

PROPOSED EXTENSION at No.11 HEMINGFIELD ROAD, WOMBWELL, BARNSELY

STEEL BEAM CALCULATIONS (Sheet 1 of 2)

Beam to support wall: Span = 2.350 plus min 100 end bearing each end

Worst case inner leaf

Loading

Roof – with ceiling (Dead Load)

Tiles felt and battens	= 0.75 kN/m ²
Rafters	= 0.20 kN/m ²
Insulation	= 0.05 kN/m ²
Plasterboard + skim	= 0.20 kN/m ²
Total	= 1.20 kN/m²

Wall (Dead Load)

100 blockwork	= 1.30 kN/m ²
Plaster	= 1.10 kN/m ²
Total	= 2.40 kN/m²

Roof – (Imposed Load) = 0.60 kN/m²

$$\text{Area of wall to UDL} = 2.600 \times 2.350 = 6.11 \text{ m}^2$$

$$\text{Area of roof to UDL} = 3.800 \times 2.350 = 8.93 \text{ m}^2$$

$$\text{Wall load} \quad \text{DL} = 6.11 \text{ m}^2 \times 2.40 \text{ kN/m}^2 \times 1.4 = 20.5 \text{ kN (Unfactored} = 14.6 \text{ kN)}$$

$$\begin{aligned} \text{Roof Load} \quad \text{DL} &= 8.93 \text{ m}^2 \times 1.20 \text{ kN/m}^2 \times 1.4 = 15.0 \text{ kN (Unfactored} = 10.7 \text{ kN)} \\ \text{LL} &= 8.93 \text{ m}^2 \times 0.60 \text{ kN/m}^2 \times 1.6 = 8.6 \text{ kN (Unfactored} = 5.4 \text{ kN)} \end{aligned}$$

$$\text{Total UDL} = 23.6 \text{ kN (Unfactored} = 16.1 \text{ kN)}$$

$$\text{MBM for UDL} = \frac{WL}{8} = \frac{23.6 \times 2.350}{8} = 6.9 \text{ kNm}$$

Try 152mm x 89mm x 16 kg/m U.B.

$$I_{xx} = 838 \text{ cm}^4$$

Check for stress

$$l = 1.2 (2.350 + (2 \times 0.152)) = 3.2 \text{ m}$$

From tables in BS 5950: fbc = 15 kNm: therefore section ok for stress

Check deflection

$$\text{Permissible} = \frac{\text{Span}}{360} = \frac{4250}{360} = 11.8 \text{ mm}$$

$$\text{Actual} = \frac{5WL^3}{384EI} = \frac{5 \times 101.6 \times 4.25^3 \times 10^3}{384 \times 2.05 \times 4440} = 11 \text{ mm}$$

Section ok for deflection

USE 2 No.152mm x 89mm x 16 kg/m U.B.s bolted together with M24 Grade 8.8 bolts with tubular steel spacers over bolts

PROPOSED EXTENSION at No.79 GRAY STREET, ELSECAR, BARNSELEY

STEEL BEAM CALCULATIONS (Sheet 2 of 2)

Padstone Calculator

COMPLIES WITH LATEST EUROPEAN DESIGN CODES

structural calculations for padstones

Beam End Reaction = **11.80** kN (factored) Variable Load Safety Factor = 1.5
Factored Load at End of Beam Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = **2.6** N/mm² (Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
Width of beam end bearing = **89** mm (A Engineering Brick = 13.2 N/mm²)
Length of beam end bearing = **215** mm (B Engineering Brick = 10.5 N/mm²)
(Weak Brickwork = approx 2.8 N/mm²)
(7.3N Blockwork usually = 4.2 N/mm²)
(10.4N Blockwork usually = 5.4 N/mm²)

$\gamma_m = 3.0$

Bearing Factor = **1.25**

Results

Maximum Bearing Stress = **1.08** N/mm²
Actual Bearing Stress = **0.62** N/mm²

Padstone Not Required

Padstone Results

Characteristic strength of Padstone = **30.0** N/mm² (A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
Width of Padstone = **152** mm (Concrete C15 = 15 N/mm²)
Length of Padstone = **330** mm (Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)