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TORSIONAL BEHAVIOUR OF AXIALLY DISCONTINUOUS THIN-WALLED STEEL FRAMES USING CHANNEL SECTIONS WITH COMPOUND STIFFENERS

MASTURA BINTI RAFEK

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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Name of Student	:	Mastura Binti Rafek
Student ID No	:	2010600312
Programme	:	Master of Science (Civil Engineering)
Faculty	:	Civil Engineering
Thesis Title	:	Torsional Behaviour of Axially Discontinuous Thin-Walled Steel Frames Using Channel Section with Compound Stiffeners
Signature of Student	:	....
Date	:	July 2013

ABSTRACT

This study is focused on the structural behaviour of thin-walled open section when subjected to torsion. When a thin-walled open section is subjected to torsion it has tendency to twist and warp. If the thin-walled member is axially discontinuous, the warping deformation could affect the non-loaded member by significant twisting. A study of this behaviour pattern has been conducted and the results obtained are presented in this thesis. A general purpose commercial software that uses finite element method was used to model the axially discontinuous thin-walled open section frames. The numerical results were used to understand the twisting and warping transmission at the member intersection. For this present study, plain channel and lipped channel sections were used. Lips can be used to improve the strength of the section and also lips can reduce large angle of twist which leads to warping deformation. The results presented show that a frame with lipped channel section has value of angle of twist lesser than the equivalent frame with plain channel section with 41.07% for loaded member and 52.73% for non-loaded member respectively. In order to understand how the twist is transmitted through the axially discontinuous system, models with different types of joints were also carried out to investigate the magnitudes and directions of the twist for both loaded and non-loaded members. Apart from considering varieties of joint types, types of lips attached at the edges of the flanges were studied. A lip was folded one, two and three times to see the influence of each folded lip and this lip is called a compound lip. Folding of the lip can be in the direction of either inwardly or outwardly. The results show that the least twisting deformation structure is with diagonally inward lips with two folds.

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