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ANALYSIS OF SHEAR WALL AND BRACED STRUCTURE USING F.E.M SIMULATION

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KEYWORDS: Braced Panel (Shear wall), Framed Structure, Laced Structure (Steel Bracings), Staad Pro V8i.

ABSTRACT
Observation of damage after earthquakes has shown that torsional vibration of buildings Induced by lateral seismic ground motion may cause serious distress in a structure, sometimes leading to its collapse. Therefore, when designing a building for lateral loads such as those generated by wind or earthquakes, a design engineer may have several alternatives. Lateral loads may be transferred to the foundation via shear wall, braced frames or rigid frames, or other methods. The design system should be strong enough to resist the seismic forces and light enough to keep the existing structural elements far from needing further reinforcement.

INTRODUCTION
Although the increase of earthquakes of destructive intensity has been confined to a relatively few areas of the world. The catastrophic consequences attending the few that have struck near centers of population have focused attention on the need to provide adequate safety against this most awesome of nature's quirks. The satisfactory performance of a large number of reinforced concrete structures subjected to severe earthquakes in different areas of the world has demonstrated that it is possible to design such structures to successfully withstand earthquake of major intensity.

Early attempts to provide for earthquake resistance in building were based on rather crude assumption about structural behavior and were handicapped by a lack of proper analytical tools as well as reliable earthquake records. Observations of the behavior of reinforced concrete structures subjected to actual earthquake, analytical studies, and laboratory experiment by a number of investigators over the last three decades or so have all contributed towards putting the subject of earthquake –resistant design on a firm rational basis. Steel bracing is a highly efficient and economical method of resisting horizontal forces in a frame structure. Bracing has been used to stabilize laterally the majority of the world's tallest building structures as well as one of the major retrofit measures. Bracing is efficient because the diagonals work in axial stress and therefore call for minimum member sizes in providing stiffness and strength against horizontal shear. A number of researchers have investigated various techniques such as infilling walls, adding walls to existing columns, encasing columns, and adding steel bracing to improve the strength and/or ductility of existing buildings. A bracing system improves the seismic performance of the frame by increasing its lateral stiffness and capacity. Through the addition of the bracing system, load could be transferred out of the frame and into the braces, bypassing the weak columns while increasing strength.

BUILDING MODELING -
A 15- storied reinforced concrete building with shear wall, without shear wall and with different types of bracing in zone V has been considered for the illustration .The main emphasis in this chapter is on calculation of base shear, frequency, period and displacement for different story, and comparing this with shear wall and bracing for different 9 types of cases as given below in figure.

Building description- Analyze a 15- storied RC building as shown in fig. The live load on all the floors is 2KN/m^2 and soil below the building is hard. The site lies in zone V. All the beams are of size 400 x 500 mm and slabs are 150 mm thick. The sizes of columns are 600 x 600 mm in all the story and the wall around is 150 mm thick. (SP : 22- 1982), Building is analysis on STAAD-PRO using response spectrum method .Using this software frequency, period, base shear, displacement is calculated.

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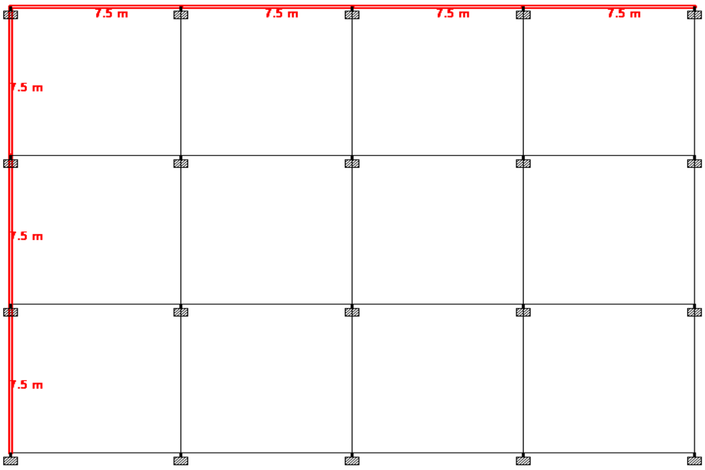

FIG.-1 PLAN

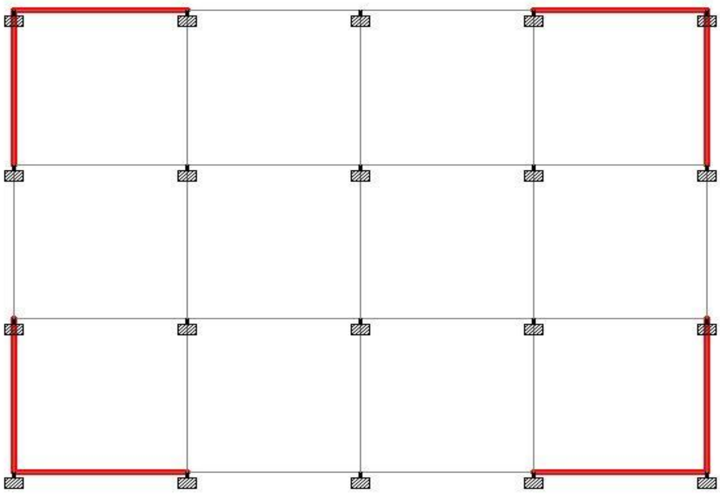

FIG.-2 BRACED PANEL (SHEAR WALL) AT CORNER

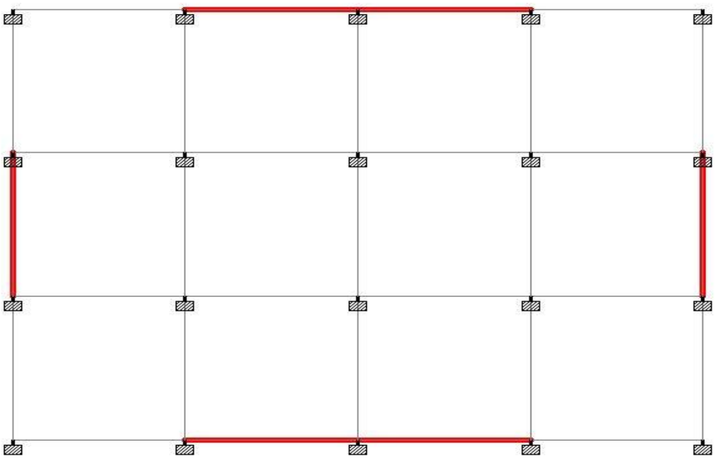

FIG.-3 BRACED PANEL (SHEAR WALL) AT MID BAY

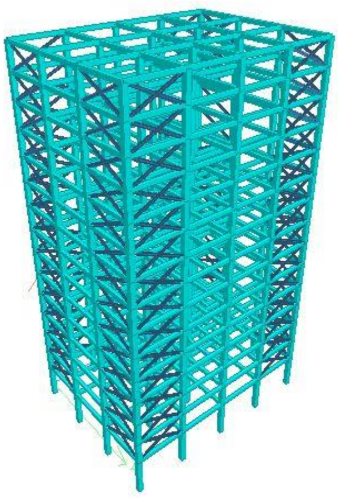
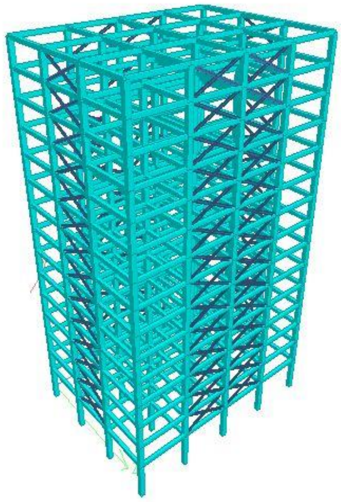

FIG.-4 CROSS BRACING AT CORNER   *FIG.-5 CROSS BRACING AT MID BAY*

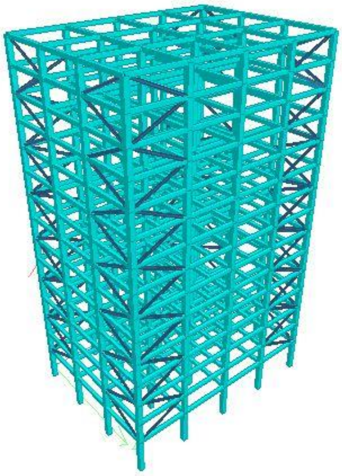
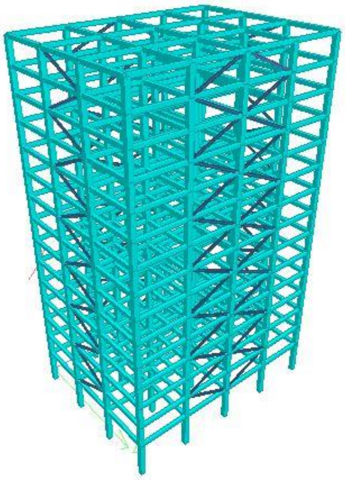

FIG.-6 DIAGONAL BRACING AT CORNER   *FIG.-7 DIAGONAL BRACING AT MID BAY*

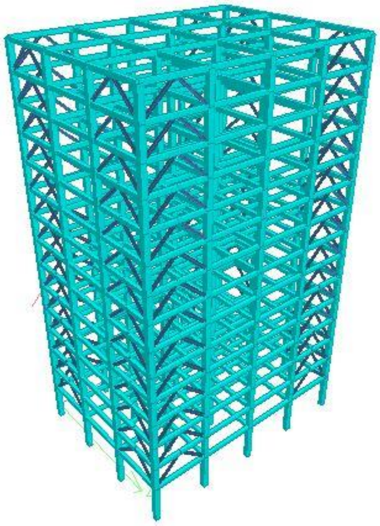
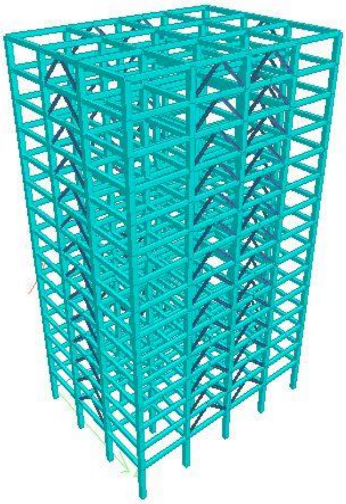

FIG.-8 INVERTED V BRACING AT CORNER   *FIG.-9 INVERTED V BRACING AT MID BAY*

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RESULTS AND DISCUSSION

BASE SHEAR- 2187 kN

Table -1 - Frequency and Period for Regular Frame

Mode	Frequency Hz	Period seconds
1	0.067	14.84
2	0.069	14.40
3	0.079	14.13

BASE SHEAR – 5721 kN

Table -2 - Frequency and Period for Braced Panel at Corner

Mode	Frequency Hz	Period seconds
1	0.088	11.38
2	0.089	11.29
3	0.111	9.03

BASE SHEAR – 5397 kN

Table -3 - Frequency and Period for Braced Panel at Mid Bay

Mode	Frequency Hz	Period seconds
1	0.080	12.48
2	0.109	9.14
3	0.112	8.89

BASE SHEAR – **4919** kN

Table -4 - Frequency and Period for Cross Steel lacing at Corner

Mode	Frequency Hz	Period seconds
1	0.067	14.85
2	0.068	14.62
3	0.081	12.34

BASE SHEAR – **4731** kN

Table -5 - Frequency and Period for Cross Steel lacing at Mid Bay

Mode	Frequency Hz	Period seconds
1	0.064	15.67
2	0.079	12.68
3	0.080	12.42

BASE SHEAR – **3631** kN

Table -6 - Frequency and Period for Diagonal Steel lacing at Corner

Mode	Frequency Hz	Period seconds
1	0.074	13.59
2	0.076	13.16
3	0.092	10.85

BASE SHEAR – **3900** kN

Table -7 - Frequency and Period for Diagonal Steel lacing at Mid Bay

Mode	Frequency Hz	Period seconds
1	0.066	15.20
2	0.080	12.47
3	0.082	12.13

BASE SHEAR – **3180** kN

Table -8 - Frequency and Period for Inverted V Steel lacing at Corner

Mode	Frequency Hz	Period seconds
1	0.063	15.92
2	0.066	15.14
3	0.070	14.26

BASE SHEAR – **3312** kN

Table -9 - Frequency and Period for Inverted V Steel lacing at Mid Bay

Mode	Frequency Hz	Period seconds
1	0.059	16.91
2	0.065	15.33
3	0.067	14.93

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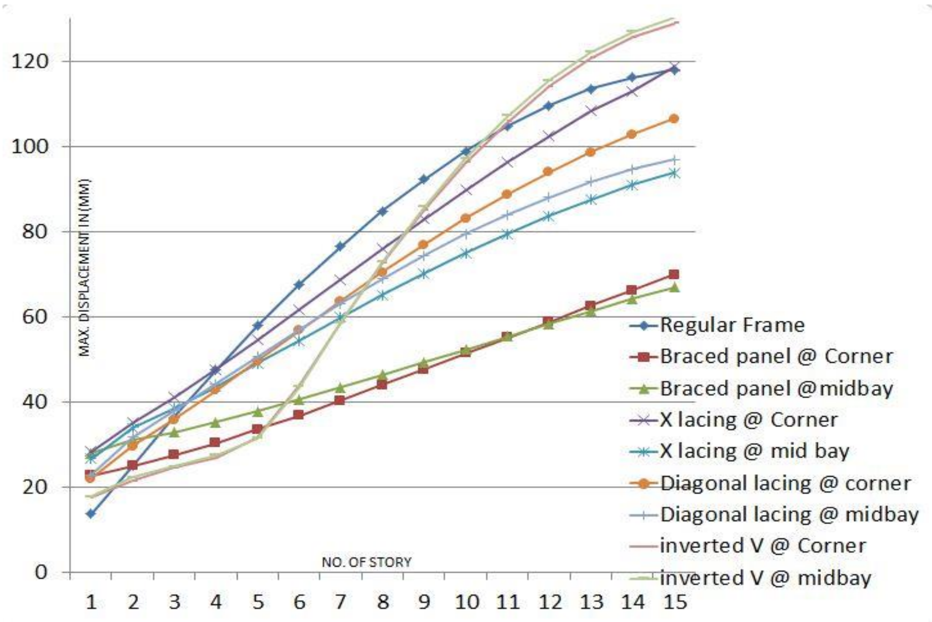

GRAPH

CONCLUSION

The fifteenth story Unsymmetrical RC frame is extensively studied for seismic loading by response spectra method using STAAD-PRO software.

The following conclusions are drawn based on present study.

1) When shear wall is provided, displacement and storey drift reduces and storey shear and base shear increases.
2) When shear wall is placed unsymmetrical and well distributed along the periphery the displacements reduce.
3) The concept of using steel bracing is one of the advantageous concepts which can be used to strengthen or retrofit the existing structures.
4) Steel bracings can be used as an alternative to the other strengthening or retrofitting techniques available as the total weight on the existing building will not change significantly.
5) The lateral displacement of building reduced by the use of braced panel at mid bay system.
6) Steel bracing reduces flexure and shear demand on beams and columns and transfer the lateral loads through axial load mechanism.

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