CHAPTER I
INTRODUCTION

1.1. Background

Yogyakarta City is the capital city of the Special Region of Yogyakarta. As a capital city that is known as “student city” and “tourism city”, Yogyakarta has been known as one of the main destinations in Indonesia. It is also known as a crowded city where the land for living are getting decreased. From the statistics, the citizens of Yogyakarta city are reported to be 376,324 people in 2021 (BPS 2022). Meanwhile the area of Yogyakarta City is only around 32.5 km^2. It makes Yogyakarta city as the most crowded city in Special Region of Yogyakarta with population of 11,579.2 people/km^2. With the population that keeps growing, an alternative solution for housing is to build flats. At the same time, to take care of one of the major problems in crowded city, pollution and waste, sustainable approach is implemented.

Yogyakarta City, as a city that is located in Ring of Fire, is very potential to earthquake damage. Not to mention, the renowned event of Yogyakarta 2006 earthquake. From this consideration, buildings in Yogyakarta must be designed as earthquake resistance buildings, especially for flat that will be occupied by residents. Therefore, the building is expected to have resistance for earthquake and have long live period.

For that matter, the flat that will be designed here will use reinforced concrete using Special Moment Resisting Frame System (*Sistem Rangka Pemikul Momen Khusus*) that is obligated for site that high potential of earthquake. Structures that have a special moment-bearing frame system have high ductility so that they will return to their original shape or will not collapse even when shaken by a severe earthquake.

The references that will be used for the earthquake resistance building are SNI 1726-2019 *Tata Cara Perencanaan Ketahanan Gempa Struktur Bangunan Gedung dan Non Gedung,* SNI 2847-2019 *Persyaratan Beton Struktural untuk Bangunan Gedung,* SNI 1729-2015 *Spesifikasi untuk Bangunan Gedung Baja Struktural,* and SNI 1727-2020 *Beban Desain Minimum dan Kriteria Terkait untuk Bangunan.* Beside the consideration of earthquake resistance, the flat will also consider the construction of lower structure and the aspect of Cost and Time Management.

1.2. General Preview

This flat is located in Ki Ageng Pamanahan Street, Yogyakarta City, Special Region of Yogyakarta. The total site area is 8,350 m^2 with building area of $28m \times 96m$. It has 5 stories with each story has 4 meters height. The second-fifth story is typical. The building uses a sustainable approach by using green material for green roof and fasad for the architectural side. The upper structure will use Steel C Channel for Purlin, Double L Channel for Truss, Special Moment Resisting Frame System for the earthquake resistance structure and Bore Pile for Deep Foundation.

1.3. Problems

Located in a crowded city where earthquakes can happen any time, the problem of this project is how to design simple flat to be safe from earthquake at 7.5 magnitude with the aspect of structural, geotechnical, and cost and time management.

1.4. Objectives

The objective of this report is to design Simple Flat in Yogyakarta City with Sustainable Approach from earthquake at 7.5 magnitude with the aspect of structural, geotechnical, and cost and time management by using the references of Indonesian National Standard (*Standar Nasional Indonesia*) and other trusted resources.

1.5. Research Methodologies

The methodologies used in this report are literature study and quantitative study based on Indonesian National Standard and many other resources. From the references, calculation and mathematical modeling is used to produce design of the building. Besides, software like ETABS and AutoCAD are also used to simplify the work. E-tabs helps to show the internal forces of frames and the behavior of building during earthquake. AutoCAD is used for producing construction drawings.

1.6. Final Project Systematics

The final project is carried out by designing the Architectural Design from Civil Engineering's aspects and knowledge, such as structural, geotechnical, and cost and time management. This project is guided by 3 teaching lecturers of each aspect and a supervisor lecturer that guides report making. This report contains five chapters. Chapter

one is an introduction which contains background, project overview, problem formulation, objectives, research methods and final project systematics. Chapter two is the structural design which contains the design of roofs, stairs, slabs, beams, and columns. Chapter three is the geotechnical design which contains the foundation design. Chapter four is a cost and time management plan that contains planning costs and duration of project work. Chapter five is the closing which contains the conclusion of the entire contents of the thesis.