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Investigate the Natural Time Period, Base Shear, Displacement, Story Drift, Story Stiffness by Etabs and Staad Pro

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ABSTRACT

The development of structural systems for G+19 buildings has focused on the present .This present study attempts to demonstrate the functionality of a building using conventional and diagrid systems. The structure under inquiry has been constructed in accordance with 1893:2016 and is a G+19 reinforced concrete frame. To look at this, natural time history analysis, storey drift, storey displacement, base shear and stiffness of each floor has been performed by Etabs and Staad pro software.

KEYWORDS: *Stiffness, Base Shear, Storey Drift, Etabs, Staad pro, software*

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INTRODUCTION

The corner-to-corner element of the diagrid underlying framework, which is used in the construction of structures and rooftops, can be described as a system produced by the crossing points of different materials like metals, concrete, or wooden pillars. The steel workers' diagrid designs are skilled at providing solutions in terms of both strength and solidity. However, diagrid is now used widely, especially in large ranges and tall constructions with intricate calculations and curved designs.

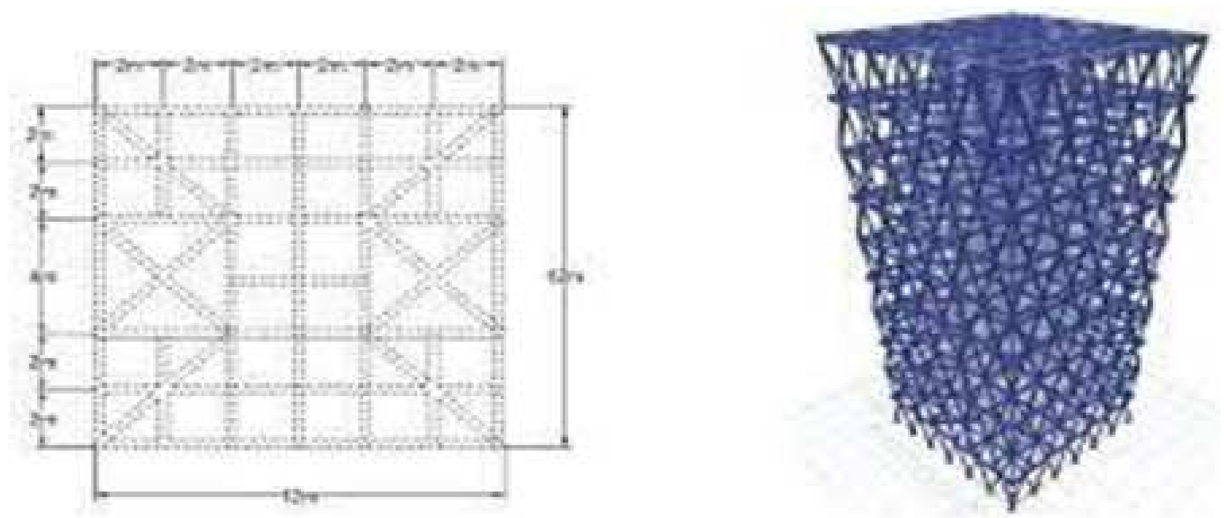

Fig. 1 Square-shaped building with a diagrid structure

DIAGRID STRUCTURAL SYSTEM MODULE GEOMETRY

Diagrid Optimal Angle

Shear and second are transmitted by the diagonal membrane from the diagrid. The height of the building determines where the diagonals should be placed. The best angle for the segments in a typical construction to have the highest twisting rigidity is 90 degrees, while the ideal angle for the diagonals to have shear, rigid nature is 35 degrees. The optimal point of the diagrid is anticipated to be halfway between the two. The received reach is typically between 60 and 70 degrees. The optimal point also increases as the structure's height increases.

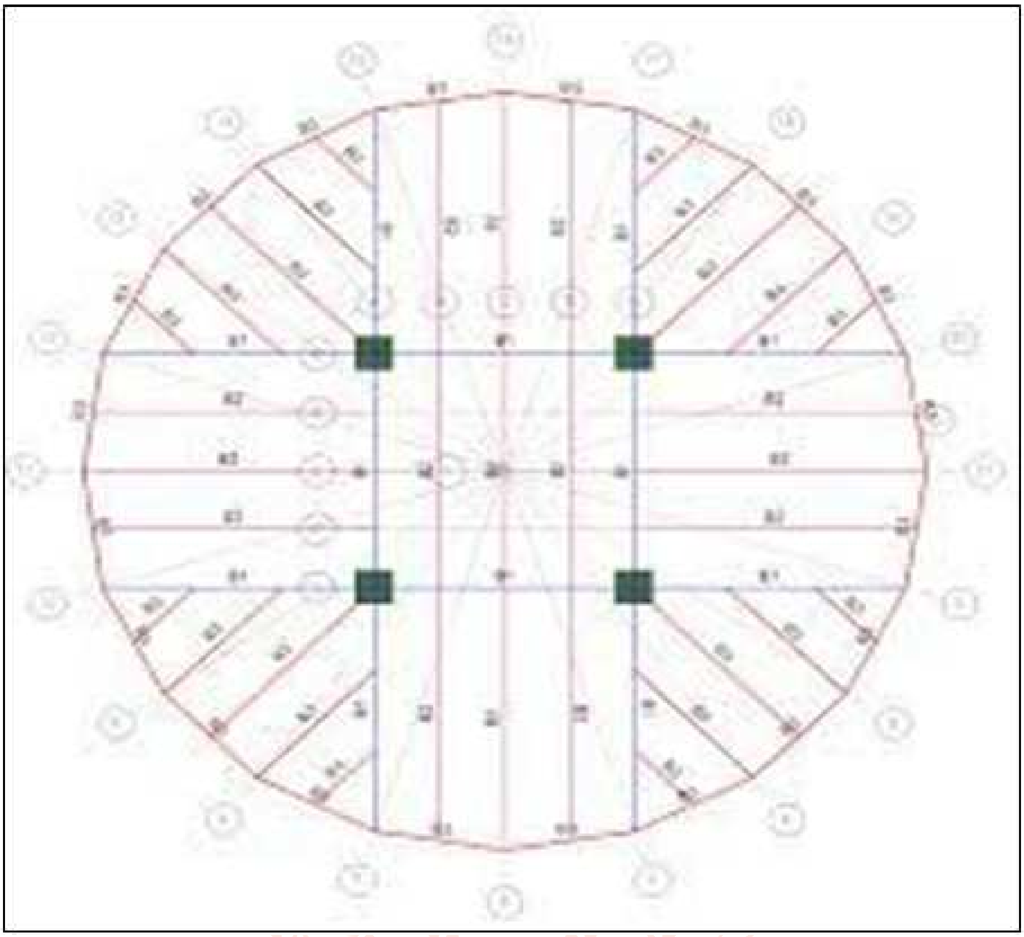

Fig 2 Diagrid's ideal representation

OBJECTIVES OF THE PRESENT WORKS

- To determine the natural time period, base shear, displacement, story drift, story stiffness by Etabs and Staad pro.
- To investigate how buildings behave during earthquakes using regular plans in accordance with IS 1893:2016 comparisons to Etabs and Staad pro.
- To assess the performance of a conventional system and diagrid configuration.
- Based on the results found by both the software also find % variation in natural time period, base shear, displacement, story drift, story stiffness by Etabs and Staad pro.

LITERATURE REVIEW

Rai and Sakalle (2017) contributed that the steel diagrid structure at an exterior portion of the construction at a 60-degree angle to the given exploration. Having an internal center made of R.C.C. segments and a R.C.C. shaft, the section was examined in detail and put up against a typical substantial construction. When compared to the standard structure framework's bending of vertical segments, the diagrid structure's inclining person transferred the sidelong loads by hub activity. A typical eleven-story RCC in seismic zones V and III is being examined for examination. It has an arrangement size of 16 m 16 m. STAAD. Pro programming is used for primary display and exploration. According to IS 1893, the seismic zone was taken into account. According to the conclusions drawn from this experiment, the diagrid structure was all the more successfully resistant to sidelong stress because of the corner-to-corner segments at the external outskirts of the buildings. Due to this characteristic of diagrid structures, the inside segment was used for gravity load obstruction and only a small amount of horizontal weight was taken into consideration. While in a typical casing structure, the horizontal load and gravity were constrained by the outside and inside segments. The following points were drawn from a previous inquiry on diagrid structure, and the analysis demonstrates that diagrid structure decreases bowing second, which in turn decreases support requirement. It also demonstrates how the use of diagrids can reduce parallel uprooting in tall structures. Having an internal center made of R.C.C. segments and a R.C.C. shaft, the section was examined in detail and put up against a typical substantial construction. When compared to the standard structure framework's bending of vertical segments, the diagrid structure's inclining person transferred the sidelong loads by hub activity. A typical eleven-story RCC in seismic zones V and III is being examined for examination. It has an arrangement size of 16 m 16 m. STAAD. Pro programming is used for primary display and exploration. According to IS 1893, the seismic zone was taken into account. According to the conclusions drawn from this experiment, the diagrid structure was all the more successfully resistant to sidelong stress because of the corner-to-corner segments at the external outskirts of the buildings. Due to this characteristic of diagrid structures, the inside segment was used for gravity load obstruction and only a small amount of horizontal weight was taken into consideration. While in a typical casing structure, the horizontal load and gravity were constrained by the outside and inside segments. The following points were drawn from a previous inquiry on diagrid structure, and the analysis demonstrates that diagrid structure decreases bowing second, which in turn decreases support requirement. It also demonstrates how the use of diagrids can reduce parallel uprooting in tall structures.

Ipe and Isaac (2017) The purpose of this paper was to examine and consider how Diagrid, Octa grid, and Hexa grid structures with variable askew points and shifted module thickness under unique stacking are presented. It also sought to identify the underlying framework that demonstrates the most unpopular narrative uprooting and float, the ideal range of the corner-to-corner point having better solidity, and the relationship between the time-frame and parallel firmness. To choose the most conservative option among the models, consider the material cost and underlying weight of each structure model.

The findings implied that each model taken into consideration here had satisfied the IS 1893 cutoff standards for relocation and tale float (II). Lower uprooting, story float, story shear, time span, and structural weight are displayed in a diagrid with 4 story modules. Boundaries indicated that this module size has been transcended. One may therefore conclude that a Diagrid with four story modules and an inclining point of 67.38 degrees was the best model in terms of awesomeness, competence, and utility. As module thickness is decreased, the principal presentation of the underlying Hexa grid and Octa grid frameworks deteriorates. All variants, with the exception of the low module thickness Hexa grid 12m module and Octa grid 12m module, can be viewed as a useful and effective alternative to the exterior supporting steel structures. Greater flexibility in arranging the interior space and veneer of the structure is provided by the Diagrid primary framework.

The underlying principles of three models of 60-story buildings are presented in this paper by Pattan **Venkatesh et al. (2018).** These three buildings are the conventional unbending outlined structure with a rectangular arrangement and plan measurements of 24 m x 24 m, the diagrid working with a rectangular arrangement and plan measurements of 24 m x 24 m, and the diagrid working with a roundabout arrangement and plan measurements of 24 m x 24 m. Using ETABS programming, demonstrating and analysis for all the aforementioned structures were completed for gravity, earthquake, and wind loads. For the plan of the underlying persons, IS 800:2007 was used. Utilizing the boundaries such as base shear, story dislodging, time spans, primary weight, and narrative float, each of the three models was studied and analyzed.

Case Study

Loading Condition

All loading is done in accordance to Indian Standards.(IS-456-2000)

Load Combination

1) 1.5 (DL + LL)
2) 1.2 (DL + LL ± EL)
3) 1.5 (DL ± EL)
4) 0.9DL ± 1.5EL

Live load – 4kN/m2 as per IS-875(Part- 2)Seismic Load

Table 1. Seismic Load

Zone Factor	0.36 (V)
Importance Factor	1.5
Response Reduction Factor	5
Soil Type	III

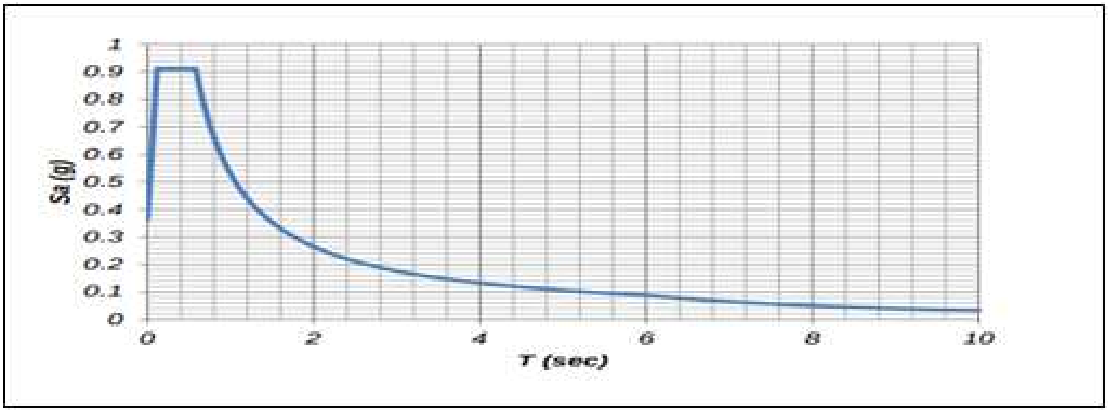

Fig 3.3 Seismic Capacity

Conclusions

1. It is also observed that the displacement is 3.98% more as per STAAD compared with ETAB for G+19 conventional building, however it is 32.09% approximately decreasing for diagrid structure.
2. Furthermore it is observed that the stiffness of the floor is 89.64% less as per STAAD compared with ETAB for G+19 conventional building, however it is 89.78% decreasing for diarid structure.
3. Results show that the base shear is 88.56% more as per STAAD compared with ETAB for G+19 conventional building; however it is 67.5% approximately increasing for diarid structure.

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