Er. PERUMAL MANIMEKALAI COLLEGE OF ENGINEERING
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DepartmentofCivilEngineering

CE3611

BUILDINGDRAWINGANDDETAILINGLABORATORY

LaboratoryManual

VI SEMESTER

EX.NO: 1 DATE :	**PRINCIPLE OF PLANNING AND ORIENTATION**

AIM :

To study the Principles of planning and orientation.

PRINCIPLES OF PLANNING

Planning is an important aspect in building construction. An Architect / Engineer should bear in mind the general principles while planning a structure. The principles involved are not rigid, but they are of very general in nature. Following are the principles involved in building planning.

1) Aspect 2) Circulation 3) Economy 4) elegance 5) Flexibility 6) Furniture requirements 7) Privacy 8) Grouping of rooms 9) Prospect 10) Roominess 11) Sanitation.
Each of the above principles of planning are briefly described below.

1) ASPECT :

The term aspect means the arrangement of doors and windows in the external walls of buildings, particularly of residential buildings, so that the occupants can enjoy the natural gifts of sunshine, breeze, scenery, etc., The sunshine and breeze develops hygienic conditions and comfort to the residents.

2) CIRCULATION :

Circulation in building is of two types, Horizontal and vertical. **Horizontal circulation** is between the rooms of the same floor. It should be achieved by the provision of passages, corridors, halls and lobbies. **Verical circulation** is between different floors, and can be achieved by the judicious provision of stair cases and lifts. Sometimes, tanks are provided in public buidings such as theatres, bus stands, truck depots or office buildings. Multistoreyed buildings should be provided with emergency exits in the event of fire.

Minimum area with sufficient light and ventilation is the basic requirement of both types of circulation units. They should add to the convenience, comfort and privacy of the users. Staircase planning requires consideration in the selection of rise, tread, width of stairs, landing and design of handrail. In the case of public buildings suitable location of staircase and their appearance helps to create a cheerful atmosphere.

3) ECONOMY :

Strictly speaking, economy is not the factor of principles of planning. But in actual practice, if the engineer is unable to controlhis work within the financial limit of the client, the project miserably fails. To avoid this, the engineer should know in advance the financialposition of the client before he finalise the project. So that the entire work will be executed within the estimated cost.

4) ELEGANCE :

The term elegance is used to indicate the architectural effect produced by elevation and general layout of the plan. A building constructed in an elevated ground will give elegance.

5) FLEXIBILITY :

Present and future requirement of a family changes as the family expands. The kitchen and dining have to be combined in most houses. It may be necessary to convert the living room into guest room, when required. The most important requirement in planning is to provide independent access to sanitary units from all rooms. In the case of public buildings like schools, hotels, etc., the plan should provid flexibility from the point of future expansion.

6) FURNITURE REQUIREMENTS :

The plans of buildings should show the layout of furniture requirements. Accordingly, the furniture should be purchased and kept in position. While working out the requirements, the normal needs of maximum number of occupants should be kept in mind. Whileplacing the furniture, it should not obstruct doors, windows and the circulation space.

7) PRIVACY :

Privacy is of two types.

1) Privacy of the whole building with reference to the surrounding buildings and roads. This can be achieved by screening the entrances (front and back), by planting of trees and creepers, etc.,

2) Privacy in different rooms i.e. bed rooms, bath rooms, kitchen, etc., This can be achieved by the correct positioning of doors and opening of shutters. The shutters should open in such a way that a person entering the room will get the maximum view. A large portion of the details of the room (such as beds in the bed room) should not be visible at a glance. For maximum privacy single shutters are better than double shutters. Provision of frosted glass for windows provided more privacy than plain glass. Louvers for shutters provide ventilation as well as privacy.

8) GROUPING OF ROOMS :

Grouping implies an arrangement of various rooms with reference to their function. As most people like to sit in verendah, the living room should naturally be next to it. The kitchen and dining room must be close to each other. Sanitary arrangements must be adjacent to the bed rooms. These should be independent access to sanitary units. The staircase must be approachable from the maximum number of rooms. The passage area must be minimum, well-ventilated and sufficiently well-fit.

Grouping varies according to the type of building. Hospitals, libraries, schools, and cinema halls should be designed taking into consideration the movement of persons from one unit to another, without causing disturbances to the other units. Location of the main and subsidiary entrances, staircases and toilet units, units on ground floor and other floors requires careful consideration.

9) PROSPECT :

Prospect means the external view as seen from certain rooms of the building. It is controlled by the surrounding peculiarities of the site of the project. In its wide sense, it also includes concealment of some undesirable views in a given outlook.

10) ROOMINESS :

Roominess means the effect derived from the space of a room, i.e.,its length, width and height. It should be planned that maximum benefit is obtained from th minimum dimensions of the room. For example, in case of residential buildings, a rectangular room is found to be convenient as compared to the square room of the same area from the view point of utility, furniture layout, etc.,

11) SANITATION :

Sufficient light, Cleanliness, Ventilation and Sanitary convenience are the main consideration in sanitation.

LIGHT :

Lighting is important from the point of view of illumination and hygiene. Lighting is of two types: natural lighting may be required to give sufficient light. The source of natural lighting is the sun. Sunlight illuminates as well as destroys germs. The minimum window area for buildins located inhot humid climates is one-seventh of the floor area, and for dry climates, one-tenth of the floor area. For buildings like schools, factories, etc., it should be one-fifth of the

floor area. The light may be distributed in three ways. (1) Directly (2) Indirectly (3) Semi-indirectly.

CLEANLINESS :

Dust is injurious to health. It allows the growth of bacteria and spread of disease. Mouldings, skintings, cornices and corners are the places of dust accumulation. The design of the room should be such that it can be cleaned easily.

VENTILATION :

Ventilation may be defined as the system of supplying or removing air by natural or mechanical means from any enclosed space to create and maintain comfortable conditions. Orientation of the building and location of windows help in proper ventilation.

SANITARY CONVENIENCE :

Water closets and bathrooms should be provided with dadoes so that they can be cleaned regularly. If water carriage system is not available, septic tank can be provided. There must be proper water supply. There shall be proper drainage to dispose off bathroom water, kitchen water, rainwater etc.,

HOME ORIENTATION

When the site and requirements of a house have been finalised, the next step is orientation of the house which means fixing the direction of the building in such a way that it derives maximum benefit from the sun, air and nature. Orientation of a building is fixed by studying the sun diagram indicating the path of sun at a particular place during the day and during the year (**FIG. 1**).

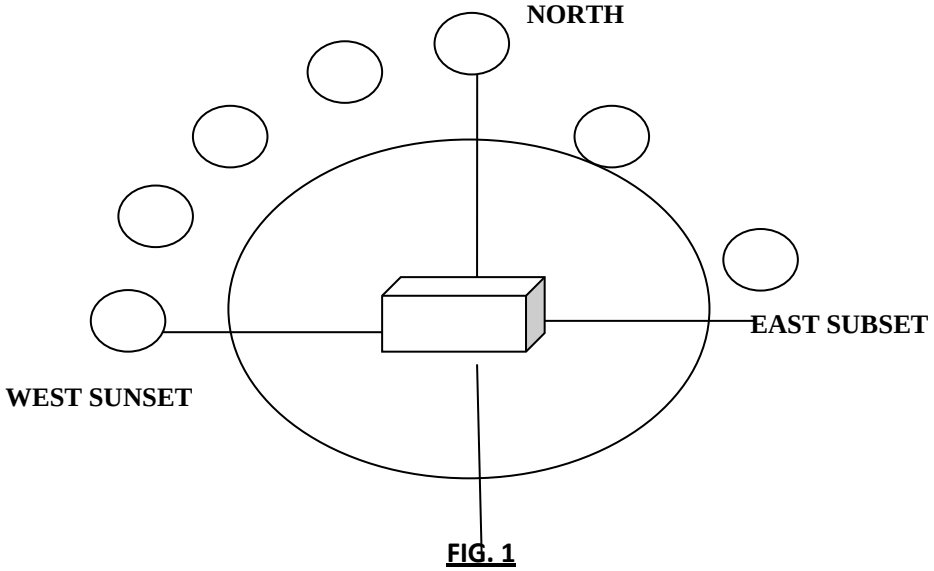


FIG. 1

Ideally, the building should be oriented to absorb as much heat as possible in winter and repel heat in summer. We know that man's health and happiness are influenced directly by the environment. Faulty housing conditions cause poor health and spread of various types of diseases. Proper orientation of a house increase fresh air and sunshine in the house, thus providing resistance to diseases.

Sunlight is one of the most important aid to health. It furnishes illumination which helps in cleanliness, prevents accidents and facilitates good version. It kills micro organisms, being one of the most effective anti-bacterial agents. It also causes beneficial chemical changes in the skin and blood and act as a general tonic to health. Good sunlight also promotes cheer and sense of well being.

Some more points regarding the orientation of a building are as follows.

(i) Long walls of the building should face north and south, short walls should face east and west (**FIG. 2**)

(ii) A verandah or balcony can be provided towards east and west to keep the rooms cool (**FIG. 3**)

(iii) To protect the building from sun and rain, sunshades are required for window facing the east, west and south (**FIG. 4**)

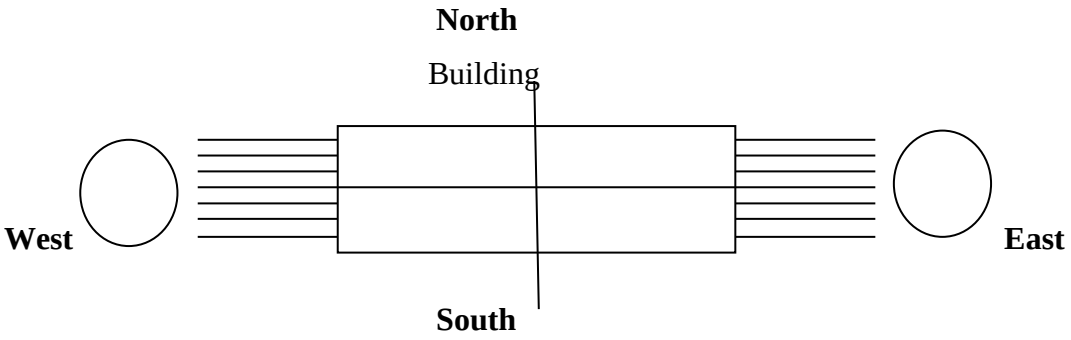
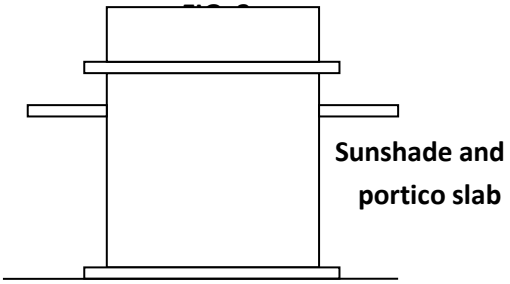


FIG. 2

FIG. 3



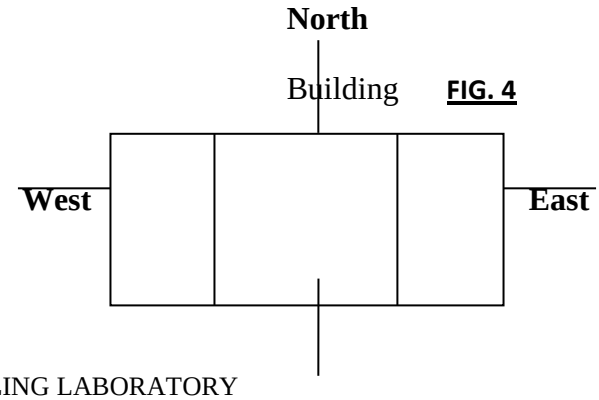


FIG. 4

EX.NO: 2 DATE :	**BUILDINGS WITH LOAD BEARING WALLS AND RCC ROOF**

AIM:

To draw the plan, elevation and section of a industrial building using the various Commands in AutoCAD

SOFTWARE USED:

Auto CAD

COMMAND USED AND THEIR DESCRIPTION:

- Limits - reset the model space limits
- Zoom – It is used to zoom the object created.
- Units – Used to set the current format for units of measure.
- Line –Line commands allows creating a line where the end points allow creating a line where the end points are dimensional co-ordinates.
- Line type – using this command different type of lines can be used to draw object.
- Offset – create a news object at a specified distance from an existing object or through a specified point.
- Fillet - This command is basically used for rounding off edges
- Trim – trims off an object using cutting edges defined by other objects.
- Break – removes only a part of an object.
- Arc – Used to create an arc segment. Methods are:

  1. 3 Points,
  2. Start, Center, End
  3. Start, Center, Angle
  4. Center, Start, End
  5. Center, Start, Angle
  6. Start, Center, Length
  7. Center, Start, Length
  8. Start, End, Angle
  9. Start, End, Radius
  10. Start, End, Diameter

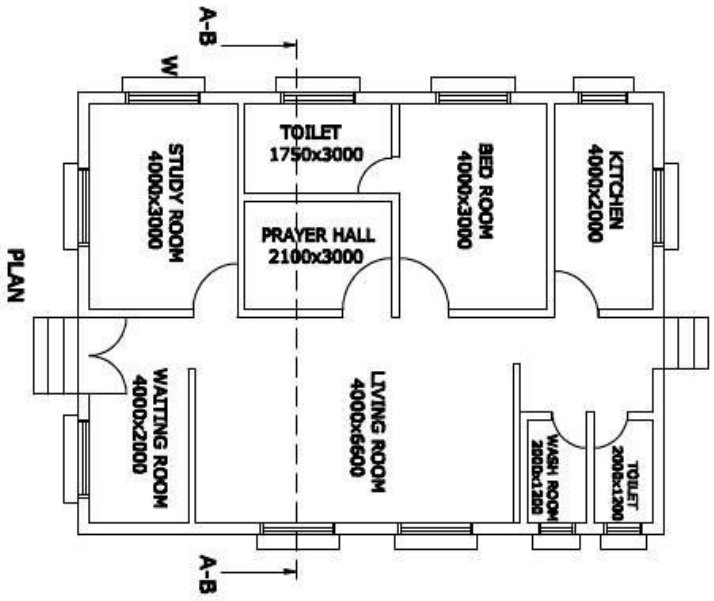
11. Continue

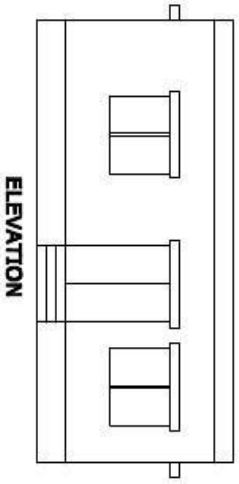
- Copy- Moves the selected objects from a given square to destination, learning a copy at the originally selected location.
- Rotate- rotate objects around a specified point
- Move- moves object to the destination place from the source place
- BHatch – makes shaded patterns as matter of few picks and clicks away
- Extend – elongates an object to a boundary defined by other objects
- Erase – used to erase the unwanted objects
- Text – creates text object with specified height and orientation
- Osnap – AutoCAD displays the object snaps tab in drafting setting dialog box. If we enter osnap at command prompt it presents options on the command line.

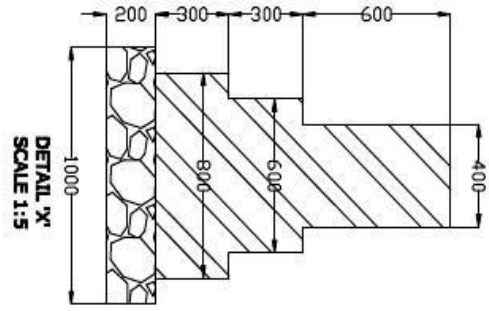
PROCEDURE :

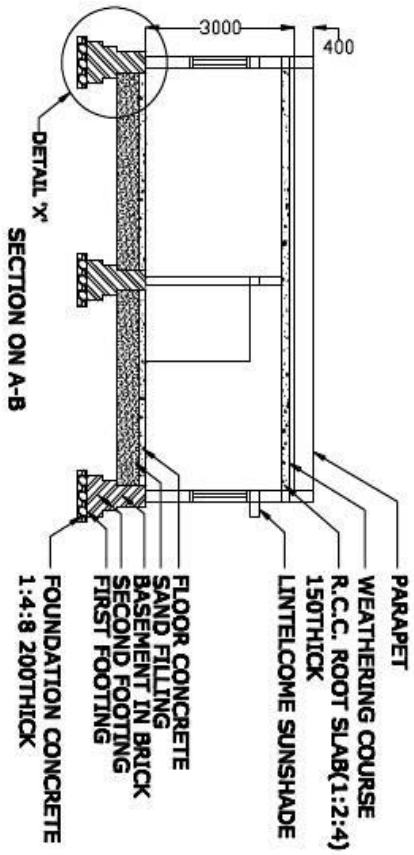
- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, set the types as decimal/precision as 0.0000 and units to scale drag and drop content as millimeters.
- By using line command, the outer line of the plan is drawn with the required dimension
- By using offset command, the outer line of the plan is drawn with the required dimension
- By using offset command, the wall thickness of the plan is given as per requirements.
- By using trim command the excess lines are trimmed.
- By using line command, each room is drawn as per requirements.
- The lines that cannot be trimmed using trim command are eliminated by break command.
- Using arc command, the doors are drawn as per the requirements of each room.
- Using copy command, the doors are copied if necessary multiply copy is used.
- Using rotate command, the doors are rotated as per the required placement for each room.
- Using move command, the doors are moved and fixed in the place on where it should be placed.
- Using rectangle command and offset command, the window is drawn separately as per the required dimensions.
- By changing the line type from continuous to dashed lines, the sun shades and ventilators are drawn.

- The windows, ventilators and sunshades are copied, rotated and moved and placed in the required place.
- Using offset command, the plinth line is drawn.
- The elevation is drawn by extending the outer line of the plan using extend command and unwanted lines are erased using erase command.
- The doors, windows, sunshade and parapet are drawn in same distance in elevation as drawn in same distance in the plan.
- The section is drawn on the adjacent side of the elevation by extending the lines.
- The various representations of brickwork, sand filling and concrete are completed in the section using BHatch command.
- Using save command, the file having plan, elevation and section is saved by giving the corresponding path name.



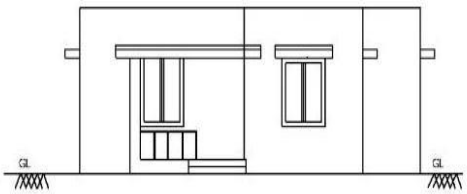




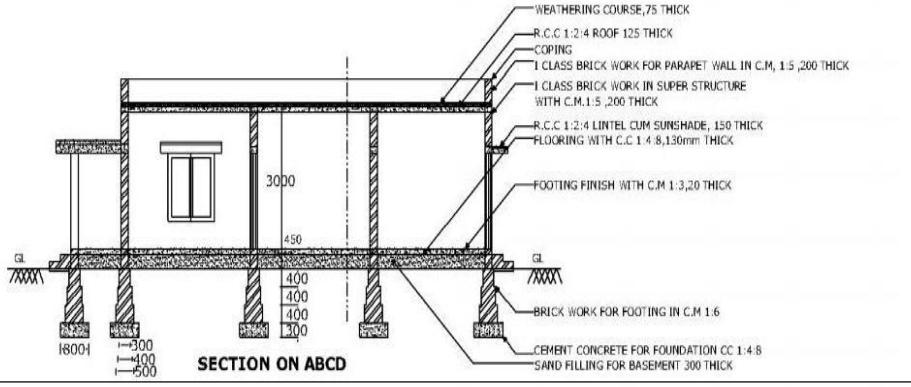


S.NO	SYMBOL	DESCRIPTION	DESIGNATION
1.	W	1500x1200	GLAZED
2.	D	1000x2100	PANELLED
3.	D1	1500x2100	PANELLED
4.	D2	700x2100	PANELLED
5.	V	900x600	GLAZED
6.	TREAD	300	
7.	RISE	150	

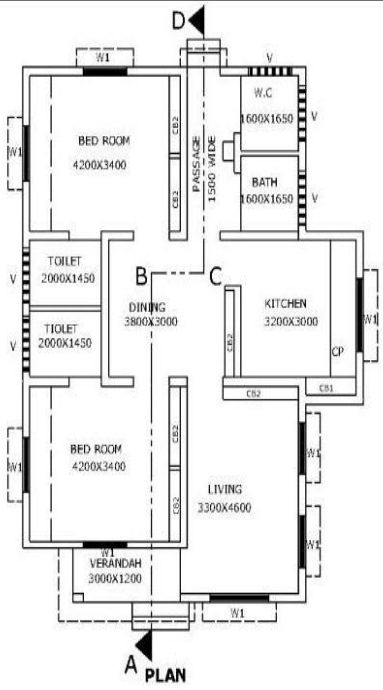
ALL DIMENSION ARE IN mm



FRONT ELEVATION



SECTION ON ABCD



REFERENCE		
TYPE	DESCRIPTION	SIZE
D1	FLUSH DOOR	1000X2100
D2	PANELLED DOOR	900X2100
W1	WINDOW GLAZED	1200X1200
V	VENTILATOR GLAZED	1200X450
O	OPENING	1200X2100
CB1	CUPBOARD	400 DEPTH
CB2	CUPBOARD	300 DEPTH
S	SHELF	200 DEPTH
STEPS	RISE	150
	TREAD	300

RESULT:

Thus the Plan, Section, Elevation of a buildings with load bearing walls was drawn by using various commands in Auto CAD.

EX.NO: 3

DATE :

BUILDINGS WITH SLOPING ROOF

AIM :

To draw the plan, elevation and section of a industrial building using the various Commands in AutoCAD

SOFTWARE USED :

- AutoCAD 2015

COMMAND USED AND THEIR DESCRIPTION :

- Limits - reset the model space limits
- Units – Used to set the current format for units of measure.
- Line –Line commands allows creating a line where the end points allow creating a line where the end points are dimensional co-ordinates.
- Offset – create a news object at a specified distance from an existing object or through a specified point.
- Trim – trims off an object using cutting edges defined by other objects.
- Break – removes only a part of an object.
- Arc – Used to create an arc segment. Methods are:

  23. 3 Points,
  24. Start, Center, End
  25. Start, Center, Angle
  26. Center, Start, End
  27. Center, Start, Angle
  28. Start, Center, Length
  29. Center, Start, Length
  30. Start, End, Angle
  31. Start, End, Radius
  32. Start, End, Diameter
  33. Continue

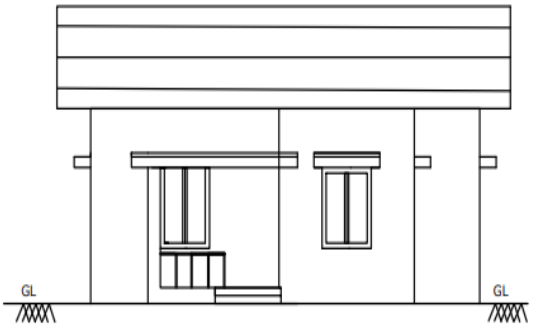
- Copy- Moves the selected objects from a given square to destination, learning a copy at the originally selected location.
- Rotate- rotate objects around a specified point
- Move- moves object to the destination place from the source place

- BHatch – makes shaded patterns as matter of few picks and clicks away
- Extend – elongates an object to a boundary defined by other objects
- Erase – used to erase the unwanted objects
- Text – creates text object with specified height and orientation

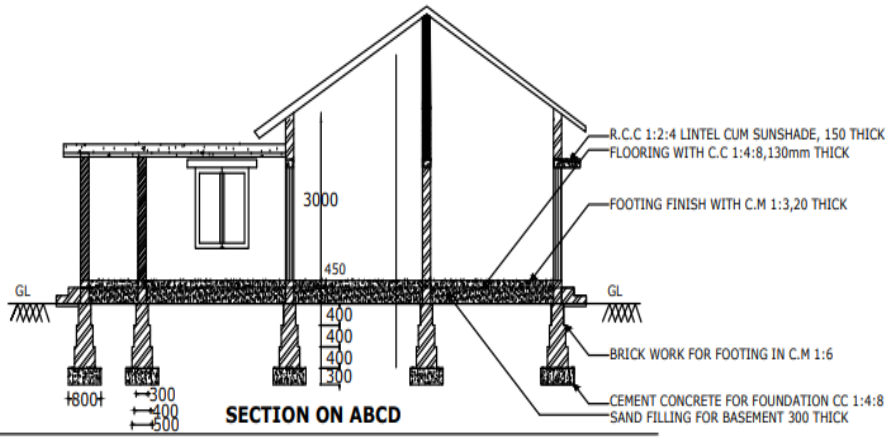
PROCEDURE :

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, set the types as decimal/precision as 0.0000 and units to scale drag and drop content as millimeters.
- By using line command, the outer line of the plan is drawn with the required dimension
- By using offset command, the outer line of the plan is drawn with the required dimension
- By using offset command, the wall thickness of the plan is given as per requirements.
- By using trim command the excess lines are trimmed.
- By using line command, each room is drawn as per requirements.
- The lines that cannot be trimmed using trim command are eliminated by break command.
- Using arc command, the doors are drawn as per the requirements of each room.
- Using copy command, the doors are copied if necessary multiply copy is used.
- Using rotate command, the doors are rotated as per the required placement for each room.
- Using move command, the doors are moved and fixed in the place on where it should be placed.
- Using rectangle command and offset command, the window is drawn separately as per the required dimensions.
- By changing the line type from continuous to dashed lines, the sun shades and ventilators are drawn.
- The windows, ventilators and sunshades are copied, rotated and moved and placed in the required place.
- Using offset command, the plinth line is drawn.
- The elevation is drawn by extending the outer line of the plan using extend command and unwanted lines are erased using erase command.
- The doors, windows, sunshade and parapet are drawn in same distance in elevation as drawn in same distance in the plan.
- The section is drawn on the adjacent side of the elevation by extending the lines.

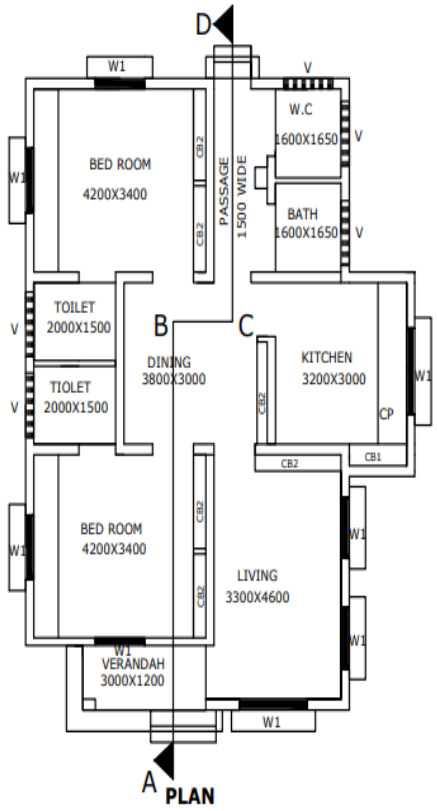
- The various representations of brickwork, sand filling and concrete are completed in the section using BHatch command.
- Using save command, the file having plan, elevation and section is saved by giving the corresponding path name.



FRONT ELEVATION



SECTION ON ABCD



PLAN

REFERENCE		
TYPE	DESCRIPTION	SIZE
D1	FLUSH DOOR	1000X2100
D2	PANELLED DOOR	900X2100
W1	WINDOW GLAZED	1200X1200
V	VENTILATOR GLAZED	1200X450
O	OPENING	1200X2100
CB1	CUPBOARD	400 DEPTH
CB2	CUPBOARD	300 DEPTH
S	SHELF	200 DEPTH
STEPS	RISE	150
	TREAD	300

RESULT :

Thus the Plan, Section, Elevation of a building with sloping roof was drawn by using various commands in Auto CAD.

EX.NO: 4

DATE :

BUILDINGS WITH FRAMED STRUCTURES.

AIM :

To draw the plan, elevation and section of a industrial building using the various Commands in AutoCAD

SOFTWARE USED:

AutoCAD

COMMAND USED AND THEIR DESCRIPTION:

- Limits - reset the model space limits
- Units – Used to set the current format for units of measure.
- Line –Line commands allows creating a line where the end points allow creating a line where the end points are dimensional co-ordinates.
- Offset – create a news object at a specified distance from an existing object or through a specified point.
- Trim – trims off an object using cutting edges defined by other objects.
- Break – removes only a part of an object.
- Arc – Used to create an arc segment. Methods are:

  12. 3 Points,
  13. Start, Center, End
  14. Start, Center, Angle
  15. Center, Start, End
  16. Center, Start, Angle
  17. Start, Center, Length
  18. Center, Start, Length
  19. Start, End, Angle
  20. Start, End, Radius
  21. Start, End, Diameter
  22. Continue

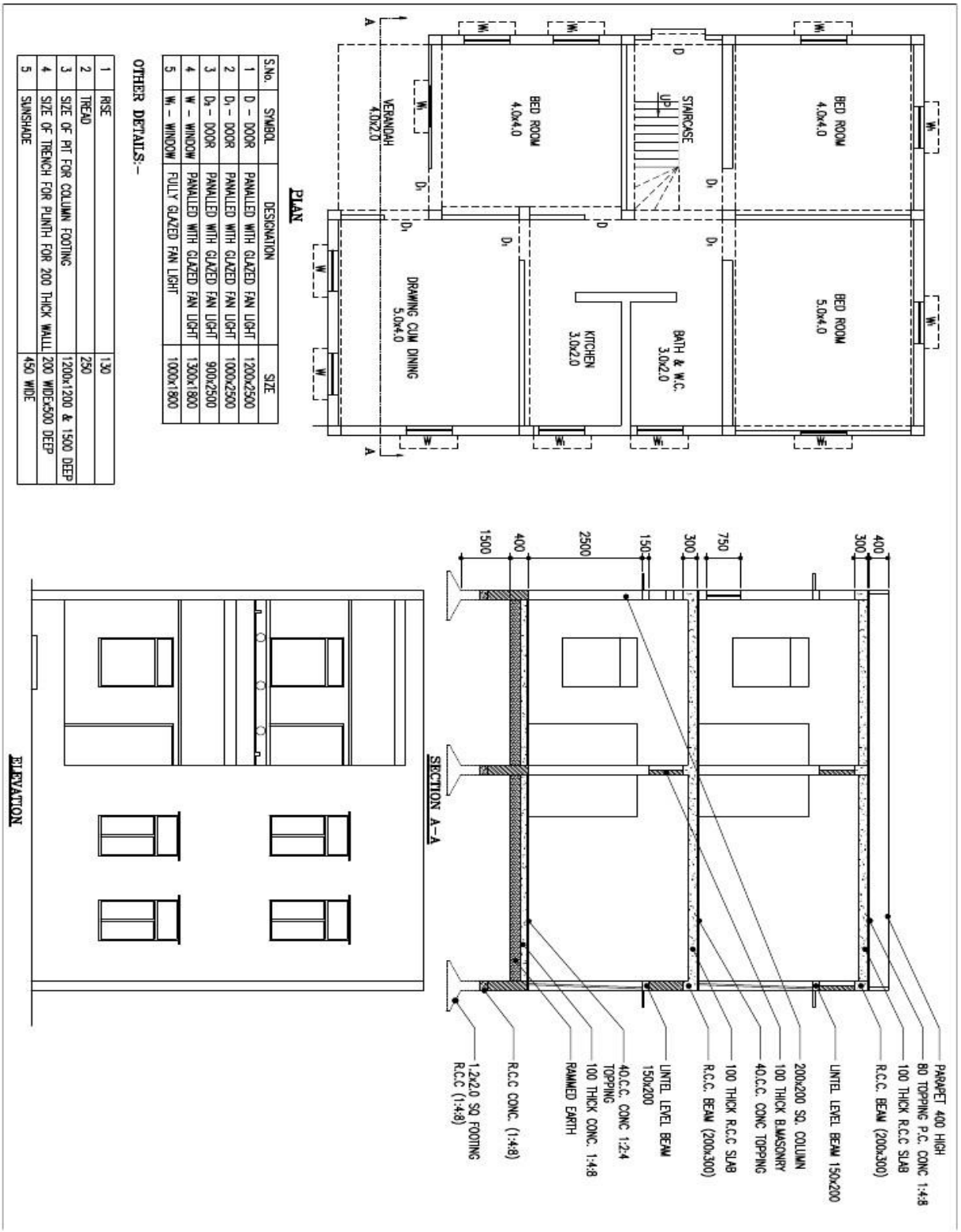
- Copy- Moves the selected objects from a given square to destination, learning a copy at the originally selected location.

- Rotate- rotate objects around a specified point
- Move- moves object to the destination place from the source place
- BHatch – makes shaded patterns as matter of few picks and clicks away
- Extend – elongates an object to a boundary defined by other objects
- Erase – used to erase the unwanted objects
- Text – creates text object with specified height and orientation

PROCEDURE :

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, set the types as decimal/precision as 0.0000 and units to scale drag and drop content as millimeters.
- Plan can be started by using line command
- After completing the outline, offset command is used and the distance is given as the brick wall thickness.
- Then door is drawn by using line, arc commands are copied as many times as needed by using copy command.
- The door are moved and placed in the portion ascertained for them.
- Then window is drawn by line, offset command copied as many times as needed and moved to their respective places
- Then section line is drawn with an arrow head
- After completing the plan of the residential building its elevation is drawn by having an extension mode on the drafting setting dialog box by using OSNAP – setting in status bar or by using the command settings.
- Elevation is drawn similar to plan, by using the line command.
- After finishing elevation, cut section is drawn in the similar manner. After drawing the cut section lines, hatching of brick work, concrete, sand filling, and floor finish are done by using BHatch command.
- Appropriate hatching style is selected from hatch or advanced and a preview is done.
- If it is ok, then enter is pressed. If it is not ok esc is pressed and esc hatching is repeated again.
- Before hatching dimensions are marked by using the leader command.
- The arrow mark lines were drawn by leader command.

- To maximize any part of the drawing room command is used.
- Arc command is used to draw arc for the representation of door.
- Erase command is used to erase any selected object
- To maximize any part of the drawing room command is used.
- Using save command the file having plan, elevation and section is saved by giving the Corresponding path name.



S.No.	SYMBOL	DESIGNATION	SIZE
1	D – DOOR	PANALLED WITH GLAZED FAN LIGHT	1200x2500
2	D_1 – DOOR	PANALLED WITH GLAZED FAN LIGHT	1000x2500
3	D_2 – DOOR	PANALLED WITH GLAZED FAN LIGHT	900x2500
4	W – WINDOW	PANALLED WITH GLAZED FAN LIGHT	1300x1800
5	W_1 – WINDOW	FULLY GLAZED FAN LIGHT	1000x1800

OTHER DETAILS:-

1	RISE	130
2	TREAD	250
3	SIZE OF PIT FOR COLUMN FOOTING	1200x1200 & 1500 DEEP
4	SIZE OF TRENCH FOR PLINTH FOR 200 THICK WALL	1200 WIDE&500 DEEP
5	SUNSHADE	450 WIDE

RESULT:

The functional requirements of the residential building (RCC framed structure) is planned and the plan, section and elevation are drawn in AutoCAD.

EX.NO: 5 DATE:	**BUILDING INFORMATION MODELING (BIM)**

AIM:

To study about the applications, benefits and risks of Building Information Modeling (BIM) software.

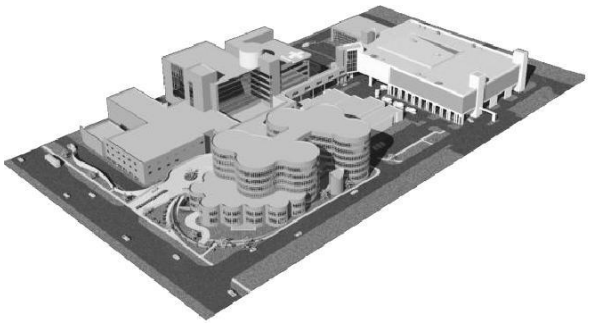
INTRODUCTION:

Building Information Modeling (BIM) has recently attained widespread attention in the Architectural, Engineering and Construction (AEC) industry. BIM represents the development and use of computer generated n-dimensional (n-D) models to simulate the planning, design, construction and operation of a facility. It helps architects, engineers and constructors to visualize what is to be built in simulated environment and to identify potential design, construction or operational problems.

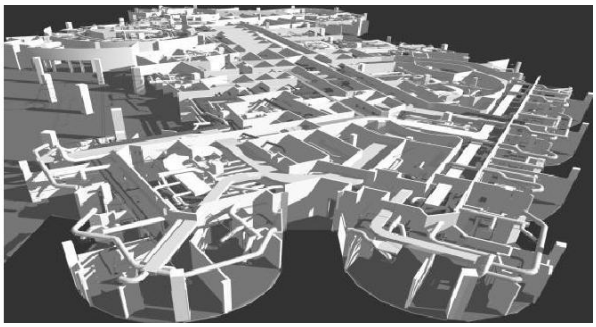
Building Information Modeling (BIM) represents the process of development and use of a computer generated model to simulate the planning, design, construction and operation of a facility as shown in Figure 1. The resulting model, a Building Information Model, is a data-rich, object-oriented, intelligent and parametric digital representation of the facility, from which views and data appropriate to various users' needs can be extracted and analyzed to generate information that can be used to make decisions and to improve the process of delivering the facility (AGC, 2005).

The principal difference between BIM and 2D CAD is that the latter describes a building by independent 2D views such as plans, sections and elevations. Editing one of these views requires that all other views must be checked and updated, an error-prone process that is one of the major causes of poor documentation. In addition, data in these 2D drawings are graphical entities only, such as lines, arcs and circles, in contrast to the intelligent contextual semantic of BIM models, where objects are defined in terms of building elements and systems such as spaces, walls, beams and columns.

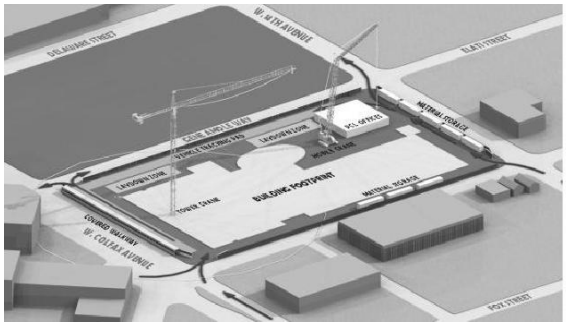
A BIM carries all information related to the building, including its physical and functional characteristics and project life cycle information, in a series of "smart objects". For example, an air conditioning unit within a BIM would also contain data about its supplier, operation and maintenance procedures, flow rates and clearance requirements.



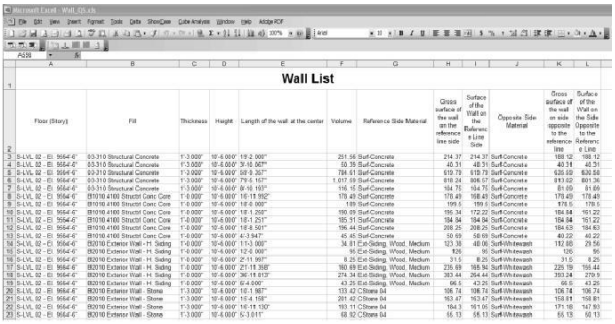
(a) 3D Architectural Model



(b) Integrated Sturcutral and MEP Model



(c) Site Logistic Planning Model



(d) Quantiy Estimates

Figure 1: Different Components of a Building Information Model

A building information model characterizes the geometry, spatial relationships, geographic information, quantities and properties of building elements, cost estimates, material inventories and project schedule. This model can be used to demonstrate the entire building life cycle. As a result, quantities and shared properties of materials can be readily extracted. Scopes of work can be easily isolated and defined. Systems, assemblies, and sequences can be shown in a relative scale with the entire facility or group of facilities. The construction documents such as the drawings, procurement details and other specifications can be easily interrelated.

BIM APPLICATION:

A building information model can be used for the following purposes:

- ***Visualization*:** 3D renderings can be easily generated in-house with little additional effort.
- ***Fabrication/shop drawings*:** it is easy to generate shop drawings for various building

systems, for example, the sheet metal ductwork shop drawing can be quickly produced once the model is complete.

Code reviews: fire departments and other officials may use these models for their review of building projects.

- ***Forensic analysis*****:** a building information model can easily be adapted to graphically illustrate potential failures, leaks, evacuation plans, etc.
- ***Facilities management*****:** facilities management departments can use BIM for renovations, space planning, and maintenance operations.

Cost estimating*:* BIM software(s) have built-in cost estimating features. Material quantities are automatically extracted and changed when any changes are made in the model.

- ***Construction sequencing:*** a building information model can be effectively used to create material ordering, fabrication, and delivery schedules for all building components.
- ***Conflict, interference and collision detection*****:** because BIM models are created, to scale, in 3D space, all major systems can be visually checked for interferences. This process can verify that piping does not intersect with steel beams, ducts or walls.

BIM BENEFITS:

The key benefit of BIM is its accurate geometrical representation of the parts of a building in an integrated data environment (CRC Construction Innovation, 2007). Other related benefits are:

- ***Faster and more effective processes*** – information is more easily shared, can be value-added and reused.

Better design – building proposals can be rigorously analyzed, simulations can be performed quickly and performance benchmarked, enabling improved and innovative solutions.

- ***Controlled whole-life costs and environmental data*** – environmental performance is more predictable, lifecycle costs are better understood.
- ***Better production quality*** – documentation output is flexible and exploits automation.
- ***Better customer service*** – proposals are better understood through accurate visualization.

Lifecycle data – requirements, design, construction and operational information can be used in facilities management.

Automated assembly – digital product data can be exploited in downstream processes and be used for manufacturing/assembling of structural systems.

BIM RISKS:

The first legal risk to determine is ownership of the BIM data and how to protect it through copyright and other laws. For example, if the owner is paying for the design, then the owner may feel entitled to own it, but if team members are providing proprietary information for use on the project, their propriety information needs to be protected as well. Thus, there is no simple answer to the question of data ownership; it requires a unique response to every project depending on the participants' needs. The goal is to avoid inhibitions or disincentives that discourage participants from fully realizing the model's potential.

When project team members, other than the owner and A/E, contribute data that is integrated into the BIM, licensing issues can arise. For example, equipment and material vendors offer designs associated with their products for the convenience of the lead designer in hopes of inducing the designer to specify the vendor's equipment. While this practice might be good for business, licensing issues can nevertheless arise if the vendor's design was produced by a designer not licensed in the location of the project

Another issue to address is who will control the entry of data into the model and be responsible for any inaccuracies in it. Taking responsibility for updating BIM data and ensuring its accuracy entails a great deal of risk. Requests for complicated indemnities by BIM users and the offer of limited warranties and disclaimers of liability by designers will be essential negotiation points that need to be resolved before BIM technology is utilized. It also requires more time spent imputing and reviewing BIM data, which is a new cost in the design and project administration process. Although these new costs may be more than offset by efficiency and schedule gains, they are still a cost that someone on the project team will have to bear. Thus, before BIM technology can be fully utilized, the risks of its use must not only be identified and allocated, but the cost of its implementation must be paid for as well.

The integrated concept of BIM blurs the level of responsibility so much that risk and liability will likely be enhanced. Consider the scenario where the owner of the building files suit over a perceived design error. The architect, engineers and other contributors of the BIM process look to each other in an effort to try to determine who had responsibility for the matter raised. If

disagreement ensues, the lead professional will not only be responsible as a matter of law to the claimant but may have difficulty proving fault with others such as the engineers.

As the dimensions of cost and schedule are layered onto the 3D model, responsibility for the proper technological interface among various programs becomes an issue. Many sophisticated contracting teams require subcontractors to submit detailed CPM schedules and cost breakdowns itemized by line items of work prior to the start of the project. The general contractor then compiles that data, creating a master schedule and cost breakdown for the entire project. When the subcontractors and prime contractor use the same software, the integration can be fluid. In cases where the data is incomplete or is submitted in a variety of scheduling and costing programs, a team member - usually a general contractor or construction manager must re-enter and update a master scheduling and costing program. That program may be a BIM module or another program that will be integrated with the 3-D model. At present, most of these project management tools and the 3-D models have been developed in isolation. Responsibility for the accuracy and coordination of cost and scheduling data must be contractually addressed.

CONCLUSION:

Building Information Modeling (BIM) is emerging as an innovative way to manage projects. Building performance and predictability of outcomes are greatly improved by adopting BIM. As the use of BIM accelerates, collaboration within project teams should increase, which will lead to improved profitability, reduced costs, better time management and improved customer/client relationships.

EX.NO: 6

DATE :

REINFORCEMENT DETAILS OF RCC STRUCTURAL ELEMENTS (SLAB, BEAM AND COLUMN)

AIM :

To draw the reinforcement details of RCC structural elements such as slab, beam and column using the various Commands in AutoCAD

SOFTWARE USED:

AutoCAD

COMMAND USED AND THEIR DESCRIPTION:

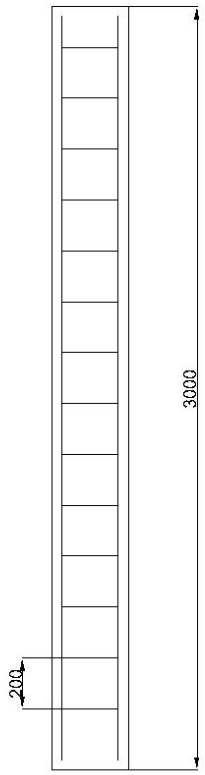
- Limits - reset the model space limits
- Units – Used to set the current format for units of measure.
- Line –Line commands allows creating a line where the end points allow creating a line where the end points are dimensional co-ordinates.
- Offset – create a news object at a specified distance from an existing object or through a specified point.
- Trim – trims off an object using cutting edges defined by other objects.
- Break – removes only a part of an object.
- Arc – Used to create an arc segment. Methods are:

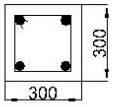
  12. 3 Points,
  13. Start, Center, End
  14. Start, Center, Angle
  15. Center, Start, End
  16. Center, Start, Angle
  17. Start, Center, Length
  18. Center, Start, Length
  19. Start, End, Angle
  20. Start, End, Radius
  21. Start, End, Diameter
  22. Continue
- Copy- Moves the selected objects from a given square to destination, learning a copy at the originally selected location.

- Rotate- rotate objects around a specified point
- Move- moves object to the destination place from the source place
- Hatch – makes shaded patterns as matter of few picks and clicks away
- Extend – elongates an object to a boundary defined by other objects
- Erase – used to erase the unwanted objects
- Text – creates text object with specified height and orientation

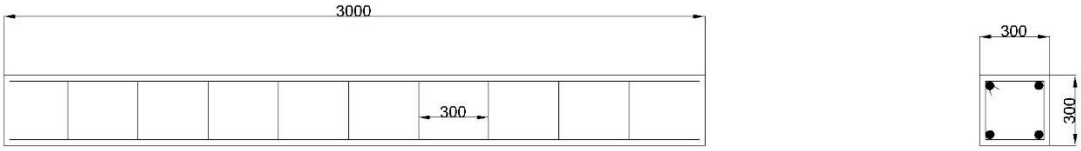
PROCEDURE:

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, set the types as decimal/precision as 0.0000 and units to scale drag and drop content as millimeters.
- Plan and Section of the beam, slab and column can be drawn by using line command
- After completing the Plan and section of slab, beam and column, Using line command at cover value as offset draw reinforcement details. i.e. main reinforcement
- Then distribution reinforcement can be drawing using circle command with diameter value as per design.
- Inside circle hatching need to be done using hatch command and need to fill with solid in the hatch.
- After hatching done, move the circle with hatch to the main reinforcement location and place it as distribution reinforcement.
- Using array command the hatched circle need to be distributed to the entire reinforcement line along the length of main reinforcement with the proper spacing as specified in the design.
- Before hatching dimensions are marked by using the leader command.
- The arrow mark lines were drawn by leader command.
- To maximize any part of the drawing zoom command is used.
- Arc command is used to draw arc for the representation of door.
- Erase command is used to erase any selected object
- To maximize any part of the drawing room command is used.
- Using save command the file having reinforcement details of structural elements is saved by giving the Corresponding path name.

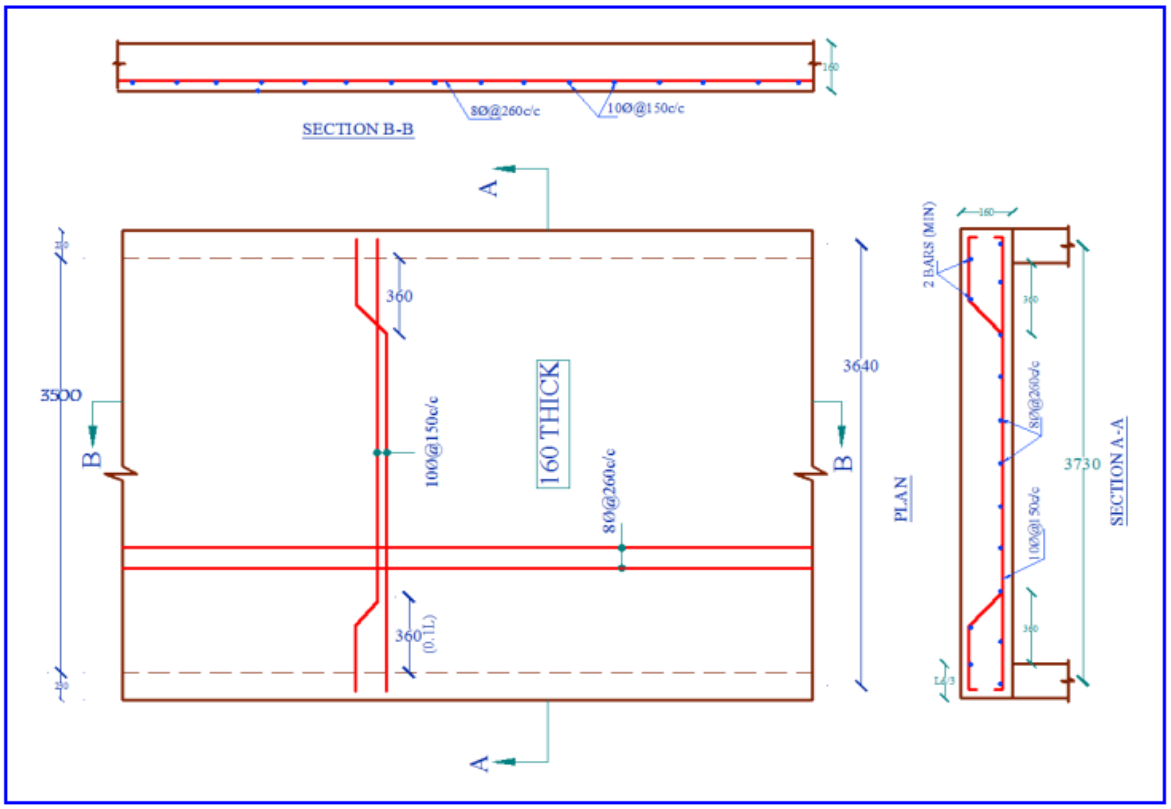




Column Reinforcement Details



Beam Reinforcement Details



Reinforcement Detail of One way slab

RESULT:

Thus the Reinforcement details of RCC structural elements (slab, beam and column) was drawn by using various commands in Auto CAD.

EX.NO: 7

DATE :

REINFORCEMENT DETAILS OF FOOTINGS (ISOLATED, STEPPED, COMBINED FOOTING)

AIM :

To draw the reinforcement details of footings (Isolated, Stepped and Combined footing) using the various Commands in AutoCAD

SOFTWARE USED:

AutoCAD

COMMAND USED AND THEIR DESCRIPTION:

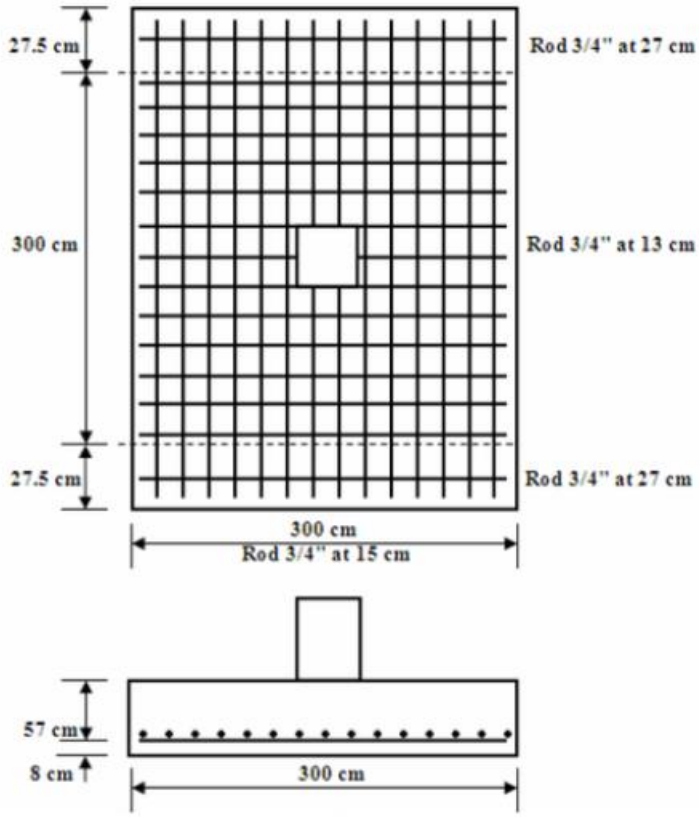
- Limits - reset the model space limits
- Units – Used to set the current format for units of measure.
- Line –Line commands allows creating a line where the end points allow creating a line where the end points are dimensional co-ordinates.
- Offset – create a news object at a specified distance from an existing object or through a specified point.
- Trim – trims off an object using cutting edges defined by other objects.
- Break – removes only a part of an object.
- Arc – Used to create an arc segment. Methods are:

  12. 3 Points,
  13. Start, Center, End
  14. Start, Center, Angle
  15. Center, Start, End
  16. Center, Start, Angle
  17. Start, Center, Length
  18. Center, Start, Length
  19. Start, End, Angle
  20. Start, End, Radius
  21. Start, End, Diameter
  22. Continue
- Copy- Moves the selected objects from a given square to destination, learning a copy at the originally selected location.

- Rotate- rotate objects around a specified point
- Move- moves object to the destination place from the source place
- Hatch – makes shaded patterns as matter of few picks and clicks away
- Extend – elongates an object to a boundary defined by other objects
- Erase – used to erase the unwanted objects
- Text – creates text object with specified height and orientation

PROCEDURE:

- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, set the types as decimal/precision as 0.0000 and units to scale drag and drop content as millimeters.
- Plan and Section of the various footings can be drawn by using line command
- After completing the Plan and section of footings, Using line command at cover value as offset draw reinforcement details. i.e. main reinforcement
- Then distribution reinforcement can be drawing using circle command with diameter value as per design.
- Inside circle hatching need to be done using hatch command and need to fill with solid in the hatch.
- After hatching done, move the circle with hatch to the main reinforcement location and place it as distribution reinforcement.
- Using array command the hatched circle need to be distributed to the entire reinforcement line along the length of main reinforcement with the proper spacing as specified in the design.
- Before hatching dimensions are marked by using the leader command.
- The arrow mark lines were drawn by leader command.
- To maximize any part of the drawing zoom command is used.
- Arc command is used to draw arc for the representation of door.
- Erase command is used to erase any selected object
- To maximize any part of the drawing room command is used.
- Using save command the file having reinforcement details of structural elements is saved by giving the Corresponding path name.



Isolated Footing Details

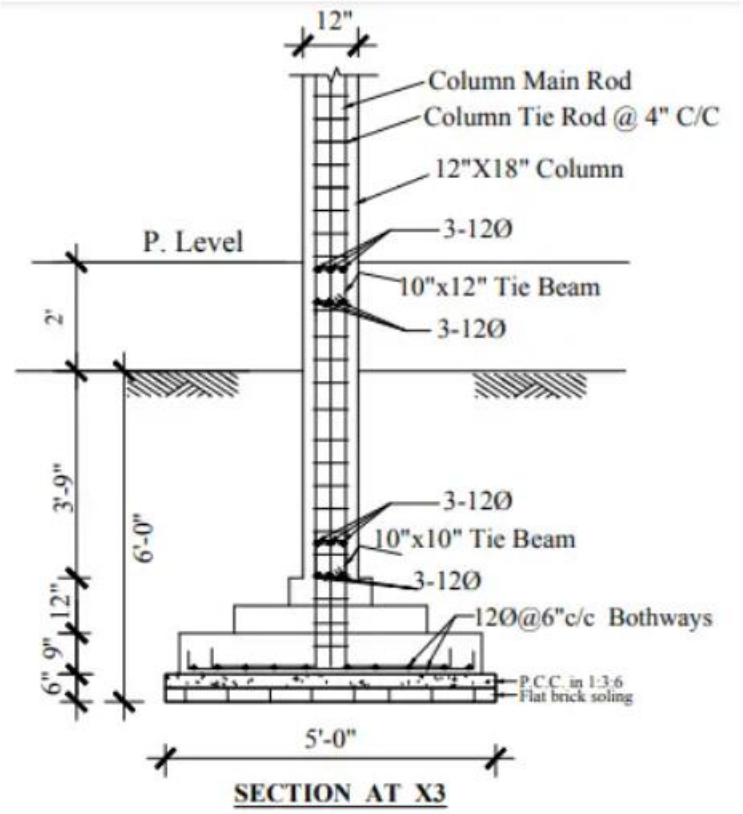


Fig:- Stepped Footing with Reinforcement

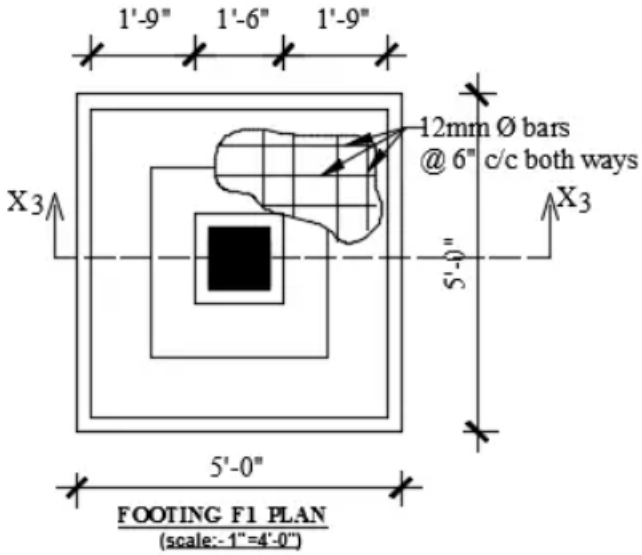
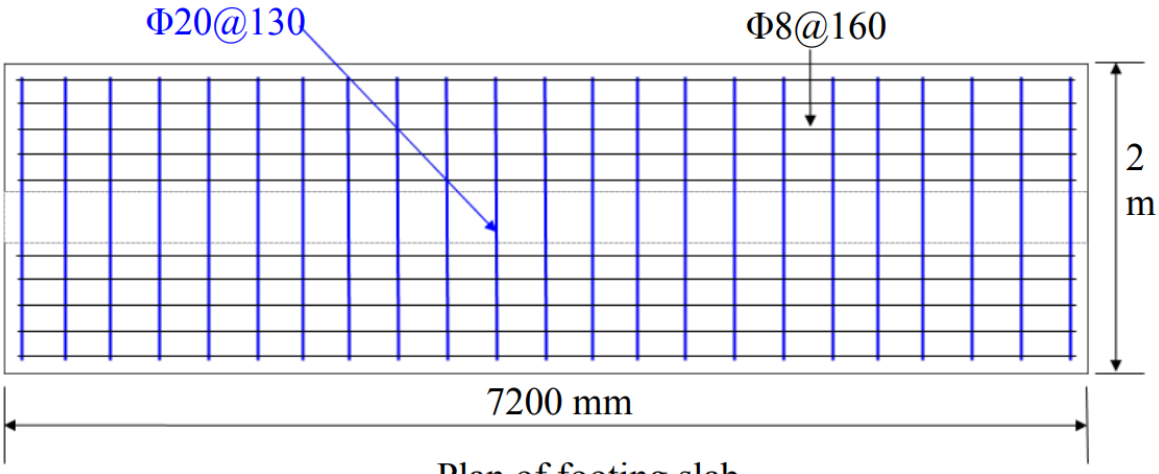
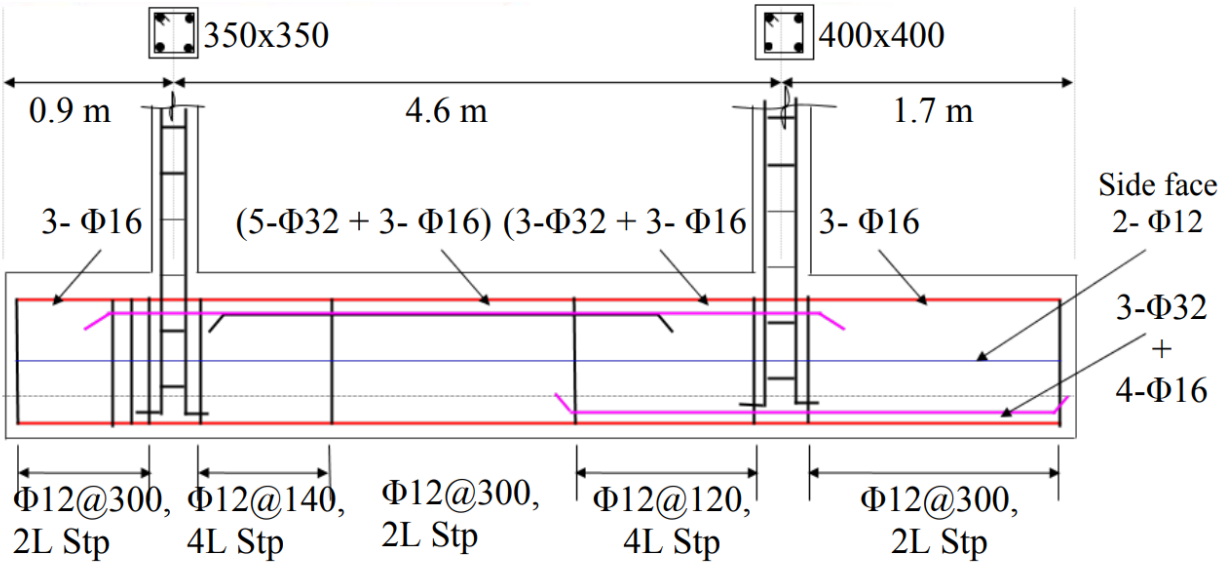
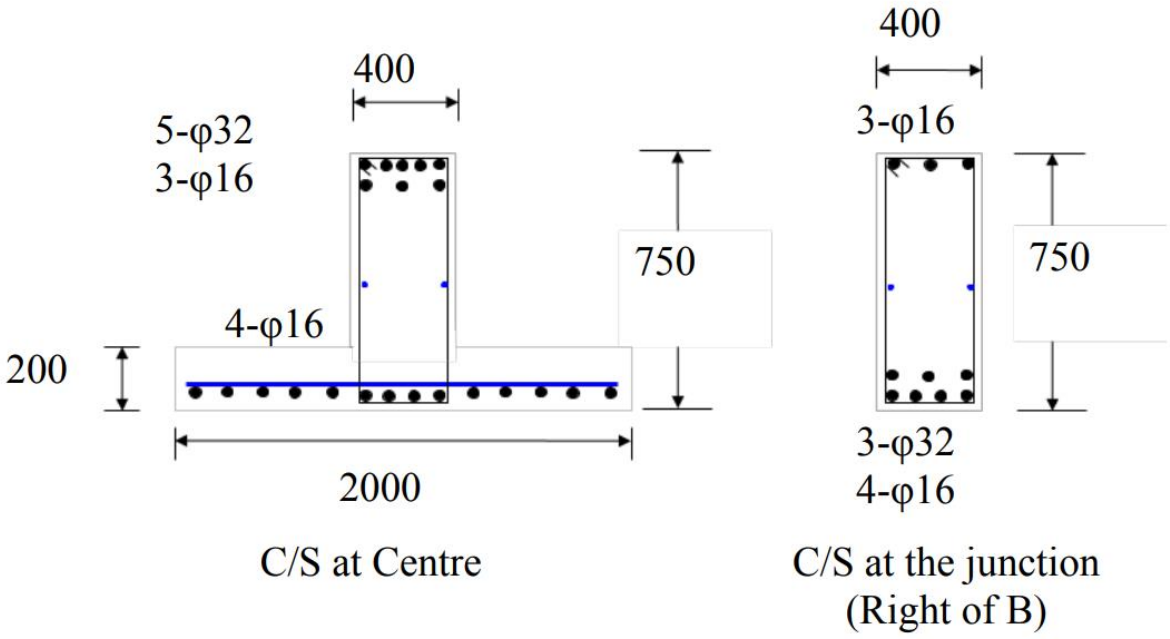


Fig:- Footing Reinforcement Detail



Plan of footing slab





RESULT:

Thus the Reinforcement details of footings (Isolated, stepped, combined footing) were drawn by using various commands in Auto CAD.

EX.NO: 8

DATE :

STEEL STRUCTURES (STEEL CONNECTIONS DETAILING, BEAM TO COLUMN CONNECTION, BEAM TO BEAM– BOLT & WELD, ROOF TRUSS & PURLIN)

AIM :

To draw the steel structures (Steel connection detailing, beam to column connection, beam to beam connection- bolt and weld, roof truss and purlin using the various Commands in AutoCAD

SOFTWARE USED:

AutoCAD

COMMAND USED AND THEIR DESCRIPTION:

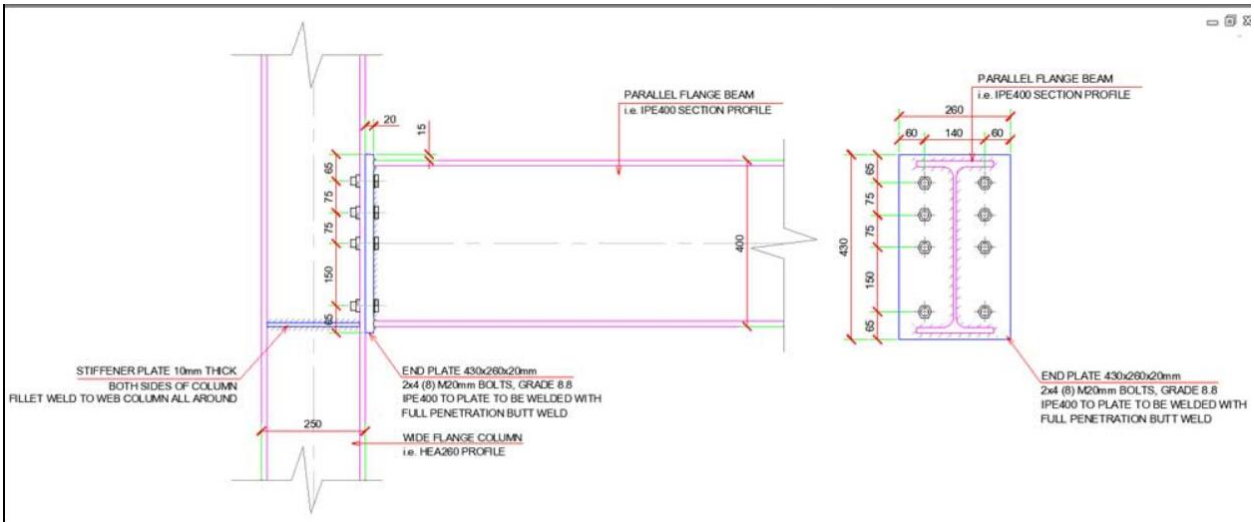
- Limits - reset the model space limits
- Units – Used to set the current format for units of measure.
- Line –Line commands allows creating a line where the end points allow creating a line where the end points are dimensional co-ordinates.
- Offset – create a news object at a specified distance from an existing object or through a specified point.
- Trim – trims off an object using cutting edges defined by other objects.
- Break – removes only a part of an object.
- Arc – Used to create an arc segment. Methods are:

  12. 3 Points,
  13. Start, Center, End
  14. Start, Center, Angle
  15. Center, Start, End
  16. Center, Start, Angle
  17. Start, Center, Length
  18. Center, Start, Length
  19. Start, End, Angle
  20. Start, End, Radius
  21. Start, End, Diameter
  22. Continue

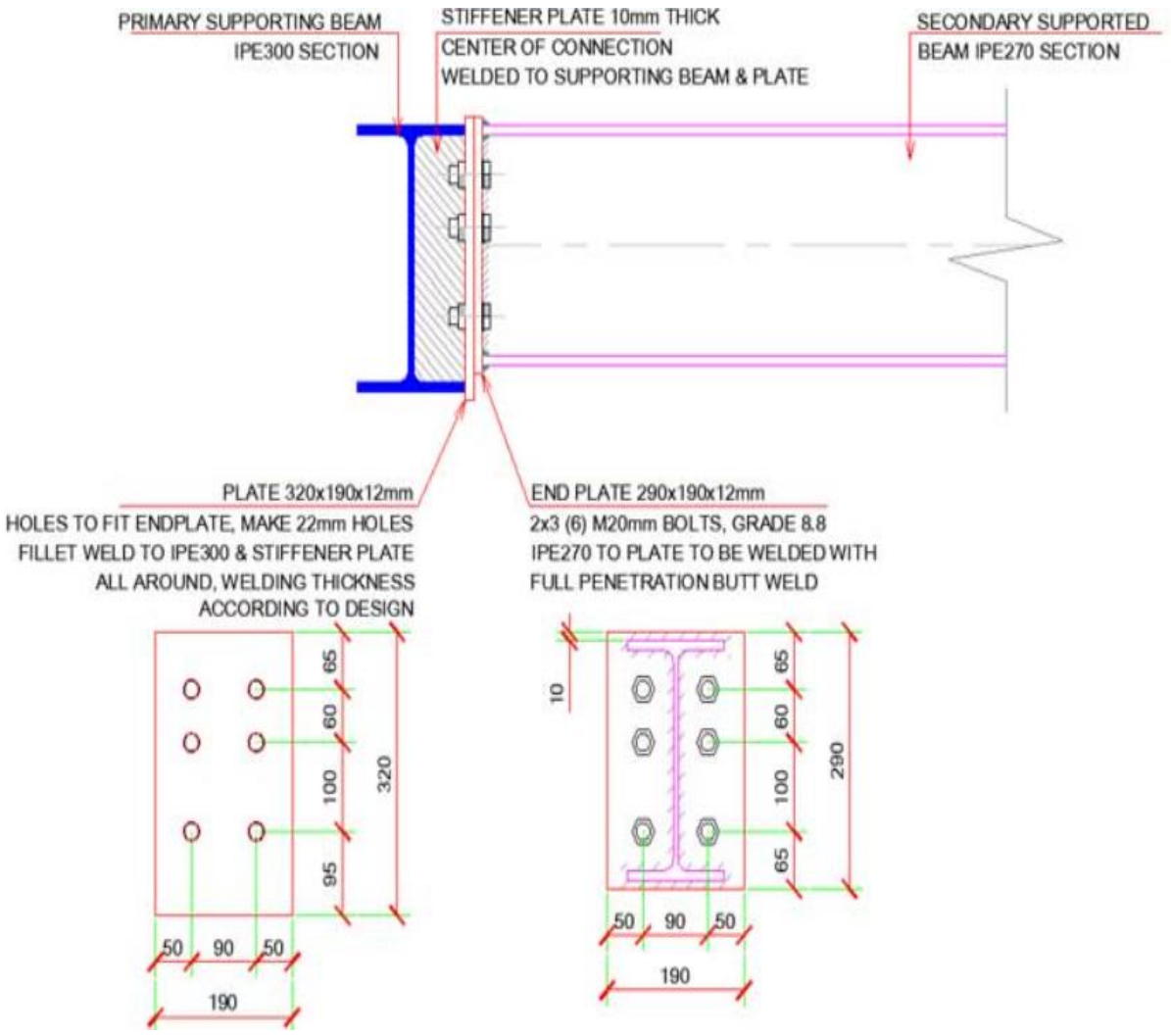
- Copy- Moves the selected objects from a given square to destination, learning a copy at the originally selected location.
- Rotate- rotate objects around a specified point
- Move- moves object to the destination place from the source place
- Hatch – makes shaded patterns as matter of few picks and clicks away
- Extend – elongates an object to a boundary defined by other objects
- Erase – used to erase the unwanted objects
- Text – creates text object with specified height and orientation

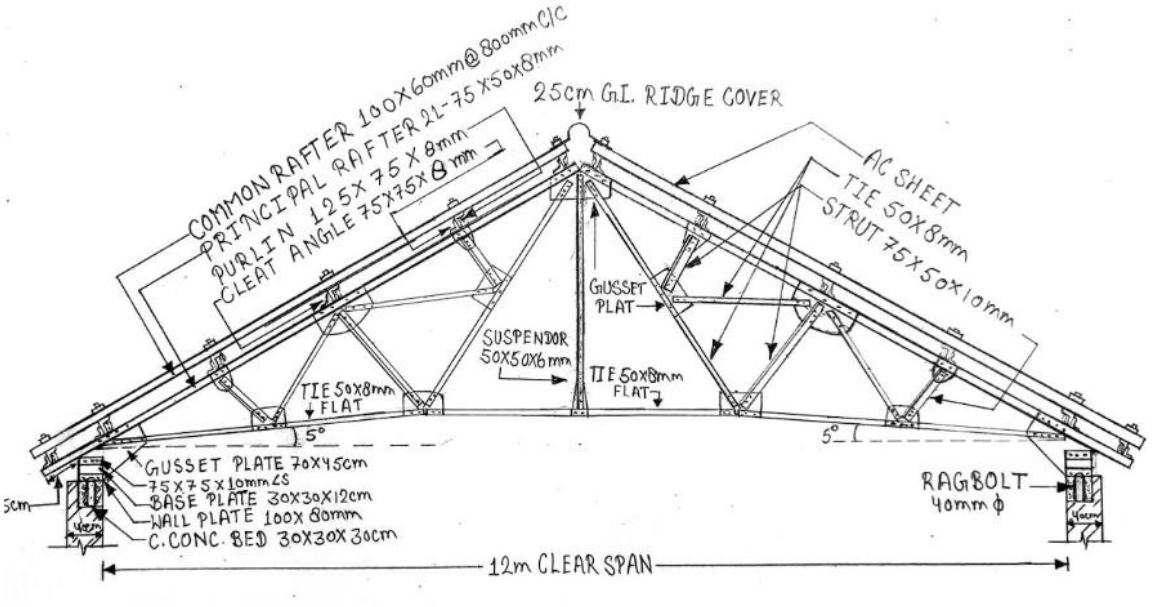
PROCEDURE:

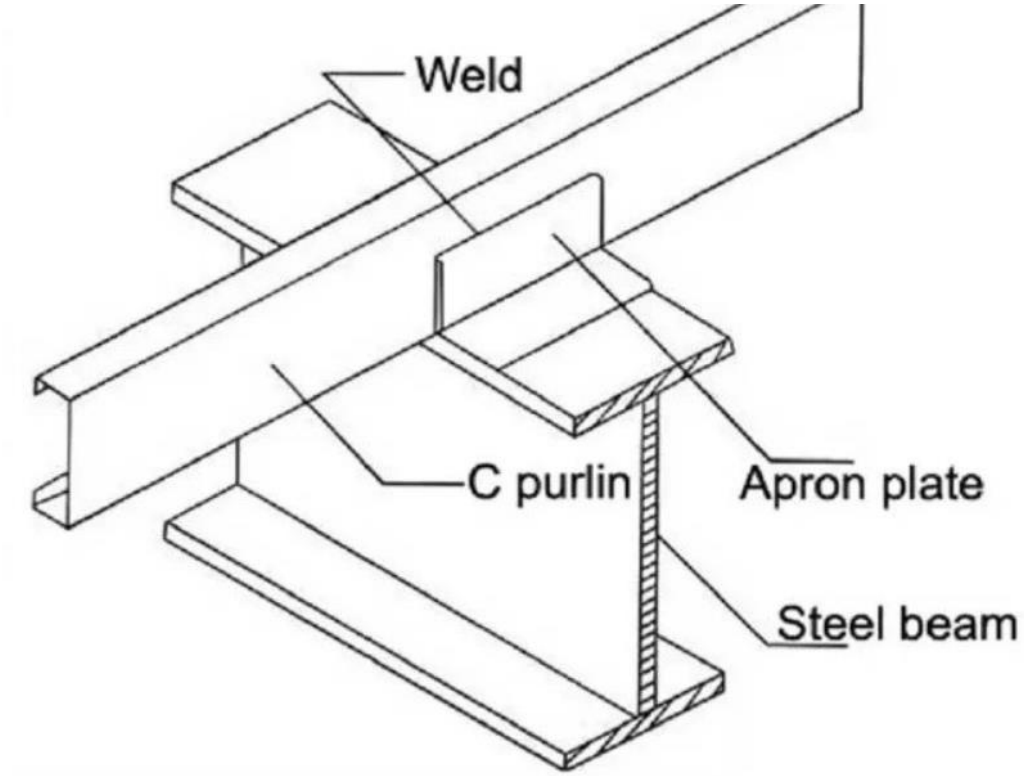
- The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements.
- By using units command, set the types as decimal/precision as 0.0000 and units to scale drag and drop content as millimeters.
- Plan and Section of the various steel elements and connection can be drawn by using line command
- After completing the Plan and section of steel elements, Using circle command with diameter, bolt connection can be drawn.
- Then using line command in inclined mode, truss can be drawn.
- Inside some portion in connection hatching need to be done using hatch command and need to fill with bar in the hatch.
- Dimensions are marked by using the leader command.
- The arrow mark lines were drawn by leader command.
- To maximize any part of the drawing zoom command is used.
- Arc command is used to draw arc for the representation of door.
- Erase command is used to erase any selected object
- To maximize any part of the drawing room command is used.
- Using save command the file having steel connection details of structural elements is saved by giving the Corresponding path name.



BEAM TO WIDE FLANGE COLUMN ENDPLATE CONNECTION DETAIL


PRIMARY SUPPORTING BEAM
IPE300 SECTION
STIFFENER PLATE 10mm THICK
CENTER OF CONNECTION
WELDED TO SUPPORTING BEAM & PLATE
SECONDARY SUPPORTED
BEAM IPE270 SECTION
PLATE 320x190x12mm
HOLES TO FIT ENDPLATE, MAKE 22mm HOLES
FILLET WELD TO IPE300 & STIFFENER PLATE
ALL AROUND, WELDING THICKNESS
ACCORDING TO DESIGN
END PLATE 290x190x12mm
2x3 (6) M20mm BOLTS, GRADE 8.8
IPE270 TO PLATE TO BE WELDED WITH
FULL PENETRATION BUTT WELD
65
60
100
95
320
50
90
50
190
10
65
60
100
65
290
50
90
50
190





RESULT:

Thus the Steel structures (Steel Connections detailing, beam to column connection, beam to beam connection – bolt & Weld, Roof truss & purlin) were drawn by using various commands in Auto CAD.