MAXSPAN SLAB DESIGN REPORT

Element: Maxspan Slab Panel 1

Design Code: BS EN 1992-1-1:2004 | Date: 28 October 2026

REFERENCE	CALCULATIONS	OUTPUT
Geometry Slab Thickness	**TOPPING THICKNESS** Concrete cover,C = 25.0 mm Bar over support,BO = 12.0 mm BRC Mesh Across,BA = 6.0 mm BRC Mesh Along,BL = 6.0 mm Spacer over maxspan,Ss = 20.0 mm $h_f = C + BO + BA + BL + Ss = 25.0 + 12.0 + 6.0 + 6.0 + 20.0 = 69.0mm$ $h_f = max(60, 69.0) = 69.0mm$ $Maxspan - depth, DM = 150.0mm$ $h = h_f + D_M = 69.0 + 150.0 = 219.0mm$	**hf = 69.0 mm** **h = 219.0 mm**
Geometry Maxspan Dimensions	**MAXSPAN DETAILS & T-BEAM GEOMETRY** Length of maxspan LM = 300.0 mm Depth of maxspan DM = 150.0 mm Top Width of maxspan WT = 380.0 mm Bottom Width of maxspan WB = 300.0 mm Depth of key DK = 50.0 mm Length of key LK = 40.0 mm Weight of maxspan WM = 8.5 kg Rib spacing bottom SB = 150.0 mm Rib spacing top ST = 70.0 mm $b_{eff} = S_B + W_B = 150.0 + 300.0 = 450.0mm$ $d = h - C - \frac{\phi}{2} = 219.0 - 25.0 - \frac{12.0}{2} = 188.0mm$ $bw = SB = 150.0mm$	**beff = 450.0 mm** **d = 188.0 mm** **bw = 150.0 mm**
EN1991-1-1 Load Calculations	**LOAD CALCULATIONS (AREA METHOD)** **(i) Number of maxpans in 1 square meter of slab** A typical unit consists of 1 maxspan and a rib **Area of a typical unit** $Unit - Area = L_M \times b_{eff}$ $Unit - Area = L_M \times b_{eff} = 300.0 \times 450.0 \times 10^{-6} = 0.135m^2$ If a typical unit consists of 1 maxspan, then for 1 square meter strip of the slab, it will be given by N; $N = \frac{1}{Unit - Area}$ $N = \frac{1}{0.135} = 7.0$ Therefore, 1m² of the slab consists of 7.0 maxspans.	**Number of maxspans = 7.0**

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EN1991-1-1 Load Calculations	**LOAD CALCULATIONS (AREA METHOD)** **(ii) Permanent loads Gk** Weight of maxpan per m² $= \frac{8.5 \times 9.81}{1000} \times 7.0 = 0.618 kN/m^2$ Volume of maxspan in 1m² of slab $= [(50.0 \times 380.0 \times 300.0) + ((150.0 - 50.0) \times 300.0 \times 300.0)] \times 10^{-6} \times 7.0 = 0.109 m^3$ Volume of 1m² slab $= 1 \times 1 \times \frac{219.0}{1000} = 0.219 m^3$ Volume of concrete in 1m² of slab $= 0.219 - 0.109 = 0.11 m^3$ Weight of concrete per m² $= 0.11 \times 25.0 = 2.753 kN/m^2$ Permanent load Gk $= 0.618 + 2.753 + 1.0 + 1.2 = 5.57 kN/m^2$	**Gk = 5.57 kN/m²**
EN1991-1-1 Load Calculations	**LOAD CALCULATIONS (AREA METHOD)** **(iii) Ultimate Design load: n** $n = 1.35G_k + 1.5Q_k$ $n = 1.35 \times 5.57 + 1.5 \times 1.2 = 9.32 kN/m^2$ Load per rib: n_{rib} $n_{rib} = n \times \frac{b_{eff}}{1000} = 9.32 \times \frac{450.0}{1000} = 4.194 kN/m$	**n = 9.32 kN/m²** **n_{rib} = 4.194 kN/m**
§5.1.1 Structural Analysis	**STRUCTURAL ANALYSIS (CONSIDER BEAM AS SIMPLY SUPPORTED)** $M_{Ed} = \frac{n_{perrib} \times L^2}{8} = \frac{4.194 \times 3.5^2}{8} = 6.422 kNm$ $V_{Ed} = \frac{n_{perrib} \times L}{2} = \frac{4.194 \times 3.5}{2} = 7.34 kN$	**MEd = 6.422 kNm** **VEd = 7.34 kN**

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§6.1 Reinforcement Design (T-Beam)	**REINFORCEMENT DESIGN** fck = 25.0 N/mm², fyk = 500.0 N/mm² For slabs, allow 20% moment redistribution and fck ≤ C50/60 Moment redistribution factor δ = 0.8 $k_{bal} = \frac{0.454(0.8-0.44)}{1.25} - \frac{0.182(0.8-0.44)^2}{1.25^2} = 0.116$ **Step 1: Moment capacity** $k = \frac{M_{Ed}}{beff d^2 f_{ck}} = \frac{6.422\times10^6}{450.0\times188.0^2\times25.0} = 0.016$ Since k = 0.016 < 0.116 → Singly reinforced **Step 2: Lever arm z** $\frac{z}{d} = 0.5 + \sqrt{0.25 - \frac{k}{1.134}} = 0.5 + \sqrt{0.25 - \frac{0.016}{1.134}} = 0.99$ $z = 0.99 \times d = 0.99 \times 188.0 = 185.0mm$ Limiting values of Z: $z_{lim} = 0.95 \times d = 0.95 \times 188.0 = 179.0mm$ $Adopted z = 179.0mm$ **Step 3: Neutral axis depth** $S = 2(d - z) = 2 \times (188.0 - 179.0) = 19.0mm$ Since S = 19.0 < 69.0 → Design as rectangular section (S < hf) **Step 4: Required reinforcement** $A_{s,req} = \frac{M_{Ed}}{0.87 f_{yk} z} = \frac{6.422\times10^6}{0.87\times500.0\times179.0} = 83.0mm^2/rib$ **Step 5: Minimum reinforcement** $f_{ctm} = 0.3(f_{ck})^{2/3} = 0.3\times(25.0)^{2/3} = 2.56N/mm^2$ $As,min = 0.26 \times \frac{fctm}{fyk} \times b \times d = 0.26 \times \frac{2.56}{500.0} \times 450.0 \times 188.0 = 38.0mm²/rib$ $0.0013bd = 0.0013 \times 450.0 \times 188.0 = 37.0mm²/rib$ $As,min = max(0.0013bd, As,min) = max(37.0, 38.0) = 38.0mm²/rib$ **Step 6: Final required area** As,req,final = max(As,min, As,req) = max(38.0, 83.0) = 83.0 mm²/rib **Step 7: Provided reinforcement** Number of bars per rib = 2.0 Hence Provide 2.0 H12.0 per rib $A_{s,prov} = \frac{\pi\phi^2}{4} \times Q_1 = \frac{\pi\times12.0^2}{4} \times 2.0 = 226.0mm^2/rib$ Check: Adequate (226 ≥ 83) *NOTE: Provide transverse ribs for larger spans at distance ≤ 10× slab thickness.*	**k = 0.016** **As,req = 83.0 mm²/rib** **As,prov = 226.0 mm²/rib** **Bars: 2.0H12.0 per rib** **Status: Adequate**

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§6.2 Shear Design	**SHEAR DESIGN** **Step 1: Shear force** $V_{Ed} = \frac{4.194 \times 3500.0 \times 10^{-3}}{2} = 7.340kN$ **Step 2: k factor** $k = 1 + \sqrt{\frac{200}{d}} \leq 2$ $k = 1 + \sqrt{\frac{200}{188.0}} = 2.0$ $k = min(2.0, 2.0) = 2.0000$ **Step 3: Reinforcement ratio** $\rho_1 = \frac{A_{s,prov}}{b_w d} \leq 0.02$ $\rho_1 = \frac{226.0}{150.0 \times 188.0} = 0.0080$ $\rho_1 = min(0.0080, 0.02) = 0.0080$ **Step 4: VRd,c** $VRd, c = 0.12 \cdot k \cdot (100 \rho_1 f_{ck})^{1/3} \cdot b_w \cdot d$ $VRd, c = 0.12 \times 2.0000 \times (100 \times 0.0080 \times 25.0)^{1/3} \times 150.0 \times 188.0 / times 10^{-3} = 18.390kN$ $VRd, c, min = 0.035 \times k^{3/2} \times \sqrt{f_{ck}} \times b_w \times d$ $VRd, c, min = 0.035 \times 2.0000^{3/2} \times \sqrt{25.0} \times 150.0 \times 188.0 / times 10^{-3} = 13.958kN$ $VRd, c = \max(18.390, 13.958) = 18.390kN$ $Check : VEd = 7.340kN \leq VRd, c = 18.390kN \rightarrow PASS$	**VRd,c = 18.39 kN** **Status: PASS**

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§7.4.2 Deflection	**DEFLECTION CHECK** **Step 1: Reference reinforcement ratio** $\rho_0 = \sqrt{f_{ck}} \times 10^{-3} = \sqrt{25.0} \times 10^{-3} = 0.0050$ **Step 2: Tension reinforcement ratio** $\rho = \frac{A_{s,prov}}{b_w d} = \frac{226.0}{150.0 \times 188.0} = 0.0029$ **Step 3: Structural system factor** K = 1.0 **Step 4: Basic L/d ratio** $\rho \le \rho_0 \rightarrow \frac{L}{d} = K\left[11 + 1.5\sqrt{f_{ck}} \times \frac{\rho_0}{\rho} + 3.2\sqrt{f_{ck}} \times \left(\frac{\rho_0}{\rho} - 1\right)^{\frac{3}{2}}\right]$ $L/d)_{basic} = 33.28$ **Step 5: Modification factor** **(i) Steel stress modification factor** $\beta_s = \frac{A_{s,prov}}{A_{s,req}}$ $\beta_s = \frac{226.0}{83.0} = 2.74$ $\beta_s = min(1.5, 2.74) = 1.50$ **(ii)Span modification factor** $\beta_L = \frac{7}{Lx}$ $\beta_L = \frac{7}{3.5} = 2.00$ $\beta_L = min(1.0, 2.00) = 1.00$ **(iii) Flange modification factor** $\beta_F = \frac{beff}{bw} = \frac{450.0}{150.00} = 3.00$ $\beta_F = 0.80$ → Interpolated factor for 1 < beff/bw < 3: **Step 6: Permitted L/d** $L/d)_{permitted} = 1.50 \times 1.00 \times 0.80 \times 33.28 = 39.93$ **Step 7: Actual L/d** $L/d)_{actual} = \frac{L_x}{d} = \frac{3500.0}{188.0} = 18.62$ **Step 8: Check** 18.62 ≤ 39.93 → OK	**Permitted L/d = 39.93** **Actual L/d = 18.62** **Status: OK**
§9.3.1.1 Flange Reinforcement (Mesh)	**FLANGE REINFORCEMENT** $A_{s,min,flange} = 0.13 \times \frac{b_{eff} \times h_f}{100} = 4.0 mm^2/m$ Selected mesh: A142, As,prov = 142 mm²/m Check: Provide A142 mesh (Area: 142 mm²/m)	**Required = 4.0 mm²/m** **Provided = 142 mm²/m** **Mesh: A142**