

A-Z Building Services A: Addlestone K115 E: h@huseyniOBO9@men.com T: 01969925562	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 3	
	Calcs by SB	Calcs date 13/08/2026	Checked by	Checked date	Approved by	Approved date

Cantilever bending moment

$$M_{cant11} = q_{netulteff1} \times [(l_{eff11} - b_{11})/2]^2/2 = \mathbf{0.0 \text{ kNm/m}}$$

Line load 2

Net 'ultimate' bearing pressure available

$$q_{netult2} = q_{net} \times w_{ult21}/(w_{D21} + w_{L21}) = \mathbf{50.1 \text{ kN/m}^2}$$

Loaded width required at formation

$$l_{req21} = w_{ult21}/q_{netult2} = \mathbf{0.120 \text{ m}}$$

Effective loaded width at u/side slab

$$l_{eff21} = \max(b_{21}, l_{req21} - 2 \times h_{coreslab} \times \tan(30)) = \mathbf{0.500 \text{ m}}$$

Effective net ult bearing pressure at u/side slab

$$q_{netulteff2} = q_{netult2} \times l_{req21}/l_{eff21} = \mathbf{12.0 \text{ kN/m}^2}$$

Cantilever bending moment

$$M_{cant21} = q_{netulteff2} \times [(l_{eff21} - b_{21})/2]^2/2 = \mathbf{0.0 \text{ kNm/m}}$$

Maximum cantilever moment

$$M_{cant1} = \max(M_{cant11}, M_{cant21}) = \mathbf{0.0 \text{ kNm/m}}$$

Reinforcement required in bottom

Maximum cantilever moment

$$M_{cantmax} = \mathbf{0.0 \text{ kNm/m}}$$

K factor

$$K_{slabbp} = M_{cantmax}/(f_{cu} \times d_{bslabmin}^2) = \mathbf{0.000}$$

Lever arm

$$Z_{slabbp} = d_{bslabmin} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{slabbp}/0.9)}) = \mathbf{95.0 \text{ mm}}$$

Area of steel required

$$A_{sslabbppreq} = M_{cantmax}/((1.0/\gamma_s) \times f_{yslab} \times Z_{slabbp}) = \mathbf{0 \text{ mm}^2/\text{m}}$$

**PASS - $A_{sslabbppreq} \leq A_{sslabbtm}$ - Area of reinforcement provided to distribute the load is adequate
The allowable bearing pressure will not be exceeded**

Internal slab bending and shear check

Applied bending moments

Span of slab

$$l_{slab} = \phi_{depslab} + d_{tslabav} = \mathbf{1470 \text{ mm}}$$

Ultimate self weight udl

$$w_{swult} = 1.4 \times w_{slab} = \mathbf{5.0 \text{ kN/m}^2}$$

Self weight moment at centre

$$M_{csw} = w_{swult} \times l_{slab}^2 \times (1 + \nu) / 64 = \mathbf{0.2 \text{ kNm/m}}$$

Self weight moment at edge

$$M_{esw} = w_{swult} \times l_{slab}^2 / 32 = \mathbf{0.3 \text{ kNm/m}}$$

Self weight shear force at edge

$$V_{sw} = w_{swult} \times l_{slab} / 4 = \mathbf{1.9 \text{ kN/m}}$$

Moments due to applied uniformly distributed loads

Ultimate applied udl

$$w_{udult} = 1.4 \times w_{Dudl} + 1.6 \times w_{Ludl} = \mathbf{15.0 \text{ kN/m}^2}$$

Moment at centre

$$M_{cudl} = w_{udult} \times l_{slab}^2 \times (1 + \nu) / 64 = \mathbf{0.6 \text{ kNm/m}}$$

Moment at edge

$$M_{eudl} = w_{udult} \times l_{slab}^2 / 32 = \mathbf{1.0 \text{ kNm/m}}$$

Shear force at edge

$$V_{udl} = w_{udult} \times l_{slab} / 4 = \mathbf{5.5 \text{ kN/m}}$$

Moment due to load number 1

Approximate equivalent udl line load 1

$$w_{udl11} = w_{ult11}/(2 \times 0.3 \times l_{slab}) = \mathbf{6.8 \text{ kN/m}^2}$$

Approximate equivalent udl line load 2

$$w_{udl21} = w_{ult21}/(2 \times 0.3 \times l_{slab}) = \mathbf{6.8 \text{ kN/m}^2}$$

Moment at centre

$$M_{c1} = (w_{udl11} + w_{udl21}) \times l_{slab}^2 \times (1 + \nu) / 64 = \mathbf{0.6 \text{ kNm/m}}$$

Moment at edge

$$M_{e1} = (w_{udl11} + w_{udl21}) \times l_{slab}^2 / 32 = \mathbf{0.9 \text{ kNm/m}}$$

Shear force at edge

$$V_1 = (w_{udl11} + w_{udl21}) \times l_{slab} / 4 = \mathbf{5.0 \text{ kN/m}}$$

Resultant moments and shears

Total moment at edge

$$M_{\Sigma e} = \mathbf{2.3 \text{ kNm/m}}$$

Total moment at centre

$$M_{\Sigma c} = \mathbf{1.4 \text{ kNm/m}}$$

Total shear force

$$V_{\Sigma} = \mathbf{12.4 \text{ kN/m}}$$

Reinforcement required in top

K factor

$$K_{slabtop} = M_{\Sigma e}/(f_{cu} \times d_{tslabav}^2) = \mathbf{0.005}$$

Lever arm

$$Z_{slabtop} = d_{tslabav} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{slabtop}/0.9)}) = \mathbf{114.0 \text{ mm}}$$

Area of steel required for bending

$$A_{sslabtopbend} = M_{\Sigma e}/((1.0/\gamma_s) \times f_{yslab} \times Z_{slabtop}) = \mathbf{46 \text{ mm}^2/\text{m}}$$

Minimum area of steel required

$$A_{sslabmin} = 0.0013 \times h_{slab} = \mathbf{195 \text{ mm}^2/\text{m}}$$

Area of steel required

$$A_{sslabtopreq} = \max(A_{sslabtopbend}, A_{sslabmin}) = \mathbf{195 \text{ mm}^2/\text{m}}$$

PASS - $A_{sslabtopreq} \leq A_{sslabtop}$ - Area of reinforcement provided in top to span local depressions is adequate