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COMPARISON OF NON-EARTHQUAKE RESISTANT AND EARTHQUAKE RESISTANT FRAMED STRUCTURES

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Abstract— framed structures are the structures having the combination of beam, column, slab and footings to resist the lateral and gravity loads. These structures are usually used to overcome the large moments developing due to the applied loading. In this study a framed structure is studied for two conditions of loadings 1) dead load and live load & 2) dead load, live load and earthquake loads. The results of selected parameters were compared.

Keywords— Framed structure, Earthquake loads, Deflection, Base shear

I. INTRODUCTION

In most of the construction in rural and urban areas, earthquake design is neglected due to ignorance. Local Municipal laws should strictly implement the construction of buildings based on earthquake resistant designs depending on zones. The main aim of earthquake resistant design is to reduce the loss of life. IS Codes recommends use of symmetrical and simpler plans for uniform load distribution. Formation of soft storey should be avoided in the framed structures.
In this paper a symmetrical framed structure is considered for analysis and design. Analysis is done using Stadd-pro software. The results of selected parameters are compared.

II. DESIGN PARAMETERS

TABLE I
(Design Parameters)

General Data:	
Building usage	Residential
Number of Storey	G+3
Type of Construction	RCC Framed structure
Typical floor height	3m
Grade of Concrete	M20
Grade of steel	Fe415
Column dimensions	350x600mm
Beam dimensions	350x500mm
Seismic Data:	
Earthquake Zone	III
Zone Factor	0.16
Response Reduction Factor	5
Importance Factor	1
Damping Ratio	0.05%

Loads Considered:
Case-I (Without earthquake force)
1) Dead Load: DL
2) Live Load: LL
Case-II (With earthquake forces)
1) Dead Load: DL
2) Live Load: LL 3) Earthquake Load: EQ

Loads Combination:
Case-I (Without earthquake force)
1.5(DL+LL)
Case-II (With earthquake forces)
1.2(DL+LL+EQ)

III. STRUCTURAL MODELLING

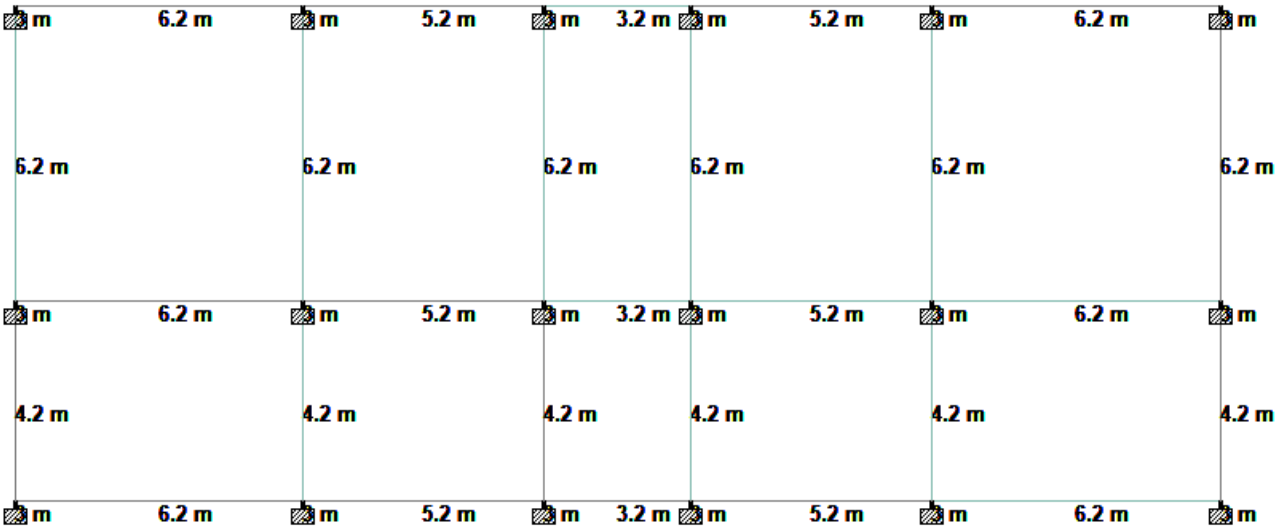

Figure-1 PLAN

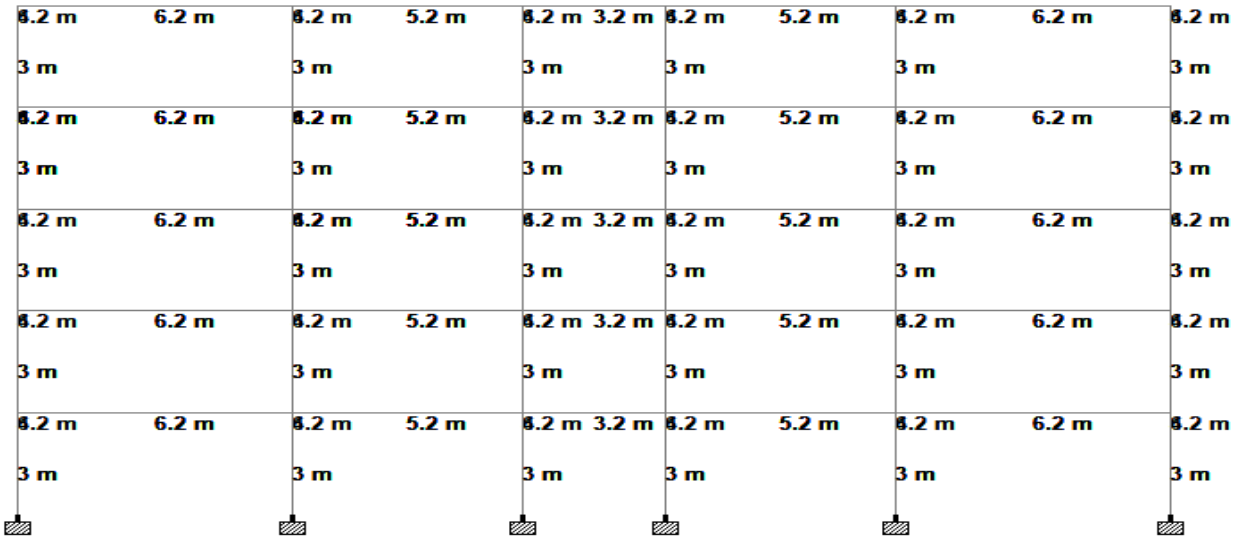

Figure-2 ELEVATION

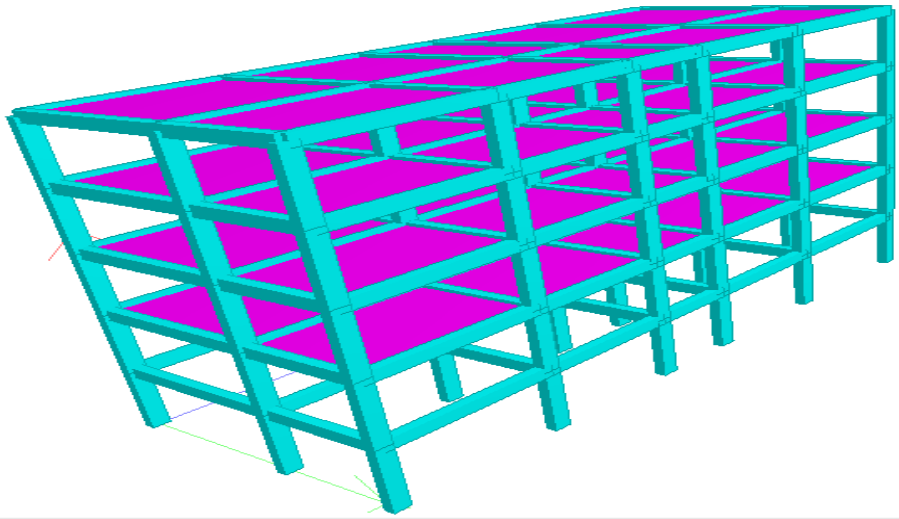

Figure -3 3D-MODEL

IV. RESULTS

SECTION CONSIDERED FOR COMPARISON OF VARIOUS PARAMETERS:

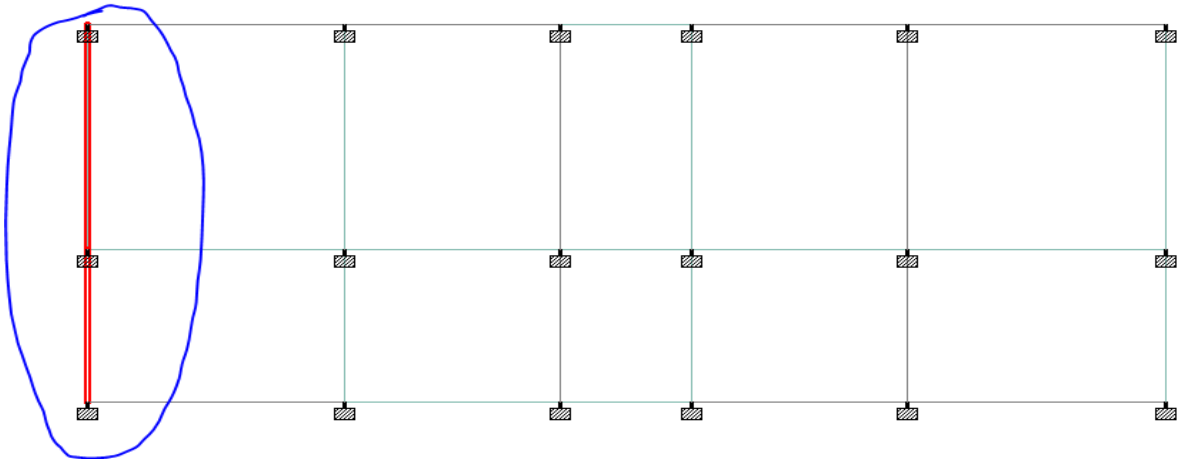

Figure-4

TABLE II
(Comparison)

Description	Case-I (Non-Earthquake Design)	Case-II (Earthquake Design)
Loading	Vertical due to DL and LL	Vertical due to DL and LL, Horizontal due to EQ
Reinforcement in beam	Beam no: 1 (external) Top reinforcement: 1389.3 sq.mm Bottom reinforcement: 1008.7 sq.mm Beam no: 72 (internal) Top reinforcement: 1511 sq.mm Bottom reinforcement: 1043.7 sq.mm	Beam no: 1 (external) Top reinforcement: 1905.2 sq.mm Bottom reinforcement: 1681.2 sq.mm Beam no: 72 (internal) Top reinforcement: 2485.7 sq.mm Bottom reinforcement: 1681.1 sq.mm
Reinforcement in column	Column no: 26(external) Steel area: 1531.6 sq.mm Column no: 143(internal) Steel area: 1680 sq.mm	Column no: 26(external) Steel area: 1680 sq.mm Column no: 143(internal) Steel area: 2287.3 sq.mm
max moment	155.129 Knm @ Level 1	124.332 Knm @ Level 3
max deflection	7.521 mm	10.4mm
Max beam stresses	11.029 N/mm^2	7.289 N/mm^2

V. CONCLUSIONS

- There is increase in reinforcement percentage in the columns and beams for earthquake resistant designs.
- Beam stresses are more for non-earthquake resistant structures whereas deflection is more in earthquake resistant structure.
- From the project analysis and design we found increase in reinforcement area, additional number of bars is required in the earthquake resistant design, which also varies from interior to exterior element design.

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