International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 06 | June-2016 www.irjet.net p-ISSN: 2395-0072

Analysis and Design of a Commercial Building

Prof. Alice T.V[1], Cynthia Fernandez [2], Ihjaz Aslam K.E[3], Sreeshma P.U[4], Unnikrishnan G[5]

[1]*Professor,MACE Kothamangalam, Kerala, India*

[2]*Under Graduate Student, Dept.of Civil Engineering, MACE Kothamangalam, Kerala, India*

[3]*Under Graduate Student, Dept.of Civil Engineering, MACE Kothamangalam, Kerala, India*

[4]*Under Graduate Student, Dept.of Civil Engineering, MACE Kothamangalam, Kerala, India*

[5]*Under Graduate Student, Dept.of Civil Engineering, MACE Kothamangalam, Kerala, India*

Abstract - *This paper deals with the analysis and design of a multistoried RCC building highlighting the effects of seismic forces. Reinforced concrete shear wall structure is an efficient seismic resistant structural system. For reducing the effect of seismic forces, shear walls are provided in the building. The modelling and the analysis of the building was done in ANSYS v12 & v14.5. The frame is designed as ordinary moment resisting frame using IS 456:2000. Other components such as slabs and staircase are designed accordingly. After providing shear walls noticeable reduction is found in the total deformation.*

Key Words: *Analysis, design, shear wall,*

1.INTRODUCTION

Shear wall is an efficient structural system and is commonly employed as a major lateral load-resisting system in building structures. Even though seismic motions involve vertical, horizontal and torsional oscillations, only horizontal motions are considered important in the design. The Indian subcontinent is divided into 4 seismic zones(II, III, IV & V), depending on the intensity of forces that can be expected to occur in that zone which, to some extent and depends on its geology and length of fault zones. The multi-storied commercial building which is analyzed and designed here is located in Maradu, Kochi, Kerala, located in seismic zone III

1.1 Shear Wall

Reinforced concrete (RC) buildings often have vertical plate like RC walls called shear walls in addition to slabs, beams and columns. These walls generally start at foundation level and are continuous throughout the building height. Their thickness can be as low as 150mm, or as high as 400mm in high rise buildings. Shear walls are usually provided along both length and width of buildings Shear walls are like vertically-oriented wide beams that carry earthquake loads downwards to the foundation.

1.2 Plan of the building

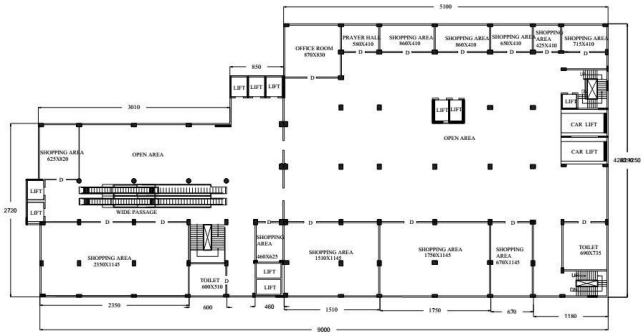


Fig 1. Plan of the Building

2.ANSYS MODELLING AND ANALYSIS

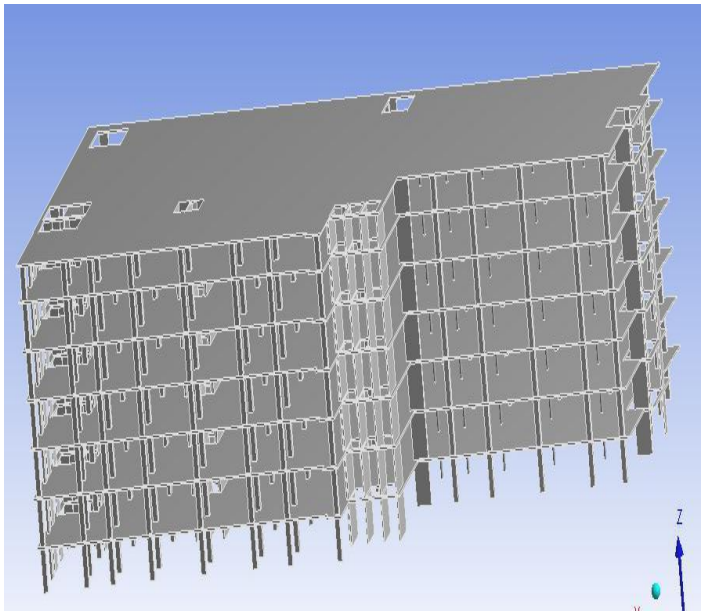


Fig 2. ANSYS model of building

2.1.ANALYSIS

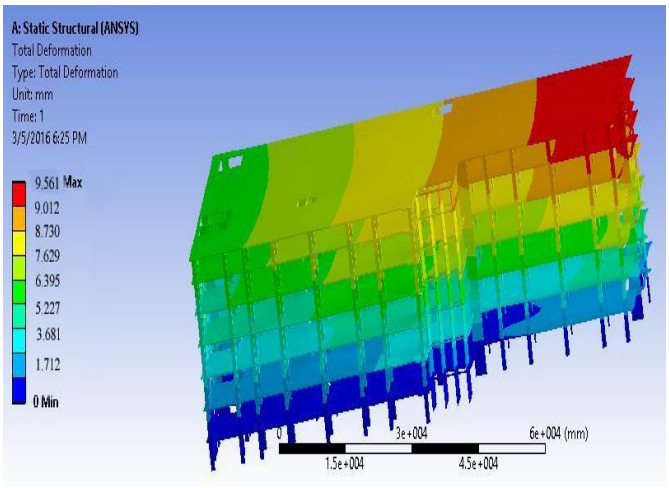


Fig 3. Total deformation

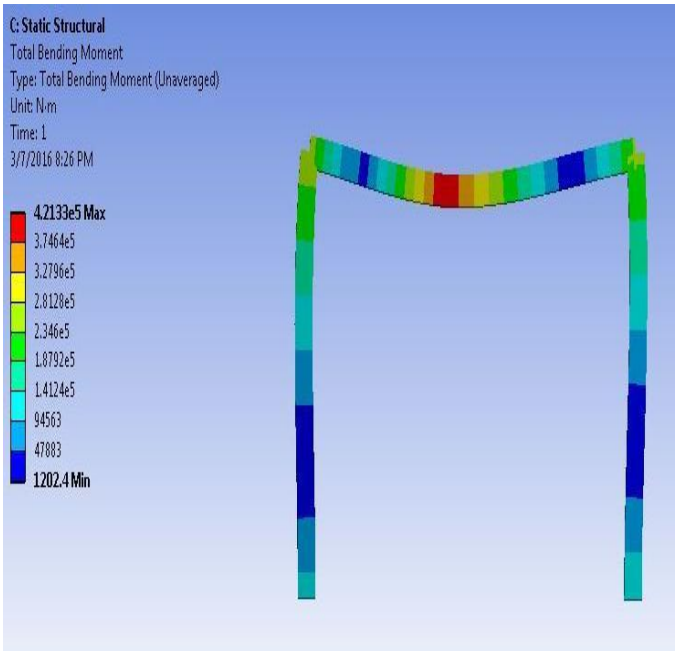
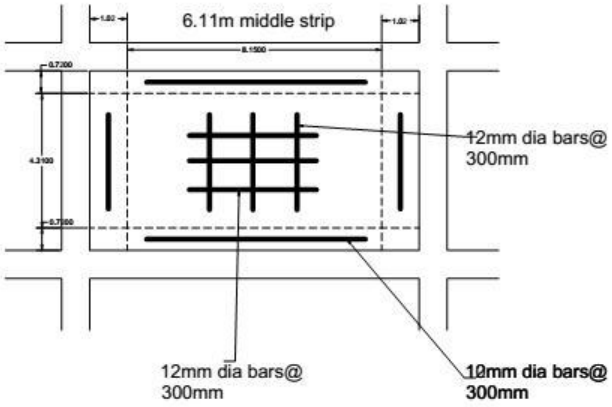


Fig 4. Bending moment

3. DESIGN OF SLABS, BEAMS, SHEAR WALL AND STAIRCASE

3.1 DESIGN OF SLAB

Slab dimension: 5.6m x 8m
Concrete grade: M25
Steel used: Fe415
Edge condition: Interior panel



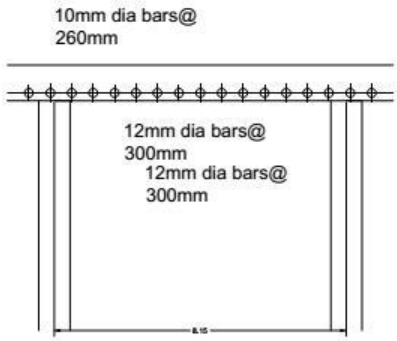


Fig 5. Reinforcement details of two way lab

3.2 DESIGN OF BEAM

Sectional area: 250mm x 500mm
Grade of materials:
Concrete: M25, Steel: Fe415

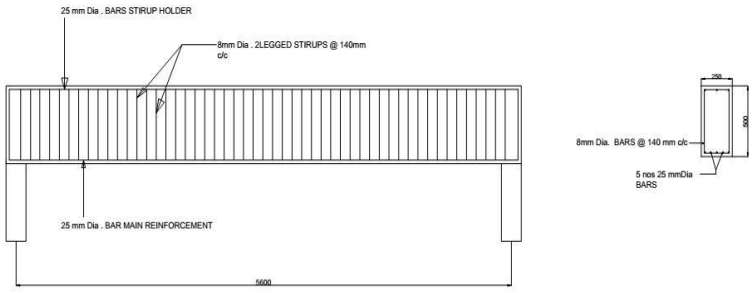


Fig 6. Reinforcement details of beam

3.3 DESIGN OF SHEAR WALL

Concrete grade: M30, Steel used: Fe415
Size: 240mm x 1000mm
Axial load, P_u= 1645kN
M_x= 86.86kNm (Moment about major axis)
M_y= 55.27kNm (Moment about minor axis)

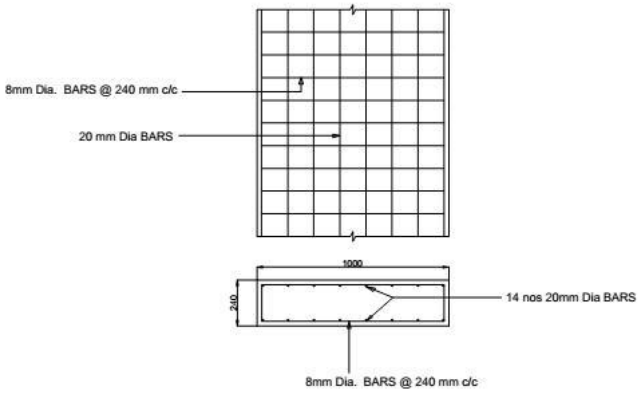


Fig 7. Reinforcement details of shear wall

3.4 DESIGN OF COLUMN

Dimension: 400mm x 800mm

M20 concrete & Fe 415 steel used

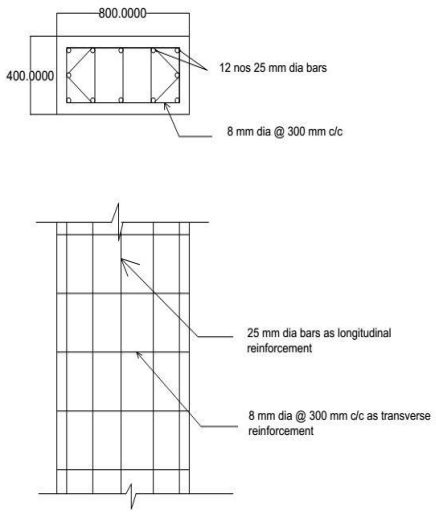


Fig 8. Reinforcement details of column

3.4 DESIGN OF STAIRCASE

Height of floor= 4.2m Height
of each flight= 2.1m Flight
width=2.1m Rise=180mm,
thread=300mm
No. of risers required=2.1/0.15=12 in each flight
No. of thread in each flight=12-1=11
Width of landing= 2.1m

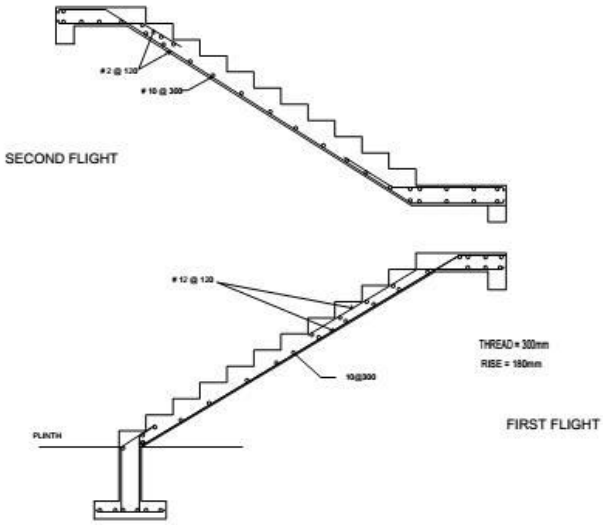


Fig 9 . Reinforcement details of stair case

4. CONCLUSION

The effect of earthquake on RCC framed structure was studied and it was designed for resisting the same. Analysis of structure was done using ANSYS v12 &v14.5. Building components such as slabs and staircases were designed using IS codes. The beams and columns were designed according to IS 456:2000. The project has also focussed on checking the seismic stability of the structure. By providing shear walls lateral deformation was found to be reduced.

REFERENCES

[1] N Subramanian, "Design of Reinforced Concrete Structures", Vol. 3, 2014, PP. 33-124.

[2] IS 456:2000, Indian Standard Plain and Reinforced Concrete-code of practice.

[3] SP 16, Design Aids For Reinforced Concrete to is 456:2000.

[4] IS 1893:2002 (Part I), Indian Standard Criteria for Earthquake Resistant Design of Structures.

[5] IS 875 (Part III)-1987, Indian Standard Criteria for Design Loads (Other than Earthquake) for Buildings and Structures.

[6] Paulay T and Priestley M. J. N, "Seismic Design of Reinforced Concrete and Masonry Buildings", John Wiley & Sons, 1992, PP. 45, 46.