CHAPTER I
INTRODUCTION

1.1 Background

Building located in earthquake zone should be design as an earthquake resistance. According to SNI 03-1726-2002 the earthquake resistance building should be designed to resist strong earthquake with frequency 500 years return period. Some structural elements are designed to may experience plastic hinge as media of energy dissipation because of the earthquake load received by the building.

The building must not be collapse for it will endanger the people inside the building. Therefore, a structural engineer should detail the elements which need to be acted as the plastic hinges to stay stable even though experience a big inelastic deformation. The detailing should be based on the earthquake risk level of the building located zone. In Indonesia, the detailing must be guided by SNI 03-2847-02 for reinforced concrete structure and SNI 1729-2002 for steel structure.

The building design needs to be examined using an analysis to determine the inelastic deformation. The analysis also evaluates the strength of the structure until its performance level. One of several methods is Nonlinear Static Pushover Analysis (NSPA). NSPA becomes popular as a simplified computer method for seismic performance evaluation of structures. NSPA can obtain more important information than the other methods. It can provide reasonable estimates of the location of the plastic hinge of the members. Besides it is simple and economical method.

The performance point of the structure depends on the lateral load pattern applied on the structure. The load pattern should be equivalent to the required earthquake load. This load is applied laterally to the structure by increment. Differ the lateral load pattern will perform differ pushover curve. FEMA-273

recommend three lateral load distribution, there are uniform distribution, equivalent lateral force distribution and SRSS distribution.

This final project will perform a building design as Special Moment Resisting Frame (SMRF) according to SNI 03-1726-2002, SNI 03-1729-2002 and SNI 03-2847-2002. The designed building will be examined and compared using two lateral load distributions recommended by FEMA-273, uniform distribution and equivalent lateral force in static pushover analysis.

1.2 Problem Statement

The problem in this final project is the difference between the behavior of a structure due to uniform distribution and equivalent lateral force in nonlinear static pushover analysis.

1.3 Problem Limitation

1. The structure which will be analyzed is two 6 story buildings. The plan and elevation view are shown in Figure 1.1 and Figure 1.2.

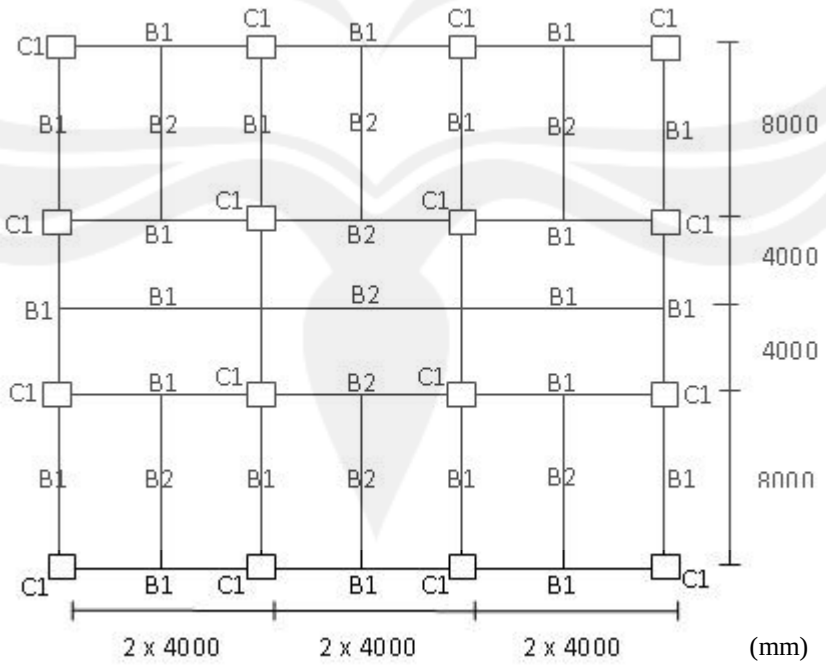

Figure 1.1 Plan view

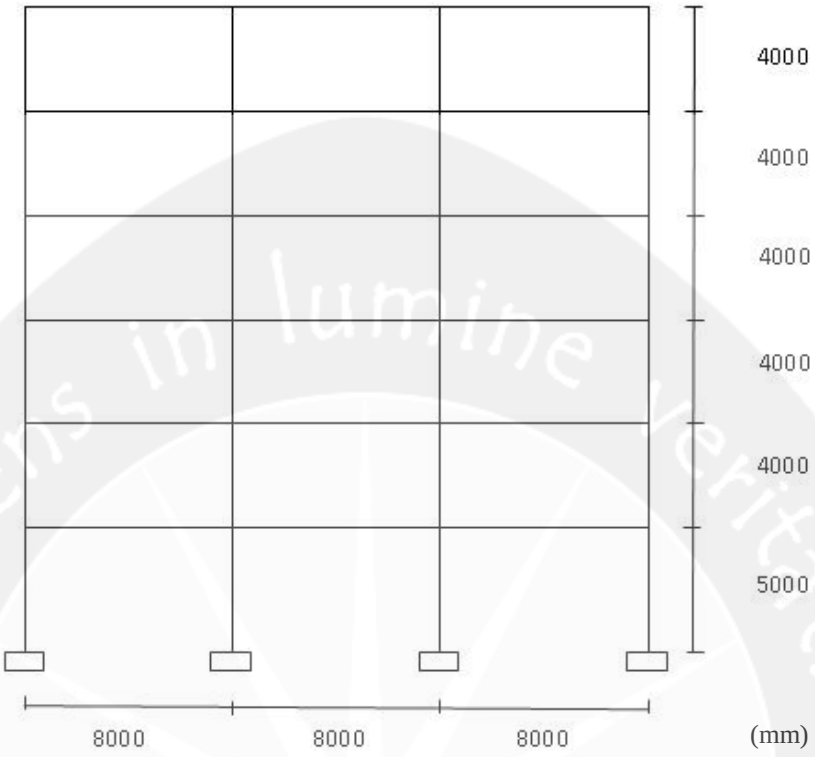

Figure 1.2 Elevation view

2. The structural members that will be designed are the beams, columns, with the dimension as stated below:

   C1 (column) = 850 x 850 mm

   B1 (primary beam) = 600 x 800 mm

   B2 (secondary beam) = 400 x 700 mm

3. The structure elements will be designed as Special Moment Resisting Frame (SMRF)
4. The analysis to be used is Nonlinear Static Pushover Analysis with two different lateral load patterns
5. The structure is located on Zone 5 where the soil type is soft soil
6. The program used for the structural analysis is ETABS Non Linear
7. The material specification:

   a. Concrete with f_c' = 25 MPa

   b. Reinforcement with:

      f_y = 240 MPa for diameter ≤ 12 mm

f_y = 400 MPa for diameter > 12 mm

1.4 Objectives

The objectives of the study are:

1. Designing a building as Special Moment Resisting Frame (SMRF)
2. Analyzing the model due to uniform distribution and equivalent lateral force using Nonlinear Pushover Analysis
3. Assessing the behavior of the building by comparing the result of the analysis. The aspect that will be considered is the maximum lateral load that a structure can withstand safely and the maximum lateral displacement at roof that a structure can withstand safely.

1.5 Methodology

The arrangement of this final project will follow these steps:

1. Material and data preparation.
2. Calculation of the loads based on building codes.
3. Structural analysis using ETABS Non Linear
4. Design the structural members using Special Moment Resisting Frame (SMRF)
5. Calculation of the lateral load using uniform distribution and equivalent lateral load
6. Applied those two lateral loads to the model in Nonlinear Pushover Analysis and comparing the result.