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RESPONSE OF R C FRAME STRUCTURES RESTING ON RAFT FOUNDATION USING STAADPRO

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ABSTRACT

In the analysis of framed structure the base is considered to be fixed neglecting the effect of soil and foundation flexibility. Flexibility of the soil causes the decrease in stiffness resulting increase in the natural period of the structure. Such increase in the natural periods, changes the seismic response of structure hence it may be an important issue for design considerations. The present study provides systematic guidelines for determining the natural periods of frame buildings due to the effect of soil-flexibility and identification of spring stiffness for different regular and irregular story buildings and various influential parameters have identified and the effect of the same on change in natural periods has to be studied. The study has carried out for building with Isolated, mat and pile foundations for different soil conditions like soft, medium and hard strata, and a comparison between the regular and irregular buildings and natures of change in the natural periods has to be present. And response spectrum analysis this study may useful for seismic design. In the soil structure interaction analysis, the building frame, foundation and soil mass consider as a complete structure which is subjected to different types of loads like dead load, live load, wind load, seismic load etc. Seismic load is essential in case of multi-storey building. In the present work, the linear interaction analysis of a three-bay six -storey plane building is considered.

The investigation on the energy transfer mechanism from soils to buildings during earthquakes is critical for the design of earthquake resistant structures and for upgrading existing structures. Thus the need for research into Soil-Structure Interaction (SSI) problems is greater than ever. Moreover, recent studies show that the effects of SSI may be detrimental to the seismic response of structure and neglecting SSI in analysis may lead to un-conservative design. Despite this, the conventional design procedure usually involves assumption of fixity at the base of foundation neglecting the flexibility of the foundation, the compressibility of soil mass and consequently the effect of foundation settlement on further redistribution of bending moment and shear force demands. Hence the soil-structure interaction analysis of multi-story buildings is the main focus of this study; the effects of SSI are analyzed for typical multi-story building resting on raft foundation. Three-dimensional FEM model is constructed to analyze the effects of different soil conditions and number of stories on the vibration characteristics and seismic response demands of building structures.

Keywords: Earthquake, Foundation, Soil Structure Interaction.

I. INTRODUCTION

Over the past 40 years, considerable progress has been made in understanding the nature of earthquakes and how they damage structures, and in improving the seismic performance of the built environment. However, much remains unknown regarding the prevention or mitigation of earthquake damage in worldwide, leaving room for further studies. During past and recent earthquakes, it is realized that the soil-structure interaction

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(SSI) effects play an important role in determining the behaviour of building structures. The experienced seismic excitation can be considered as function of the fault rupture mechanism, travel path effects, local site effects, and SSI effects. Irrespective of the structure, the local soil conditions can dramatically influence the earthquake motion from the bedrock level to the ground surface, through their dynamic filtering effects. One example is the 1985 Mexico City earthquake where deep soft soils amplified the ground motion and modified the frequency of ground shaking. Similar behaviour was observed during the 1989 Loma Prieta earthquake, in which the sections of the Cypress freeway in Oakland collapsed due to the soil-related motion amplification. The seismic soil structure interaction of multi-story buildings becomes very important after the destruction of recent major earthquakes. For the structure founded on the soil, the motion of the base of the structure will be different from the case of fixed base, because of the coupling of the structure-soil system. It is true that taking the soil into account when calculating the seismic response of the structure does complicate the analysis considerably. It also makes it necessary to estimate additional key parameters, which are difficult to determine, such as the dynamic properties of the soil such as site response, radiation damping and kinematic interaction.

The soil structure interaction is a special field of analysis in earthquake engineering, this soil structure interaction is defined as “The dynamic interrelationship between the response of the structure is influenced by the motion of the soil and the soil response is influenced by the motion of structure is called a soil structure interaction.” However engineering community discussed about SSI only when the basement motion by interaction force as compared to the ground motion of free field. The stress and deformation in the supporting soil cause vibration of structure generates base shear, moment, displacement and alter the natural period, since in reality it is not fixed base structure, the deformation of soil further modify the response of the structure. Any structure subjected to seismic force during an earthquake, the waves that arrive produce motions in the structure itself. Motions depend on the structures vibration characteristics and the structural layout or building. For the structure to response to the motion, it needs to overcome its own inertia, which result in an interaction between the structure and the soil. Such an interdependent behaviour between soil and structure regulating the overall response is referred as interaction behaviour in the present context. It is common practice that we consider the analysis of structure and foundation separately. The procedure in which the action of soil imparts the movement of the structure and the movement of the structure affects the action of the soil is called as SSI. Impendence difference is characterized as result of speed and thickness of soil. Seismic wave ventures quicker in hard shakes in contrasted with milder shakes and silt. As the waves goes from harder to milder rocks, they turn out to be moderate and should get greater in abundance to convey the same measure of the energy, in this way shaking tends to more grounded at sides with gentler surface layers, where seismic waves move more gradually.

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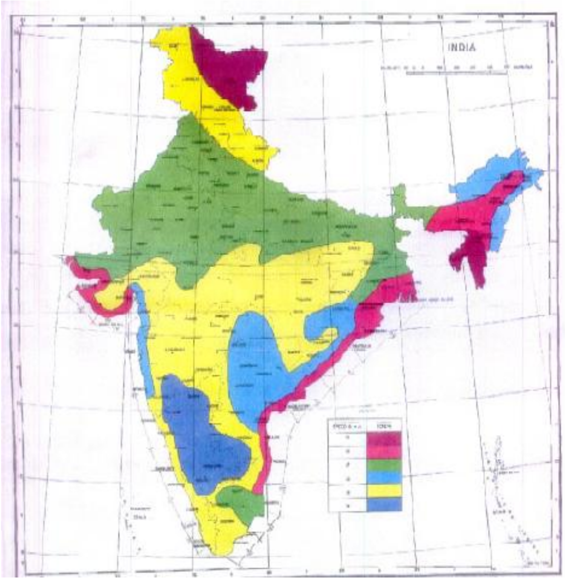

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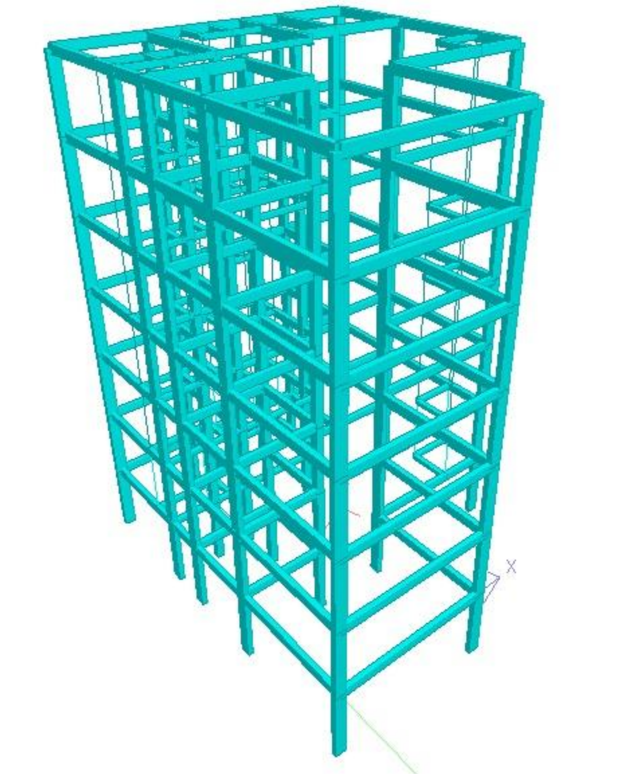
III. STAADPRO IMAGES



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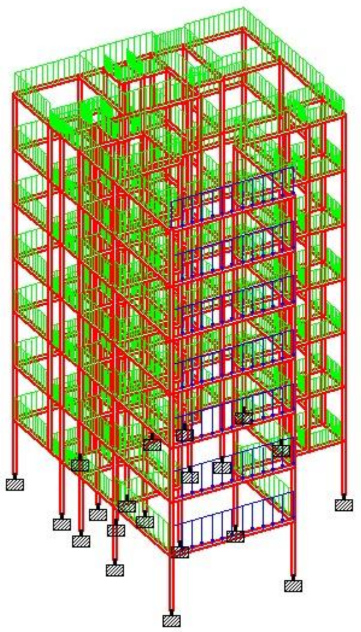

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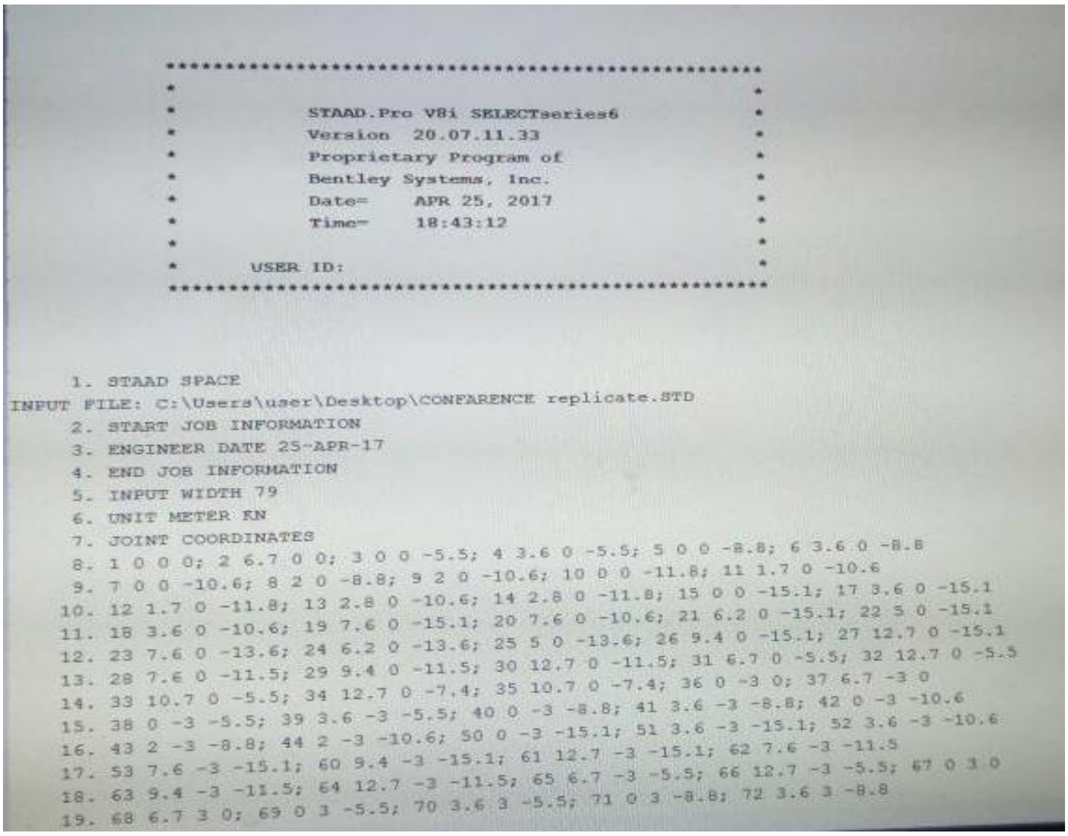

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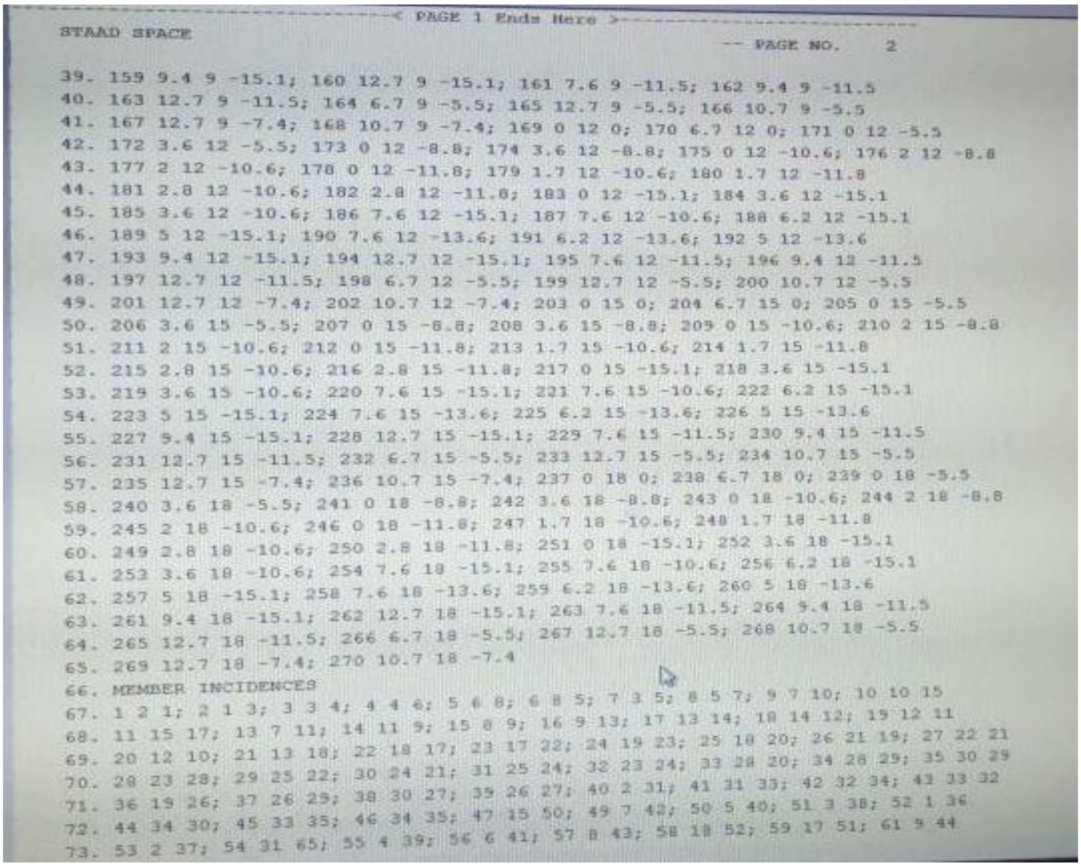

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V. CONCLUSION

The paper shows that including soil in a model of structure does not always have beneficial effects, as often believed.

1. Designing using Software's like Staad reduces lot of time in design work.
2. Details of each and every member can be obtained using staad pro.
3. All the List of failed beams can be obtained and also Better Section is given by the software.
4. Accuracy is improved by using software.

The main aim of this report is to study how to approach the design of building based on IS codes .The loadings to be considered, planning of column, beam and slabs, analysis of building with the staad pro software.

1) Fundamental natural period

The fundamental natural period of a specific structure considering interaction is more than that of non-interaction investigation furthermore it increments as the shear modulus of the soil declines. With expansion in number of stories fundamental natural period increments.

2) Base shear

Base shear values for interaction case is more than that of non-interaction case, as the shear modulus of the soil abatements base shear increments. With expansion in number of stories base shear increments.

3) Maximum lateral displacement

For the increment in shear modulus and number of stories the maximum lateral displacement of the structural element discovered to be expanded. The estimations of maximum lateral displacement resulting from a fixed base analysis are impressively improved when interaction analysis of the system is considered.

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BIOGRAPHICAL NOTES

Prof. Mahadeva M is working as assistant professor in civil engineering department for last 2 years and he also worked as assistant professor in k s institute of technology. He received is **M.Tech in civil engineering** with specialization in **CAD structures** from visvesvaraya technological university. His research interest is in the field of soil structure interaction, structural engineering, earth quake engineering.

U G STUDENTS

SINDHU P

VENKATADRI E