



**50 SCHOOL LANE
HIGHAM
ME37JF**

TD DESIGN
NORTHUMBERLAND ROAD
ISTEAD RISE
DA13 9J
Tel : 07960470201

STEEL BEAM CALCULATIONS
for
50 SCHOOL LANE
HIGHAM
ME3 7JF

Date:-DECEMBER 2024

REV.	DATE	BY	DESCRIPTION



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DESIGN STATEMENTS

DEMOLITION

Existing garage removed.

PROPOSED ROOF

Comprises of timber joist supported on loadbearing masonry.

MASONRY

300mm cavity wall with 100mm blockwork, 100mm blockwork and assumed 100mm cavity. Cladding fixed to external.



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50 SCHOOL LANE LOADINGS

<u>ROOF</u>	Dead Load (Gk)	Felt & Battens	=0.05	
		Rafters	=0.25	
		Insulation	=0.05	
		Ceiling	=0.15	<u>Total 0.50 kN/m²</u>
	Imposed Load (Qk)	Roof= $0.6([60-35]/30)$	=0.50	
		Ceiling	=0.25	<u>Total 0.75 kN/m²</u>
MASONRY WALLS (300mm)	Dead Load (Gk)	Brickwork	= 2.00	
		Brickwork (100mm th.)	=2.25	
		Plasterboard	=0.25	<u>Total 4.50 kN/m²</u>



TIMBER JOIST ANALYSIS & DESIGN (EN1995-1-1:2004)

In accordance with EN1995-1-1:2004 + A2:2014 incorporating corrigendum June 2006 and the UK national annex

Tedds calculation version 1.0.07

Joist details

Description; 47 x 125 C24 timber joists
Joist spacing; $s_{Joist} = 400$ mm



Forces input on Joist

Vertical permanent load on joist; $F_{G_Joist} = 0.65$ kN/m²
Vertical imposed load on joist; $F_{Q_Joist} = 0.75$ kN/m²

Joist loading details

Distributed loads

Vertical permanent load on joist; $p_G = F_{G_Joist} \times s_{Joist} = 0.26$ kN/m
Vertical imposed load on joist; $p_Q = F_{Q_Joist} \times s_{Joist} = 0.30$ kN/m

Member results summary	Unit	Capacity	Maximum	Utilisation	Result
Bearing stress	N/mm ²	1.7	0.2	0.138	PASS
Bending stress	N/mm ²	16.8	10.0	0.596	PASS
Shear stress	N/mm ²	2.7	0.5	0.202	PASS
Deflection	mm	13.7	12.8	0.935	PASS

ANALYSIS

Tedds calculation version 1.0.38

Loading

Self weight included (Permanent x 1)

Load combination factors

Load combination	Permanent	Imposed	Snow	Wind
1.35G + 1.50Q (Strength)	1.35	1.50	0.00	0.00
1.00G + 1.00Q (Service)	1.00	1.00	0.00	0.00

Member Loads

Member	Load case	Load Type	Orientation	Description
Member	Permanent	UDL	GlobalZ	0.26 kN/m at 0 m to 3.435 m
Member	Imposed	UDL	GlobalZ	0.3 kN/m at 0 m to 3.435 m



Results

Total deflection

1.35G + 1.50Q (Strength) - Total deflection



1.00G + 1.00Q (Service) - Total deflection



Node deflections

Load combination: 1.35G + 1.50Q (Strength)

Node	Deflection		Rotation (°)	Co-ordinate system
	X (mm)	Z (mm)		
1	0	0	0.95862	
2	0	0	-0.95862	

Load combination: 1.00G + 1.00Q (Service)

Node	Deflection		Rotation (°)	Co-ordinate system
	X (mm)	Z (mm)		
1	0	0	0.67176	
2	0	0	-0.67176	

Total base reactions

Load case/combination	Force	
	FX (kN)	FZ (kN)
1.35G + 1.50Q (Strength)	0	2.9
1.00G + 1.00Q (Service)	0	2

Element end forces

Load combination: 1.35G + 1.50Q (Strength)

Element	Length (m)	Nodes Start/End	Axial force (kN)	Shear force (kN)	Moment (kNm)
1	3.435	1	0	-1.4	0
		2	0	-1.4	0

Load combination: 1.00G + 1.00Q (Service)

Element	Length (m)	Nodes Start/End	Axial force (kN)	Shear force (kN)	Moment (kNm)
1	3.435	1	0	-1	0



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Element	Length (m)	Nodes Start/End	Axial force (kN)	Shear force (kN)	Moment (kNm)
		2	0	-1	0

Forces

Strength combinations - Moment envelope (kNm)



Strength combinations - Shear envelope (kN)



Member results

Envelope - Strength combinations

Member	Position (m)	Shear force (kN)	Moment (kNm)
Member	0	1.4 (max abs)	0 (min)
	1.718	0	1.2 (max)
	3.435	-1.4	0 (min)

;

Tedds calculation version 2.2.20

Member - Span 1

Partial factor for material properties and resistances

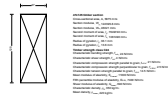
Partial factor for material properties - Table 2.3; $\gamma_M = 1.300$

Member details

Load duration - cl.2.3.1.2; Medium-term
Service class - cl.2.3.1.3; 2

Timber section details

Number of timber sections in member; $N = 1$
Breadth of sections; $b = 47 \text{ mm}$
Depth of sections; $h = 125 \text{ mm}$
Timber strength class - EN 338:2016 Table 1; **C24**



Span details

Bearing length; $L_b = 100 \text{ mm}$

Consider Combination 1 - 1.35G + 1.50Q (Strength)

Modification factors

Duration of load and moisture content - Table 3.1; $k_{mod} = 0.8$
Deformation factor - Table 3.2; $k_{def} = 0.8$
Depth factor for bending - Major axis - exp.3.1; $k_{h,m,y} = \min((150 \text{ mm} / h)^{0.2}, 1.3) = 1.037$
Bending stress re-distribution factor - cl.6.1.6(2); $k_m = 0.7$
Crack factor for shear resistance - cl.6.1.7(2); $k_{cr} = 0.67$
System strength factor - cl.6.6; $k_{sys} = 1.1$

Check design at start of span

Check compression perpendicular to the grain - cl.6.1.5

Design perpendicular compression - major axis; $F_{c,y,90,d} = 1.432 \text{ kN}$
Effective contact length; $L_{b,ef} = L_b + \min(L_b, 30 \text{ mm}) = 130 \text{ mm}$
Design perpendicular compressive stress - exp.6.4; $\sigma_{c,y,90,d} = F_{c,y,90,d} / (b \times L_{b,ef}) = 0.234 \text{ N/mm}^2$
Design perpendicular compressive strength; $f_{c,y,90,d} = k_{mod} \times k_{sys} \times f_{c,90,k} / \gamma_M = 1.692 \text{ N/mm}^2$
 $\sigma_{c,y,90,d} / (k_{c,90} \times f_{c,y,90,d}) = 0.138$

PASS - Design perpendicular compression strength exceeds design perpendicular compression stress

Check shear force - Section 6.1.7

Design shear force; $F_{y,d} = 1.432 \text{ kN}$
Design shear stress - exp.6.60; $\tau_{y,d} = 1.5 \times F_{y,d} / (k_{cr} \times b \times h) = 0.546 \text{ N/mm}^2$
Design shear strength; $f_{v,y,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = 2.708 \text{ N/mm}^2$
 $\tau_{y,d} / f_{v,y,d} = 0.202$

PASS - Design shear strength exceeds design shear stress

Check design 1718 mm along span

Check bending moment - Section 6.1.6

Design bending moment; $M_{y,d} = 1.23 \text{ kNm}$
Design bending stress; $\sigma_{m,y,d} = M_{y,d} / W_y = 10.046 \text{ N/mm}^2$



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Design bending strength;
N/mm²

$$f_{m,y,d} = k_{h,m,y} \times k_{mod} \times k_{sys} \times f_{m,k} / \gamma_M = \mathbf{16.849}$$

$$\sigma_{m,y,d} / f_{m,y,d} = \mathbf{0.596}$$

PASS - Design bending strength exceeds design bending stress

Consider Combination 2 - 1.00G + 1.00Q (Service)

Check design 1717 mm along span

Check y-y axis deflection - Section 7.2

Instantaneous deflection;

$$\delta_y = \mathbf{12.8 \text{ mm}}$$

Allowable deflection;

$$\delta_{y,Allowable} = L_{m1,s1} / 250 = \mathbf{13.7 \text{ mm}}$$

$$\delta_y / \delta_{y,Allowable} = \mathbf{0.935}$$

PASS - Allowable deflection exceeds instantaneous deflection

**THEREFORE 47x125 C24 FLAT ROOF JOIST AT 400mm
CENTERS ARE SUFFICIENT FOR SUPPORTING ROOF
LOADS FOR 50 SCHOOL LANE**



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LINTELS

TWO OPENING SIZES ARE 1740mm AND 1540mm

THE LINTELS ARE SUPPORTING ONE COARSE OF BLOCKWORK AND FLAT ROOF LOADS

LINTELS INSTALLED ARE STANDARD DUTY LINTELS. I CAN CONFIRM FROM VISUAL INSPECTION THIS WILL SUFFICE FOR SUPPORTING THE STRUCTURAL LOADS

I CAN CONFIRM THE LINTELS MINIMUM BEARING OF 150mm



MASONRY

3.6N/mm² BLOCKWORK IS SUFFICIENT FOR THE MASONRY WALL CONSTRUCTION

**THEREFORE I CAN CONFIRM THE LINTELS AND
MASONRY SUFFICE FOR THE CONSTRUCTION FOR 50
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FOUNDATIONS

THE BELOW IS TAKEN FROM THE BGS MAPS.

IF THE FOUNDATIONS BEAR ONTO CHALK THIS WILL SUFFICE

FOUNDATIONS BEARING WITHIN THE CLAY SHOULD MINIMUM 1000mm DEEP TO ACCOMMODATE THE HIGH VCP WITHOUT TESTING. PLEASE NOTE THERE ARE NO TREES WITHIN THE LOCAL VICINTY TO IMPACT ON SHRINKAGE AND SWELLING

Geology



Bedrock geology



Seaford Chalk Formation - Chalk. Sedimentary bedrock formed between 89.8 and 83.6 million years ago during the Cretaceous period.

[More Information](#)

Superficial deposits



Head - Clay, silt, sand and gravel. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.

[More Information](#)

**THEREFORE BASED ON THE BGS MAPS, PHOTOS AND
CONFIRMATION FROM CLIENT ON FOUNDATIONS DUG
CAN CONFIRM THE FOUNDATIONS WILL SUFFICE**



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CONSTRUCTION PHOTOS



ASBUILT PHOTOS





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STRUCTURAL NOTES

General

The information provided is to be read in conjunction with architect's drawings. All infill timbers, noggins spacers, etc are to be installed in accordance with good building practice. Do not scale from the details and communicate any discrepancies with the designer before proceeding. We rely on the work be carried out by a competent builder who will be responsible for setting out. Should the geometry of the building be such that the proposals are unworkable then please contact the structural engineer immediately prior to ordering materials. Calculations must be approved by building control prior to commencement. Any information that varies should be reported to the engineer immediately. Dimension must be checked by a competent individual.