Comparative Study of X Type Bracing and V Type Bracing in Multi Storied Building

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***Abstract*:- Bracings are structural component used to resist lateral loads in multistoried buildings. In this study a comparison of X type bracing and V type bracing is done. For that an eight storied building is having x type bracing and v type bracing is analyzed using Staad pro vi8.The results are then compared.**

1.INTRODUCTION

Population is hiking day by day. Increase in populations demands more buildings which includes residential building, institutions, educational etc. Due to lack of space according to the increasing population construction of multistoried buildings are increasing. Multi storied buildings are more vulnerable to lateral load like earthquake loads, wind load etc. due to its height. If the structure is not designed to resist these loads seismic pounding deformation if structure, displacement, storey drift etc. take place. Many structural components are used to resist these lateral loads effectively.

Bracings are structural components used in multi storied building to resist lateral loads effectively. They are more effective and economical. Structural steel members are used as bracings. Bracing system works by taking the load coming to the columns and thus it increases the stiffness of the structure and in turn the stability of the structure increases. It is the strongest system to sustain lateral loads.

There are different types of bracings.

1. Diagonal bracing
2. X type bracing
3. K type bracing
4. Inverted v bracing
5. V type bracing

DIAGONAL BRACING

In this type of bracing a structural member is placed diagonally into the rectangular space of the structure.

X TYPE BRACING

These types of bracing are also known as cross bracing. X bracing is formed by crossing two diagonal structural members.

K TYPE BRACING

These types of bracings are constructed by placing two members diagonally in such a way that the one end of member meet at the one end of other member at the mid height of each column.

INVERTED V TYPE BRACING

These types of bracings include two diagonal members that starts from the either end of the horizontal member meets at the upper portion of the horizontal member above it.

V TYPE BRACING

In v type bracing two member starting from the either end of horizontal member meets at the center point of the horizontal member above it.

2.LITERATURE REVIEW

Umesh R Biradar et.al studied the effects of different types of bracing systems in multi storied structure. In this paper 7 models with different types of bracings are created and analyzed for equivalent static analysis, linear dynamic analysis and pushover analysis to find out story drift, displacement, shear force and time period. The result is then compared to the outcome of model without bracing.

Nauman Mohammed et.al compared the characteristics of the RC building with bracing to a one without bracing.

Sunder M Deshmukh et.al compared the results of analysis of building without bracing to one which is fully braced and to one which is braced partially. Analysis was done using STAAD PRO Vi8.

Anik P Mundada et.al considered an eight storied building for the study. The structures having rectangular column with different type of bracings were analyzed using STAAD PRO Vi8. The results were compared to result of analysis of structure without bracing.

Anik P Mundada et.al analyzed structures having circular column with different type of bracings using STAAD PRO Vi8. Then the results are compared to result of structure without bracings.

Prof.Saritha Singhala et.al analyzed structures with different types of bracing at different positions. Types of bracings used are x type, v type and k type. The results are compared with the results of unbraced bracings. Analysis was done by response spectrum analysis using STTAD PRO Vi8.

3.RELATED WORK

3.1Building description

An eight storied building with 3 bays is considered for the comparing the effects of X type and V type bracing. The building is assumed to be located at zone lll. There are 3 bays in both x and z direction. Type of bracing used are X type and V type.

Building type	Residential
No of storeys	G+8
Seismic zone	lll
Grade of steel	Fe500
Grade of concrete	M25
Seismic load	As per IS 1893
Live load	3kN/m^2
Floor finishing	1Kn/m^2
Size of bracing	200mm*200mm

4.METHODOLOGY

The buildings rectangular columns with X type and V type are modeled and analyzed by equivalent static method using STAAD PRO Vi8. From the analysis shear forces, bending moment, displacement, deflection, axial force and storey drift is obtained. To find the effects of these bracings on the structure the results obtained is compared.

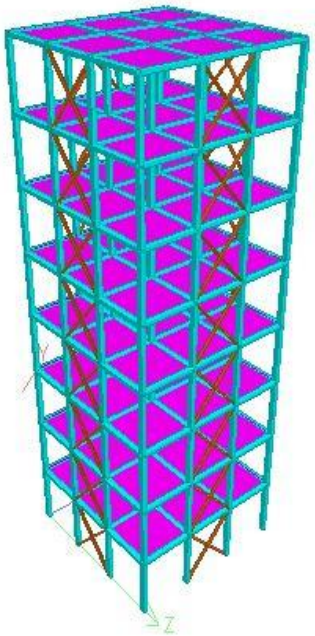


FIG 1 STRUCTURE WITH X BRACING

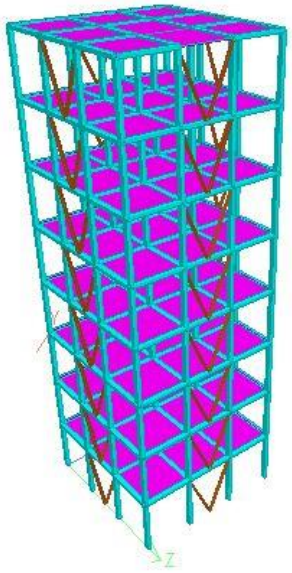


FIG 2. STRUCTURE WITH V BRACING

TABLE 1 SHEAR FORCE

FLOOR	HEIGHT	X BRACED	V BRACED
BASE	0	16.54	13.31
GROUND	2	15.42	13.35
1	5	16.2	15.87
2	8	17.59	17.23
3	11	18.65	18.69
4	14	19.68	19.72
5	17	20.89	20.96
6	20	21.78	21.86
7	23	21.78	22.32
8	26	26.5	27.1
9	29	26.5	27.1

GRAPH 1

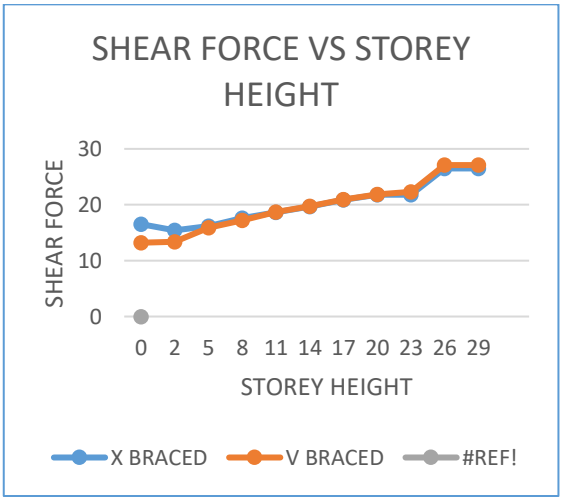


TABLE 2 BENDING MOMENT

FLOOR	HEIGHT	X BRACED	V BRACED
BASE	0	12.32	8.89
GROUND	2	22.18	22
1	5	24.32	24.45
2	8	28	27
3	11	29.32	30.12
4	14	30.12	31.1
5	17	32	32.75
6	20	33.45	34
7	23	33.87	34.98
8	26	36.58	3707
9	29	44.32	45

GRAPH 3

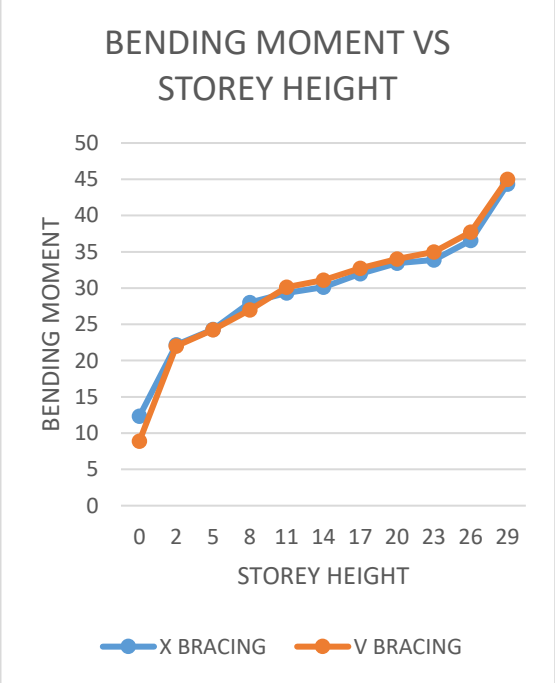


TABLE 3 DISPLACEMENT

FLOOR	HEIGHT	X TYPE	V TYPE
BASE	0	0	0
GROUND	2	.135	.14
1	5	.392	.435
2	8	.681	.762
3	11	.998	1.098
4	14	1.32	1.461
5	17	1.645	1.8
6	20	1.92	2.154
7	23	2.26	2.45
8	26	2.49	2.725
9	29	2.64	2.91

GRAPH 4

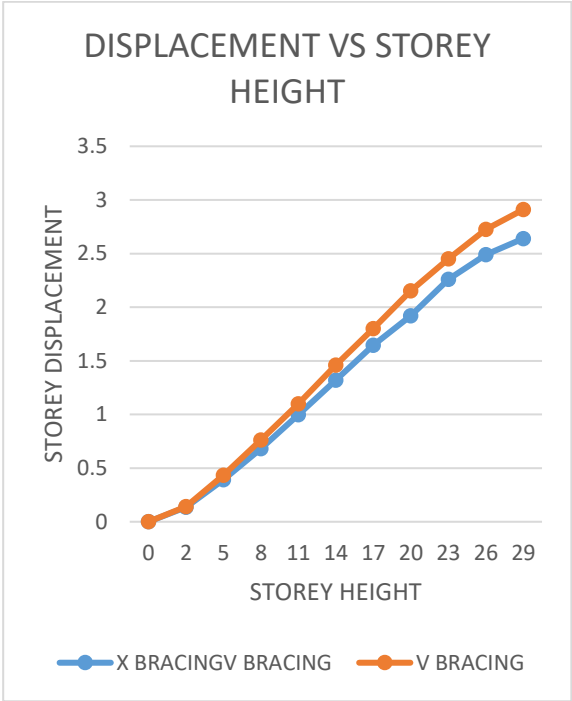
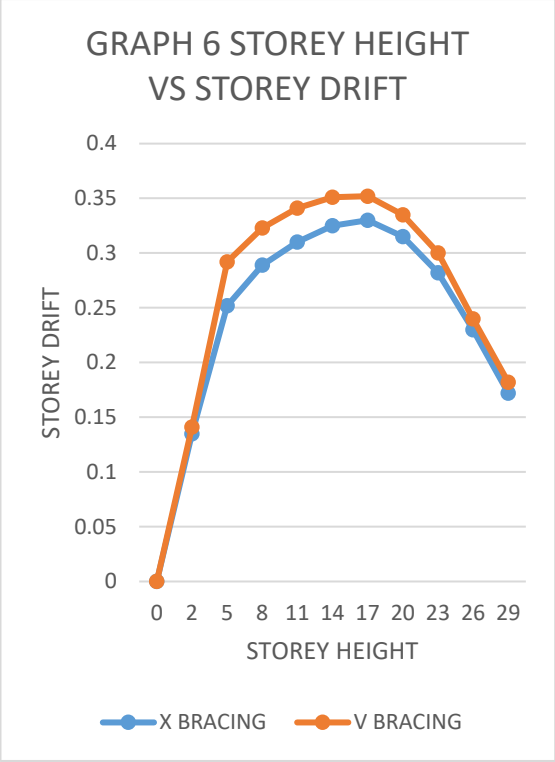


TABLE 4 STOREY DRIFT

FLOOR	HEIGHT	X BRACING	V BRACING
BASE	0	0	0
GROUND	2	.135	.141
1	5	.252	.292
2	8	.289	.323
3	11	.31	.341
4	14	.325	.351
5	17	.33	.352
6	20	.315	.335
7	23	.282	.3
8	26	.23	.24
9	29	.172	.182



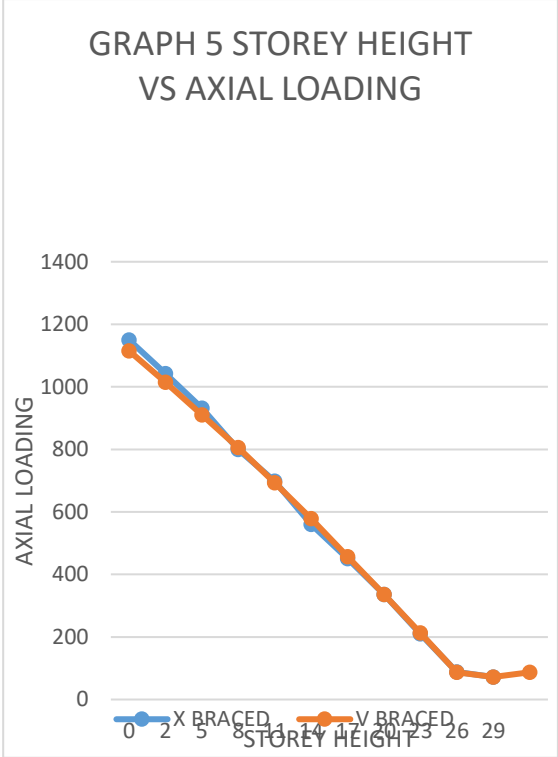


TABLE 5 AXIAL FORCE

FLOOR	HEIGHT	X BRACING	V BRACING
BASE	0	1150	1115
GROUND	2	1042	1015
1	5	932	910
2	8	800	806
3	11	698	693.25
4	14	560	578
5	17	450	452.6
6	20	336	335.85
7	23	210	213
8	26	88	86.65
9	29	72	72.12

RESULT

- Shear force at the base for structure with x type bracing is 16.54kN and it is 13.31kN for structure with v type bracing. The shear force at top is 26.5kN and 27.1kN for structure with x type and v type respectively.
- Bending moment at base of structure having x type bracing is12.32kN/m^2 and at top is 44.32Kn/m^2. For building with v type structure, the bending moment at top is 8.89Kn/m^2 and at top it is 45Kn/m^2.
- Displacement at the top of the structure with x type bracing is 2.64 and for structure with v type bracing is 2.91. At base it is zero for both structures.
- Storey drift at the base of the structure with x bracing is .135 and at top it is .172. For structure with v bracing the storey drift at the base is .141 and at the top it is .181
- The axial force at the base of the structure with x bracing is 1150 kN and at top it is 72 kN. For structure with v type bracing the axial force at top is 1115 kN and at top it is 72.12kN.

CONCLUSION

Bending moment and shear force is less for building with x bracing than building with v bracing. Axial force is more for building with x bracing. From the results we can conclude that the x bracing gives more performance than v bracing.

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