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Comparative Study of Behavior of Framed Structure Under Seismic Zone III & IV Using STAAD Pro

Mr. Girish S. Gaikwad[1], Mr. Sarang P. Patankar[2], Mr. Arjun M. Shinde[3], Mr. Rohan N. Saste[4], Mr. Siddhant A. Nikam[5], Mr. A. N. Shaikh[6]
[12345]Students, Department of Civil Engineering, YSPM's Yashoda Technical Campus, Satara
[6]Assistant Professor, Department of Civil Engineering, YSPM's Yashoda Technical Campus, Satara

Abstract
Designing a structure to sustain during an earthquake makes it very uneconomical, as the earthquakes may or mostly may not occur in entire lifespan of building since it is inconsistent phenomena. In this paper a G+4 RCC building is designed in zone III and zone IV by using STAAD Pro software. Various characters like lateral displacement and storey drift will be studied. The main aim of this paper is to think on variations in RCC members, most extreme shear power, greatest redirection all these factors shows increase from zone III to zone IV.

Keywords: *Seismic zones, STAAD PRO, Lateral Displacement, .*

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I. INTRODUCTION

Designing structure with the help of STAAD Pro V8i which is referenced to IS 1893(PART 1): 2002 "Criteria for Earthquake Resistant Design of Structure" ensures that building has minimum strength to withstand minor earthquake occurring frequently and resisting moderate earthquakes without significant structural damage. This document is presented to improve the productivity of sustained earthquake mitigation strategies and the capacity to secure structures, frameworks, to Investigate a multiplex RCC operating for open shaking strength to think about the effects of different seismic zones, Knowing the relationship between different procedures for seismic inspection and their seismic response, gain useful learning in basic inspection, seismic assessment, drafting and identification of auxiliary parts using earthquake resistant design norms. We are also configuring the G+4 custom build, it means that if the zone changes from zone III to zone IV, the structure planned by us at that point will be fixed. Also, by calculating this we will perceive the amount spent putting together such a structure.

Seismic tremor shaking is irregular and varies with time. Be that as it may, most plan codes speak of inertia forces caused by jolting as the net effect of arbitrary jolts, such as static parallel power proportional to the structure. This strength is called the seismic design base shear VB and remains the base quantity associated with the strength-based earthquake resistant structure of structures. This strength is based on the seismic hazard in the area of the structure spoken by the seismic zone factor z. The codes reflect this by presenting a flexibility factor sa/g. This way of thinking is presented with the help of the response reduction factor r, which is larger for flexible structures and smaller for weak structures. Therefore, the seismic shake claim plan is evaluated solely on the basis of probabilistic ideas and the earthquake effects plan is called a seismic shake safe structure against reasonable estimate of interest. The design base shear VB was taken according to the Indian seismic code is 1893(part 1)-2007.

1.1 Basic Design Codes

Design should be carried so as to confirm to to the following:
1. IS 456: 2000- Plain and reinforced concrete- code of practice (fourth revision)
2. National Building Code 2005
3. Loading Standards IS 875 (Part 1-5): 1987- code of practice for design loads (other than earthquake) for buildings and structures (second revision)
Part 1: Dead Loads
Part 2: Live Loads
Part 3: Wind Loads
Part 4: Snow Loads

Part 5: Special Loads and load combinations

1.2 Design Handbooks

SP 16: 1980- Design Aids (For RCC) to IS 456: 1978
SP 24: 1983- Explanatory handbook on IS 456:1978
SP 34: 1987- Handbooks on concrete Reinforced and Detailing.

1.3 STAAD Pro. V8i

Structural Analysis & Design is used to create the model which would then be able to investigated, analysed & designed. After examination and configuration is finished, the GUI can likewise be utilised to see outcomes graphically. It is a general useful census for auxiliary inspection and combines of Steel, concrete, Timber and aluminum construction. Its adaptability for different codes of design makes it versatile.

II. OBJECTIVES

2.1 To design G+ 4 structure for zone III & IV on STAAD Pro.
2.2 To compare the behavior of framed structure in seismic zone III & IV.
2.3 To make a total plan of the main auxiliary components of a specific structure & find out steel increment.

III. METHODOLOGY

3.1 Creation of node foci: Considering the centreline layout of the plan, we entered the hub documents into the STAAD document.
3.2 Representation of bars and segments: Using the inclusion bar layout, we plotted between beams & columns.
3.3 3D perspective on the building: Here we used the transition repetitive pattern in the Y header to get a 3D perspective on the structure.
3.4 Supports and property: After the formation of the structure, the supports at the base of the structure are specified as fixed. Likewise, the Materials were determined and the cross segments were distributed to the individuals.
4 3D render view: After feature clustering, a 3D rendering perspective can be viewed on the structure.
5 Assignment of seismic loads: We have defined the seismic loads specified in the IS1893:2002 code with appropriate ground loads in order to disable seismic loads instantly. Loads are included load case subtleties in +X, **-**X, +Z, **-**Z headings with determined seismic factor.
6 Assignment of wind loads: Wind loads are characterized according to IS 875 Part 3, depending on the determined power and input factor.
7 Assignment of dead loads: For external dividers, internal dividers, parapet dividers, constant loads including the self-weight of the structure are determined in accordance with IS 875 part 1.
8 Assignment of live loads: Live loads are relegated for each floor as 3 KN/M^2 dependent on IS 875 PART 2.
9 Adding of load combination: After all batches have been dropped, batch mixes are given with the appropriate factor of safety in accordance with IS 875 Part 5.
10 Analysis: After all the above progress paid off, we played out examination and checked for errors.
11 Design: Finally, the solid plan proceeds according to IS 456:2000, characterizing the appropriate plan orders for the various key segments. After the allocation of orders, we investigated whether there were errors again concrete design.
12 Report: After no error found the reports are downloaded and same procedure is repeated but this time with different Seismic Zone.
After following the above specifications the structure is designed for the Seismic zone III. Since, the same structure can be designed for Zone IV only with minor alterations in the Seismic Load case and reports can be compared.

IV. SIMULATION

The input data is as follow,
1.START CONCRETE DESIGN
2.CODE INDIAN
3.CLEAR 0.025 MEMB 124 125 127 TO 172 174 TO 185 189 191 195 197 TO 263 280 **-** 228. 281 TO 344 360 TO 424 440 TO 504 520 TO 584 229.
3.CLEAR 0.04 MEMB 81 84 88 92 93 96 97 102 112 116 TO 118 186 190 192 196 264 **-** 230. 265 TO 276 278 279 345 TO 359 425 TO 439 505 TO 519 585 TO 604 231.

4.FYMAIN 415000 ALL
5.FYSEC 415000 ALL
6.MAXMAIN 32 ALL
7.MAXSEC 16 ALL
8.MINMAIN 8 ALL
9.MINSEC 8 ALL
10.RATIO 4 MEMB 81 84 88 92 93 96 97 102 112 116 TO 118 186 190 192 196 **-** 238. 264 TO 276 278 279 345 TO 359 425 TO 439 505 TO 519 585 TO 604 239.
11.DESIGN BEAM 124 125 127 TO 172 174 TO 185 189 191 195 197 TO 263 280 TO 344 **-** 240. 360 TO 424 440 TO 504 520 TO 584

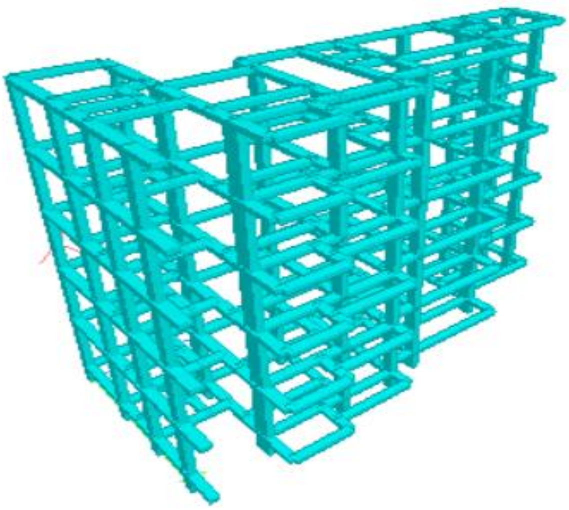

Figure1: 3-D Rendered View

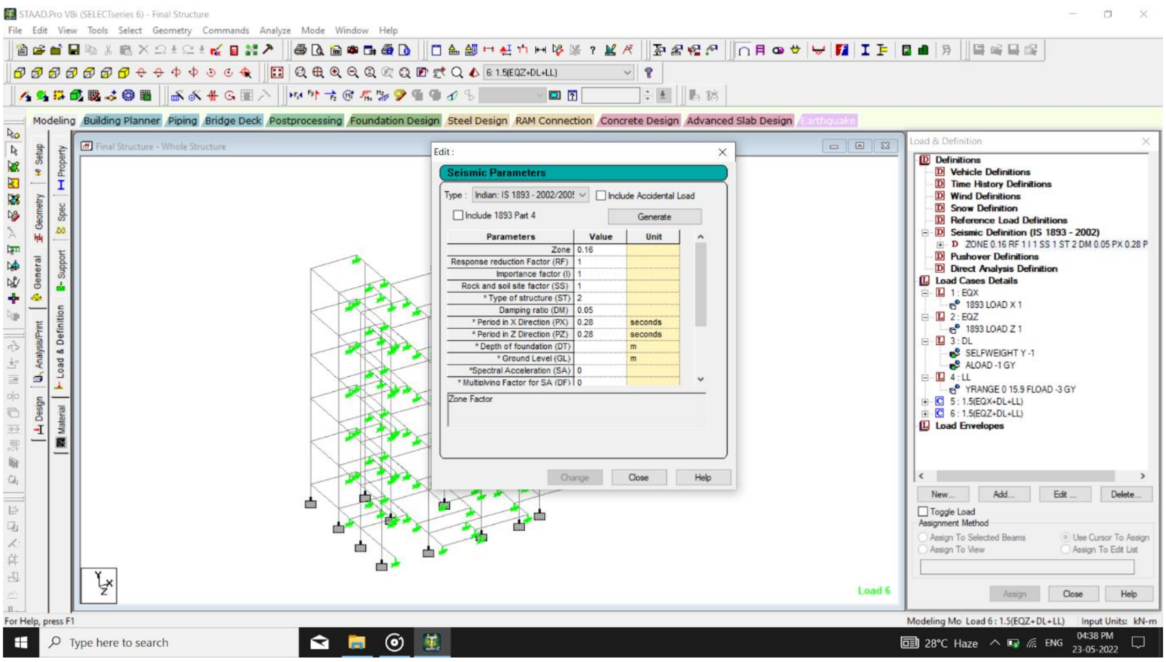

Figure2: Seismic Parameters

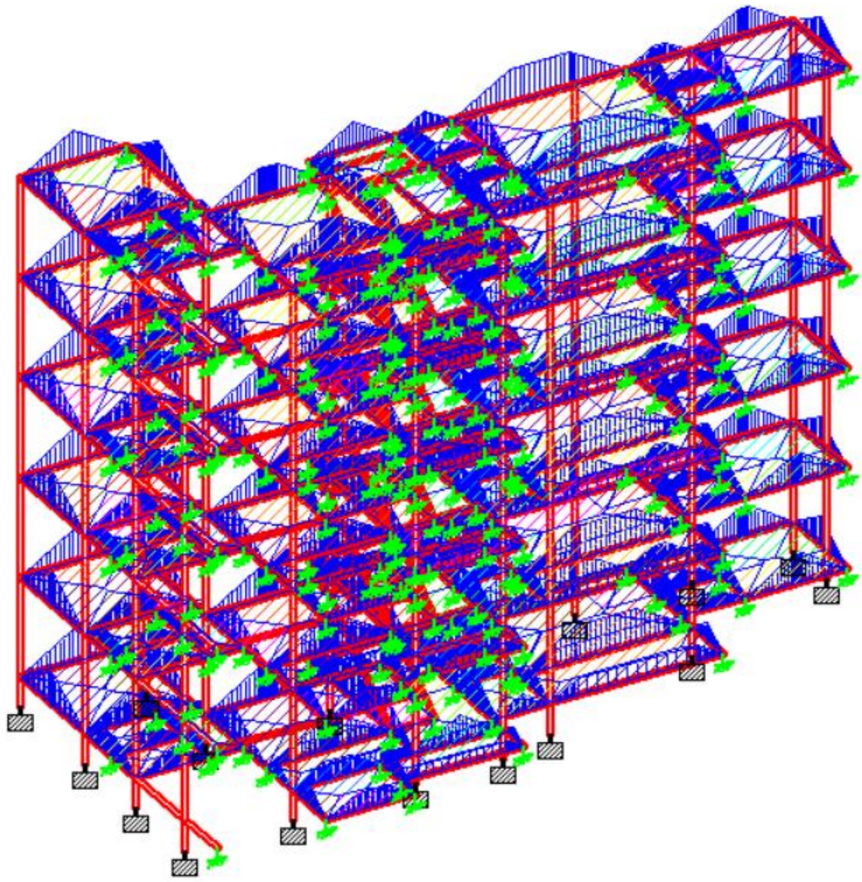

Figure3: Dead Load & Live Loads

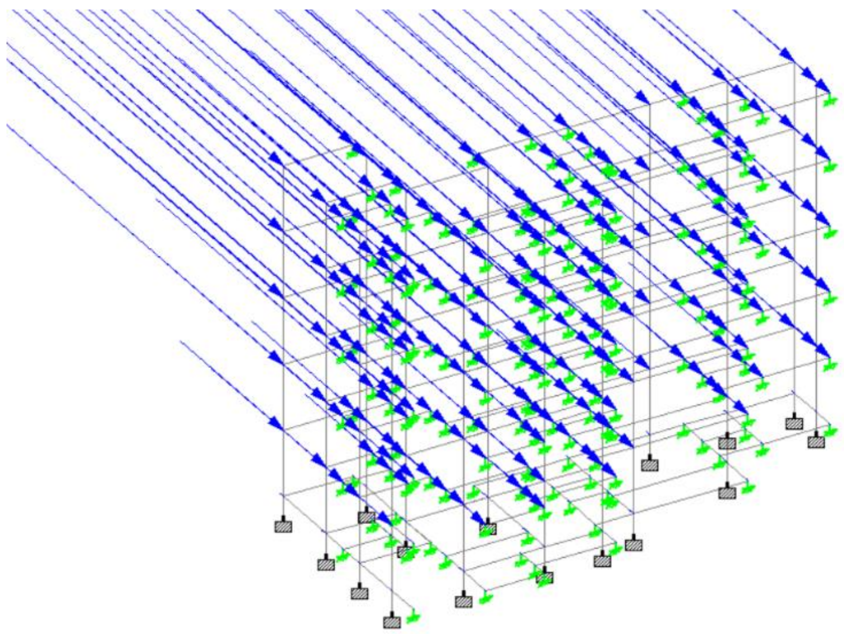

Figure4: Seismic Forces in X- Direction (maximum)

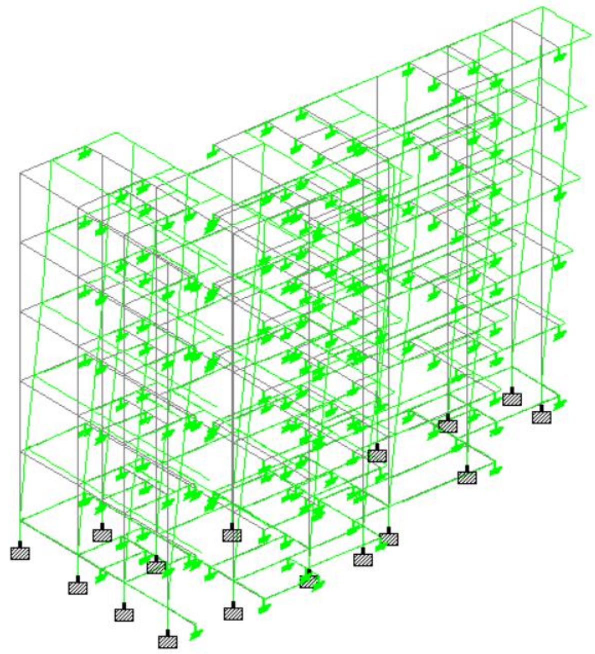

Figure5: Deflection Of Members

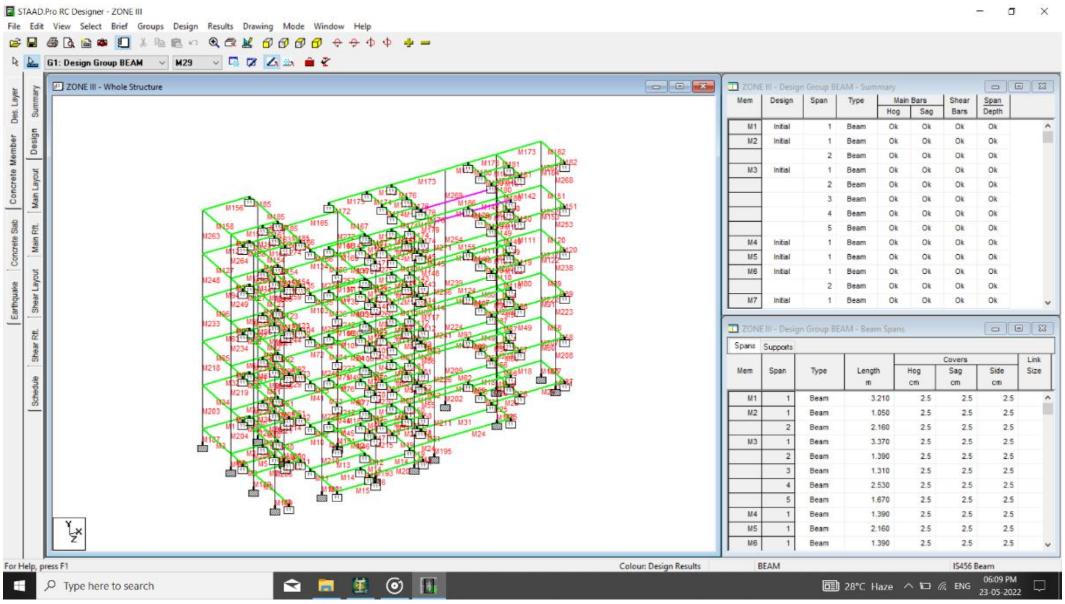

Figure6: Beam Check

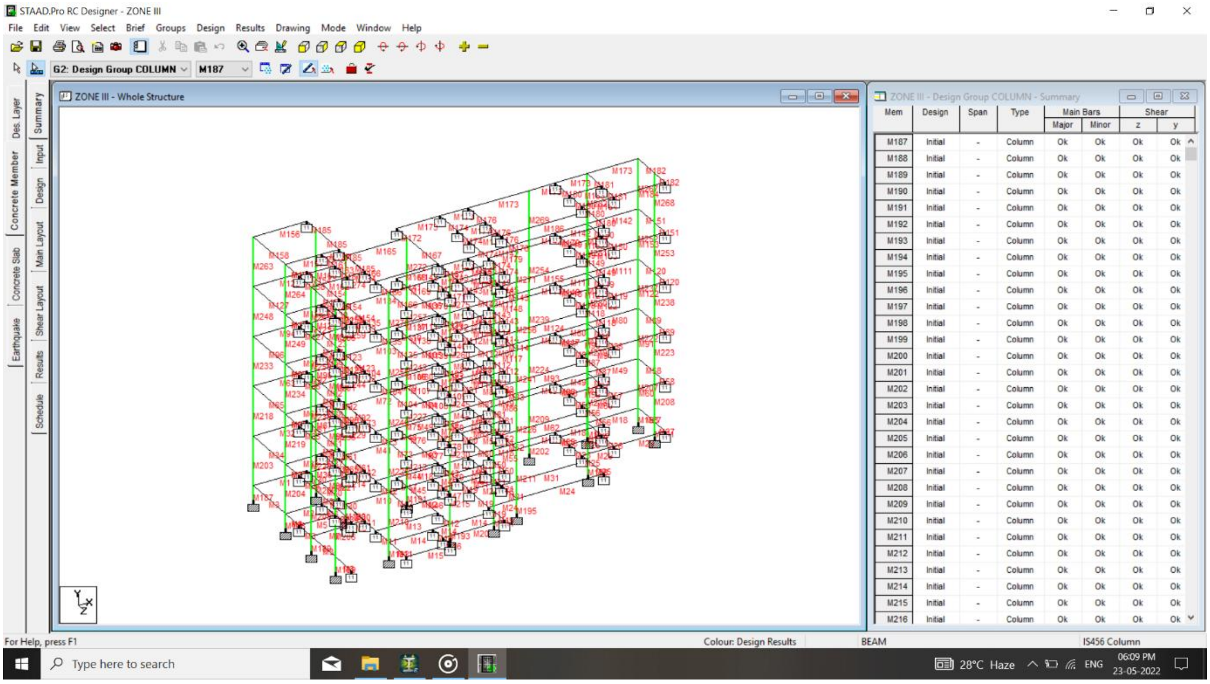

Figure7: Column Check

V. CONCLUSION

5.1 Total 2.47% more steel is require to design the structure from Zone III to Zone IV.
5.2 Maximum nodal displacement is increased by 8.33mm showing more horizontal forces in higher zone.
5.3 Maximum bending moment is increased by 30.84 kNm results in more steel in beam section.
5.4 Maximum shear forces increased by 15.32 kN resulting in additional 1.3% shear reinforcement in zone IV.
5.5 After analyzing the G+4 storey building structure, it was concluded that the building is safe under dead load, wind load and seismic loads in both zones if additional 2.5% reinforcement is provided.

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