

EXPERIMENTAL TESTS OF BEAMS  
WITH ECCENTRIC WEB OPENINGS

by

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A MASTER'S THESIS

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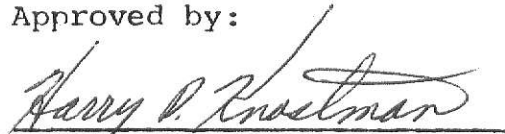
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TABLE OF CONTENTS

	Page
List of Figures - - - - -	iii
List of Tables - - - - -	v
Nomenclature - - - - -	vi
Introduction - - - - -	1
Test Set-up and Test Procedure - - - - -	5
Introduction - - - - -	5
Specimen Description - - - - -	5
Instrumentation - - - - -	7
Test Set-up - - - - -	9
Test Procedure - - - - -	10
Theoretical Methods - - - - -	13
Numerical Integration Program - - - - -	13
Deflections - - - - -	16
Vierendeel Analysis - - - - -	18
Finite Element Analysis - - - - -	21
Elastic Test Results - - - - -	24
Deflections - - - - -	24
Strains - - - - -	25
Ultimate Load Test Results - - - - -	28
Introduction - - - - -	28
Beam 1 - - - - -	28
Beam 2 - - - - -	30
Conclusions - - - - -	33
Acknowledgements - - - - -	35
References - - - - -	36
Figures and Tables - - - - -	38
Abstract	

## LIST OF FIGURES

	Page
Fig. 1 - Diagrams for Numerical Integration Program - - -	13, 15
Fig. 2 - Diagrams for Vierendeel Analysis - - - - -	19
Fig. 3 - Idealized Beam for Finite Element Method - - -	22
Fig. 4 - Test Set-ups - - - - -	38
Fig. 5 - Opening and Reinforcement Details - - - - -	39
Fig. 6 - Tensile Specimen Details - - - - -	40
Fig. 7 - Cross-Section Dimension Locations - - - - -	41
Fig. 8 - Strain Gage Locations - Beam 1 - - - - -	45
Fig. 9 - Strain Gage Locations - Beam 2 - - - - -	46
Fig. 10 - Dial Gage Support Details - - - - -	47
Fig. 11 - Support Pedestal - - - - -	48
Fig. 12 - Load vs. Mid-span Deflection Elastic Load Tests - Beam 1 - - - - -	50
Fig. 13 - Load vs. Mid-span Deflection Elastic Load Tests - Beam 2 - - - - -	51
Fig. 14 - Stress Distribution Curves - Beam 1 - M/V = 80 -	52
Fig. 15 - Stress Distribution Curves - Beam 1 - M/V = 60 -	53
Fig. 16 - Stress Distribution Curves - Beam 1 - M/V = 40 -	54
Fig. 17 - Stress Distribution Curves - Beam 1 - M/V = 20 -	55
Fig. 18 - Stress Distribution Curves - Beam 2 - M/V = 80 -	56
Fig. 19 - Stress Distribution Curves - Beam 2 - M/V = 60 -	57
Fig. 20 - Stress Distribution Curves - Beam 2 - M/V = 40 -	58
Fig. 21 - Stress Distribution Curves - Beam 2 - M/V = 20 -	59
Fig. 22 - Load vs. Mid-span Deflection Ultimate Load Test - Beam 1 - - - - -	60
Fig. 23 - Load vs. Mid-span Deflection Ultimate Load Test - Beam 2 - - - - -	61

Fig. 24 - Mode of Failure - Beam 1 - - - - - 62  
Fig. 25 - Interaction Curves - - - - - 63  
Fig. 26 - Mode of Failure - Beam 2 - - - - - 64

## LIST OF TABLES

	Page
Table 1 - Tensile Test Results - - - - -	40
Table 2 - Cross-Sectional Dimensions and Properties (At Opening) - - - - -	42
Table 3 - Cross-Sectional Dimensions (At Ends) - - - - -	44
Table 4 - Deflection Readings For 20 <sup>k</sup> Load - - - - -	49

## NOMENCLATURE

Symbols

- A - cross-sectional area
- E - modulus of elasticity
- F - force
- G - shear modulus
- I - moment of inertia
- L - length
- M - moment
- Q - resultant force
- P - applied load
- V - shear
- a - half the distance between cross-sections
- d - length of moment arm
- f - stress
- h - depth
- k - kip
- m - moment due to unit load
- t - thickness
- v - shear due to unit load
- x - longitudinal distance from centerline of opening
- y - transverse distance from edge of  $i^{\text{th}}$  element to stress resultant
- y - transverse distance from centroidal axis to any fiber
- z - transverse distance from outer edge of flange to  $i^{\text{th}}$  element
- $\delta$  - deflection
- $\sigma$  - normal stress

Subscripts

- B - bottom section
- N - net section
- O - distance referring to moment-shear ratio
- P - plastic
- T - top section
- b - bending
- i - numerical designation
- u - ultimate
- w - web
- 1 - primary
- 1 - section including cover plates
- 2 - secondary

Abbreviations

- HME - high moment edge
- in. - inch, inches
- ksi - kips per square inch
- LME - low moment edge
- N.A. - neutral axis