iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** IV **Month of publication:** April 2023

DOI: https://doi.org/10.22214/ijraset.2023.50355

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

Research Paper on ROTUNDA

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***Abstract:** This Paperwork focuses on the comparison of seismic analysis of Modern office building design. The performance of the building is analyzed in Zone II, Zone III, Zone IV, and Zone V. The study includes understanding the main consideration factor that leads the structure to perform poorly during the earthquake for humans. Provision of shear walls are installed is installed to enhance the lateral stiffness, ductility, minimum lateral displacements, and structure safety to enhance the lateral stiffness, ductility, minimum lateral displacements, and safety of the structure. Storey drift and lateral displacements are the critical issues in seismic design of buildings. Due to the Industrial revolution, availability of jobs and facilities, population from rural area is migrating towards cities. Because of this metro cities are very thickly populated. Availability of land goes on decreasing and land cost also increases. To overcome this problem the use of multistoried buildings is necessary. But such provisions increase self-weight and live load along with earthquake forces. With increase in height stress, strain, deformation and displacement in the structure, the cost of construction increases due to increased cross-sections of the elements. Multi-Storey buildings are designed to carry gravity loads, earthquake loads and their combinations. I.S. codes provide these loading combinations for which structure needs to be analyzed and designed. The analysis is aimed at finding the internal forces in component of structures and to find displacements developed in the structure leading to the development of strains. Structure must be safe from both strength viewpoint and serviceability as well. While vertical forces are most significant, the primary problem for most structures is force in the horizontal or lateral direction, which tends to subject buildings to large horizontal distortion. Therefore, most buildings are designed with lateral-force-resisting systems to resist the effects of earthquake forces. Bare frames are found to be more flexible and have large section requirement to with stand forces induced.*
***Keywords:** Multistorey Building, STAAD PRO, I.S CODES, Building software*

I. INTRODUCTION

Lateral forces on buildings such as wind, earthquake and blast forces can produce critical stresses in the buildings that causes excessive lateral sway of the buildings and undesirable stresses and vibrations in the buildings. Design and structural evaluation of the building systems subjected to lateral loads form the important task of the present generation and the designers are faced with problems of providing adequate strength and stability of buildings against lateral loads. Different lateral loads resisting systems are used in high-rise buildings as the lateral loads due to earthquakes are a matter of concern. Steel plate shear walls systems are used in steel structures buildings and their effect shows unequal variations and behavior against seismic loads. Recently, laminated composite plate shear walls are used as a lateral load resisting system where the laminated composite plates are used as infill plate in shear walls. The laminated composite plates are made by constructing plates of two or more thin bonded layers of materials and can be cross-ply or angle-ply laminates. Importance of Multistoried Building The tallness of a building is relative and cannot be defined in absolute terms either in relation to height or the number of stories. But, from a structural engineer's point of view the tall building or multi-storied building can be defined as one that, by virtue of its height, is affected by lateral forces due to wind or earthquake or both to an extent that they play a key role in the structural design. Tall structures have fascinated humanity from the beginning of civilization. The Egyptian Pyramids, one among the seven wonders of world, constructed in 2600 B.C. are among such ancient tall structures. Such structures were constructed for defense and to show pride of the population in their civilization. The development of the high-rise building has followed the growth of the city closely. The process of urbanization that started with the age of industrialization is still in progress in developing countries like India. Industrialization causes migration of people to urban centers where job opportunities are significant. The land available for buildings to accommodate this migration is becoming scarce, resulting in rapid increase in the cost of land. Thus, developers have looked to the sky to make their profits. The result is multistoried buildings, as they provide a large floor area in a small area of land in urban centers.

When it comes to designing modern office buildings using STAAD Pro V8i, there are several factors to consider. These may include:

1) *Building Codes and Regulations:* The software should be able to comply with the latest building codes and regulations to ensure that the design is safe and meets the required standards.

2) *Building Height and Size:* The software should be able to handle large and tall buildings, which are common in modern office building design.
3) *Structural Materials*: The software should be able to handle several types of structural materials, such as concrete, steel, and wood, which are commonly used in modern office building construction.
4) *Sustainability:* Modern office building designs often prioritize sustainability and energy efficiency. The software should be able to incorporate sustainable design principles into the building design.
5) *Collaboration:* STAAD Pro V8i allows engineers to work collaboratively on a project. This feature is useful for modern office building design, as it often involves multiple stakeholders.

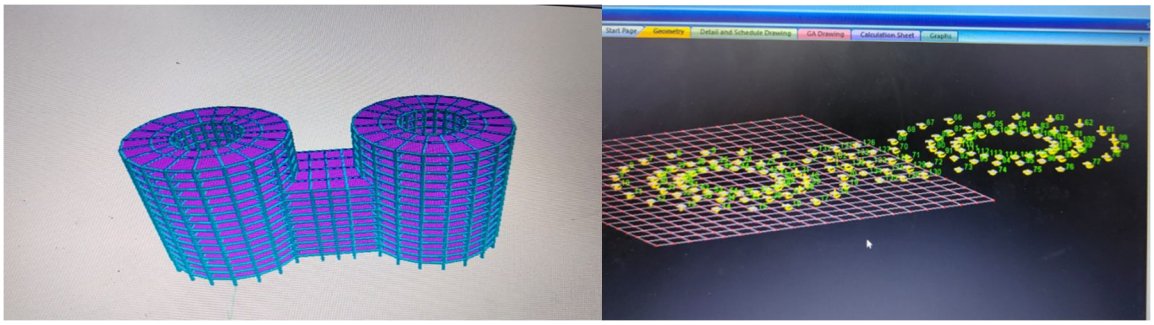
II. METHODOLOGY

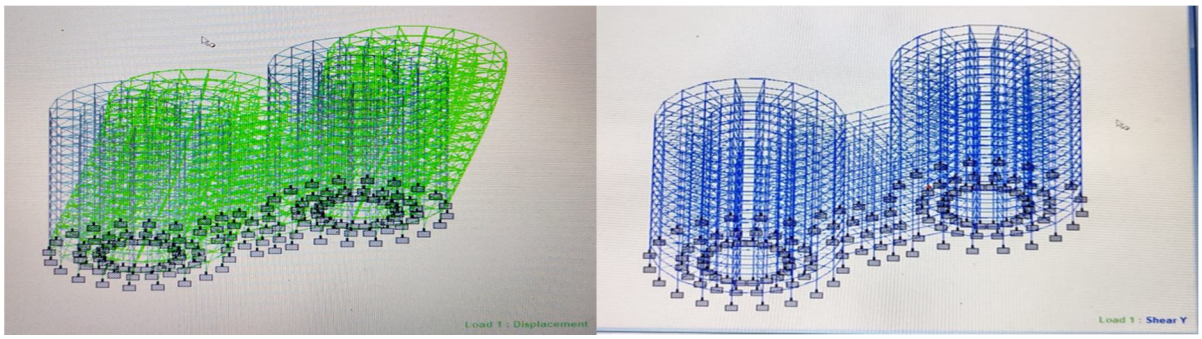
Complete designing work is done manually, and modelling is done on STAAD PRO, then the cases taken with respect to different loading types are then solved and the result will guide the whole work to the result and conclusion section.

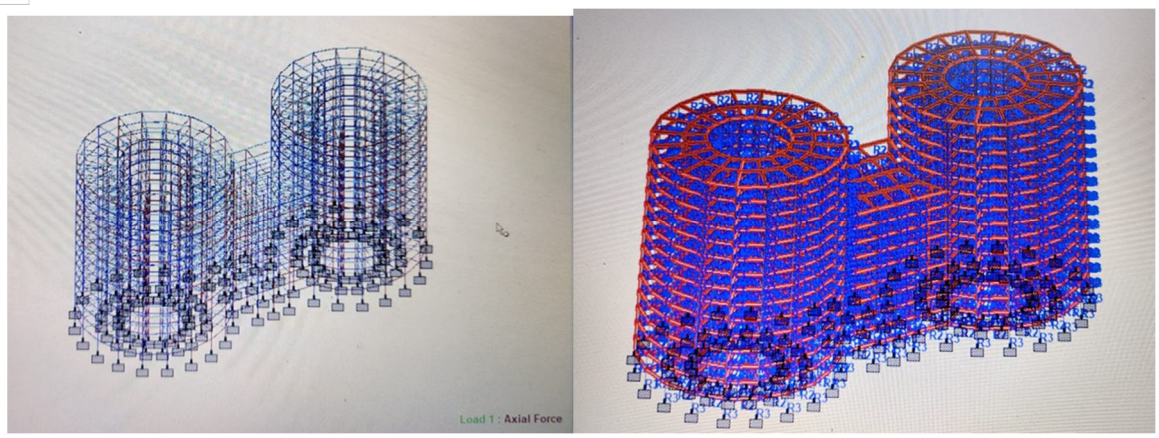
Loads on Buildings There are several types of loads acting on the building, but there are two types of loads, which a structure must support.

1) *Gravity load:* These act vertically downward and can be further divided into 'Dead Load' and 'Live Load'. Dead load consists of the weight of the structure itself including the frame, walls, plaster, flooring, waterproofing, fixed furniture etc. Live load constitutes the transient loads such as the weight of people, movable furniture, furnishings, domestic equipment etc.
2) *Lateral loads:* These act horizontally on the building. The most common lateral loads are wind load and earthquake load. These are occasional loads and may act in any direction.

Type of structure: multi-Storey frame models
Radius of circle: 18m,12m,6m
Angle: 360 Deg.
No. of bays along periphery: 20
Distance between two circular building: 14m
Default step spacing: 3m
Beam 500mm (about 1.64 ft) x 500mm (for all beams)
Column 600mm x 600mm (for all column)
Plate thickness 0.150m
Seismic zone V
Materials Concrete (M 40) and Reinforcement (Fe600).







III. CONCLUSION

The circular or cylindrical shape is symmetrical whereas a square has 4 axes of symmetry, and a rectangle has 2 axes of symmetry so circular column will have the same moment of inertia at all axes to avoid buckling failure.

The rectangular or square column has four weak points (corner edge), but the circular is in the shape of a cylinder, so there are no weak points.

The circular column is strong in compression compared to the square column in the same cross-sectional area.

Circular column occupies a smaller area, if you construct a circular column having the same diameter as a square column side length the circular column holds only 0.785 times of the square column area.

Using STAAD Pro. the analysis of multi-Storey building has been completed much quicker when compared with manual analysis.

The reinforcement percentage in the sections is more in the case of software design compared to manual calculations.

Designing using Software like STAAD reduces a lot of time in design work.

Reinforcement Details of each member can be obtained using STAAD pro.

All the List of failed frame sections can be Obtained in the report given by STAAD Pro so that we can change the property data for a better section.

Shear variation and moment variation of section can be observed clearly on the building

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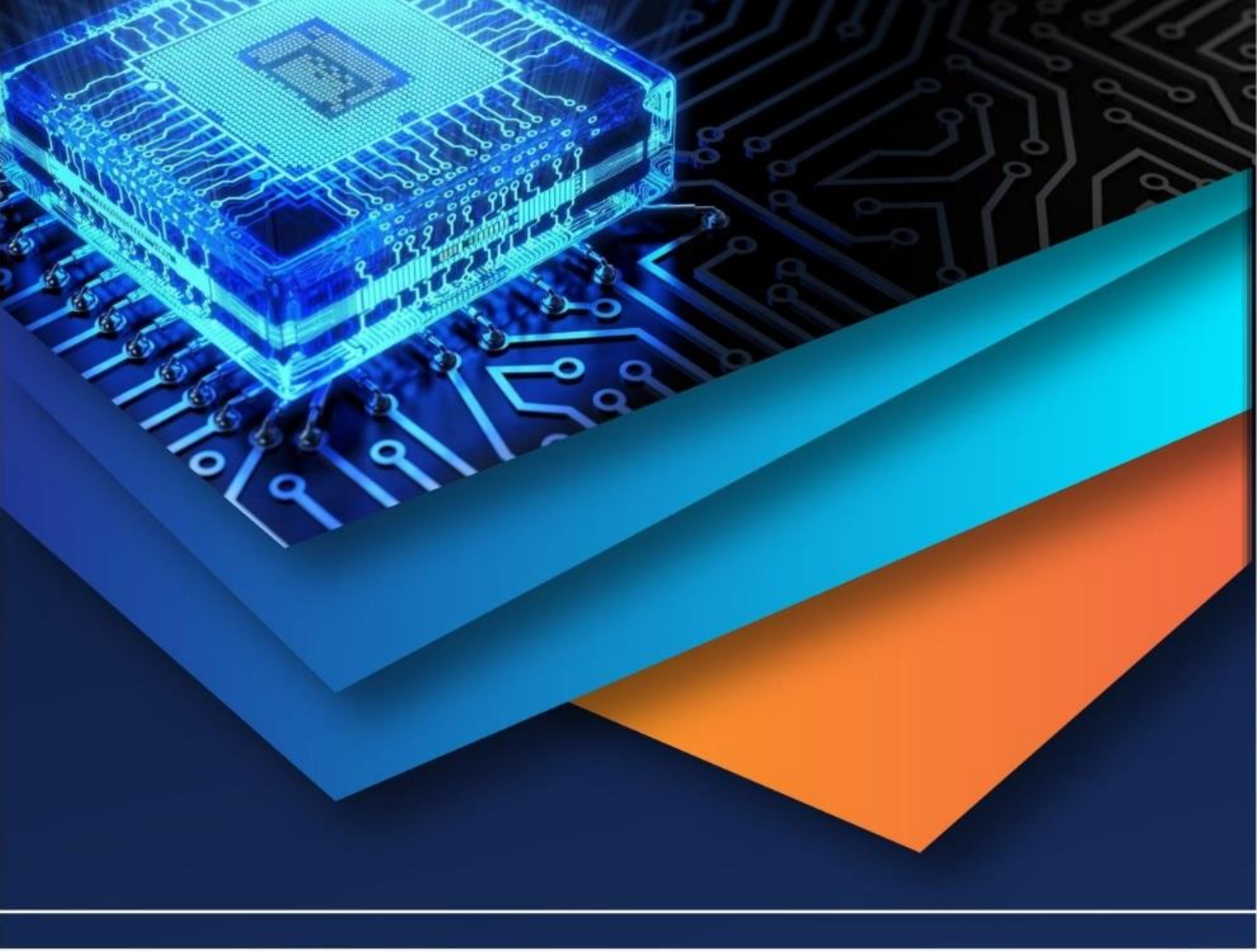

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