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TO STUDY OF EFFICIENT ECCENTRIC BRACING SYSTEM IN TALL STEEL BUILDINGS

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ABSTRACT

The aim of present study effective bracing system has been investigated for G+20 building by using STAAD.pro v8i. The objective of this paper is to analysis and design different parameter in high rise steel structure by using staad.pro v8i. For this purpose G+20 structure is used with eccentric bracing system under different types of lateral loading. Design & Analyzed result obtained in staad.pro for efficient bracing system.

Key words: Bracing system, High rise steel structure, Lateral loading.

I. INTRODUCTION

In building structures lateral loads are act. So we need to resist the lateral loads by using lateral load resisting system like shear wall and bracing system. Bracing are member of the structural they are either eccentric or concentric. Bracing are said to be concentric if they are joined at centre of beam with column beam junction or direct column beam junction and eccentric if a above condition not gets satisfied. For this purpose G+20 multi-storied steel building model is used with same configuration and different bracing system is used.

In this project comparative study of high rise steel frame building without bracing and same building with eccentric type of bracings like inverted V and single diagonal bracing and performance of each frame has been carried out. According, to parameters like lateral displacement, base shear and total weight comparing the which bracing system is efficient to sustain the loads.

II.OBJECTIVE

- To study the role of bracing system in high rise steel structure.
- Analysis and design different parameter in high rise steel structure by using STAAD pro v8i
- To study the behavior of high rise steel structure with and without bracing system in different load condition.
- To investigate efficient bracing system in high rise steel structure by following point of view

- Lateral displacement

-Base shear

-Total weight

III.METHODOLOGY

1.Collection of relevant present work through journals, technical magazines, international technical papers, Proceeding reference books and through interne

2.Analysis and design of high rise steel structures by using staad.pro v8i

3. Analysis the result obtained in staad.pro for efficient bracing system and behavior of high rise steel structure in different load conditions.

- Lateral displacement

- Base shear

-Total weight

IV.MODELLING

In this paper, G+20 high rise steel structure having plan size 20m x 20m for a x and z direction respectively. Floor to floor height of building is 3m and 5 bays of 4m each along x and z direction. The lateral loads act on building based on Indian Standard. The building is construct on zone III as per IS 1893 (part I) 2002 and basic wind speed 39m/s as per IS 875 Part3 1987. For this site location medium soil strata is assume.

4.1 Beams and column schedule

Floor	Column section
1 to 11	UPT12 section
12 to 14	ISWB600400 x 2040
15,16	ISWB600350 x 2040
17,18	ISWB550350 x 2040
floor	Beam Section
All (Inner and Outer beam)	ISLB400
Bracing angle section	ISA 120 x 80 x 12
Eccentricity of eccentric bracing system	750 mm

4.2 UPT 12 section property:

D	1000 mm
Tf	50 mm
Wf	400 mm
Tw	30 mm
Tf1	50 mm

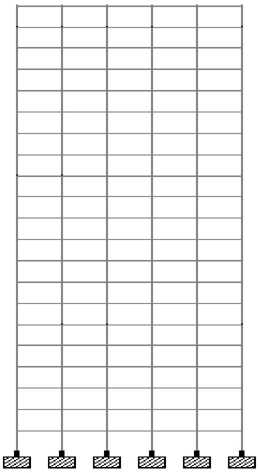
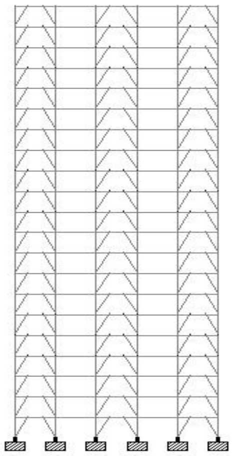
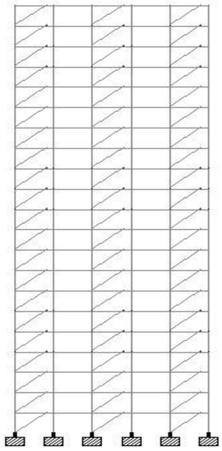

Fig.No.1 Fig. No. 2 Fig.No.3

Without Braced System Inverted V Braced System Diagonal Braced System

V. LOADING

1.Dead load

Self weight of R.C.C slab -

Self weight = thickness x Density

= 0.150 x 25

= 3.75 kn/m2

Assume floor finish = 1 kn /m2

Total self weight of slab = 4.75 kn /m2

Calculation of self weight of brick wall having 12 mm plastering:-

Thickness of brick wall = 230 mm

Total self weight of brick wall = (0.230x20x3)+2(0.012x22 x 3)

=15.38 kn /m

2. Live load:

2 kn / m2 over a slab up to 63 floors

3. Seismic load:

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According to I.S 1893-2002 part 1 the design horizontal seismic coefficient Ah for a structure shall be determined by following expression:

$$Ah = \frac{Z\ I\ Sa}{2\ R\ g}$$

Zone factor, Z	0.16 for zone III
Importance Factor, I	1.5
Type of soil	Medium Soil
Response reduction factor, R for without and with braced models.	5
Fundamental Damping ratio	0.05

4. Wind load:

It can be mathematically expressed as follow:

Vz = Vb x k1 x k2 x k3

Basic wind speed, Vb	39m/s
Risk co-efficient factor, K1	1.06
Terrain, Height and structure size factor, K2	Varies with respect to height
Topography factor, K3	1

VI. RESULT

6.1.Maximum joint displacement at top storey in z direction.

Model	Lateral displacement
Without braced system	285.978
Inverted v braced system	273.923
Diagonal braced system	241.769

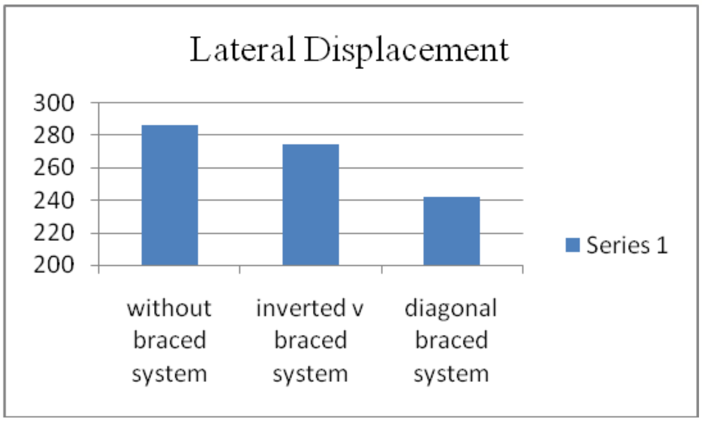
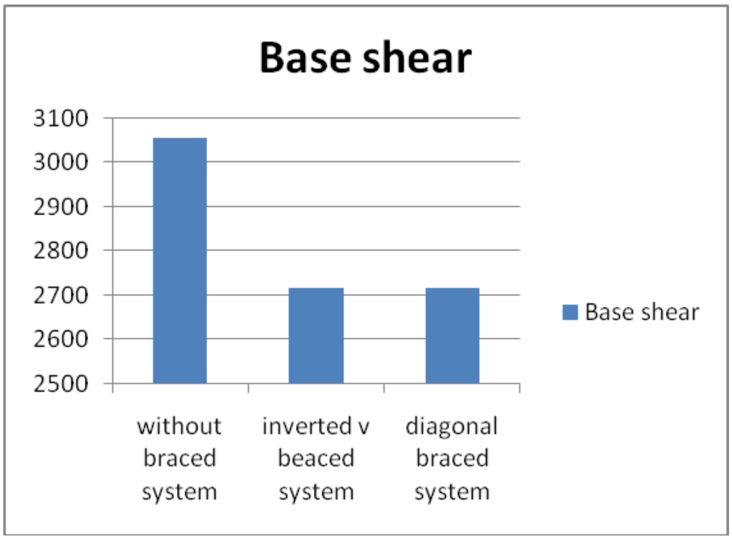


Fig.4 Show maximum joint displacement at top storey in z direction.

6.2 Base shear :

Models	Base shear (KN)
Without braced system	3057.47
Inverted v braced system	2718.08
Diagonal braced system	2738.45



.Fig.5 Show maximum base shear in X direction

6.3. Total weight:

MODELS	TOTAL WEIGHT IN KN.
Without braced system	$1.138X10^5$
Inverted v braced system	$1.1451X10^5$
Diagonal braced system	$1.1447X10^5$

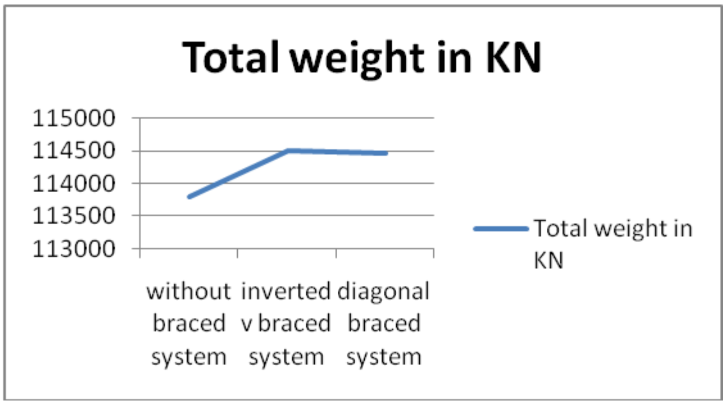


Fig 6 show total weight of different models

VII. CONCLUSION

1. Diagonal braced system having least lateral displacement and it reduced by 15.46 % with respect to without braced structure.

2. Inverted v braced system have less base shear and it reduce 11.10% as compare to without braced structure
3. Total weight of structure is increased by 0.62% in Inverted v braced system with respect to without braced system.

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