

Consulting Civil & Structural Engineers

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**Calculation Sheet**

Ref: 4663

Date: 28/01/2022

Project: 67 ACTON GATE, WREXHAM

Sheet No. 1

Calculations By: SFH

Checked By: GJH

Member Ref	Calculations	Output
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LOADINGS**ROOF**

Tiles $= 0.55 \text{ KN/m}^2$

Battens $= 0.05$

Felt $= 0.03$

Rafters $= 0.07$

$= 0.70 \text{ KN/m}^2$

Load on plan $= 0.70/\text{Cos}30^\circ$ **$= 0.81 \text{ KN/m}^2$**

Imposed **$= 0.75 \text{ KN/m}^2$**

CEILING

Insulation $= 0.02 \text{ KN/m}^2$

Joists $= 0.07$

Plasterboard $= 0.13$

Skim coat $= 0.05$

$= 0.27 \text{ KN/m}^2$

Imposed **$= 0.25 \text{ KN/m}^2$**

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Sheet No. 2

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FIRST FLOOR*Boards* = 0.14 KN/m²*Joists* = 0.18*Insulations* = 0.02*Plasterboard* = 0.13*Skim coat* = 0.05*Partitions* = 0.40**= 0.92 KN/m²***Imposed* **= 1.50 KN/m²****EXTERNAL WALLS***Render* = 0.30*Brickwork outer leaf* = 2.20*Brickwork inner leaf* = 2.20*1x plastered* = 0.22**= 4.92 KN/m²**

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Sheet No. 3

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CONSIDER BEAMS OVER NEW OPENING IN KITCHEN*Effective span = 3.00m***Load to beam**

Dead load;

<i>Roof</i>	$= 0.81 \times 1.35 = 1.09 \text{ KN/m}$
<i>Ceiling</i>	$= 0.27 \times 1.35 = 0.34$
<i>First floor</i>	$= 0.92 \times 1.35 = 1.24$
<i>Ext Wall</i>	$= 2.50 \times 2.70 = 6.75$
	<u>$= 9.42 \text{ KN/m}$</u>

Imposed load;

<i>Roof</i>	$= 0.75 \times 1.35 = 1.01 \text{ KN/m}$
<i>Ceiling</i>	$= 0.25 \times 1.35 = 0.36$
<i>First floor</i>	$= 1.50 \times 1.35 = 2.03$
	<u>$= 3.40 \text{ KN/m}$</u>

See pages 4-5, Adopt 2No 178 x 102 @ 19 Kg UB

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Sheet No. 4

Calculations By: SFH

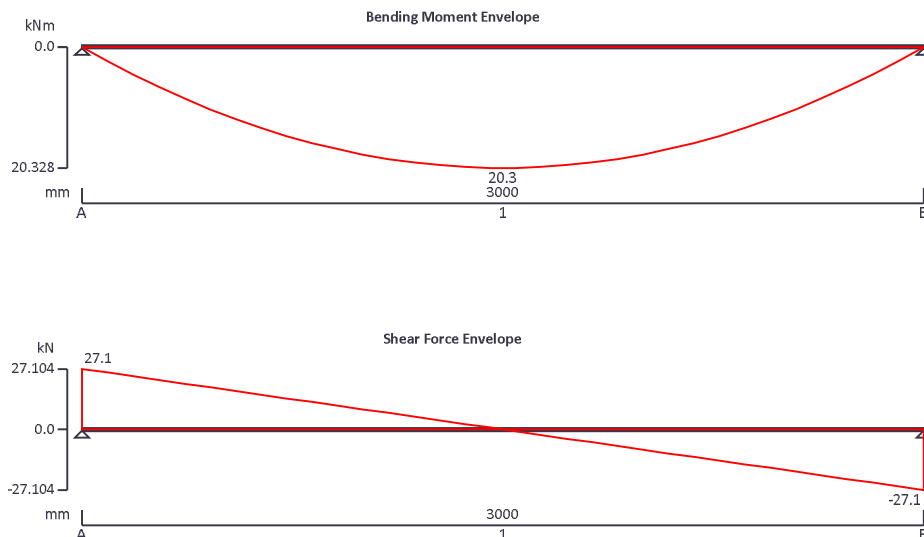
Checked By: GJH

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CONSIDER BEAMS OVER NEW OPENING IN KITCHEN

STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex



Support conditions

Support A Vertically restrained

Rotationally free

Support B Vertically restrained

Rotationally free

Applied loading

Beam loads Permanent self weight of beam $\times 1$

Permanent full UDL 9.42 kN/m

Variable full UDL 3.4 kN/m

Analysis results

Maximum moment $M_{\max} = 20.3 \text{ kNm}$ $M_{\min} = 0 \text{ kNm}$

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Sheet No. 5

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Maximum shear $V_{\max} = 27.1 \text{ kN}$ $V_{\min} = -27.1 \text{ kN}$ Deflection $\delta_{\max} = 4.8 \text{ mm}$ $\delta_{\min} = 0 \text{ mm}$ Maximum reaction at support A $R_{A_{\max}} = 27.1 \text{ kN}$ $R_{A_{\min}} = 27.1 \text{ kN}$ Unfactored permanent load reaction at support A $R_{A_{\text{Permanent}}} = 14.4 \text{ kN}$ Unfactored variable load reaction at support A $R_{A_{\text{Variable}}} = 5.1 \text{ kN}$ Maximum reaction at support B $R_{B_{\max}} = 27.1 \text{ kN}$ $R_{B_{\min}} = 27.1 \text{ kN}$ Unfactored permanent load reaction at support B $R_{B_{\text{Permanent}}} = 14.4 \text{ kN}$ Unfactored variable load reaction at support B $R_{B_{\text{Variable}}} = 5.1 \text{ kN}$ **Section details**Section type **UB 178x102x19 (BS4-1)** Steel grade **S275**Section classification **Class 1****Check shear - Section 6.2.6**Design shear force $V_{Ed} = 27 \text{ kN}$ Design shear resistance $V_{c,Rd} = 156.4 \text{ kN}$ **PASS - Design shear resistance exceeds design shear force****Check bending moment - Section 6.2.5**Design bending moment $M_{Ed} = 20.3 \text{ kNm}$ Des.bending resist.moment $M_{c,Rd} = 47.1 \text{ kNm}$ **Slenderness ratio for lateral torsional buckling**LTB slenderness ratio $\bar{\lambda}_{LT} = 0.960$ Limiting slenderness ratio $\bar{\lambda}_{LT,0} = 0.400$ $\bar{\lambda}_{LT} > \bar{\lambda}_{LT,0}$ - Lateral torsional buckling cannot be ignored**Design resistance for buckling - Section 6.3.2.1**Des.buckling resist.moment $M_{b,Rd} = 35.1 \text{ kNm}$ **PASS - Design buckling resistance moment exceeds design bending moment****Check vertical deflection - Section 7.2.1**

Consider deflection due to permanent and variable loads

Limiting deflection $\delta_{lim} = 8.3 \text{ mm}$ Maximum deflection $\delta = 4.818 \text{ mm}$ **PASS - Maximum deflection does not exceed deflection limit**

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CONSIDER BEARING**Ultimate load;** $(14.40 \times 1.4) + (5.10 \times 1.6) = 28.32 \text{ KN}$ $F_k = 5.80 \text{ N/mm}^2$ $\gamma_m = 3.50$ **Design Stress;** $\frac{1.50 \times 5.80}{3.50} = 2.49 \text{ N/mm}^2$ **Length of padstone =** $\frac{28.32 \times 10^3}{100 \times 2.49} = 114 \text{ mm}$ Provide 150mm long bearings. No padstones required.