IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ANALYSIS AND DESIGN OF RESIDENTIAL BUILDING

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Abstract - *As we know that our country population is rising day by day, so it leads towards the huge scarcity of land in future.*

So, focusing towards this major issue of land scarcity faced by the people in future we have tried to plan, design and analysis of residential building. We have also focused to provide more efficient and durable residential building focusing on the safety of the building by various loads acting on it which can cause deformation and fatigue. We have used different software like AutoCAD for planning and STAAD.pro for design and analysis purpose. With the help of this software, we can provide more efficient data in less efforts and time. In this we have also focused on the area we are using we have to give more appropriate building consuming less space.

***Key Words*: Residential Building, plan, AutoCAD, Design, analysis, STAAD.pro.**

1. INTRODUCTION

Day by day humans are facing various stumbling block due to change in nature like earthquake, tsunami, landslides etc. so it is really important to focus on durability, stability and strength of a building, so that a building stand safely. We also focus on the loads coming on the superstructure and substructure of the building. This project work is to design and analyses the various loads like dead load, live load and seismic load acting on the residential building.

AutoCAD: We can define AutoCAD as software which is used for design and drafting. It is mainly used for creation, modification and optimization of a design.

1. In this we can do both 2d and 3D modeling and drawing.
2. John Walker had developed the AutoCAD in 1982 with the help of Autodesk and maintains it successfully.

STADD.pro: This software is used by the structural engineers, for design and analysis purpose. STAAD.pro has a GUI-Graphical user interface by which we can generate the model of the structure, after which it is then analyzed by STAAD engine. After we complete the design and analysis the GUI can be used to view the result graphically.

1.1 OBJECTIVES

Computer aided analysis and design of residential building by using STAAD PRO Includes -

1. Generation of structural framing plan
2. Creation of model of structure in STAAD PRO
3. Application of various load combinations on the member
4. Analysis of the structure
5. Design of the structure

1.2 METHODOLOGY

STEP 1: Selection of site or a plot
STEP 2: 3bhk plan with the help of AutoCAD
STEP 3: To analyze the residential building and structural elements like beams, stairs, columns, slabs of (G +5) Building with the help of STAAD.pro.
STEP 4: To design the residential building of (G +5) Building with the help of STAAD.pro

2. PLAN OF BUILDING

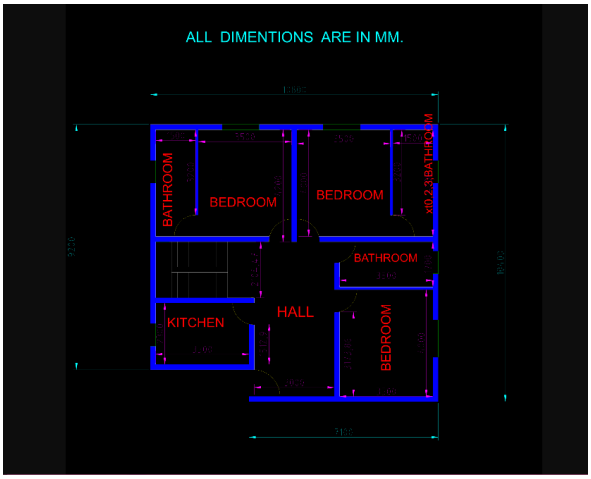


Fig -1: Name of the figure

3. RESULT AND DISCUSSION

Selection of site or a plot: When we select an area, we firstly focus on the different facilities available near by the location. Site selection is the most crucial step for building a residential structure. The proposed location should not be in an isolated place where the rate of crimes are substantially less; and it should be in a place with good community. However, it should not be too noisy neighborhood either as it may cause inconvenience to members of the family. In addition, the location should be in a place where mode of convenience is good and shopping facilities are easily available. These factors also increase the chance of future growth of property rate. One should check the future possibility of development of roads in the area.

DESIGN PERIMETER:

clear cover for beam=30mm
clear cover for column=50mm
fc=30000n/mm2
fymain=50000n/mm2
fy sec- 500000 n/mm2
max main- 32mm
max sec- 20mm
min main- 16mm
min sec- 8mm

BASIC DETAILS:

number of nodes =175	highest node =175
number of element=390	highest beam =390
number of plates=96	highest plate=486

Calculation of 3BHK Plan

1. Scale 1/100
2. Loaded wall / outer wall = 20 cm
3. Partition Wall=10 cm
4. Area

- Bed Room = 14 + 14 + 14
  = 42 m^2
- Bathroom = 6 + 6 + 5.95
  = 17.95m^2
- Hall = 5.8 * 3 = 17.4m^2
- Kitchen = 2.3 * 3.5 = 8.05 m^2
- Stairs = 3.5 * 2.1 =7.35m^2

5 Total Area with Wall = 10.8 *10.2
= 110.16m^2

6 Total Area without Wall = 42 + 17.95 +17.4 + 8.05 +7.35
= 92.75m^2

Assigning of the column

Columns are designed for axial forces and biaxial moments per IS 456:2000. All major criteria for selecting longitudinal and transverse reinforcement by IS:456 have been taken care of in the column design of STAAD.

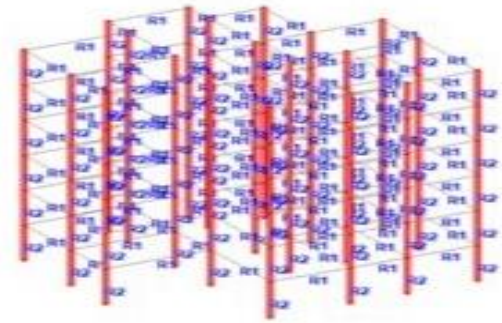


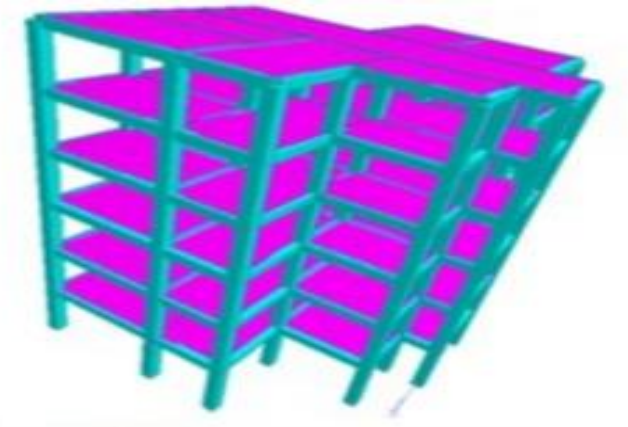
Fig 2: assign of column

Assigning of the plate:

Fig 3: Assigning of the plate

Plates are designed for floor loads. The plate thickness are provides 150mm

3D VIEW:



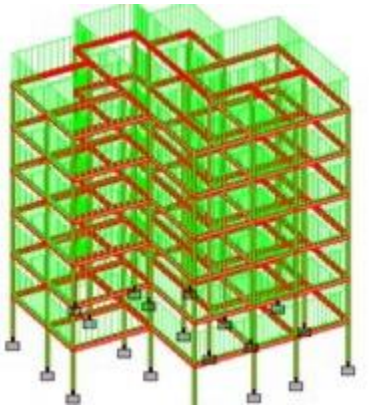
APPLICATION OF LOAD:

dead load (self - weight)

floor load

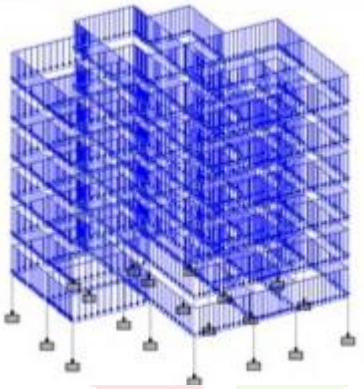
wind load .

SELF - WEIGHT: the self weight is not but actually this the that type of load of building /structure itself. This load is generated by in STADD PRO.



FLOOR LOAD:

The live loads were generated in a similar manner as done in the earlier case for the dead load on each floor. This may be done from the member load button from the load case column. Floor load is generated by the STADD PRO. Software where the basic entity (plates, solid ,and surface)which is acts as the medium for application of load not the part of the structural



model.

WIND LOAD:

Wind is correlative motion of air to the surface of the earth. Under the defined load category, the definition of wind load was supplied. The wind intensities at various heights were calculated manually and feed to the software. Based on those values it generates the wind load on different floors.

RUN ANALYSIS:

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      ************** CONCRETE TAKE OFF **************
           (FOR BEAMS, COLUMNS AND PLATES DESIGNED ABOVE)
NOTE: CONCRETE QUANTITY REPRESENTS VOLUME OF CONCRETE IN BEAMS, COLUMNS, A
      REINFORCING STEEL QUANTITY REPRESENTS REINFORCING STEEL IN BEAMS AND
      REINFORCING STEEL IN PLATES IS NOT INCLUDED IN THE REPORTED QUANTITY

     TOTAL VOLUME OF CONCRETE =      2722.0 CU.METER

                  BAR DIA          WEIGHT
                  (in mm)         (in New)
                 --------         --------
                     8              100231
                    10               48225
                    12              281107
                    16             1000039
                    20              527602
                    25              414480
                    32               72461
                               ------------
                 *** TOTAL=      2444145
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3. CONCLUSIONS

1) The structural elements of building are safe in flexure and shear.
2) Storey displacement for conventional slab is 92.6% more than the load bearing wall.
3) Load bearing wall is safer against wind and earthquake loads.
4) Proposed sizes of structural elements can be used in building as it is.

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