



SIGNATURE
STRUCTURES
Engineering Design

450 Carlton Rd, Barnsley

V4965

SCOPE

Design calculations for proposed works for new pitched roof above rear of detached residential building

FROM SITE MEASUREMENTS



RELEVANT ARCHITECTURAL DRAWINGS



RELEVANT CODES OF PRACTICE

EUROCODES

GENERAL EN 1990 - Eurocode 0: Basis of structural design

PP7312 :2002 , Building Regulations 2010

LOADING EN 1991 - Eurocode 1: Actions on structures

STEELWORK EN 1993 - Eurocode 3: Design of steel structures

TIMBER EN 1995 - Eurocode 5: Design of timber structures

MASONRY EN 1996 - Eurocode 6: Design of masonry structures

CONCRETE EN 1992 - Eurocode 2: Design of concrete structures

FOUNDATIONS EN 1997 - Eurocode 7: Geotechnical Design

NOT FOR BUILDERS

Builders must use drawings only



CALCULATION PACK



SIGNATURE
STRUCTURES

Project.

450 Carlton Rd, Barnsley

Prepared by.

DM

Project Ref.

V4965

Sheet No.

03

Date

24/11/2020

Q1 - rafters

Ref: Calc
Sheet 04

Span = 2.00m

LOAD	DL	LL
Roof	1.25(0.4)	0.75(0.4)
W	0.42kN/m	0.36kN/m



125x44
grade C16
timber
C40 concrete

Q2 - flat roof DTH

Ref: Calc
Sheet 05

Span = 2.450m

LOAD	DL	LL
Floor roof	0.8(0.4)	0.75(0.4)
W	0.36kN/m	0.36kN/m



As rafter

Q3 - Roof beam

Ref: Calc
Sheet 06-07

Span = 4.500m

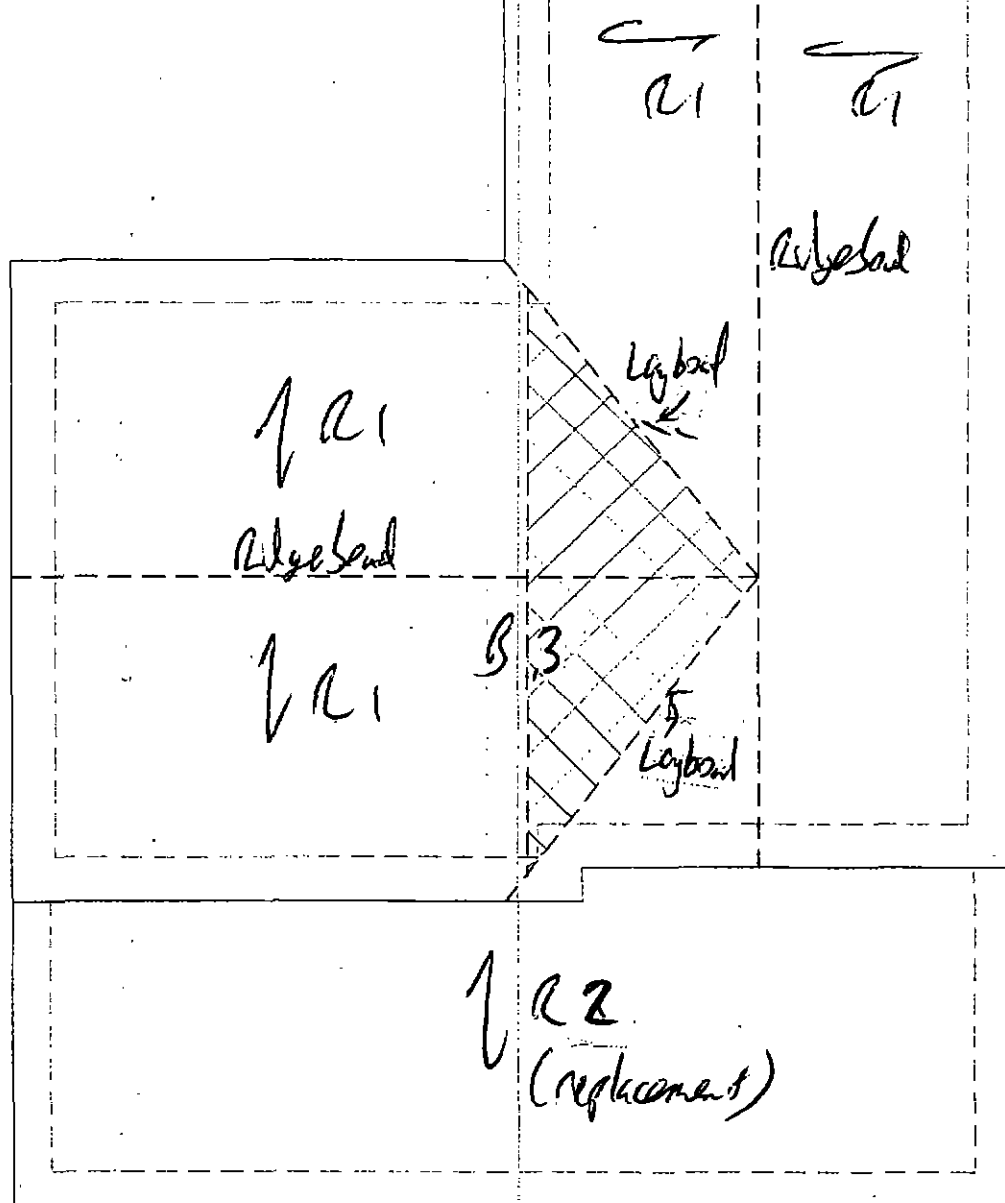
LOAD	DL	LL
Roof	1.05($\frac{7}{2}$)	0.75($\frac{7}{2}$)
W	2.1kN/m	1.8kN/m



178x102x19
kg/m UB

 SIGNATURE STRUCTURES		Project.	
		450 Carlton Rd, Barnsley	
Prepared by.	OM	Project Ref.	V4965
Sheet No.	01	Date	24/11/2020
<u>LOADS</u>		<u>SLS</u>	<u>ULS</u>
ROOF			
Coverings (Tiles)		0.60	
Battens, Felt, Insulation		0.05	
Rafters / Trussed Rafters		0.15	
Ceiling Joists		0.25	
Ceiling			
DEAD		1.05	
IMPOSED		0.75	1.20
TOTAL		1.80	2.70
FLAT ROOF			
Chippings, 3 Layer Felt, Boards, Joists, Insulation & Ceiling		0.80	1.12
FLOOR			
Coverings		0.10	
Joists		0.15	
Ceiling		0.25	
Partitions generally			
DEAD		0.50	0.70
IMPOSED		1.50	2.40
TOTAL		2.00	3.10
WALLS			
Brickwork outer leaf (102 mm - fair faced)		2.00	2.80
Brickwork outer leaf (102 mm - rendered)		2.50	3.50
Brickwork inner leaf (102 mm - plastered)		2.25	3.15
Blockwork inner Leaf (100mm - plastered /1)		1.75	2.50
Blockwork partition (100mm - plastered/2)		2.10	3.00
Timber stud (75mm - plastered/2)		0.70	1.00
Lightweight stud		0.50	0.70

Re-roof, above
existing flat roof





Signature Structures
Office 5, Cybor House, Tapton, Sheffield
0114 345 0381
office@sign-structures.com

Project				Job Ref.			
450 Carlton Rd, Barnsley				V4965			
Section				Sheet no./rev.			
R1 - RAFTERS				04			
Calc. by		Date	Chk'd by	Date	App'd by		Date
DM		25/11/20	DM	25/11/20			

Analysis for a simply-supported single-span timber beam to BS 5268

TEDDS calculation version 1.0.02

Span length & partial factors for loading

Span (mm)	Factors for moments & forces			Factors for deflection		
	γ_{fd}	γ_{fi}	γ_{fw}	γ_{dd}	γ_{di}	γ_{dw}
2000	1.00	1.00	1.00	1.00	1.00	1.00

Loading data (unfactored)

Ref.	Category	Type	Load kN/m	Position mm	Load kN/m	Position mm
1	"Dead"	"ROOF"				
2	"Imposed"	"ROOF"				

Loading data (unfactored)

Ref.	Category	Type	Load kN/m	Position mm	Load kN/m	Position mm
1	"Dead"	UDL	0.4	0	-	2000
2	"Imposed"	UDL	0.3	0	-	2000

Analysis results - entire span

R_s kN (fac)	R_b kN (fac)	V kN (fac)	M kNm (fac)	Sense	Deflection: δEI kNm ³	Direction
0.7	0.7	0.7	0.4	"Sagging"	0.15	"Down"

Unfactored support reactions

Support A	Dead load	-0.4 kN	Live load	-0.3 kN	Wind load	0.0 kN
Support B	Dead load	-0.4 kN	Live load	-0.3 kN	Wind load	0.0 kN

Member design checks for a simply-supported single-span timber beam to BS 5268

Timber member design BS 5268-2:2002

Summary of results				
Section size	D = 125 mm	B = 44 mm	A = 5500 mm ²	
Section properties (x-x)	$I_{xx} = 7161460 \text{ mm}^4$	$Z_{xx} = 114583 \text{ mm}^3$	$r_{xx} = 36.1 \text{ mm}$	
(y-y)	$I_{yy} = 887330 \text{ mm}^4$	$Z_{yy} = 40333 \text{ mm}^3$	$r_{yy} = 12.7 \text{ mm}$	
Grade	"C16"		$\sigma_c = 6.80 \text{ N/mm}^2$	
Check	Stress	Capacity	Notes	Result
Bending stress	$\sigma_{m, \text{ed, pers}} = M / Z_{xx} = 3.14 \text{ N/mm}^2$	$\sigma_{m, \text{adm, pers}} = 8.02 \text{ N/mm}^2$	Moment M = 0.4 kNm	Pass
Shear stress	$\tau_s = 0.20 \text{ N/mm}^2$	$\tau_{\text{adm}} = 0.92 \text{ N/mm}^2$	Shear V = 0.7 kN	Pass
Deflection	$\delta = 2.5 \text{ mm}$	14 mm		Pass
	$\delta / L_s = 0.00126$	0.003		Pass

 Signature Structures Office 6, Cybor House, Tapton, Sheffield 0114 345 0381 office@sign-structures.com	Project 450 Carlton Rd, Barnsley				Job Ref. V4965	
	Section R2 - FLAT ROOF JOISTS				Sheet no./rev. 05	
	Calc. by DM	Date 25/11/20	Chk'd by DM	Date 25/11/20	App'd by	Date

Analysis for a simply-supported single-span timber beam to BS 5268

TEDDS calculation version 1.0.02

Span length & partial factors for loading

Span (mm)	Factors for moments & forces			Factors for deflection		
	γ_{fs}	γ_{fi}	γ_{fw}	γ_{fd}	γ_{de}	γ_{dw}
2450	1.00	1.00	1.00	1.00	1.00	1.00

Loading data (unfactored)

Ref.	Category	Type	Load kN/m	Position mm	Load kN/m	Position mm
1	"Dead"	"ROOF"				
2	"Imposed"	"ROOF"				

Loading data (unfactored)

Ref.	Category	Type	Load kN/m	Position mm	Load kN/m	Position mm
1	"Dead"	UDL	0.3	0	-	2450
2	"Imposed"	UDL	0.3	0	-	2450

Analysis results - entire span

R_a kN (fac)	R_b kN (fac)	V kN (fac)	M kNm (fac)	Sense	Deflection: δEI kNm ³	Direction
0.8	0.8	0.8	0.5	"Sagging"	0.29	"Down"

Unfactored support reactions

Support A	Dead load -0.4 kN	Live load -0.4 kN	Wind load 0.0 kN
Support B	Dead load -0.4 kN	Live load -0.4 kN	Wind load 0.0 kN

Member design checks for a simply-supported single-span timber beam to BS 5268

Timber member design BS 5268-2:2002

Summary of results				
Section size	D = 125 mm	B = 44 mm	A = 5500 mm ²	
Section properties (x-x)	$I_{xx} = 7161460 \text{ mm}^4$	$Z_{xx} = 114583 \text{ mm}^3$	$r_{xx} = 36.1 \text{ mm}$	
	(y-y)	$I_{yy} = 887330 \text{ mm}^4$	$Z_{yy} = 40333 \text{ mm}^3$	$r_{yy} = 12.7 \text{ mm}$
Grade	"C16"	$\sigma_c = 6.80 \text{ N/mm}^2$		
Check	Stress	Capacity	Notes	Result
Bending stress	$\sigma_{max,perm} = M / Z_{xx} = 4.06 \text{ N/mm}^2$	$\sigma_{max,perm} = 8.02 \text{ N/mm}^2$	Moment M = 0.5 kNm	Pass
Shear stress	$\tau_s = 0.21 \text{ N/mm}^2$	$\tau_{adm} = 0.92 \text{ N/mm}^2$	Shear V = 0.8 kN	Pass
Deflection	$\delta = 4.8 \text{ mm}$	14 mm		Pass
	$\delta / L_s = 0.00196$	0.003		Pass

 Signature Structures Office 6, Cybor House, Tipton, Sheffield 0114 346 0381 office@sign-structures.com	Project 450 Carlton Rd, Barnsley				Job Ref. V4965	
	Section B3 - SUPPORT BEAM				Sheet no./rev. 06	
	Calc. by DM	Date 25/11/20	Chk'd by DM	Date 25/11/20	App'd by	Date

Analysis for a simply-supported single-span beam to BS 5950 (with LTB)

TEDDS calculation version 1.0.02

Span length & partial factors for loading

Span (mm)	Factors for moments & forces			Factors for deflection		
	γ_{fs}	γ_{fi}	γ_{fw}	γ_{dd}	γ_{di}	γ_{dw}
4500	1.40	1.60	0.00	1.00	1.00	1.00

Load descriptions

Loads are applied normal to the major principal axis (x-axis) of the member.

Ref.	Category	Description
1	"Dead"	"ROOF"
2	"Imposed"	"ROOF"

Loading data (unfactored)

Ref.	Category	Type	Load kN/m	Position mm	Load kN/m	Position mm
1	"Dead"	UDL	2.1	0	-	4500
2	"Imposed"	UDL	1.5	0	-	4500

Analysis results - entire span

R_a kN (fac)	R_b kN (fac)	F_{vy} kN (fac)	M_x kNm (fac)	Sense	Deflection: $\delta E I_x$	
12.0	12.0	12.0	13.5	"Sagging"	kNm ³	Direction
					19.22	"Down"

Unfactored support reactions

Support A	Dead load -4.7 kN	Live load -3.4 kN	Wind load 0.0 kN
Support B	Dead load -4.7 kN	Live load -3.4 kN	Wind load 0.0 kN

LTB segment results

Seg.	x_p mm	x_a mm	LT mm	MLT kNm (fac)	M_{MLT2} kNm (fac)	M_{MLT3} kNm (fac)	M_{MLT4} kNm (fac)
1	0	4500	4500	13.5	10.1	13.5	10.1

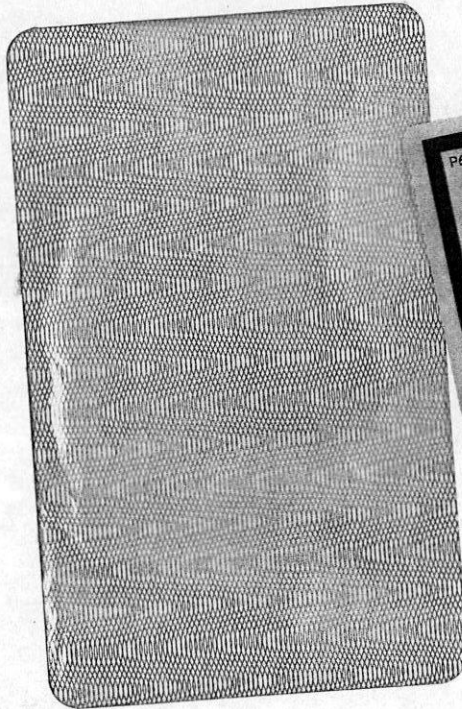
Member design checks for a simply-supported single-span beam to BS 5950 (with LTB)

 Signature Structures Office 6, Cybor House, Tipton, Sheffield 0114 345 0381 office@sign-structures.com	Project		450 Carlton Rd, Barnsley		Job Ref.		V4965	
	Section		B3 - SUPPORT BEAM		Sheet no./rev.		07	
	Calc. by	Date	Chk'd by	Date	App'd by	Date		
	DM	25/11/20	DM	25/11/20				

Summary of results

Material	Grade = "S275"	$p_y = 275 \text{ N/mm}^2$
Section	"UB 178x102x19"	Classification "Plastic"

Check	Load	Capacity	Notes	Result
Deflection	$\delta_{y_max} = 6.9 \text{ mm}$	$\delta_{lim} = 12.5 \text{ mm}$	Span / 360 or 14.0 mm	Pass
Shear	$F_{vy} = 12.0 \text{ kN}$	$P_{vy} = 140.8 \text{ kN}$	Low shear	Pass
Moment	$M_x = 13.5 \text{ kNm}$	$M_{cx} = 47.1 \text{ kNm}$	Low shear	Pass
LTB	$M_{LT} = 13.5 \text{ kNm}$	$M_b / m_{LT} = 18.8 \text{ kNm}$	$L_{E_LT} = 4.5 \text{ m}$ $m_{LT} = 0.93$	Pass



F/L
12-5-21
SA



Account Postage GB
AC02359090390

