Design of Residential Apartment Building by using Struds

G. DIVYA RANI[1], SATYA SHIVA PRASAD[2]
[1]PG Scholar, Holy Mary Institute of Technology, Bogaram, Ranga Reddy(Dt), TS, India.
[2]Assistant Professor, Holy Mary Institute of Technology, Bogaram, Ranga Reddy(Dt), TS, India.

Abstract: The task of our project is to design the given Residential Apartment pertaining to Indian Standard codes. The design of a building can be done manually or with the help of Software. We have chosen to do our project with Software because designing manually consumes lot of time, effort and can contain errors whereas by using software we can save time and obtain results without errors. As mentioned above, we have used software named 'SRTUDS' abbreviated as "Structural Analysis Design and Detailing Software'. The purpose of using the software is that it is user friendly and has unique features like it designs the structural components individually along with their Analysis and Results. Another useful feature of this software is that we can view the Shear force, Bending moment, Torsion diagrams at each level of the building. The procedure followed by us is as follows: We have collected the drawing plans along with its specification from the construction site. After studying the plan and its criteria we have commenced our project by designing the structural components of building namely slabs, beams, columns and footings. The design of slab was designed by us as mentioned in the plan after which we have placed the columns in their desired locations. Then we have given the material properties along with their grades to beams and columns.

Keywords: Shear Force, Bending Moment, Post-Processor, Slabs, Beams, Columns, Footings.

I. INTRODUCTION

The process of planning, designing and construction of a structure is considered to be as old as the human civilization. Our country is experiencing unprecedented Problems of urban population. There is a growing tendency of rural influx into big cities due to the developing economy and industrialization besides the growth of population. This lead to large scale construction and planning to meet the growing demand of urban population also cost of land is forcing planners to get in for "APARTMENT" and these buildings become inevitable. A structure is an assembly of a number of members such as slabs, columns, beams, walls and so on. The members are proportional to resist the loads and forces, changes in climate conditions such as temperature, frost, chemical attack and so on. A structure is said to be efficiently designed, if all the components are so arranged that transmit their self weight and other imposed loads to foundations of supporting structure by cheapest means so as to satisfy the requirements of architecture stability and the nature of the site with sufficient safety. The building design must be such as to ensure that the building has adequate strength, high ductility and will remain as one unit even while subjected to very large deformations.Multi-storeyed apartment buildings have a lot of assets than duplex, single and other formsares of residential and residential and commercial buildings with respect to overall economy in construction and maximum utilization of plinth area, for an average man(an apartment) sort of multi-storeyed building is the most suitable form of house to suit in budget and for commercial enterprise to establish is building in the modest of city, he is restricted to limited site area. The result he has to choose a multi-storeyed building complex the overall appearance of the city flourishes.

A. Software's Used for the Analysis and Design

The following are some of the software's used for design and analysis.

STAAD Pro: STAAD.Pro is a general purpose structural analysis and design program with applications primarily in the building industry- commercial buildings, bridges and highway structures, industrial structures, chemical plant structures, dams, retaining walls, turbine foundations, culverts and other embedded structures, etc.

II. REPORTS

A. Foundation Design Detail Report SBC Check

- Upward pressure due to axial load ,(p_{r1w}) = P1 / (L x B) = 278.94 KN/m^2
- Upward pressure due to M_x,(P_{r2w}) =WM_X / (L x B x B/6) =5.4948 KN/m^2
- Upward pressure due to M_y ,(P_{r3w}) = WM_Y / (B x L x L/6) =10.2787 KN/m^2
- Maximum upward pressure , (Up_{maxw}) =P_{r1w} + P_{r2w} + P_{r3w} $_=$294.71 kn/m^2
- Minimum upward pressure , (Up_{minw}) =P_{r1w} + P_{r2w} + P_{r3w} $_=$294.71 kn/m^2
- Up_{maxw}(294.91 KN/m^2) < SBC (300.00 KN/m^2) , Hence safe.

Design of SLABS:

- Design Method : Limit State Method
- Design Code : IS 456 :2000

TABLE I:

Load combination	Design pressures (KN/m²)		Working pressures (KN/m²)	
	Maximum	Minimum	Maximum	Minimum
1.50 DL +1.50 LL	442.37	395.05	294.91	263.37

Design of Slab:
- Slab Name   :SI
- Slab Type   : Two Way Slab
- Grade of Concrete   : M20
- Grade of Steel   :Fe415
- Dimensions   :L_x = 6.248 m ,L_y = 3.848 m ,Thickness = 125mm
- SpanRatio :Longer/Shorter = 1.624
- Boundary Condition : One short edge discontinuous

B. Beam Detail Report
Floor 1:
Design of Beam Group   : BGI

Beam :   PBI

Material Properties:

f_{ck} = 20.00 N/mm^2

f_y =415.00N/mm^2

Design Data:

Dimensions:

Beam Type   = 'Rectangular Beam'

Width (b)   = 230 mm

Total depth (D)   =575 mm

Effective Tension Cover   = 33 mm

Effective Compression Cover   = 33 mm

 Clear side Cover   =25 mm

Effective depth (d)   = 542 mm

Span   = 6.782 m

Clear Span (L)   = 6.782 m

Loading On The Beam :
Self wt. of Beam : - 3.306 KN/m
Wall Load:
- UDL in KN/m
- St.pt 0.000 m L = 3.391 m Max. Value = - 16.560 KN/m
- + St.pt 3.391 m L = 3.391 m Max. Value = - 16.560 KN/m

III. CONCLUSION

Finally, we have provided walls where required depending on the type of wall internal wall or external wall. After this we enter the pre-processor mode where we check for any errors if any after which the post-processor is opened where we get all the design details along with their reports. Each floor can be seen with the help of Shear force, Bending moment, deflection diagrams. The results of our project were thus obtained and were found to be effective. A five storied apartment was analyzed and designed by using STRUDS software. The design and corresponding reinforcement details of slabs, beams, columns and footings are presented in the form of reports obtained from STRUDS software.

IV. REFERENCE
[1]www.engineeringsciencesprep.com/.
[2]https://en.wikipedia.org/wiki/Civil_engineering.
[3]civil.columbia.edu/what-civil engineering.
[4]study.com/.../Civil_Engineer_Occupati nal_Outlook_and_Career_Profil.
[5]www.iitg.ac.in/civil/accessengineeringlibrary.com/subject/ ivil_engineering.
[6]www.about.com/Civil+Engineering+Online.