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Design and Analysis of a Bank Building

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Abstract - *A bank building is a building which is designed specifically as a bank with an ATM attached to it and the vehicle parking for the public can also be done near the premises. The structural elements in the building should be strong and capable to withstand the likely adverse effects of natural agencies. The locker rooms must be secured with thicker walls compared to the walls of other walls for safety issue .The planning, analysis and design is based on all Indian Standard Codes of practice and detailed drawings for the respective designs of the parking are presented. The structural members were designed using Limit State Method and Indian Standard Codes was referred IS 456-2000, IS 875 and SP-16. Plan & detailing of structural member have drawn using AutoCAD software. The analysis of the bank building is done in Staad Pro software. The Building plan in India will be recognized by National Building Code (NBC). The bank building designed is a Two-Storey Building (G+1).*

Key Words: Strong, thicker walls, Limit State Method, structural member, design, analysis.

1. INTRODUCTION

1.1 GENERAL

A bank is an institution which deals with the financial related services. The earned and saving s money can be deposited and loans are provide to those who needs money. The mortgage loans and gold loans are also provided by the bank. Hence it is necessary to provide safety for storage of important documents, cash and other valuable jewels.

We have made a survey from the existing banks and have noticed that there is no parking facilities provided for the customers who had come to the bank. This leads to traffic congestion in the surrounding area. The need for parking spaces is on rise due to a rapid increase in the number of vehicles. Parking in public areas can be difficult with little or no form of security and it leads to traffic congestion in the surrounding area. So, it is important to park the vehicle in the premises.

Bank buildings have a number of unique features that distinguish them from other buildings. It has come with a number of reliefs such as utilization of spaces, natural lighting and ventilation and more security.

The Bank building is planned with proper ventilation and solar panels are installed for energy efficiency. The building is planned in such a way that the sunlight enters the building.

This project presents the design of a bank building for the mitigation of traffic challenges in public areas using various case studies. Basically, this building is a G+1 building which consists of an ATM, waiting room, counters, manager room, assistant manager room, document room, safe room, power room, restrooms and a parking facility. Fire extinguishers are placed at every corner of the building. A dog-legged staircase is used to access from the first floor to the ground floor and vice-versa.

This project is entitled, "DESIGN AND ANALYSIS OF BANK BUILDING" deals with design and analysis of G+1 storied building.

1.2 OBJECTIVE

1. To design a G+1 bank building this could provide sufficient space for public utilization.
2. To draw the plan, section and elevation of a bank building using AUTOCADD 2016 software.
3. To design a bank with parking facility for the public.
4. To analyze the structure using STAAD PRO V8i.
5. To design all structural members based on limit state method of design.
6. To prepare reinforcement detailing.

1.3 SCOPE

1. Proper ventilation.
2. Adequate space facility.
3. Adequate parking facility
4. Sufficient security for Locker room.

1.4 LIMIT STATE DESIGNS

Partial safety factors are used in this method to determine the design loads and design strength of materials from their characteristic values. This method gives economical results when compared with the conventional working stress method.

The Structural components are

i. Foundation
ii. Column
iii. Beam
iv. Slab

1.5 PLANNING CONSIDERATION

The plan of the bank building was done in AUTOCADD software. Number of storey isG+1.Total plinth area is 600 sq.m. Ground floor built-up area is 371 sq.m. First floor built-up area is 229 sq.m. The plot is facing in the West direction. The number of doors and window should be limited in the Bank Building. The Elevation and Sectional view was designed in Revit Architecture. The Analysis was done in StaadPro software. The reinforcement detailing was done in AUTOCADD software.

2. METHODOLOGY

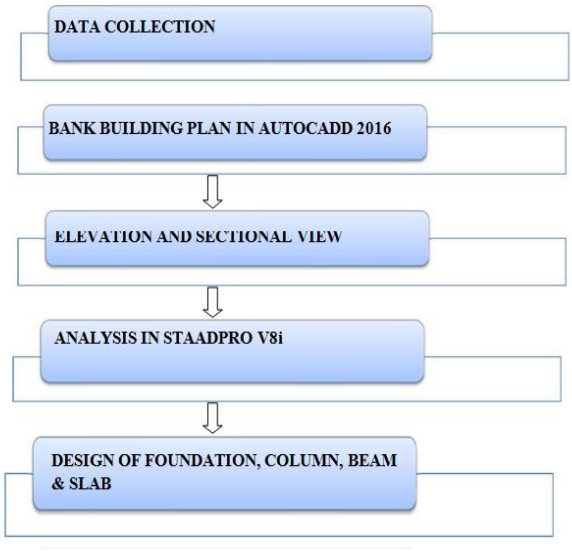

Fig-1: Methodology Chart

3. BANK BUILDING PLAN, ELEVATION AND SECTION

The bank building plan was done in AUTOCADD software. The Elevation and Sectional view was done in Revit Architecture software.

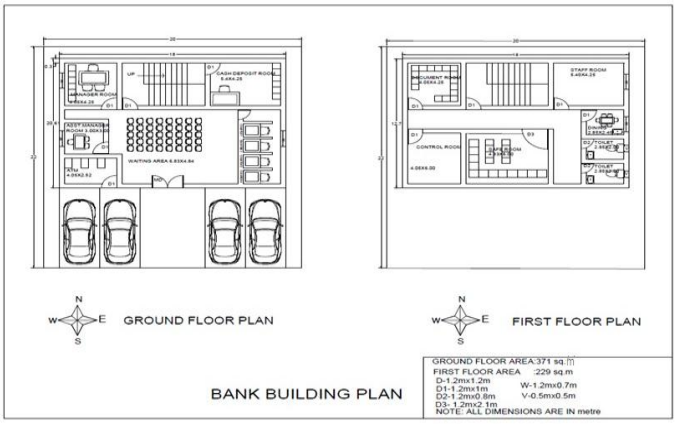

Fig-2: Plan of the Bank Building

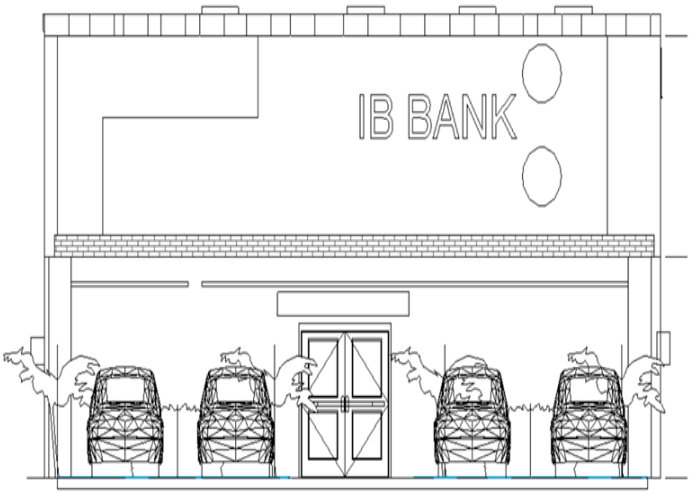

Fig-3: Elevation of the Bank Building

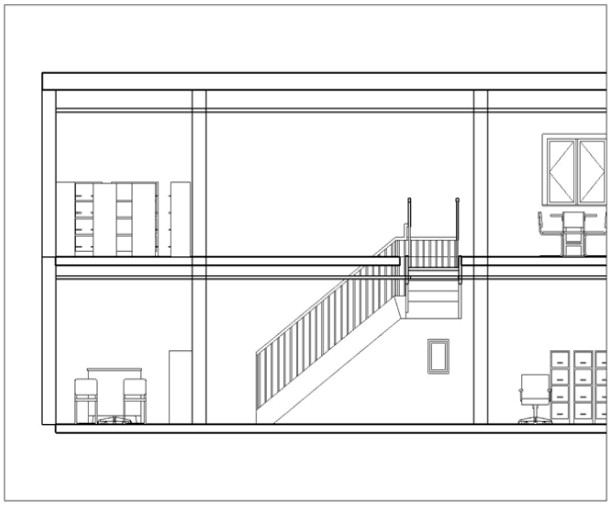

Fig -4: Sectional View of the Bank Building

4. ANALYSIS IN STAADPRO

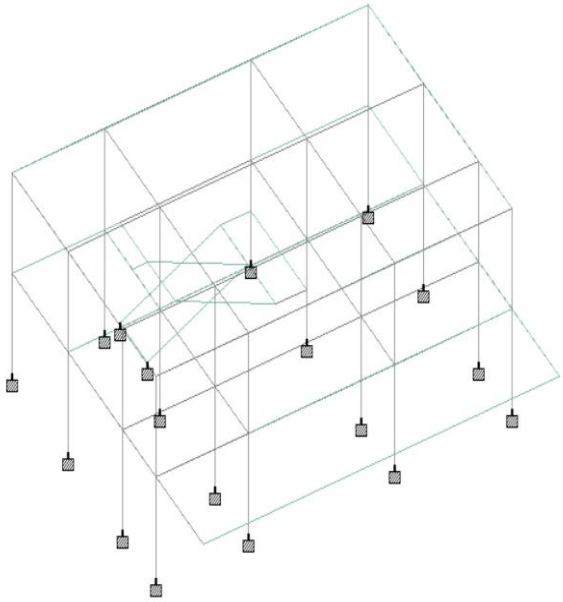

Fig-5: Whole Framed Structure

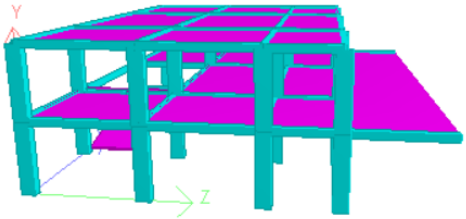

Fig-6: Rendered Image

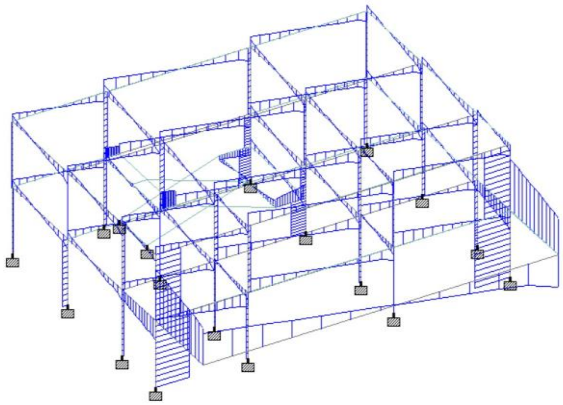

Fig-7: Shear Force Diagram

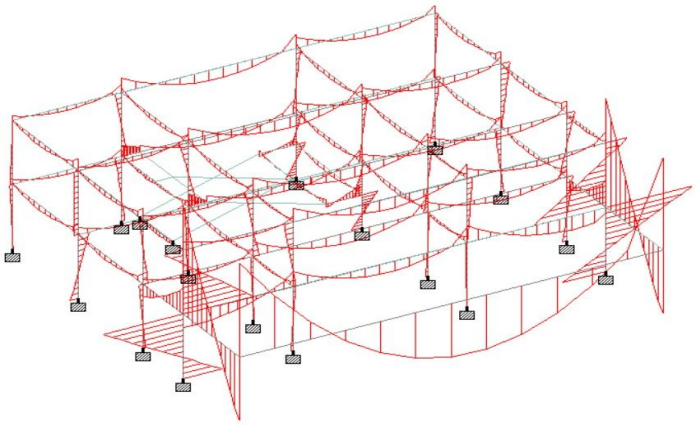

Fig-8: Bending Moment Diagram

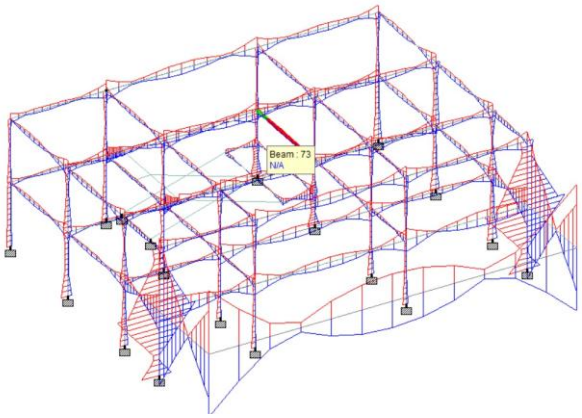

Fig-9: Beam & Column Stresses

5. DESIGN OF SLAB, BEAM, COLUMN, FOUNDATION AND STAIRCASE

5.1 DESIGN OF SLAB

Slab Dimension: 2.73m x 2.84m.
Grade of Concrete used: M20.
Grade of Steel used: Fe500.
Clear Cover: 20 mm.

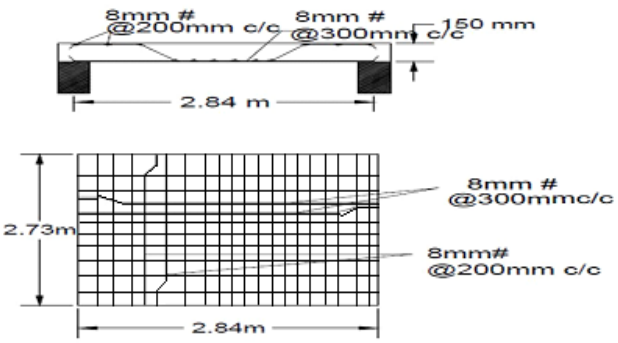

Fig-10: Reinforcement detailing of two way slab

5.2 DESIGN OF BEAM

Beam Dimension: 230mm x 300mm.
Clear span: 4.45m.
Grade of Concrete used: M20.
Grade of Steel used: Fe500.
Clear cover: 25 mm.

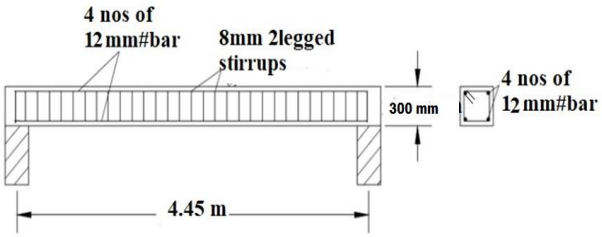

Fig-11: Reinforcement detailing of beam

5.3 DESIGN OF COLUMN

Column Dimension: 600mm x300mm.
Grade of Concrete used: M20.
Grade of Steel used: Fe500.
Clear cover: 50 mm.

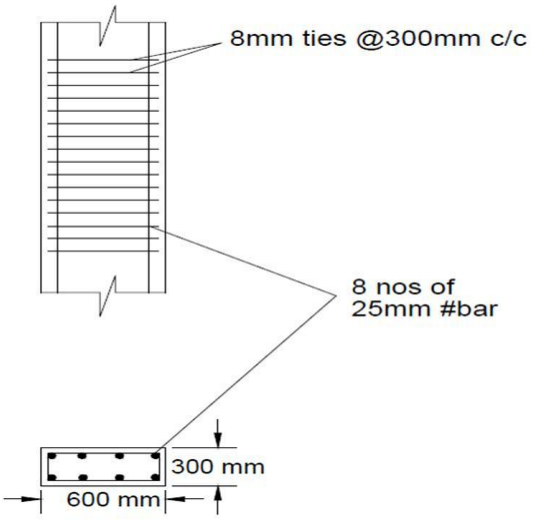

Fig-12: Reinforcement detailing of Column

5.4 DESIGN OF FOUNDATION

Safe Bearing Capacity (S.B.C) =225 KN/m^2.
Total load on footing =850 KN.
Column Dimension: 600mm x300mm.
Grade of Concrete used: M20.
Grade of Steel used: Fe500.
Clear cover: 40 mm.

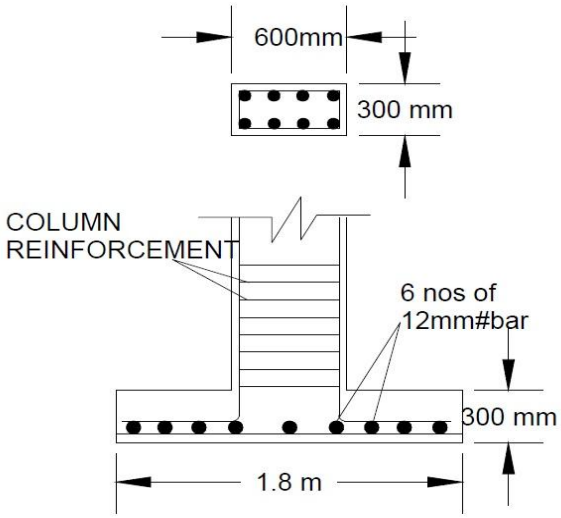

Fig-13: Reinforcement detailing of footing

5.4 DESIGN OF STAIRCASE

Type of Staircase: Dog Legged.
Height between the floors: 3.2m.
Width of each flight: 1.25m.
Height of each flight: 1.6m.
Number of risers in each flight = 1.6/0.175 = 9.
Number of thread in each flight = 9 -1 = 8.
Height of raiser: 175mm.
Tread breadth: 250mm.

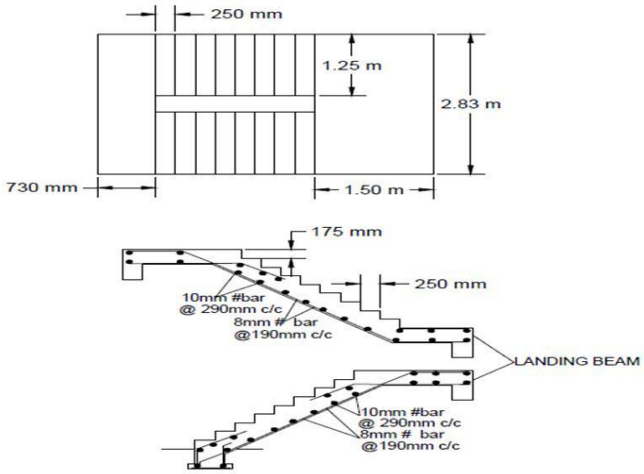

Fig-14: Reinforcement detailing Staircase

6. CONCLUSIONS

This project has invariably fulfilled our primary objective of gaining knowledge in design procedure and analysis. It gave us a chance to exploit the theory we studied so far. It brought to light the scope of theory and salient features of our professions.

In the construction of a bank building, the most important factor to be considered is the structural safety and design criteria, in addition with the economy of the building. This building is to be provided with the facilities of parking cars as well as two wheelers. It is so designed in such a way that the users can utilize the parking without any difficulties.

The structure has been analyzed in STAAD PRO software, the slabs, beams, columns, foundation and staircase are designed in the Auto CADD software.

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