

Project 1 storey outbuilding - RAFT FOUNDATION - 150mm slab				Job no. 2023-7459	
Calcs for Wendover Lower Rochester Road Higham Rochester Kent ME3 7HD				Start page no./Revision 7	
Calcs by SB	Calcs date 16/10/2023	Checked by	Checked date	Approved by	Approved date

Reinforcement required in top of edge beam

K factor

$$K_{\text{corner}} = M_{\Sigma \text{corner}} / (f_{cu} \times b_{\text{edgetop}} \times d_{\text{edgetop}}^2) = 0.006$$

Lever arm

$$z_{\text{corner}} = d_{\text{edgetop}} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{\text{corner}}/0.9)}) = 239 \text{ mm}$$

Area of steel required for bending

$$A_{\text{scornerbend}} = M_{\Sigma \text{corner}} / ((1.0/\gamma_s) \times f_y \times z_{\text{corner}}) = 57 \text{ mm}^2$$

Minimum area of steel required

$$A_{\text{scornermin}} = A_{\text{sedgetopmin}} = 151 \text{ mm}^2$$

Area of steel required

$$A_{\text{scorner}} = \max(A_{\text{scornerbend}}, A_{\text{scornermin}}) = 151 \text{ mm}^2$$

PASS - $A_{\text{scorner}} \leq A_{\text{sedgetop}}$ - Area of reinforcement provided in top of edge beams at corners is adequate

Corner beam shear check

Average web width

$$b_w = b_{\text{edge}} + (h_{\text{edge}}/\tan(\alpha_{\text{edge}}))/2 = 387 \text{ mm}$$

Applied shear stress

$$v_{\text{corner}} = V_{\Sigma \text{corner}} / (b_w \times d_{\text{edgetop}}) = 0.138 \text{ N/mm}^2$$

Tension steel ratio

$$\rho_{\text{corner}} = 100 \times A_{\text{sedgetop}} / (b_w \times d_{\text{edgetop}}) = 0.348$$

From BS8110-1:1997 - Table 3.8

Design concrete shear strength

$$v_{\text{ccorner}} = 0.497 \text{ N/mm}^2$$

$$v_{\text{corner}} \leq v_{\text{ccorner}} + 0.4 \text{ N/mm}^2 - \text{Therefore minimum links required}$$

Link area to spacing ratio required

$$A_{sv_upon_svreqcorner} = 0.4 \text{ N/mm}^2 \times b_w / ((1.0/\gamma_s) \times f_{ys}) = 0.356 \text{ mm}$$

Link area to spacing ratio provided

$$A_{sv_upon_svprovedge} = N_{\text{edgelink}} \times \pi \times \phi_{\text{edgelink}}^2 / (4 \times s_{\text{vedge}}) = 0.754 \text{ mm}$$

PASS - $A_{sv_upon_svreqcorner} \leq A_{sv_upon_svprovedge}$ - Shear reinforcement provided in edge beams at corners is adequate

Corner beam deflection check

Basic allowable span to depth ratio

$$\text{Ratio}_{\text{basiccorner}} = 7.0$$

Moment factor

$$M_{\text{factorcorner}} = M_{\Sigma \text{corner}} / (b_{\text{edgetop}} \times d_{\text{edgetop}}^2) = 0.195 \text{ N/mm}^2$$

Steel service stress

$$f_{\text{scorner}} = 2/3 \times f_y \times A_{\text{scornerbend}} / A_{\text{sedgetop}} = 55.574 \text{ N/mm}^2$$

Modification factor

$$MF_{\text{corner}} = \min(2.0, 0.55 + [(477 \text{ N/mm}^2 - f_{\text{scorner}}) / (120 \times (0.9 \text{ N/mm}^2 + M_{\text{factorcorner}}))])$$

$$MF_{\text{corner}} = 2.000$$

Modified allowable span to depth ratio

$$\text{Ratio}_{\text{allowcorner}} = \text{Ratio}_{\text{basiccorner}} \times MF_{\text{corner}} = 14.000$$

Actual span to depth ratio

$$\text{Ratio}_{\text{actualcorner}} = l_{\text{corner}} / d_{\text{edgetop}} = 4.288$$

PASS - $\text{Ratio}_{\text{actualcorner}} \leq \text{Ratio}_{\text{allowcorner}}$ - Edge beam span to depth ratio is adequate