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Analysis and seismic Design of Composite Structure Using Different Steel Bracing

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Abstract - *The aim of the present work is to analyze a multistory composite structure (G+10) and comparison between moment resisting, X-bracing, K-bracing, V-bracing and eccentric bracing frame for earthquake forces following IS 1893 and then design it as per IS 800:2007. The frame consists of ten stories' and has nine bays in horizontal direction and five bays in lateral direction. The designed frame was again analyzed and results were compared in terms of sections used. The major view in the design of multistoried steel building with apply different loads are DL, LL, WL, EQ and load combination. Apply analysis and include design parameter. This study is presented to illustrate the effect and result of different types of bracing systems such are axial force, story drift, displacement and bending stress. A commercial software package names STAAD.Pro V8i is used for the analysis of steel buildings and different parameters are compared.*

Key Words: **composite structure, bracing, knee bracing, X bracing.**

1. INTRODUCTION

In this study composite structure is consider. In composite structure column and beam are steel section as per Indian standard. The slab is placed forever over steel sheet which act as deck. Achieves as a form for the concrete during construction and also place reinforcement over it. The bracing use for better load resisting especial for earthquake load act on structure.

A braced bent consists of diagonal members that are connected other members forms a vertical and horizontal truss to resist the horizontal forces. Bracing is efficient because the diagonals work against horizontal shear. Two type of bracing provide in structure concentric brace frame and eccentric brace frame. In this structure the 3 type of brace systems use

Concentric brace: - X-brace, A-brace, K-brace.

Eccentric brace: - knee brace and

Simple moment resisting structure.

The position of bracing is deciding at or near extremities of the structure

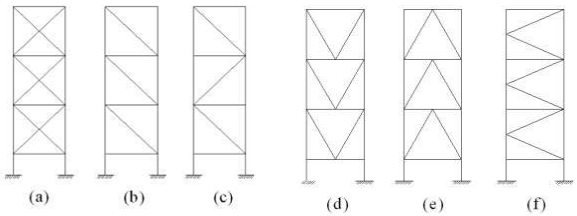

Fig 1: - concentric brace system (X type, diagonal type, V type, A type, K type)

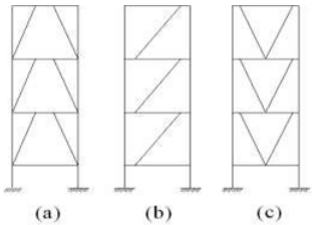

Fig 2: - eccentric brace system (Knee type)

2. DETAIL OF STRUCTURE

Overview of structure:

Utility of building:	Commercial high rise
No of stories:	G+10
Shape of the building:	Per floor office and
No of staircases:	1
No of lifts:	3
Type of construction:	Composite framed structure

Geometric details:

Width of structure:	54m
Length of structure:	25m
Height of structure:	38.3m
Ground floor:	3.3m
Floor to floor height:	3.3m.
Terrace to top floor:	2.0m

Materials:

Concrete grade:	M30
All steel section grade:	Fe470
Reinforce bar grade:	Fe415
Steel decking sheets	galvanized steel corrugated sheet

3. ASSUMPTION

The following are the assumptions made:

The dimension of the building is 54m X 25m and height of storey is 38m. Building is situated in Surat. The wind speed is 44m/s and earthquake zone II. The different properties and grade of material are also assumptions.

4. PLAN AND ELEVATION

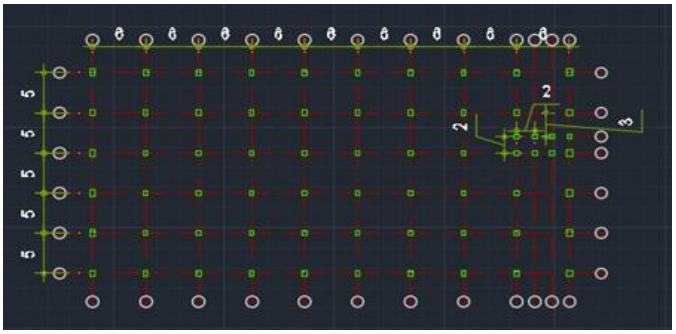

Fig 3: - Grid plan

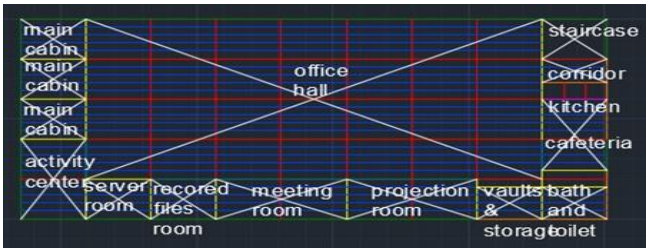

Fig 4: - Imposed load distribution

Fig 5: - Moment resisting frame

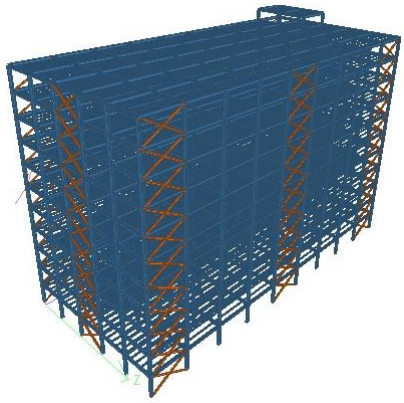

Fig 6: - X type bracing system

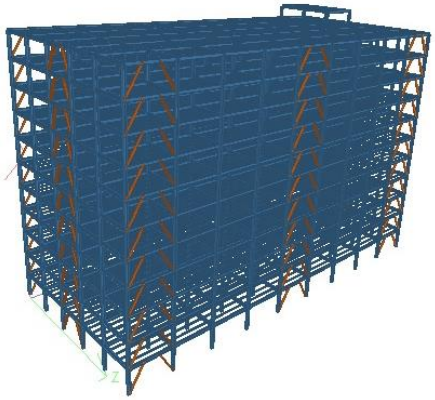

Fig 7: - Knee type bracing system

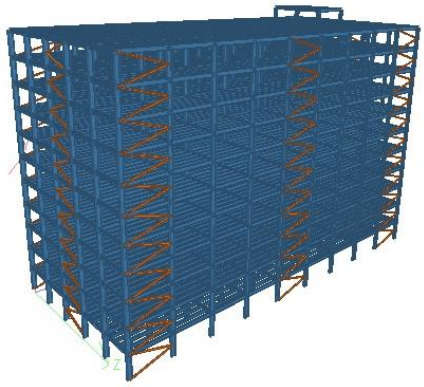

Fig 8: - K type bracing system

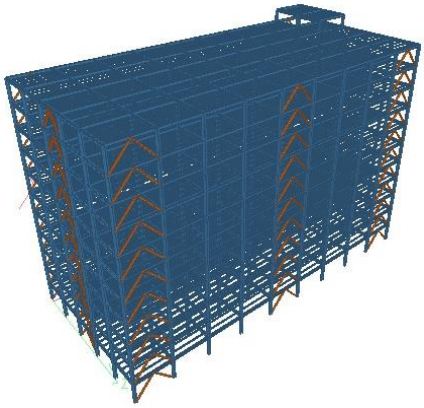

Fig 9: - V type bracing system

5. SECTION PROPERTIES

Beam: - HEB300, HEB300, ISMB200
Column: - WPB 320X300X245, WPB 320X300X126.6
Bracing: - CHS219.1x8, CHS273x8

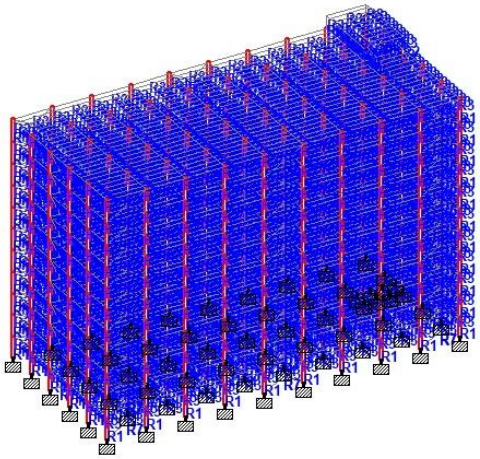

Fig 10: - Section WPB320X300X245(mm)

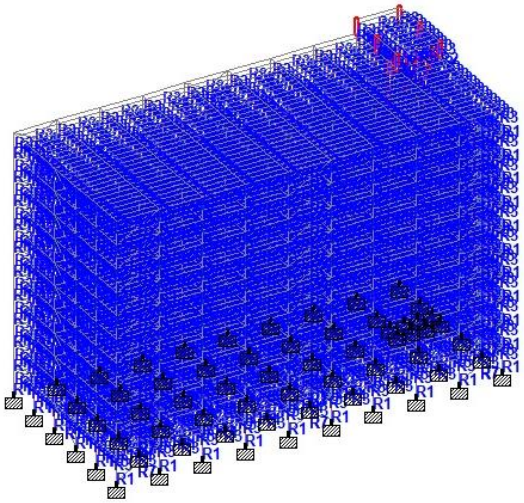

Fig 11: - Section WPB320X300X126.6(mm)

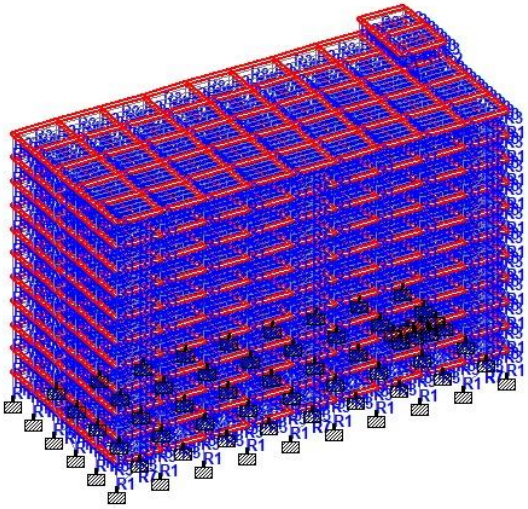

Fig 12: - Section HEB300(mm)

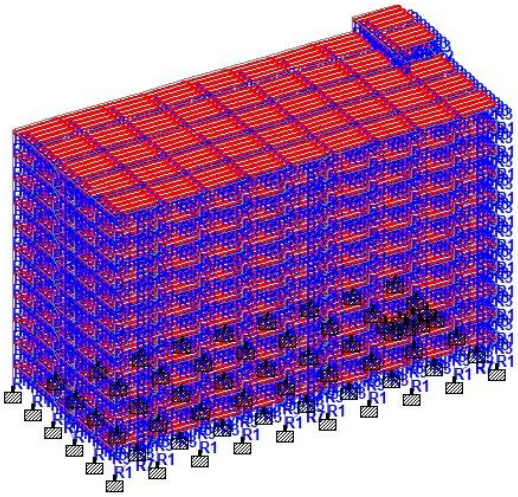

Fig 13: - Section HEB300 (mm)

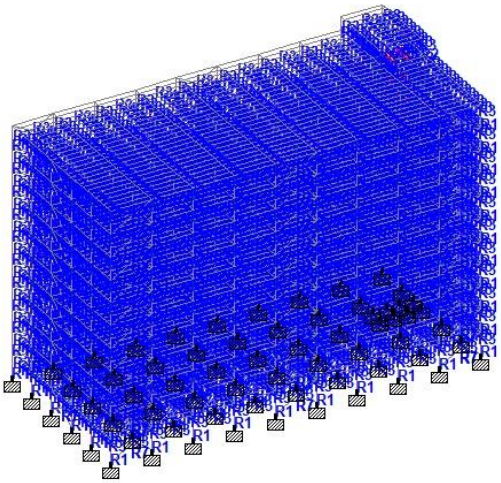

Fig 14: - Section ISMB200(mm)

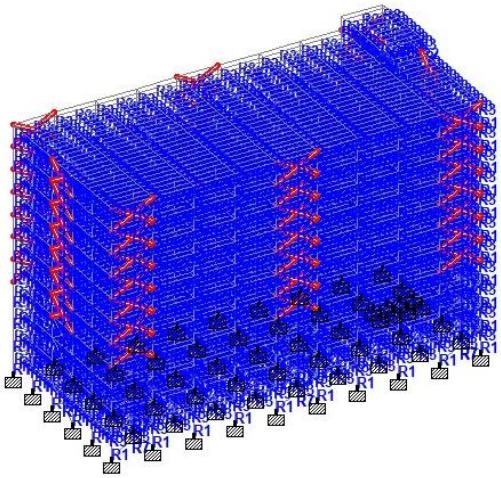

Fig 15: - Section CHS219.1x8(mm)

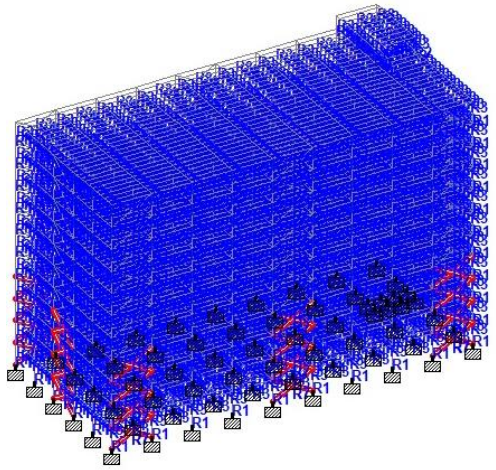

Fig 15: - Section CHS273x8(mm)

6. APPLIED LOADS

- Dead load: - Different load applied each section assuming office building and calculating different material use for construction and elevation and interior work. All load is carried out as per IS875 part1
- Imposed load: - calculate and divide floor in different load distribution as per image. All load is carried out as per IS875 part2
- Wind load: - calculate as per IS875 part3.
  Location : Belgaum
  Wind speed: 44m/s
  Terrain category: 3
  Class : B
  K1 : 1.07
  K2 : 1.06
  K3 : 1.0(flat topography)
- Earthquake load: - calculate as per 1883:2002. structure situated in Surat.
  Zone factor: 0.16
  Response reduction:
  Moment resisting strcutre:5

Concentric brace steel structure: 4
Eccentric brace steel structure: 5
Soil type: soft soil
Structure type: steel frame

6. RESULT

Analysis is carried out for different types of bracing system. After the analysis done the result such as Displacement, stress, axial force, weight and storey drift of the structure is noticed.

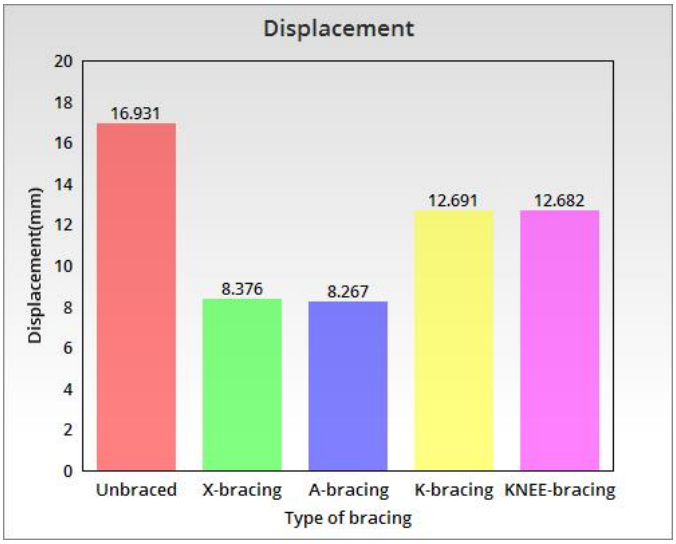

Chart 1 Maximum Displacement (mm)

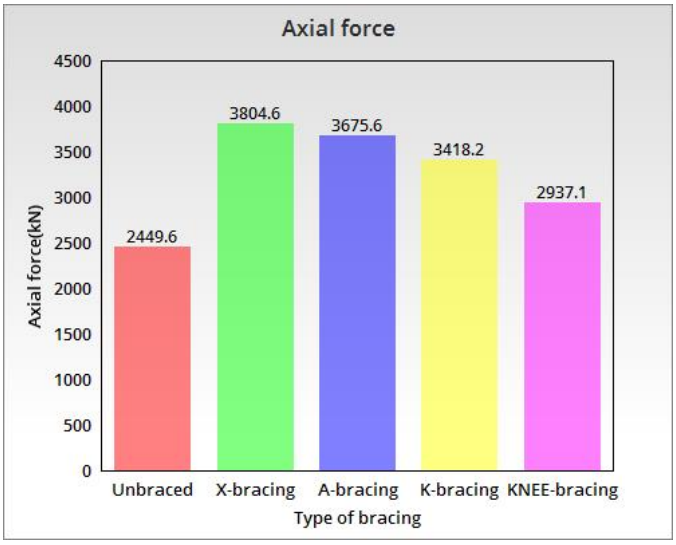

Chart 2 Maximum Axial Force (kN)

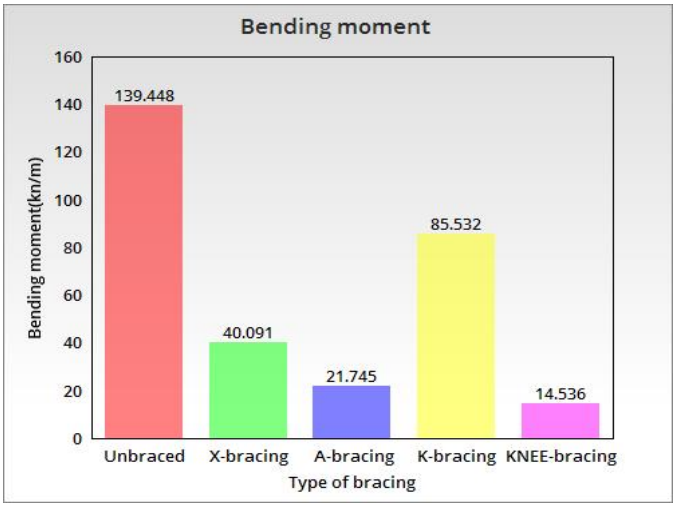

Chart 3 Bending moment (kN/m)

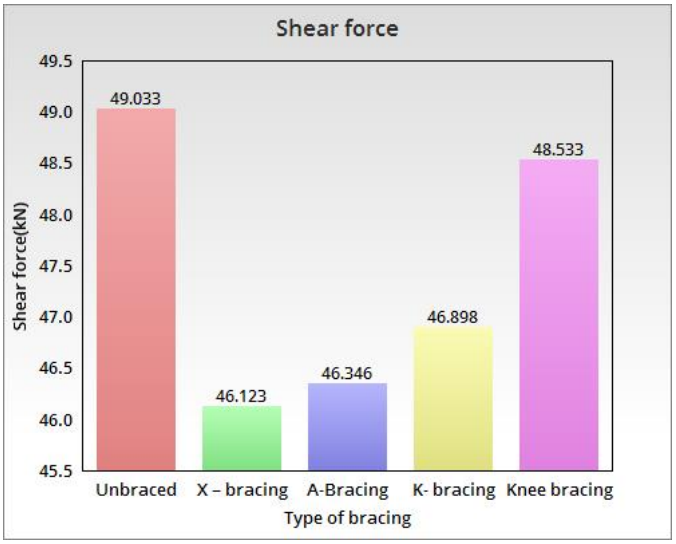

Chart 4 Shear force (kN)

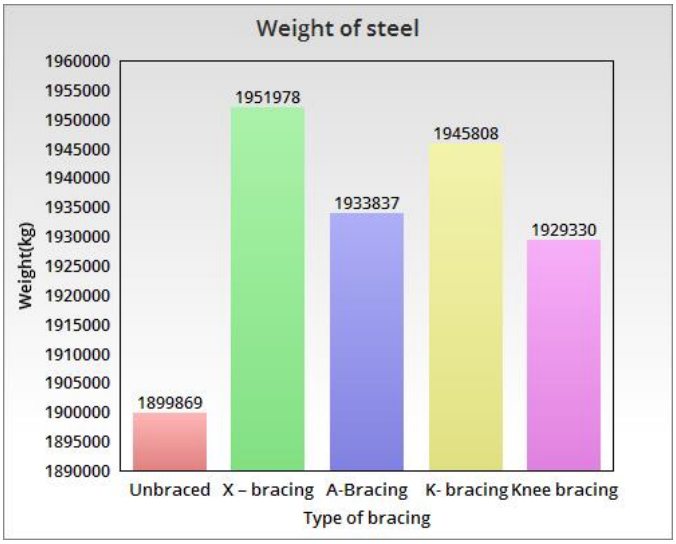

Chart 7 Weight of steel (kg)

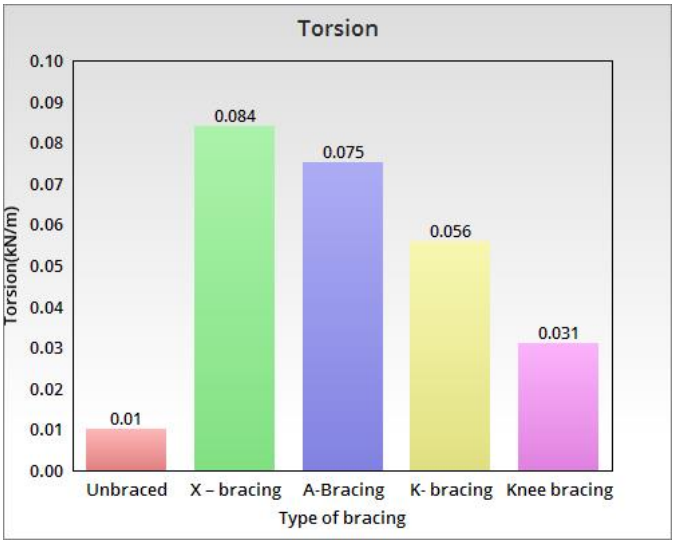

Chart 5 Torsion (kN)

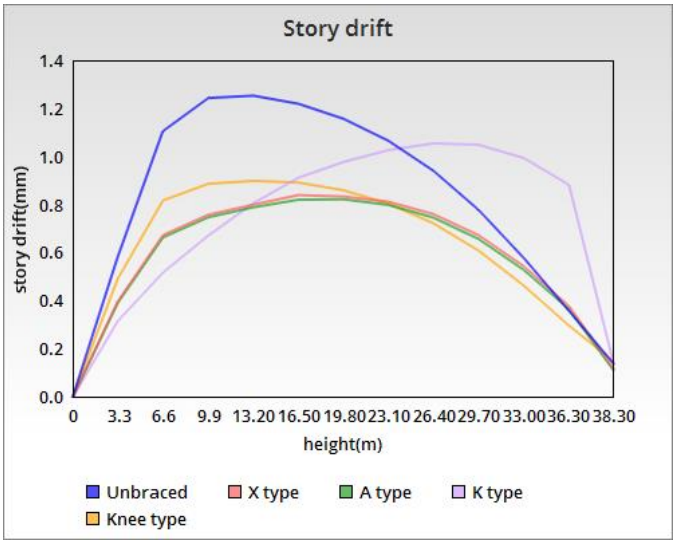

Chart 8 Storey drift

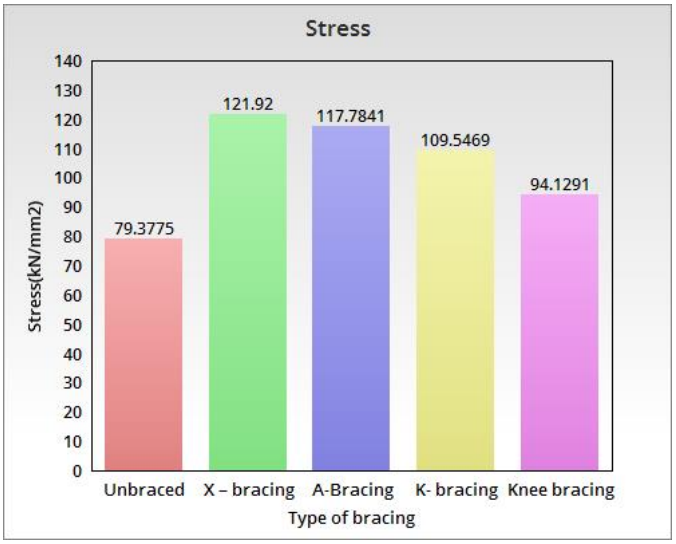

Chart 6 Stress (kN/mm2)

7. CONCLUSIONS

- Without bracing structure frame have more shear than braced structure. Here the X type bracing system create lowest shear.
- Axial forces in columns increases from unbraced to braced system.
- The X and A type bracing has less story drift compare to other.
- Stress on column in brace structure have high compare to moment resisting. X-bracing creates high stress.
- Knee bracing has low weight as compare to other brace structure.
- Bending moment in braced structure has low as compare to unbraced system.
- Torsion in braced structure has high compare to unbrace structure. X bracing type structure creates highest torsion.

6. REFERENCES

[1] Suresh P, Panduranga Rao B, Kalyana Rama J.S." Influence of diagonal braces in RCC multi- storied frames under wind loads: A case study"] International journal of Civil and Structural Engineering Volume 3, No 1, 2012

[2] A Study On Bracing Systems On High Rise Steel Structures Jagadish J. S [1], Tejas D. Doshi [2] International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 7, July – 2013