

Using ETAB, Analysis and design a residential building.

Mohit Kumar¹, Ankit Kumar²

¹ Structural Engineering Student, Department of Civil Engineering, RGEC, Meerut-250004, Uttar Pradesh., INDIA

² Assistant Professor, Department of Civil Engineering, RGEC, Meerut-250004, Uttar Pradesh., INDIA

ABSTRACT

This project's primary goal was to analysis and design a multi-story high raised residential structure while taking into account the impacts of lateral seismic loads in according with IS 1893 & IS 4326 for ductile detailing. The building regarded as being in seismic zone 4 Purposes of the analysis.

The traditional complex structural system, are both analysis and design using the ETABS.

Key word: - Seismic Analysis, Multi Storied Residential Building and ETABS Software Tools.

Date of Submission: 18-07-2022

Date of acceptance: 02-08-2022

INTRODUCTION

The present assignment a residential complex building has been preferred as an ordinary-moment resist reinforced cement-concrete frame. This building complex is assumed to have 2 basements out of which one is positioned fully below the natural land level and then in second basement floor consisting of again parking area is partly situated above ground or the natural land level and on top of it we can see the inhabitant floors which are 2B+G+12 in numbers. Above all floors we can find terrace floor as in case of any building in order to cover up the top most floor. This erection is assumed to be placed in zone: IV as per the code IS: 1893-2002. Prime utilization of two basements in this whole building complex is for 2 wheelers & four wheelers. With the purpose of boost the rigidity of the whole structure the shear walls are introduced enclosing the staircase and also at the lift area. This helps the building complex to tackle the seismic effects that may arise in zone VI. We have made use of ETABS 2016 software for performing analysis & also the design.

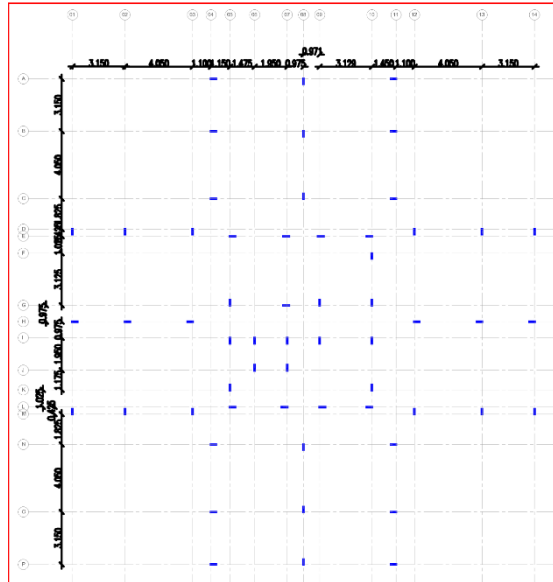
After the analysis & the design is carried out using the software a manual design for 4 structural members will also be carried out which are choose randomly and then the comparison is made just to ensure if the results are in line with the chosen coal requirements.

Modell of structure

Project Details

- Purpose of the building :- Residential building
- Shape of building :- Plan Plus Shaped structure
- No of stories :- 2 B+G+12
- Type of Walls: - Brick Wall.
- Height of stories:- 3.05m similar stories
- Between foundation & plinth :- 3.05m
- Beam size:- 300 x 600mm
- Column:- 300 x 800mm
- Slab Thickness :- 150mm
- Wall's Thickness: - 230mm, 115mm.

Residential Building of symmetrical Plan:-



Material properties

- Grade of concrete = M40
- Grade of steel = Fe500
- Density of concrete = 25KN/m³
- OPC Cement = 43 Grade.
- Grade of PCC= M10

Description of loads

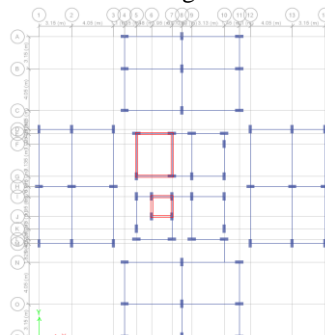
- All moving loads come under live loads.
- Live load (on floor): 2 KN/m² (IS 875: 1987 Part 2)
- Live load (on floor): 1KN/m² (IS 875: 1987 Part 2)
- Floor completes are very forced dead load.
- Floor completion (on floor): 1.5KN/m²
- Floor completion (on floor): 2KN/m²

Seismic loads

The seismic load calculate in acceding with IS-1893 Noida being in severe seismic intensity zone 4 following factor.

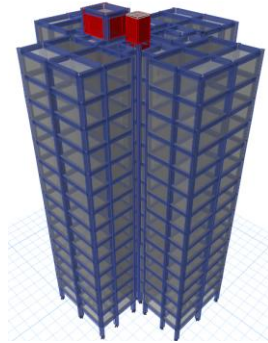
Area	NCR.
Zone	4
Zone factor (z)	0.24
Special R.C Shear wall building	5
Impact factor	1.2
Damping structure	5%
Soil type	Medium soil 2.

The building is propose to have ordinary moment resenting force.

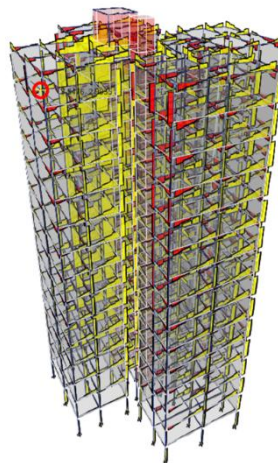


Column and beam plan at plinth level

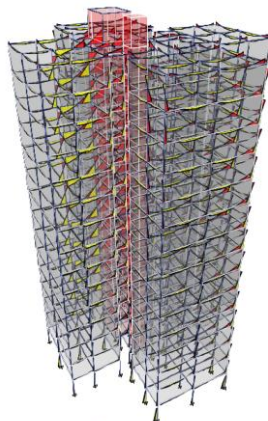
Result and Analysis



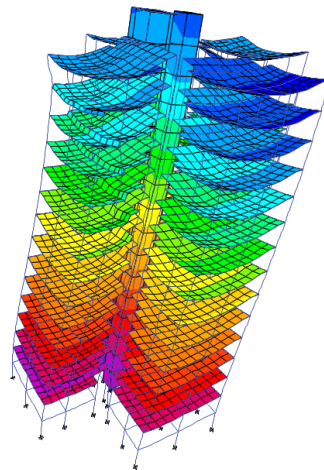
Isometric view of the building



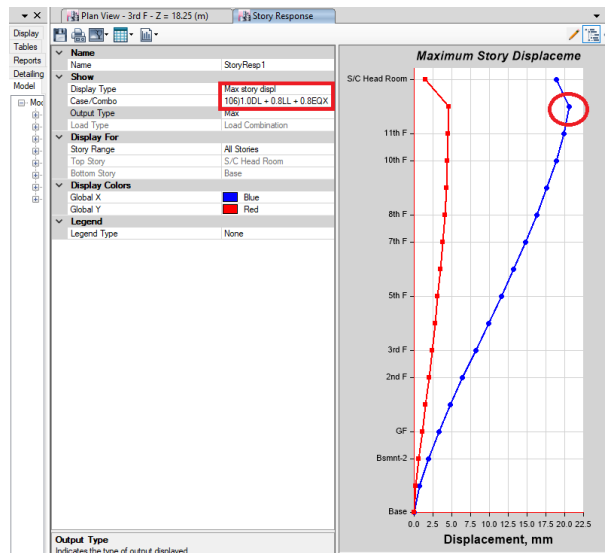
Shear Force for the building



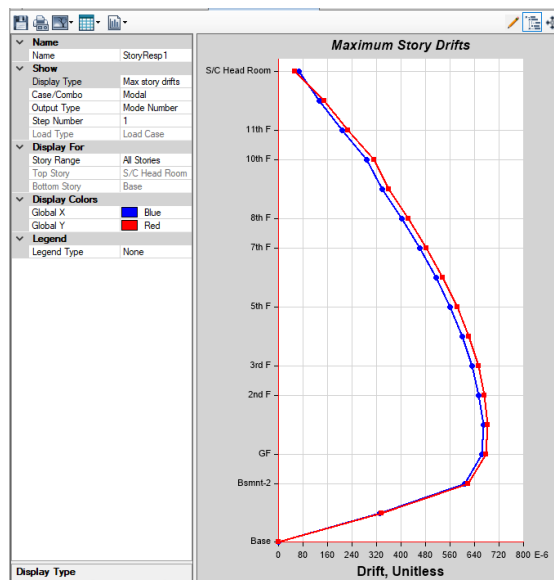
Bending Moment for the building



DETECTION FOR 1.0 DLTU.0LLTU.0EQX



Maximum story displacement



Maximum story drifts

III. CONCLUSION

From the above analysis and design of the selected building has been carried out and the below conclusions were drawn

- Our project deal with provision of earthquake resistant structure which is also economic.
- Seismic analysis was done by using ETABS software and successfully verified as per IS 1893- 2002.
- The provided column and beam sections where capable of taking the moments and load produced due to the wind load and seismic load. This is evident from the percentage of steel obtained during the design. All most all the columns and the beams have minimum reinforcement. Hence the selected sections are sufficient enough to resist the moments and the loads.
- Since this is the residential building depth of slab was assumed to be 125mm thick. This was also sufficient as the maximum dimension of the slab was 5.5m. Also grade of concrete was M40. Due to these reasons we were able to get nominal spacing of the reinforcement with the minimum diameter of 8 mm.
- For the design of footing SBC of 300 kN/sqm at a depth of 3 m was assumed. With this assumption a sizes of the footings for the selected joints were designed and the sizes were safe.

REFERENCES

- [1]. Bureau Of Indian Standard, IS:456(2000),Plain And Reinforced Concrete Code Of Practice
- [2]. Is 875 (Part 2):1987, Indian Standard "Code Of Practice for Design Loads (Other Than Earthquake) For Building and Structures", Part 2 Imposed Loads (Second Revision), Bureau of Indian Standards, New Delhi.
- [3]. S. K. Jain and S. K. Thakkar, "Effect of Superstructure Stiffening in Base Isolated Tall Buildings, " IE (I) Journal.CV, 85, (2004): pp. 142-148
- [4]. Duggal S.K., "Earthquake Resistant Design Structure", Tata Mcgraw Hill Publication, 10th Edition 2004.
- [5]. Mahesh N. Patil, Yogesh N. Sonawane, "Seismic Analysis Of Multi-Storied Building"
- [6]. Indian Standard Criteria for Earthquake Resistant Design Structure 1839-2002.and IS 875 (Part 2):1987.