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STRENGTHENING OF REINFORCED LIGTH WEIGHT CONCRETE BEAMS USING CARBON AND GLASS FIBERS

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Statement

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LIST OF SYMBOLS

A_f, A_{fv} = Area of FRP external reinforcement.

A_s= Total area of longitudinal steel reinforcement

b_f = The width of FRP
b_w = Width of concrete section

CE=Environmental reduction factor

d, d_{fv} = Effective depth of the concrete section.

d'= Distance from centroid of compressive steel to upper face of member

d_f = Depth of FRP shear reinforcement.

E_f, E_{fu} = Tensile modulus of elasticity of FRP.

E_s = Modulus of elasticity of steel

F_c, f_{cm}, f_c', f_{cd}, f_{cu} = the cylinder compressive strength of concrete
f_{fe}, f_f = Tensile strength of the FRP
f_y, fs = Steel yield strength
h = Depth of concrete beam
h_f = Distance from extreme compression fibre to centroid of tension reinforcement

n = Number of plies of FRP reinforcement

k_1, K_2= Modification factors

Kv= the bond-reduction coefficient

Le= the active bond length

q_{fu} = The nominal shear strength of the FRP shear reinforcement

S_f = Spacing of FRP shear reinforcement (distance between the centerline of the strips).

t_f = Nominal thickness of one ply of the FRP reinforcement

Vu= The shear capacity Vu of the shear strengthened RC beam

Vc= The shear resistance of the concrete and longitudinal steel reinforcements

Vs = The shear capacity of transverse steel reinforcements or bent-up steel bars

V_f = The accurate prediction of the FRP shear contribution

w_f = Width of the FRP reinforcing plies

ε_{fu}*= Maximum strain in the FRP

ε_f, ε_{fe}= FRP strain

ε_{bi}= = Initial strain in concrete at the level of the FRP at service load level when installing the FRP

ε_s= Strain of the steel reinforcement

ε_{cu}= Ultimate concrete strain

ε_{ef} = Effective strain in FRP reinforcement.

γ_f = Material strength reduction factor of FRP shear reinforcement.

γ_S = Material safety factor for the steel reinforcement

γ_c = Material safety factor for the concrete

$\rho_f =$ FRP reinforcement ratio

$\theta =$ = Angle of diagonal crack with respect to the member axis

α = Angle of inclination of FRP reinforcement to the longitudinal axis of the member

β_1= Coefficient accounting for the bond characteristics of the reinforcement

ψ = Load combination factor, or stress block area coefficient

$\delta_G =$ Stress block centroid coefficient

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