CHAPTER 1

INTRODUCTION

1.1 Background of Research

Cold-formed steel structure are steel structural product that are made by bending flat sheets of steel at ambient temperature into shapes. Currently, there are three methods involved in production of cold-formed steel which are folding, press barking and roll forming. These methods allow cold-formed steel to have diversity in shapes, sizes and applications. It also increases the yield strength and tensile strength of the cold-formed steel but these methods cause the ductility of cold-formed steel sections to decrease at the angular corner. The angular corner often has imperfections due to the method of producing the cold-formed steel itself. As shown in Figure 1.1, cold-formed steel is produced in various shape and section such as single open section, open built-up section and closed built-up section. For this research, open built-up section, also known as I section, will be used.

This research will also focus on the effect of perforations on the cold-formed steel. The cold-formed steel structure often come with perforations for the ease of construction works. Perforation is the opening made on the cold-formed steel to accommodate electrical wiring, plumbing, air conditioner, connections of structure etc.
The application of cold-formed steel is an extent to the Industrialised Building System (IBS) that promotes high quality of work with minimum waste. The application of cold-formed steel structure includes trusses, frame, doorways, beam, column etc. The usage of cold-formed steel is still limited in Malaysia but it is widely used in United States and Great Britain since it is introduced in 1850. Malaysia uses British Standard BS5950 as design reference.

Cold-formed steel are on high demand as it can be produced in large quantity with a control quality. It is a lot more light compared to hot-rolled steel and it is one of the material that has a highest strength-to-weight ratio. It gives more design option with better material used. Cold-formed steel is highly durable and provides resistant towards termites and rotting. Galvanized cold-formed steel also provides long-term corrosion resistant.

Figure 1.1 The diversity of shape for cold-formed steel

1.2 Problem Statement

Cold-formed steel members are often accommodated with perforations with different size and shape to ease the construction work. However, these perforations may affect the ultimate strength and elastic stiffness of the structural member. The ultimate
strength and elastic stiffness also varies with the position of the perforations on the cold-formed steel structure.

In a structure as a column, cold-formed steel member is loaded in compression and their strength is restraint by buckling. There are various buckling behaviour that may be observe from a cold-formed steel structure which are local buckling, torsional buckling and flexural-torsional buckling. The buckling behaviour may also be affected by the position of perforations on the member.

1.3 Objective of Research

The objectives of the research are:

i. To determine the ultimate load of axially loaded built-up cold-formed steel column with perforations.

ii. To study the effect of perforations on the axial load of the axially loaded built-up cold-formed steel column.

iii. To study the failure mode and behaviour of axially loaded built-up cold-formed steel column with different perforation position.

1.4 Scope of Research

The scope of these research covers on the compression test for axially loaded built-up cold-formed steel with perforations. The experiment will be done at the laboratory. The scopes of work are:

i. Position of the perforations

ii. Support of the column

iii. The back-to-back sections of the cold-formed steel

1.5 Significant of Research

For this research, compression test will be conducted on multiple samples to determine the ultimate load of axially loaded built-up cold-formed steel column with perforations. These sample is different in term of it perforation position and slightly