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Research Paper

A PROJECT ON SEISMIC EFFICIENCY OF COMBINATION OF BRACING FOR STEEL BUILDING BY ETABS SOFTWARE

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ABSTRACT Earthquake-resistant structures are structures designed to protect buildings from earthquakes. While no structure can be entirely immune to damage from earthquakes, the goal of earthquake-resistant construction is to erect structures that fare better during seismic activity than their conventional counterparts. According to building codes, earthquake-resistant structures are intended to withstand the largest earthquake of a certain probability that is likely to occur at their location. This means the loss of life should be minimized by preventing collapse of the buildings for rare earthquakes while the loss of the functionality should be limited for more frequent ones. Now a day's steel bracings technique and shear wall systems are generally using for designing of earth quake resistant structure due to simple construction methods, easy to install and they are reduces the deflection and shear in past studies the earth quack resistant structure is designed by using steel bracings or shear wall systems in present study a comparison made between these two systems along with general building in high seismic zone.

In the present study a G+11 story steel building is modeled by using ETABS software and analyzed in response spectrum analysis and the comparison is made between the general building, steel bracings building to design the earth quake resistant structures design. The results like story drift, story shear, story moment, building torsion, time period, and model stiffness were compared for the different building models namely general building, bracings at corner, bracings at center and alternatives bracings locations..

Key words: Earthquake, Pushover analysis, story drift, story shear, story moment, building torsion, time period, model stiffness.

1. INTRODUCTION

In decades ago Steel structure assumes a significant job in the development business. It is important to plan a structure to perform well under seismic burdens. Shear limit of the structure can be expanded by presenting Steel bracings in the basic framework. Bracings can be utilized as retrofit also. For example, D, K, and V type unpredictable bracings. Plan of such structure ought to have great malleability property to perform well under seismic burdens. To assess pliability and different properties for every flighty propping Push over examination is performed.

A straightforward PC based push-over investigation is a procedure for execution based structure of structure systems subject to quake stacking. Push over investigation achieves much significance in the previous decades because of its straightforwardness and the adequacy of the outcomes. The present examination builds up a push-over investigation for various capricious steel edges structured by IS-800 (2007) and pliability conduct of each edge.

Bracing system

A propped edge is a basic framework usually utilized in structures subject to sidelong loads, for example, wind and seismic weight. The individuals in a supported edge are commonly made of auxiliary steel, which can work adequately both in strain and pressure.

The pillars and sections that structure the edge convey vertical burdens, and the propping framework conveys the horizontal burdens. The situating of supports, be that as it may, can be hazardous as they can meddle with the plan of the façade and the situation of openings. Structures receiving innovative or post-innovator styles have reacted to this by communicating propping as an inward or outside plan highlight.

Objectives of the study

The following are the main objectives of the project

1. To study the seismic behavior of building by using IS 1893:2002
2. To design the earth quake resistant structure by using steel bracings in zone V.
3. To study the multi story building of G+11 building under the seismic loading application.s
4. To compare the results of story drift, shear force, bending moment, building torsion of buildings for earth quake resistant buildings.
5. To study the multi story buildings in ETABS

2. LITERATURE REVIEW

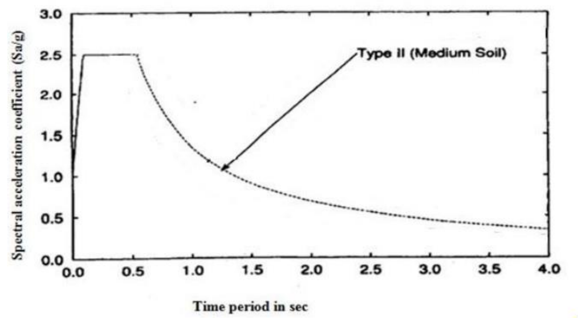
Jayaram Nayak B[1], Kiran Kamath[2], Avinash A R[3] et al.,(2018) The present examination centers around seismic execution of three dimensional propped steel casing structures by shifting stature of bracings in casing structure. investigation is performed utilizing ETABS programming.
From this examination it was inferred that, viewpoint proportion of one demonstrates a superior seismic exhibition when contrasted and rest of the models considered.

Mohd Mubeen[1], Khalid Nayaz Khan[2], Mohammed Idrees Khan[3], et al.,(2015) In this proposition, the nonlinear sucker examination is done for skyscraper steel casing working with various examples of unpredictable propping frameworks. There are n" quantities of conceivable outcomes to organize Steel bracings, for example, Diagonal, X, K, and V, Chevron type offbeat bracings. A normal 10-story steel casing building is broke down for different kinds of unconventional bracings like Diagonal, V, Chevron or Inverted V and Performance of each casing is helped out through nonlinear static examination. From this examination it was presumed that the dislodging of the steel uncovered edge model can be leveled out by Special Moment Resisting Frame, for example, steel supporting as a horizontal burden opposing framework.

3. METHODOLOGY

Response spectrum analysis

The representation of maximum response of idealized single degree freedom system having certain period and damping, during earthquake ground motions. This analysis is carried out according to the code IS 1893-2002 (part1). Here type of soil, seismic zone factor should be entered from IS 1893-2002 (part1). The standard response spectra for type of soil considered is applied to building for the analysis in ETABS 2013 software. Following diagram shows the standard response spectrum for medium soil type and that can be given in the form of time period versus spectral acceleration coefficient (Sa/g).



Response spectrum for medium soil type for 5% damping

4. MODELING OF BUILDING IN ETABS SOFTWARE

Problem statement:

In the present study, analysis of G+ 11 stories building in Zone V seismic zones is carried out in ETABS.

Basic parameters considered for the analysis are

1. Utility of Buildings : Residential Building
2. No of Storey : 12Stories
3. Grade of concrete : M30
4. Grade of Reinforcing steel : Fe250
5. Type of construction : Steel framed structure
6. Dimensions of beam : ISWB400
7. Dimensions of column : ISWB600
8. Thickness of slab : 150mm
9. Height of bottom story : 4m
10. Height of Remaining story : 3m
11. Building height :36.3m
12. Live load : 3.5 KN/m^2
13. Dead load : 2 KN/m^2
14. Density of concrete : 25 KN/m^3
15. Loads considered in Buildings : Dead load, Live load, Floor load Earthquake ,Wind load
16. Seismic Zones : Zone V
17. Site type : II
18. Importance factor : 1
19. Response reduction factor : 5
20. Damping Ratio : 5%
21. Structure class : B
22. Basic wind speed : 44m/s
23. Wind design code : IS 875: 1987 (Part 3)
24. RCC design code : IS 456:2000
25. Steel design code : IS 800: 2007
26. Earth quake design code : IS 1893 : 2002 (Part 1).

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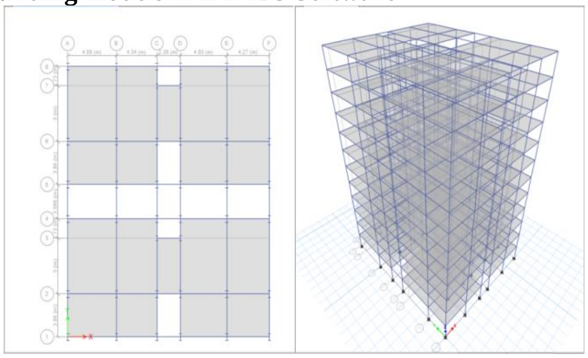
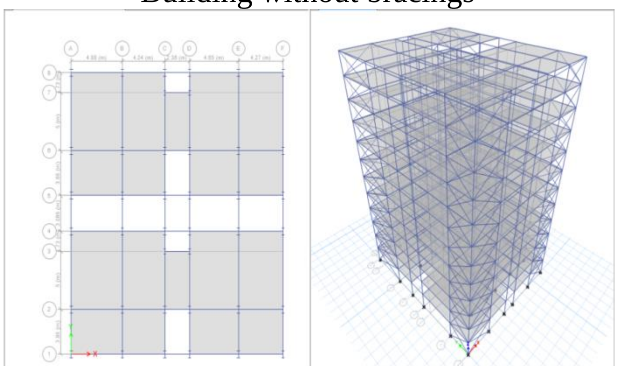
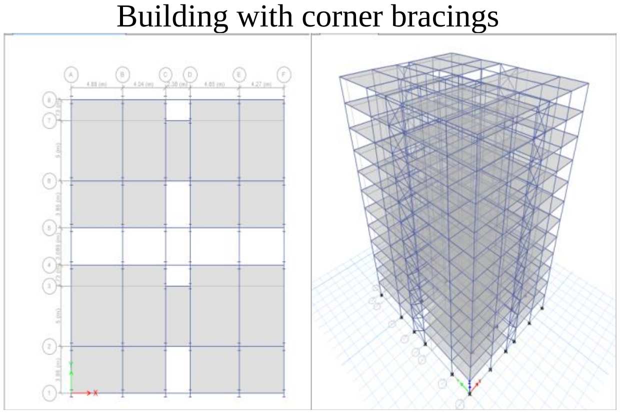
Building models in ETABS Software



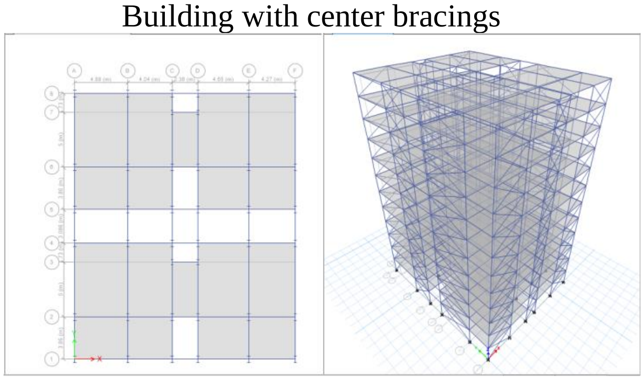
Building without bracings



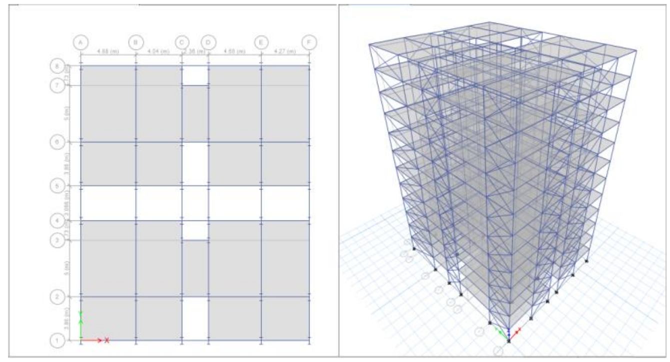
Building with corner bracings



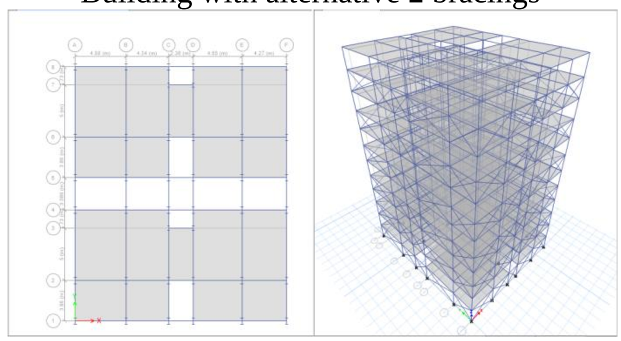
Building with center bracings



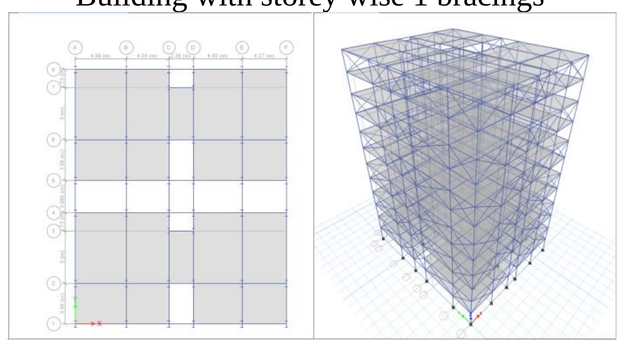
Building with alternative 1 bracings



Building with alternative 2 bracings



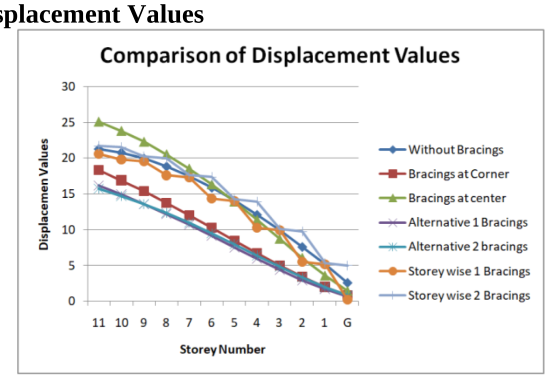
Building with storey wise 1 bracings



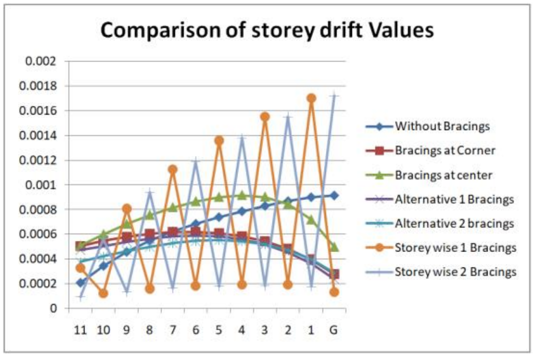
Building with storey wise 2 bracings

5. RESULTS AND ANALYSIS

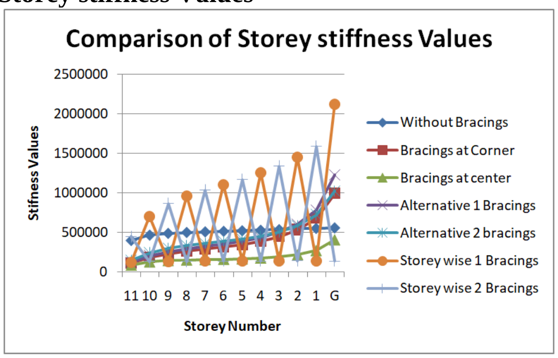
Displacement Values



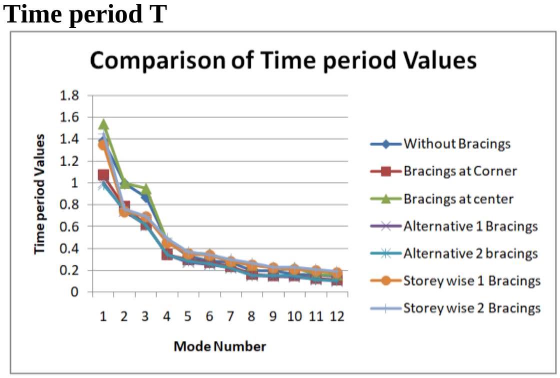
Storey drift Values



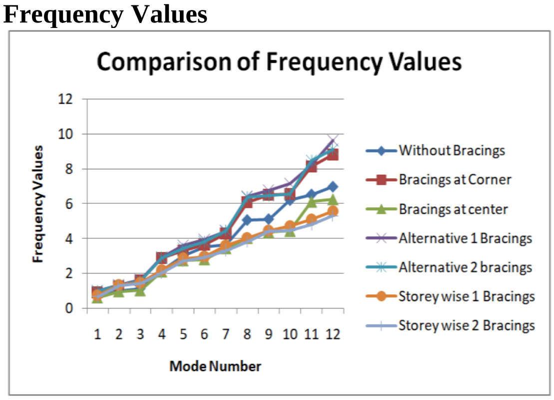
Storey stiffness Values



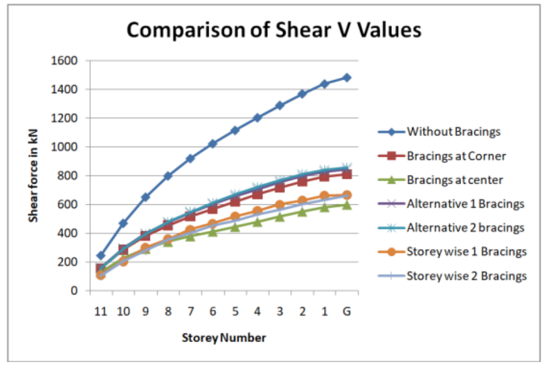
Time period T



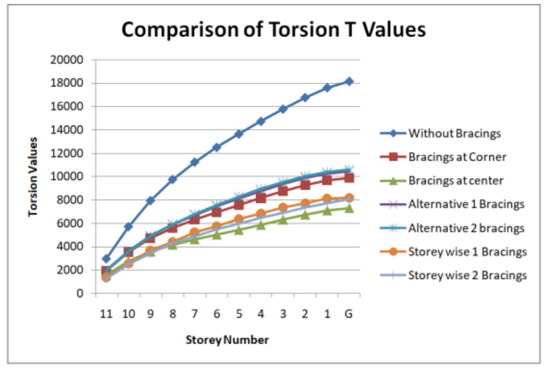
Frequency Values



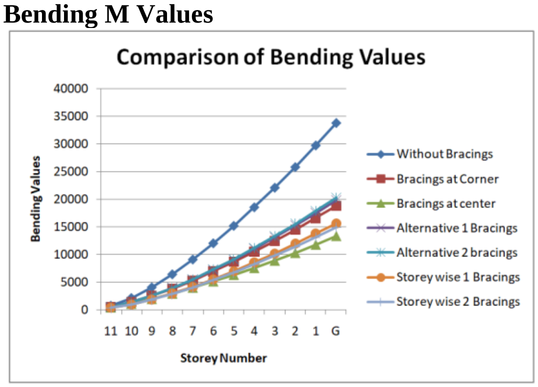
Shear V Values



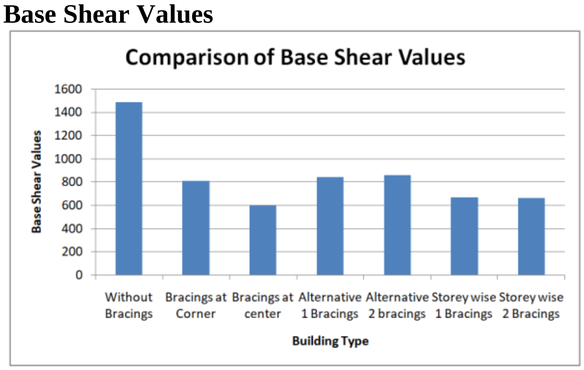
Torsion T Values



Bending M Values



Base Shear Values



6. CONCLUSIONS

From this study the following conclusions were made

1. Steel bracings can be used as an alternative to the other strengthen or retrofitting techniques available as the total weight on the existing building will not change significantly.
2. The location of bracing members has significant effect on the seismic response of the shear-wall frame and braced frame respectively.
3. The alternative locations of brace member are favorable as they are effective in reducing actions induced in frame with less horizontal deflection and drift.
4. Story drift decreases from top story to bottom story the higher value of story drift observed for building with alternative bracings than remaining cases building
5. The maximum value of shear was observed for steel bracings without bracings building than remaining cases
6. The maximum value of story bending was observed for without bracing buildings when we compared with building made with bracings building.
7. The building torsion increases from top story to bottom story 1 the maximum value of building torsion is observed for building without bracings.
8. The value of time period decreases from mode 1 to mode 12 the maximum value of time period was observed for general building.
9. The value of frequency increases from mode 1 to mode 12 the maximum value of time period was observed for bracings building.

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