International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 09 | Sept - 2021 ISSN: 2582-3930

"A STUDY OF SEISMIC BEHAVIOR OF TUBE STRUCTUR"

Mr. Digambar S. khorate, Prof. N. P. Phadtare$_2$

[1]*P.G Scholar,* Padmabhooshan Vasantraodada Patil Institute of Technology, Budhgaon, Sangli.
[2]*Professor, Dept. of Civil Engineering, Padmabhooshan Vasantraodada Patil Institute of Technology, Budhgaon, Sangli.*

Abstract – In present time due to less availability of land and increasing population so the tall buildings is better as it take less space.Tubular structure is a common feature in tall buildings.The tubular structures are different types.The concept of tubular structure is that the building can be designed to resist lateral loads by designing it like a hollow cantilever perpendicular to the ground.Tubular structures are better compared to other Normal RCC structuralr systems because it has less storey shear, storey displacement, storey drift. The seismic analysis is carried out by using Equivalent static method. The modeling and analysis is done using staad pro software. The Frame Tube Structure and Tube in Tube Structure are modeled and compared with the conventional moment resisting frame Structure. The Analysis and comparison is made for characteristics such as maximum displacement and Storey Drift of these structures.The study of seismic behaviour of tube
structures is carried for these structures for zone IV.

Key Words: Equivalent static, Storey Drift, storey Shear, Storey displacement, zone IV.

1. INTRODUCTION

. Now days, the tall buildings are getting lighter and slender because of small areas available and for economy purpose, with the use of modern materials and advanced technologies of construction. The building location, structural geometry, building orientation, wind velocity and geological position are the factors on which the earthquake loads and wind loads depend. It is need of ours to calculate lateral loads for the safe structural design of high-rise buildings. The lateral resisting high-rise structures are analyzed and designed using different software's.There are three major factors to consider in the design of all structures: strength, rigidity, and stability. In the design of tall buildings, the structural system must also meet these requirements. Strength requirement is the dominant factor in the design of low-height structures. The height increases, the rigidity and stability requirements become more important, and they are often the dominant factors in the design.

2. LITERATURE REVIEW

1.Nimmy dileep (2015) [4]:
In this study the seismic performance of tube in tube structures three models were developed in SAP2000 software by varying location of the thinner tubes. And the structures is analyses by equivalent static, response spectrum method and also time history analysis is done and the output of three models are evaluated to have a comparative study of tier seismic performance . From the above study it is concluded that time history analysis predict the structural response more accurately than equivalent static analysis and response analysis.

2.Seismic Behavior of RCC Framed Tube Structure (Earthquake resistant structures) Subathra Kannan, 2nd Year ME.,(Structural Engineering), Ranganathan Engineering College, Coimbatore
In this paper, Frame tube structure is introduced and analyzed for gravity loads and lateral forces. The aim of the project was to know the behavior of frame tube structure, to achieve this a typical 26 story RCC building had been modeled for various zones in India (for zone –III, IV, V) by using ETAB software. Frame tube structure and conventional structure are compared by analyzing the both for self weight, imposed forces, wind forces and earthquake forces and designed with the help of computer programming software ETABS. The lateral analysis of both structures was carried out by using the response spectrum method.

The frame tube structure and conventional structure are compared for same characteristics maximum displacement, storey shear, storey drift and time period. The results and behavior of both structures are observed. The results and behavior indicates that the frame tube structure is advantageous in many ways than conventional structure. [5]

3.Analysis of Different Forms of Tube in Tube Structures Subjected to Latera Loads Mohan K T1, Rahul Y2 and Virendra Kumara K N3 1,2P G Student VVIT/VTU, 3 Professors and HOD, Dept. of civil engg., VVIT/VTU, Karnataka, India

In this paper the tube in tube structure is introduced and analyzed for different tube in tube structures subjected to gravity loading and seismic and wind loading. The aim of this paper was to know the behavior of tube in tube structure, to achieve this various shapes of structure such as square, rectangle, triangular and hexagon structures of G+ 59 storeys with floor height of 3.6m had been modeled for two seismic zones (zone-II and V) in India. SAP 2000 software is used for modeling and analysis. The response spectrum analysis method is used for seismic analysis of various shapes of tube in tube structures and outputs are evaluated for comparison of study of their earthquake performance. In this project it is concluded that, the tube in tube square structure absorb more lateral forces than framed tube and other shapes of tube in tube structures. It is also concluded that, the triangle structure has more displacement, drift and time period but less base shear for zone-II and V. Therefore triangular structure is considered as more vulnerable than other structures. [7]

4.COMPARATIVE STUDY OF TUBE IN TUBE STRUCTURES AND TUBED MEGA FRAMES Abhishek1, Smitha B K2 1P G Student EWIT 2Assist. Professor, Dept. of civil Engg., EWIT, Karnataka, India

A normal bare frame structure, tube mega frames structure and tube in tube structure is analyzed for comparative study with respect to seismic performances. The ETABS software is used for modeling and analysis of these structures for seismic zone II and V. A 40 storey different structures with 3m height of each storey is modeled and analyzed. The linear static and response spectrum methods are taken for analysis. The main aim of this project was to study the seismic behavior of tube in tube, tube mega frame and conventional bare frame structure with respect to various characteristics such as storey displacement, drift, base shear and time period. From the output it is concluded that the tube mega frame structure and tube in tube structure reduces the displacement and storey drift than conventional bare frame structure. Time period in tube in tube and tube mega frame structure is reduces than conventional bare framed structure. The tube in tube structure is performing more against seismic forces in seismic zones. [8]

3. METHODOLOGY

1. For the study reinforced concrete structure is considered, having G+32 stories of each floors is considered as 3.5m height & total height of building is 115.5
2. For the reference base model, a regular reinforced concrete moment resisting bare frame model is considered.
3. Tube-in-Tube and Frame Tube structure are modelled with reference to base model by using Staad-pro Software.
4. The floor height is kept constant for all models in order to get consistent results.
5. To understand the behaviour under lateral loads the loads are applied as per IS 1893: 2002 are used.
6. Based on the results and responses from applied gravity and seismic loads, conclusion will be made.

4. CONCLUSION

- Tube-in-Tube and Frame Tube structure Both are strongly resists earthquake forces as compare to Conventional Moment resisting frame.
- Both Tube Structures strongly support the earthquake design philosophy of Strong Column and Weak Beam.
- The Tube in Tube Structure are reduces maximum displacement about 38% as compared to maximum displacement of Conventional Moment resisting frame for seismic zones IV.
- Frame Tube Structure reduces maximum displacement about 27% as compared to maximum displacement of Conventional Moment resisting frame for seismic zones IV.
- The story drift for tube in tube structure is reduced about 30.8% for zone IV in comparison to Conventional Moment resisting frame.

5. REFERENCE

1. Dileep Nimmy Dileep, R. Renjith, "Analytical investigation on the performance of tube in tube structures subjected to lateral loads", International Journal of research and Applications, 3(4).

2. J. Archana, P .R. Reshmi, "Comparative Study on Tube in Tube Structures and Tubed Mega Frames" International Journal of Innovative Research in Science, Engineering and Technology, 5(8), pp. 14745-14752 (2016).

3. K. Mohan, Y. Rahul and K N Virendra Kumara, "Analysis of Different Forms of Tube in Tube Structures Subjected to Lateral Loads" International Journal of Innovative Science, Engineering & Technology, 4(2), pp 56-64 (2017).

4.Analysis of Different Forms of Tube in Tube Structures Subjected to LateralLoads Mohan K T1 , Rahul Y2 and Virendra Kumara K N3 1,2 PG Student Department of civil engineering, VVIT/VTU, Karnataka, India 3Professor and HOD, Department of civil engineering, VVIT/VTU, Karnataka,India

5.Seismic Behavior of RCC Framed Tube Structure (Earthquake resistant structures) Subathra Kannan,2nd Year ME.,(Structural Engineering),Ranganathan Engineering College, Coimbatore.

6.DYNAMIC ANALYSIS OF TUBE-IN-TUBE TALL BUILDINGS Lavanya.T1, Sathyanarayana Sridhar.R21 Post Graduate student, M.E. Computer Methods and applications in StructuralEngineering. 2Associate Professor,Department of Civil Engineering,Coimbatore Institute of Technology, Coimbatore-04, Tamilnadu, India.

7.Analysis of Different Forms of Tube in Tube Structures Subjected to LateralLoads Mohan K T1, Rahul Y2 and Virendra Kumara K N3 1,2P G Student Department of civil engineering, VVIT/VTU, Karnataka, India 3Professor and HOD, Department of civil engineering, VVIT/VTU, Karnataka, India