

Seismic Behavior of G+10 Residential Buildings: A focused review on the seismic response of this specific building typology

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Abstract:

Earth is the one of the planet where all types of creatures are easily survive. But earthquake is most destructive phenomena of nature and destroy the earth. So we have to know the about earthquake and their effect on the residential Building. And research for prevention of the building due to earthquake. In this paper we are analyzed building for zone iv and see the result how much affected building by earthquake, and for reduce the effect of earthquake provide X bracing in the building. And analyzed by Staad Pro vi 8 software two model building one is the without X bracing and second building is analyzed with X bracing and see their result. we get the result with X bracing is more strength than without X bracing.

Keywords:- Residential building (G+10), seismic effect, X Bracing ,Zone iv.

Introduction

All type of structures mostly exist on the surface of the earth .Due to growth rate of people and industrialization ,the problem of the gradual rise in the earth temperature is referred to as global warming. It is the one causes of the earthquake. Which is most dangerous and destroy in the huge amount. During the earthquake structures are failed .So we have to reduce the effect of earthquake in the building. For reduce the effect of earthquake we have to the know about earthquake in different zone and their intensity. In this paper analysis to the residential building in simple way and check the effect of earthquake and for reduce it, use of X steel bracing in the middle of the building. And will compare their result.

Types of Bracing:-

Bracing systems play a crucial role in the stability and safety of modern building. A bracing system is structural element to resist lateral forces liked wind, seismic, and other loads that causes of building to sway are collapse. A well designed bracing in construction can improve a buildings stability for withstand these force and minimize damage to the structure and its occupants. Vertical loads are supported by the columns, beam, frame but bracing support lateral loads.

Single Diagonals Bracing :-

For the high rise building the improvement of lateral response is a subject concern for both wind, and seismic regions. To reduce the effect of wind, and seismic properly oriented single diagonal bracings are introduced in order to bring advantageous interaction between these two modes .

Cross-Bracing:-

In this bracing use two diagonal member crossing each other so this is called cross bracing and also called X bracing. This is resistant to tension. Tension cause interference with window.

K-Bracing :-

In this bracing connect two member at mid height ,it is made shape as K so this called K bracing. Allows for more flexibility in the facade in result in less bending in the floor. It is not recommended in seismic regions due to the potential for column failure.

V-Bracing:-

In this type of bracing two diagonal members connect as a V shape. It can considerably lessen the buckling capacity of the compression brace. Used in seismic region with centric bracing structures.

Advantage of X Bracing :-

Structural stability:- Cross bracing can help keep building stable during seismic events and high winds, and can reduce the likelihood of damage to the structure.

Load distribution :- Cross bracing can distribute vertical bending effect between beams, and share lateral effects like wind and collision loading.

Buckling control :- Cross bracing can help prevent buckling in main beams, especially during construction when wet concrete can put stress on steel beams.

Economy :- Cross bracing can be more economical than other option. For example, in smaller spans, sheeting can be used to brace the building

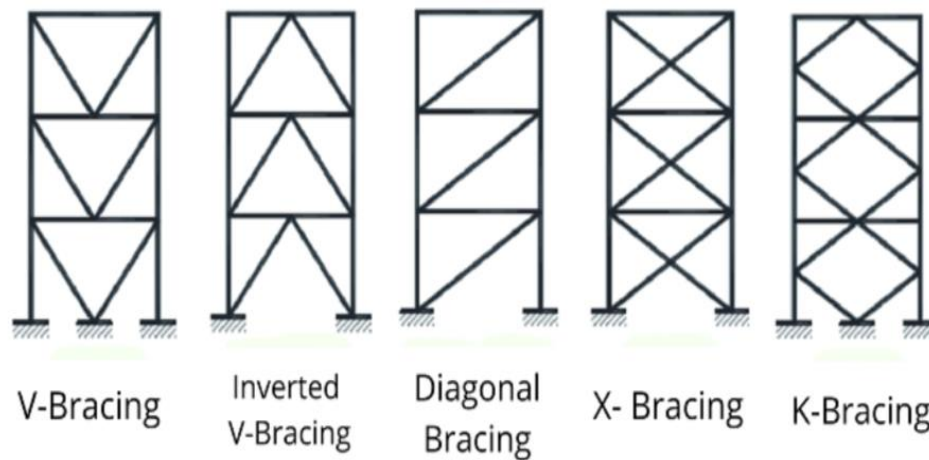


Figure 1. :-Different type of bracing

(Source:- <https://civilwale.com/types-of-bracing-systems/>)

LITERATURE REVIEW

Pravin S. Kamble et.al.[1] (2016) In this research paper author used different type of bracing (X,V,K) and knee bracing. And analysis by computer software SAP 2000 and pushover analysis. Result get satisfying.in this analysis comparision between the seismic parameter such as roof displacement, time period storey drift, base shear analysis by steel bare frame with different bracing pattern are studied. And found that the X type of bracing significantly contributes to the stucture stiffness and it proved for use to reduce the maximum interstates drift of steel in comparion of other bracing system.

Sk Muiz Sk Abd Razak et. al. [2] (2018) In this paper review the influenc of the various type of structural performance of building. In this found the result against excessive lateral drift. A typical typical method employed to control lateral drift is structural bracing, which works by increasing stiffness and stability of structure. In the structure excessive latral drift can turn towards crack formation, and leading to structure damage. In this paper researchers studied the history of structural bracing and differences between numerous structural bracing in trm of suitability to different types of building and loading, mechanism technical details, advantage and disadvantage overall effect behaviour performance.

Kartik Prashar et.al. [3] (2018) In this paper researcher is analysed in high rise RC building bracing system is provide for stiffness, strength and energy dissipation to resist the lateral load. And analysis for high rise building study about the different bracing system for prevention of seismic safe structure with adequate lateral resistance. Bracing system is provide column member to resist lateral load. Bracing system is to installed ,economical and occupies less space. The structure is analysed for seismic zone v with different types of bracing and compared with the braced frame by use of ETAB software.

Maddigari et. al. [4] (2018) The buildings which appeared to be strong enough may be crumble like houses of cards during earthquake and deficiencies may be exposed.this paper is analysed at the basis of Bhuj earthquake 2001 in this huge earthquake the most building collapsed were found. It has raised question about adequacy of framed structure to resist strong motion. For provide earthquake resistant building analysed by use of a non- linear static pushover.To get better result G+10 structure analysed by using SAP 2000 v16 software. The result in the base of shear, displacement, time period, location of hinge and pushover curve are compared. In this analysis get the result that bracing provide in middle of the building is more beneficial than other arrangement of bracing.

Megha Chauhan et.al.[5] (2019) In this journal analysed high rise building frame with bracing and shear links at the external member. Vertical shear links in characteristic bracing system, not similar to one located in the structure and can be easily modify therefore after seismic effects considering that other frame elements will remain elastic the vertical shear links should be change, and then frame structure can function normally. A X type bracing system will be designed and fit with high accuracy and small change in its characteristic reduce the ductility without increasing the stiffness but unlike knee brace, vertical shear link can be easily designed and implement.the analysis completed by using tool Staad: Review.

Shivani B.Dasare et.al.[6] (2022) In this journal author analyzed comparative between unbraced and X & V braced multistorey building against earthquake. India is today a rapidly expanding nation , and its population rises, more infrastructure is required .Indias infrastructure is expand in this situation causing a rise house demand. To satisfy the need for more residential commercial land ,so we can go for vertical construction reinforced concrete building is mainly designed only to resist the gravity loads that are acting on the structure, therefore the designing the building don't pay attention to the seismic load then causes building collapse.for earthquake resistant structure author provide bracing system.

Nandona Goswami et.al.[7] (2022) In this review author used bracing,bracing is one of the most used for resist to lateral load in multi storey frame structure.It help resist from earthquake effect collapse or damage. The aim of this study to know the response of providing bracing in high rise building. It necessary for analysis, design, and post effect of bracing during the seismic effect in the building. This review is analysed with and without bracing by using tool ETAB, SAP,Staad Pro.

Shivam Prajapati et.al. [8] (2022) In this paper analysis is done for G+23 storey steel frame building with different pattern of bracing system. Researcher take the member property of beams 300mmX400mm and 300mmX500mm and ISLB 50 section are used to compare for same pattern of beam, column, and bracing. This analysis completed by using tool ETAB Software. The property of section used as IS 456:2016 and per IS 800:2007 which is analysis for a various type of bracing X,V, and inverted. In this study model G+23 with square shape building plan 52X52m, each floor of height is 3.2m.

Shree Laxmi et. al. [9] (2022) In this paper author analyzed different between X type bracing and V type bracing. Bracing are structural component used for resist lateral load in multistorey building. In this paper author used X type bracing for 8 storey and V type bracing using tool staad pro. And result compared.

Alnajjar et. al. [10] (2023) This research paper examines the integration of seismic bracing in building design to enhance both safety and aesthetics, focusing specifically on Istanbul . In this paper researcher present a case study of 40 year .Old apartment building with three stories above ground and two basement floors , measuring 19 meters in length ,14 meters in width and approximately 11 meters height . seismic bracing is an essential technique .

Swapni et. al. [11] (2023) In this paper review author present a seismic analysis of G+10 building with and without zipper brace frame . In this paper author introduced zipper brace frame as an innovative system that has shown promising results in enhancing seismic performance while maintaining architectural aesthetics, two analytical models are created . One model created for with incorporating zipper brace and another without zipper brace frame. In this paper author includes several key aspects .Storey drift ,lateral displacement and base shear.

Rangraj B et.al. [12] (2023) In this review paper author analysis comparative of unbraced and chevron braced building of different stories. With the new construction of steel buildings is increasing the rapidly especially in earthquake zone. A steel structure can be considered as unbraced if the structural element provide itself lateral load resistant and a braced structure is one where braced frame provide lateral resistant . Author used chevron bracing in their paper it is also known as inverted V bracing. Linear static and dynamic analysis are carried out to study the behavior of G+3, G+7, and G+10 storied steel building with and without chevron bracing with tool Staad.

Prateek Raushan et.al.[13] In this review paper author are analysis of building. In the building provide Bracing and improve for lateral load resistance. In this paper different types of Bracing used and comparison their results, displacement, maximum bending moment, shear, drift, analysis done by using staad pro software

OBJECTIVE OF ANALYSIS:-

The main objective of this project is reduce the effect of seismic vibration which is produce during the and affected to structure. So for this problem in the building provide better strength than normal building. By provision of X bracing in the structure and see the result with and without bracing and compare their defilection, maximum bending.This analyzed done for zone. Scope of seismic analysis is provide to knowledge about earthquake and effect of it in the structure.How to prevent structure by provide bracing and reduce the effected from earthquake.

BACKGROUND

Shear stress is the component of stress coplanar with a material cross section.

For calculation of shear stress formula

$$\text{Shear stress} = F/A$$

Where

F : Applied force

A :Cross sectional area

It is calculated as the distance from the point. A Bending moment is simply the bend that occurs in a beam due to a moment.

$$M/I = f/y = E/R$$

Where

M : Bending moment

I : Moment of inertia

f : Bending stress

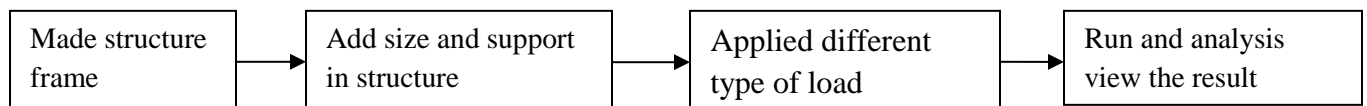
y : Distance of outer fiber from its centre of gravity

E :Modulus of elastisity

R : Radius of curvature

Storey displacement is the absolute value of the deflection of a single storey in a multi storied building relative to the grund level or base of the structure.

FLOW CHART



CONCLUSION

The review of this paper in the basis of studied on various research paper on the topic analysis of residential building with and without bracing. To provide the building resist against seismic effect by provision of bracing in centr of the building.The analysis of building their size of beam and column, height are designed and provide thickness,apply the load by using tool Staad Pro software. By the provision of X bracing in the middle of the building get result that over all effect of seismic on the building reduced 30%,than before providing of bracing.There is significant reduce the

maximum moment on top floor that indicate the advantage of bracing use in building for lateral load effect which is produce during the earthquake. This analysis performance is performed for the zone IV, take out the value of zone factor 0.24 from IS code 1893:2005.

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