

LIST OF EXPERIMENTS

1. Introduction to computer aided drafting & coordinate system.
2. Exercise on Draw & Modify tool bars.
3. Exercise on Layer, Dimension, Texting & Block etc.
4. Drawing a plan of Building and dimensioning using layers.
Single storied buildings b) Multi storied buildings.
5. Developing sections and elevations for given
a) Single storied buildings b) Multi storied buildings.
6. Drawing of building components like walls, lintels, Doors, and Windows.
7. Introduction to 3 – D view.
8. Exercise on 3 – D.

EX.NO: 1

Date:

**INTRODUCTION TO COMPUTER AIDED DRAFTING AND DIFFERENT
COORDINATE SYSTEM**

AIM

To learn the concept of computer aided drafting and introduce to different coordinate system in AutoCAD software package.

INTRODUCTION

Drawing is the language of engineers. An engineer must be well conversant with drawings. Drawings represent reduced shape of structure and the owner will be able to see what is going to happen. Drawings are prepared as per the requirements of owner. In case of public buildings, the functional aspects are studied and accordingly the drawings are prepared as per recommendations laid down in National Building Code (N.B.C) or as per Indian Standard specifications. Any modifications like additions or omissions can be suggested from a study of the drawings before actual construction of the structure is started. Drawings provide a language with specific data to Architects, Engineers and workmen at the site to construct the structure accordingly.

In case of public buildings or any other civil engineering works, it is essential to work out different items of construction with their quantities for estimating the total cost of construction project. For this purpose, drawings of different parts and different views are essential so that the approval of work from the sanctioning authority can be obtained. Further the detailed drawings form an essential contract documents when the work is handed over to a contractor. Hence it is necessary to prepare detailed drawings, which will inform the contractor, the exact information, which he needs during the construction of different items of work. Drawings, thus prepared should be carefully even after the completion of work. Thus, it becomes assess the possibility of further vertical expansion by referring to the foundation details initially provided.

REQUIREMENTS OF GOOD DRAWING:

1. Drawing should be clear, simple and clean
2. Should agree with the actual measurements by the accurately drawn scaled measurements.
3. Exact information should be provided in order to carry out the work at site without scaling for missing measurements
4. Only minimum notes to support the drawings should be indicated in the drawings.
5. Sufficient space should be provided between the views so as to mark the dimensions without crowding.

COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

INTRODUCTION TO COMPUTER AIDED DRAFTING

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

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

1. Conceptualize his ideas
2. Modify the design very easily
3. Perform animation
4. Make design calculations
5. Use colours, fonts and other aesthetic features.

REASONS FOR IMPLEMENTING A CAD SYSTEM

1. Improved productivity in drafting
2. Shorter preparation time for drawing
3. Reduced man power requirement
4. Custom modifications in drawing are easier
5. More efficient operation in drafting
6. Minimized transcription errors in drawing
7. Better designs can be evolved
8. Revisions are possible
9. Colors can be used to customize the product
10. Hatching of all sections with different filling patterns

LAUNCHING AUTOCAD FROM OPERATING SYSTEM

- Click on Start.
- Go to Programs
- Go to Auto Desk
- Go to Auto CAD 2012- English
- Click on Auto CAD 2012- English.

Using your pointing device

One of the key means of controlling commands & inputting information into your drawing file will be by using your mouse.

Using three button mouse

1. Left button: data / accept – used to select command & enter points.
2. Middle button: It is used as Pan and scroll zooming
3. Right button: Reset / reject / repeat last command – used to end a command or to display a small pull-down menu or to repeat last command.

Using the Key boards

1. Typing Command name is “command line”. Can run all the commands in auto CAD.
2. Enter button and Space bar can be used to accept a command or repeat last command.
3. The Function Keys can be used as toggle buttons to switch ON/ OFF for some of functions.

The Important ones are

S.NO	FUNCTION KEY	FUNCTION
1	F1	Help
2	F2	Command line history
3	F3	Object snap
4	F4	3D Osnap
5	F5	Isoplane Top/Left/Right
6	F6	Dynamic UCS on/off
7	F7	Toggle grid on/off
8	F8	Ortho on/off
9	F9	Snap on/off
10	F10	Polar on/off
11	F11	Object snap tracking
12	F12	Dynamic on/off

USER COORDINATE SYSTEM

You can enter pts directly on the command line using 3 different systems. The one you use is depend on which is more applicable for the situation. The first assignment will get you used to this the 3 systems are as follows.

a. Absolute Coordinate system (x, y)

Absolute coordinates refers to a Cartesian System that uses x-axis, y-axis, and sometimes a z-axis to establish a point some distance from a common origin.

b. Relative rectangular Coordinate system @ (x, y)

c. Relative Polar Coordinate system: You would use this system if you know that you want

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to draw a line a certain distance at a perpendicular angle. We would enter this as at D < A.
where, D is the distance and A is the angle.

COMMANDS IN AUTOCAD BEFORE STARTING THE DRAWING

Before we start to draw any drawing, we must set Units, Limits & Grid.

Units

Command: units (enter) Type Decimal Millimetres Click on ok.

Limits

Command: limits (enter) Specify lower left corner – (0, 0) Specify upper right corner (10000, 10000)

Grid on

Click on F7

Zoom Command

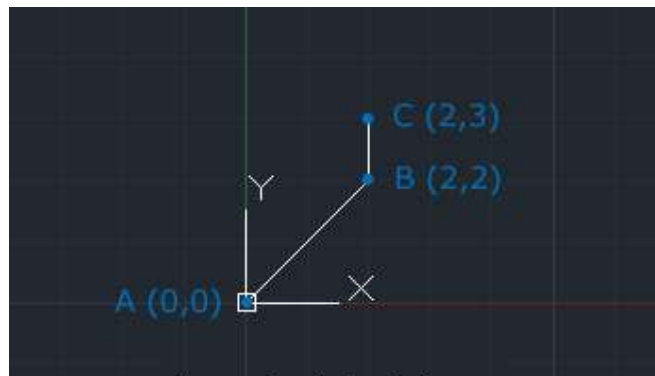
Command: Z enter Options: (All / centre/ dynamic/ Extents/ Previous/ scale/ window/ object/ real Time)

Line command

Command: L (enter)

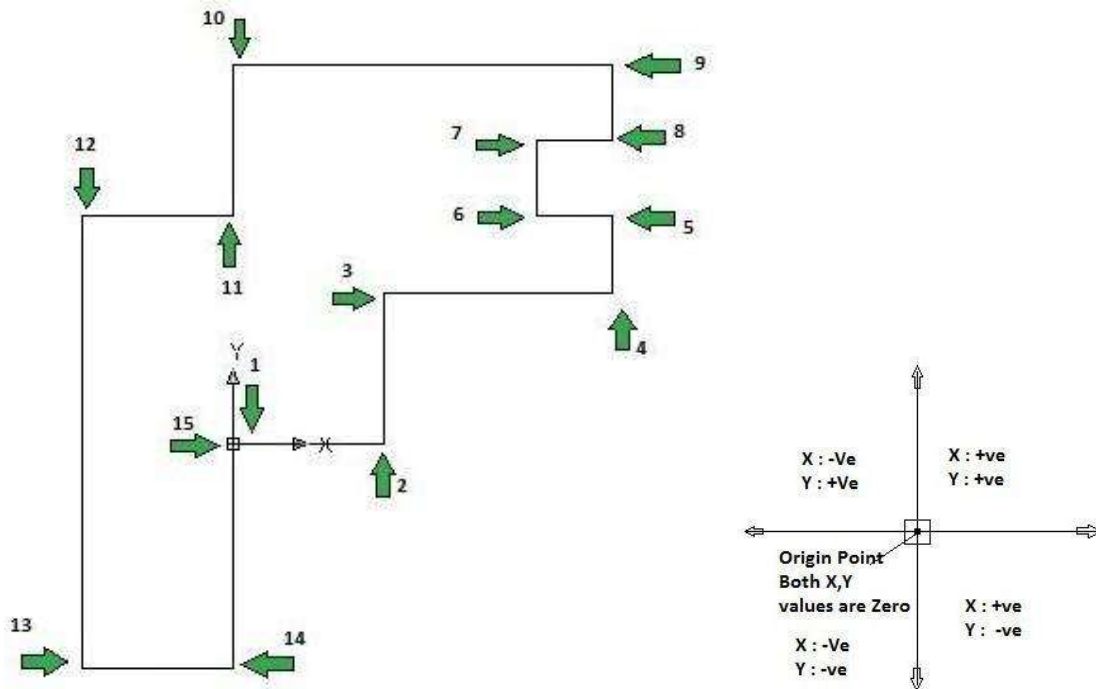
USING ABSOLUTE COORDINATE SYSTEM

Absolute Coordinates uses the Cartesian System to specify a position in the X, Y, and (if needed) Z axes to locate a point from the 0-X, 0-Y, and 0-Z (0,0,0) point. To locate a point using the **Absolute Coordinate** system, type the X-value, Y-value, and, if needed, the Z-value separated by commas (with no spaces).



1. Enter LINE command: L [Enter]
2. Start line at point A: 0,0 [Enter]
3. End first line at point B: 2,2 [Enter]
4. End of second line at point C: 2,3 [Enter]

Example on Absolute Coordinate System

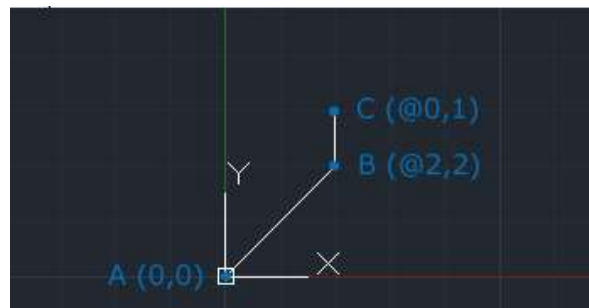


Steps to be followed to draw the diagram

- | | |
|-------------|--------------|
| 1. L enter | 2. 0, 0 |
| 3. 20, 0 | 4. 20, 20 |
| 5. 50, 20 | 6. 50, 30 |
| 7. 40, 30 | 8. 40, 40 |
| 9. 50, 40 | 10. 50, 50 |
| 11. 0, 50 | 12. 0, 30 |
| 13. -20, 30 | 14. -20, -30 |
| 15. 0, -30 | 16. 0, 0 |

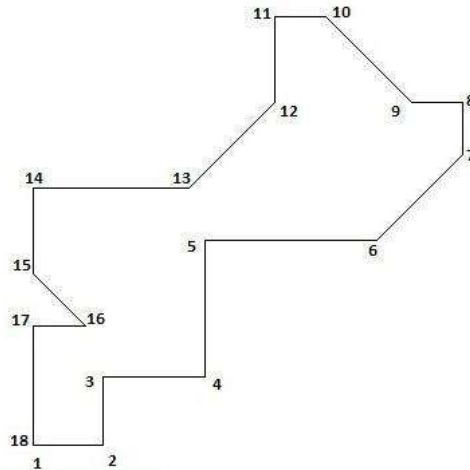
USING RELATIVE RECTANGULAR COORDINATE SYSTEM

After first points entered, your next points can be entered by specifying the next coordinate compare/relative from the first points. The relative coordinate started with symbol “@” tell AutoCAD it was a relative coordinate. Using relative coordinate, points entered by typing @x,y [Enter].



1. Enter LINE command: L [Enter]
2. Start line at point A: 0,0 [Enter]
3. End first line at point B: @2,2 [Enter]
4. End of second line at point C: @0,1 [Enter]

Example on Relative Rectangular Coordinate System

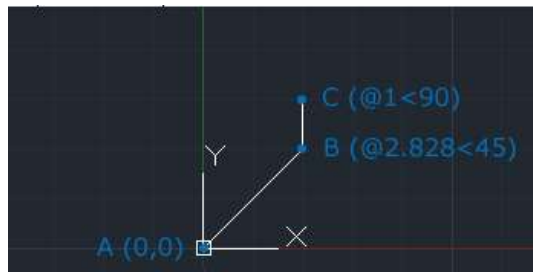


Steps to be followed to draw the diagram

- | | |
|---|----------------|
| 1. L enter for line & specify and point | 2. @ 40, 0 |
| 3. @ 0, 40 | 4. @ 60, 0 |
| 5. @0, 80 | 6. @ 100, 0 |
| 7. @ 50, 50 | 8. @ 0, 30 |
| 9. @ 0, -30 | 10. @ -50, -50 |
| 11. @ -30, 0 | 12. @ 0, -50 |
| 13. @ -50, 50 | 14. @ 0, -50 |
| 15. @ 30, -30 | 16. @ 0, -30 |
| 17. @ 0, -70 or c | |

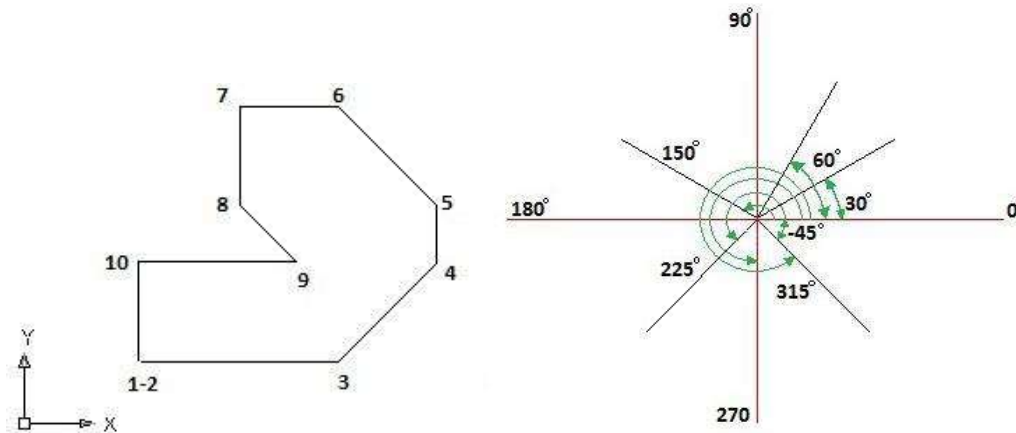
USING RELATIVE POLAR COORDINATE SYSTEM

Polar coordinates used when you need to draw the next points at specify angle. Polar coordinates system in AutoCAD specifies distance length at which angle. Using polar coordinate, points entered by typing @distance<angle [Enter].



1. Enter LINE command: L [Enter]
2. Start line at point A: 0,0 [Enter]
3. End first line at point B: @2.828<45 [Enter]
4. End of second line at point C: @1<90 [Enter]

Example on Relative Polar Coordinate System



Steps to be followed to draw the diagram

1. Type L and press enter
2. @100 < 0
3. @ 70 < 45
4. @ 30 < 90
5. @ 70 < 135
6. @ 50 < 180
7. @ 50 < 270
8. @ 40 < 315
9. @ 80 < 180
10. @ 50 < 270

Construction Line

Command: XL enter XLINE Specify a point or [Hor/ ver/ Ang/ Bisect/ offset]: h

Polyline

Command: PL (enter)

Specify Start point:

Specify next point (or) [Arc/ Half width/ length/ undo/ width]: click on screen

For arc in the polyline enter option 'A'

Arc

Command: Arc (enter)

Specify 1st point: click on screen

Specify 2nd point: click on screen

Specify end point: click on screen

Revision cloud

Command: Revcloud (enter)

Specify start pt or [arc/length/object/ style]

s (enter)

Spline

Command: Spl (enter)

Click on screen

Hatch

Command: h (enter)

Scale – 50 (properties)

Click on pick pts.

Click on rectangle

Command: H (enter)

Scale – 0.5

Pick pts

Click on rectangle

Point & Point style

Points are very simple objects and the process of creating them is very simple.

Points are rarely used as drawing components although there is no reason why they could not be.

For Example: Points are automatically created when you measure and divide commands and to set act distance along lines

Point:

Command: po (enter)

Click on Screen

Object snap

Command: OS (enter)

Select the required node otherwise (select all)

Text command

Command: t (enter)

Specify two corners

Enter the text

Click on ok

Copy

Command: co (or) cp (enter)

Select the Object (enter)

Select the base point and place the point

Mirror

Command: mi (enter)

Select the object (enter)

Specify the first pt of mirror line

Specify the second pt of mirror line

Erase the source object (Yes/No) <N>

Offset

Command: O (enter)

Enter the offset distance:

example: 10 (enter)

Select the object and direct the offset

Rectangular Array

Command: ar (enter)

Select Tick The rectangular array

Enter the no of rows

Enter the no of columns

Click on the selected objects button

Polar array

Command: ar (enter)

Tick polar array

Select the objects

Enter the total no of items

Specify the angle

Specify the centre point

Move

Command: m (enter)

Select the object

Specify the base point

Click wherever required

Rotate

Command: ro (enter)

Select the object (enter)

Specify the base point

Enter the angle

Example: 45⁰ enter

Scale

Command: sc (enter)

Select the object (enter)

Specify the base points

Enter the scale factor Example: 2 (enter)

Stretch

s (enter)

Select the object (enter)

Specify Base point and drag the mouse

towards the required direction V 25

Trim

Command: tr (enter)

Select cutting edges (enter)

Select the objects to trim

Extend

Command: Ex (enter)

Select boundary edges (enter)

Then select the object to extend

Break

Command: br (enter)

Select 1st point and 2nd point

Chamfer

Draw a rectangle of 100 x 50) Command: Cha (enter) d (enter)

Enter the distance 15 (enter)

Enter the distance 10 (enter)

Select two adjacent line on screen

Fillet

Command: f (enter)

r (enter)

example: 10 (enter)

Explode

x (enter)

Select the object (enter)

CONVENTIONAL SIGNS AND SYMBOLS FOR HATCH

Conventional signs are used to represent the particular item like stone masonry, brick masonry, concrete etc in the section of drawing. (i.e.,) when the materials are cut by any imaginary plane.

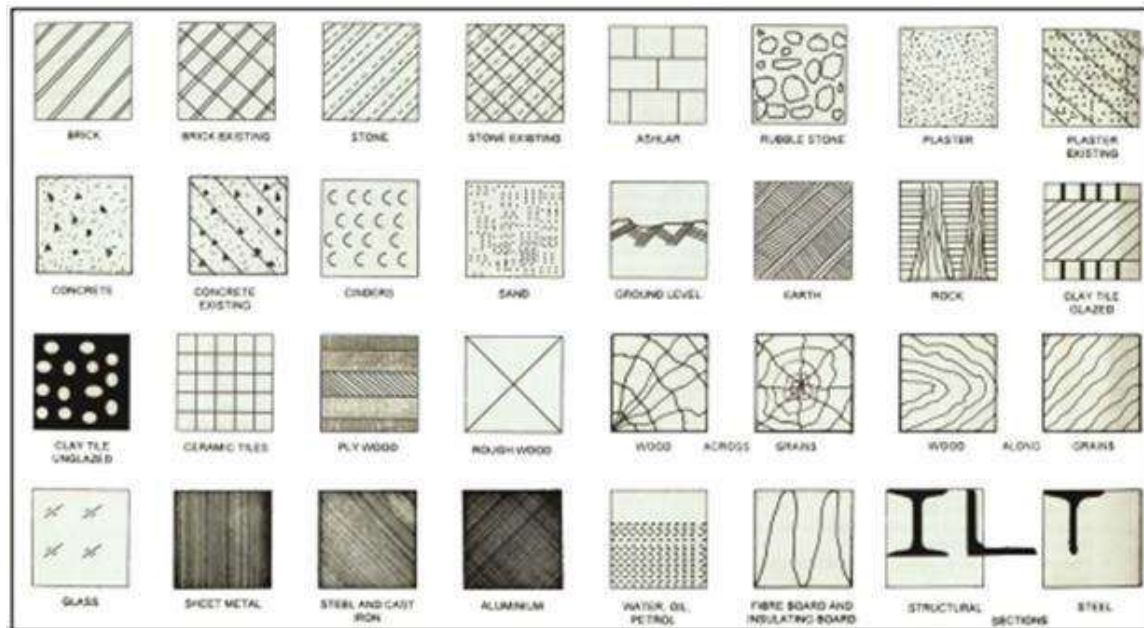
Conventional symbols are provided to indicate doors, windows, their fixing, movement of

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shutters. When they are closed or opened, various water supply and sanitary fixtures like tap, wash basin, W.C., urinals, Kitchen sink, shower etc, symbols are used to indicate the position of electrical fittings like lamp, switch, power socket, fan etc. To indicate positions of furniture on drawing room, bedroom, suitable symbols are used.

The Bureau of Indian standards (B.I.S) has recommended the conventional signs and symbols for the following purposes.

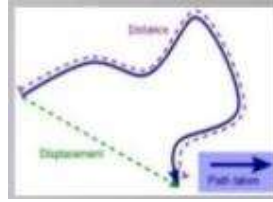
1. Avoid confusion and to understand the drawings
2. Save the time in making out various details in the drawing
3. Identify the various details of materials, Electrical fixtures, water supply and sanitary fittings, Position of furniture's etc.
4. To prevent any dispute between contractor and owner in the actual construction of the structure. The conventional signs for civil engg materials is shown in fig



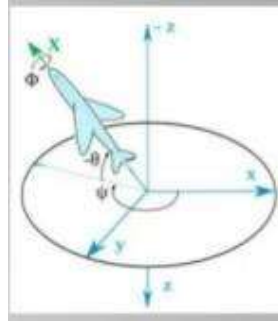
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PRACTICAL IMPLEMENTATION

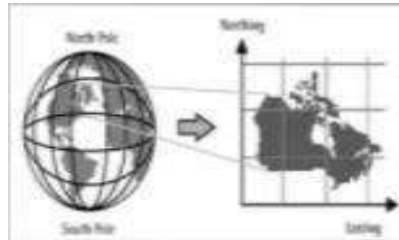
1. Describing position



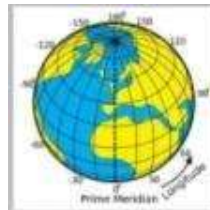
2. Location of Air transport



3. Map Projections



4. Latitude and Longitude



VIVA QUESTIONS

1. What is the full form of AUTOCAD?

2. List the benefits of AUTOCAD?

3. What are the limitations of AUTOCAD?

4. What are the applications of CAD?

5. Who created the AUTOCAD?

6. Who is the father of AUTOCAD?

7. Who is the owner of AUTOCAD?

8. Who was discovered AUTOCAD?

9. What is the difference between AUTOCAD and AUTODESK?

10. Define polar coordinates.

EX.NO: 2

Date:

EXERCISE ON DRAW & MODIFY TOOL BARS**AIM**

To learn the commands in Draw tool bars.

PROCEDURE**DRAW COMMANDS**

- | | |
|---------------|-------------------------|
| 1. Line | 10. Solid |
| 2. Pline | 11. Drawing of polygon |
| 3. Line type | 12. Point |
| 4. Curves | 13. Erasing of object |
| 5. Circle | 14. Colouring of Object |
| 6. Donut | 15. Filling of object |
| 7. Ellipse | 16. Hatch |
| 8. Arc | 17. Scaling of drawing |
| 9. Rectangles | |

- 1. LINE:** A line is specified by giving its two end points or first point and the distance of line along with its angle of inclination. A line can be drawn by using two commands.

Command: **line**

Specify first point: Specify a point (1)

Specify next point or [Undo]: Specify a point (2)

The second point can be indicated by @d<a

Where d is the distance of line and a is the angle of inclination in degrees

- 2. PLINE:** This is a poly line which allows continuous segment of the line and it is drawn similar to the line command. The polyline allows changing the thickness of the line according to the requirement.

From the Draw tool bar choose the Polyline flyout.

Draw pull down menu: Polyline

At the command prompt, enter **pline**

Syntax

Specify start point: Specify a point (1)

Current line-width is <current>

Specify next point or [Arc/Close/Half width/Length/Undo/Width]: Specify a point (2) or enter an option.

6. DONUT: This draws filled circles and rings.

Donuts are constructed of a closed polyline composed of wide arc segments. At the command prompt, enter **donut**

- a. Specify inside diameter of donut <current>
- b. Specify a distance or press ENTER
- c. **If you specify an inside diameter of 0, the donut is a filled circle.**
- d. Specify outside diameter of donut <current>: Specify a distance or press ENTER
- e. Specify centre of donut or <exit>: Specify a point (1) or press ENTER to end the command

7. ELLIPSE: It is a curve having major and minor axis with a centre. Creates an ellipse or an elliptic arc.

Axis end point: Defines the first axis by two specified endpoints. The angle of the first axis determines the angle of the ellipse. The first axis can define either the major or the minor axis of the ellipse.

8. ARC: Creates an elliptical arc. The angle of the first axis determines the angle of the elliptical arc. The first axis can define either the major or the minor axis of the elliptical arc.

Center: Creates the ellipse by a specified centre point.

Isocircle: Creates an isometric circle in the current isometric drawing plane.

At the command prompt, enter **ellipse**

Arc: The arc is a curve specified by centre and radius as well as the start angle and end angle. There are seven methods used for drawing an arc.

1. Three-point method
2. Start point-centre point –end point
3. Start point-centre point-length of chord
4. Start point-end point –angle of inclusion
5. Start point-end point-direction
6. Start point-centre point-angle of inclusion
7. Start point-end point-radius

These methods can be used by executing the arc command

ARC: creates an arc.

At the command prompt, enter **arc**

Centre/<start point>: specify a point, enter c, or press enter

Polyarc: the second method of the drawing the arc is poly arc by use of pline command. This

command allows drawing of filled arc of any width .it also allows for drawing of a regular or irregular curve.

9. RECTANGLES: Draws a rectangular polyline

At the command prompt, enter **rectangle**

- a. First corner: specify point (1)
- b. Other corner: specify point (2)

Drawing of Rectangle: A rectangle can be drawn by LINE command or by Rectangle command. The **PLINE** command also allows for drawing of hollow or filled rectangle. A **SOLID** command is also used for drawing of filled rectangles.

10. SOLID: Creates solid –filled polygons solids are filled only when fill system variable is set to on view is set to plan.

- a. At the command prompt, enter **solid**
- b. First corner: specify point (1)
- c. Other corner: specify point (2)
- d. The first two points define one edge of the polygon.
- e. Third point: specify a point (3) diagonally opposite the second
- f. Fourth point: specify a point (4) or press enter

11. DRAWING OF POLYGON: Creates an equilateral closed polyline, A polygon is a polyline object. AUTOCAD draws polyline with zero width and no tangent information.

- a. At the command prompt enter **polygon**
- b. Number of sides <current>: enter a value between **3 and 1024** or press enter Edge/<centre of polygon>: **specify a point (1) or enter.**

12. POINT: Creates a point object points can act as nodes to which you can snap objects you can specify a full 3D location for a point.

At the command prompt, enter **point**

Point: specify a point

13. ERASING OF OBJECT: The object can be removed or erased by use of erase command
ERASE

This removes object from drawing

At the command prompt, enter erase Select objects: use an object selection method.

14. COLOURING OF OBJECT: The object can be drawn with any variety of colour which ranges from 0 to 256. The setting of colour can be done by colour command

COLOUR

Sets the colour for new objects. At the command prompt, enter colour <current>: enter a value (1-255), colour name, by block, or by layer

15. FILLING OF OBJECT: The object can be filled with different colours and patterns by use of hatch command

This command allows selection of various patterns, scale of pattern and angle of pattern.

16. HATCH: This fills an area with a pattern. HATCH fills the specified hatch boundary with non-associative hatch A non –associative hatch is not updated when its boundaries are modified a hatch boundary consists of an object or objects that completely enclose an area

At the command prompt, enter **hatch**

Pattern (? Or name/ U, style) <current>: enter a predefined pattern name, enter u, enter? Or press enter.

17. SCALING OF DRAWING: zoom command displays the object at a specified scale factor. the value entered is relative to the limits of the drawing for example entering 2 doubles the apparent display size of any objects from what it would be if it were zoomed to the limits of the drawing.

If you enter a value followed by XP, auto CAD specifies the scale relative to paper space unit's. for example, entering 0.5xp displays model space at half the scale of paper space unit's. the following illustration shows a number of viewports arranged in paper space. the view in each view port is scaled relative to paper space. the first view is scaled 1=1 relative to paper space (1xp), the second is scaled 0.5=1 relative to paper space (0.5xp), and so on.

AIM

To learn the commands in Modify tool bar

PROCEDURE

TRANSFORMATIONS: These are the modifications in the drawn objects. There are different types of transformations used

1. **MOVE:** This allows to move or displace objects a specified distance in a specified direction
 - a. At the command prompt, enter move
 - b. Select objects: use an object selection method

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- c. Base point or displacement: specify a base point (1)
 - d. Second point of displacement: specify a point (2) or press enter
2. **COPY:** This is used for producing a duplicate copy of the drawing. At the command prompt, enter copy
- a. Select objects: use an object selection method
 - b. <Base point or displacement >/multiple: specify a base
3. **ROTATE:** It moves objects about a base point at the command prompt, enter rotate Select
- a. objects: use an object selection method
 - b. <Rotate angle >/reference: specify an angle or enter r
4. **STRETCH:** This moves or stretches objects. AutoCAD stretches lines, arcs, elliptical arcs, splines, rays and polyline segments that cross the selection window.
- a. At the command prompt, enter stretch
 - b. Select objects: use the CPOLYGON or cross object selection method
 - c. (1,2) Base point or displacement: specify a point (3) or press
 - d. Second point of displacement: specify a point (\$) or press
5. **EXTEND:** This extends an object to meet another object. Objects that can be extended include arcs, elliptical arcs, lines, open 2D, and 3Dpolylines and rays.
- a. At command prompt, enter extend
 - b. Select boundary edges
 - c. (projmode=UCS, edge mode=no extend)
 - d. Select objects: use an object selection method
6. **SCALE:** This enlarges or reduces selected objects equally in X and Y Directions At the command prompt, enter scale
- a. Select objects: use an object selection method
 - b. Base point: specify a point (1)
 - c. <Scale factor>/reference: specify a scale or enter r
7. **TRACE:** This creates solid lines. From the miscellaneous tool bar choose At the command prompt, enter trace
- a. Trace width<current>: specify a distance, enter a value, or press enter

- b. From point: specify point (1)
 - c. To point: specify a point (2)
 - d. To point: specify a point (3) or press to end the command
8. **EXTRUDE:** This creates unique solid primitives by extruding existing two-dimensional objects extrudes also creates solids by extruding two-dimensional objects along a specified path. we can extrude multiple objects with extrude
- a. At the command prompt enter, extrude
 - b. Select objects: use an object selection method
 - c. Path/<height of extrusion>: specify a distance or enter p
9. **MIRROR:** This is used to producing mirror image of the object
- a. At the command prompt enter, mirror
 - b. Select objects: use an object selection method
 - c. First point of the mirror line: specify a point (1)
 - d. Second point: specify a point (2)
10. **OFFSET:** This creates concentric circles, parallel lines and parallel curves, offset creates a creates a new object at a specified distance from an existing object or through a specified point
- a. At the command prompt enter, offset
 - b. Offset distance: specify a distance, enter t or press enter
11. **ARRAY:** This creates multiple copies of objects in pattern. Each object in an array can be manipulated independently
- a. At the command prompt enter, array
 - b. Rectangular or polar array<current>: enter an option or press enter specify a point
12. **CUTTING OF OBJECTS:** The drawn objects can be cut or trimmed by using following commands
- i) **TRIM:** Trims objects at a cutting object defined by other objects. Objects that can be trimmed include arcs, circles, elliptical arcs, lines, open 2D and 3D polylines rays and splines
 - a. At the command prompt, enter trim
 - b. Select cutting edges:

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- c. Select objects: use object selection method
- d. <Select object to trim>/project/edge/undo: select an object, enter an option, or press enter
- ii) **BREAK:** This erases an object or splits the object in to two parts from the modify toolbar
select break flyout
 - a. At the command prompt, enter break
 - b. Select objects: use an object selection method
 - c. First point of the mirror line: specify a point (1) on an object
 - d. Enter second point: specify the second break point (2) or enter F

PRACTICAL IMPLEMENTATION

- 1. Architectural drawing of all kinds
- 2. Interior design and facility planning
- 3. Easy to modify with the modify tool bar for accurate drawings.
- 4. Easy to draw the basic geometrical shapes with the draw tool bar.

VIVA QUESTIONS

1. What is the command for line?

2. What are the options available in the draw tool bar?

3. What are the options available in the modify tool bar?

4. List out any five 2D commands.

5. Explain the types of lines

6. What is the use of hatching?

7. What are the commands for cutting of objects?

8. What is the use of F8 function key?

9. What is the command for arc?

10. How the command linear dimension is operated?

EX.NO: 3

Date:

EXERCISE ON LAYER, DIMENSION, TEXTING & BLOCK ETC

AIM

To learn the commands in layer, dimension and texting tool bar

PROCEDURE

Dimensioning in Drawings: The dimensions are inserted in the drawing by use of DIM command. There are various types of dimensions used in AutoCAD.

1. Linear dimensions

- a. Horizontal- this allows horizontal dimensions
- b. Vertical- this allows vertical dimensions
- c. Aligned- this allows inclined dimensions
- d. Rotated- this allows inclined dimensions

2. Angular dimensions

- a. This allows angular dimensioning of objects

3. Radial dimensions

- a. This allows radial dimensioning of arc or circle

4. Diametric dimensions

- a. This allows diametrical dimensions of the circle

For dimensioning of objects, the first point and second point have to be specified. The dimension text must be written and then the position of dimension must be specified at the command prompt, enter dim

Dim: Enter a dimensioning mode command

AREA: This allows calculation of the area and perimeter of objects or of defined areas from the object properties toolbar, choose the inquiry flyout, then

- a. At the command prompt, enter area
- b. <First point>/object/add/subtract: specify a point or enter option

FILLET: Rounds and fillets the edges of the object

- a. At the command prompt enter fillet Polyline / Radius / Trim / <Select first object>:
- b. Use an object selection method or enter an option Select first object
- c. Select second object: use an object selection method Enter radius <current>: specify a distance or press
- d. Chain / Radius <Select edge>: Select edges or enter c or r their intersection.

CO-ORDINATE SYSTEM: The co- ordinate system can be modified in the AutoCAD. There are two types of co- ordinate systems used. The WCS (World co- ordinate system) is a universal system in which its origin is at the fixed position. The UCS (User co- ordinate system) is a system in which user can fix his origin at any point.

UCS: This manages user co- ordinate systems at the command prompt enter UCS

UNION: This measures the distance and angle between two points.

- a. At the command prompt,
- b. Enter union
- c. Select object: Use an object selection method

DISTANCE: This measures the distance and the angle between two points.

- a. At the command prompt area enter dist.
- b. First point: Specify a point (1)
- c. Second point: Specify a point
- d. (2) Distance = calculated distance
- e. Angle in XY plane = angle from XY plane = angle
- f. Delta X = change in X
- g. Delta Y = change in
- h. Y Delta Z = change in Z.

REGENERATION OF DRAWING: ACAD provides a facility of regenerating a drawing to clear the cross points or marks on the screen.

- REDRAW
- REGEN
- REGENALL
- REGENAUTO

TOLERANCE: This creates geometric tolerances. Geometric tolerances define the maximum allowable variations of form or profile, orientation, location and runout from the exact geometry in a drawing. They specify the required accuracy for proper function and fit the objects drawn in AutoCAD

SKETCH: This creates a series of free hand line segments. From the miscellaneous toolbar, choose

- a. At the command prompt enter sketch
- b. Follow the prompting

COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

TEXT: The text in software is indicated by font's. the fonts define the shapes of the text characters that make up each character set. In AUTOCAD, you can use true type fonts in addition to AUTOCAD's own compiled shape (SHX) fonts.

A font is indicated by various parameters like

- i. Style: these are four types: normal, bold, italic, underline
- ii. Size: this is the size of characters
- iii. Colour: there are facilities to colour the characters selecting layer.
- iv. Type: different types of fonts may be used:
 - Mono text: COMPUTER AIDED DESIGN
 - Romans: COMPUTER AIDED DESIGN
 - Romand: **COMPUTER AIDED DESIGN**

DTEXT: This displays text on the screen as it is entered. AutoCAD can create text with a variety of character patterns, or fonts. These fonts can be stretched, compressed, oblique, mirrored, or aligned in a vertical column by applying a style to the font .text can be rotated, justified, and made any size.

- a. At the command prompt, enter text
- b. Justify/style/<start point>: specify a point or enter an option

TEXT: This creates a single line of text AutoCAD can create text with a variety of character patterns, or fonts. These fonts can be stretched, compressed, oblique, mirrored, or aligned in a vertical column by applying a style to the font.

- a. At the command prompt, enter text
- b. Justify/style/<start point>: specify a point or enter an option

QTEXT: This controls the display and plotting of text and attribute of objects.

- a. At the command prompt, enter text
- b. ON/OFF <current>: enter on or off, or press enter

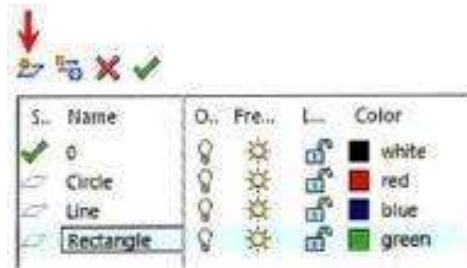
LAYER: In this practice exercise, you create layers in the Properties Manager dialog box and select the layer from the Layer Control list to draw objects on the appropriate layer.

To create the layers:

- a. On the ribbon, click Home tab > Layers panel > Layer Properties.
- b. In the dialog box, click New. Create the following layers:
 - Layer Name: Circle, Color: Red
 - Layer Name: Line, Color: Blue

- Layer Name: Rectangle, Color: Green

Note: If you enter the layer name and then a comma, a new layer name field appears. The layers are automatically listed in alphabetical order.



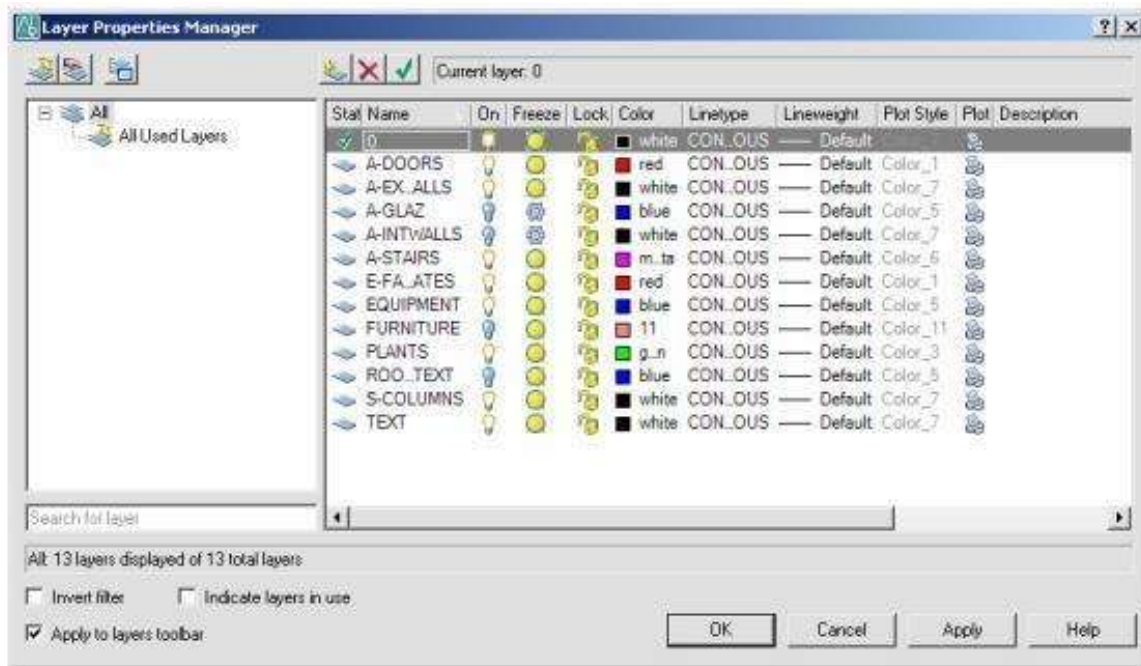
1. Close the Layer Properties Manager dialog box.
2. Note: If you enter the **layer** name and then a comma, a new **layer** name field appears. The **layers** are automatically listed in alphabetical order.

MATCH PROPERTIES

1. Choose Modify, Match Properties. or
2. Click the Match Properties Icon from the Standard toolbar. or
3. Type Command: MATCHPROP or MA
4. Select the object whose properties you want to copy (1).
5. Select the objects to which you want to apply the properties (2).

LAYER STATES

1. Choose the layer icon.
2. Select various layers to be ON, OFF, FROZEN, LOCKED, etc.
3. Choose the Save State button.
4. Choose Restore State to restore the layer settings.



COLOR COMMAND

1. Choose Format, Color, or
2. Type DDColor at the command prompt. Command: DDColor or COL or
3. Choose Color on the Object Properties toolbar and then select a color from the list or select Other to display the Select Color dialog box.



TIP:

These settings ignore the current layer settings for color.

By Layer

If you enter by layer, new objects assume the color of the layer upon which they are drawn.

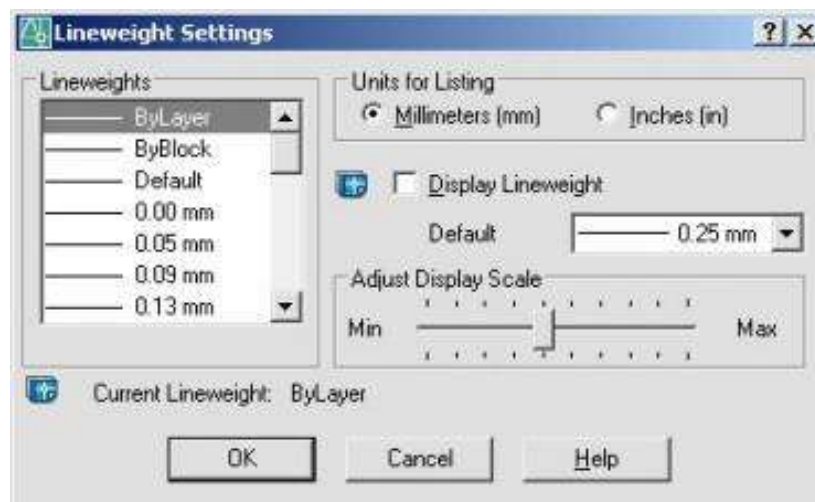
By Block

If you enter by block, AutoCAD draws new objects in the default color (white or black, depending on your configuration) until they are grouped into a block. When the block is inserted in the drawing, the objects in the block inherit the current setting of the COLOR command.

LINEWEIGHTS

Loading and Changing Line weights

1. Choose Format, Line weight... or
2. Type LINEWEIGHT at the command prompt. Command: LINEWEIGHT or LWEIGHT or
3. Pick a line weight to make current from the Object Properties menu.

**PRACTICAL IMPLEMENTATION**

11. Layer toolbar helps us to maintain drawing organized.
12. Maintain drawing standard as well.
13. Dimensioning tools can automatically measure distances and place dimensions on your drawing.
14. The layer command is used to control and manage the drawings in AutoCAD for different purposes.
15. It increases the display performance of the AutoCAD by hiding the portion of our drawing when needed.
16. It also improves the visual complexity of the drawing.
17. With the help of dimensions tool bar we can change the position style and height of character
18. The layer command is used to control and manage the drawings in AutoCAD

VIVA QUESTIONS

1. List out the types of lines.

2. List the types of coordinate systems?

3. Give 5 drawing file (DWG file) history.

4. What is automated drafting?

5. What is dynamic UCS?

6. List out the function keys and their functions.

7. List out the steps to save the drawing file.

8. How to use the line and polyline options?

19. Define aligned dimension?

20. What is .dwg?

EX.NO: 4

Date:

DRAWING A PLAN OF BUILDING AND DIMENSIONING USING LAYERS

A) SINGLE STORIED BUILDINGS B) MULTI STORIED BUILDINGS

AIM

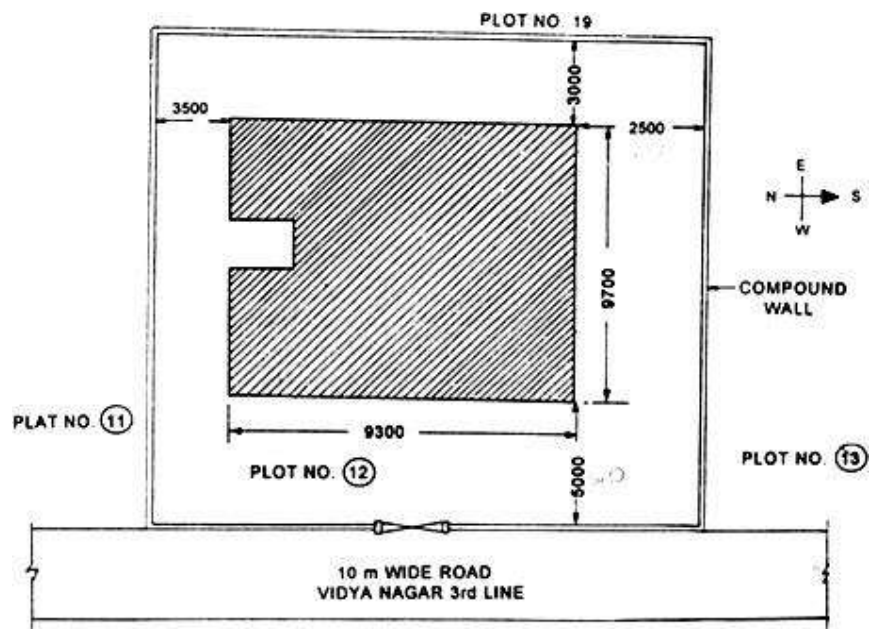
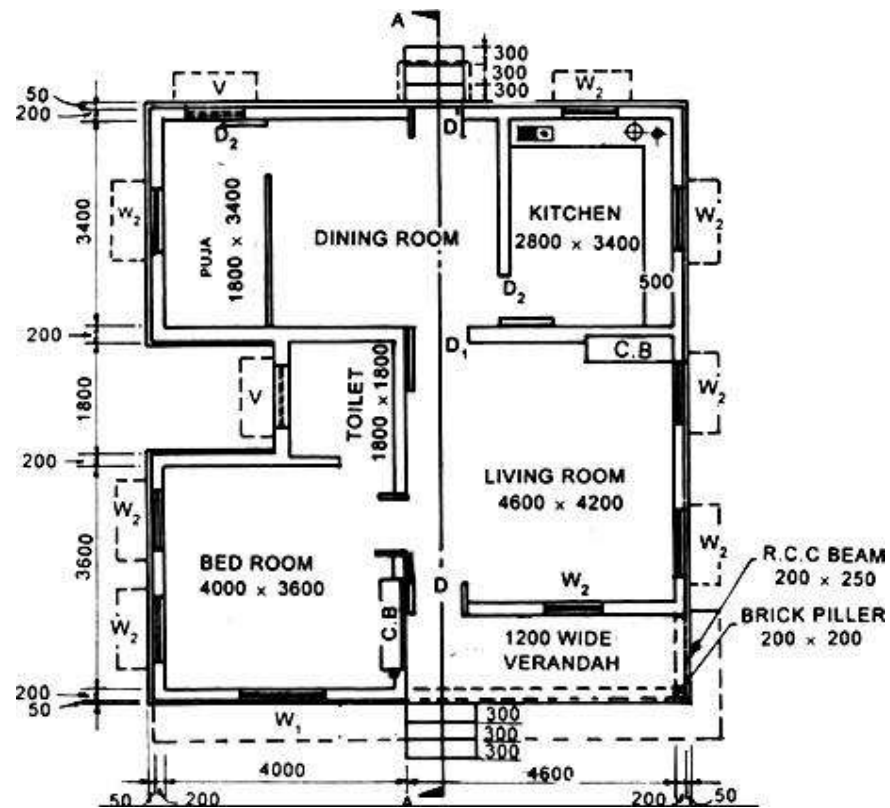
Draw plan of Single-storey and Multi-storey building.

SPECIFICATIONS

1. Foundation: All the walls are taken to depth of 900mm below ground level and C.C bed 700mm wide and 300mm thick. Footing with brick masonry 400mm wide and 600mm depth.
2. Basement: The height of basement is 450mm and width of wall is 300mm. Steps are provided both on front side and rear side over a C.C bed of 150mm thick with an offset of 150mm on all three sides. Tread and rise of steps are 300mm and 150mm.
3. Flooring: Flooring consists of 20mm thick C.M. 1:4 over a bed of cement concrete (1:4:8) 100mm thick. The remaining part of the basement is filled and compacted with sand.
4. Superstructure & Roofing: All the walls are taken to a height of 3200mm and 200mm thick.
5. Roofing consists of R.C.C. slab roofing 120mm thick and projected by 200mm beyond the outer face of walls. The roof slab is provided with weatherproof course 15mm thick.
6. Sunshades: Continuous sunshade is provided on front side of the building. The thickness of sunshade at the wall end is 75mm and at the free end thickness is 50mm. Isolated sunshades are provided over windows and external doors extending the R.C.C Lintels kept over such openings on other three sides. The projection of sunshades is extended 600mm from the face of wall.
7. Lintels: R.C.C lintels on all openings like doors, windows, and cupboards are 150mm thick having a bearing of 150mm on either side.
8. Doors, Windows & Cupboards:
 - D1 - 2No. 1000 x 2000mm Fully Paneled Door
 - D2 - 1No. 900 x 1800mm Fully Paneled Door
 - W - 6No. 1000 x 1200mm Fully Paneled Window
 - CB - 1No. 1200 x 1500mm Cupboard

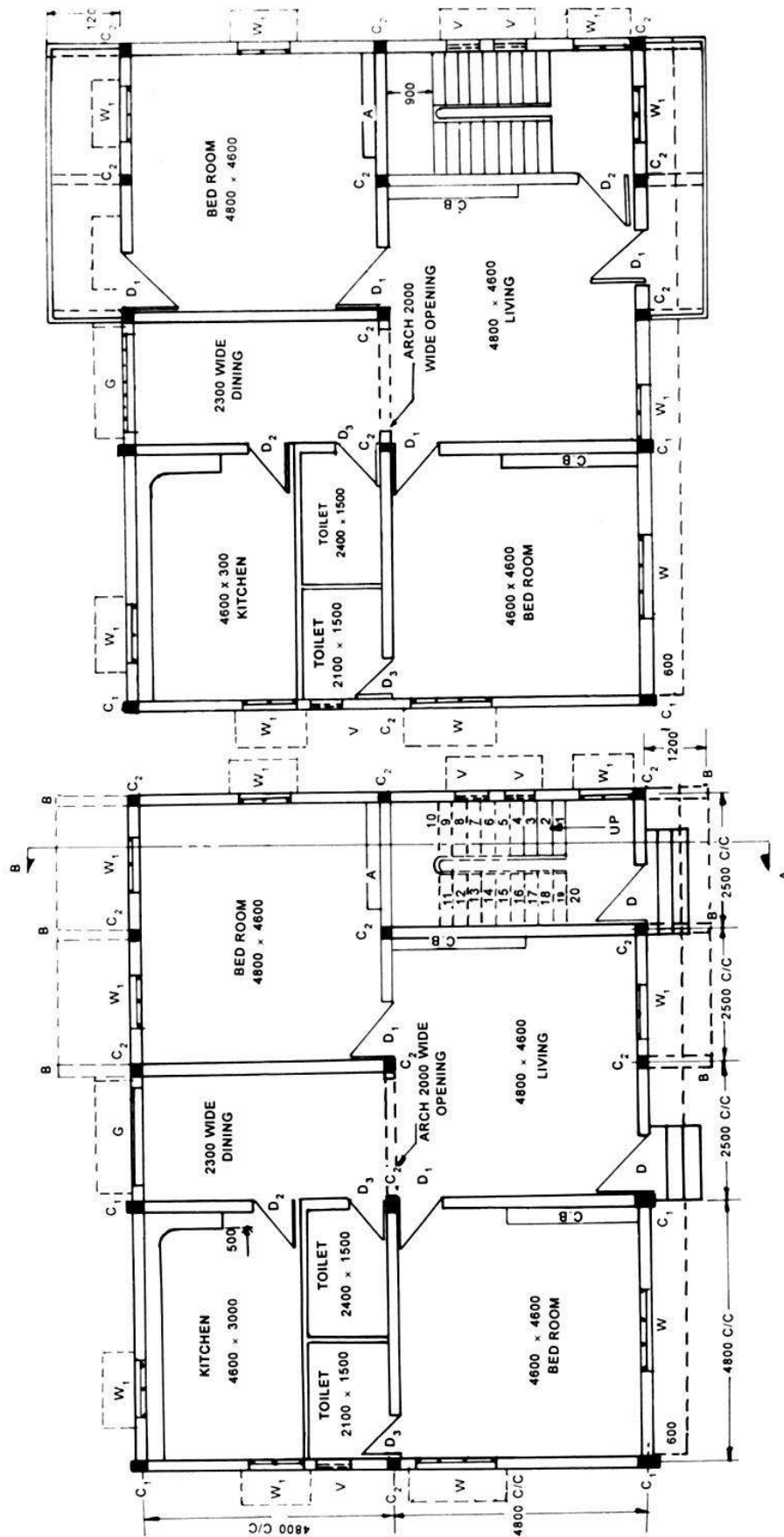
INFERENCE

The plan, section and elevation is drawn.



Single Storey Building

TWO STOREY FRAMED STRUCTURE



Multi storey building

VIVA QUESTIONS

1. What are the commands for line, polyline and construction line?

2. Give the steps how the option mirror is used?

3. What is the purpose of Extrude option?

4. What is the command for move and copy?

5. What is the use of object snap tracking?

6. What is the purpose of giving limits to the drawing file?

7. What are the transformation commands?

8. What are the types of dimensions in drawing?

9. What is the command for rotate?

10. What is known by drawing environment?

EX.NO: 5

Date:

DRAWING A SECTIONS AND ELEVATIONS FOR GIVEN

A) SINGLE STORIED BUILDINGS B) MULTI STORIED BUILDINGS

AIM

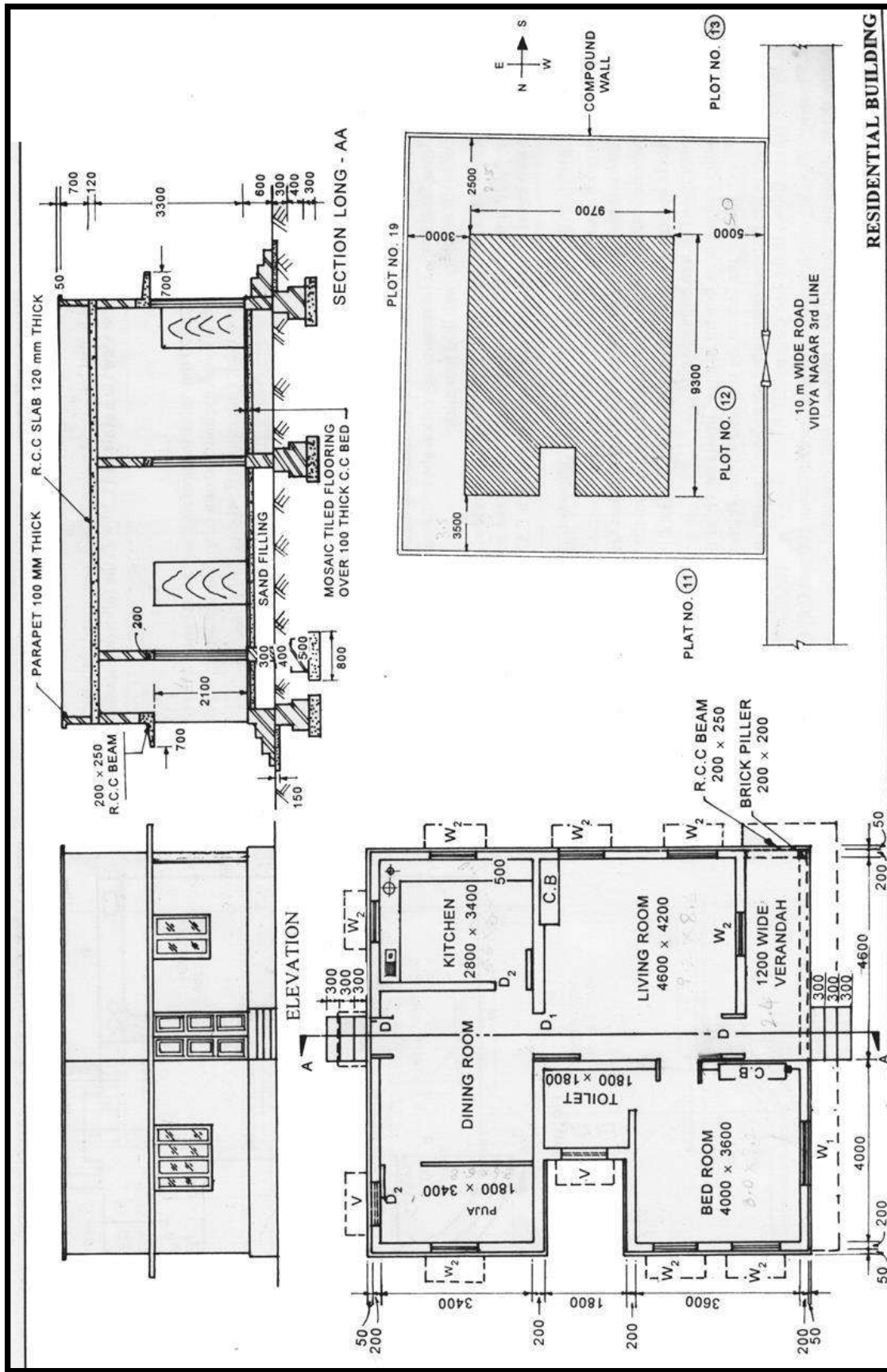
Draw section and elevation of Single-storey and Multi-storey buildings.

SPECIFICATIONS

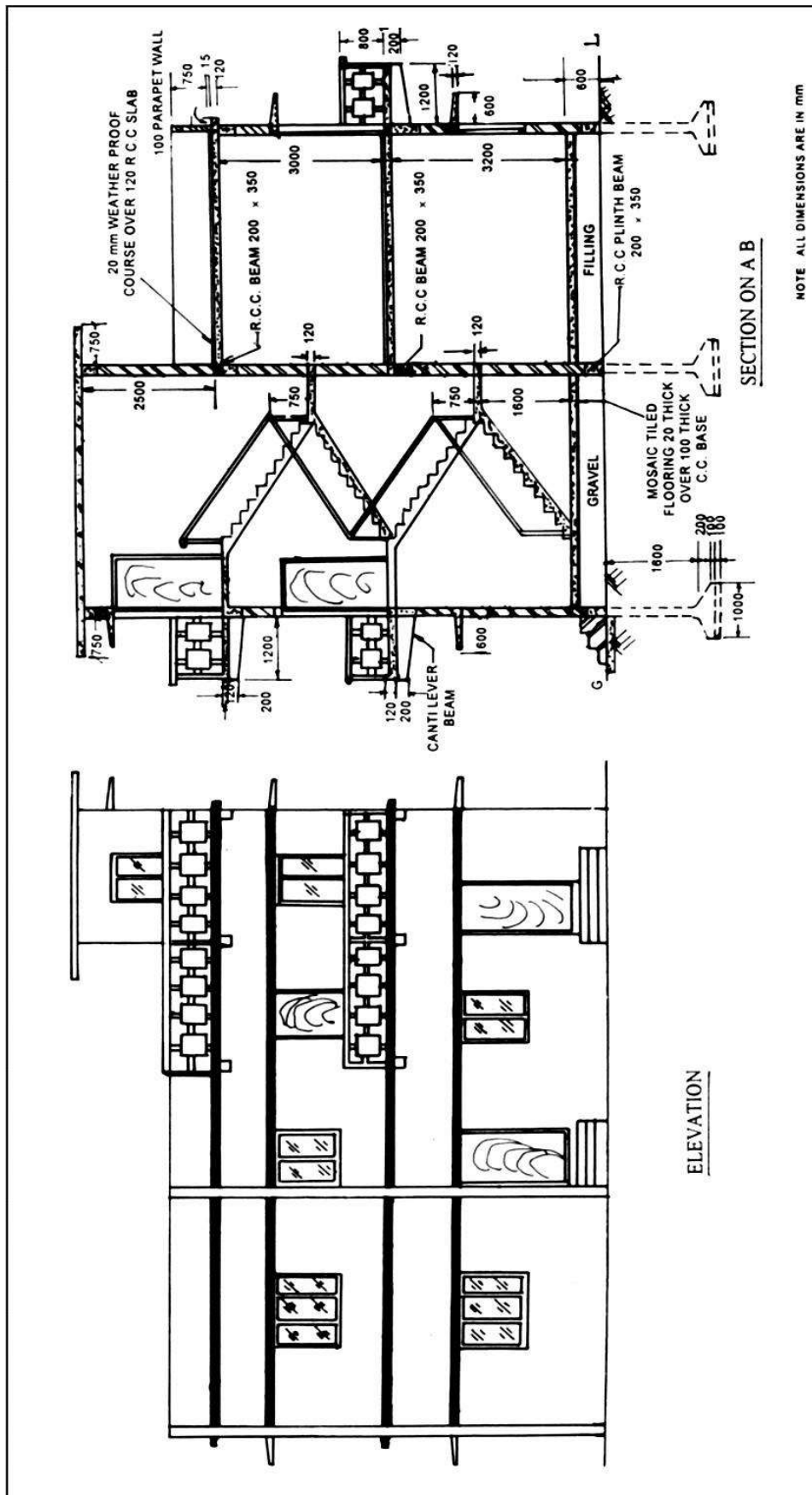
1. Foundation: All the walls are taken to depth of 2000mm below ground level and C.C bed 1000mm wide and 300mm thick with a PCC of 100 thick.
2. Basement: The height of basement is 450mm and width of wall is 300mm. Steps are provided both on front side and rear side over a C.C bed of 150mm thick with an offset of 150mm on all three sides. Tread and rise of steps are 300mm and 150mm.
3. Flooring: Flooring consists of 20mm thick C.M. 1:4 over a bed of cement concrete (1:4:8) 100mm thick. The remaining part of the basement is filled and compacted with sand.
4. Superstructure & Roofing: All the walls are taken to a height of 3200mm and 200mm thick. Roofing consists of R.C.C. slab roofing 120mm thick and projected by 200mm beyond the outer face of walls. The roof slab is provided with weatherproof course 15mm thick.
5. Sunshades: Continuous sunshade is provided on front side of the building. The thickness of sunshade at the wall end is 75mm and at the free end thickness is 50mm. Isolated sunshades are provided over windows and external doors extending the R.C.C Lintels kept over such openings on other three sides. The projection of sunshades is extended 600mm from the face of wall.
6. Lintels: R.C.C lintels on all openings like doors, windows, and cupboards are 150mm thick having a bearing of 150mm on either side.
7. Doors, Windows & Cupboards:
D1 - 2No. 1000 x 2000mm Fully Paneled Door
D2 - 1No. 900 x 1800mm Fully Paneled Door
W - 6No. 1000 x 1200mm Fully Paneled Window
CB - 1No. 1200 x 1500mm Cupboard

INFERENCE

The plan, section and elevation is drawn.



Single storey building



Multi Storey Building

COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

PRACTICAL IMPLEMENTATION

1. This knowledge will be helpful to draw building planning for single storey and multi stories building accurately and effectively with all the required details.



VIVA QUESTIONS

1. Define plan?

2. What is meant by multi storied building?

3. How to use hatch?

4. What are the standard dimensions of main door and bathroom door?

5. What are the standard dimensions of single and double window?

6. What is meant by soft storey?

7. _____ door swings both ways.

8. What is dimension of inner wall?

9. what are the standard dimensions of ventilator?

10. What is the thickness of outer wall?

EX.NO: 6

Date:

DRAWING OF BUILDING COMPONENTS LIKE WALLS, LINTELS, DOORS, AND WINDOWS

AIM

To draw the doors, windows and lintel as per the given dimensions.

SPECIFICATIONS

1. Foundation: The foundation for all walls will be in CC 1:4:8 Mix 800mm wide and 300mm thick laid at 1100mm below GL. The masonry footing will be in brick work in CM 1:5. The first footing being 500X400 and second footing being 400X400 for all walls.

2. Basement: The basement will be in brick masonry in CM 1:5 Mix 300 wide and 600 thick above GL for all walls. In between the walls filled with clear sand of 500mm thick. A damp proof course in CM 1:3, 50 thick will be provided for all walls at basement level.

3. Flooring: The flooring will be in CC 1:4:8, 100mm thick. Plastered smooth with CM 1:3 in 15mm thick.

4. Super structure: All walls will be in Brick work in CM 1:5 Mix using first class brick 300mm thick. The height of wall will be 3300 above Floor level.

5. Plastering: All the walls including basement will be plastered smooth with 1:4 externally and 1:6 internally. Parapet walls 100 thick and 650mm height will be provided all around.

6. Lintel: All opening will be provided with RCC lintel sunshade 1:2:4 mix, 150 mm thick.

7. Sunshade: Width of sunshade is 600 mm and 150 thick, free ends 75 tk.

8. Roofing: The roofing will be of RCC 1:2:4 mix 120 thick flat slabs over the room. A weathering course in brick jelly lime concrete 1:5:9 mix plastered with combination mortar 20 thick over slab.

9. Steps: Steps will be in brick work in cement mortar 1:5 laid on 150 thick cement concrete 1:4:8 footing. Rise = 150, Tread = 300.

10. Doors and windows:

D- Door paneled - 1200 x 2100

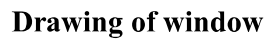
W- Window paneled - 1200 x 1500

Refer the figure for the detailed specification of door and window.

INFERENCE

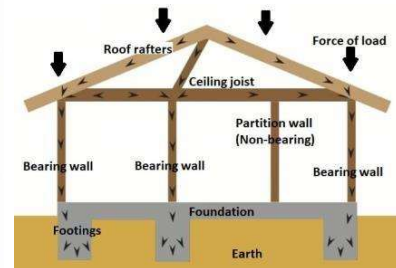
The plan of a residential building is drawn from the given line plan.





COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB PRACTICAL IMPLEMENTATION

1. Knowledge will be helpful to draw components of the building such as walls lintels doors and windows object and once we create we can use multiple times



VIVA QUESTIONS

1. What is door?

2. What are the components of door?

3. What is the difference between plan and section?

4. What is section?

5. what is single storey building?

6. What is the difference between single storey building and multi storey building?

7. Define lintel?

8. Define trim?

9. What is an arch?

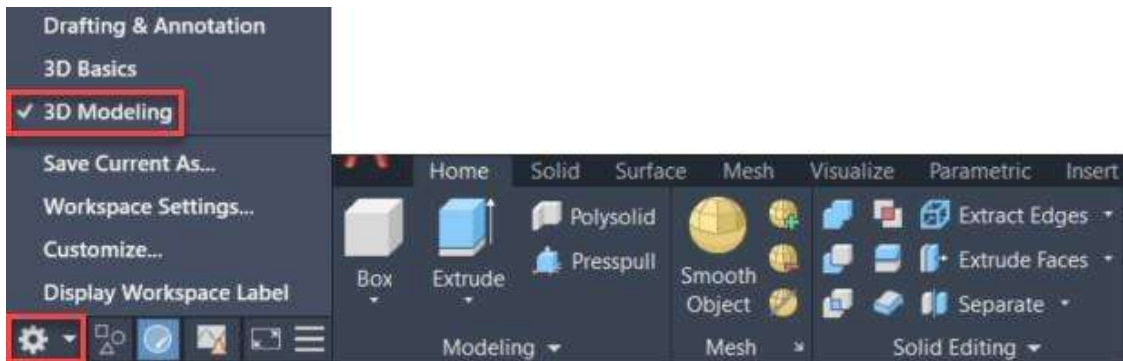
10. List the commands used to draw the door and window.

EX.NO: 7

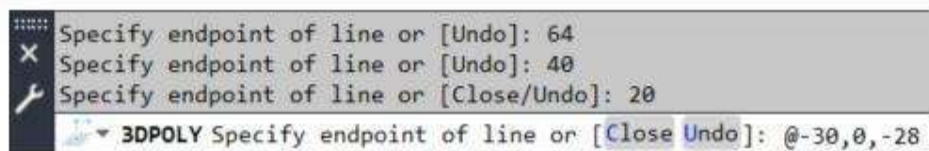
Date:

INTRODUCTION TO 3 – D VIEW

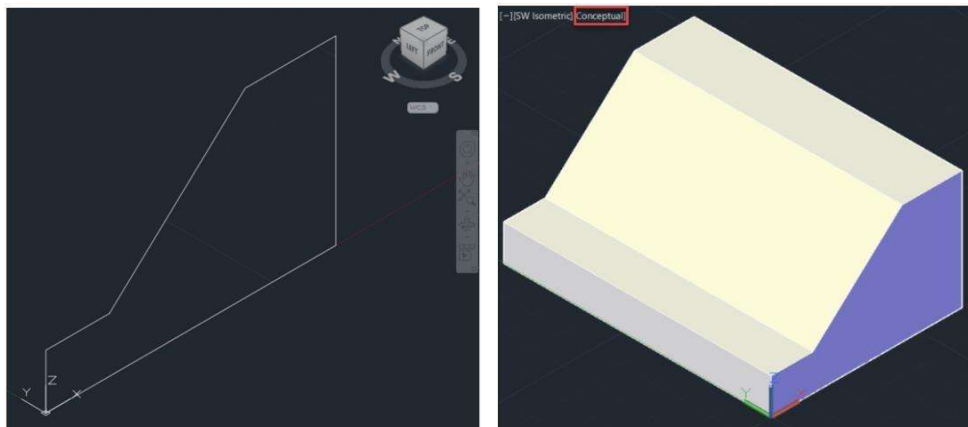
AutoCAD is widely known and utilised as a 2D drafting tool. However, its use for 3D modelling is not as prevalent. This post introduces AutoCAD users to some of the most common 3D tools in AutoCAD by creating the simple shape. Before we start modelling, we need to change the workspace to “3D modeling” from the status bar at the bottom of the application. The ribbon will update to show 3D tools.



You can start by navigating to an isometric view by clicking on a corner of the view cube on the top right of model space. If you do not see the view cube, you can make it visible from the ‘View’ tab of the ribbon. Launch the 3DPOLY command to draw a closed 3D polyline in the front view (XZ plane). Starting on the origin and with ortho mode on (F8), start drawing as you would in a 2D view, keeping in mind that if you specify coordinates, you will need to provide them in all three axes.

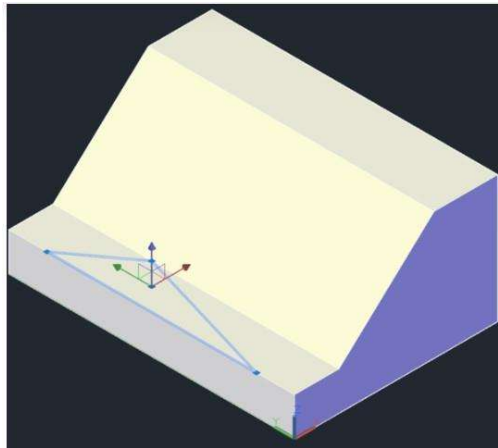


Select the EXTRUDE command from the ‘Home’ tab of the AutoCAD ribbon, pick the 3D polyline from the previous step and then type 90 as the height of extrusion to create a 3D solid. You can control the visual style from the top left corner of model space.

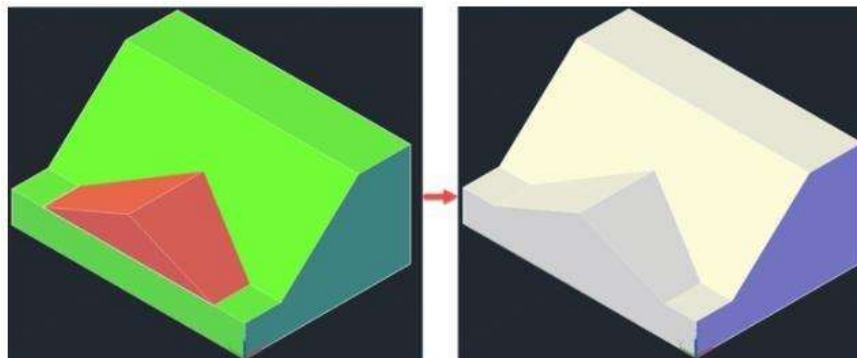


COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

Draw a triangle using a closed 3D polyline as shown below and extrude it to the back of the shape. You may find the 'Extension' object snap useful to find the vertices of the triangle.

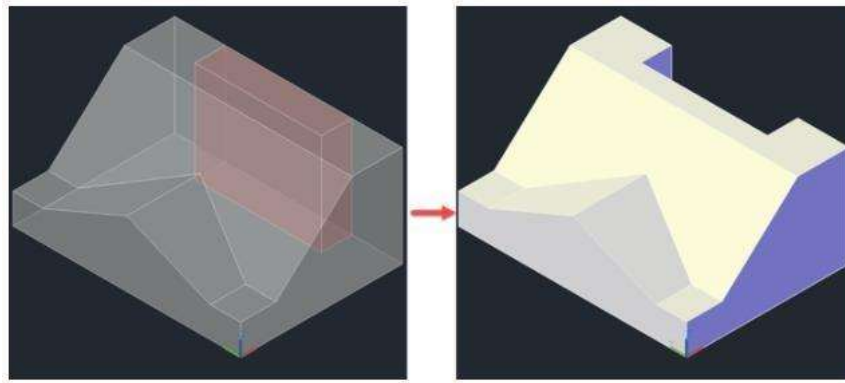


At this point, we have two independent solids that intersect. Pick the UNION command and then select them both to combine them into a single object.



To finish the shape, draw a rectangle on the top face and extrude it to the base. Using the SUBTRACT tool, select the solid to subtract from first, press <Enter>, and then select the solid to subtract.





Some of the benefits of 3D modelling are:

- Using 3D models, users can get a more evocative design, and they can even see the virtual images of their projects.
- An architectural 3D model is much more interesting and realistic than a 2D model.
- The experience that a 3D model gives is much more compelling and satisfying to the user than viewing a 2D drawing. The user can see the impact of all the minor and major changes made in a 3D model. This also aids in the better finishing of the designs without wasting time and money.
- 3D models are an amazing advantage to interior designers as they get to create and then modify 3D interior as well as exterior as per their need and choice.
- In a 3D design, the user gets to know the physical dimensions of the objects and their distance in relation to other objects in the total layout. This feature helps enormously to see and modify arrangements of objects based on their sizes.
- Some artists use a mixture of 3D modelling for best results by editing the 2D computer-rendered images from the 3D model.

TOP AUTOCAD 3D COMMANDS

11. REVOLVE

- Location: Draw > Modeling > Revolve
- This AutoCAD 3D command creates a 3D solid by revolving a 2D object around an axis.

12. EXTRUDE

- Location: Draw > Modeling > Extrude
- This AutoCAD 3D Extrude command allows the user to create a 3D object by extruding a 2D face along a line or path. For example, A cylinder can be created by selecting a 2D circle and extruding it along with a path.

13. SWEEP

- Location: Draw > Modeling > Sweep
- This command helps the user to extrude the 2D objects without the 2D face being orthogonal to the beginning of the path.

14. UNION

- Location: Modify > Solids Editing > Union
- This AutoCAD 3D command allows the user to combine two objects converting them into one single object.

15. SUBTRACT

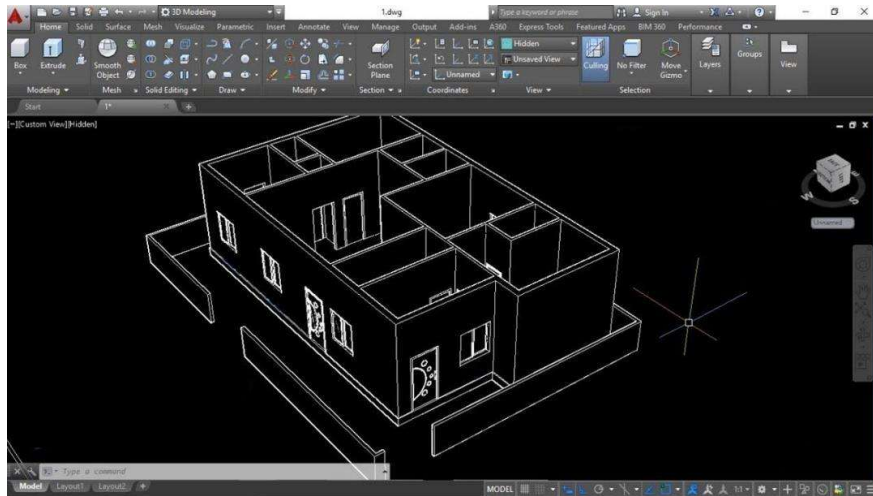
- Location: Modify > Solids Editing > Subtract
- This command is opposite to the union command; this command works when there is a common area in both the objects. Then this command subtracts the object A from the object B.

16. INTERSECT

- Location: Modify > Solid Editing > Intersect
- With this AutoCAD 3D command, the user is left with the area that is common to both the objects.

PRACTICAL IMPLEMENTATION

1. Will be able to draw and see element in three dimensions, so that visualization of the drawing will be good we can use these 3D drawings to explain and convince the client.
2. Architectural usages



VIVA QUESTIONS

1. Define elevation?

2. What is the minimum clear height of the floor?

3. The middle horizontal member of shutter is called_____.

4. Mullion is_____member employed to sub divide a window or door opening vertically.

5. A casement window hung horizontally is called_____.

6. List out the types of windows.

7. A casement window hung horizontally is called_____.

8. What is window?

9. What are the components of window?

10. What is the difference between plan and elevation?

EX.NO: 8

Date:

EXERCISE ON 3 – D

AIM

To draw the plan of a residential building for the given line plan

SPECIFICATIONS

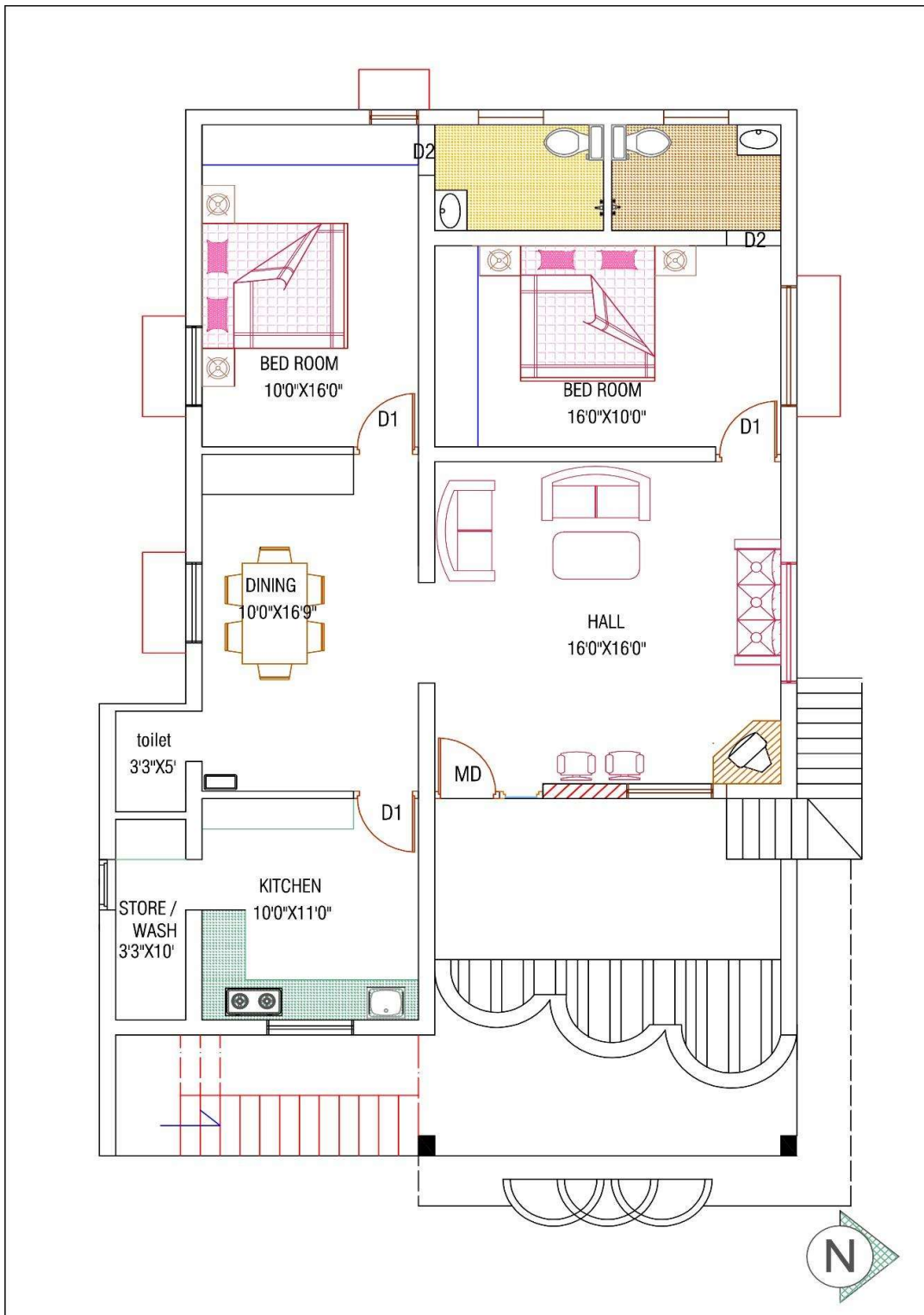
The following specifications refer to residential building with RCC flat roof

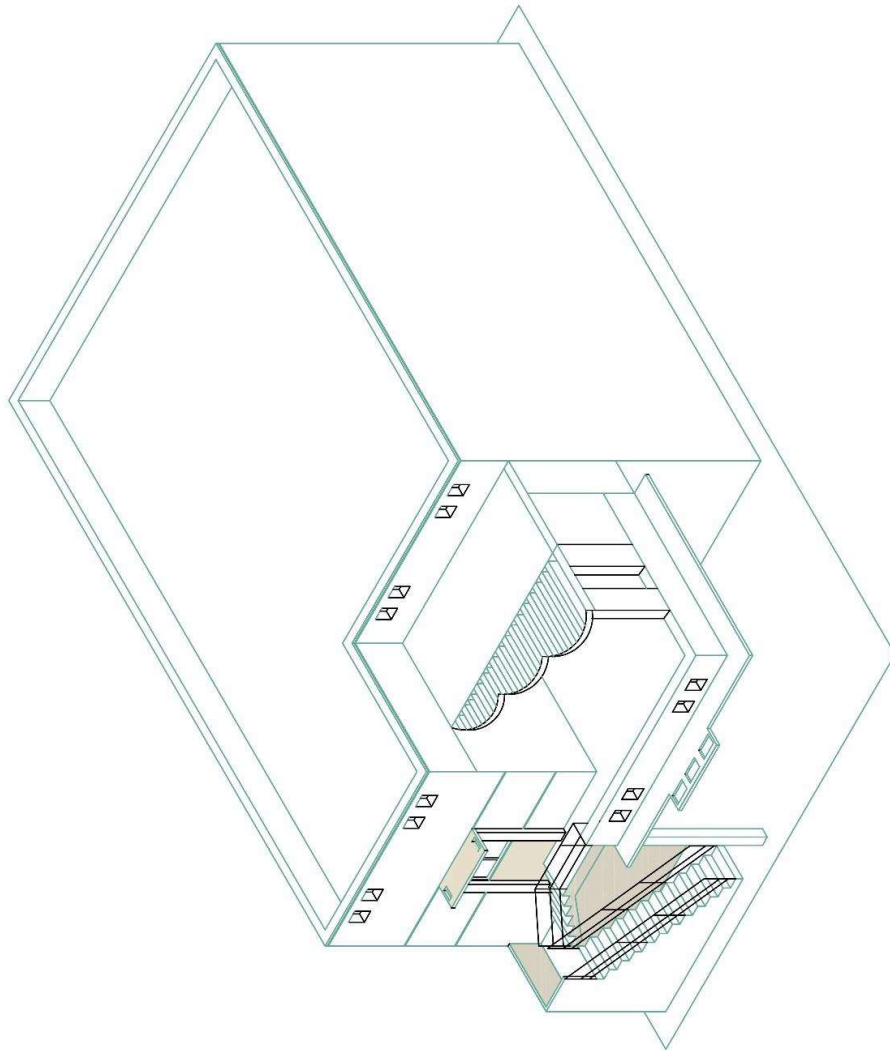
1. Basement: The basement will be in RR masonry in CM 1:5 Mix 200 wide and 300 thick above GL for all walls. In between the walls filled with clear sand of 150mm thick. A damp proof course in CM 1:3, 20 thick will be provided for all walls at basement level.
2. Flooring: The flooring will be in CC 1:4:8, 130mm thick. Plastered smooth with CM 1:3 in 20mm thick.
3. Super structure: All walls will be in Brick work in CM 1:5 Mix using first class brick 200mm thick. The height of each floor will be 3000 above Floor level.
4. Plastering: All the walls including basement will be plastered smooth with 1:4 externally and 1:6 internally. Parapet walls 200 thick and 450mm height will be provided all around.
5. Lintel: All opening will be provided with RCC lintel sunshade 1:2:4 mix, 150 mm thick.
6. Sunshade: Width of sunshade is 600 mm and 150 thick, free ends 75 tk.
7. Roofing: Trussed roof shown in figure.
8. Steps: Steps will be in brick work in cement mortar 1:5 laid on 1800x450x150 thick cement concrete 1:4:8 footing Rise = 150, Tread = 300.
9. Doors and windows:

D- Door	- 1200 x 2100
W- Window paneled	- 1200 x 1500

INFERENCE

The plan and 3D elevation of the residential building is drawn.

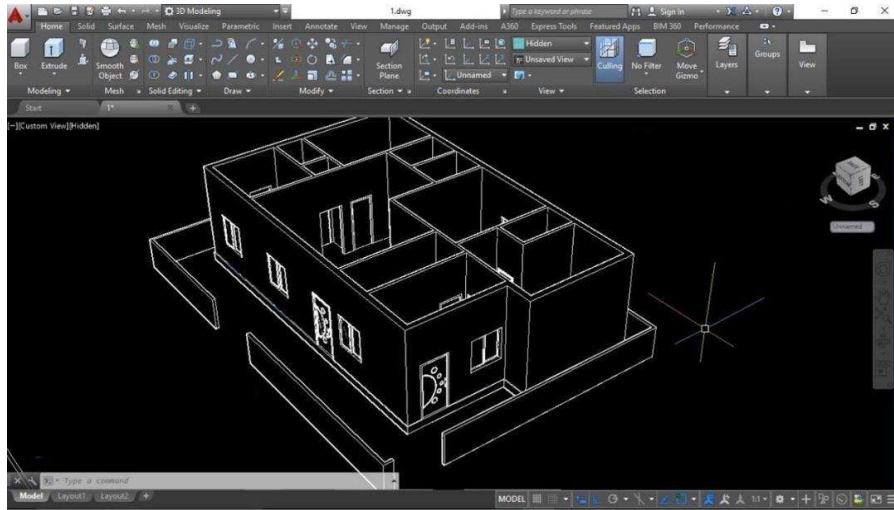




COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

PRACTICAL IMPLEMENTATION

1. Will be able to draw and see element in three dimensions, so that visualization of the drawing will be good we can use these 3D drawings to explain and convince the client.
2. Architectural usages



VIVA QUESTIONS

1. What are dimension variables?

2. What is damp proof course?

3. What is a dwelling?

4. What is stone masonry?

5. What are the different types of foundation?

COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

6. What are the different types of truss?

7. Draw north light truss?

8. What is girder?

9. What is purlin?

10. What is damp proof course?

CONTENT BEYOND THE SYLLABUS

DRAWING THE PLAN, SECTION AND ELEVATION FOR AN INDUSTRIAL BUILDING

AIM

To draw the plan of a residential building for the given line plan

SPECIFICATIONS

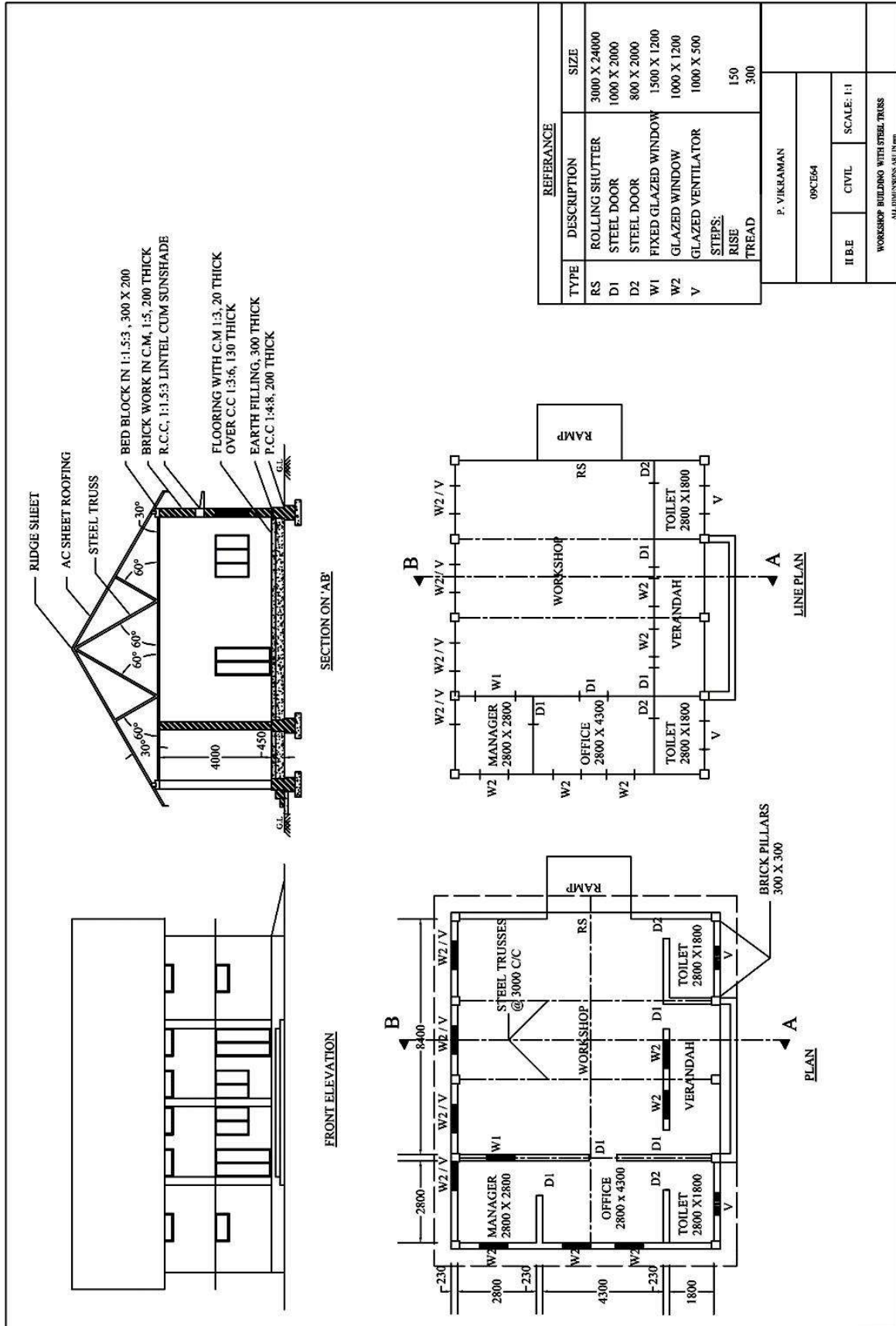
The following specifications refer to residential building with RCC flat roof

1. Foundation: The foundation for all walls will be in CC 1:4:8 Mix 600mm wide and 200mm thick laid at 600mm below GL. The masonry footing will be in brick work in CM 1:5. The first footing being 400X400 for all walls.
2. Basement: The basement will be in RR masonry in CM 1:5 Mix 200 wide and 300 thick above GL for all walls. In between the walls filled with clear sand of 150mm thick. A damp proof course in CM 1:3, 20 thick will be provided for all walls at basement level.
3. Flooring: The flooring will be in CC 1:4:8, 130mm thick. Plastered smooth with CM 1:3 in 20mm thick.
4. Super structure: All walls will be in Brick work in CM 1:5 Mix using first class brick 200mm thick. The height of wall will be 3000 above Floor level.
5. Plastering: All the walls including basement will be plastered smooth with 1:4 externally and 1:6 internally. Parapet walls 200 thick and 450mm height will be provided all around.
6. Lintel: All opening will be provided with RCC lintel sunshade 1:2:4 mix, 150 mm thick.
7. Sunshade: Width of sunshade is 600 mm and 150 thick, free ends 75 tk.
8. Roofing: Trussed roof shown in figure.
9. Steps: Steps will be in brick work in cement mortar 1:5 laid on 1800x450x150 thick cement concrete 1:4:8 footing. Rise = 150, Tread = 300.
10. Doors and windows:

D- Door	- 1500 x 2100
W- Window paneled	- 1200 x 1200

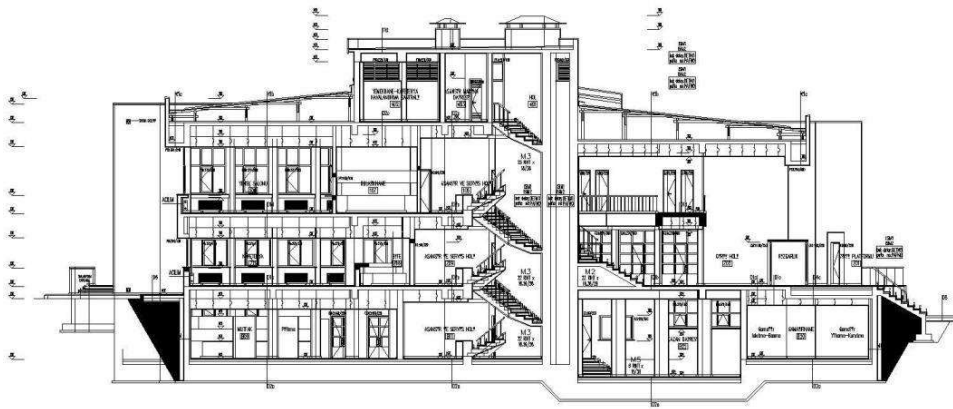
INFERENCE

The plan of a residential building is drawn from the given line plan.



PRACTICAL IMPLEMENTATION

1. Helps in design and detailing of industry building



VIVA QUESTIONS

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

2. Define foundation for a simple building.

3. List the functions of foundation

4. What is the minimum depth of shallow foundation?

5. List out the types of building symbols.

6. What are all the basic kinds of building?

7. What kinds of doors are available in buildings?

8. What is footing?

9. Define PCC and RCC.

10. How to fix scale for a building.
