CHAPTER I
INTRODUCTION

1.1 General Description

This Youth Center, located in Bengkulu City, aims to be a place where young people can socialize, learn new skills, access support services, and participate in productive activities. Structurally, this building uses concrete materials for portal structures (slabs, beams, and columns). The building largely consists of a three-story section, with a two-story section that includes an auditorium area that occupies both stories.

1.2 Regulations and Planning Standards

The planning guidelines and criteria applied in this project are as follows:

1. Beban Minimum untuk Perancangan Bangunan Gedung dan Struktur Lain (SNI 1727:2013)
2. Standar Perencanaan Ketahanan Gempa untuk Struktur Bangunan Gedung (SNI 1726:2012)
3. Tata Cara Perencanaan Struktur Baja untuk Bangunan Gedung (SNI 1729:2015)
4. Tata Cara Perhitungan Struktur Beton untuk Bangunan Gedung (SNI 2847:2013)

1.3 Structural Material Specifications

The following material requirements were employed in this work:

1. Steel
   - The steel material used is A36 steel with yield strength fy = 250 MPa and ultimate strength fu = 400 MPa
   - The modulus of elasticity, Es = 200,000 MPa
2. Concrete
   - Concrete compressive strength at 28 days age, fc’ = 30 MPa (substructure)
   - Concrete modulus of elasticity, Ec = 4700 √ fc’ = 23500 MPa
3. Steel Reinforcement
   - For steel reinforcement with D > 12 mm, deformed rebar is used with yield strength, fy = 420 MPa.

- For steel reinforcement with D ≤ 12 mm, smooth rebar is used with yield strength, fy = 420 MPa.
- Steel modulus of elasticity, Es = 200,000 MPa.

1.4 Objective

The goal of this paper is to use the Indonesian National Standard (Standar Nasional Indonesia) and other reliable resources as references to build The Youth Center in Bengkulu City using a sustainable approach, taking into account structural, geotechnical, cost, and time considerations.

1.5 Research Methodologies

This report uses quantitative research and literary analysis, referencing pertinent sources such as the Indonesian National Standard. Using references, mathematics and mathematical modeling are used to determine the building's design. To improve workflow efficiency, digital tools like AutoCAD and Midas are also used. The internal forces operating on the frames and the behavior of the building during seismic events are visualized using Midas. Building blueprints are created using AutoCAD software.

1.6 Structure Planning Method

1.6.1 Structure System

The structure of the youth center is designed as a special moment resisting frame, with beams and columns as moment resistors.

1.6.2 Structural Model

The structure design process is done according to the internal forces that occur in the structure due to the loads that are acting on the structure. These internal forces are obtained by using three-dimensional structural modeling using the MIDAS Gen software. In the structural models, beams and columns were created using the general beam/tapered beam element option in MIDAS Gen, while floor and roof slabs were created using the plate element.

1.6.3 Service Limit Performance

The service limit performance is assessed based on the service load combination. One of the service limit criteria that will be evaluated is the divergence between floors that is caused by the design earthquake, for each of the structure's orthogonal axes. The divergence between floors must be less than the allowable deviation of floors, with the purpose being to limit the occurrence of exaggerated melting of steel and fracturing of concrete, preventing damage to the non-structural elements, and preventing drifting that could disturb the occupants of the building.

1.6.4 Ultimate Limit Performance

The safety of the structure to support the ultimate design load is determined by the ultimate limit performance. To assess the ultimate limit performance, the ultimate load combination is applied to determine the maximum internal forces that take place in the structural elements. These internal forces would be used in the design process of the building's structural elements including the columns, beams, slabs, foundations, etc.

CHAPTER II
YOUTH CENTER SUPERSTRUCTURE DESIGN

2.1 General Description of Structure

Superstructure is every structural component in the building that is built above the ground. In the Bengkulu Youth Center project, the superstructure consists of the roof structure, columns, beams, slabs, stair components, and the joints that connect the beams and columns. The superstructure is mainly composed of steel-reinforced concrete, with the roof components, such as the purlins and trusses, being made of steel.

The layout of the building as seen from the top view is irregular. The building consists of two main parts which can be designated the north and south sections of the youth center. The north section includes three stories comprising the communal rooms, activity rooms, working spaces, as well as the staff office space. The south section is two stories tall and houses the auditorium space and its surrounding features. These two sections each have a hip roof that is identical to each other, and the sections are connected by an eight-meter wide and two-story high corridor.

Viewing the building from a side view, the two sections can be seen clearly. It shows that the building is relatively wide especially compared to its height. It also