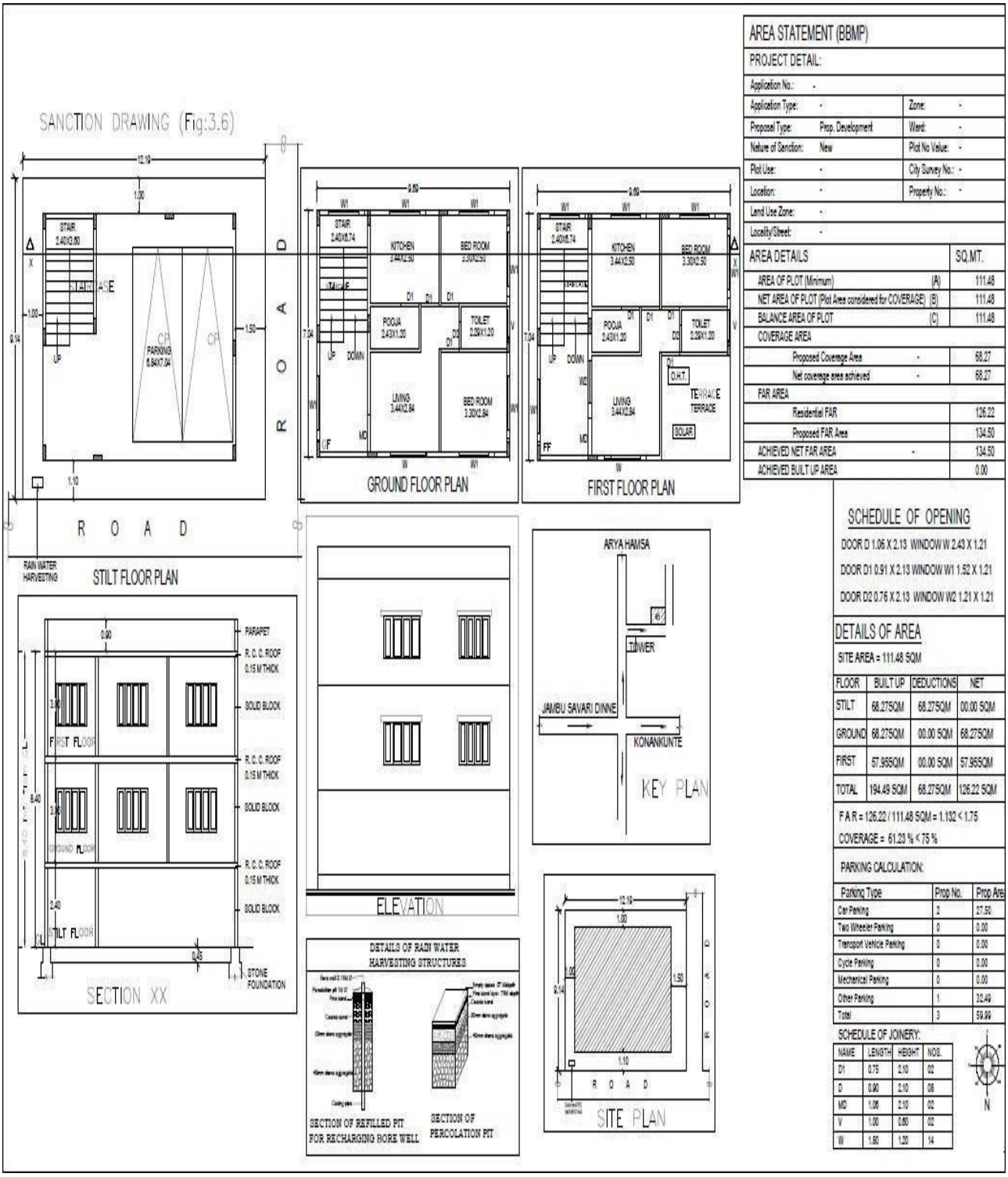
**Mandatory instructions:**

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).
5. Employment of child labour in the construction activities is strictly prohibited.

**Exercise 3.6**

Prepare the submission drawing (sanction drawing) of stilt with two storey residential building with access to terrace including all details and statements as per the local by- laws for a site of (9 x 12) m.

***Solution: Refer Fig. 3.6***



# इंटरनेट मानक

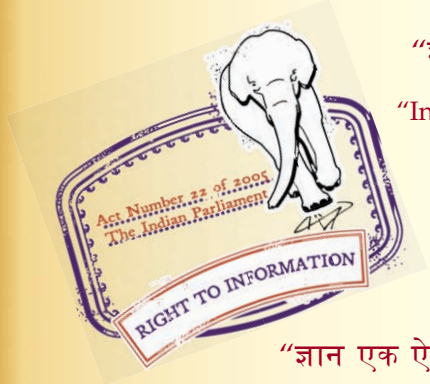
## Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 962 (1989): Code of practice for architectural and building drawings [CED 51: Planning, Housing and pre-fabricated construction]




"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"


"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 962 : 1989
( Reaffirmed 2001 )

भारतीय मानक

# वास्तुकीय और इमारती ड्राइंगों की रीति संहिता

( दूसरा पुनरीक्षण )

# *Indian Standard*

# CODE OF PRACTICE FOR ARCHITECTURAL AND BUILDING DRAWINGS

*( Second Revision )*

First Reprint JUNE 1993

UDC 721·021·22



BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

*March* 1991

Price Group 11

**Planning, Byelaws and Dimensional Co-ordination Sectional Committee, BDC 10**

CONTENTS



## FOREWORD

This Indian Standard ( Second Revision ) was adopted by the Bureau of Indian Standards on 3 April 1989, after the draft finalized by the Planning, Byelaws and Dimensional Co-ordination Sectional Committee had been approved by the Civil Engineering Division Council.

It has been found desirable to codify the numerous architectural and building drawing office practices followed in the various architectural and civil engineering departments, so that the drawings prepared in any office can be read without fear of misinterpretation. The purpose of this code is to establish certain conventions, in order to avoid confusion, increase speed and achieve quick identification wherever this is reasonably possible.

This standard was originally published in 1967. The present revision has been undertaken with a view to updating the contents of the standard. The revision takes into account international drawing practices. In this present revision recommendations with regard to sizes of drawings, scales, line work, lettering and dimensioning and nomenclature of buildings have been aligned with international practice.

Considerable assistance has been derived in the formulation of this code from the following standards published by the International Organization for Standardization:

| | |
|---|---|
| ISO 2595 : 1973 | Building drawings — Dimensioning of production drawings — Representation of manufacturing and work sizes |
| ISO 4067 ( 2 ) : 1980 | Building and civil engineering drawings — Installations — Part 2 Simplified representation of sanitary appliance |
| ISO 4067 ( 6 ) : 1985 | Technical drawings — Installations — Part 6 Graphical symbols for supply water and drainage systems in the ground |
| ISO 4157 ( 1 ) : 1980 | Building drawing — Part 1 Designation of buildings and parts of buildings |
| ISO 4157 ( 2 ) : 1982 | Technical drawings — Construction drawings designation of buildings and parts of buildings — Part 2 Designation of rooms and other areas |

This standard also covers nomenclature of floors and storeys at present covered in IS 2332 : 1972 'Nomenclature of floors and storeys', consequently this standard is withdrawn. The present nomenclature is based on international practice but the earlier provisions of IS 2332 : 1972 relating to mezzanine, galleries and basements have been retained.

# *Indian Standard*

# CODE OF PRACTICE FOR ARCHITECTURAL AND BUILDING DRAWINGS

## *( Second Revision )*

### 1 SCOPE

**1.1** This code lays down the recommendation for sizes, layout, reproduction, folding of prints, scales, projection, line work, lettering and dimensioning, graphical symbols, abbreviation, representation of materials in section, numbering of building, designation of rooms and other areas.

### 2 REFERENCES

**2.1** The following Indian Standards are necessary adjuncts to this standard:

| *IS No.* | *Title* |
|---|---|
| 9609 ( Part 1 ) : 1983 | Lettering on technical drawings : Part 1 English characters |
| 10711 : 1983 | Sizes of drawing sheets |
| 10713 : 1983 | Scales for use on technical drawings |
| 10714 : 1983 | General principles of presentation on technical drawings |
| 10720 : 1983 | Technical drawings for structural metal works |
| 11665 : 1985 | Technical drawings — Title block |

### 3 SIZES OF DRAWINGS

#### 3.1 Selection and Designation of Sizes

The original drawing should be made on the smallest sheet permitting the necessary clarity and resolution.

The choice of sizes of the original drawing and its reproductions shall be made from the series shown in **3.2**, **3.3**, and **3.4** in that order.

Drawing sheets may be used with their longer sides positioned either horizontally or vertically.

#### 3.2 Sizes Series A ( First Choice )

The preferred sizes of the trimmed sheets, as selected from the main A series, are given in Table 1.

#### 3.3 Special Elongated Sizes ( Second Choice )

When a sheet of greater length is needed, one of the sizes in Table 2 should be used.

**Table 1 Preferred Sizes**

( *Clause* 3.2 )

| Designation (1) | Dimension, mm (2) |
|---|---|
| A0 | 841 × 1 189 |
| A1 | 594 × 841 |
| A2 | 420 × 594 |
| A3 | 297 × 420 |
| A4 | 210 × 297 |

**Table 2 Special Elongated Sizes**

( *Clause* 3.3 )

| Designation (1) | Dimension, mm (2) |
|---|---|
| A3 × 3 | 420 × 891 |
| A3 × 4 | 420 × 1 189 |
| A4 × 3 | 297 × 630 |
| A4 × 4 | 297 × 841 |
| A4 × 5 | 297 × 1 051 |

These sizes are obtained by extending the shorter sides of a formaf of the A series to lengths that are multiples of the shorter side of the chosen basic format.

#### 3.4 Exceptional Elongated Sizes ( Third Choice )

When a very large or extra elongated sheet is essential, one of the sizes in Table 3 should be used.

These sizes are obtained by extending the shorter sides of a format of the A series to lengths that are multiples of the shorter side of the chosen basic format.

### 4 LAYOUT OF DRAWINGS

#### 4.1 General

For details about layout of drawings reference shall be made to IS 10711 : 1983.

**Table 3 Exceptional Elongated Sizes**

( *Clause* 3.4 )

| Designation | Dimension, mm |
|---|---|
| (1) | (2) |
| A0 × 2 | 1 189 × 1 682 |
| A0 × 3 | 1 189 × 2 523* |
| A1 × 3 | 841 × 1 783 |
| A1 × 4 | 841 × 2 378* |
| A2 × 3 | 594 × 1 261 |
| A2 × 4 | 594 × 1 682 |
| A2 × 5 | 594 × 2 102 |
| A3 × 5 | 420 × 1 486 |
| A3 × 6 | 420 × 1 783 |
| A3 × 7 | 420 × 2 080 |
| A4 × 6 | 297 × 1 261 |
| A4 × 7 | 297 × 1 471 |
| A4 × 8 | 297 × 1 682 |
| A4 × 9 | 297 × 1 892 |

*For practical reasons the use of these sizes is not advisable.

### 4.2 Revision

**4.2.1** Drawings shall record all alterations or revisions made from time to time. A convenient form is a panel giving the revision number ( or letter ), date, zone or part revised, brief record and dated initials of the approving authority.

**4.2.2** The panel for revision and any other information ancillary to the revision should be contiguous with the title block and read from bottom upwards and may run horizontally or vertically with respect to the drawing sheet.

**4.2.3** The method of assigning revision number varies with types of drawings and each organization or architect may adopt suitable internal system, but in all cases, care shall be taken that the record of revision is so tied with the drawing that it is easily found. This is particularly necessary on large sheets.

**4.2.4** The number and date of revision shall be added in the revision panel.

### 4.3 Numbering of Drawing Sheet

**4.3.1** A methodical system of numbering of drawings is essential. The system of numbering drawings shall be a matter of individual departments or firms to decide but, in general, the following rules are recommended:

a) A register, book or master file should be used for the systematic allocation of drawing numbers with a card index for ready reference. A system of straight consecutive numbering will be found to meet general conditions. In an organization, where several sections are engaged in different types of drawings, it may be convenient to issue batches of numbers to the various sections.

b) It will be advantageous to indicate the date of the drawing along with the drawing number and separated by a hyphen or a dash. This will limit the serial numbering of drawings to one calendar year, a fresh series being started every year. Location of old drawings in the register and in the filing cabinets will be easy.

**4.3.2** In case of large construction project works, where several series of drawings, for example, architectural drawings, structural drawings, constructional drawings, plumbing drawings, electrical drawings and mechanical drawings are made; the drawing number of such series shall be prefixed with letters like, A, S, O, P, E and M respectively.

**4.3.2.1** When a drawing covers several sheets for convenience in handling, as in the case of a longitudinal section of a railway or road project, the same number should be given to all the sheets in the series with the consecutive sheet number given within brackets after the sub-number. For example, a sheet should be designated as R 65-11 ( 4 of 10 ) which will indicate that the drawing is the fourth of 10 sheets in sub-number 11 of project R 65. All such sheets should be of the same size.

**4.3.3** A key diagram showing the index of sheets should be given, where necessary, at the bottom of the sheet to indicate at a glance all the drawing sheets contiguous to the sheet under consideration.

### 4.4 Repetition of Drawing Number

**4.4.1** For ready reference, the drawing number shall be repeated:

a) at the top *right-hand corner* in vertical filing, and

b) at the top *right-hand corner* and the bottom *left-hand corner* in rolls.

**4.4.2** When more than one sheet is required for the project, or a part of a complicated building or layout, and a particular drawing is one such sheet, the numbering shall show the total number of sheets in the series and the number of the particular sheet as in the following example:

'SHEET 4 OF 12'

This entry shall come next to the repeated drawing number.

### 4.5 Additional Information

**4.5.1** For details about additional information reference shall be made to IS 11665 : 1985.

## 5 REPRODUCTION OF DRAWINGS

**5.1** Original drawings and tracings are normally preserved carefully and copies are used in workshop or on sites. The following types of copies are in common use:

a) Dyeline prints are produced by exposing sensitized paper to light in contact with the original translucent drawing. They are developed to produce positive copies by means of ammonia gas or in semi-dry process by a light application of liquid developer. The copy gives black lines in semi-dry process and blue lines with ammonia process on a white or tinted background.

b) Ferro-prussiate or blue prints are developed by immersion in water. They have been largely superseded by dyeline prints.

c) Projection ( photographic ) copying on photo-sensitive materials: paper, film, and translucent paper, permits a change of scale, enlargement or reduction. To conserve filing space, for security purposes and safety in storage and transport, originals can be photographically reduced on to film. These reductions can be enlarged to make working copies or they can be inspected at an enlarged scale in a viewer, in which the image is projected on to a ground glass screen.

d) Copies which are to be water-coloured should be made on matt or rough paper.

e) Reflex copies are made on photo-sensitive materials, or translucent paper and can be produced from opaque originals. The reproductions are made by contact and must therefore be of the same size as the original.

**5.2** All the above processes, except ferro-prussiate, can provide translucent copies from which further copies can be made. These are very useful for the preparation of drawings showing services ( pipe run, etc ) which can be examined on the translucent copy.

**5.3** The dimensions, thickness and other characteristics of the lines should be kept in view while preparing drawing for micro filming.

## 6 FOLDING OF PRINTS

**6.1** The method of folding prints of drawings for storing in filing cases, attaching to correspondence files, or for binding in special reports is illustrated in Fig. 1 and 1A.

**6.2** The recommended method of folding embodies the following features:

a) The method allows drawings to be unfolded and re-folded when attached to other papers without the necessity for removal from the file and without the possibility of the print being torn. Lower portion of the left-hand margin of the sheet may be cut after retaining 297 mm long top portion in order to provide for filing the drawings in the files.

b) All maps and plans are folded to final size for convenience of record in office files.

c) There is no necessity to open up a drawing to see what it refers to as the title block, which gives the particulars of the drawings, is visible on the bottom right-hand corner of the folded drawings.

d) Plans may be opened out easily by holding firmly the top left-hand corner and pulling the bottom right-hand corner.

**6.3** The following procedure shall be adopted in the order indicated:

a) Always fold vertically first,

b) Fold horizontally next,

c) Folded drawing to be of A4 size, and

d) Title block to be on the topmost fold for easy reference.

The different stages of folding are indicated in Fig. 1 for some of the sizes.

## 7 SCALES

**7.1** The scales shall be chosen in accordance with IS 10713 : 1983.

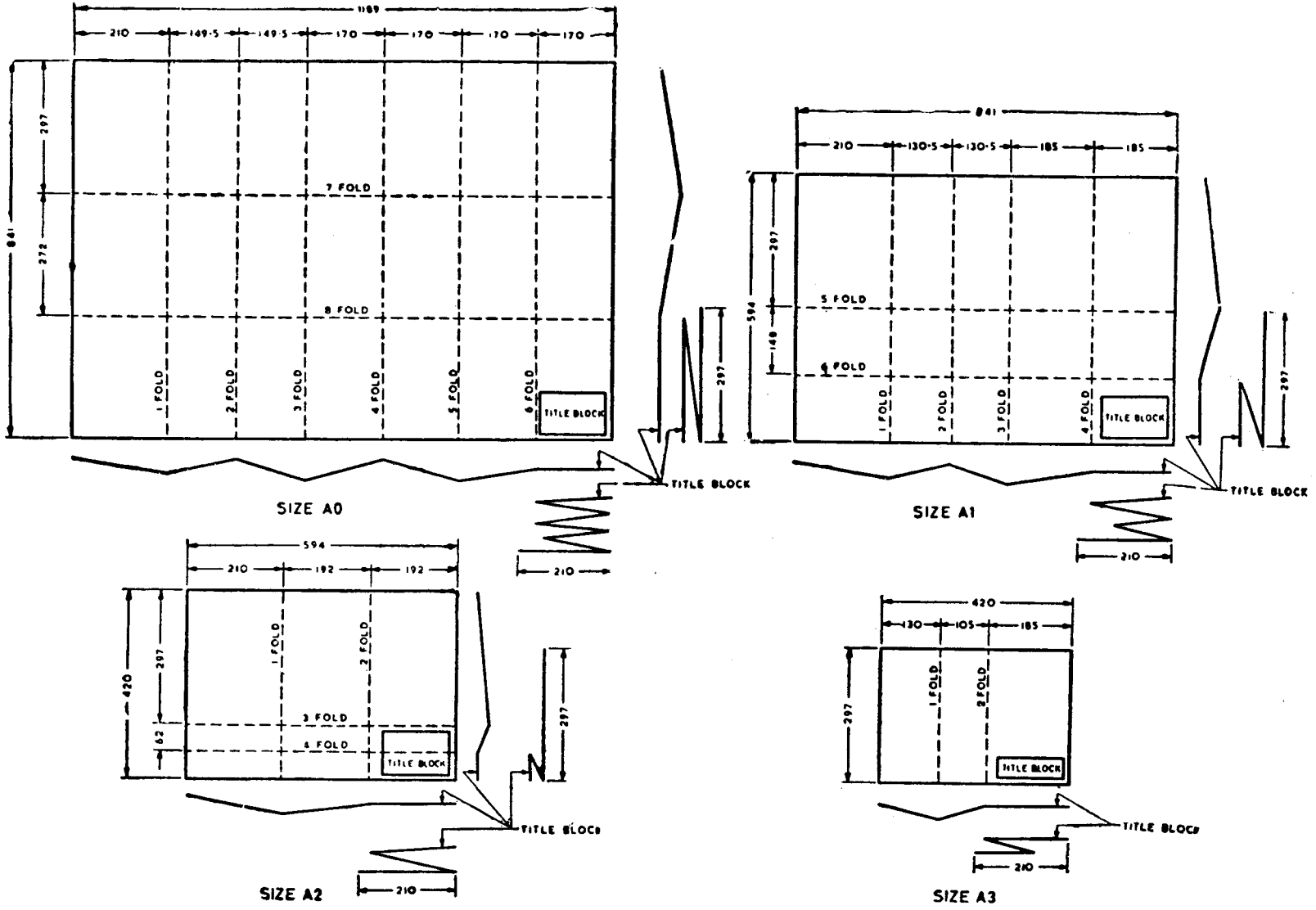
**7.2** The recommended scales for use on technical drawings are specified in Table 4.

**Table 4 Recommended Scales**

| Category | Recommended Scales | | |
|---|---|---|---|
| Enlargement scales | 50 : 1 | 20 : 1 | 10 : 1 |
| | 5 : 1 | 2 : 1 | |
| Full size | | | 1 : 1 |
| Reduction scales | 1 : 2 | 1 : 5 | 1 : 10 |
| | 1 : 20 | 1 : 50 | 1 : 100 |
| | 1 : 200 | 1 : 500 | 1 : 1 000 |
| | 1 : 2 000 | 1 : 5 000 | 1 : 10 000 |

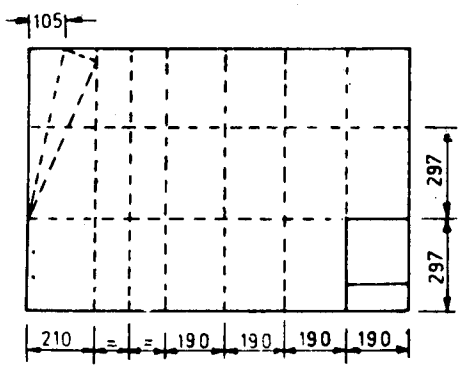
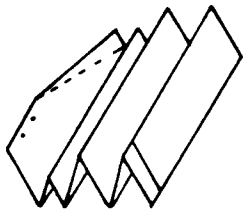
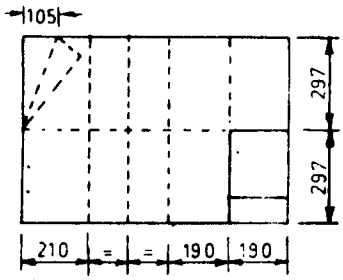
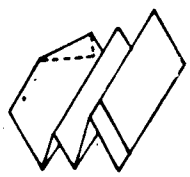
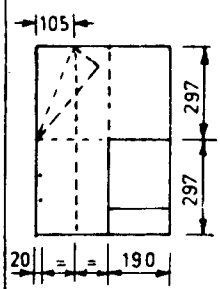
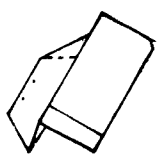
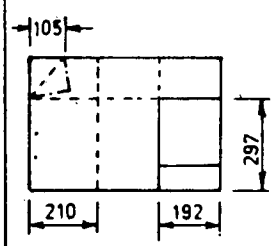
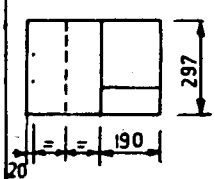
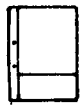
## 8 PROJECTION

**8.0** For details about principle of presentation, reference shall be made to IS 10714 : 1983.




All dimensions in millimetres.

FIG. 1 FOLDING OF PRINTS

| | | | |
|---|---|---|---|
| A0<br>841 x 1189 |  |  |  |
| A1<br>594 x 841 |  |  |  |
| A2<br>420 x 594 |  |  |  |
| A2<br>420 x 594 |  |  |  |
| A3<br>297 x 420 |  |  |  |

All dimensions in millimetres.

FIG. 1A FOLDING OF PRINTS

**8.1** First angle projection is that in which each view is so placed that it represents the side of the object remote from it in the adjacent view ( *see* Fig. 2 ).

**8.1.1** With reference to the front view, the other views are arranged as follows:

a) The view from above placed underneath,
b) The view from below placed above,
c) The view from left placed on the right,
d) The view from right placed on the left, and
e) The view from the rear may be placed on the left or on the right as found convenient.

**8.2** Third angle projection is that in which each view is so placed that it represents the side of the object near to it in the adjacent view ( *see* Fig. 2 ). This method has the important advantage that the features of adjacent views are in juxtaposition; thus it is easier than the first angle projection in projecting one view from the other when drawing, and also easier in associating those features when dimensioning or reading drawing.

**8.2.1** With reference to the front view, the other views are arranged as follows:

a) The view from above placed above,
b) The view from below placed underneath,
c) The view from the left placed on the left,
d) The view from the right placed on the right, and
e) The view from the rear may be placed on the left or on the right as found convenient.

## 9 LINE WORK

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

### 9.2 Types of Lines

The types and thickness of line shown in the Table 5 should be used.

In cases where other types or thicknesses of line are used for special fields, or if the lines specified in the table are used for applications other than those detailed in the last column of the table, the conventions adopted must be indicated or explained by notes on the drawing concerned.

### 9.3 Thickness of Lines

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

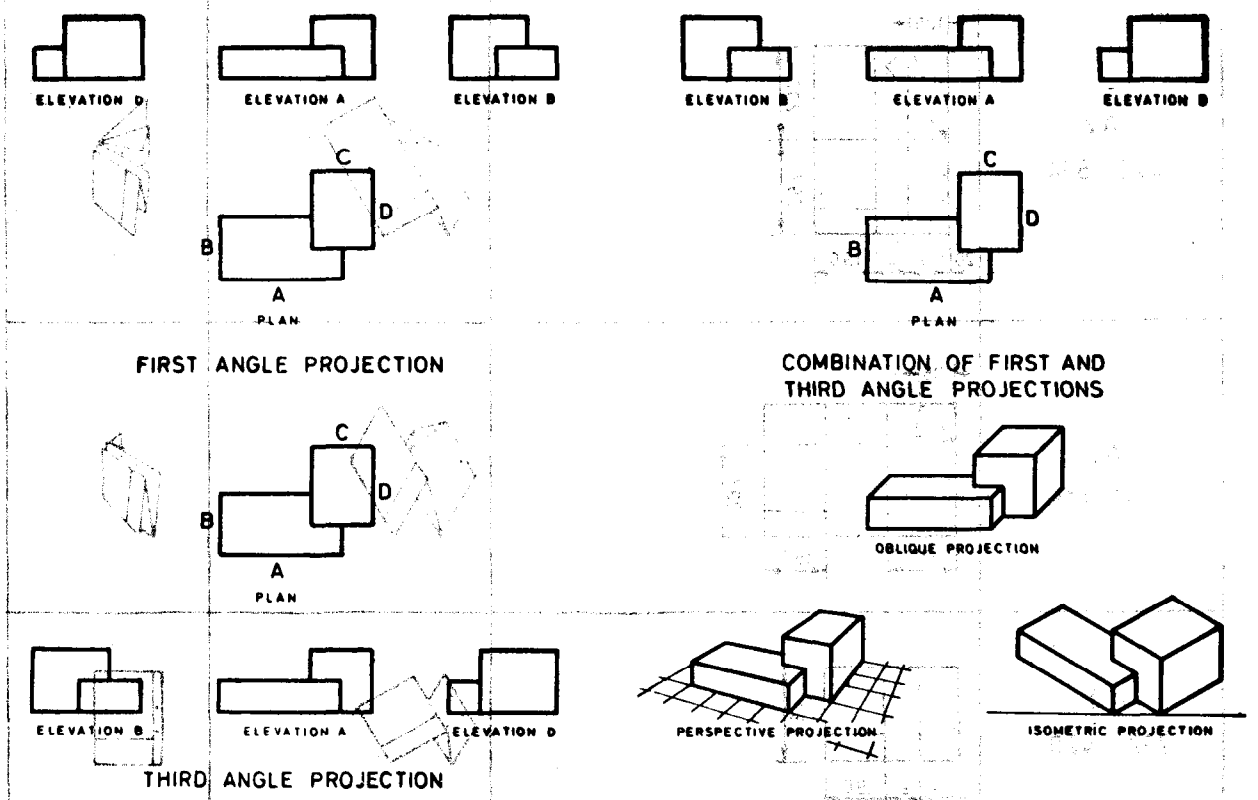



FIG. 2 METHODS OF PROJECTION

The thickness of lines should be chosen according to the size and the type of the drawing from the following range:

0·18, 0·25, 0·35, 0·5, 0·7, 1, 1·4 and 2 mm.

NOTE — Owing to difficulties in certain methods of reproduction, the line thickness of 0·18 mm should be avoided.

For all views of one piece to the same scale, the thickness of lines should be the same.

### 9.4 Spacing of Lines

The minimum space between parallel lines, including hatching, should never be less than twice the thickness of the heaviest line. It is recommended that these spaces should never be less than 0·7 mm.

**Table 5**

( *Clause* 9.2 )

| Line | Description | General Applications |
|---|---|---|
| A | Continuous thick | A1 Visible outlines<br>A2 Visible edges |
| B | Continuous thin ( straight or curved ) | B1 Imaginary lines of intersection<br>B2 Dimension lines<br>B3 Projection lines<br>B4 Leader lines<br>B5 Hatching<br>B6 Outlines of revolved sections in place<br>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*<br>E2 Hidden edges* |
| F | Dashed thin | F1 Hidden outlines*<br>F2 Hidden edges* |
| G | Chain thin | G1 Centre lines<br>G2 Lines of symmetry<br>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<br>K2 Alternative and extreme positions of movable parts<br>K3 Centroidal lines<br>K4 Initial outlines prior to forming<br>K5 Parts situated in front of the cutting plane |

*Although two alternatives are available, it is recommended that on any one drawing, only one type of line be used.

†This type of line is suited for production of drawings by machines.

## 10 LETTERING AND DIMENSIONING

**10.1** For details of lettering reference shall be made to IS 9609 ( Part 1 ) : 1983.

### 10.2 Dimensioning

**10.2.1** *Notation of Dimensioning*

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

**10.2.1.2** 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 ).

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

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

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

**10.2.2** *Termination of Dimension Lines*

**10.2.2.1** *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 ).

**10.2.2.2** *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 ).

**10.2.3** *Inscription of Dimensions*

**10.2.3.1** *Single dimensions, chain dimensions and parallel dimensions*

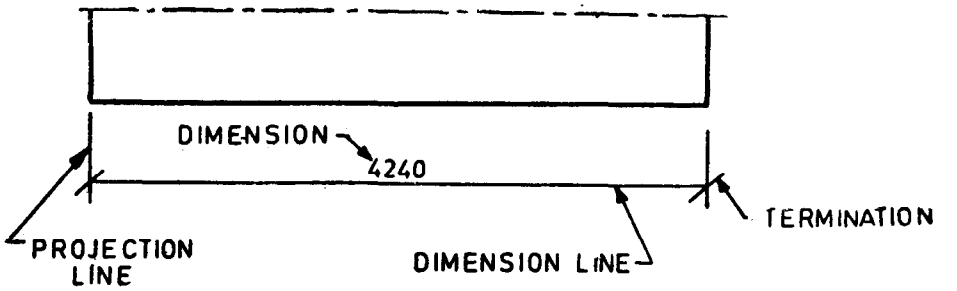
Dimensions shall be placed near the middle of, above and clear of the dimension line. The figures shall be oriented so that they can be read from the bottom or from the right of the drawing ( Fig. 4 and 5 ).

**10.2.3.2** *Superimposed running dimensions*

Dimensions shall be placed near the arrowhead:

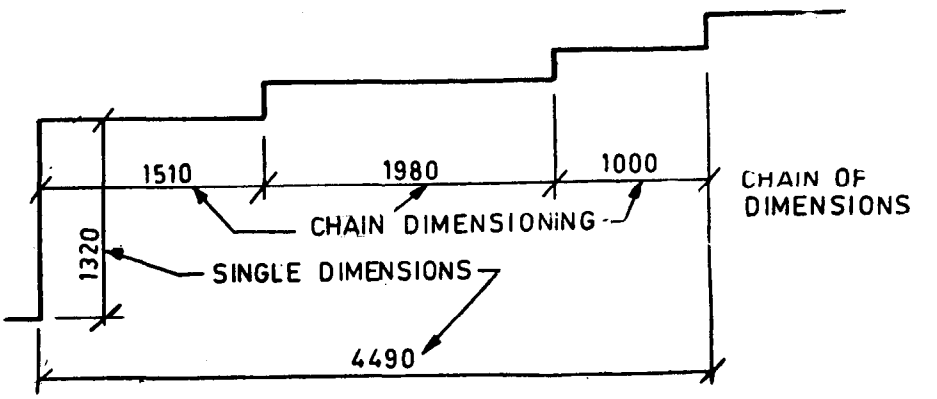
a) in line with the projection line ( Fig. 6 ), or

b) where there is no risk of confusion, above and clear of the dimension line ( Fig. 7 ).



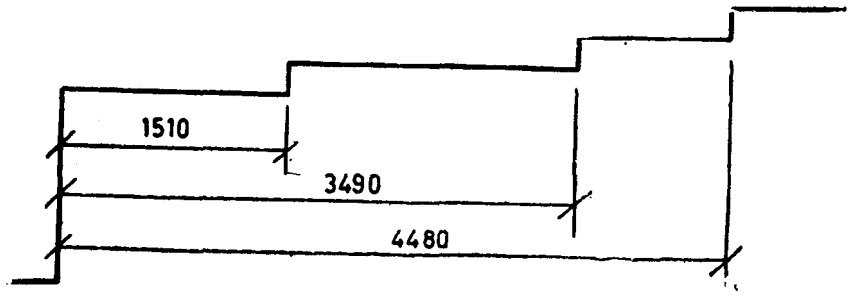

All dimensions in millimetres.

FIG. 3 SINGLE DIMENSION



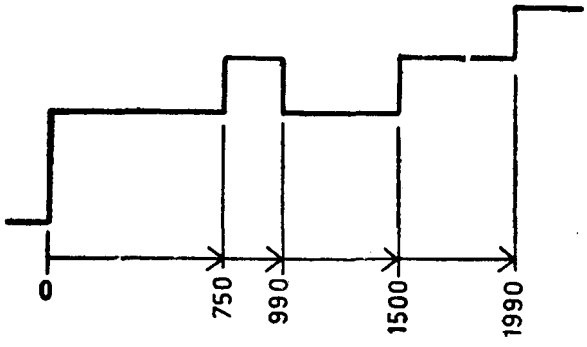

All dimensions in millimetres.

FIG. 4 SINGLE DIMENSIONS AND CHAIN DIMENSIONING



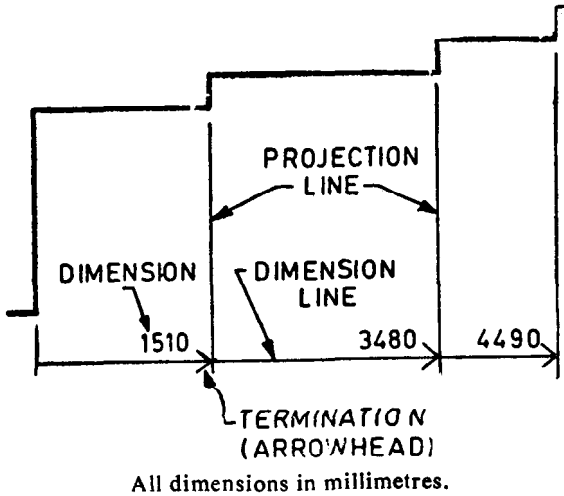

All dimensions in millimetres.

FIG. 5 PARALLEL DIMENSIONING




All dimensions in millimetres.

FIG 6 SUPER-IMPOSED RUNNING DIMENSIONS a)




All dimensions in millimetres.

FIG. 7 SUPER-IMPOSED RUNNING DIMENSIONS b)

**10.2.4** Where the structure is framed, all dimensions should be related to the column or stanchion centres, which, in turn, are related to the building line.

**10.2.5** Where the structure is of wall-bearing construction, dimensions should be related to the rough unfinished wall faces.

**10.2.6** *Units of Dimensioning*

Dimensioning shall be done normally in millimetres. The symbol for the unit may be omitted provided that a prominent note is added stating the unit in which all the dimensions of the drawing are expressed. In case other units of dimensions are used, these shall be denoted by specific notations.

## 11 GRAPHICAL SYMBOLS

**11.1** Symbols are in constant use on small-scale drawings and it is considered that time would be saved and confusion avoided if a standard rang of symbols is extensively used.

**11.2** Careful attention shall be given to the size of these symbols, having due ragard to the scale of the drawings. Wherever practicable, they shall be drawn to scale. Some symbols may have to be slightly enlarged for the purpose of clear indication.

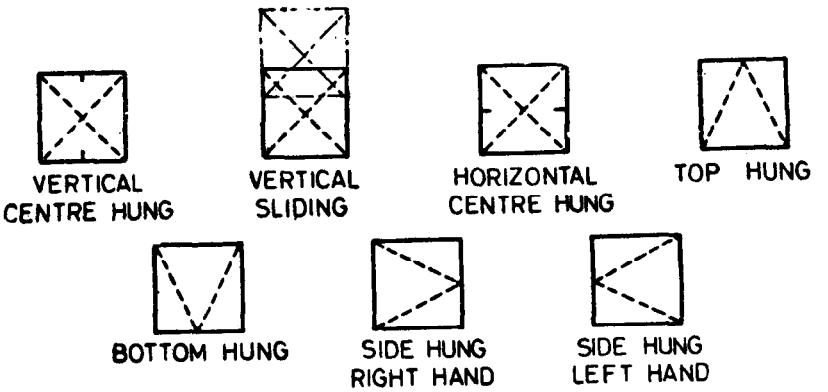
**11.3 Windows, Doors, etc**

Generally, window openings shall be defined in elevation, and doors, screens and sliding windows on the plan. Symbols for windows are shown in Fig. 8. The point or apex of two lines crossing the ventilator or casement indicates the hinged side.

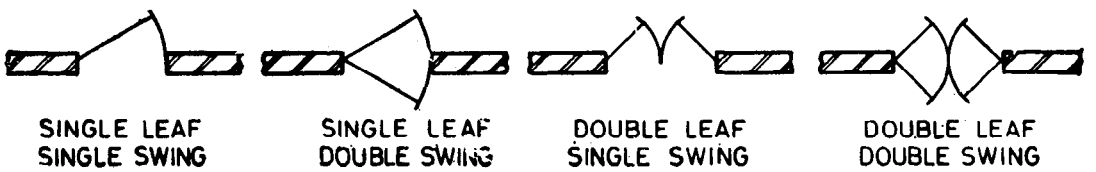
**11.4** Symbols for electrical installations shall be as given in Fig. 9.

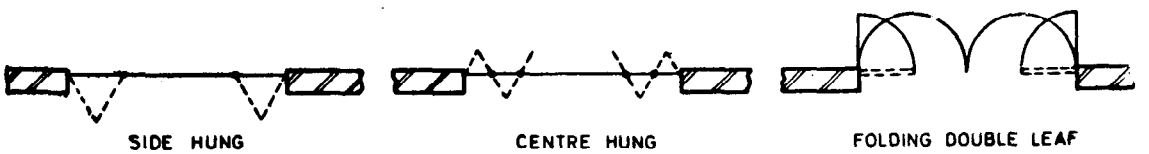
**11.5** Symbols for gas fittings shall be as given in Fig. 10.

**11.6** Symbols recommended for sanitary appliances and general fitments shall be as given in Fig. 11 and 12.

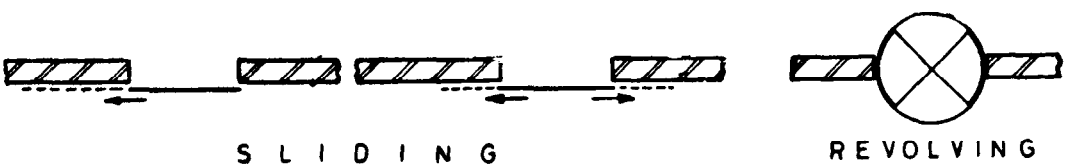


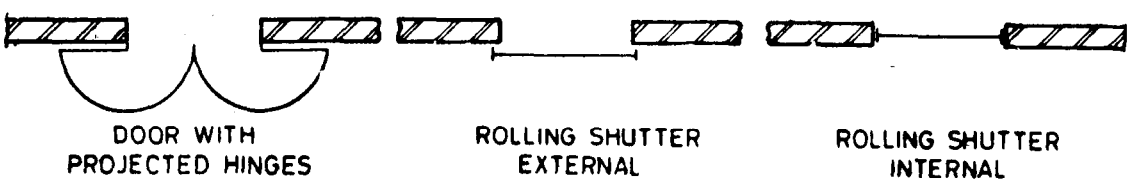

WINDOWS




SLIDING-FOLDING DOORS AND WINDOWS




DOORS

FIG. 8 GRAPHICAL SYMBOLS FOR DOORS AND WINDOWS

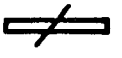
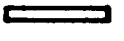
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Main fuse-board without switches, lighting |  | Counterweight pendant |  |
| Main fuse-board with switches, lighting |  | Rod pendant |  |
| Main fuse-board without switches, power |  | Chain pendant |  |
| | | Light bracket |  |
| Main fuse-board with switches, power |  | Batten lampholder |  |
| | | Water-tight light fitting |  |
| Light plugs |  | Bulk-head fitting |  |
| Power plug |  | Power factor capacitor ( when installed remote from the lamp unit ) |  |
| Distribution fuse-board without switches, lighting |  | Fluorescent light ( single ) |  |
| Distribution fuse-board with switches, lighting |  | Fluorescent light ( double ) |  |
| | | Lighting outlet connection to an emergency system |  |
| Distribution fuse-board without switches, power |  | Choke (when installed remote from the lamp unit) |  |
| Distribution fuse-board with switches, power |  | One-way switch |  |
| Main switches, lighting |  | Two-way switch |  |
| Main switches, power |  | Intermediate switch |  |
| Meter |  | Pendant switch |  |
| Single light pendant |  | Pull switch |  |

FIG. 9 SYMBOLS FOR ELECTRICAL INSTALLATIONS — *Contd*

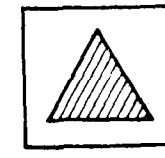
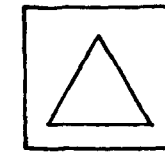
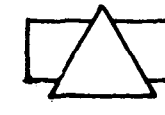
| Name | Symbol | Name | Symbol |
|---|---|---|---|
| Socket-outlet, 2 pin 5 amp |  | Bell push |  |
| Socket-outlet, 3 pin 5 amp |  | Bell |  |
| Socket-outlet and switch combined, 2 pin 5 amp |  | Buzzer |  |
| Socket-outlet and switch combined, 3 pin 5 amp |  | Indicator ( at 'N', insert number of ways ) |  |
| Socket-outlet, 2 pin 15 amp |  | Telephone instrument point public service |  |
| Socket-outlet, 3 pin 15 amp |  | Telephone instrument point internal |  |
| Socket-outlet and switch combined, 2 pin 15 amp |  | Telephone cable distribution board public service |  |
| Socket-outlet and switch combined, 3 pin 15 amp |  | | |
| Convection heater |  | | |
| Electric unit heater |  | | |
| Immersion heater |  | Telephone cable distribution board internal |  |
| Thermostat |  | | |
| Immersion heater with incorporated thermostat |  | Telephone private exchange public service |  |
| Self-contained electric water heater |  | | |
| Humidistat |  | Telephone private exchange or internal |  |

FIG. 9 SYMBOLS FOR ELECTRICAL INSTALLATIONS — *Contd*

| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| *Relay ( at 'N', insert the number of ways ) |  | Aerial |  |
| Synchronous clock outlet |  | Ceiling fan |  |
| Impulse clock outlet |  | Bracket fan |  |
| Master clock |  | Exhaust fan |  |
| Fire alarm push |  | Fan regulator |  |
| Automatic contact |  | Cooker control unit |  |
| Bell connected to fire alarm |  | | |
| Fire alarm indicator ( at 'N', insert number of ways ) |  | Earth point |  |
| | | Surge diverter |  |
| Amplifier |  | Pilot or corridor lamp |  |
| Control board |  | Indicator ( buzzer may be added, if required ) |  |
| | | Relay |  |
| Microphone outlet |  | | |
| | | Reset position |  |
| Loudspeaker outlet |  | Horn or hooter |  |
| Receiver outlet |  | Siren |  |

*This general symbol is applicable to any system by the addition of an identifying symbol ( appropriate to a particular system ) in the upper half, for example, bell system relay.

Where items of operations are combined, the symbols may be combined, for example, indicator and bell.

FIG. 9 SYMBOLS FOR ELECTRICAL INSTALLATIONS

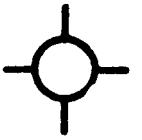
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| One-way cock, bench type |  | One-way cock, full way, bench type |  |
| Two-way cock, bench type |  | Two-way cock, full way, bench type |  |
| Three-way cock, bench type |  | One-way cock, full way, wall type |  |
| Four-way cock, bench type |  | Two-way cock, full way, wall type |  |
| One-way cock, wall type, side inlet |  | Front control, lead only, bench type |  |
| Two-way cock, wall type, side inlet |  | Front control for cock, bench type |  |
| | | Ledge cock |  |

FIG. 10 SYMBOLS FOR GAS FITTINGS

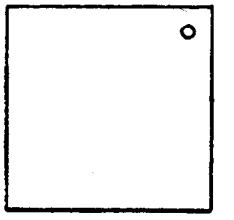
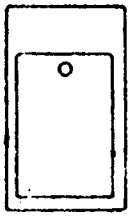
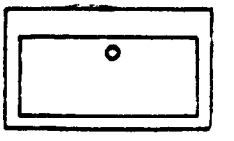
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Bath |  | Shower tray |  |
| Bidet |  | Wash basin |  |

FIG. 11 SYMBOLS FOR SANITARY INSTALLATIONS — *Contd*

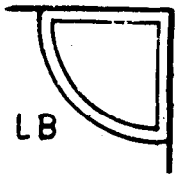
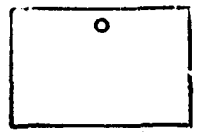
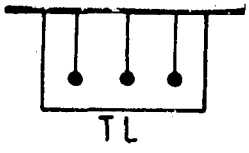
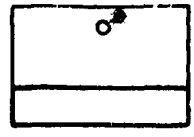
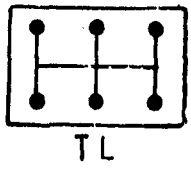
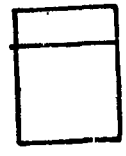
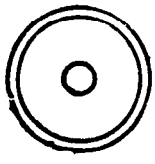
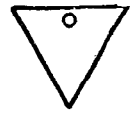
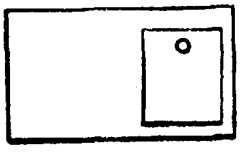
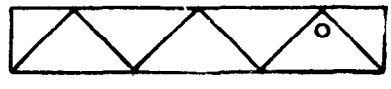
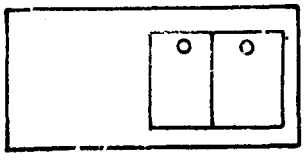
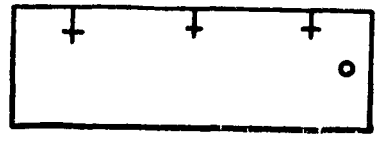
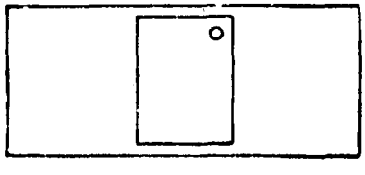
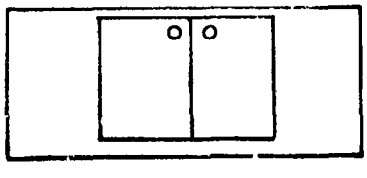
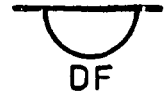
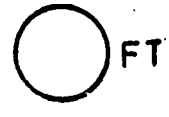
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Corner lavatory basin |   | Cleaner's sink |  |
| Trough lavatory, wall type |   | Laundry sink |  |
| Trough lavatory, island type |   | WC |  |
| Circular washing fountain |  | Urinal bowl |  |
| Single sink, left hand drainer |  | Urinal stalls |  |
| Double sink, left hand drainer |  | Industrial washing trough |  |
| Single sink, with double drain board |  | Pedestal drinking fountain |   |
| Double sink with double drain board |  | Drinking fountain, wall type |   |
| | | Floor trap |   |

FIG. 11 SYMBOLS FOR SANITARY INSTALLATIONS

| Name | Symbol | Name | Symbol |
|---|---|---|---|
| Hot or cold water drain off | | Hot water cylinder | HWC |
| Drain cock | DC | Heating feed and expansion tank | F & EXP T |
| | | Hose tack | HR |
| Stop valve or sluice valve | SV | Hose bib | HB |
| Mixing valve, hand control | | Fire extinguisher | FE |
| Mixing valve, thermostatic | | Fire cock | |
| Safety valve | | | |
| Change of pipe size | 2 1 | Fire cock | FH |
| Water meter | WM | Fire hydrant | |
| | | Sprinkler | SP |
| Horizontal calorifier with tubular heat exchanger | | Pump | P |
| Horizontal calorifier with annular heat exchanger | | Vacuum pump | VAC |
| | | Gully | G |
| Vertical calorifier with tubular heat exchanger | | Grease trap | GT |
| Vertical calorifier with annular heat exchanger | | Rain water head | RWH |
| Hot water tank | HWT | Rodding eye | RE |

FIG. 12 FITMENT SYMBOLS — *Contd*

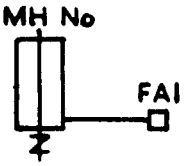
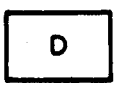
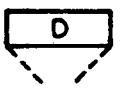
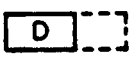
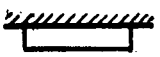
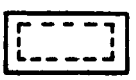
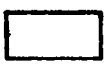
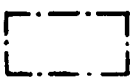
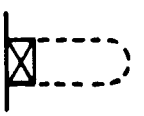
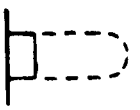
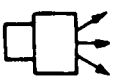
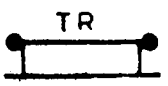
| Name | Symbol | Name | Symbol |
|---|---|---|---|
| Manhole or inspection chamber |   | Stair |   |
| Cold water cistern |   | Cooker |   |
| Intercepting trap and fresh air inlet |   | Refrigerator |   |
| Vent inlet |  | Wash boiler, 'G' gas, 'E' electric |   |
| Vent outlet |  | Washing machine, wringe type |   |
| Rain-water outlet |   | Washing machine, automatic |   |
| Radiator |   | Centrifugal dryer |   |
| Unit heater |  | Cabinet dryer |   |
| Convector |  | Rack dryer |   |
| Surface panel, wall type |  | Laundry tray, single |   |
| Surface panel, ceiling type |  | Laundry tray, double |   |
| Embedded panel in cast-in ceiling |  | Ironing machine |   |
| Embedded panel in suspended ceiling |  | Built-in ironing board |  |
| Embedded panel in cast-in floor |  | Surfacing ironing board |  |
| Unit heater |  | Bed |  |
| Towel rail |   | | |

FIG. 12 FITMENT SYMBOLS

**11.7** The following types of lines, as appropriate, shall be used to distinguish between different types of drains and pipes:

a) A line consisting of medium length, dashes, for soil or combined drains:

— — — — — — — — — —

b) A dotted chain line, for surface water drain:

— · — · — · — · — · — · —

NOTE — Lines to indicate drainage systems are frequently drawn on the reverse side of the relevant drawing.

c) A large chain line, for pipes at high level or in roof space:

— · — · — · — · — · — · —

d) A full line, for pipes at skirting or floor level.

———————————

e) An interrupted dotted line, for pipes under floors. Two lines used in the same fashion shall denote ventilating ducts, the distance apart denoting the width:

… … …

f) The direction of flow of fluid in a pipe shall be indicated by means of an arrow head thus:

Rise and direction of flow Rise: 1 in 50 

Fall and direction of flow Fall: 1 in 50 

g) The initial letters of the words: rise, drop, from above, from below, to above, to below, are used to denote the route of vertical pipes, thus:

*Upward Flow*

i) Through flow to space above TA

ii) Through flow from space below FB

iii) Both directions combining (i) and (ii) R

*Downward Flow*

i) Through flow to space below TB

ii) Through flow from space above FA

iii) Both directions combining (i) and (ii) D

**11.7.1** A vertical pipe on plan is shown by a dot in conjunction with one or the other of the abbreviations given in **11.7** (g). If the pipe is housed in a chase in the wall, the dot is shown inside the wall, surrounded by a rectangle with one face flush with the wall and the note 'IN CHASE' is added. If the pipe is encased, the dot and the rectangle are shown outside the thickness of the wall and the note 'ENCASED' is added.

**11.7.2** Identification letters shall be used to denote the services thus:

air, A; drainage, D; electricity, E; fire service, F; gas, G; oil, O; refrigeration, R; steam, S; water, W.

**11.8** Symbols for rolled steel sections are given in IS 10720 : 1983.

**11.9** Conventional signs for land survey plans are given in Fig. 13.

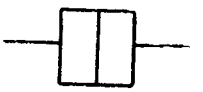
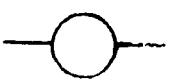
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Village as surveyed: | | Wells fitting and other components for supply water and drainage system in the ground — General Symbol |  |
| a) Open |  | | |
| b) Walled |  | Rain water well ( street inlet ) |  |
| Deserted site |  | Inspection well ( cleaning well )<br>a) manhole<br>b) cleaning well |  |

FIG. 13 SYMBOLS FOR LAND SURVEYING — *Contd*

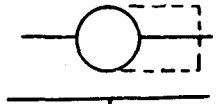
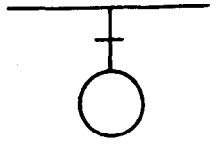
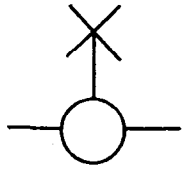
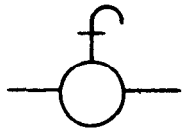
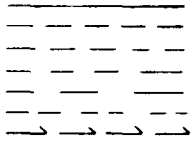
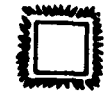
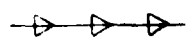
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Draining well |  | Swamp or marsh with cultivation |  |
| Manhole and protection pipe |  | Reeds in perennial water |  |
| Well for drainage of pressure conduits |  | Culvert |  |
| Well with de-aeration device |  | Lake or tank, as surveyed: With defined limit of perennial water |  |
| Flushing post |  | Lake or tank, as surveyed: With fluctuating limit of perennial water |  |
| General well |  | Lake or tank, as surveyed: With embankment under 3 m |  |
| Spring |  | Lake or tank, as surveyed: With embankment 3 m or over |  |
| Conduit, ditch and pipe — General symbol |  | Lake or tank, as surveyed: With very steep embankment |  |
| Method A: All kinds of conduits and pipes ( continuous line in combination with designation code ) |   | Excavated tank, as surveyed: Perennial |  |
| Method B: ( Symbolic line, indication of the nature of fluids ) |  | Excavated tank, as surveyed: Non-perennial |  |
| Proposed conduit and pipe — General symbol ( Methods A and B ) Continuous thick line ( Type A of ISO 128 ) |  | Excavated tank, as surveyed: Perennial with high embankment |  |
| Existing conduit and pipe — General symbol ( Methods A and B ) Continuous thin line ( Type B of ISO 128 ) |  | Tank, conventional: Perennial |  |
| Pressure sewage pipe ( Arrow is the symbol ) |  | Tank, conventional: Non-perennial |  |

FIG. 13 SYMBOLS FOR LAND SURVEYING — *Contd*

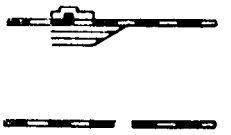
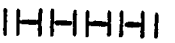
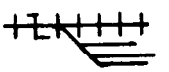
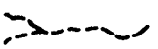
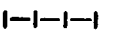
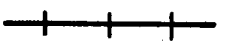
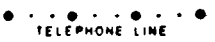
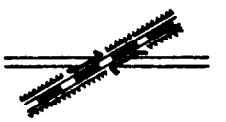
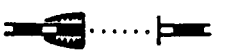
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Water reservoir |  | Railway, broad gauge double-line:<br>i) Open, with sidings, distance stone and station with enclosure ( as surveyed )<br>ii) Under construction |  |
| Water pumping station |  | | |
| Water treatment plant |  | Railway, broad gauge single-line:<br>i) Open, with sidings, and station and enclosure ( conventional ) |  |
| Waste water reservoir |  | | |
| Waste water pumping station |  | ii) Under construction |  |
| Waste water treatment plant |  | Railway, other gauges double-line:<br>i) Open with sidings |  |
| Quarry, with greatest depth |  | ii) Under construction |  |
| Single line stream: Perennial |  | Railway, other gauges single-line:<br>i) Open with sidings |  |
| Single line stream: Approximate or undefined |  | ii) Under construction |  |
| Telegraph line |  | Mineral line or tramway |  |
| Telephone |  | Level crossing |  |
| Electric power line:<br>Main transmission line with substation<br>i) conventional on all scales<br>ii) local distribution line ( conventional) |  <br>  | Road over railway |  |
| Ropeway with terminus |  | Road ( or railway ) under railway |  |
| Wireless station:<br>i) As surveyed |  | Railway tunnel, with or without cutting, as surveyed |  |
| ii) Conventional |  | Tunnel ( different purposes, proposed |  |

FIG. 13 SYMBOLS FOR LAND SURVEYING — *Contd*

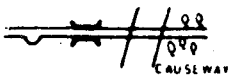
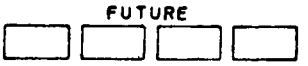
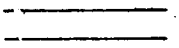
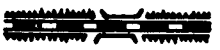
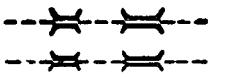
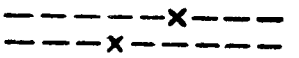
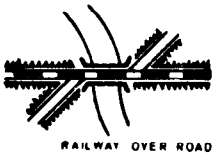
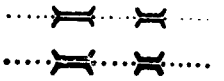
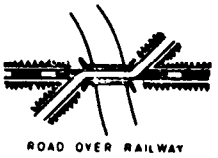
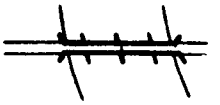
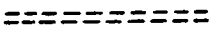
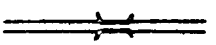
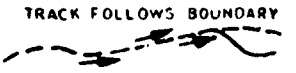
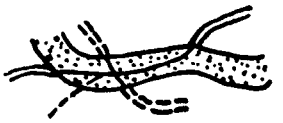
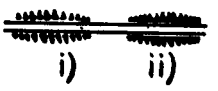
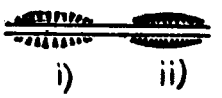
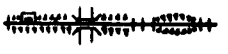
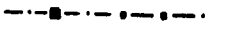
| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Tunnel, existing |   | Other roads:<br>i) Metalled, also di stance stone, bridge and Irish bridge or causeway, and avenue of trees |   |
| Tunnel, future |   | ii) Unmetalled |  |
| Ditch, permanently open |  | Cart-track with bridge |  |
| Bridge carrying railway |  | Pack-track with bridge, culvert |  |
| Bridge carrying: | | Pack-track with pass and height |  |
| i) Railway over road |   | Foot-path with bridge, culvert:<br>In symbol of tracks the heavier symbols should be used in afforested or contoured areas or where emphasis is required in open areas. Symbols may be still heavier if required to give emphasis in afforested or contoured areas |   |
| ii) Road over railway ( the descriptive wording should be omitted only where there is no room ) |   | |  |
| Bridge carrying road and broad gauge railway: |  | Bridge of boats or pontoon bridge (explanatory words to be typed against the symbol) |  |
| Roads of 1st importance:<br>i) Metalled, and important bridge with piers over river ( the normal distance between the piers should be 3 mm on scale of drawing, varying slightly to permit an equal spacing between piers ) |  | Ferry or ford |   |
| | | Track or path coincident with bed of stream:<br>i) For short distance |  |
| ii) Unmetalled |  | ii) For long distance |   |
| | | Track or path following boundary:<br>i) Short distance |  |
| Roads of 2nd importance:<br>Metalled |  | ii) Long distance |   |

FIG. 13 SYMBOLS FOR LAND SURVEYING — *Contd*

| NAME | SYMBOL |
|---|---|
| Roads in dry river-bed: | |
| i) With steep river banks |  |
| ii) With shelving river banks |  |
| |  |
| Unmetalled road along tank bund | OR WHEN SPACE PERMITS  |
| Road or railway embankment: | |
| i) 2 m to 3 m high |  i) ii) |
| ii) 3 m high or over and steep, with sharp edge at top | |
| Road or railway cutting: | |
| i) 2 m to 3 m deep |  i) ii) |
| ii) 3 m deep or more and steep, with sharp edge at top | |
| Protective embankment: | |
| i) 2 m to 3 m high |  i) ii) |
| ii) 3 m high or over and steep, with sharp edge at top | |
| Embankments, cuttings and bridges: | |
| i) With narrow gauge railway ( 'sleepers' omitted ): Along single-line |  |
| ii) With narrow gauge railway ( 'sleepers' omitted ): Along double-line ( *Note*—'Single line' or 'Double line', may be typed along the line, if necessary ) |  |
| International boundaries: | |
| i) Without pillars |  |
| ii) With main and subsidiary pillars |  |

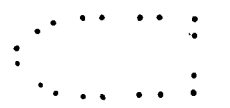
| NAME | SYMBOL |
|---|---|
| State boundaries: | |
| i) Demarcated |  |
| ii) Undemarcated |  |
| District boundaries |  |
| Sub-division, township, taluk, tahsil, zamindari or similar partition |  |
| Pargana boundary in Uttar Pradesh |  |
| Reserved or protected forest ( green riband will appear along the external boundaries and along those between forests of different ownerships ) |  |
| Village boundaries: In symbols for boundaries boundary pillars should be drawn first, fitting in the boundary symbol afterwards, even if the length of bars does not agree |  |
| Boundaries along: | |
| i) One side of road, track or path |  |
| ii) Centre of road, track or path ( when it is the recognised boundary ) |  |
| iii) One side of river |  |
| iv) Centre of river |  |
| v) Bed of river as surveyed |  |

FIG. 13 SYMBOLS FOR LAND SURVEYING — *Contd*

| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Wooded area: | | Trees: | |
| i) Not enclosed | | i) Scattered | |
| | | ii) Surveyed | |
| ii) Enclosed by wall or permanent fence | | Scattered scrub and undergrowth | |
| Limits of cultivation, open and along stream of ravine | | Grass: | GRASS 3 m HIGH |
| | | High with description of height and variety | |
| Demarcated limits of camping ground | CAMP | Cane-brake | |
| Salt pan | SALT PAN | Pine, fir, etc | |
| Orchard or garden: | | Palm | |
| i) Not enclosed | | Palmyra | |
| ii) Enclosed by a wall or permanent fence | | Bamboo | |
| Tea garden, as surveyed | | Aloes or cactus | |
| | | Other trees | |
| Betel or vine on trellis | | Plantain trees | |
| Vegetable garden | | Stone waste | STONY WASTE |

FIG. 13 SYMBOLS FOR LAND SURVEYING — *Contd*

| NAME | SYMBOL | NAME | SYMBOL |
|---|---|---|---|
| Tangent point |  | Mosque |  |
| Grave yard |  | | |
| Temple |  | Church |  |

FIG. 13 SYMBOLS FOR LAND SURVEYING

## 12 ABBREVIATIONS

**12.1** Abbreviations are generally used in drawing for the sake of clarity. A systematic notation of urchitectural and building terms is necessary for aniformity, 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 |

**Table 6 ( *Contd* )**

| Term | Abbreviation and/or Symbol |
|---|---|
| **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 |
| Cosecent | 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 |
| **D** | |
| Damp proof course | DPC |
| Decimetre | dm |

Table 6 ( *Contd* )

| Term | Abbreviation and/or Symbol |
|---|---|
| Degree ( angle ) | deg,° |
| Degree Celsius | °C |
| Diameter | DIA, $\phi$ |
| 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 |

Table 6 ( *Contd* )

| Term | Abbreviation and/or Symbol |
|---|---|
| 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, $\infty$ |
| 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 | $\geqslant$, $\geq$ |
| 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 |

Table 6 ( *Contd* )

| Term | Abbreviation and/or Symbol |
|---|---|
| **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 ( $10^{-6}$ ) | $\mu$ |
| Micro ampere | $\mu$A |
| Micro metre ( or micron ) | $\mu$m |
| Mild steel | MS |
| Milli ($10^{-3}$) | m |
| Milliampere | mA |
| Milligram | mg |
| Millilitre | ml |
| Millimetre | mm |
| Minimum | MIN |
| Minute ( time ) | min |
| Much larger than | $>>$ |
| Much smaller than | $<<$ |
| **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, $\Omega$ |
| 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 |

Table 6 ( *Contd* )

| Term | Abbreviation and/or Symbol |
|---|---|
| Precast | PRECAST |
| Prefabrication | PREFAB |
| Prestressed concrete | PCONC |
| **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 | $<$, $\leqq$ |
| 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 | $mm^2$ |

Table 6 ( *Concluded* )

| Term | Abbreviation and/or Symbol |
|---|---|
| Standard | std |
| Standard datum | SD |
| Standard level | SL |
| Standard wire gauge | SWG |
| Stand pipe | Sp |
| Stop valve | SV |
| Street gully | SG |
| Survey of India bench mark | BM |
| Switch | SW |
| **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 |

## 13 CONVENTIONAL REPRESENTATION OF MATERIALS IN SECTION

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

### 13.2 Hatching

Discretion should naturally be used in adopting the spacing of hatching lines to the scale of the drawing.

**13.2.1** It is recommended that when hatching on tracing paper or cloth, a sheet of squared paper shall be placed underneath to preserve uniformity of spacing and direction of the hatching.

**13.3** When indicating concrete, coarse aggregate shall be shown for mass concrete and finer aggregate for reinforced concrete.

**13.4** Where large areas of section hatching are to be indicated, and especially for such materials as concrete and plaster, it is recommended that a portion near the edge only be treated, the hatching gradually fading towards the centre.

**13.5** Areas in section which are too thin for line sectioning, such as some of the metal sections, shall be blackened in solid, leaving a thin space between adjacent portions.

## 14 NUMBERING OF BUILDINGS AND PARTS OF BUILDINGS

### 14.1 Designation Systems

The designations for different parts of a project should be chosen according to the same principles.

All drawings and parts of drawings should be executed in such a way that the drawing alone is sufficient to describe the item without the addition of words or initials.

However, when a drawing depicts a number of similar items ( for example, a plan of a building with many windows ), one may, if necessary, identify them separately ( for example, by a sequence of numbers ). This also applies in the case where similar items, such as, windows, can be confused with other elements of similar appearance such as doors. For this identification the principles outlined in this standard should be adhered to.

### 14.2 Type Designations

Different objects are classified according to the type, for example the kind or design of the object ( *see* Fig. 14 ).

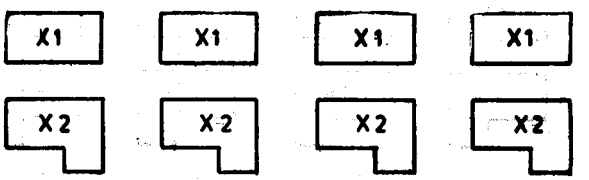
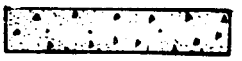
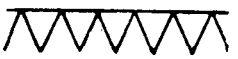
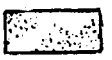



FIG. 14 EXAMPLES OF TYPE DESIGNATION

**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 |  | Green |
| Glass |  | Blue |
| Fibre building board and insulation board |  | Sepia |
| Metal sections |  | Black |

Applicable to large scales only

### 14.3 Individual Designation

Each separate object is identified. The individual designation is often an indication of position ( *see* Fig. 15 ).

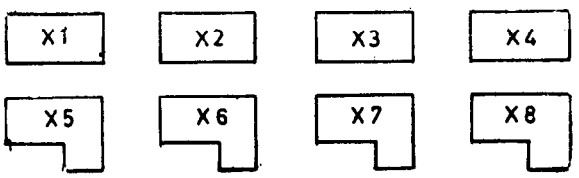



FIG. 15 EXAMPLES OF INDIVIDUAL DESIGNATION

### 14.4 Designation Code

The complete designation consists of a principal and an additional designation.

#### 14.4.1 Principal Designation

The principal designation indicates the category of objects at different levels in the documentation. It should consist of:

a) text in full, for example, HOUSE, ROOM, WINDOW, DOOR, FENCE, CUT-OFF VALVES;

b) Abbreviation, for example, H, R, W, D, F, COV;

c) other systematical designation, for example: doors: 1, windows: 2, parts: 3, etc.

Playground equipment: A, outdoor furniture: B, other equipment: C, etc.

d) designation according to a general classification and coding system.

The principal designation may be omitted when the rest of the documentation shows the intention.

**14.4.2** *Additional Designation*

Additional designations indicate a further specification in the category. They should consist of:

a) for type designations, numerals and letters, for example 'W 12 b', where 'W' is the principal designation for window, 12 is the additional designation for type, material, dimensions, etc, and 'b' is the additional designation for variant, for example, notch for a window sill; and

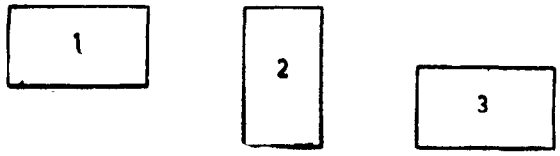
b) for individual designations, numerals or letters in running order, for example, P1, P2, P3, etc, where 'P' is the principal designation for pillar, and 1, 2, 3, etc, each pillar individually designated. The individual designation may also consist of coordinates.

**14.5 Designation Application**

**14.5.1** *Buildings*

Buildings belonging to the same project are indicated with a principal and an additional designation, for example, HOUSE 1, HOUSE 2, etc ( *see* Fig. 16 ).

The designation for a part of a building consists of a principal designation completed with a systematical letter or numeric designation, for example HOUSE 2 PART A, HOUSE 2 PART B, etc ( *see* Fig. 17 ).




( The principal designation HOUSE has been omitted )

FIG. 16 DESIGNATION OF BUILDINGS

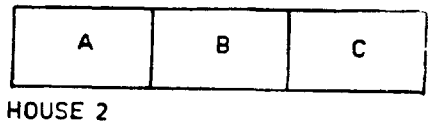



FIG. 17 DESIGNATION OF PARTS OF A BUILDING

**14.5.2** *Storeys*

A storey means a space between two consecutive levels, bounded by physical limits ( floors, ceiling and walls ), including these limits. The concepts of 'storey' and 'level' are complementary but the one should not be confused with the other.

Each storey should be designated by numerals following a logical sequence. The numbering from bottom to top starts with 1 at the lowest level usable for any purpose ( *see* Fig. 18 ).

Zero designates the space which is situated immediately below the lowest level usable for any purpose.

The numbering applies not only to the usable space of a given storey but also to the physical limits bounding this space.

To express the transition from one number to another, it is recommended that the level is indicated at the upper face level of the load-bearing floor element ( *see* Fig. 19 ).

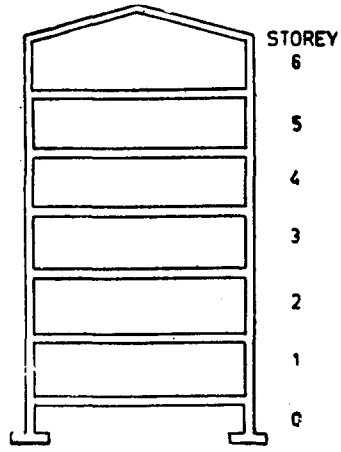



FIG. 18 NUMBERING OF STOREYS

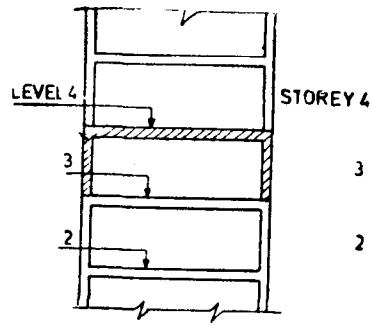



FIG. 19 INDICATION OF THE LEVEL

When there are differences in level inside a building, for example, mezzanine, offset levels, landings, ramps, etc, every necessary indication should be given in order to avoid errors. These indications should be in the form of levels or listed abbreviations and placed beside the numbering of the storey concerned.

Staircases should have the same numbering as the storey in which they are situated, whether or not they have half landings.

**14.5.3** *Parts of Storeys*

The designation for a part of a storey when the documentation is divided into several drawings consists of the designation of the storey completed by a systematic all letter or numeric designation, for example STOREY 3 PART A, STOREY 3 PART B, etc ( *see* Fig. 20 ).

**14.5.4** *Floors*

The floors ( floor structures ) are numbered serially from the bottom to the top of the building, in accordance with the number of the storey of which they form a part ( *see* Fig. 21 ).

**14.5.5** The designation of the intermediate storey or mezzanine shall be the same as the designation of the storey in which it is situated with the prefix *M* or *G* according to the type whether it is a mezzanine or a gallery respectively.

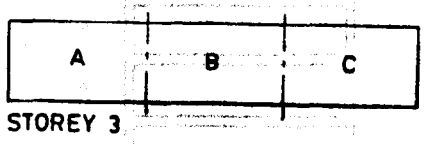



FIG. 20 DESIGNATION OF PARTS OF STOREY

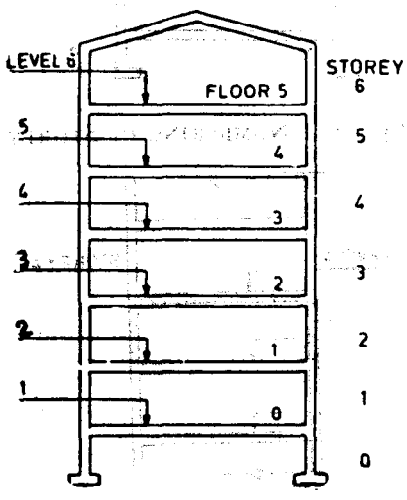



FIG. 21 FLOOR NUMBERING

**14.5.5.1** The designation of the floor of the mezzanine or gallery shall be the same as the storey it serves.

**14.5.5.2** If a number of mezzanine occurs in a building between two floor levels, they may be designated as *MX*-1, *MX*-2 where *X* refers to the designation of the storey in which they are situated and 1 refers to the sequential number of mezzanine in the particular group, the sequence being adopted in any easily identifiable pattern.

**14.5.5.3** If a number of galleries occurs in a building between two floor level, they may be designated as *GX*-1. *GX*-2 where *X* refers to the designation of the storey in which they are situated and 1 refers to the sequential number of gallery in the particular group, the sequence being adopted in any easily identifiable pattern.

**14.5.6** For determination of the sequential number of a subsidiary storey, the first subsidiary storey shall be taken as the storey immediately below the first floor. The designation of the subsidiary storey shall have prefix SS. The designation of the floor for subsidiary storey shall be the same as the storey it serves.

**14.5.7** For the determination of the sequential number of basement storeys; where there are no subsidiary storeys, the storeys below the first floor, shall be assigned suffixes B1, B2, B3, and so on starting with the storey immediately below the first floor level.

**14.5.7.1** Where there are subsidiary storeys in a building, the storeys below the last subsidiary storey shall be designated similarly as basement storeys as explained in **14.5.7**.

**14.5.7.2** The designation of the floor of a basement storey shall be the same as the storey it serves.

**14.6 Columns, Floors, Walls, Beams, etc**

Columns, slabs, walls, beams, etc, are designated with a principal designation ( abbreviation ) and an additional designation ( numerals ) according to Fig. 22. The first numeral in the additional designation indicates the storey number and the last two digits the number of the feature according to the following example:

| | | |
|---|---|---|
| Columns | = | C 201, C 202 |
| Slabs | = | S 201, S 202 |
| Walls | = | W 201, W 202 |
| Beams | = | B 201, B 202 |

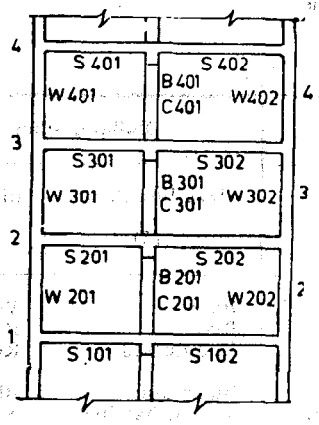



FIG. 22 EXAMPLES OF DESIGNATION FOR COLUMNS, FLOORS, WALLS AND BEAMS

## 15 DESIGNATION OF ROOMS AND OTHER AREAS

### 15.1 Designation Principles

**15.1.1** Room numbers are used on each storey in consecutive order within the limits of all the parts of the building.

**15.1.2** If several buildings are included in the project, room numbers shall be allocated independently to each building in accordance with **15.1.1**.

**15.1.3** The numbers and the names of the rooms are indicated within each space in the following way:

324 RECEPTION  325 RECORDS

For clarity, the numbers and names should be underlined.

**15.1.4** In small spaces, it is sufficient to indicate only the room numbers, as follows:

326

**15.1.5** Room numbers are given as three digit numbers ( if this is enough ), the first digit of which is the storey number of the building and the last two digits are serial numbers, allocated to each room in the actual storey:

Storey 1 : Room numbers 101-199 ( 1 001-1 999 );

Storey 2 : Room numbers 201-299 ( 2 001-2 999 );

etc

**15.1.6** Room numbering is carried out in each storey so that orientation in the building is facilitated. It should be done clockwise in the order in which the rooms are reached from the main entrance or the last entrance from the left end of the building.

**15.1.7** Small spaces, such as spaces for cleaning utensils and toilets, should be provided with room numbers. ( Spaces, such as small cupboards, may alternatively be allocated the number of the room in which they are situated followed by an appropriate suffix. )

**15.1.8** If a new room is added so late in the design process that the room numbering is already allocated this new room is given the same room number as the room from which the space has been taken. The two rooms are differentiated by the addition of a letter, as follows:

127A  127B

**15.1.9** There should be no gaps left in the room numbering sequence. If two rooms are made into one, the new room is given both the earlier room numbers, as follows:

127,128

**15.1.10** Block number and room number may be written together, as follows:

2/216 [ = block 2, room 216 ( No. 16 on storey 2 )]

**15.1.11** Spaces in basements and attics should be given their appropriate storey numbers in accordance with **13** followed by their room numbers.

### 15.2 Designation of Separate Suites of Rooms Within Buildings

**15.2.1** The number of the suite should be followed by the number of the room.

**15.2.2** Suite numbers should be indicated on the plans.

**15.2.3** Rooms within each suite should be given consecutive numbers. The numbers and the names of each room are indicated in the following way:

1. ENTRANCE 2. LIVING ROOM

3. KITCHEN 4. BEDROOM 1

5. BEDROOM 2

**15.2.4** Block number, suite number and room number may be written together, as follows:

2/314/1 [ = block 2, suite 314 ( No. 14 on storey 3 ) room 1 ]

## 16 COLOURING THE PLAN

**16.1** Master plans, zone plans, etc, may be coloured as specified in Table 8.

## Table 8 Colouring the Plan

( *Clause* 16.1 )

| Sl No. | Item | Site Plan | | Building Plan | |
|---|---|---|---|---|---|
| | | Dye-Line Print | Blue Print | Dye-line Print | Blue Print |
| (1) | (2) | (3) | (4) | (5) | (6) |
| 1 | Existing work | Black ( outline ) | White | Black | White |
| 2 | Proposed work | Red filled in | Red | Red | Red |
| 3 | Drainage and sewage work | Red dotted | Red dotted | Red dotted | Red dotted |
| 4 | Water supply works | Black dotted | Black dotted | Black dotted | Black dotted |
| 5 | Work proposed to be dismantled | Yellow hatched | Yellow hatched | Yellow hatched | Yellow hatched |
| 6 | Open spaces | No colour | No colour | — | — |
| 7 | Plot lines | Thick, black | Thick, black | — | — |
| 8 | Permissible building lines | Thick, dotted black | Thick, dotted black | — | — |
| 9 | Existing street(s) | Green | Green | — | — |
| 10 | Future street(s) if any | Green, dotted | Green dotted | — | — |

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