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DESIGN OF DUPLEX BUILDING

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Abstract - The aim of our work is to design the given DUPLEX HOUSE according to Indian Standard codes. At present work we used software named "STAAD Pro". By using the software is that it is user friendly and has exceptional features like it designs the structural components individually along with their Analysis and Results. Additional useful feature of this software is that we can view the Shear force, Bending moment, Torsion diagrams at each level of the building. Now a days there are several software's are available in market for analysis and design of " Civil Engineering structures " like ETABS, STAAD Pro and STRUDS etc.

***Key Words*: Duplex House, Analysis and Results, Shear Force, Bending Moment, Staad Pro.**

1.INTRODUCTION

A building frame was Rectangular in shape and Duplex building. Duplex building, multi-paneled frame is a complicated statically intermediate structure. A design of R.C building of G+1 frame work is taken up. The building in plan consists of columns built monolithically forming a network. The area of building is 1800 sq feet. The design is made using software on structural analysis design (Staad Pro).The building subjected to both the vertical loads as well as horizontal loads. The vertical load consists of dead load of structural components such as beams, columns, slabs etc. and live loads. The building is designed as two dimensional vertical frame and analyzed for the maximum and minimum bending moments and shear forces by trial and error methods as per IS456-2000.

1.1 Design Data

The design data shall be as follows:

Live load: 2.5.0 kN/m^2

Water proofing: 2.0 kN/m^2

Terrace finish: 1.0 kN/m^2

Location: Awadh Enclave, opposite to BBD university
Depth of foundation below ground:1.905 m
Type of soil: Type III, SOFT soil as per IS:1893
Average thickness of footing: 0.305m,isolated footings
Storey height:3m
Floors: G.F. + First Floor
Ground beams: To be provided at 100 mm below G.L.
Plinth level: 0.6 m

Wall: 230 mm thick brick masonry walls only at periphery.:

1.2 General Specification

A Ground plus 1 storey building for a residential purpose and is located in seismic zone III on a site with soft soil. Design the building for seismic loads as per IS 1893(Part 1): 2002. The building will be used for exhibitions, as an art gallery or show room, etc., so that there are no walls inside the building. Only external walls 230 mm thick with 12 mm plaster on both sides are considered. For simplicity in analysis, no balconies are used in the building. At ground floor, slabs are not provided and the floor will directly rest on ground. Therefore, only ground beams passing through columns are provided as tie beams. The floor beams are thus absent in the ground floor. Secondary floor beams are so

arranged that they act as simply supported beams and that maximum number of main beams get flanged beam effect. The main beams rest centrally on columns to avoid local eccentricity. For all structural elements, M25 grade concrete will be used. However, higher M30 grade concrete is used for central columns up to plinth, in ground floor and in the first floor.

2. Staad Pro.

The GUI (or user) communicates with the STAAD analysis engine through the STD input file. That input file is a text file consisting of a series of commands which are executed sequentially. The commands contain either instructions or data pertaining to analysis and/or design. The STAAD input file can be created through a text editor or the GUI Modeling facility. In general, any text editor may be utilized to edit/create the STD input file.

The material constants are: modulus of elasticity (E); weight density (DEN); Poisson's ratio (POISS); co efficient of thermal expansion (ALPHA), Composite Damping Ratio, and beta angle (BETA) or coordinates for any reference (REF) point. E value for members must be provided or the analysis will not be performed. Weight density (DEN) is used only whenself weight of the structure is to be taken into account. Poisson's ratio (POISS) is used to calculate the shear modulus (commonly known as G) by the formula,

G = 0.5 x E/ (1 + POISS)

If Poisson's ratio is not provided, STAAD will assume a value for this quantity based on the value of E. Coefficient of thermal expansion (ALPHA) is used to calculate the expansion of the members if temperature loads are applied.

Supports are specified as PINNED, FIXED, or FIXED with different releases (known as FIXED BUT). A pinned support has restraints against all translational movement and none against rotational movement. In other words, a pinned support will have reactions for all forces but will resist no moments. A fixed support has restraints against all directions of movement.
Loads in a structure can be specified as joint load, member load, temperature load and fixed-end member load. STAAD can also generate the self-weight of the structure and use it as uniformly distributed member loads in analysis. Any fraction of this self weight can also be applied in any desired direction.
A STRUCTURE can be defined as an assemblage of elements. STAAD is capable of analyzing and designing structures consisting of frame, plate/shell and solid elements. Almost any type of structure can be analyzed by STAAD. A SPACE structure, which is a three dimensional framed structure with loads applied in any plane, is the most general. A PLANE structure is bound by a global X-Y coordinate system with loads in the same plane. A TRUSS structure consists of truss members which can have only axial member forces and no bending in the members

3. CONCLUSIONS

This project includes the layout of G+1 duplex building using AutoCAD, Analysis and Design using STAAD Pro. The design of a building can be done manually or with the help of Software. We have selected to do our project with Software because designing manually consumes a lot of time, effort and can contain mistakes whereas by using software we can save time and obtain results without errors. At present work we used software named "STAAD Pro". By using the software is that it is user friendly and has exceptional features like it designs the structural components individually along with their Analysis and Results.This software contains all the necessary tools required to design a structure. It works in sync with other such as STAAD PRO foundation , STAAD PRO offshore and ram for designing foundation , offshore structure and steel structure. Other than building bridges , pipes ,share wall etc. can also be design.It can be calculate reinforcement from concrete beams , column and share wall**.** While designing the structure if any failure occurs the software will be noticed immediately so we can correct the design immediately.

By using Staad. Pro. we can analyze the structure very accurately and quickly when compared to the manual methods.

The analysis and design by using Staad. Pro. software is given results with negligible difference with manual calculations.

Thus the software is good for using analysis and the design of structure, simple and also providing other advantages to the users as specified. The concrete used is M25 grade and steel is used HYSD reinforcement of grade Fe 415 confirming to IS: 1786 is used throughout.

We experienced a lot of things related to building design which increases Our knowledge and interest towards the building design

All the work is done very accurately with the help of our team members and group coordinator. We also increases our team work knowledge in this project

The cost estimate for the project has been calculated using long wall and short wall Method in Microsoft Excel. For the Abstract cost CPWD Schedule of rates has been followed and a total cost of Rs 4462423 has been calculated.

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REFERENCES

[1] Sinha S.N, Reinforced concrete design, Tata McCraw-Hill, New Delhi, 1998.

[2] Raju Krishna N, RCC design new age International Publisher, New Delhi, 2003.

[3] IS-1893(Part-1):2002, Criteria for earth quake resistant design of structure.

[4] IS-13920:1993, Ductile detailing of RCC structure subjected to earthquake force.

[5] IS-456:2000 of practice for plain and reinforced concrete.

[6] STAAD.Pro is a 3D structural analysis and Design software by Bentley.

BIOGRAPHIES

Mr. Abhay Yadav was born in 1993 in Orai (Jalaun). He received his Bachelor of Technology degree in Civil Engineering from Uttar Pradesh Technical University, Lucknow, in 2014. In 2016 he received his Master's degree in Structural Engineering from Babu Banarasi Das University, Lucknow. He joined BBDNITM, Lucknow in 2016 as a faculty where he is now Assistant Professor in Civil Engineering department with a total of 5 years of experience.

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