iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IV **Month of publication:** April 2022

DOI: https://doi.org/10.22214/ijraset.2022.41776

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IV Apr 2022- Available at www.ijraset.com

To Study and Analyze Effects of Bracing in Design of Building

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Abstract: ***High rise structure thanks to its exposure to varied gravity loads, lateral loads and therefore the exponential height of structure has become a costlier solution. The increasing cost of concrete structure and therefore the time interval of construction in concrete high rise structure has given chance to explore and research new technologies and new materials to form the structure more stable and economical. One among the solutions is to supply bracings to the member. There are many conveniences of the bracing systems in order that they're widely used. These are: Braced frames are accessible to all or any sorts of structures like bridges, aircrafts, and cranes. There's no need of highly skilled laborers if the bolted connections are utilized and plus there's no deformation problem at the connection. The paper also includes the various sorts of braces which may be used appropriately and therefore the comparison between buildings with members without braces and buildings with braces.***

I. INTRODUCTION

Bracing is one among the foremost versatile lateral load resisting systems in multi-storied buildings. Bracing may be a highly efficient and economical method of resisting horizontal force in a frame structure. Braced frame may be a structural system, which is meant primarily to resist wind loads and earthquake forces. Braced frames are often an efficient system for seismic retrofit thanks to their high stiffness. Braced frames are nearly always composed of steel members. The beams and columns that form the frame carry vertical loads, and therefore the bracing system carries the lateral loads. Braced frames reduce lateral displacement, also because the bending moment in columns. Steel bracing is economical, easy to erect, occupies less space and has flexibility to style for meeting the specified strength and stiffness. It allows obtaining an excellent increase of lateral stiffness with a minimal added weight, and so it's very effectiveforexistingstructureforwhichthepoorlateralstiffnessisthemainproblem. A braced frame may be a really strong structural system commonly utilized in structures subject to lateral loads like wind and seismic pressure. The members during a braced frame are generally made from steel , which may work effectively both in tension and compression.

Multistory ferroconcrete buildings are susceptible to excessive deformation, which necessitate the introduction of special measures to decrease this deformation. RC bracing is one among the lateral loads opposing frameworks in multistory structures. RC bracing system enhances the resistance of the structure against horizontal forces by expanding its stiffness and stability. Bracings hold the structure stable by exchanging the horizontal loads, for instance , quake or wind burdens right down to the bottom and oppose sidelong loads, therein way keep the influence of the structure.

II. BRACING MODEL

Types of bracing system

1) XBracing
2) VBracing
3) InvertedV
4) Diagonal

X Bracing uses two diagonal members crossing one another . These only need to be resistant to tension, one brace at a time acting to resist sideways forces, depending on the direction of loading.as a result, steel cables can also be used for cross-bracing. XBracing on the outside face of a building can interfere with the positioning and functioning of window openings. It also results in greater bending floor beams. Two diagonal members forming a V-shape extend downwards from the top two corners of a horizontal member and meet at a center point on the lower horizontal member. The systems can significantly reduce the buckling capacity of the compression brace so that it is less than the tension yield capacity of the tension brace. This can mean that when the braces reach their resistance capacity, the load must instead be resisted in the bending of the horizontal member.

Inverted V-bracing (also known as chevron bracing) involves the two members meeting at a center point on the upper horizontal member Both systems can significantly reduce the buckling capacity of the compression brace so that it is less than the tension yield capacity of the tension brace. This can mean that when the brace reach their resistance capacity, the load must instead be resisted in the bending of the horizontal member. Bracing, which provides stability and resists lateral loads ,may be from diagonal steel members or, from a concrete 'core'. In braced construction, beams and columns are designed under vertical load only,assuming the bracing system carries all lateral loads.

III. REVIEWS

1) Structural behavior of steel building with concentric and eccentric bracing: a comparative study

Zasiah Tafheem, ShovonaKhusruhave enlisted the advantages of steel bracings which helps to strengthen or retrofit the existing structures. On comparison it has been found out by the authors that that the concentric (X) bracing reduces more lateral displacement and thus significantly contributes to greater structural stiffness to the structure. Whereas the conclusion includes The concept of using steel bracing is one of the advantageous concepts which can be used to strengthen or retrofit the existing structures. The lateral storey displacements of the building are greatly reduced by the use of concentric (X) bracing in comparison to eccentric (V) bracing system.By considering lateral stiffness, the concentric (X) bracing has been found the most suitable one for the steel building studied under the present study.The inter-storey drift is greatly reduced in presence of bracing system. As a result, it can be said that bracing system has more influence on the restriction to relative floor to floor lateral displacement.

2) Effects of various bracing in building with rectangular and circular columns

This paper includes the comparison of seismic analysis of building with rectangular and circular columns by using differing types of bracing system and also the comparison between rectangular and circular column is administered . For this analysis of labor an eight-storey(G+8) building is taken into account which is situated in seismic zone III. The building models are analyzed by equivalent static analysis as per recommendation given by IS 1893:2002 using Staad Pro V8i software. It concludes that Bracing system reduces not only bending moment but also shear force within the columns and also transfer the lateral loads through axial load mechanism to the inspiration . Range of twenty-two change of shear force for bottom 5.5 to 8.8% and for top 8.9 to 10% whereas for bending moment 3.3 to 10% for bottom and 11.3 to 12.4% for top. Bracing system increases the axial loading within the column. . within the final conclusion it can conclude that Xtype bracing system is best than other specified bracing system. Especially just in case of rectangular columns model compare with circular columns model.

3) Seismic response of rc building with soft stories

The authors Hiten L. Kheni, Anuj K. Chandiwala discusses about the displacement estimates of the codal lateral load patterns are observed to be smaller for the lower stories and bigger for the upper stories and are independent of the entire number stories of the models.It is seen that the estimations of the primary mode lateral load pattern results in more accurate displacement, the deviations on the results of this lateral load pattern decreases thanks to the existence of the soft stories because the number of stories and number of spans increase. After the analysis is completed it had been acknowledged that the displacement estimates of the codal lateral load patterns are observed to be smaller for the lower stories and bigger for the upper stories and are independent of the entire number stories of the models. The uniform lateral load pattern results in overestimations of displacements for all of the models and deformation levels. The estimations of the primary mode lateral load pattern results in more accurate displacement, the deviations on the results of this lateral load pattern decreases thanks to the existence of the soft stories because the number of stories and number of spans increase.

4) Optimal bracing type and position to attenuate lateral drift in high-rise buildings

The results of this study shows that adding bracing members to the instant frame structure increases stability and reduces drift. it's found that cross bracing have the very best resistance to the lateral drift compared to the others. Also this study shows that adding the braces to the core of building reduces the drift far more than adding them to the building facades.The ultimate loads, mid-span deflections and ductility ratios of the models increase with increasing the worth of compressive strength of concrete and HPFRCC. the quantity of injury is severe in RC models compared to RH models. The yield and supreme loads increase with increasing the strain reinforcement ratio in RH beams, but the last word deflection, ultimate curvature and ductility ratio decrease.

5) Seismic Assessment of Braced RC Frames

In this paper the author have considered the convenience of construction and therefore the relatively low cost, steel bracing appears to be attractive compared to other conventional upgrading techniques like adding concrete or masonry shear walls or base isolation systems. The bracing methods adopted fall under two main categories, namely (i) external bracing and (ii) internal bracing. within the external bracing system, existing buildings are retrofitted by attaching an area or global bracing system to the outside frames. Th. within the internal bracing method, the buildings are retrofitted by incorporating a bracing system inside the individual units or panels of the RC frames. Successful retrofits of existing buildings using different sorts of X, V and K concentric and eccentric braces within steel frames are reported.

6) Performance of High-Rise Steel Building With and Without Bracings

This paper includes comparative study on performance of high-rise steel building with and without bracings, administered on a residential building by considering the gravity loads and lateral loads within the sort of Earth quake loads and Wind loads incorporating the Bracings to scale back lateral loads on structural elements. during this study, a 20 storey steel frame structure has been selected to be idealized as multi storey steel building model. The model is analyzed by the authors B. Kranthi Kumar, N.VidyaSagar Lal using STAAD.Pro 2008 structural analysis software with the consideration of wind and earthquake loads. At an equivalent time the influence of X-bracing pattern has been investigated.The building proposed in designed by Limit State Method consistent with steel code IS: 800-2007, the Wind load analysis consistent with IS: 875-(part-3)1987 and seismic/Earth quake loads consistent with IS: 1893 (Part-1)-2002. during this study the node displacements of buildings having with and without bracings of wind and earthquake effect of Zone II and Zone V, and the axial force of the members of the buildings having with and without bracings of wind and earthquake effect of Zone II and Zone V.

7) A Review of Influence of Various Types of Structural Bracing to the Structural Performance of Buildings

This paper reviews the influence of varied sorts of structural bracing to structural performance of buildings. The history of structural bracing is visited and therefore the differences between numerous structural bracing in term of suitability to differing types of buildings and loading, mechanisms, technical details, advantages and limitations, and the overall effect on the structural behavior and performance are dissected. Proper and efficient structural bracing is pertinent for every high rise building as this may lead towards safer, sustainable and more economical buildings, which are cheaper to take care of throughout the life of the buildings in the future. The authors S.m. razak, t.c. kong conclude that eccentric braces allow to prolong the half-life of structure.

IV. CONCLUSION

The following points have been concluded from above reviews:

1) For resisting earthquake forces large sections for members need to be provided, these leads to increase in material cost unlike in bracing structure which will reduce section size.

2) Through analysis it will be clear that Bracing system reduces not only bending moment but also shear force in the columns and also transfer the lateral loads through axial load mechanism to the foundation.

3) Bracing system increases the stiffness of the structure and reduces the displacement. The performance of the X-braced system is better than the other specified bracing system.

REFERENCES

[1] Anik P. Mundada, Dr. Prashant O. Modani, “Effects Of Various Bracing In Building With Rectangular Columns”, International Journal Of Advances In Engineering And Management (IJAEM), ISSN: 2395-5252, Vol. 2, Issue 1, June 2020, PP. 223-231.

[2] A Kadid, “Seismic Assessment Of Braced RC Frames”, Published In 1877–7058 © 2011 Published By Elsevier Ltd. Doi:10.1016/J.Proeng.2011.07.365

[3] .M. Razak, T.C. Kong, “A Review Of Influence Of Various Types Of Structural Bracing To The Structural Performance Of Buildings”, Published By E3S Web Of Conferences 34, 01010 (2018)

[4] J.P. Desai, “Seismic Response Of R.C. Braced Frames”,Published By Computers &Structuresvolume 29, Issue 4

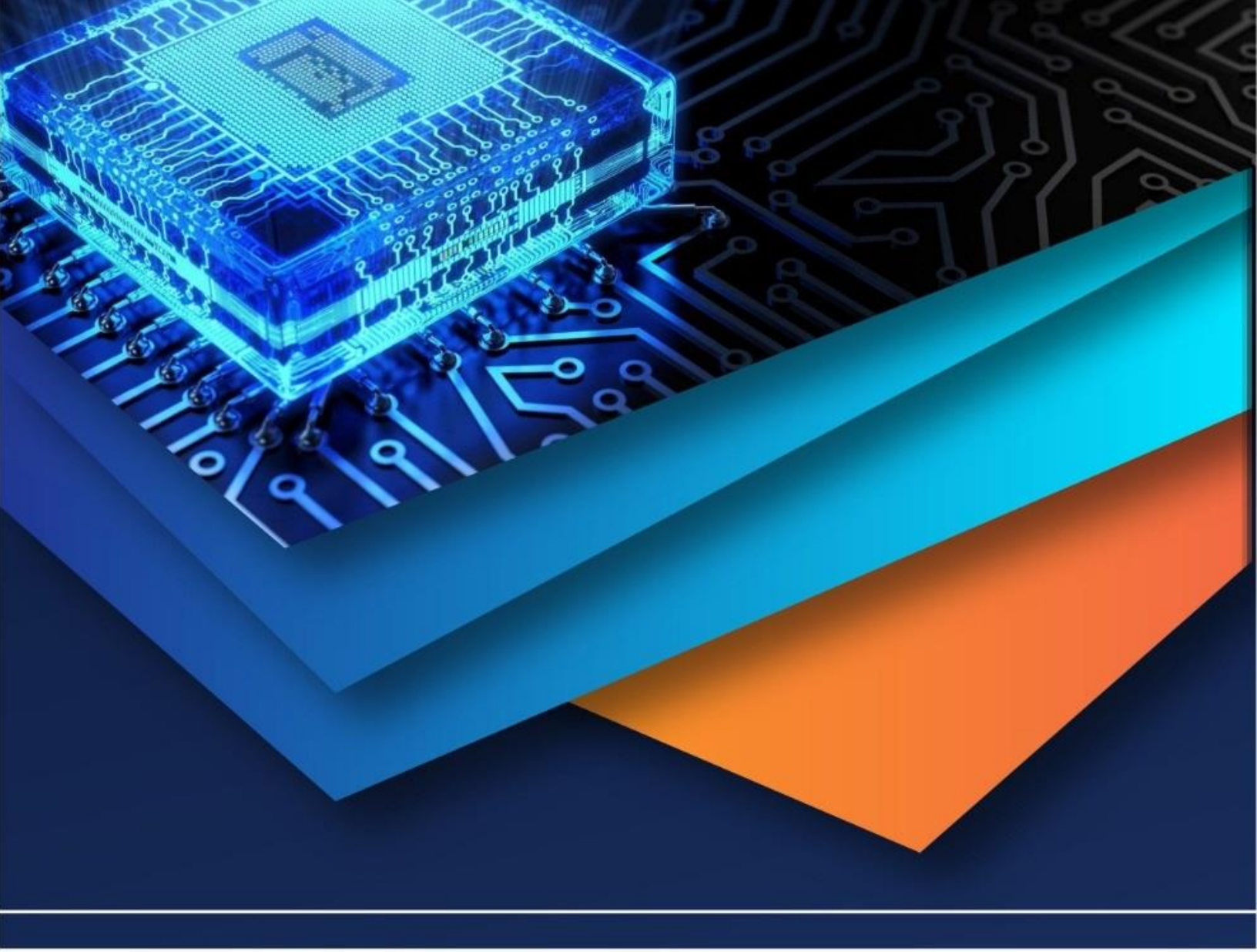
[5] Z.A. Siddiqi, Rashid Hameed , “Comparison Of Different Bracing Systems For Tall Buildings”,Published In Article · January 2014

[6] Anik P. Mundada1, Prof. G. P. Deshmukh2 Effects Of Various Bracing In Building With Rectangular And Circular Columns Published In International Journal Of Advances In Engineering And Management (IJAEM) · October 2020 DOI: 10.35629/5252-020899110

[7] Patil S.S, “Seismic Response OfCellwise Braced Multistoried Frames”, Published By International Journal Of Latest Trends In Engineering And Technology (IJLTET)

[8] B. Kranthi Kumar, N.Vidyasagar Lal , “Performance Of High-Rise Steel Building With And Without Bracings”, Published By G.Hymavathi Et Al. Int. Journal Of Engineering Research And Applications ISSN: 2248-9622, Vol. 5, Issue 11, (Part - 4) November 2015, Pp.103-114

Websites
[1] http://www.ijaem.net/
[2] https://oaji.net/articles/
[3] www.ijera.com
[4] www.ijltet.org



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