

# Studying the influence of soils under the foundation on the structural system when subjected to seismic loads

## Part 2: Research model of a high-rise building in earthquake impact analysis

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**Abstract:** Big earthquakes with the intensity of earth-quaking from VII degrees to IX degrees were forecasted to be able to occur in Viet Nam. Therefore, studying to calculate the impacts of earthquakes on building structures in Viet Nam is very necessary. This paper studies the influence of different types of soil on the structural system of high-rise buildings when the building is subjected to earthquakes. After analyzing the model in Etabs software, the authors found that different types of ground for displacement, internal force difference up to 167%. At the same time, the authors also proposed a procedure to calculate the earthquake load-bearing structures using the response spectrum of many types of copper vibrations. It helps design engineers to easily apply structural calculations. To achieve the stated objective of the study. The overall content of this study is organized into four parts. Part 1: Methodological content; Part 2: Research model of a high-rise building in earthquake impact analysis; Part 3: Simulate the impact of earthquakes on a high-rise building; Part 4: proposes a vibration calculation procedure for high-rise buildings.

**Keywords:** Earthquake, high-rise building, response spectrum, displacement, internal force.

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Date of Submission: 01-01-2022

Date of Acceptance: 10-01-2022

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### I. INTRODUCTION

In recent times, earthquakes have occurred frequently with increasing magnitude. The occurrence of earthquakes causes a lot of damage to buildings. In Thai Nguyen, there have been more tremors in recent years. Although it has not caused much damage to the works, but the works are also affected. Due to climate change, human impact on the stratigraphic structure, the risk of increasing the vibrations causing earthquakes is increasing. Planning and investing in earthquake mitigation strategies is becoming a topical issue. It is very urgent in many countries around the world, including Vietnam. If you do not want to pay the cost of many times greater costs for earthquake response operations or earthquake reconstruction and recovery activities, it is necessary to have planning and done before the earthquake has happened. Recognize the importance of earthquake prevention and mitigation. Since 2000, Vietnam has started a new research direction on urban earthquake risk assessment, structural behavior research when subjected to earthquake loads.

### II. RESEARCH MODEL OF HIGH-RISE BUILDINGS

#### 2.1 Design basis of high-rise buildings subjected to earthquake loads

Research on reinforced concrete structures for 15-story buildings in Thai Nguyen City; has a typical floor plan as shown in Figure 1

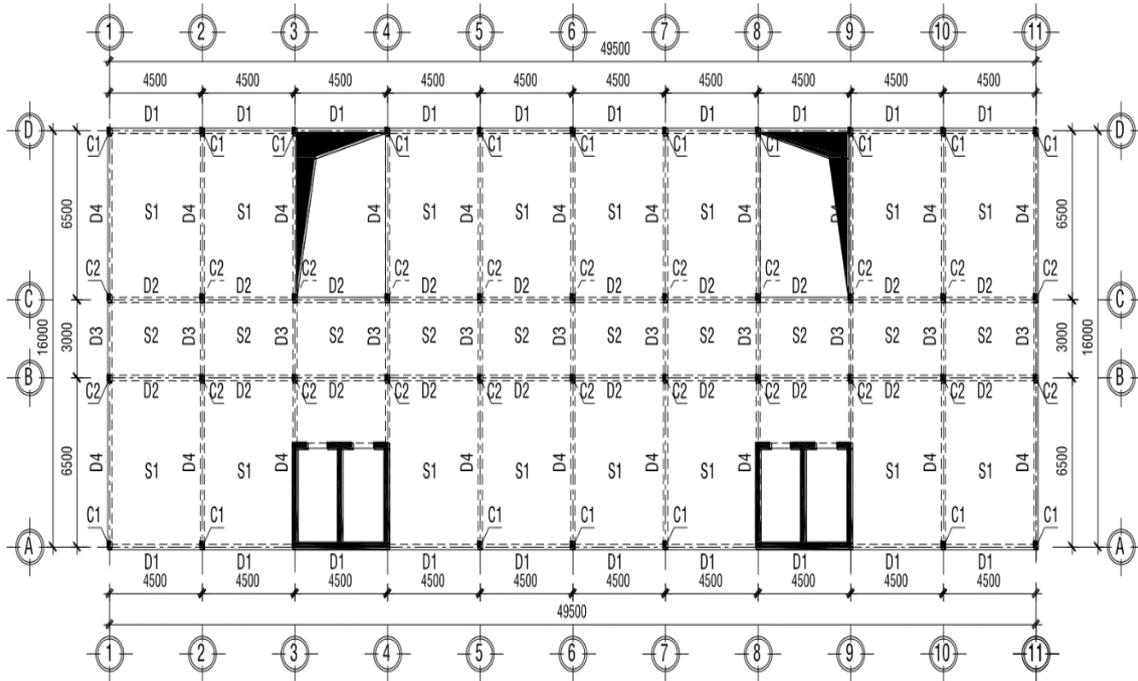


Figure 1. Typical floor plan of floors 1-15

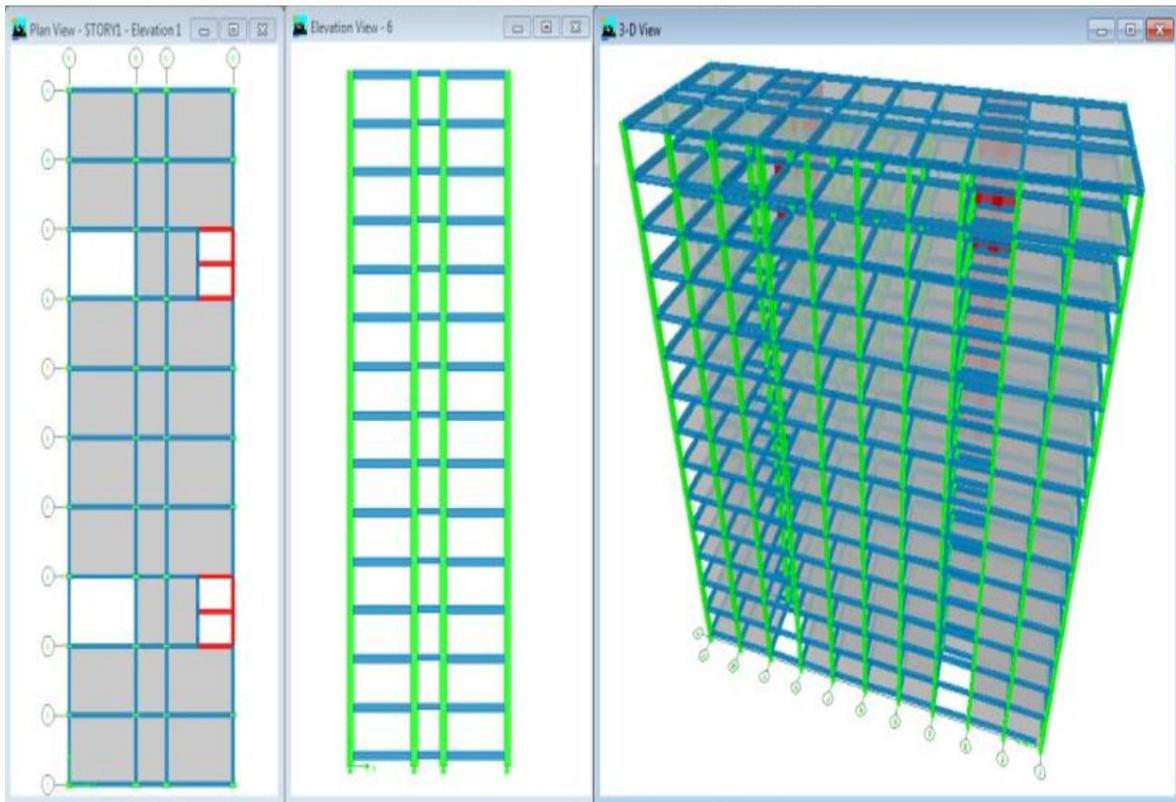


Figure 2. Building structure model in ETABS

**Materials:** Reinforced Concrete; Using durable grade concrete B25. Height of each floor:  $h_f = 3.3$  (m); distance from foundation beam to foundation surface 1.5 (m).

**Section:** Floor S1 (120 mm), S2 (100 mm); Core thickness  $\delta = 250$  mm; Beams D1,2,3 (250x400) mm, D4 (250x550) mm; Column C1 (300x600) mm, Column C2 (300x700) mm.

**Calculated load:**

- Static loads due to the weight of the structure itself: Floors, beams, columns, walls, declared for ETABS v9.2 software to calculate automatically.

- Static load of floor structural layers:  $g_{tt} = 1.1$  (kN/m<sup>2</sup>).
- Static load due to walls built on beams:  $g_t = 11.48$  (kN/m).
- Floor live load: S1 ( $p_{tt} = 2,4$  kN/m<sup>2</sup>); S2 ( $p_{tt} = 3,6$  kN/m<sup>2</sup>)
- Earthquake load: importance factor  $\gamma = 1$ ; behavior coefficient  $q = 3.9$ .

### **III. CONCLUSION**

The article has built a high-rise building model on ETABS software. The construction model of the high-rise building, combined with the author's pre-realized analytical methods, the simulation results to evaluate the impact of earthquakes on the building will be carried out in the next study.

#### **Conflict of interest**

There is no conflict to disclose.

### **ACKNOWLEDGEMENT**

This work is supported by Thai Nguyen University of Technology, Vietnam.

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Nhu Thi Lan Huong. "Studying the influence of soils under the foundation on the structural system when subjected to seismic loads." *International Journal of Engineering and Science*, vol. 12, no. 1, 2022, pp. 08-10.