CHAPTER I

INTRODUCTION

1.1. Background

Indonesia is located on three major tectonic plates intersection, which are Indo-Australia plate, Eurasia plate, and Pacific plate. Indonesia is also passed by ring of fire volcanic mountain range. As a result, several areas of Indonesia are prone to both volcanic and seismic earthquakes. As Indonesia has high seismic and volcanic activity, this make Indonesia prone to both frequently occurring low energy earthquake and occasionally major earthquakes. As an example, Yogyakarta is susceptible to volcanic earthquakes, small earthquake, and major earthquake. In 2006 a major earthquake destroys the majority of the building.

When earthquake occurs, the building resists the force and displacement. When the force or displacement exceed the limits the damage occurs to the building to a certain extend. When building is designed to respond elastically with no ductility, it may fail to the ground motion due the force is greater than building strength. On the other hand, if the building designed with ductility, it will be damaged but still able to withstand severe ground motion without failure. Contrary to previous method, base isolation reduces the response of the structure by separate and reducing the ground motion from the earth (Buchanan et al., 2011).

Base isolation is one of building passive vibration control. By reducing building vibration and increasing building fundamental period, base isolation can reduce the ground motion response on the structure. The building will suffer less or minor damages from the earthquakes. This will make the collateral damages from the earthquakes significantly decrease, especially from high seismic and volcanic activity. As the vibration is considerably reduced, the non-structural damage and human injury will be also minimized.

The base isolation can be applied both to new buildings and old buildings. By applying base isolation in building design, the reinforcement of building can be reduced. In the old building, the system can be used to maintain the structural strength and reduce maintenance or repair cost of the building.

1.2 Scope of Project

Universitas Atma Jaya Yogyakarta (UAJY) is one of the universities located on earthquake-prone region. UAJY has a risk of both frequently small and major earthquake. The building will need to be repaired after each earthquake to maintain its structural strength. This will require a significant cost. One of the solutions is to use to use base isolation as vibration control. The scope of the project:

a. The control system to be analyzed and designed is the base isolation system.

b. The structure that will be used for the analysis and design is Universitas Atma Jaya Yogyakarta's Library. It is 23.1 meters tall, consisting of 4 stories and 1 basement.

c. The design procedure will follow the design procedure proposed by MCEER technical report on Property Modification Factor for Seismic Isolator: Design Guidance for Building (which based on 14 November draft of AISC 7-2016).

d. The building follow the standard of SNI -3-1726-2012, as only one ground motion used for comparison.

e. The analysis will mainly be the response of the structure such as the story drifts, base shear, and acceleration of the structure when earthquake dynamic loading is applied.

1.3 Originality

The topic of base isolation system design is relatively new and rarely used in Indonesia. Only several buildings in Indonesia that use this system. The topic "Effect of base isolation on structure response on Universitas Atma Jaya Yogyakarta Library's has never been used on any other final project before. Therefore, there has never been any attempt to design a using base isolation for UAJY's library.

1.4 Objectives

The objectives of this project are as follow:

a. Provide a design that can successfully reduce the displacement, story drifts, and shear on the structure.

b. Analyzed and compare the structure before and after using base isolation.