iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VIII **Month of publication:** August 2022

DOI: https://doi.org/10.22214/ijraset.2022.46215

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 VIII August 2022- Available at www.ijraset.com

Study the Seismic Behavior of Special Columns in Multi-Story (G+4) Building for Seismic Zone III

Himanshu Krishna[1], Prince Yadav[2]
[1]*MTech Student Structural Engineering,* [2]*Assistant Professor CED, Institute of Engineering & Technology Lucknow*

Abstract: ***Columns are RC building structural elements that are primarily subjected to axial load and moments as they transport them from the superstructure to the substructure. Columns of various shapes and sizes are used. Popular column shapes include square, rectangular, and circular columns, as well as L-shaped, T-shaped, and (+) shaped columns, which are uncommon but provide more interior space than commonly used column shapes. This study aims to examine the seismic performance of multistory G+4 buildings with Rectangular columns and building with specially shaped columns. According to IS Code 1893(part 1):2016, the proposed buildings are analyzed using equivalent static analysis for zone III in soil condition 3. ETABs are used to analyze the models. After analysis, we conclude that buildings having special columns are safer and have more space as compared to the regular shaped column buildings***
Keywords: Special shape column, Multistory buildings, ETABs, IS-CODE 1893(part1):2016, Seismic analysis G+4

I. INTRODUCTION

Structural design is a blend of art and science, and structure behavior is the unspoken emotion of an Engineer with knowledge acumen. It may involve statistical principles, dynamics, material mechanics, and structural analysis to create a safe economic structure that is lasting and serves the desired goal.

A structural engineer's primary responsibility is to ensure the safety of building occupants by replacing traditional construction practices with modified techniques that allow a large population to be accommodated in a given area and large commercial space to be created in a confined area to improve the living environment. It is critical to replace traditional building approaches with modified ones. Buildings, which are often intended for office, institutional, or commercial use, are among the most notable space definitions in the twentieth-century architectural history of urbanization. They are essentially a response to the fast increase of the urban population and the need for economic operations to be as close to one another as feasible.

As per previous work by Preetha Vetc.all. (2020) where they study about the y G+4 multi-storied building composed of RCC columns and two different composite columns viz. Encased column and Infill rectangular tubes are analyzed by using ETABS software. Where they conclude that Story shear and drift reduces to composite columns as compare to RCC column . And the study by Shu Sua ,Xiaodong Lia etc.all; (2018) on A comparative study of environmental performance between CFST and RC columns under combinations of compression and bending where they assessed and compared the EI of columns constructed with two concrete types (CFST and RC) and three cross-sections (circular, rectangular and square) under different combinations of compression and bending. And the study by Vidhya Purushothamanetc. all (2017) where they evaluate the comparison of composite columns with concrete filled steel tube and composite encased I section column. This paper mainly emphasizes on structural behavior of multi-storey building for different plan configurations like Rectangular, C, L and H shape with two different column property and they concluded that building with composite column is more effective against lateral loads.

II. OBJECTIVES

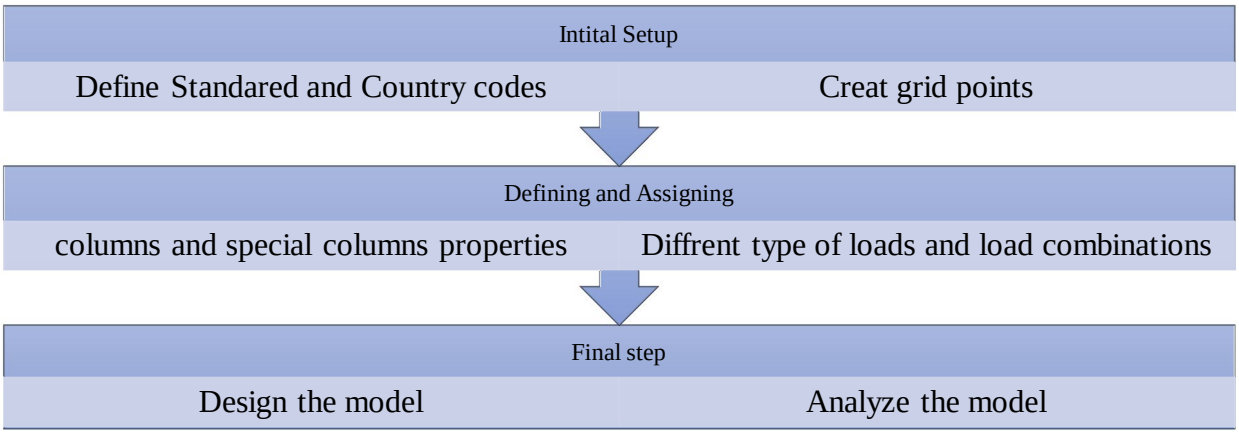
1) To compare the Rectangular columns with special columns in G+4 storey structure
2) To study the behavior of cross (+) Shaped, T shaped, and L shaped column under Seismic forces in zone force
3) To perform static linear analysis on G+4 story building.
4) To evaluate seismic parameters like story displacement, story drift, story shears and story stiffness for proposed structural models.

III. METHODOLOGY

For the present thesis work, modeling and analysis are carried out for rectangular-shaped buildings.

©IJRASET: All Rights are Reserved

Where we modeled two buildings one is with a regular rectangular RC column whereas the other one had special columns i.e. L-Shaped columns at a corner Crossed (+) Shaped columns at the center of the building and T-Shaped columns at the boundary of the model as shown in the fig. 2. For achieving the goals, we use ETABs as software and in ETABs we used the following steps as mentioned below.



Building Parameters

Area of building	15*20 m^2
Height of building	12m
Shape of building	Rectangular
Seismic zone	III
Seismic Zone factor	0.160
Silt type	II
Importance Factor, I	1.2
R	5
IS Codes adopt for research	IS: 1893:2016 (part1), IS 456:200, IS 875
Size of beam	250*500 mm^2
Height of Parapet Wall	1.0m

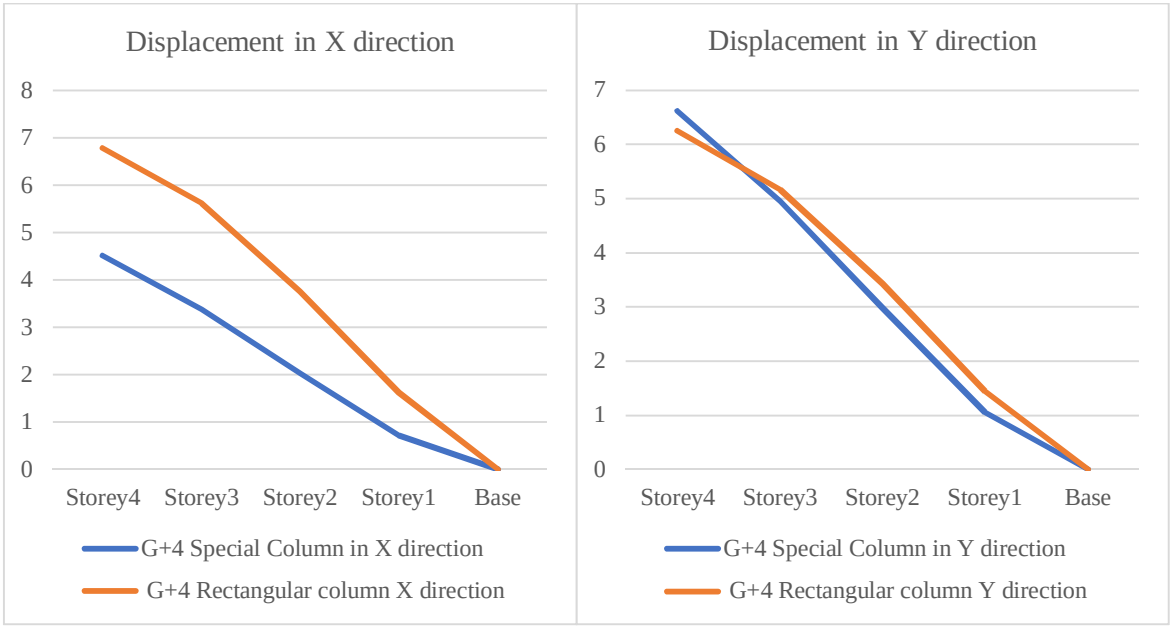
Shape of Columns	**Size**
L Shaped	550*500*250
T shaped	550*550*250
+ shape	600*600*250

Regular shaped Columns	Size
C1	400*400
C2	500*500

IV. RESULTS

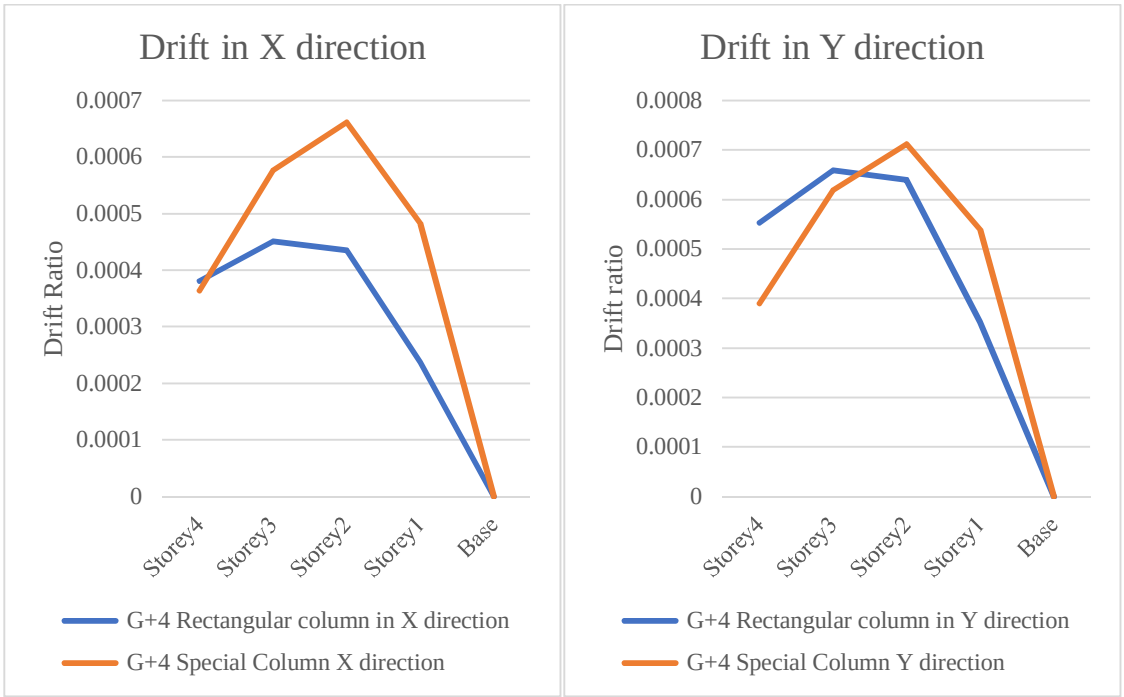
A. Story Displacement

The lateral displacement of the tale relative to the base is referred to as story displacement. The lateral force-resisting system can reduce the building's excessive lateral displacement. We calculate displacement with square shape column and special shape columns in building and here observed that building with special shape coulomb had minimum displacement than the Square column in both X and Y direction



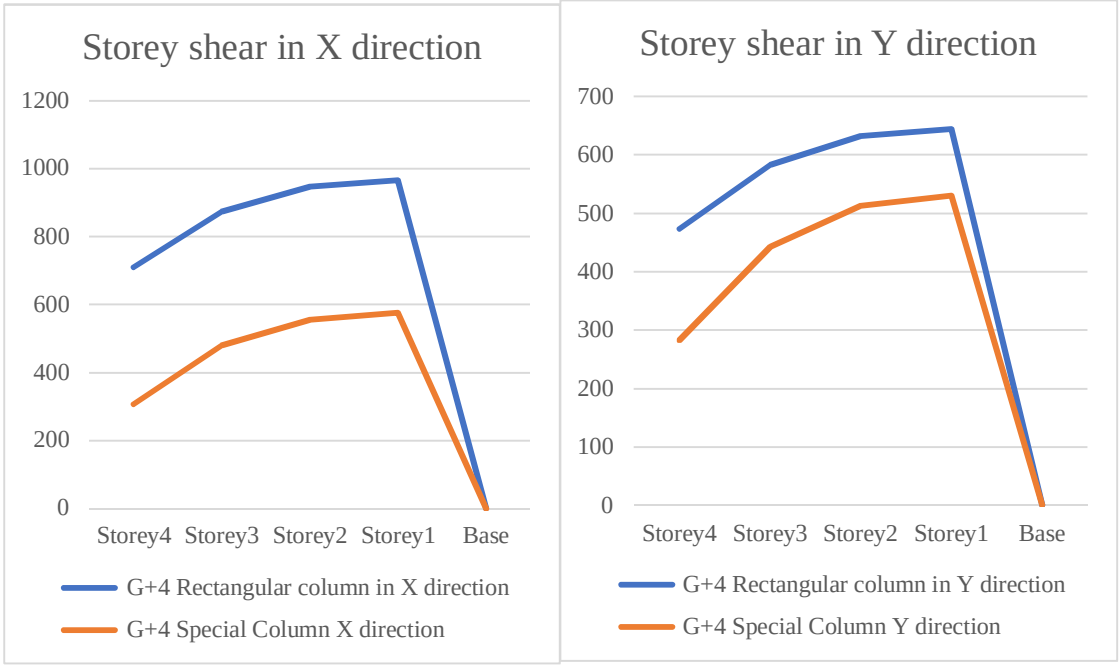
B. Story Drift

The plot of the resultant drifts per level, on the other hand, is known as story drift. Drift is a unit less number obtained by dividing the relative lateral displacement by the story height, and it indicates how far a story is moved by a given weight. Here we observe that Drift in the Special column is minimum in comparison with the Regular column and it is observed that for the 8th story it is maximum as compared to other storey.



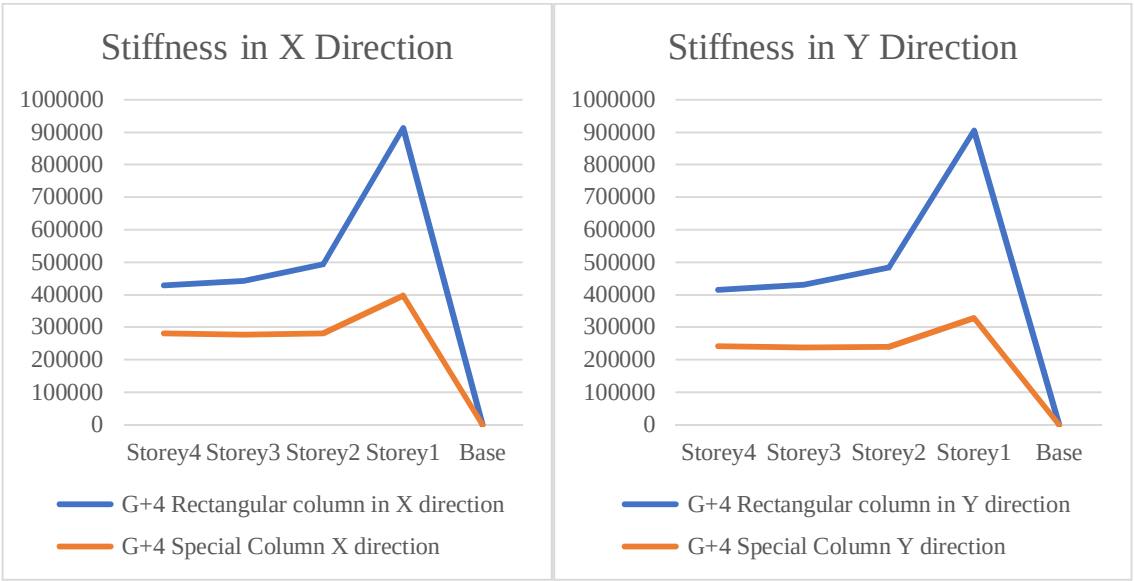
C. Story Shear

It is the lateral force acting on a storey due to the forces such as seismic and wind force. It is calculated for each storey, changes from minimum at the top to maximum at the bottom of the building. The graph of story shear shows how much lateral load, i.e. seismic, is acting per storey.



D. Story stiffness

As long as we're talking about the elastic response, narrative stiffness is independent of the sort of load (Linear Static)



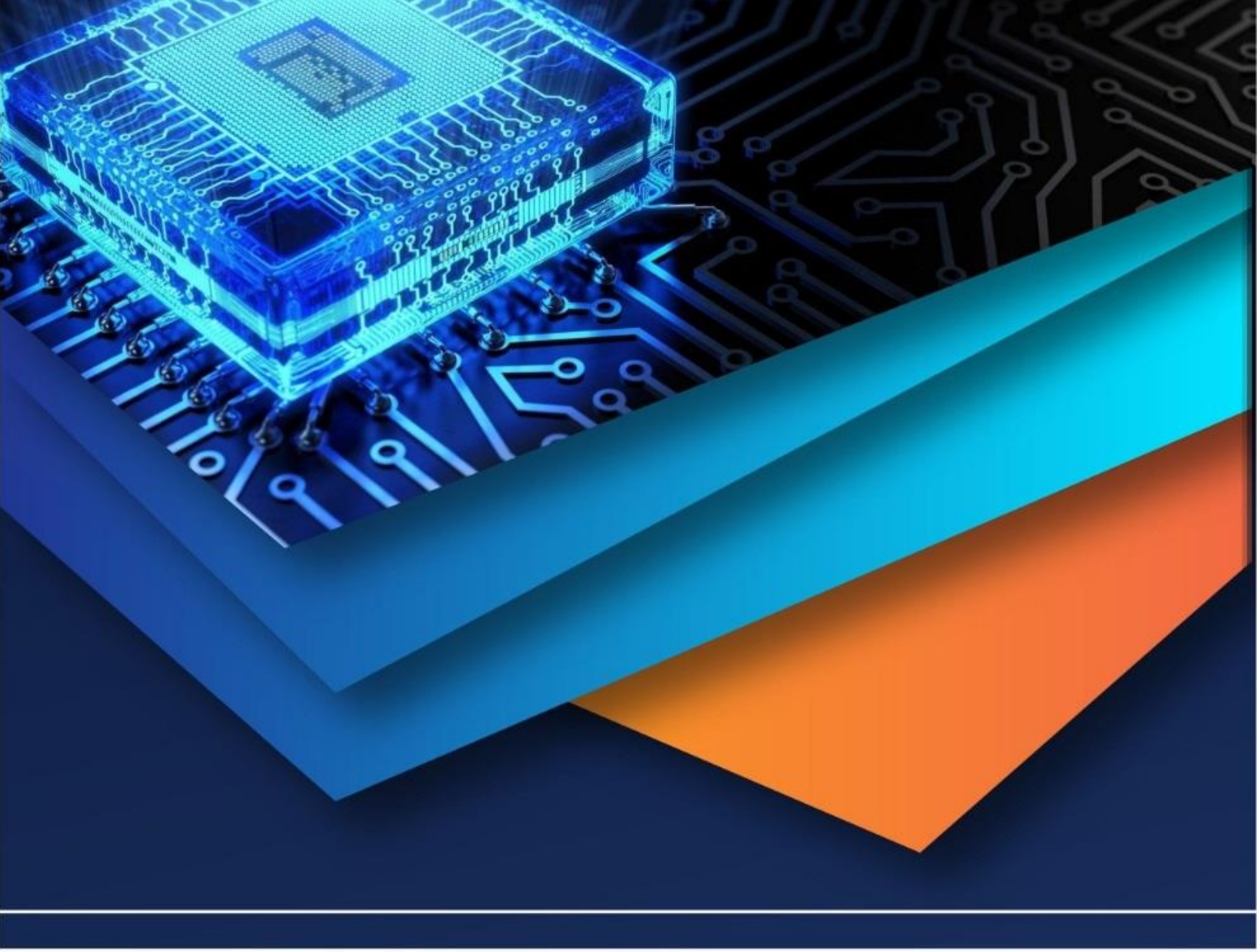
V. CONCLUSION

1) Observed that building with special columns shows minimum deflections, drift, shear forces as compare to regular column building.
2) Also, it seen that building had special columns shows maximum stiffness then regular column building
3) After analysis it is observed that building with special column is safer than building with regular Columns.
4) Carpet Area is also increased in building having special columns.

©IJRASET: All Rights are Reserved

REFERENCES

[1] Faizulla Z Shariff , Suma Devi " Comparative Study on RCC and CFT Multi-Storeyed Buildings"; International Research Journal of Engineering and Technology Volume: 02Issue: 03 June-2015
[2] S.Varadharajan, V.K. Sehgal, B.Saini "Review of different Structural irregularities in buildings" Journal of Structural Engineering,Vol. 39, No. 5, December 2012 - January 2013
[3] Shilpa Sara Kurian, Dinu Paulose, Sreepriyamohan" Study On Concrete Filled SteelTube";IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, PP 25-33 -2016
[4] Prof. M.R.Wakchaure,AnantwadShirish,RohitNikam "study of plan irregularity on high-rise structures";international journal of innovative research anddevelopment,www.ijird.com Vol 1 Issue 8 October, 2012
[5] Abhay Guleria "Structural Analysis of a Multi-Storeyed Building using ETABS for different.
[6] Plan Configurations" International Journal of Engineering Research & Technology (IJERT)ISSN: 2278-0181 IJERTV3IS051552 www.ijert.org Vol. 3 Issue 5, May 14
[7] Vidhya Purushothaman, Archana Sukumaran "Comparative Study on Seismic Analysis of Multi Storied Buildings with Composite Columns" International Journal of Engineering Research & Technology (IJERT)



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)