RECTANGULAR BEAM SUPPORT DESIGN REPORT

Element: Rectangular Beam Support 001

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

REFERENCE	CALCULATIONS	OUTPUT
§5.3.2.1 Beam Support Parameters	**BEAM SUPPORT PARAMETERS** Beam breadth, bw = 230.0 mm Beam depth, h = 450.0 mm Concrete cover, CC = 30.0 mm Assumed tension reinforcement H = 16.0 mm Assumed link size = 8.0 mm $d = h - \frac{\phi_{main}}{2} - CC - \phi_{link}$ $= 450.0 - \frac{16.0}{2} - 30.0 - 8.0 = 404.0mm$ Design Hogging Moment, MEd = 150.0 kNm	**bw = 230.0 mm** **h = 450.0 mm** **d = 404.0 mm** **MEd = 150.0 kNm**
§6.1 Design Parameters	**FLEXURAL DESIGN** fck = 25.0 N/mm² fyk = 500.0 N/mm² **Moment capacity** For beams , assume 0% moment redistribution and fck ≤ C50/60 Moment redistribution factor δ = 1.0 $k_{bal} = \frac{0.454(1.0-0.44)}{1.25} - \frac{0.182(1.0-0.44)^2}{1.25^2} = 0.167$ $k = \frac{M_{Ed}}{b_w d^2 f_{ck}} = \frac{150.0 \times 10^6}{230.0 \times 404.0^2 \times 25.0} = 0.16$ Since k = 0.16 < kbal = 0.167 → Singly reinforced **Lever arm z** $\frac{z}{d} = 0.5 + \sqrt{0.25 - \frac{k}{1.134}}$ $\frac{z}{d} = 0.5 + \sqrt{0.25 - \frac{0.16}{1.134}} = N/A$ $z = N/A \times d = N/A \times 404.0 = 335.3mm$ Limiting values of Z $\frac{z_{lim}}{d} = 0.95$ $z_{lim} = 0.95d = 0.95 \times 404.0 = 383.8mm$ $Therefore, z = min(z, zlim) = min(335.3mm, 383.8mm) = 335.3mm$	**k = 0.16** **kbal = 0.167** **SINGLY REINFORCED** **z = 335.3 mm**

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§6.1 Reinforcement	**LONGITUDINAL REINFORCEMENT** $A_{s,req} = \frac{M_{Ed}}{0.87 f_{yk} z} = \frac{150.0 \times 10^6}{0.87 \times 500.0 \times 335.3} = 1028.0 mm^2$ **Minimum reinforcement** $f_{ctm} = 0.3 \times f_{ck}^{2/3} = 0.3 \times 25.0^{2/3} = 2.565 N/mm^2$ $As, min = 0.26 \times \frac{f_{ctm}}{fyk} \times bw \times d$ $= 0.26 \times \frac{2.565}{500.0} \times 230.0 \times 404.0 = 124.0 mm^2$ $0.0013 \times bw \times d = 0.0013 \times 230.0 \times 404.0 = 121.0 mm^2$ $As, min = max(121.0 mm^2, 124.0 mm^2) = 124.0 mm^2$ **Maximum reinforcement** $As, max = 0.04 \times bw \times h = 0.04 \times 230.0 \times 450.0 = 4140.0 mm^2$ $As, min = 124.0 mm^2 \leq As, req = 1028.0 mm^2 \leq As, max = 4140.0 mm^2$ $As, req, final = 1028.0 mm^2$ **Provided reinforcement (top)** Provide 2.0 H16.0 top steel $A_{s,prov} = \frac{\pi \phi^2}{4} \times Q = \frac{\pi \times 16.0^2}{4} \times 2.0 = 402 mm^2$ Extra: 1.0 H16.0 top steel $A_{s,prov} = \frac{\pi \phi^2}{4} \times Q = \frac{\pi \times 16.0^2}{4} \times 1.0 = 201 mm^2$ $A_{s,prov} = 402 + 201 = 603 mm^2$ Check: As,prov = 603mm² < As,req = 1028.0 mm², INADEQUATE	**As,req = 1028.0 mm²** **As,min = 124.0 mm²** **As,max = 4140.0 mm²** **Provided: 2.0 H16.0 top** **As,prov = 603 mm²** **Status: INADEQUATE**