

UNIVERSITI TEKNOLOGI MARA

**BEHAVIOUR OF PROFILED WEB
TAPERED GIRDERS UNDER
STATIC SHEAR LOADING**

HISHAM BIN SAHARI

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ABSTRACT

Economical and efficient design of steel girders normally requires thin webs. Adequate out of plane stiffness and shear buckling resistance without using transverse intermediate stiffeners or using a thick material can be achieved by using profiled webs. Since the advent of steel structures, it has been desired to reduce the weight and cost of the component parts. With the advance of welding technology, the use of thin profiled webs has been widely used in recent years. The focus of this study is to investigate the behaviour of tapered plate girders with trapezoidally profiled webs under static shear loading. This study involves numerical analysis using the finite element software package, LUSAS to execute linear and nonlinear analysis. The numerical study includes the development of non- linear simulation and geometry of finite element models. The entire plate components such as flanges, web and stiffeners were modelled by using eight- noded quadrilateral thin shell elements. Each specimen was run under a static shear load placed on the top flange. Series of eigenvalue buckling analysis were performed to obtain the critical buckling loads of tapered girder models and respective buckling modes were identified and investigated. The results are compared with previous experimental results. Parametric studies which involve various geometries of tapered panels were done in order to find the most optimum design situations. The results from the finite element analysis are presented and discussed. The ultimate shear load capacities of different types of geometric and their buckling modes are discovered. The shear capacities of girders with profiled webs are increased 21.8% - 36.3% higher compare to the girders with flat webs. The buckling modes that occurred in this study are local and global buckling mode. The typical failure mode of a tapered girder with profiled web is initially in the local buckling mode. The buckling phenomenon starts from local buckling mode in the early stage normally after the load reaches its peak and then transformed to global buckling mode at failure load. The buckling starts locally in the flat part of web sub- panel and then propagates to another sub- panel which is then in the global buckling mode. From the results, this study shows that different geometric parameters influence the strength of the profiled tapered plate girders.

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TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xiv
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Objectives of Research	3
1.4 Scope of Work	3
1.5 Significance of Study	4
CHAPTER TWO: LITERATURE REVIEW	5
2.1 Introduction to Plate Girders	5
2.1.1 Tension Field Actions	6
2.2 Introduction to Profiled Web Girders	9
2.2.1 Application of Girders with Profiled Webs	11
2.2.2 Advantages of Profiled Webbed Girder System	12
2.2.3 Buckling Behaviour of Profiled Web Girder	13
2.2.4 Shear Strength Base on Local Buckling	15
2.2.5 Shear Strength Base on Global Buckling	21
2.2.6 Factors Influencing Shear Capacity of Profiled Web Girder	26
2.2.7 Overview of Researches on Girders with Profiled Webs	26
2.3 Introduction to Tapered Plate Girders	33
2.3.1 Purpose of Tapering	33

2.3.2	Ultimate Shear Strength for Tapered Plate Girders	34
2.3.3	Overview of Research on Tapered Girders	35
2.4	Concluding Remark	42
CHAPTER THREE: METHODOLOGY		44
3.1	Introduction	44
3.2	Research Design	45
3.3	Procedure of Finite Element Modeling and Analysis	52
3.3.1	Numerical Model	52
3.3.2	Geometry Properties of Numerical Models	52
3.3.3	Model Attributes	55
3.3.3	Meshing	55
3.3.4	Loading and boundary condition	56
3.3.5	Linear buckling analysis	58
3.3.6	Non- Linear Buckling Analysis	60
3.3.7	Convergence Study	60
3.4	Validation of Non- Linear Finite Element Results with Pre Existing Experimental Results	61
3.5	Tapered Girders with Profiled Web (Series 3)	67
3.6	Concluding Remark	69
CHAPTER FOUR: PARAMETRIC STUDY OF SERIES 4 MODELS		71
4.1	Introduction	71
4.2	Modelling	71
4.3	Effect of Flange Thickness	75
4.4	Effect of Web Thickness	99
4.5	Effect of Aspect Ratio of the Web Panels	119
4.6	Effect of the Inclined Flange Slope	120
4.7	Concluding Remark	120
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATION		122
5.1	Conclusions	122
5.2	Recommendation	123