

BYTNAR

DESIGN THE WORLD AROUND YOU



**STRUCTURAL DESIGN CALCULATIONS
FOR
EXTENSION AND ALTERATION WORKS
AT**

27 BRIDGE STREET, WYE, TN25 5ED

On behalf of: Ms Jenny Prentice



Unit Loading Spreadsheet

Project: 27 BRIDGE STREET, WYE, TN25 5ED

Calculations: Alteration and Extension Works

Date: Aug-2025

Sheet No:

Job No: 2528

By: Piotr Bytnar

Actions on structures: WYE

BS EN 1991

1	Building Category A	
	L.L.	
	People and furniture	1.50 kN/m ²
2	Timber Roof/ External Wall	
	D.L.	1.10 kN/m ²
	L.L.	0.60 kN/m ²
3	Timber Flooring	
	D.L.	0.65 kN/m ²
4	Brick Wall	
	D.L.	20.00 kN/m ³
	112.5mm Thick	2.25 kN/m ²
	225 mm Thick	4.50 kN/m ²
	340mm Thick	6.80 kN/m ²
	450mm Thick	9.00 kN/m ²
	Plaster	0.50 kN/m ²

CALCULATION SHEET

Project: 27 BRIDGE STREET, WYE, TN25 5ED
Calculations: Wraparound Extension - Internal Alteration
Date: Aug-2025

Sheet No: 1
Job No: 2528
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Design Approach.

I - Gravity Loads:

- to be resisted by structural members bearing on masonry and tied to it.

II - Stability:

- the house is inherently stable relying on buttressing and diaphragm actions of floors, roofs, infill panels and walls.

III - Foundations:

- It is acknowledged the house is partially founded on natural ground to the front and partially over gasometer remaining structure to the back.

The existing house has settled and is considered as hard spot, likewise the remaining gasometer structure.

The existing ground is varied and likely contaminated. Natural ground of clay/silt loamy character. The envisaged behaviour of foundation allows for differential settlement and wall damage. It is considered more economically to fix eventual cracks than to provide stiff alternatives.

- Trees - there is a mature Sycamore 10m away, however the ground is waterlogged and nearby structures do not suffer damage nor roots where trial pits were dug.

CALCULATION SHEET

Project: 27 BRIDGE STREET, WYE, TN25 5ED
 Calculations: ROOFS' RAFFERS
 Date: Aug-2025

Sheet No: 1
 Job No: 2528
 By: Piotr Bytnar

Span: 2,2m
 3,5m

Action: a) ROOF RAFFERS @ 400mm c/c

$$q_n = 0,8 \text{ [kN/m}^2\text{]} \times 0,4 \text{ m} = 0,32 \text{ [kN/m]}$$

$$q_n = 0,6 \text{ [kN/m}^2\text{]} \times 0,4 \text{ m} = 0,24 \text{ [kN/m]}$$

$$\underline{\underline{0,56 \text{ kN/m}}} \Rightarrow \text{US} = 0,79 \text{ kN/m}$$

i) 2,2m $M_{ed} = 2,2^2 \times 0,79 / 8 = 0,48 \text{ kNm}$

• check S9000 C16

$$M_{b,red} = \frac{S_{xx} \times 10^2}{6} \times 16 \times 0,6 / 1,1 \times 10^{-6} = 0,62 \text{ kNm} \checkmark$$

$$f = \frac{5 \times 0,56 \times 2,2^4 \times 10^{10}}{384 \times 8000 \times \left(\frac{S_{xx} \times 10^2}{12}\right)} = 5 \text{ mm} \checkmark$$

ii) 3,5 $M_{ed} = 1,21 \text{ kNm}$

• check S9125 C16

$$M_{b,red} = 1,89 \text{ kNm} \checkmark \quad f = 6,1 \text{ mm} \checkmark$$

CALCULATION SHEET

Project: 27 BRIDGE STREET, WYE, TN25 5ED
 Calculations: CWJ/S
 Date: Aug-2025

Sheet No: 1
 Job No: 2528
 By: Piotr Bytnar

Lintel L1.01 $\approx 2,7m$

Actions:

I a) inner leaf: 2,1m of roof

$$q_k = 0,8 \text{ [kN/m}^2] \times 2,1 = 1,68 \text{ [kN/m]}$$

$$q_k = 0,6 \text{ [kN/m}^2] \times 2,1 = 1,26 \text{ [kN/m]}$$

$$\underline{\underline{2,94}}$$

b) block wall: 0,37m $q_k = 0,62 \text{ kN/m}$

$$\Sigma \text{ SLS} = 3,56 \text{ kN/m} \quad \text{UIS} = 5,00 \text{ kN/m}$$

II b) Block outer leaf:

$$q_k = 0,25 \times 20 \times 0,115 = 1,75 \text{ kN/m} - \text{SLS} \Rightarrow \text{UIS} = 2,94 \text{ kN/m}$$

$\Sigma = 1,6 \text{ kN/m} \text{ } 1:1/3:1 \Rightarrow \text{Use Calcule Lintel CG} \quad \text{SWL} = 26 \text{ kN } 1:1/19:1 \checkmark$

Lintel L1.02 $\approx 2,2m$
 $\approx 0,9m$

Actions:

a) 0,525 of wall (block): $q_k = 0,85 \text{ kN/m}$

b) 0,4m of roof: $q_k = 0,32 \text{ kN/m}$ $q_k = 0,24 \text{ kN/m}$

$$\Sigma 1,41 \text{ kN/m} - \text{SLS} \quad \text{UIS} = 1,94 \text{ kN/m}$$

2,2m - VSE: Square Concrete S10 $\left[\begin{array}{c} 100 \\ \square \\ 100 \end{array} \right]_{100}$ SWL = 2,22 kN/m \checkmark

0,9m - VSE: $\rho 100 \left[\begin{array}{c} 100 \\ \square \\ 100 \end{array} \right]_{100}$ SWL = 6,97 kN/m \checkmark

CALCULATION SHEET

Project: 27 BRIDGE STREET, WYE, TN25 5ED
 Calculations: BACK FACADE SUPPORTING BEAM
 Date: Aug-2025

Sheet No: 1
 Job No: 2528
 By: Piotr Bytnar

$$Bl. 01 \approx 5,6m$$

Actions:

a) Flat Roof: $q_k = 0,8 \text{ [kN/m}^2] \times 1,7m = 1,36 \text{ [kN/m]}$
 $q_k = 0,6 \text{ [kN/m}^2] \times 1,7m = 1,02 \text{ [kN/m]}$

b) Floor: $q_k = 0,65 \text{ [kN/m}^2] \times 1,7m = 1,11 \text{ [kN/m]}$
 $q_k = 1,5 \text{ [kN/m}^2] \times 1,7m = 2,55 \text{ [kN/m]}$

c) External Timber Wall:

$$q_k = 1,1 \text{ kN/m}^2 \times 2,6m = 2,86 \text{ kN/m}$$

d) Attic: $q_k = 0,65 \text{ [kN/m}^2] \times 1,7 = 1,11 \text{ kN/m}$
 $q_k = 0,75 \text{ [kN/m}^2] \times 1,7 = 1,28 \text{ kN/m}$

e) Roof: $q_k = 1,1 \text{ [kN/m}^2] \times 4,6 = 5,06 \text{ kN/m}$
 $q_k = 0,6 \text{ [kN/m}^2] \times 4,6 = 2,76 \text{ kN/m}$

$$q_k = 11,5 \text{ kN/m}$$

$$q_k = 7,61 \text{ kN/m}$$

$$SLS = 19,11 \text{ kN/m}$$

$$ULS = 26,94 \text{ kN/m}$$

$$R_{s15} = 53,5 \text{ kN}$$

$$R_{d15} = 75,4 \text{ kN}$$

$$M_{ed} = 26,94 \times 5,6^2 / 8 = 103,6 \text{ kNm}$$

$$I_{req} = 6,35 \times 19,11 \times 5,6^3 / 11,2 = 10655 \text{ cm}^4$$

$$V_{ed} = UC 254 \times 254 \times 73 S275 \quad M_{reqd} = 222 \text{ kNm} \quad \checkmark \quad I_y = 11400 \text{ cm}^4 \quad \checkmark$$

$$\text{Prestress: } 53,5 \text{ kN} / 100 \times 0,88 \text{ N/mm}^2 = 608 \text{ mm} \Rightarrow 670 \text{ mm} \times 300 \text{ deep}$$

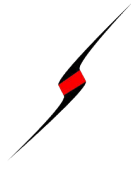
$$\text{Wall Capacity} = 0,88 \times 100 \times 1700 \times 0,4 = 59,84 \text{ kN} \quad \checkmark$$

$$\text{Foundation pressure: } 53,5 \text{ kN} / (3 \times 0,6) = 30 \text{ kN/m}^2 \quad \checkmark$$

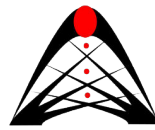
BYTNAR



CHARTERED
STRUCTURAL
ENGINEER



PARTY WALL
SURVEYOR



ARCHITECTURE
PRINCIPAL
DESIGNER



DESIGN
AND
MANAGE