FINITE ELEMENT ANALYSIS ON FLUSH END PLATE CONNECTION USING LUSAS SOFTWARE

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DEDICATION

To husband and children
Thank you for your support
&
To friends
thank you for eveything

ACKNOWLEDGEMENT

Alhmadulilah, Praise to Almighty Allah for the blessing and His permission, I am able to complete my master project.

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ABSTRACT

This paper present and discuss the finite element method as an alternative method to investigate the behaviour of the flush end plate. The finite element results are compared with the results of the experimental tests taken from literature. The three dimensional materially static non-linear finite element analys is using **LUSAS** modeller was perform the bolted flush end plate connection. The moment-rotation curve was plotted from the result and the curve was superimpose with the experimental curve to check the accuracy of the analyses method. It was found that the two curves coin-side quite well with each other. The difference in values of the moment resistance of the two curves is 15..62 %. In this research also found that a 3.125% increase in the end plate thickness produces a 3.03% the moment of resistance of the connection. The results of this study shows an agreement with previous researchers that the connecti behaves in between pinned and fully rigid and posses some rotational stiffness.

ABSTRAK

Tesis ini membincangkan mengenai finite element method sebagai satu alternatif untuk mengkaji kelakuan sambungan plat hujung sedatar. Keputusan dari finite element method dibandingkan dengan keputusan ujian yang telah dijalankan sebelum ini. Model yang dibuat dalam perisian komputer adalah dalam bentuk tiga dimensi dengan menggunakan LUSAS modeler. Graf momen–putaran dilakarkan dan dibandingkan dengan graf momen-putaran yang sedia ada dari ujian makmal. Dari analisa didapati bahawa lengkungan antara ujian makmal dan computer adalah bersentuhan antara satu sama lain. Perbezaan bagi momen rintangan adalah 15.62 %. Untuk plat yang berlainan ketebalan juga dapat dianalisa dan keputusannya adalah 3.125 % dan momen rintangan juga meninkat sebanyak 3.03 %. Keputusan dari kajian ini menunjukan persamaan dengan penyelidik-penyelidik terdahulu yang mana perlakuan sambungan adalah di antara sambungan pin dan tegar serta sedikit kekukuhan putaran.

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LIST OF SYMBOLS

M	Moment
ϕ	Rotation
ε	Strain
σ	Stress
dy	Displacement in Y
dz	Displacement in Z
k	Spring stiffness
v	poisson ratio
E	Modulus Young

CHAPTER I

INTRODUCTION

1.1 Problem Statement

Connections in a steel frame structure are very important elements in transferring load such as gravity, wind and seismic load. Therefore it is important to obtain an understanding at their structural behaviour. In the past, experimental approach has been used widely to study the behaviour of connections. But these are expensive and sometimes difficult to perform. An alternative is to use finite element analysis but the results need to be calibrated against good experimental test data. Therefore in this project it was proposed to carry a finite element investigation to study the behaviour of a flush end plate connection.

1.2 Problem of Study

The overall behaviour of connection is importance in analysis and design of structures. In design, a connection is considered as pin or rigid where a pin connection only take the axial force while the rigid connection resists the moment without any rotation.

In real a situation, a connection behaves in between the two cases above which is call semi-rigid. The most accurate method to study the non-linear behaviour of a connection is to fabricate the full scale connection and test these to fail. Unfortunately this is time consuming, expensive to undertake and has the disadvantage of only recording strain readings at pre-defined gauge locations on the test connection.

A three dimensional materially static non-linear finite element analysis approach has therefore been developed as an alternative method of connection appraisal.

1.3 Objectives of Study

Main objective of this research is to use the finite element analysis using LUSAS software [1] to model and analyse a flush end plate connection. The moment-rotation curve will be plotted and compared the result of an experimental test.

1.4 Scope of Study

The experimental work reported by Husin [2] focused mainly on flush end plate bolted connection. The plate has 4 holes and M20 bolt were used. The end plate thickness was 12 mm.

The column size was 200 x 200 x 56.2 – 3 m and the size of the beam was 250 x 125 x 25.1 – 1.5m. Static loads were applied at 1.3 m from the face of the column.

LUSAS software will be used to model the connections. The result from the finite element analysis, mainly moment-rotation curve, will be compared with the existing experimental result.

1.5 Significance of Research

The research significance to be obtained from this study will be the results and analysis of the behaviour of beam to column flush end plate connection. It is necessary to compare the moment –rotation curve of the result from the finite element analysis and that of the experimental testing. The aim is to determine the accuracy of the analytical method and to verify the predicted strength of the flush end plate connection.

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