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EL-Mansoura University
Faculty of Engineering
Structural Eng. Dept.

Employment of Polymer Concrete In Perforated Composite Section for Beams with Eccentric Holes and calculation of plastic behavior for this type of beams

BY
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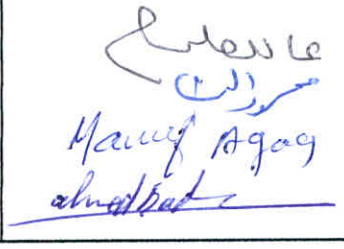
1- Prof. Dr. Adel Helmy Salem 2- Prof. Dr. Mahmoud I. El-Banna 3- Prof. Dr. Youssef I. Agag 4- Assoc. Prof. Dr. Ahmed El- Said Badr	

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ABSTRACT

The main objective of this thesis is devoted to study the plastic behavior of composite beams with polymer concrete slab and multiple eccentric web openings. The opening locations were varied over the beam's length to investigate the different moment-shear ratios applied to the center-line of the critical opening. The analytical model of such beams includs the study of the different hole failure mechanism that the beam may be subjected to such as, single hole failure, double hole failure and global hole failure. Also, the stability of web-post between adjacent holes is studied to avoid the failure due to the interaction between openings. The analysis is based on the conservatively assumed stress distribution at the hole boundaries and satisfies equilibrium and yield condition. The analysis is limited in scope to rectangular openings and includes the contribution of the polymer concrete slab to shear strength, as well as flexural strength.

In general, the obtained results from the analysis are presented in a series of interaction diagrams to explore the effects of opening dimensions, eccentricity, spacing between web openings and the concrete slab parameters on the strength of the composite beam.

Finally, Comparisons are made between the obtained results from the analysis and those previously obtained ,either experimentally or theoretically, to verify the general accuracy of the analysis. In general, the analysis provides realistic, and generally conservative predictions of the strength for the previously tested beams.

TABLE OF CONTENTS

Subject	Page
NOTATION	v
CHAPTER 1 INTRODUCTION	1
1-1 Preamble	1
1-2 General Design Concepts	1
1-3 Scope and Objectives	3
1-4 Thesis Contents	4
CHAPTER 2 LITERATURE REVIEW	
2-1 Introduction	7
2-2 Prediction of Internal Stresses in Perforated Beams	8
2-2-1 prediction of internal stresses in steel beams	8
2-2-2 prediction of internal stresses in perforated composite beams	15
2-3 A Short Review for the Distribution of Shear Force at Eccentric Web Opening	19
2-4 Review of Previous Researches on Plastic Analysis of Perforated Composite Beams	21
2-4-1 Tood and Cooper analysis	21
2-4-2 Clawson and Darwin analysis	22
2-4-3 Darwin and Donahey analysis	24
2-5 A Short Review for Polymer Concrete	26
2-5-1 polymer cement concrete PCC	27

Subject	Page
2-5-2 polymer impregnated concrete PIC	29
2-5-3 polymer concrete PC	32
2-5-4 general remarks on polymer concrete	33
CHAPTER 3 PLASTIC ANALYSIS OF COMPOSITE BEAMS WITH POLYMER CONCRETE AND ECCENTRIC HOLES	
3-1 Introduction	35
3-2 Analysis of Composite Beams with Polymer Concrete and Single hole Failure	36
3-2-1 forces acting at opening	36
3-2-2 failure modes	38
3-2-2-1 failure under pure moment	38
3-2-2-2 failure under combined moment and shear	39
3-2-3 stress distributions at critical sections	40
3-2-3-1 stress distribution for bottom tee	40
3-2-3-2 stress distribution for top tee	42
3-2-4 yield condition	43
3-2-5 analysis of composite beams with single hole failure	44
3-2-5-1 equilibrium equations for bottom tee	45
3-2-5-2 equilibrium equations for top tee	46
3-2-6 interaction diagrams	48
3-2-6-1 maximum shear capacity for bottom and top tees	48
3-2-6-2 case of combined moment and shear	49
3-2-6-3 case of pure moment	51

Subject	Page
3-3 Analysis of Composite Beams with Polymer Concrete and Double Hole Failure	53
3-3-1 forces acting at openings	53
3-3-2 failure modes	55
3-3-2-1 double hole failure under pure moment	55
3-3-2-2 double hole failure under combined moment and shear	56
3-3-3 analysis of composite beams with double holes failure	57
3-3-3-1 maximum shear strength for bottom and top tees	58
3-3-3-2 case of combined moment and shear	61
3-4 Analysis of Composite Beams with Polymer Concrete and Global Holes Failure	63
3-4-1 forces acting at opening	64
3-4-2 analysis of composite beams with global holes failure	65
3-4-2-1 maximum shear strength for bottom and top tees	65
3-4-2-2 case of combined moment and shear case	68
3-5 Instability of Web-Post	70
3-5-1 general	70
3-5-2 minimum width (Cpmin) of web posts between openings	70
CHAPTER 4 APPLICATION	
4-1 Introduction	75
4-2 Interaction Diagrams for Final Results	75

Subject	Page
4-3 Comparison of Results	108
4-3-1 comparison with the experimental results of Darwin [9]	108
4-3-1-1 Darwin's large steel sections	110
4-3-1-2 Darwin's small steel sections	113
4-3-2 comparison with the experimental results of Granade	116
CHAPTER 5 CONCLUSIONS and RECOMMENDATIONS	
5-1 Introduction	130
5-2 Conclusions	131
5-3 Recommendations for Design of Perforated Composite Beams	133
5-4 Recommendations for Future Researches	135
REFERENCES	136
APPENDIX I COMPUTER PROGRAMS	141

NOTATION

The Following symbols and abbreviations are used in the thesis

a	: half length of opening;
b_f	: width of flange
b_{eff}	: Effective width of concrete slab;
C	:depth to neutral axis from top of concrete slab;
c_p	: width of web post;
d	: depth of steel section;
e	: opening eccentricity;
F_{yf}	: flange yield stress;
F_{yw}	: web yield stress;
F_b	: normal stress, bottom tee section;
F_t	: normal stress, top tee section;
F	: reduced concrete compresive strength;
F_c	: uniaxial concrete compresive strength;
h	: half height of hole;
H_p	: force at the end of web post;
K_{1b}	: stress reversal coefficient, section 1 (bottom);
K_{2b}	: stress reversal coefficient, section 2 (bottom);
K_{1t}	: stress reversal coefficient, section 1 (top);
K_{2t}	: stress reversal coefficient, section 2 (top);
M	: moment at center line of opening;
M_{pst}	: post plastic moment;
M_{pg}	: plastic moment capacity for uncut section;
m_{t1}	: secondary moment, section 1 (top);
m_{t2}	: secondary moment, section 2 (top);