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.2022.41283

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

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

Comparative Study of Conventional Frame and Diagonally Intersecting Metal with Geometric Irregularities

Manthan I. Shah[1], Vishal B. Patel[2], Snehal V.Mevada[3]
[1, 2, 3]*Structural Engineering Department, Birla Vishvakarma Mahavidhyalaya, Gujrat*

Abstract: ***Compare the performance of Diagrid structural system and chevron braced frame by using Staad pro software. To analyses the stability of structure in seismic zone according to comparison between bending moment diagram, shear force variation.***
The STAAD-PRO software is used to develop 3D rendering model and to carry out the analysis. The lateral load such as earthquake to be applied on the buildings are based on the Indian standards. The study is performed for seismic zone –IV (Delhi) as per IS 1893:2002 (Earthquake load).
Keyword: ***Diagrid Structure, Conventional Frame, Tall Buildings, Lateral loads, Staad Pro.***

I. INTRODUCTION

In today trend population is increased day by day this population space required is insufficient therefore there is need of develop tall building for development of city. Now a days, tall buildings is used for both residential and commercial purpose. For increasing the stability of structure the grid type of frame is usually used.
Diagrid is a form of truss. The structural efficiency of a Diagrid system also avoiding interior and corner column, therefore allowing significant flexibility with the floor plan.
The diagonal member in Diagrid structural system can carry gravity loads as well as lateral forces due to their triangulated configuration.
There are many cases of damage of building from past earthquake all over the world due to their structural simplicity building are particularly vulnerable to damage and can collapse when subjected to earthquake motion. In simple or conventional building, when height of building increases the lateral load resisting system (includes earthquake load and wind load) becomes more important the structural system that resists gravitational load.
The simple buildings as its height increases due to intensity earthquake it experiences or it starts deforming its shape in the form buckling. And it causes the collapse of building .Therefore the response of structures to seismic activity has attracted the attention of engineers due to consequences that accompany the earthquakes. The introduction and improvement of computer technology gave lots of scope for researches and practicing engineers to study the use of earthquake resisting frame technology to reduce the damage.

II. LATERAL LOAD RESISTING SYSTEM ARE

A. Interior Structure
1) Rigid Frames
2) Braced Hinged Frames
3) Shear Wall / Hinged Frames, Shear Wall (or Shear Truss) - Frame Interaction System
4) Outrigger and belt truss Structure

B. Exterior Structure
1) Framed Tube / Braced Tube /Bundled Tube /Tube in Tube Structure
2) Diagrid Structure
3) Space Truss Structures
4) Super frames
5) Exo-skeleton Structure

III. METHEDOLOGY

Diagrid frame system and chevron braced frame system of high rise building means analysis and design of different types of structural models in high rise buildings. Different types of frame provided in high rise building were taken for the study. Diagrid system and chevron braced system in multistorey building are used to resist lateral force due to earthquake load and wind load. In multistorey building height of building frame increases, its overall response to lateral load such as earthquake and wind increase. In this thesis, we compared Diagrid frame with chevron braced frame and conventional frame. For irregular plan,C-Plan and T-plan taken for analysis.

IV. ANALYSIS OF THE DIAGRID MODEL, CHEVRON BRACED AND CONVENTIONAL FRAME

The models of Diagrid frame, chevron braced and conventional frame for C-Type and T-type is analyze by Equivalent static analysis (linear static response method). Analysis has been performed as per IS 1893 (part-1) 2002 for each model using STADD Pro V8i (computer and structures) software. Earthquake Load case calculation according to is code and its distribution along the height of building is done. The seismic weight is calculated using full dead load of structure plus 25% of live load. Different parameters such as stiffness, axial force, drift, shear force and bending moment are studied for all the models. Displacements are found out and inter storey drift.C-1: Diagrid Structure corresponding to an C-Base plan.

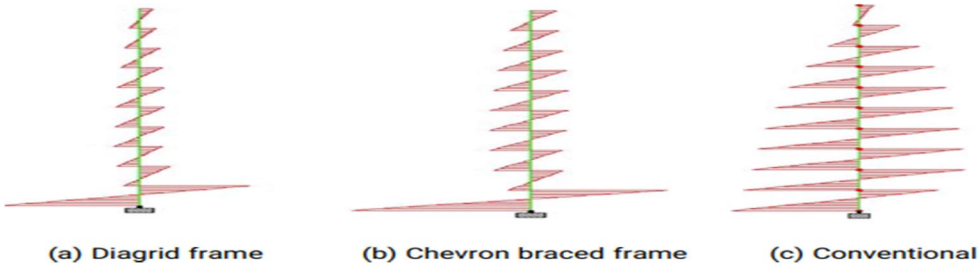


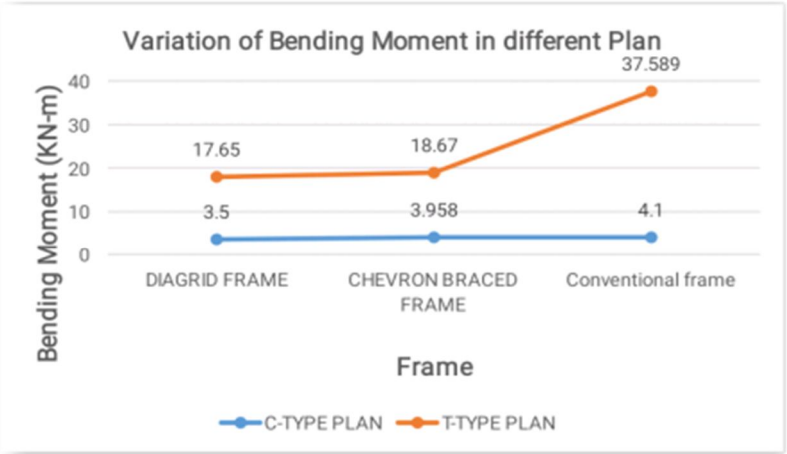
Figure – Bending Moment in Interior Column For C- Plan

Table. Shows Base Shear Calculation By Staad Pro

Plan	C-Type Of Structure			T-Type Of Plan Structure		
	Diagrid frame	Chevron Braced frame	conventional frame	Diagrid frame	Chevron Braced frame	conventional frame
Base Shear	1025.93	1099.86	1111.92	792.5	843.48	864.88

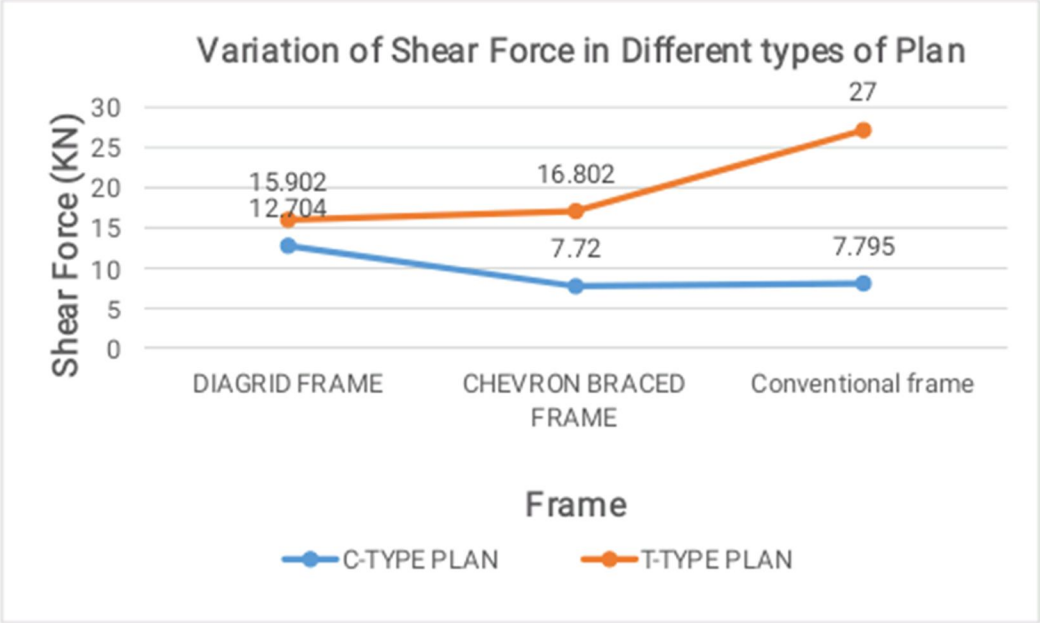
V. BENDING MOMENT IN DIFFERENT FRAME STRUCTURE

The comparasion between bending moment in interior column diagrid building,chevron braced building and conventional building for c type plan and T type planas shown in below figure.



VI. VARIATION OF MAXIMUM SHEAR FORCE IN KN WITH DIFFERENT TYPE OF PLAN

1) In C-Type plan value of shear force is less in conventional frame as compared to chevron braced frame and diagrid frame.
2) In T-Type plan value of shear force is less in diagrid frame as compared to chevron braced frame and conventional frame.



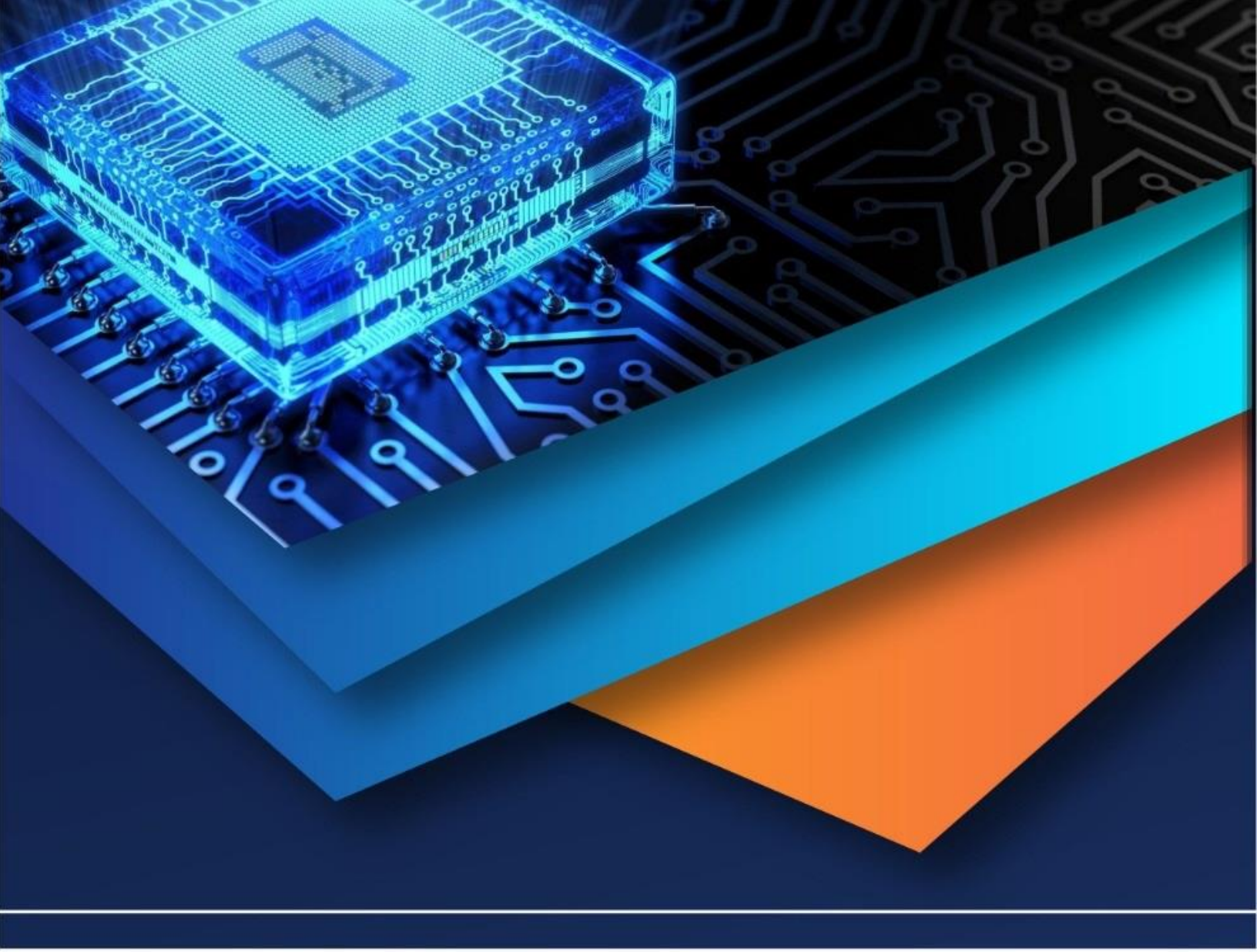
VII. CONCLUSION

In this study the seismic analysis performed on building by using STAAD Software. Initially, the comparison between Diagrid model, chevron braced and conventional model for C-Type and T-Type done separately by using various parameter like shear force, bending moment, axial force, displacement and storey drift. The following observations are drawn from the results obtained through analyses.

1) A significant decrease of bending moment, shear force and axial force in interior column of Diagrid building is found in comparison to conventional building and chevron braced building.
2) Diagrid structure shows less maximum bending moment value than other two structures for both plans.

REFERENCES

[1] K. Moon, "Optimum Grid Geometry of Diagrid Structures for Tall Buildings", Architectural Science Review, Vol. 51.3, 2008.
[2] J. Kim, Young-Ho-Lee, "Seismic Performance Evaluation of Diagrid System Building", 2012.
[3] M.Shah, S. Mevada, V. Patel, "Comparative Study Of Diagrid Structures With Conventional Frame Structures", ISSN:2248-9622,VOL.6, Issue 5,part-2,May 2016.
[4] C. Pattar, Prof. Smt. V. Gokak, "Analysis Of Diagrid With Plan Irregularity", International research journal of Engineering and technology, Vol. 05, Issue 08, 2018.
[5] C. Nayak , S. Walke, and S. Kokare(2020), "Optimal Structural Design of Diagrid Structure for Tall Structure" Springer Nature Singapore Pte Ltd. 2020.V. K. Gunjan et al. (Eds.): ICRRM 2019 – System Reliability, Quality Control, Safety, Maintenance and Management, pp. 263–271, 2020.
[6] Nishith B. Panchal, Dr. V. R. Patel, Dr. I. I. Pandya, "Optimum Angle of Diagrid Structural System' International Journal of Engineering and Technical Research (IJETR) ISSN: 2321-0869, Volume-2, Issue-6, June 2014.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY