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COMPARATIVE STUDY IN THE ANALYSIS OF MULTISTOREY RCC STRUCTUR BY USING DIFFERENT TYPES OF CONCENTRIC BRACING SYSTEM (BY USING SOFTWARE)

Dhiraj Naxine *, Associate Prof.R.V.R.K Prasad
CIVIL ENGINEERING,K.D.K COLLEGE OF ENGG. NAGPUR,INDIA

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ABSTRACT

The most of the RCC buildings were failed Iin the past due to lateral load. Bracings systems are one of the lateral load resisting system which has got structural importance specially in reinforced concrete buildings. Different bracing systems are efficient enough for seismic responses. Steel bracing systems have both practical and economical advantages. The application of steel bracings is faster to execute. The steel bracings are usually installed between existing vertical members. The purpose of the study of seismic response of a building is to design and build a structure in which the damage to the structure and its structure component by earthquake is minimized. The paper aims towards the review of study of analysis of Unbraced and braced multistorey RCC building conducted by various authors in the past.

KEYWORDS: RCC Frame,Bracing,Earthquake,ETAB'S

INTRODUCTION

In earthquake design the building has to go through regular motion at its base, which leads to inertia force in the building that consecutively causes stresses. India has experienced number of earthquakes that caused large damage to residential and industrial structure. For earthquake resistant design the normal building should be able to resist minor, moderate, sever shaking. In the circumstances of the building, simple shape configuration building transfer the earthquake force in the direct path to the base while in complex shape building the load transferring path is indirect which leads to generation of stresses at the corners. Seismic Analysis is a subset of structural analysis and is the calculation of the response of a building structure to earthquakes. It is part of the process of structural design, earthquake engineering or structural assessment and retrofit in regions where earthquakes are prevalent. In order to make multi-storey structures stronger and stiffer, which are more susceptible to earthquake and wind forces, the cross sections of the member increases from top to bottom this makes the structure uneconomical owing to safety of structure .The behavior of the buildings during earthquake depends not only on the size of the members and amount of reinforcement, but to a great extent on the placing and detailing of the reinforcement. Therefore, it is necessary to provide special mechanism that to improve lateral stability of the structure. There are various types of bracing systems like X bracing, V bracing, inverted V bracing, K bracing, diagonal bracing and so on.

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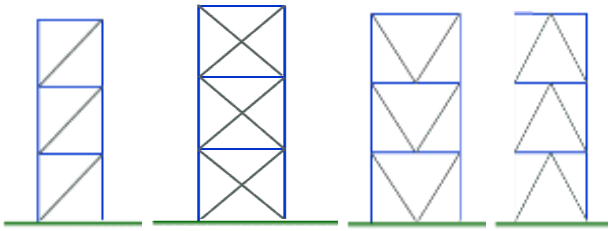
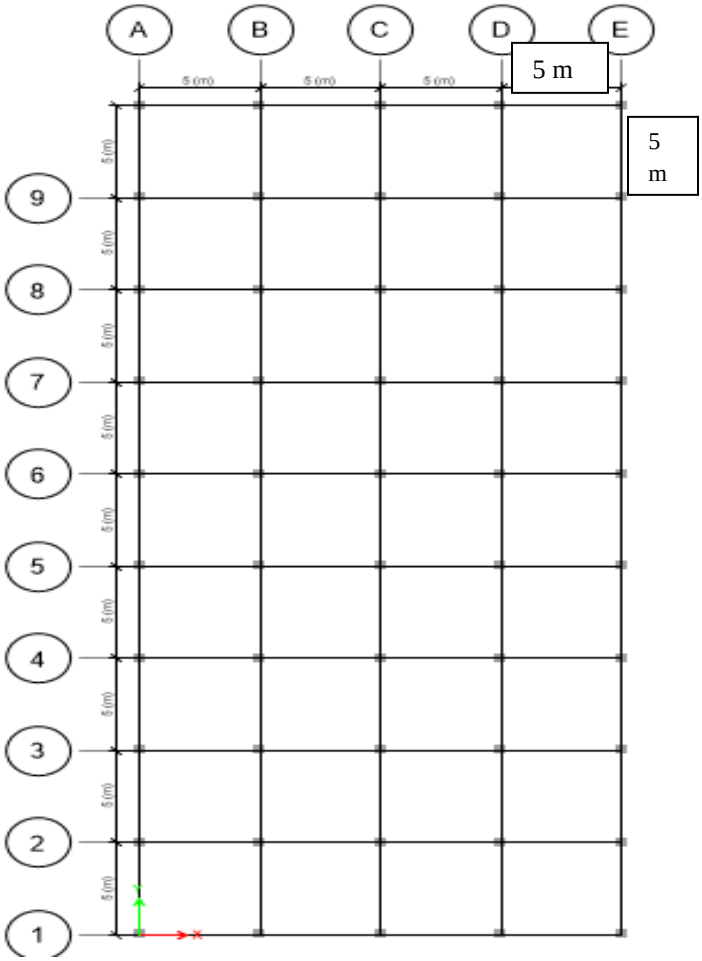


Single Diagonal X Bracing V And Inverted V Bracing

MODELLING

1) PLAN

The analysis of G+10 floors is carried out using ETAB'S software for special moment resisting frame situated in zone V. The RCC G+10 structure is analysed without bracings and with different types of bracings system. Bending moments, shear forces, storey shears, story drifts and axial forces is compared for all type of structural systems i.e. braced and unbraced structural.



Plan area	20 X 45 m
Structure	SMRF
No. of stories	10
Type of building use	Residential
Grade of concrete	M30
Beam Size	.35 x.5 m
Column Size	.5 X .5 m
Dead Load Intensity	3 KN/m²
Live Load Intensity	2 KN/ m²
Seismic Zone	V
Zone Factor	.36
Importance Factor, I	1
ResponseReduction Factor, RF	5
Depth of foundation	3 m
Floor to floor height	3m

FIG: PLAN OF BUILDING (20 X 45 m)

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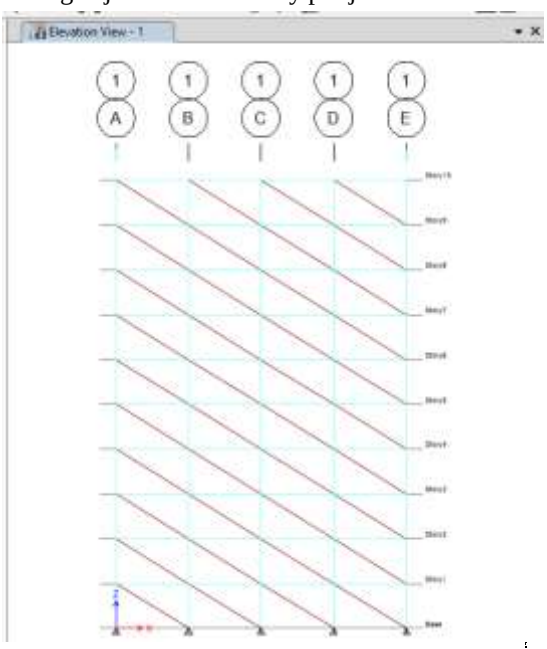
2) RCC BUILDING WITHOUT BRACINGS.

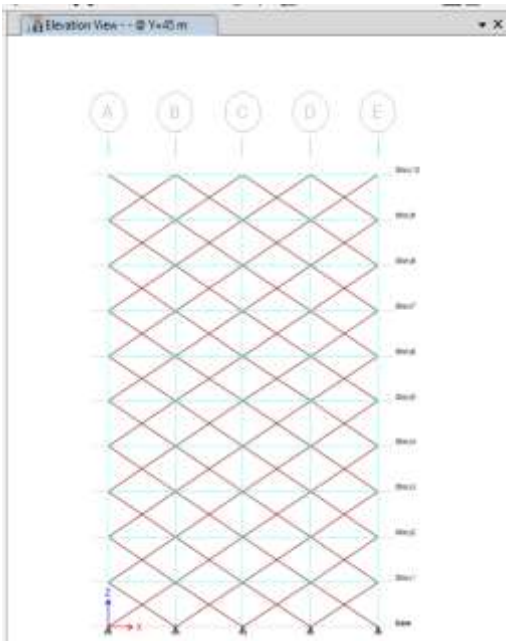
Selected plan area is rectangular and of size 20 X 45 m and divided into 36 strip of size 5 X 5 m. The potential advantage of bracing system is the comparatively small increase in mass associated with the retrofitting scheme since this is a great problem for several retrofitting techniques. The application of steel bracings is faster to execute. The steel bracings are usually installed between existing vertical members.

3) RCC BUILDING WITH SINGLE DIAGONAL BRACING

Model A is a multi-storeyed building modelled as per the above plan. The dimension of columns and beams are 0.5mx0.5m, 0.35mx0.5m respectively. The bracing system used in this case is Steel inclined member with cross section dimensions 150X150X10 mm. The single bracing is provided diagonally between two floors as shown in figures. Bracing is join with frame by pin joint.



MODEL A: RCC BUILDING WITH SINGLE BRACING



MODEL B: RCC BUILDING WITH X BRACING SYSTEM

4) RCC BUILDING WITH CROSS OR X BRACING.

Model B is a multi-storeyed building modelled as per the above plan. The dimension of columns and beams are 0.5mx0.5m, 0.35mx0.5m respectively. The bracing system used in this case is Steel inclined member with cross section dimensions 150X150X10 mm . The bracings are provided diagonally in both ways between two floors such that cross each other to form an x bracing as shown in figures. A braced bent consists of usual columns and girders whose primary purpose is to support the gravity loading, and diagonal bracing members that are connected so that total set of members forms a vertical cantilever truss to resist the horizontal forces.

5) RCC BUILDING WITH V BRACING

Model C is a multi-storeyed building modelled as per the above plan. The dimension of columns and beams are 0.5mx0.5m, 0.35mx0.5m respectively. The bracing system used in this case is Steel inclined member with cross section dimensions 150X150X10 mm.The bracing are provided as shown in fig.

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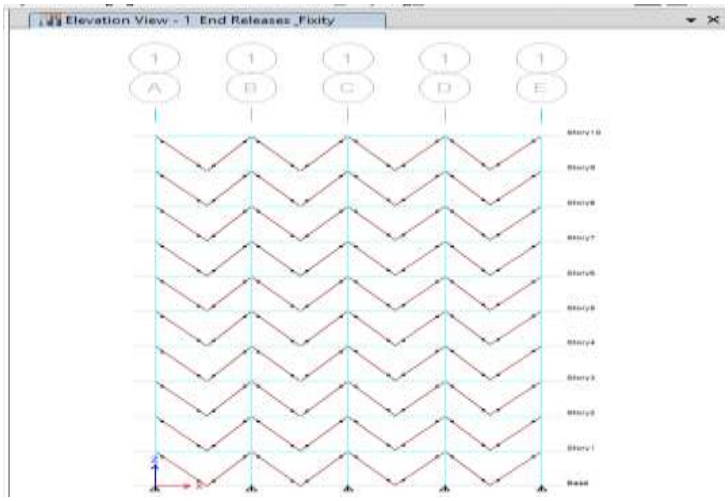

MODEL C: RCC BUILDING WITH V BRACING

RESULTS AND DISCUSSION

1) SHEAR FORCE IN BEAMS

SYSTEM→ Level ↓	Unbraced	Single diagonal	X bracing	V bracing	inverted V
1	-121.597	-130.221	-124.812	-136.911	-5.6294
2	-114.505	-124.465	-121.409	-127.918	-10.6479
3	-110.092	-121.512	-120.008	-118.947	-15.4586
4	-106.112	-118.925	-118.776	-110.427	-20.7887
5	-102.816	-116.792	-117.853	-102.073	-26.5559
6	-100.159	-115.018	-117.149	-93.898	-32.7123
7	-98.1314	-113.579	-116.643	-85.893	-39.2152
8	-96.7561	-112.374	-116.206	-77.9802	-46.1559
9	-95.5357	-111.779	-116.352	-70.7003	-52.8152
10	-27.4907	-40.6519	-44.443	-45.0526	-18.1226

2) BENDING MOMENT IN BEAM

SYSTEM→ Level ↓	Unbraced	Single diagonal	X bracing	V bracing	inverted V
1	-87.2044	-106.027	-94.5839	-108.391	28.019
2	-73.1548	-95.263	-88.6887	-95.7349	25.3942
3	-62.855	-88.2872	-85.2265	-84.2797	22.9205
4	-53.9683	-82.6073	-82.5388	-73.971	19.3436
5	-46.5434	-77.8621	-80.4664	-64.21	14.9288
6	-40.5749	-73.9437	-78.9053	-54.9792	9.7475
7	-36.0078	-70.7542	-77.7607	-46.2181	3.8756
8	-32.9726	-68.2052	-76.8839	-37.8065	-2.9407
9	-29.9861	-66.4223	-76.7466	-30.2134	-9.1387
10	15.9126	-14.2117	-22.9254	-23.4479	7.4716

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3) AXIAL FORCE IN COLUMN

SYSTEM→ LEVEL	UNBRACED	SINGLE BRACING	X BRACING	V bracing	inverted V
1	4926.252	4802.0407	4618.5905	4392.3065	4504.0894
2	4434.7868	4300.3989	4143.1038	4201.6302	4031.8416
3	3937.7808	3797.5481	3657.873	3719.0649	3552.9571
4	3419.5027	3293.2218	3171.8293	3235.5645	3072.0438
5	2901.6237	2786.5655	2684.1031	2750.1805	2589.2155
6	2378.4425	2278.3345	2195.2989	2263.2668	2104.967
7	1851.0538	1769.1138	1705.7121	1775.2862	1619.6248
8	1320.5355	1259.4655	1215.6615	1286.625	1133.2422
9	787.843	750.0291	725.5954	797.8453	645.9788
10	254.4049	239.4575	231.4332	307.6862	208.1686

4) BEMDING MOMENT IN COLUMN (Mx)

SYSTEM→ LEVEL	UNBRACED	SINGLE BRACING	X BRACING	V bracing	inverted V
1	18.4993	23.0928	18.3481	20.3139	-0.2185
2	-75.223	-75.4507	-67.9357	-72.5787	1.1915
3	-69.3861	-68.4015	-59.9848	-63.4185	-6.6059
4	-76.9438	-72.4201	-63.6579	-62.2802	-12.0636
5	-81.3469	-73.7424	-64.8592	-60.1243	-17.666
6	-85.3089	-74.846	-66.0749	-57.5835	-22.9265
7	-88.4122	-75.4382	-66.9719	-54.6251	-27.9751
8	-90.6731	-75.4825	-67.4631	-51.3808	-32.8464
9	-92.315	-75.9277	-68.8317	-47.4409	-37.4895
10	-93.9881	-72.6458	-64.237	-47.0119	-39.182

5) BEMDING MOMENT IN COLUMN (Mx)

SYSTEM→ LEVEL	UNBRACED	SINGLE BRACING	X BRACING	V bracing	inverted V
1	18.9735	24.9489	19.1266	21.1831	0.2818
2	-74.0538	-77.5813	-67.0222	-71.2438	1.0657
3	-69.8841	-71.7582	-60.355	-64.1804	-6.7762
4	-76.8691	-75.1126	-64.0214	-62.8135	-12.1332
5	-81.3514	-76.0691	-65.3795	-60.762	-17.918
6	-85.3115	-76.8103	-66.7042	-58.308	-23.331
7	-88.4147	-77.0428	-67.6954	-55.4256	-28.5361
8	-90.6803	-76.7085	-68.2256	-52.2156	-33.4627
9	-92.679	-76.9036	-69.4706	-48.2535	-38.1386
10	-91.5569	-70.7531	-62.7099	-45.4692	-37.2299

From result it has been seen that,due to application of bracing shear force and bending moment increases in the beam other than inverted V bracing system but in the column due to application of bracing Axial force and Bending moment reduces.

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CONCLUSION

After the analysis of the structure with different types of structural systems, it has been concluded that the maximum reduction in the Axial force and Bending moment occurs after the application of cross bracing and v bracing system. Bracing system reduces bending moments in the columns.The lateral load is transferred to the foundation through axial action. The performance of cross bracing system and inverted bracing system is better than the other specified bracing systems. Steel bracings can be used to retrofit the existing structure. Total weight of the existing structure will not change significantly after the application of the bracings.

REFERENCES

[1] Nauman Mohammed, Islam Nazrul, "Behaviour of Multistorey RCC Structure with Different Type of Bracing System", Vol. 2, Issue 12, December 2013.
[2] Umesh.R.Biradar1, Shivaraj Mangalgi, "Seismic response of reinforced concrete structure by using different bracing SYSTEMS", Volume: 03 Issue: 09 Sep-2014.
[3] Dhananjay. S. Pawar, S. Abdulla U. Phadnis, Raju. S. Shinde, Yugandhar. N. Jinde, "Analysis of multistoried braced frame subjected to seismic and gravity loading", Vol. 5, Issue 3, (Part -3) March 2015.
[4] Shahrzad Eghtesadi, Danesh Nourzadeh, Khosrow Bargi, "Comparative Study on Different Types of Bracing Systems in Steel Structures", World Academy of Science, Engineering and Technology 73 2011.
[5] Karthik K. M, Vidyashree. D, "Effect of steel bracing on vertically irregular r.c.c building frames under seismic loads", Volume-04 Issue 06 June-2015.
[6] Shachindra Kumar Chadhar, Dr. Abhay Sharma, "seismic behavior of rc building frame with steel bracing system using various arrangements", Volume: 02 Issue: 05 Aug-2015
[7] IS 1893(Part-I) 2002: Criteria for Earthquake Resistant Design of Structures, Part-I General Provision and Buildings (Fifth Revision). Bureau of Indian Standards, New Delhi.
[8] IS 456: 2000. "Indian Standard Code of Practice for plain and reinforced Concrete", Bureau of Indian Standards, New Delhi.
[9] SP:64-Explanatory handbook on Indian standard Code of Practice for design loads (other than earthquake) for buildings and structures. Part-3, Wind Loads.
[10] IS 875: Part III – Code of Practice for design loads (other than earthquake) for buildings and structures.