Comparative Study of Hexagrid with Conventional Structure By Using STAAD Pro.

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Abstract- *High rise buildings are very common these days because of the efficiency use of location is justified. The study is about honeycombed system which also known as the hexagrid structural system used in tall structure construction. This paper deals with the technique and its effect on the normal conventional type structure. The response, mode shapes and forces of the building with the earthquake and lateral forces such as wind forces have been studied. The comparative analysis is done by using software based results. In this project a hexagrid structure and conventional structure building is considered. Both buildings are same in area and provided with same no. columns. The buildings considered are G+10 with 3.3m difference within the floor. Both the buildings are analyzed in STAAD Pro V8i. software. Important parameters such as seismic and wind forces are applied. According to analysis done, different parameters such as base shear, story drift, modal mass participation factors etc. are checked and compared.*

Keywords- Hexagrid Structure, wind analysis , conventional structure

I. INTRODUCTION

High rise building structure construction have grown in large number recently. Due to less availability of area and plots . Multi storey building are more effective utilise the space rather than small height building. As the height of building increases, it exposes to various forces which are dominant in lateral. Such forces are wind and seismic which tremendously effect the life of the building. Thus the high risebuilding are to be improved for such parameters and hence hexagrid structure is introduced.

Honeycomb structure is a type of structure which achieves both the goals and also by increasing the strength increases the aesthetic appearance of the structure found to be environment friendly.

As the height increases, the wind forces begin to dominate. Therefore, structural framework for high rise buildings is developed around concepts associated with seismic and wind forces subjected to it at top level.

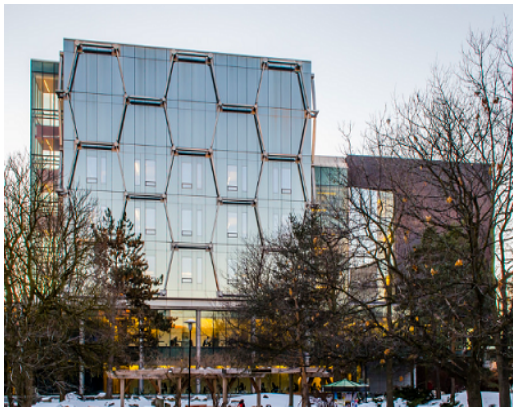

Figure 1. Quantum Nano centre, Canada

II. OBJECTIVE

1. The objective of the project is to check the wind analysis & earthquake analysis of hexagrid structure with respect to the conventional type structure. Determining the following parameters between conventional and hexagrid structure.

- Modal mass participation factor.
- Base shear.
- Axial force in column.
- Bending moment in beams.
- Shear forces in beams

III. METHODOLOGY

Methodology of this project consists of a conventional type structure with biometric hexagrid structure by using the software STAAD pro.

Creating model of below mentioned architectural drawing in STAAD pro V8i.

- Providing property of the members.
- Applying loads on member according to IS 875:1987
- Details of parameters for wind analysis.
- Analysis of structure using STAAD pro V8i.
- Obtaining results and comparing the results with manual calculations.

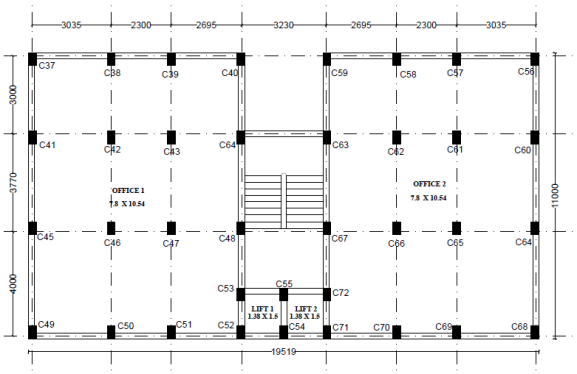

Figure 2. Architectural Plan

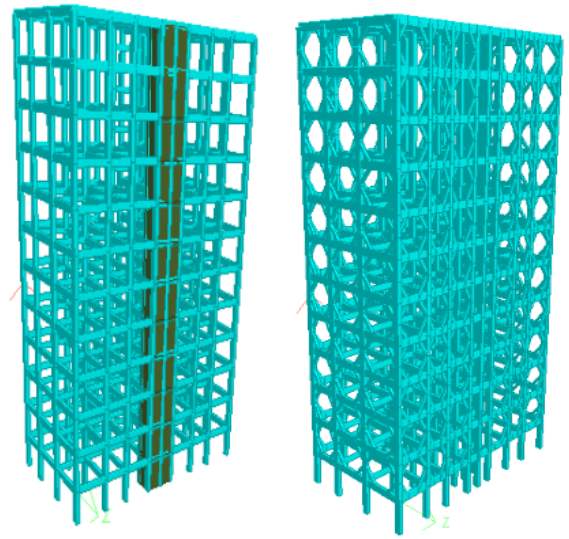

Figure 3. D Model in STAAD of Conventional Structure with Shear Wall & Hexagrid structure.

IV. LOADING

I. Live load (Imposed load)

As per IS 875:1987 Part2 . Imposed floor load on any residential building is given as.
Live load on all the floors of commercial building - 3 KN/m2
Live load on roof with access provided - 1.5 KN/m2.

II. Dead load

Weight of slab, beams and columns
Brickwork load in structure
Floor Finish of 1kN/m2

III. Seismic load

EQ in X direction
EQ in Z direction.

IV. Wind load`

According to IS 875:1987 PART 3
Applying wind in X & Z direction.

V. Load Combination

According to seismic load combination according to IS 1893:2002 part 1
Applying wind combination according to IS456:2000.

V. RESULTS

1. Modal Mass Participation Factor

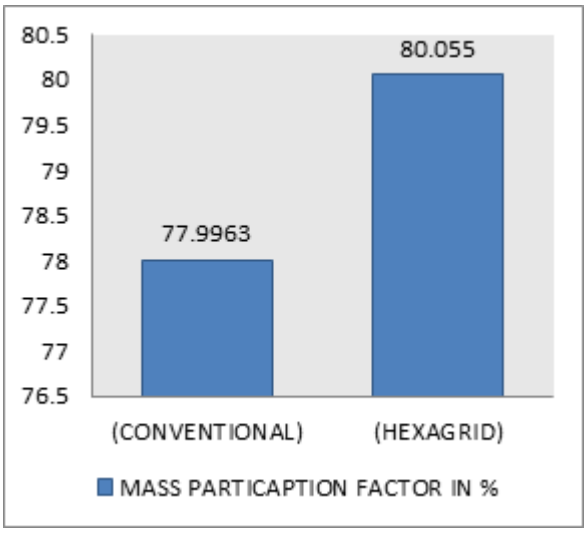

Figure 4.

2. Base Shear

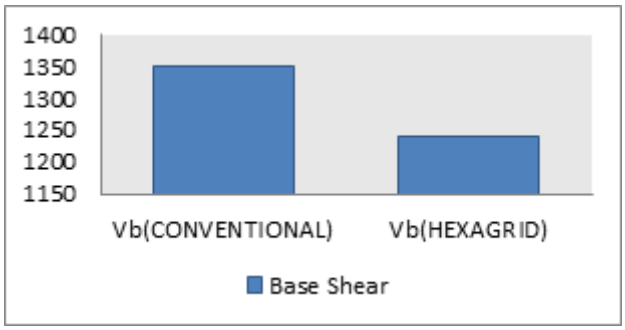

Figure 5.

3. Axial Force

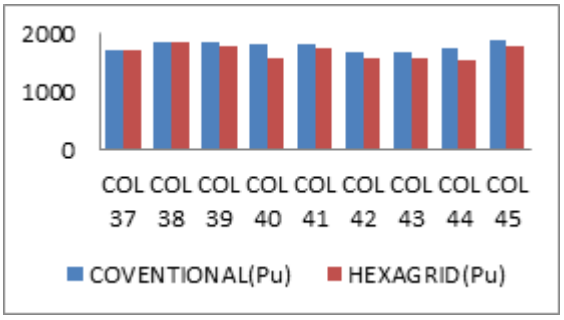

Figure 6.

4. Bending moments(Ground floor)

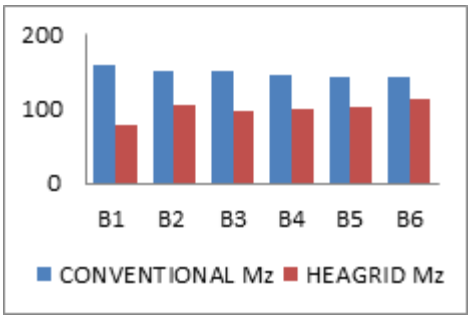

Figure 7.

5. Shear Force in Beams(ground floor)

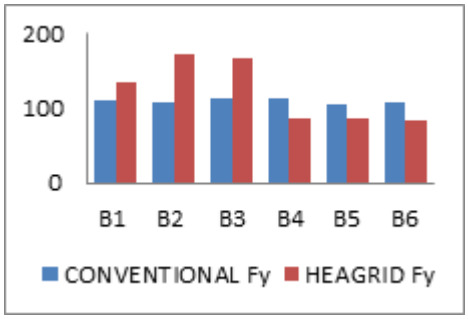

Figure 8

VI. CONCLUSION

1. **Modal Mass participation factor:** In sixth mode shape hexagrid achieves 90% than conventional structure, hence it can better perform in wind and seismic forces.
2. **Base shear:** It is directly proportional to seismic weight of the building. Thus it clearly shows that the seismic weight of conventional building is more than hexagrid structure. Hence it can be stated that, the conventional structure is more vulnerable to earthquake forces.
3. **Axial forces.** There conventional structure showed more axial forces than hexagrid structure, due to presence of shear wall & conventional members.
4. **Bending moment:** In bending moment, conventional structure has increased value than hexagrid structure. Thus the required percentage of steel in conventional structure will be more than the hexagrid structure.
5. **Shear force:** Shear force in both structure are nearly the same. It is increased in outer beam due to resting of diagonal or hexagrid beam

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[5] IS875:1987 Part 1- Dead Loads - Unit Weights Of Building Materials And Stored Materials

[6] IS875:1987 Part 2- Imposed loads

[7] IS875:1987 Part 3- Wind Loads.