AXIALLY LOADED BUILT-UP C-SECTION COLD-FORMED STEEL WITH HOLES

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I hereby declare that I have checked this thesis and, in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor in Civil Engineering.

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Kajian eksperimen dijalankan untuk mengkaji kelakuanseluli terbentuk sejuk terbina. Kancing binaan dalam kajian ini terdiri daripada dua bahagian C berorientaskan back-to-back membentuk suatu keratan rentas berbentuk I. Dimensi untuk spesimen diameter terbahagi kepada dua iaitu 103mm dan 203mm untuk disiasat. Untuk setiap spesimen, stud disambungkan kepada satu sama lain dengan dua skru penggerudian diri yang dijarakkan pada selang yang ditetapkan. Seksyen trek keluli yang terbentuk sejuk telah bersambung dengan tegak lurus ke setiap hujung stud terbina dengan skru penggerudian sendiri melalui setiap bebibir bahagian C. Tujuan bahagian trek adalah untuk mengekalkan hujung kancing bersama dan mewakili lampiran akhir biasa. Spesimen dikimpal dengan saiz plat keluli spesifik sebelum diuji. Tujuan spesimen dikimpal adalah untuk memegang spesimen semasa ujian dan untuk mendapatkan hasil yang lebih tepat diperoleh. Keputusan spesimen boleh diperolehi oleh beban muktamad dari setiap spesimen dan untuk mengkaji tingkah laku tengkuk disebabkan oleh kedudukan pembukaan yang berbeza dalam spesimen.
ABSTRACT

An experimental investigation was conducted to study the behavior of built-up cold-formed steel. The built-up studs in this study consisted of two C-sections oriented back-to-back forming an I-shaped cross-section. The dimension for diameter built-up specimens are divided into two that are 103mm and 203mm to be investigated. For each specimen, the studs were connected to each other with two self-drilling screws spaced at a set interval. A cold-formed steel track section was connected running perpendicular to each end of the built-up stud with a single self-drilling screw through each flange of the C-sections. The purpose of the track section was to keep the ends of the studs together and represents a common end attachment. The specimens are welded with the specific size of steel plate before being testing. The purpose of welded specimen are to hold the specimens during testing and for more accurate result obtain. The result of the specimen can be obtained by the ultimate load from each specimen and to study the buckling behavior due to the different opening position in specimens.
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<td>Lateral back</td>
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<td>Cold-Formed steel</td>
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<td>AISI</td>
<td>American Iron Steel Inside</td>
</tr>
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<td>BS</td>
<td>British Standard</td>
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<td>BTB</td>
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CHAPTER 1

INTRODUCTION

1.1 Introduction

Steel is one of the material of construction and is a basic ingredient needed in construction. In steel structures, there are two types of structural steel members that are hot-rolled steel members and cold-formed. The usage of cold-formed steel structures in the building construction industry is rapidly increasing due to their potential benefits including high strength to weight ratio, rapid constructability and ease of transportability than hot rolled steel. Cold-formed steel structural members are commonly provided with holes to accommodate electrical and plumbing of building.

Cold-Formed Steel (CFS) industry have improved in technology and low production cost to produce more structurally efficient and economic cross section shapes. One of the most favourable ways to perform this task is to connect two or more single members together to form a built-up section, e.g. simply connecting two channel sections back to back to form a built-up I-section. Members with built-up section can carry more load and span more distance. There are different between the built-up C-section with plain and lipped angle. These types of sections can be shown in Figures 1.1. Loading is rarely concentric due to attachments along the angles legs. For plain and lipped channel have different centroid that will affect the angles legs. Plain angles have no primary warping resistance and local-plate buckling and global torsional buckling have nearly identical deformations.
1.2 Background of Study

Opening in cold formed steel columns section (CFS) are widely used in steel frames structures to facilitate piping, electrical, mechanical and sanitary works for maintenance services and inspections. Openings also made specifically for fasteners such as bolts and screws. By considering openings in steel columns sections are to reduce the materials volume without affecting the structural strength or serviceability requirement in addition to reduce the cold bridging effect when opening channel section steel column are used in the external wall panels at cold region. The ultimate strength and elastic stiffness of a structural member can vary with opening position, size, shape and orientation. In evaluation of the section properties of members in compression, openings need to be considered. The perforations can be divided by pre-punched or punched-on-site but mostly pre-punched are more favourable due to the problem that will rise later if the holes are not accurately made.

Use of built-up cold-formed steel got several advantages. The first advantages are production and handling such as ease of production. To produce new shapes without built special production method is fastened the standard -C and Z shape by a bolt, screw, or weld. Formation of (CFS) structure can be more easier and faster without heavy lifting equipment that suitable to up to semi high building. Strength and stability are the second advantages. Higher stability and capacity for built-up section due to combination of two or more standard section that produce greater cross-section properties. The eccentricity between the shear can be devastate with the symmetry of built-up section. Built-up section with Back-To-Back (BTB) advantages to strengthening external frame column and closed built-up section used to support long beam and double storey house.
Figure 1.1  Dimension of the built-up C-section plain and lipped angles  
Source: LYSAGHT (January 2010).

Table 1.1  Table of properties of plain and lipped channel with centroid position  
Source: LYSAGHT (January 2010).

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