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Analysis of Behaviour of Multistorey RCC Structure with different Types of Bracing System (By Using Software)

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Abstract: ***India is a developing country and has developed in every sense since its independence. The most important are the infrastructural development which is to be provided in order to generate an efficient way to work. Infrastructure has become very important in today's era, since it has been the key factor in the growth of a country, be it in information technology, logistics or any other senses. The presence of high rise buildings in a country displays its economic strength. The structure is subjected to different types of loading mainly gravity loads and horizontal loads. The gravity loads acting vertically downwards which includes dead load of the structure and live load. The Horizontal loads are acting parallel to ground surface either in transverse direction or in lateral direction which includes loads due to Earthquake, wind loads etc.***

Steel use in RCC structure increases the ductility of the section or member. In case of steel structures, the sizes of the section become lighter. Due to this vertical downward force gets reduced significantly. As vertical downward force reduces structure gets more susceptible to lateral loads, to resist this lateral loads different systems or structural components were used. In case of RCC structure very commonly shear walls are provided and in case of steel structure bracings.

Bracings are member of the structure they are either eccentric or co-centric. Bracings are said to be concentric if they are jointed at centre of beam with column beam junction or direct column beam junction and eccentric if above condition not gets satisfied. In this study different types of bracing systems are using to know the behavior of structure .Types of bracing system are Single Diagonal, X Bracing, V and Inverted V Bracing

The main objectives of the project are to analyze the behavior of multistory building without using bracing system and with using bracing system. Analysis of the behavior of structure after using different types bracing system. Make the building earthquake resistant against seismic effect using bracing system. Analysis of Unbraced and braced Multi-storey RCC building by using ETAB.

Keywords: RCC Building, Steel Bracing, X Bracing, Diagonal Bracing, V And Inverted V Bracing.

I. AIM

The AIM of this paper is to evaluate the response of braced and unbraced structure subjected to seismic loads and to identify the suitable bracing system for resisting the seismic load efficiently

II. OBJECTIVES

The main objectives of the project are

1) To analyze the behavior of multistorey building without using bracing system and with using bracing system.
2) Another object is to analysis of the behavior of structure after using different types bracing system.
3) To make the building earthquake resistant against seismic effect using bracing system.
4) **T**o analysis of Unbraced and braced multistorey RCC building by using ETAB.
5) To Compare the response of different braced and unbraced building subjected to lateral loads

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III. INTRODUCTION

The structure is subjected to different types of loading mainly gravity loads and horizontal loads. The gravity loads acting vertically downwards which includes dead load of the structure and live load. The Horizontal loads are acting parallel to ground surface either in transverse direction or in lateral direction which includes loads due to Earthquake, wind loads etc.

Steel use in RCC structure increases the ductility of the section or member. In case of steel structures, the sizes of the section become lighter. Due to this vertical downward force gets reduced significantly. As vertical downward force reduces structure gets more susceptible to lateral loads, to resist this lateral loads different systems or structural components were used. In case of RCC structure very commonly shear walls are provided and in case of steel structure bracings.

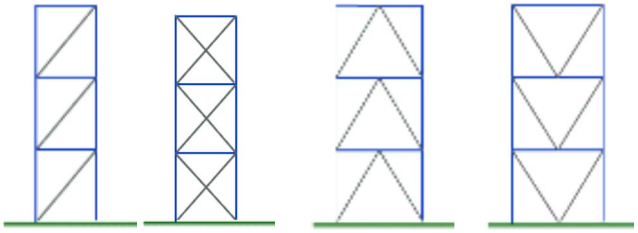
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A. Types of Bracing System

1) Single Diagonal
2) X Bracing
3) V And Inverted V Bracing



Single Diagonal X Bracing V And Inverted V Bracing

IV. METHODOLOGY

A. Analysis of structure without using bracing system
B. Analysis of structure with using bracing system
C. Single diagonal bracing
1) X bracing
2) V bracing
3) Inverted v bracing
D. Comparison of results on behavior of structure with or without bracing system.
E. For all analysis use of ETAB software.

V. LITERATURE REVIEW

Design and analysis ten storied building using ETABS software-2016Ali author: Kadhim Sallal
Department of Hydraulic Structures, College of Water Resource Engineering, Iraq
In this study it is concluded that, the value of dead, live and floor finish loads obtained by the ETABS program are similar to the manually calculated values The analysis results of the structural integrity of building in withstanding the design earthquake loadings was conducted and was judged to be safe. Various important results like bending moments, shear force and deflection results are similar to the manually calculated values.
Structural Analysis of a Multi-Storeyed Building using ETABS for different Plan Configurations (may 2014)
Abhay Guleria Undergraduate, Deptt.of Civil Engineering ,J.N.G.E.C. Sundernagar, Sundernagar, India
In this project the analysis of the multi-storeyed building reflected that the storey overturning moment varies inversely with storey height. Moreover, L-shape, I-shape type buildings give almost similar response against the overturning moment. Storey drift displacement increased with storey height up to 6th storeyreaching to maximum value and then started decreasing. From dynamic analysis, mode shapes are generated and it can be concluded that asymmetrical plans undergo more deformation than symmetrical plans. Asymmetrical plans should beadopted considering into gaps.
Analysis and Design Of Multistory Apartment Building Using ETABS (may 2017)
Sayyed A.Ahad1, Hashmi S Afzal2, Pathan Tabrej3, Shaikh Ammar4,
Shaikh Vikhar5, Shivaji Bidve6
Department of Civil Engineering, Sandipani Technical Campus Faculty Of Engineering,SRTMUN University, Latur, Maharashtra
Analysis and design of an apartment building havingG+10 storeys is done. Analysis is done by using the software ETABS V15.2, which proved to be premium of great potential in analysis and design of various sections. The structural elements like RCC frame, shear wall and retaining walls are also provided. As per the soil investigation report, an isolated footing is provided. The design of RCC frame members like beam and column was done using ETABS. The analysis and design was done according to standard specifications to thepossible extend.

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Analysis And Design Of G+4 Residentialbuilding Using ETABS

U.P.B.C. Sekhar

Assistant Professor, Department of Civil Engineering,

K L University, Vaddeswaram, Guntur, A.P, Ind

Based on the analysis and design of multi-storied building, the following conclusions are made

1) Our project deals with provision of earthquake resistant structure which is also economic.
2) Minimum sizes of the beams and columns were provided as B230mmX450mm and C230mmX450 mm, after analysis only the failed column axes and dimensions were changed to C230mmX750 mm which comes under economic.
3) Seismic analysis was done by using ETABS software and successfully verified manually as per IS 1893-2002.
4) There is a gradual increase in the value of lateral forces from bottom floor to top floor in software analysis.
5) Maximum Shear force is 93.8KN and Maximum Bending Moment values is 79.5KN, which is acted at top floor of the building.

Analysis and design of Multi storey Structure Using ETABS Rohitkumar.B.R.1, Sachin.P.Dyavappanavar2, Sushmitha.N.J,3Sunitha.V4, Vinayak.Yadwad5
Assistant Professor, Department of Civil Engineering, Jain Institute of Technology. Davanagere, Karnataka, India

a) The preparation of the project has provided an excellent opportunity to emerge ourselves in planning and designing of multi-storeyed hostel building.
b) This project has given an opportunity to re-collect and co-ordinate the various methods of designing and engineering principles which we have learnt in our lower classes.
c) Design was done by using ETABS software and successfully verified manually as per IS 456-2000.
d) By using ETABS, the analysis and design work can be completed within the stipulated time.
e) The analysis and design results obtained from software are safe when compared with manual calculations and design.

VI. DESCRIPTION OF THE BUILDING

In this study eight story building of having four bays each are having the four meter length.
The following are the description of the building.

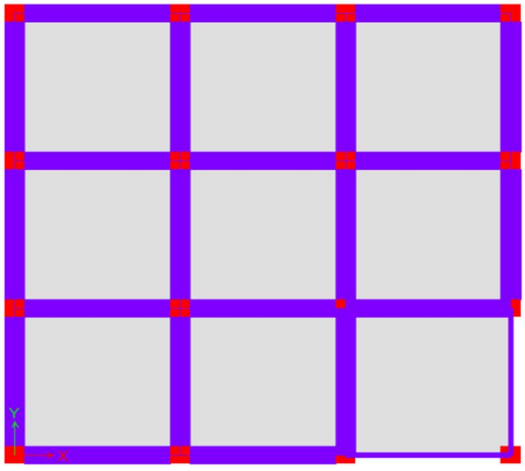
1) Type of the frame : special moment resisting frame
2) Number of stories : G+16
3) Zone : IV
4) Importance factor (i) : 1
5) Response reduction factor (R) : 5
6) Slab thickness : 150mm
7) Live load : 3.0 KN/m2
8) Height of the floor : 3m
9) M30 grade concrete is used for columns and M30 is used for both beams and slab
10) Fe 500 steel is used.
11) Density of concrete: 25 KN/M3
12) ISMB300 is used for steel bracing.
13) Size of beam : 600mmX900mm
14) Size of Column: 900mmx600mms

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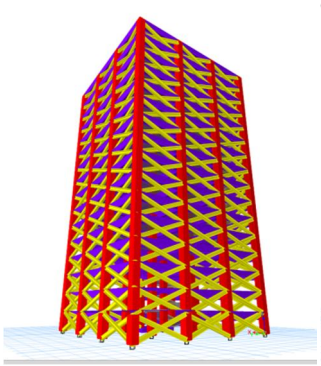
PROPERTY	VALUE
Name	ISMB 300
Common Name	Indian Standard Medium Weight Beam 300
Weight per Meter (w)	44.20 Kg/m
Sectional Area (a)	56.26 cm^2
Depth of Section (h)	300 mm
Width of Flange (b)	140 mm
Thickness of Flange (t_f)	12.40 mm
Thickness of Web (t_w)	7.50 mm
Moment of Inertia (l_{xx})	8603.60 cm^4
Moment of Inertia (l_{yy})	453.90 cm^4
Radius of Gyration (r_{xx})	12.37 cm
Radius of Gyration (r_{yy})	2.84 cm

VII. MODELING OF BUILDING

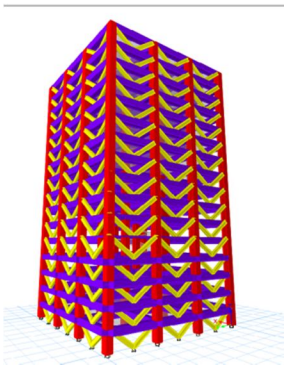


2D VIEW

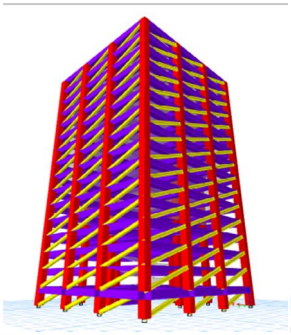
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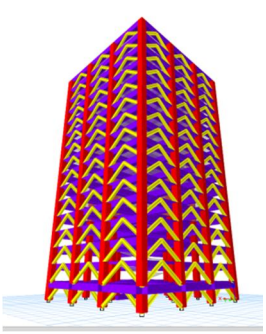
X Bracing system



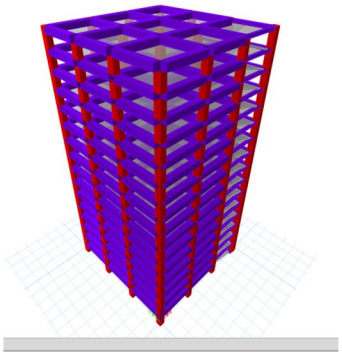
V Bracing system



Ecentric Back Bracing



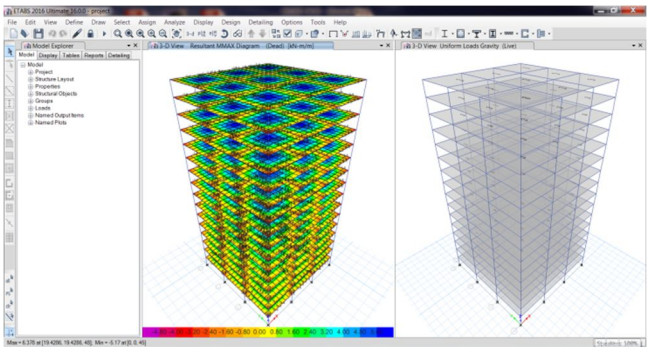
Inverted V Bracing system



3D view without Bracing system

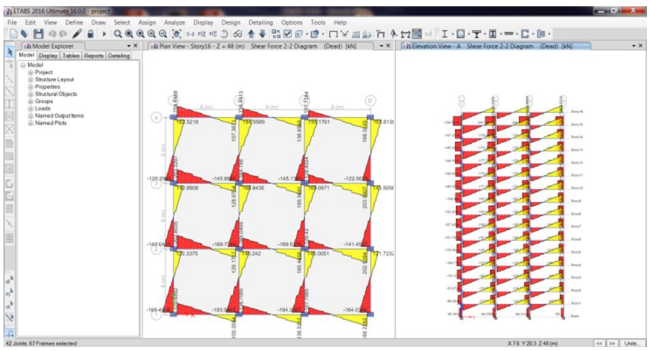
VIII. RESULTS

A. *Resultant Forces*

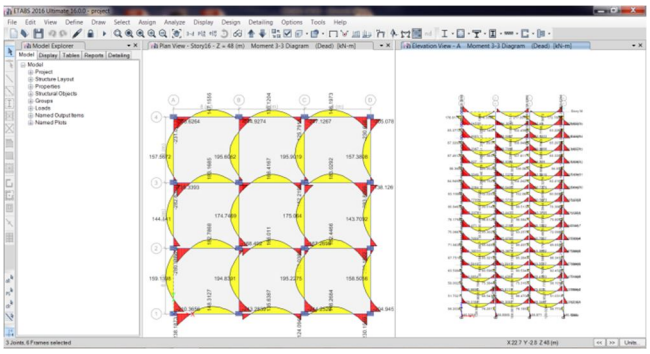


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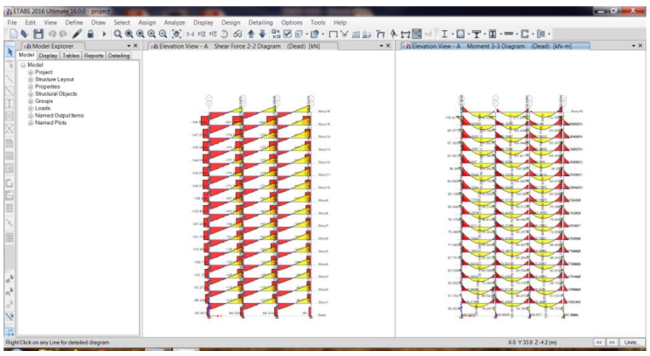
B. Shear Force Diagram



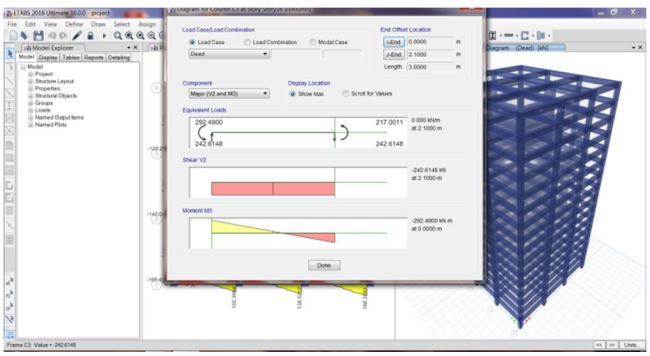
C. Bending Moment Diagram



D. BMD & SFD of the Structure

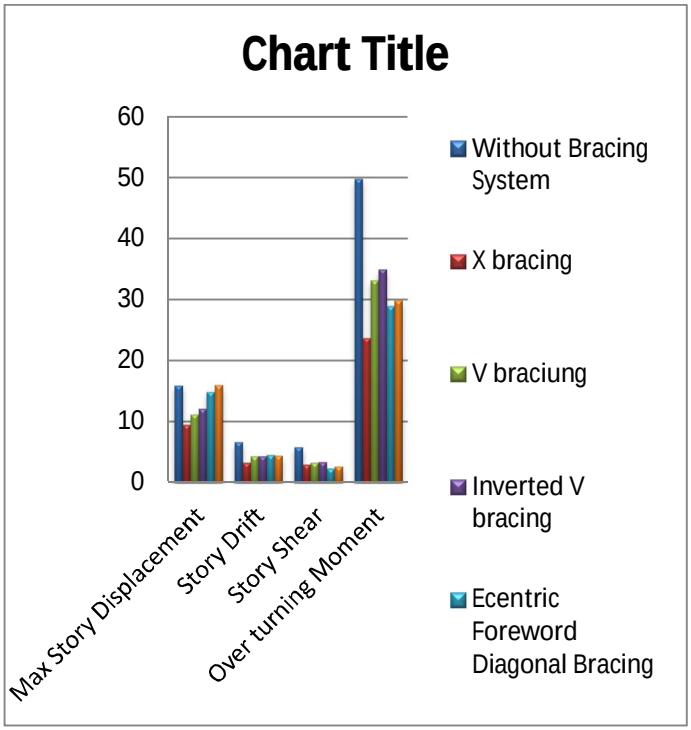


E. Diagram Showing the details of a Member



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F. Comparison of Results



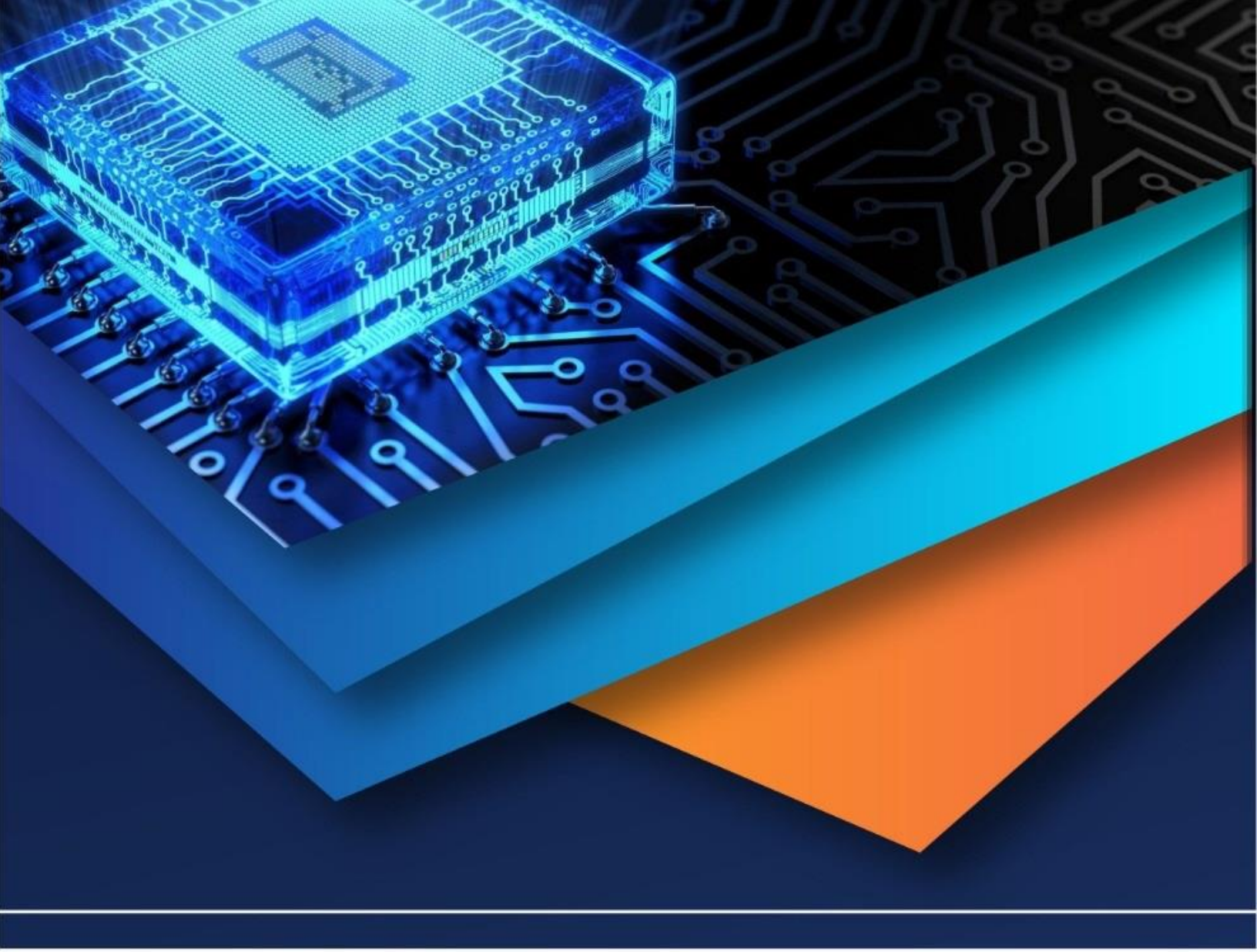
IX. CONCLUSION

After the analysis of the structure with different types of structural systems, it has been concluded that the displacement of the structure decreases after the application of bracing system. The maximum reduction in the lateral displacement occurs after the application of cross bracing system. Bracing system reduces bending moments and shear forces in the columns. The lateral load is transferred to the foundation through axial action. The performance of cross bracing system is better than the other specified bracing systems. Steel bracings can be used to retrofit the existing structure

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