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"COMPARATIVE SEISMIC ANALYSIS OF RECTANCULAR FRAME WITH CIRCULAR FRAME"

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Abstract –- Earth tremors occurred in any structure depicts that if the structure is not systematically designed to resist seismic loads, then it led to overall collapse of the edifice. To ensure the safety of structure against the lateral effects developed on it, it is necessary to study of seismic performance of earthquake resistance structures. This investigation is performed by using method of equivalent static load of seismic analysis for G+29 storey building having rectangular and circular shape model and which is subjected to dead, live, seismic load as per IS codes. In this paper the evaluated results of base shear, storey drift, bending moment, shear force, axial force is compared which is generated by using STAAD software. These analyses are carried out in zone V with hard soil condition and using SMRF type building. The Indian standard used are IS1893:2016 part1

Key Words: Static analysis, earthquake evaluation, Storey displacement, comparative analysis.

Introduction

When earth tremors start, edifice will undergo in dynamic motion because of the reason that the structure is subjected to inertia forces that acted in direction opposite to the direction of acceleration of earthquake excitations. During earthquake there is evolve of elastic energy by sudden tremble which results in ground vibration. So, the loads distinct than gravity loads, the structure experiences horizontal forces of substantial magnitude at the time of earthquake. It is necessary to evaluate and specify these lateral forces over the structure in order to sketch out the design of a structure to counteract the forces. There are many governing factors of seismic performance of structure like ductility, shapes, etc. It is observed that the different shape shows the different behavior under the effect of seismic forces. The study focused on the determination and compare the seismic forces on the structure having circular geometry and rectangular geometry and under the effect of seismic effects as per the IS: 1893.

OBJECTIVES:

[1]. The main objective of this study is to understand the behavior of RC frame high rise structure having different shapes and which under the seismic effect.

[2]. To compare the results obtained in study by the help of structure analysis and design software.

[3]. To determine the variation in forces due to the change of shape of the structure under the action of seismic forces.

[4]. There is also a comparison of results in terms of max drift, maximum displacement of story, developed base shear in different levels of structure.

2. METHODOLOGY

The steps are followed for creating the model of Structure in structure analysis and design software:

1. Method of co-ordinates system are used to prepare the plan of the structure by providing the coordinates of the nodes and by joining all the nodes in X and Z direction.
2. Translation repeat command helps to create the structure in the Y direction by providing the no. of storey and height of each storey.
3. In the third step we assigning the properties and materials to the components like beam, columns and slabs.
4. The columns are categized in different size i.e., up to 11th floor the columns size is 850x850mm, from 12th floor to 22nd floor the column is of 650x650mm and the remaining column up to 29th floor column is of 450x450mm size. All the floor beams are of similar dimension of 300x450mm.
5. Fixed supports are created in the next step and assign to the structure.
6. Providing the Seismic definition as per IS 1893:2016 part 1 before applying the load to the structure in the STAAD Software.
7. The different load i.e., dead load, live load, seismic load and different load combination are assign to the edifice.
8. Analysis is done by using Run Analysis command and output file are created.
9. After analysis go to post processing mode for checked the results of storey drift, bending moment, shear force base shear etc.

Above all steps used are similar for creating both the structure, rectangular as well as the circular structure.

TABLE-1. GEOMETRY & LOAD CONSIDERATION

Description	Values
Seismic zone	V
Soil	Hard
Number of storeys	29
Shapes of structure	Circular & Rectangular
Number of bays in X direction	Five
Number of bays in Z direction	Four
Height of each storey	3.0 m
Bay width in X direction	6m
Bay width in Z direction	5 m
Dia of circular structure	30m
Size of beam	300 x 450 mm
Size of column upto 11th floor	850 x 850 mm
Size of column from 12th floor to 22nd floor	650x650mm
Size of column from 22nd floor to 29th floor	450x450mm
Thickness of R.C.C. slab	150 mm

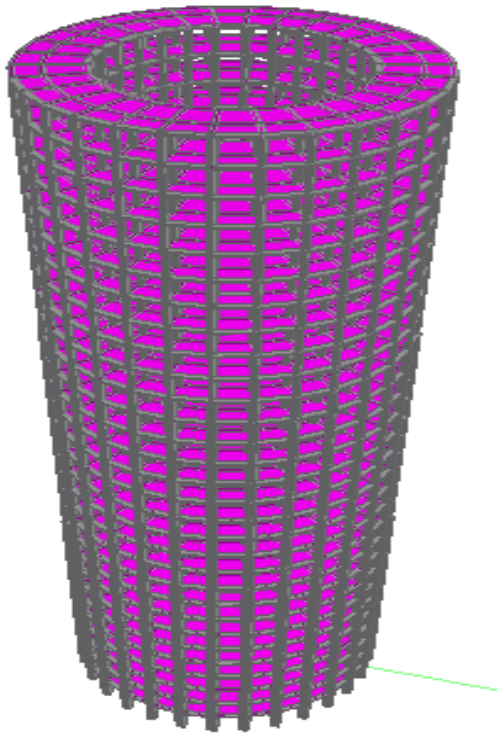


Fig 1: Circular Bare frame (MODEL 1)

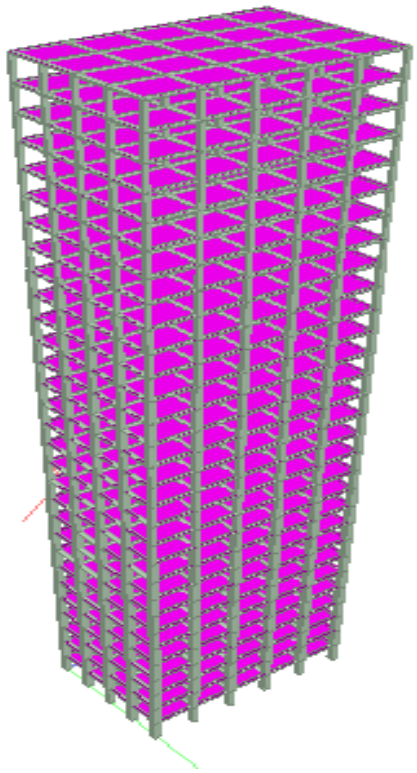


Fig 2: Rectangular Bare frame (MODEL 2)

RESULTS & ANALYSIS:

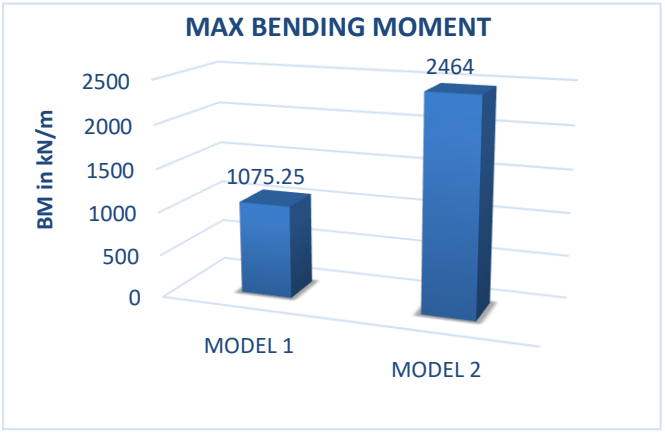


Fig 4: bending moment comparison

The bending moment is decreasing in model 1 about 43.64% compared to model 2.

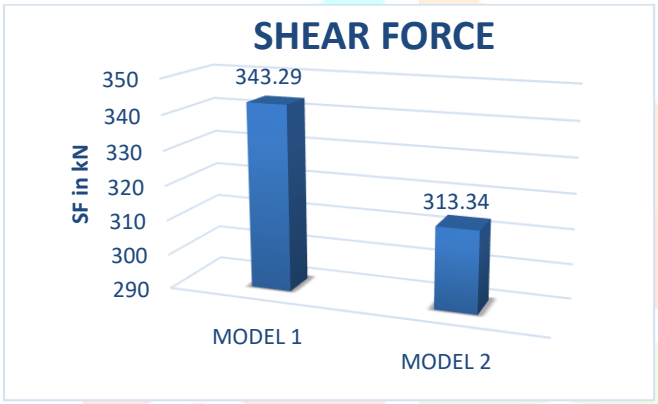


Fig.5 Shear force comparison

The shear force in model 2 is lowered by 9% compared to model 1 thus it is more effective in stabilizing the lateral forces.

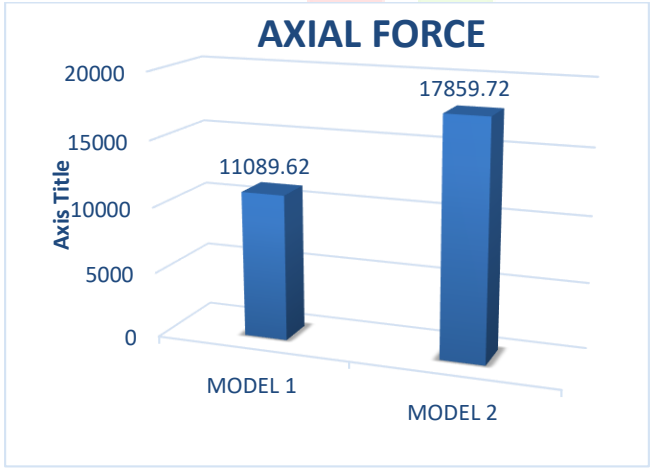


Fig 6: axial force comparison

Values of axial force is reduced in model 1 by 37.91% compare to model 1.

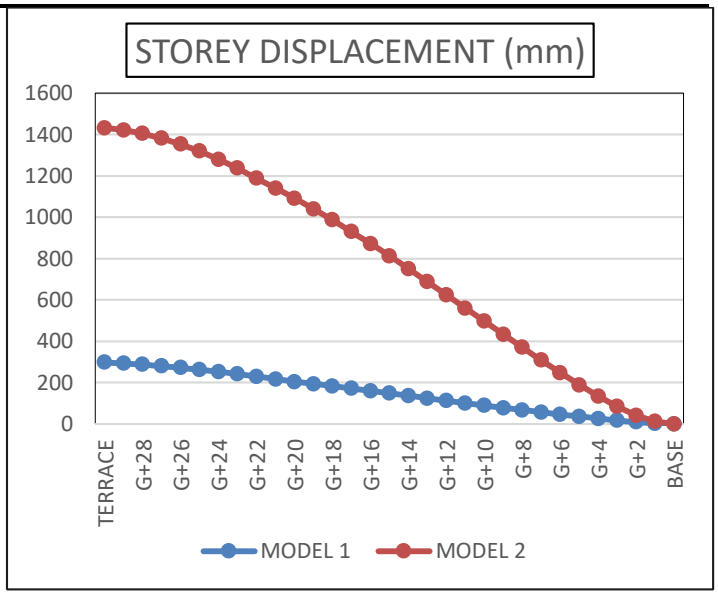
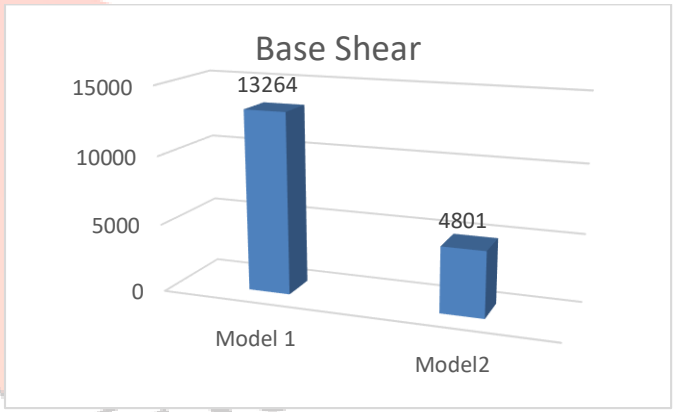


Fig 7: storey displacement comparison

The storey drift is reduced in model 1 about 380% compared to model 2 which clearly depicts that the model 1 is more effective in reducing the lateral forces.



The base shear is increasing in model 1 about 176% compared to model 2.

CONCLUSION:

The results from the research enable us to understand about the shear force, bending moment, axial forces, and storey displacement occurred in the structure. The maximum BM is decreases in model 1 about 43.64% compared to model 2. Shear force is increases in model 1 about 9%. Axial force is reducing in model 1 about 37.91% compare to model 2. The maximum displacement in the top storey is reducing in model 1 about 380% compared to model 2. Base shear is increasing in model 1 about 176% compared to model 2. Research concluded that the forces are efficiently managed in the model 1 and make it stable during the time occurring of earth termer.

REFERNCES:

1. VikasGovalkar, P. J. Salunke, N. G. Gore (2014) Analysis of Bare Frame and Infilled Frame with Different Position of Shear Wall International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-3 Issue-3, July 2014

2. Kiran kamath, Shruthi, Shashikumar Rao (2015), Department of Civil Engineering, Manipal Institute of Technology, Manipal, Comparative Study on Concentric Steel Braced Frame Structure due to Effect of Aspect Ratio using Pushover Analysis. International Journal of Scientific Research Engineering & Technology (IJSRET), ISSN 2278 – 0882Volume 4, Issue 3, March 2015

3. Prof. Prakash Sangave , Mr. Nikhil MadurMadur, Mr. SagarWaghmareWaghmare, Mr. Rakesh Shete, Mr. Vinayak Mankondi, Mr. Vinayak Gundla (2015)Comparative Study of Analysis and Design of R.C. and Steel Structure.

4. Ghalimath A.G., Waghmare Y.M, ZadbukeA.A ,Chaudhari A.R. (2015)Comparative Study of Multistoried concrete Building with Shear Wall and Masonry Infill Frame For Various Types of Soil and Seismic Zones.International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056Volume: 02 Issue: 05 | Aug-2015

5. Mohd Atif, Prof. Laxmikant Vairagade, Vikrant Nair. (2015) comparative study of multistory building stiff with bracing and shear wall. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056Volume: 02 Issue: 05 | Aug-2015

6. Dharanya, Gayathri, Deepika (2017) Comparison Study of Shear Wall and Bracings under Seismic Loading in Multi- Storey Residential Building International Journal of chemtech researchcoden (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online) Vol.10 No.8, pp 417-424, 2017

7. Jonty Choudhry Dr. G.P. Choudhry, GEC jagdalpur (C.G) (2018), Comparative Study and Analysis of Unbraced RCC Framed Structure with Steel Braced RCC Framed Structure using Response Spectrum Method International Journal of Engineering Research& Technology (IJERT)ISSN: 2278-0181IJERTV7IS080045:Vol. 7 Issue 08, August-2018

8. IS: 1893(Part-I)-2002, Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standard, New Delhi.

9. IS 875(Part III):1987 Indian Standard Code of Practice for Design loads (Other than Earthquake) for buildings and structures, Bureau of Indian Standards, New Delhi.

10. IS 456:2000, Indian Standard Code of Practice for Reinforced Cement Concrete, Bureau of Indian Standards, New Delhi.