CHAPTER I
INTRODUCTION

1.1 Background of The Research

On structural design, the capacity of the main structure is a representation from the structural strength itself. The important function of structure to distribute all loads towards the ground makes the complete reason that the designed structure must be able to withstand all the loads. Concrete and reinforced concrete are used as the common materials on the structure. Reinforced concrete can be used to some structural element such are beams, columns, slabs, and foundations.

(Wight & MacGregor, 2012) Explained that concrete is material that strong in compression, but weak in tension. Because of that statement, the combination from concrete and steel reinforcement which is strong in tension is the solution to improve the concrete ability to withstand the tension that works on that concrete. (Zaidir, 2015, p. 4) shows that concrete and steel reinforcement are binding into each other without any slip (friction) so that reinforced concrete works together to carry the loads.

Reinforced concrete are consist of concrete, flexural reinforcement (longitudinal bar), and shear reinforcement (stirrup). Flexural reinforcement (longitudinal bar) which consist of compression reinforcement and tension reinforcement is steel reinforcement that designed to withstand bending moment that works on the structure. Shear reinforcement (stirrup) is steel reinforcement that designed to withstand the shear force that works on the structure.

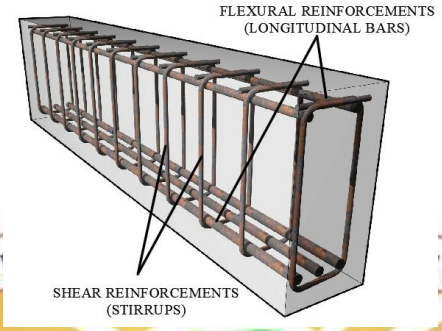

Figure 1.1 Steel reinforcement

In structural design, safety about the structural strength and stability while the structure sustains the loads should be guaranteed. Loading conditions that might occur can be a reference in structural design. In reinforced concrete beams, dead loads or vertical loads are dominating, but if there are additional forces with horizontal property occur such are wind or centrifugal force, the load will become biaxial load. It is also very common on seismic loads that have the uncertain direction of load. So, the behavior about biaxial loads should be reviewed further. Biaxial loads can be described as follows,

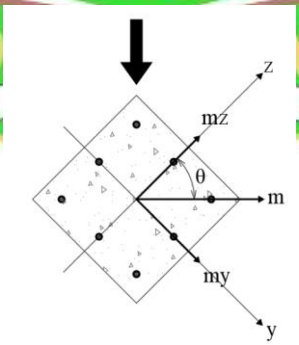

Figure 1.2 Biaxial loads

Shear failure happens suddenly without any sign, while flexural failure happens with a sign like cracks on the structure, because of that before the flexural failure happens people still can run out from building to save themselves. The statement above shows that safety factor for shear failure should be designed to happen after the flexural failure.

Based on the background above, an experimental study conducted to determine the effect of longitudinal steel reinforcement ratio on shear capacity of reinforced concrete beams with a square section that rotated 45 degrees.

1.2 Objective and Benefits of The Research

The objective of this research is to determine the effect of longitudinal steel reinforcement ratio on shear of reinforced concrete beams with a square section that rotated 45 degrees.

Academically, this research is expected to provide scientific contributions to the study about the shear capacity and flexural capacity of reinforced concrete beams in biaxial conditions. Studies about shear capacity and flexural capacity of reinforced concrete are quite a lot, but only a few studies have discussed the relation between biaxial conditions with shear capacity and flexural capacity of reinforced concrete beams. Through this research, it is expected to be able to provide some new references about biaxial conditions and the effects on shear capacity and flexural capacity of reinforced concrete beams.

Practically, this research is expected to provide benefits through an analysis of biaxial conditions given to those who will design a

structure, especially in earthquake potential areas. As has been known, seismic force is very closely related to biaxial conditions due to the uncertain direction of forces. Through this research, it is expected that those who will design a structure, especially in earthquake potential areas, can add some knowledge about biaxial loads behavior on reinforced concrete.

1.3 Scope and Limitation

The scope and limitation of this research are as follows,

1. The structure used in this research is reinforced concrete beams with 22 MPa compressive strength.
2. Structural elements in this research are tested using hinged and roller support.
3. The total number of specimens is six square-section beams with a size of 250 mm x 250 mm and net length of 2000 mm.
4. The specimens were varied based on the diameter of the longitudinal reinforcement which having sizes of 13 mm, 16 mm, and 19 mm.
5. The specimens were varied without rotation and with a 45 degrees rotation.
6. To analyze the effect of longitudinal reinforcement ratio on shear capacity and flexural capacity of reinforced concrete beams.
7. Analysis of crack patterns based on visual observations.
8. Theoretical study of shear capacity and flexural capacity of reinforced concrete based on SNI 2847:2013.

1.4 Systematical of Writing

The systematical of writing this undergraduate thesis are as follows,

CHAPTER I INTRODUCTION

This chapter describes the background of the research, the objective and benefits of the research, the scope and limitation of the research, and the systematical of writing.

CHAPTER II REVIEW OF LITERATURE

This chapter describes the shear strength and flexural strength also the equations regarding the shear capacity and flexural capacity which used in this undergraduate thesis.

CHAPTER III METHODOLOGY

This chapter describes the stages of this thesis from a general description to the conclusion at the end.

CHAPTER IV RESULTS AND DISCUSSION

This chapter describes the stage of problem-solving until the results are obtained. Results are displayed with graphs, tables, and figures.

CHAPTER V CONCLUSIONS

This chapter outlines the conclusions of this research. Also, the suggestions about the research.