BEHAVIOR OF FLANGED CONCRETE BEAMS WITH WEB OPENING UNDER PURE TORSION

By
Eng. Ahmed El sayed Salem Salama

A Thesis Submitted to
The Faculty of Engineering at Cairo University
In Partial Fulfillment of the Requirements for the Mater Degree
In
Structural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT

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Dedication

This thesis is dedicated to my mother.

For her endless love, support and encouragement

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Nomenclature

A_o : cross-sectional area bounded by the centerline of the shear flow path.

A_{oh} : the area enclosed by the centerline of the hoop.

A_t : cross-sectional area of one leg of closed stirrups.

$\overline{A_1}$: cross-sectional area of longitudinal bars within the shear-compression zone = 1/2 total longitudinal steel of four corner bars.

A_1 : is area enclosed by centroids of corner longitudinal steel in chord member.

A_{cp} : the area bounded by the outer perimeter of concrete cross section.

a : depth of stress block.

b_o : length of opening.

E_s: the young's modulus of elasticity.

E_c : the modulus of Elasticity of concrete.

f_{sy} : yield strength of stirrups.

f_{ly} : yield strength of longitudinal bars.

f_{Ly} : the yield stress of the longitudinal reinforcement.

F_{ty} : the yield stress of the stirrups.

f_t :stress in stirrups.