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SEISMIC ANALYSIS AND COMPARISON OF IS 1893 (PART-1) 2002 AND 2016 OF (G+4) RESIDENTIAL BUILDING

Anoj Surwase [1], Dr. Sanjay K. Kulkarni [2] & Prof. Manoj Deosarkar [3]

[*1.]P.G. Student, Department of Civil Engineering, D.Y. Patil School of Engineering & Technology, Lohegaon, Maharashtra, India

[2]Associate professor, D.Y. Patil School of Engineering & Technology, Lohegaon, Maharashtra, India

[3]Assistant Professor, Department of Civil Engineering, D.Y. Patil School of Engineering & Technology, Lohegaon, Maharashtra, India

ABSTRACT

Considerable improvement in earthquake resistant design has been observed in recent past.
As a result, Indian seismic code IS: 1893 has also been revised in year 2016, after a gap of 14 years. This paper presents the seismic load estimation for multistorey buildings as per IS: 1893-2002 and IS: 1893-2016 recommendations. The method of analysis and design of multi-storey (G+4) residential building located in zone III, IV. The scope behind presenting this project is to learn relevant Indian standard codes are used for design of various building element such as beam, column, slab, foundation and stair case using a software E-tab under the seismic load and wind load acting the structure. We have to find out the values in project base shear, time period, maximum story displacement.

Keywords: *ETAB, Equivalent Static Method, IS 1893 (Part-1) 2002 and 2016.)*

I. INTRODUCTION

The effective design and construction of an earthquake resistant structure have great importance have all the world. Geographical statistics of India shows that almost 54% of the land is vulnerable to earthquake. This Project presents Seismic Analysis and Comparison of Is 1893 (Part-1) 2002 and 2016 of (G+4) Residential Building using ETAB software with lateral loading effect of an earthquake. This Analysis is carried out by plan under seismic zone III and IV. IS 1893 (Part-1) 2002 has been revised after 14 years.

Objectives and Limitation: -

- In software to carry out the storey deflection, shear force and bending moment and compare the results by manual.
- Compare the lateral forces in IS 1893 (Part1):2002 to IS 1893 (Part1):2016.
- Designing is completely based on IS codes.

II. PROBLEM STATEMENT AND METHODOLOGY

Design and analysis of (G+4) residential structure. The building is located in zone III and IV. The soil condition is medium stiff and the R.C frame are infilled with brick masonry. Plan of Residential Building is follows.

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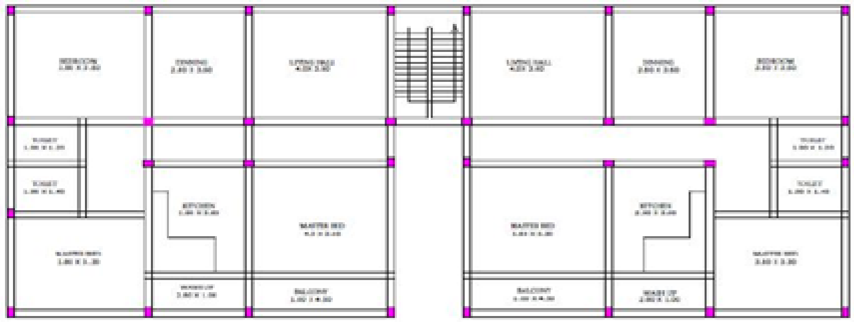

Fig.1 Typical Floor Plan

DATA

- Live Load: 3.0 KN/m2
- Thickness of slab: 125 mm
- Beam Size: 230x300 mm
- Column Size: 230x300 mm
- External Wall Thickness: 230 mm
- Internal Wall Thickness: 100 mm
- Earthquake Load: As Per IS: 1893-2002 (Part-1), IS 1893-2016 (Part 1).

Table 1. Importance Factor

Sr. No	Structure	I
1	Important service and community buildings or structures (for example critical governance buildings, schools), signature buildings, monument buildings, lifeline and emergency buildings (for example hospital buildings, telephone exchange buildings, television stations buildings, radio station buildings; bus station buildings and metro rail buildings), railway stations, airports, food storage buildings (such as warehouses), fuel station buildings, electric power station buildings and fire station buildings), and large community hall buildings (for example cinema halls, shopping malls, assembly halls and subway stations) and power station.	1.5
2	Residential or commercial buildings (other than those listed in Sl. No.1 with occupancy more than 200 persons	1.2
3	All other buildings.	1.0

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III. RESULT AND DISCUSSION

- The lateral forces are obtained using equivalent static methods recommended IS: 1893-2016 (Part -1) and is high as compared to IS: 1893-2002.
- In this project only, importance factor is considered which is 1.2.
- The lateral loads induced due to earthquakes are obtained using equivalent static methods recommended by IS: 1893-2002 and IS: 1893-2016 (Part -1). The lateral forces are more in IS 1893-2016 as compared to 2002 due to importance factor.

Table.2 Base Shear in Zone III

Floor Level	Seismic Coefficient Method	
	IS 1893 (Part1)-2002	IS 1893 (Part1)-2016
1	216 KN	260 KN
2	195 KN	234 KN
3	115 KN	138.24 KN
4	57 KN	68 KN
(G)	18.18KN	22 KN

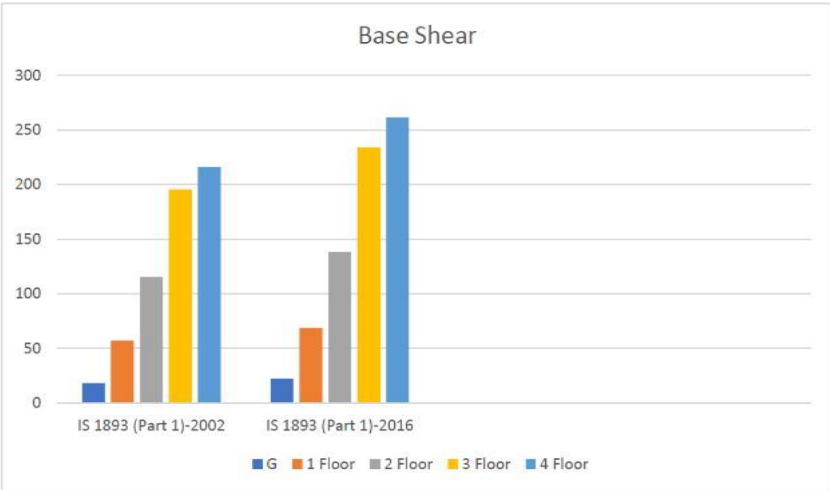

Fig.2 Base Shear in Zone III

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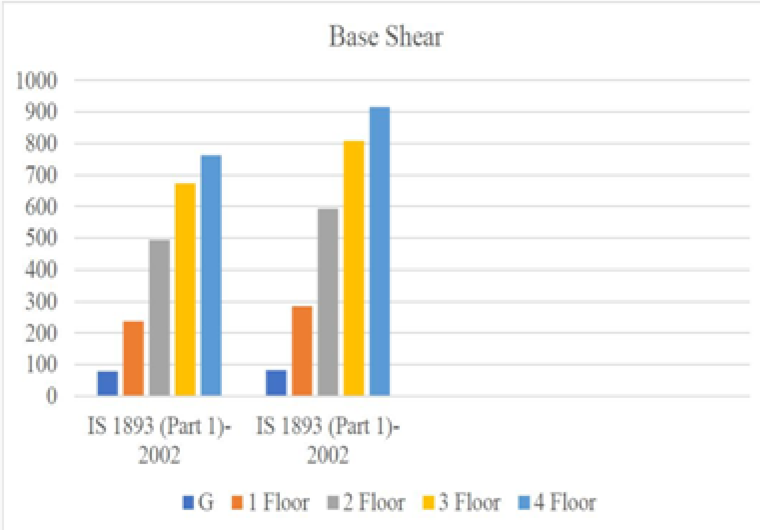

Fig.3 Base Shear in Zone III

Above fig shows that the maximum base shear in IS 1893(Part-1)-2016 and 2002 is 260 KN and 216 KN.

The base Shear in zone III and IV is gradually increases from ground to last fifth floor. The value of base shear is more in IS 1893(Part-1)-2016. Importance Factor value for residential building is 1.2 in IS 1893(Part-1)-2000 and in IS 1893(Part-1)-2002 is 1

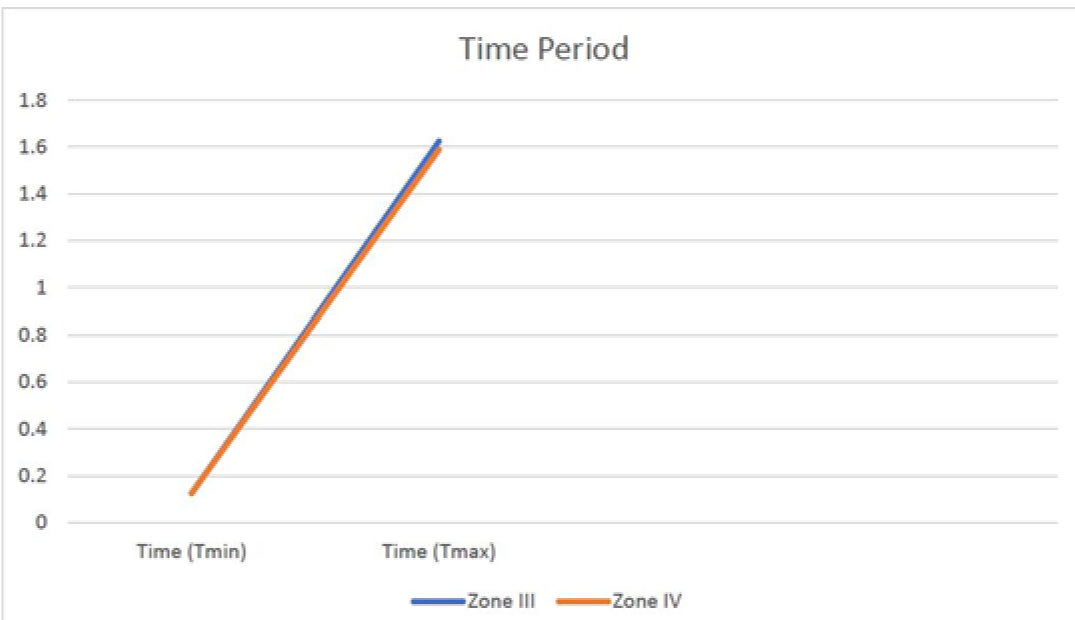

Fig.4 Time period in Zone III and IV

The maximum and minimum time period for zone III and zone IV is 1.624s, 0.125s and 1.589s,0. 121s.This value shows that time period decreases while we are going to zone III to zone IV.

Fig.5 Maximum Story Displacement in Zone III and IV

Maximum Story Displacement in Zone IV is more 24.82mm and zone III is 8. 46mm.Above fig. shows that the displacement in zone IV at Y direction is more.

IV. CONCLUSION

- The seismic design approach, in both the versions, is based on designing a strong and ductile structure, which can take care of the inertial forces generated by earthquake shaking. Unlike previous version of 2002, the latest 2016 version clearly reflects that design seismic force is much higher than what can be expected during strong shaking.
- In IS:1893-2002 version, seismic coefficient method yields lower values of base shear relative to equivalent static method.
- The maximum story deflection in zone IV is more in X and Y direction as compared to zone III structure.
- The maximum lateral force in zone IV in Y is more as compared to zone III.

REFERENCES

1. *Anirudh Gottala, "Comparative study of static and dynamic seismic analysis of a multistorey building", International Journal of Science Technology and Engineering.*
2. *Awkar J. C. and Lui E.M, "Seismic analysis and response of multi-storey semi rigid frames", Journal of Engineering Structures, Volume 21, Issue 5, Page no: 425-442, 1997.*
3. *Mohit Sharma and Dr. Savita Maru "Dynamic Analysis of Multistoried Regular Building" International Journal of Mechanical and Civil Engineering, Volume 11, Issue 1 Jan. 2014.*
4. *Kulkarni J.G., Kore P. N., S. B. Tanawade, "Analysis of Multi-storey Building Frames Subjected to Gravity and Seismic Loads with Varying Inertia", International Journal of Engineering and Innovative Technology (IJEIT), Volume 2, Issue 10, April 2013.*
5. *Sayed Mahmoud and Waleed Abdallah Saudi Arabia "Response Analysis of Multi-Story RC Buildings under Equivalent Static and Dynamic Loads according to Egyptian Code ", International Journal of Civil and Structural Engineering Research, Vol. 2, Issue 1, April 2014.*
6. *Mahesh N. Patil, Yogesh N. Sonawane, "Seismic Analysis of Multi-Storied Building", International Journal of Engineering and Innovative Technology, ISSN: 2277-3754, Volume 4, Issue 9, March 2015, PP 123-129.*

7. Balaji. U, "Design and Analysis of Multi-Storied Building under static and dynamic loading conditions using ETABS", International Journal of Technical Research and Applications, ISSN: 2320-8163, Volume 4, Issue 4 (July-Aug, 2016), PP. 1-5.
8. B. Srikanth and V. Ramesh "Comparative Study of Seismic Response for Seismic Coefficient and Response Spectrum Methods", International Journal of Engineering Research and Applications, ISSN: 2248-9622, Vol. 3, Issue 5, Sep-Oct 2013.
9. Girum Mindaye, Dr. Shaik Yajdani "Seismic Analysis of a Multistorey RC Frame Building in Different Seismic Zones",International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 9, September 2016.
10. IS 1893(Part-1):2002, IS (Part-1):2016 and IS 456:2000