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ANALYSIS AND DESIGN OF (G+20) MULTI-STOREY RESIDENTIAL BUILDING USING STAAD.PRO

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ABSTRACT

In order to compete in the ever growing competent market it is very important for a structural Engineer to save time. as a sequel to this an attempt is made to analyze and design a Multistoried building by using a software package staad pro For analyzing a multi storied building one has to consider all the possible loadings and see that the structure is safe against all possible loading conditions. There are several methods for analysis of different frames like kani's method, cantilever method, portal method, Matrix method. The main objective of this project is to analyse and design a (G+20) multi-storeyed building using STAAD.Pro. The code refers for this project are NBC, IS 456-2000, SP16.The concrete mix used in this project is M30.

Keywords: STAAD.Pro, Multi-storey building, Concrete mix, Steel strength, Limit state method

1. INTRODUCTION

Building construction is the engineering deals with the construction of building such as residential houses. In a simple building can be define as an enclose space by walls with roof, food, cloth and the basic needs of human beings. In the early ancient times humans lived in caves, over trees or under trees, to protect themselves from wild animals, rain, sun, etc. as the times passed as humans being started living in huts made of timber branches. The shelters of those old have been developed nowadays into beautiful houses. Rich people live in sophisticated condition houses.Buildings are the important indicator of social progress of the county. Every human has desire to own comfortable homes on an average generally one spends his two-third life times in the houses. The security civic sense of the responsibility. These are the few reasons which are responsible that the person do utmost effort and spend hard earned saving in owning houses.Nowadays the house building is major work of the social progress of the county. Daily new techniques are being developed for the construction of houses economically, quickly and fulfilling the requirements of the community engineers and architects do the design work, planning and layout, etc, of the buildings. Draughtsman are responsible for doing the drawing works of building as for the direction of engineers and architects.The draughtsman must know his job and should be able to follow the instruction of the engineer and should be able to draw the required drawing of the building, site plans and layout plans etc, as for the requirements.

2. A BRIEF DESCRIPTION OF SOFTWARE USED

The software's used in this project are,

- STAAD.Pro
- Auto CAD

2.1 STAAD.PRO

- STAAD Pro is a structural analysis design program software
- It includes a state of art user interface, visualization tools and international design codes
- It is used for 3D model generation, analysis and multi-material design

- The commercial version of STAAD PRO supports several Steel, concrete and timber design codes
- It is the one of the software application created to help structural engineer to automate their task and to remove the tedious and long procedures of the manual methods

2.2 AUTO CAD

- AutoCAD can be defined as the use of computer systems to assist in the creation, modification, optimization of a design.
- In this, we can create both 2D and 3D drawings used in construction and manufacturing.
- It was developed by John Walker in the year 1982 with the help of AUTODESK and maintain it successfully.

2.3 Reasons for implementing CAD systems:

- To increase the productivity of the designer.
- To improve the quality of design.
- To create a database for manufacturing.
- To improve communication through documentation.

2.4 Types Of Loads Used:

- Dead load
- Live load
- Wind load

Dead Load:

All permanent loads in the building are considered as dead loads. The dead loads comprise of self- weight of the building, weight of wall, weight of slab, floor finish and permanent materials placed on the building. Dead loads are specified in IS 875 (Part 1).

Live load

Imposed load is created by the meant use or occupancy of a building together with the load of movable partitions, distributed and concentrated loads, load due to impact and vibration and dust loads. Live loads are specified in IS 875 (Part 2).

Wind load

These loads rely on the rate of the wind at the situation of the structure, permeableness of the structure, height of the structure etc. They will be horizontal or inclined forces. Wind loads are specified in IS 875 (Part 3).

Density of materials used:

MATERIAL:	DENSITY
i) Plain concrete	24.0KN/m
ii) Reinforced	25.0KN/m
iii) Flooring material(c.m)	20.0KN/m
iv) Brick masonry	19.0KN/m3
v) Fly ash	5.0KN/m3

LIVE LOADS:

In accordance with IS. 875-86

i) Live load on slabs = 20.0KN/m2

ii) Live load on passage = 4.0KN/m2

iii)Live load on stairs = 4.0KN/m2

DESIGN CONSTANTS:

Using M30 and Fe 415 grade of concrete and steel for beams, slabs, footings, columns.

Therefore:-

Fck = Characteristic strength for M30-30N/mm^2

Fy = Characteristic strength of steel-415N/mm^2

Statement of project:

Salient features:

Utility of building: Residential Building

No of stories: 20

Shape of the building: 1 APARTMENTS (Flats)

No of staircases: 2

No. of flats: 40

No of lifts: 2

Type of construction: R.C.C framed structure

Types of walls: brick wall

Geometric details:

Ground floor: 3m

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Floor to floor height: 3m.
Height of plinth: 0.6m
Depth of foundation: 500mm

Materials:

Concrete grade: M30
All steel grades: Fe415 grade
Bearing capacity of soil: 300KN/M^2

LOAD COMBINATIONS:

The different combinations used in the project are,

- 1.5 (DL + LL)
- 1.2 (DL + LL + WLX)
- 1.2 (DL + LL + WLZ)
- 1.2 (DL + LL - WLX)
- 1.2 (DL + LL – WLZ)
- 1.5 (DL + WLX)
- 1.5 (DL + WLZ)
- 1.5 (DL - WLX)
- 1.5 (DL - WLZ)
- 1 (DL + LL)
- 1 (DL + LL + WLX)
- 1 (DL + LL + WLZ)
- 1 (DL + LL - WLX)
- 1 (DL + LL - WLZ)

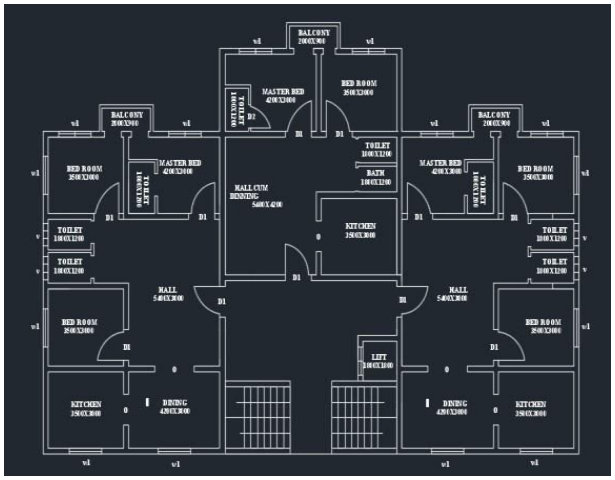

Fig no 1: Floor plan

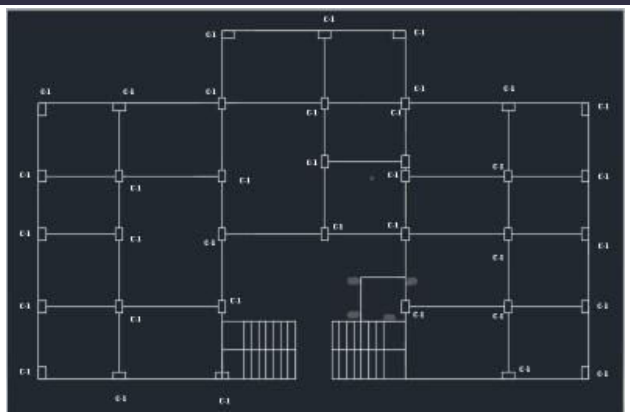

Fig no 2: Location Of Columns

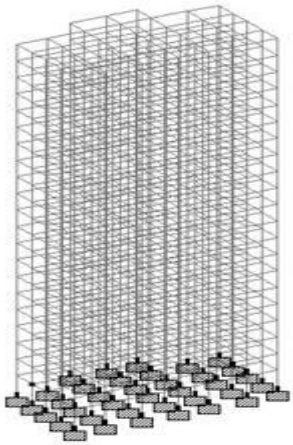

Fig no 3: 3-D View of the model

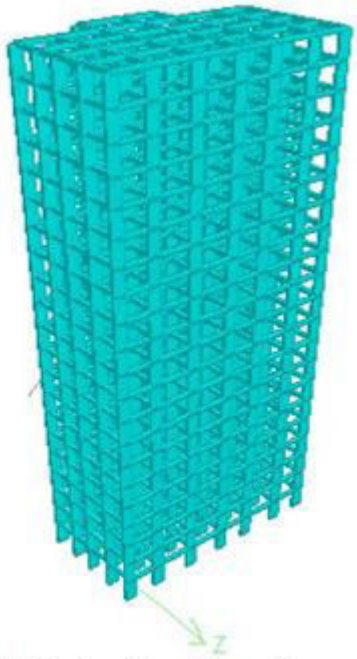

Fig no 4: 3-D Rendered view of the model

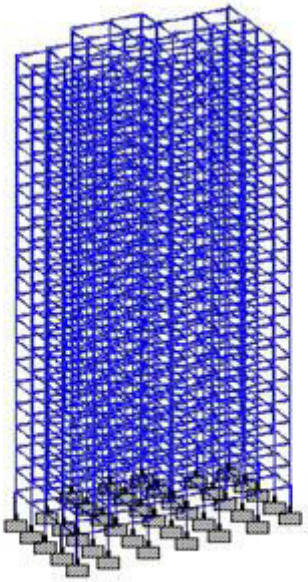

Fig no 5: Shear Force Diagram

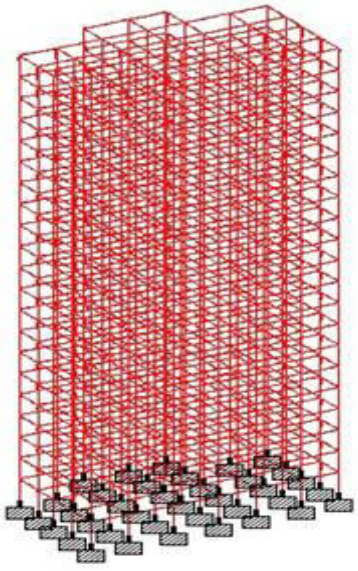

Fig no 6: Bending moment diagram

Conclusion:

From the comparison result obtained from MIDAS, STAAD Pro and Manual computation,almost all the structural elements passed the checks carried out on them including the deflection,shear forces and bending moment. The list of failed elements was indicated by both MIDAS andSTAAD Pro software programs and better section were selected. The analysis and design of thenew section were performed again and result came out immediately.

The use of Computer Aided tools in structural analysis and design has been proven to beeffective from the results output. It was observed that the time for performing the design work issignificantly reduced. However, the software programs can be easily misused without observingproper precautions in the analysis and design procedures which can lead to structural failures,costly disputes and poor performing structures. Thus, this explains the importance of comparisonbetween different software packages and more importantly performing hand calculations for likea floor and comparing for the same floor in the software packages. Therefore, it can beconcluded that the structure has fulfilled the Ultimate Limit State and the Serviceability Limit State requirements.

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