Time History Analysis On G+12 Residential Building Using Staad Pro

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Abstract In this project, studied the dynamic behaviour of buildings situated on grounds. The analysis is performed on structures situated on Plain topography using STAAD Pro Software. EL-Centro earthquake data is used for time history analysis. The present project deals with the analysis of a multi storied residential building of G+12. loads are applied and the design for beams, columns, footing is obtained. STAAD Pro with its new features surpassed its predecessors, and compotators with its data sharing capabilities with other major software like AutoCAD, and MS Excel. We conclude that staad pro is a very powerful tool which can save much time and is very accurate in Designs.

Key Words: Highrise Building, STAAD Pro, Time History Analysis.

1. INTRODUCTION

Most civil engineering structures incorporate structural elements that have direct contact with the ground. When external forces, such as earthquakes, impact these systems, the structural displacements and ground displacements are interdependent. This phenomenon, where the response of the soil affects the movement of the structure and vice versa, is known as soil-structure interaction (SSI).

Traditional structural design approaches often overlook the effects of SSI, which is acceptable for light structures in firm soil like low-rise buildings and basic rigid retaining walls. However, the significance of SSI becomes more pronounced for heavy structures situated on softer soils, such as nuclear power plants, high-rise buildings, and elevated highways on soft ground.

Objectives Of Study:

- The present study aims to analyze the performance of R.C. frames by conducting a Time History Analysis.
- Another objective of the study is to analyze the performance of R.C. buildings situated on plain grounds by conducting a Time History Analysis.
- The study focuses on Twelve-story RC frames on Plain grounds.
- To account for soil structure interaction, the subgrade modulus property is designed to represent the stiffness of the foundation.
- Time History Analysis utilizes EL Centro Earthquake data.

2. LITERATURE REVIEW

- **Hanumantha Rao et al:** The constructions suffer more damage than their common counterparts regarding seismic design codes and limitation compulsory. The irregularity of the reason story failure is due to the non-distribution of demand to supply ratio resting on the extra hand, non-columns. In this paper, the structure selected for study is the building. The structure for which mathematical models are generated in the structural fundamentals M40 G is rigid. Seismic loads for 4 to 7-story complex buildings were considered.
- **Hemalah et al:** conducted research on the lack of flat land in mountainous regions which forces construction activities to occur on sloped terrain, leading to the development of various structures housing complexes, medical, and educational institutions, accommodations, and on hilly inclines. The seismic performance of structures during earthquakes is influenced by how mass and stiffness are distributed in both the horizontal and vertical directions. Buildings erected in mountainous zones are particularly vulnerable to earthquakes.
- **Kuladeepu et al:** conducted research indicating that the seismic design of building frames typically overlooks the soil flexibility effect, with designs based on dynamic analysis results under fixed base conditions. The flexibility effect of the soil leads to the extension of the lateral natural period due to an overall decrease in the structure's lateral stiffness.
- **Ratna Priya et al:** conducted a study on the seismic response of building frames in different zones, considering both flexible and rigid supports. When a structure experiences an earthquake, it interacts with the foundation and soil, resulting in varying ground motion. This means that the movement of the entire structure is influenced not only by the type of soil but also by the type of structure. As seismic waves propagate through the ground, they change soil properties and behave differently based on the specific properties of the soil. In this study,

various soil layers were considered, and the corresponding vertical and lateral displacements were determined for a G+4 building in zones II, III, IV, and V. The building was modeled using STAAD, considering different types of soils such as hard, medium, and soft. The findings of the study include calculations of vertical and lateral support reactions for different soil types in various seismic zones, as well as a comparison between rigid and flexible supports.

- **Vishruth et al:** conducted a study in 2015 focusing on the earthquake response of-story buildings with fixed foundations. They investigated both symmetric and asymmetric building plans with equal areas. The study involved replacing the fixed supports with various soil conditions, including cohesive and cohesionless soil, to analyze soil-structure interaction effects due to earthquake excitation.

3. ANALYSIS OF G +12 RCC FRAMED BUILDING USING STAAD.PRO

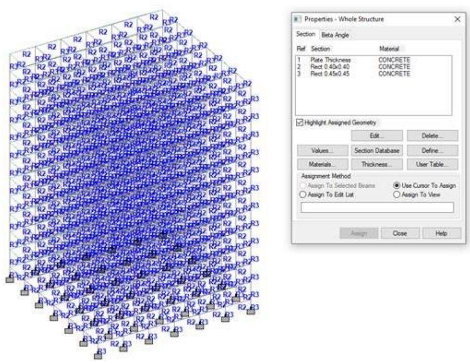

Fig 1: Generation of Member Property

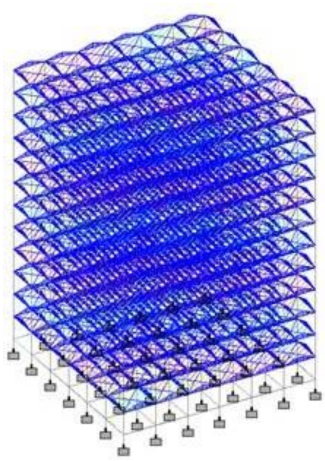

Fig 2: The Structure Under DL From Slab

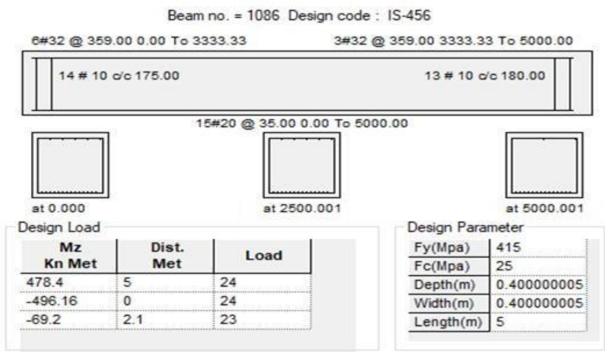

Fig 3: Reinforcement Details of Beam

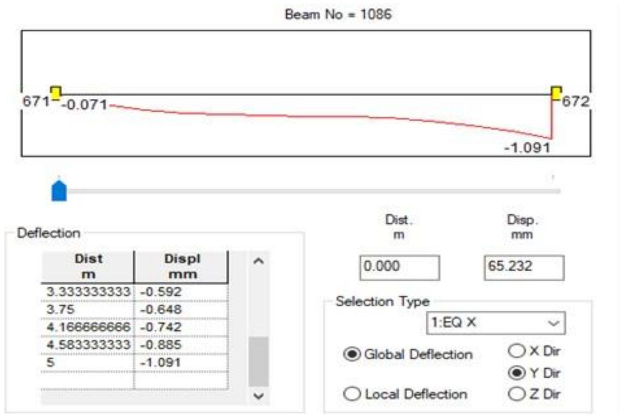

Fig 4: Deflection of a Beam in Global X- X-Direction

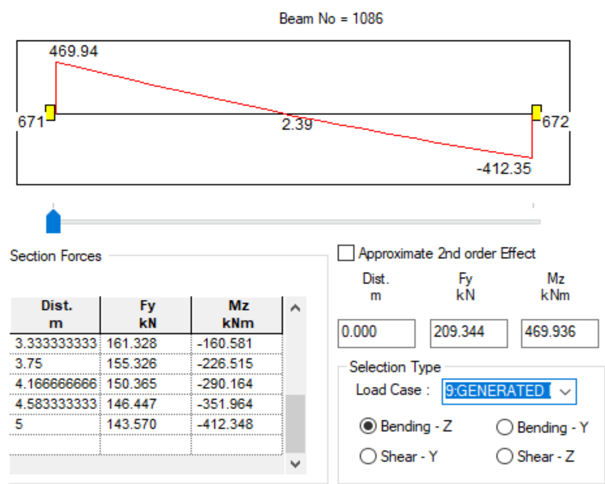

Fig 5: Shear Force Diagram of Beam

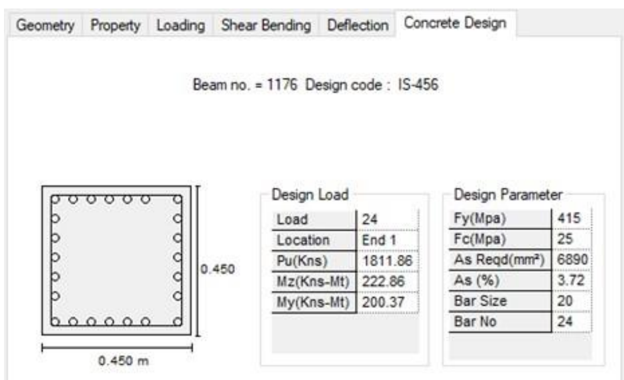

Fig 6: Reinforcement Details of Column

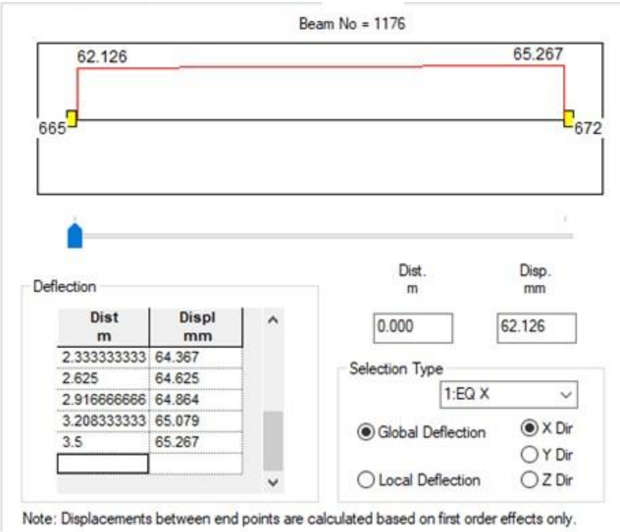

Fig 7: Deflection of Column in Global X-direction

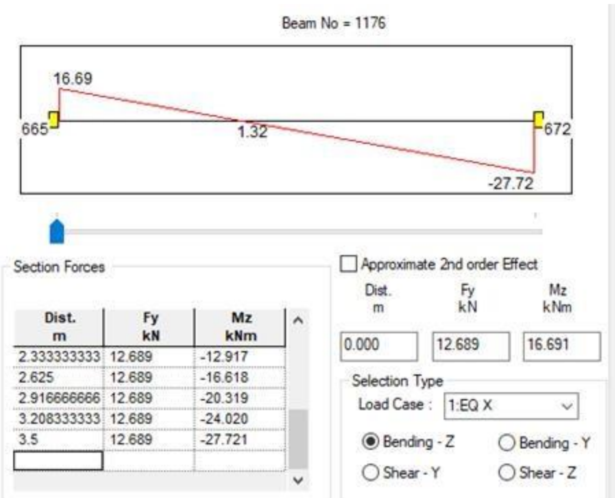

Fig 8: Shear Force Diagram of Column

4. RESULT AND DISCUSSION

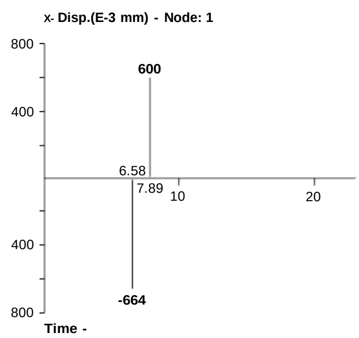

Fig 9: Displacement vs Time in X-axis

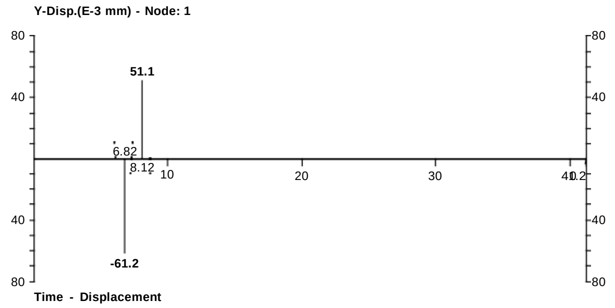

Fig 10: Displacement vs Time in Y-axis

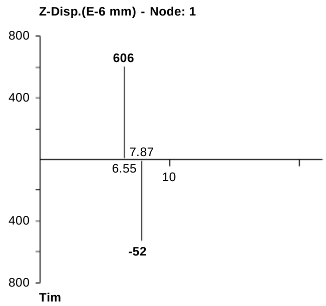

Fig 11: Displacement vs Time in Z-axis

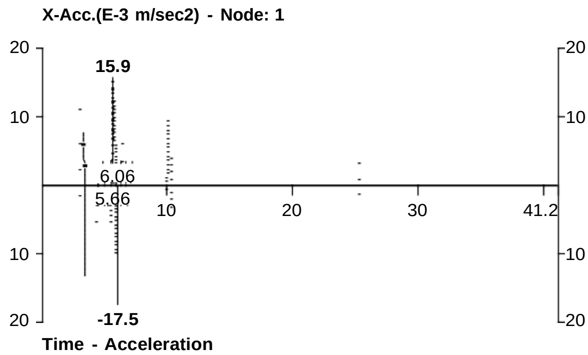

Fig 12: Acceleration vs Time in X-axis

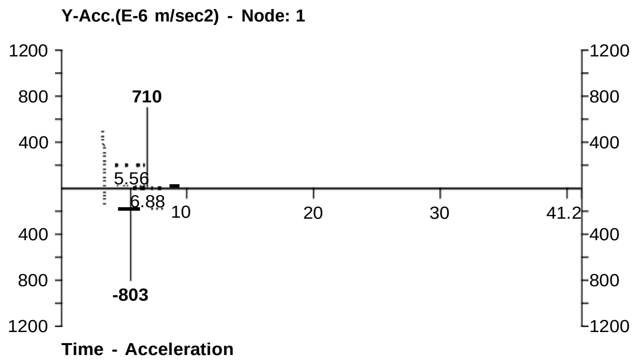

Fig 13: Acceleration vs Time in Y-axis

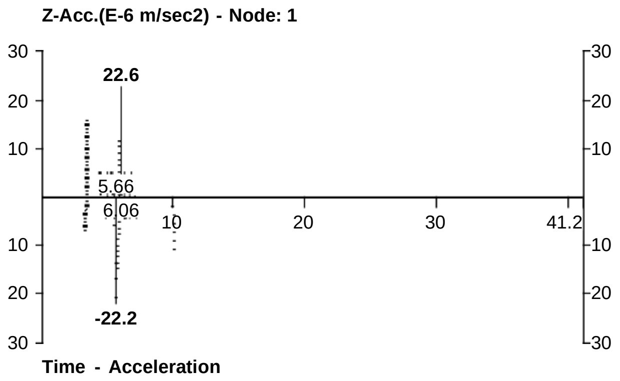

Fig 14: Acceleration vs Time in Z-axis

5. CONCLUSION

In this project, we have gotten an idea about the handling of an integral building design software i.e., STAAD Pro and we have also studied the seismic force responses on the building life cycle and behavior of the building using time history analysis.

- The modal calculation for the building is performed and natural frequency for different mode shapes of the building is obtained
- The building G+12 structure is designed, and time history analysis is performed.
- The time history analysis performed, through which the bending moments are obtained
- Using STAAD Pro software, the analysis was done as per IS codes. The design is safe in all aspects
- The design of slab, beam, and column are designed in the limit state method which is safe at the control of deflection and in all aspects.
- Finally the structure is designed to withstand safely all loads liable to act on it throughout its lifetime, it shall also satisfy the serviceability requirement

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