

23rd June 2026
Job No: 11055ADL84

Structural Calculations

Existing Roof Structure Analysis (Part of Conversion Proposal) 69 High Street West Lavington Nr Devizes Wiltshire

Project	Existing Roof Truss Analysis - 69 High Street, West Lavington	Sheet no./rev. ADL84/ 1
	Introduction, Assumptions & Loading	By/Date MM / June '26
<u>Introduction</u> The proposed works at 69 High Street in West Lavington consist of the conversion of outbuildings to the rear of the property. The main outbuilding is single storey and has a duo-pitched tiled roof supported by a timber structure, i.e. rafters, purlins and individual trusses. As part of the conversion, solar pv panels will be added to the roof in defined areas. These calculations will consider the existing purlins and roof trusses and their ability to support both the existing and additional loads. <u>Assumptions</u> Location of the site is West Lavington in a country location. Codes to be used include but not limited to: BS EN 1991 – Eurocode 1 - Actions on Structures BS EN 1993 – Eurocode 5 – Design of Timber Structures <u>Loads</u> Roof (33° pitch) Dead: Assume 0.60 kN/m² normal to roof incl tiles, battens etc. $\equiv 0.60 \text{ kN/m}^2 / \cos 33^\circ \quad \equiv \quad 0.72 \text{ kN/m}^2 \text{ in plan}$ Live: $0.60 \text{ kN/m}^2 \times (60 - 33)/30 \quad \equiv \quad 0.54 \text{ kN/m}^2 \text{ in plan}$ Solar Panels Dead: 0.20 kN/m² (Note: Assume coverage is 70%, i.e. loading = 0.14 kN/m²) The following analysis shows that the existing purlins are capable of supporting the additional load from the solar pv panels but the roof truss, although it can still be incorporated into the conversion, the rafter elements need to be strengthened by adding timber section, one to each side.		

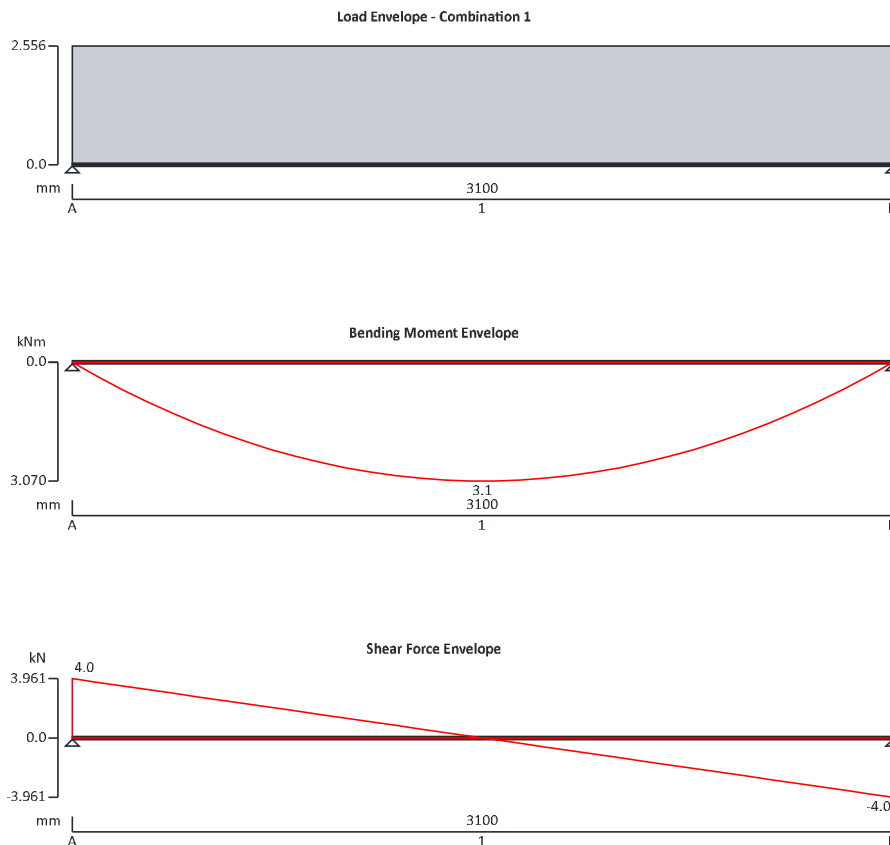
Project	69 High Street, West Lavington	Sheet no./rev.	ADL84/ 2
Existing Purlin Analysis		By/Date	MM / Jun-26

TIMBER BEAM ANALYSIS & DESIGN (EN1995)

TIMBER BEAM ANALYSIS & DESIGN TO EN1995-1-1:2004

In accordance with EN1995-1-1:2004 + A2:2014 and Corrigendum No.1 and the UK National Annex incorporating National Amendment No.1

Tedds calculation version
1.7.05



Applied loading

Beam loads

Permanent self weight of beam $\times 1$

Roof DL: $0.72 \text{ kN/m}^2 \times 2.80/2$ Permanent full UDL 1.010 kN/m

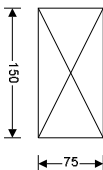
Roof LL: $0.54 \text{ kN/m}^2 \times 2.80/2$ Variable full UDL 0.760 kN/m

Load combinations

Load combination 1 Support A Permanent $\times 1.35$

Variable $\times 1.50$

Span 1 Permanent $\times 1.35$

Project 69 High Street, West Lavington	Sheet no./rev. ADL84/ 3
Existing Purlin Analysis	By/Date MM / Jun-26
Variable $\times 1.50$ Support B Permanent $\times 1.35$ Variable $\times 1.50$ Analysis results Maximum moment $M_{\max} = 3.070 \text{ kNm}$ $M_{\min} = 0.000 \text{ kNm}$ Design moment $M = \max(\text{abs}(M_{\max}), \text{abs}(M_{\min})) = 3.070 \text{ kNm}$ Maximum shear $F_{\max} = 3.961 \text{ kN}$ $F_{\min} = -3.961 \text{ kN}$ Design shear $F = \max(\text{abs}(F_{\max}), \text{abs}(F_{\min})) = 3.961 \text{ kN}$ Total load on beam $W_{\text{tot}} = 7.922 \text{ kN}$ Reactions at support A $R_{A_{\max}} = 3.961 \text{ kN}$ $R_{A_{\min}} = 3.961 \text{ kN}$ Unfactored permanent load reaction at support A $R_{A_{\text{Permanent}}} = 1.625 \text{ kN}$ Unfactored variable load reaction at support A $R_{A_{\text{Variable}}} = 1.178 \text{ kN}$ Reactions at support B $R_{B_{\max}} = 3.961 \text{ kN}$ $R_{B_{\min}} = 3.961 \text{ kN}$ Unfactored permanent load reaction at support B $R_{B_{\text{Permanent}}} = 1.625 \text{ kN}$ Unfactored variable load reaction at support B $R_{B_{\text{Variable}}} = 1.178 \text{ kN}$   Timber section details Breadth of timber sections $b = 75 \text{ mm}$ Depth of timber sections $h = 150 \text{ mm}$ Number of timber sections in member $N = 1$ Overall breadth of timber member $b_o = N \times b = 75 \text{ mm}$ Timber strength class - EN 338:2016 Table 1 C24 Member details Load duration - cl.2.3.1.2 Medium-term Service class of timber - cl.2.3.1.3 1 Length of span $L_{s1} = 3100 \text{ mm}$ Length of bearing $L_b = 100 \text{ mm}$ Section properties Cross sectional area of member $A = N \times b \times h = 11250 \text{ mm}^2$ Section modulus $W_y = N \times b \times h^2 / 6 = 281250 \text{ mm}^3$	

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84/ 4
Existing Purlin Analysis		By/Date	MM / Jun-26
$W_z = h \times (N \times b)^2 / 6 = \mathbf{140625 \text{ mm}^3}$ Second moment of area $I_y = N \times b \times h^3 / 12 = \mathbf{21093750 \text{ mm}^4}$ $I_z = h \times (N \times b)^3 / 12 = \mathbf{5273437 \text{ mm}^4}$ Radius of gyration $r_y = \sqrt{I_y / A} = \mathbf{43.3 \text{ mm}}$ $r_z = \sqrt{I_z / A} = \mathbf{21.7 \text{ mm}}$ Partial factor for material properties and resistances Partial factor for material properties - Table 2.3 $\gamma_M = \mathbf{1.300}$ Modification factors Modification factor for load duration and moisture content - Table 3.1 $k_{mod} = \mathbf{0.800}$ Deformation factor for service classes - Table 3.2 $k_{def} = \mathbf{0.600}$ Depth factor for bending - exp.3.1 $k_{h,m} = \mathbf{1.000}$ Depth factor for tension - exp.3.1 $k_{h,t} = \mathbf{1.000}$ Bending stress re-distribution factor - cl.6.1.6(2) $k_m = \mathbf{0.700}$ Crack factor for shear resistance - cl.6.1.7(2) $k_{cr} = \mathbf{0.670}$ Load configuration factor - exp.6.4 $k_{c,90} = \mathbf{1.500}$ System strength factor - cl.6.6 $k_{sys} = \mathbf{1.000}$ Lateral buckling factor - cl.6.3.3(5) $k_{crit} = \mathbf{1.000}$ Compression perpendicular to the grain - cl.6.1.5 Design compressive stress $\sigma_{c,90,d} = R_{A,max} / (N \times b \times (L_b + \min(L_b, 30 \text{ mm}))) = \mathbf{0.406 \text{ N/mm}^2}$ Design compressive strength $f_{c,90,d} = k_{mod} \times k_{sys} \times k_{c,90} \times f_{c,90,k} / \gamma_M = \mathbf{2.308 \text{ N/mm}^2}$ $\sigma_{c,90,d} / f_{c,90,d} = \mathbf{0.176}$ PASS - Design compressive strength exceeds design compressive stress at bearing Bending - cl 6.1.6 Design bending stress $\sigma_{m,d} = M / W_y = \mathbf{10.915 \text{ N/mm}^2}$ Design bending strength $f_{m,d} = k_{h,m} \times k_{mod} \times k_{sys} \times k_{crit} \times f_{m,k} / \gamma_M = \mathbf{14.769 \text{ N/mm}^2}$ $\sigma_{m,d} / f_{m,d} = \mathbf{0.739}$ PASS - Design bending strength			

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84/ 5
Existing Purlin Analysis		By/Date	MM / Jun-26
		exceeds design bending stress	
Shear - cl.6.1.7			
Applied shear stress		$\tau_d = 3 \times F / (2 \times k_{cr} \times A) = \mathbf{0.788 \text{ N/mm}^2}$	
Permissible shear stress		$f_{v,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = \mathbf{2.462 \text{ N/mm}^2}$	
$\tau_d / f_{v,d} = \mathbf{0.320}$			
		PASS - Design shear strength exceeds design shear stress	

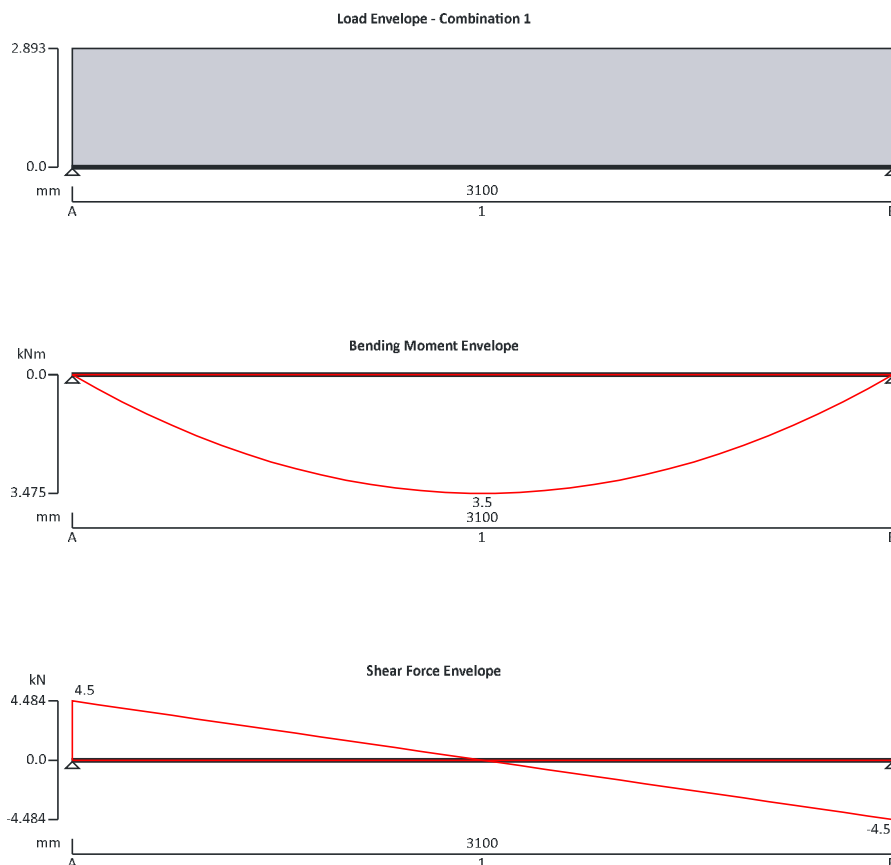
Project	69 High Street, West Lavington	Sheet no./rev.	ADL84/ 6
Existing Purlin Analysis – with addition of solar panels		By/Date	MM / Jun-26

TIMBER BEAM ANALYSIS & DESIGN (EN1995)

TIMBER BEAM ANALYSIS & DESIGN TO EN1995-1-1:2004

In accordance with EN1995-1-1:2004 + A2:2014 and Corrigendum No.1 and the UK National Annex incorporating National Amendment No.1

Tedds calculation version 1.7.05



Applied loading

Beam loads

Roof DL: $0.72 \text{ kN/m}^2 \times 2.80/2$
Roof LL: $0.54 \text{ kN/m}^2 \times 2.80/2$
Solar Panels: $0.18 \text{ kN/m}^2 \times 2.80/2$

Permanent self weight of beam $\times 1$
Permanent full UDL 1.010 kN/m
Variable full UDL 0.760 kN/m
Permanent full UDL 0.250 kN/m

Load combinations

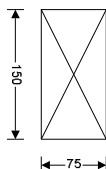
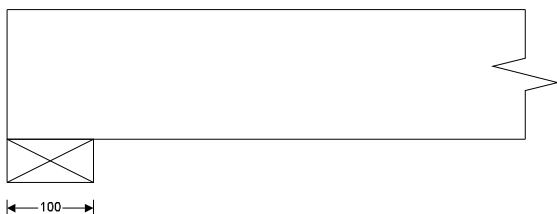
Load combination 1

Support A

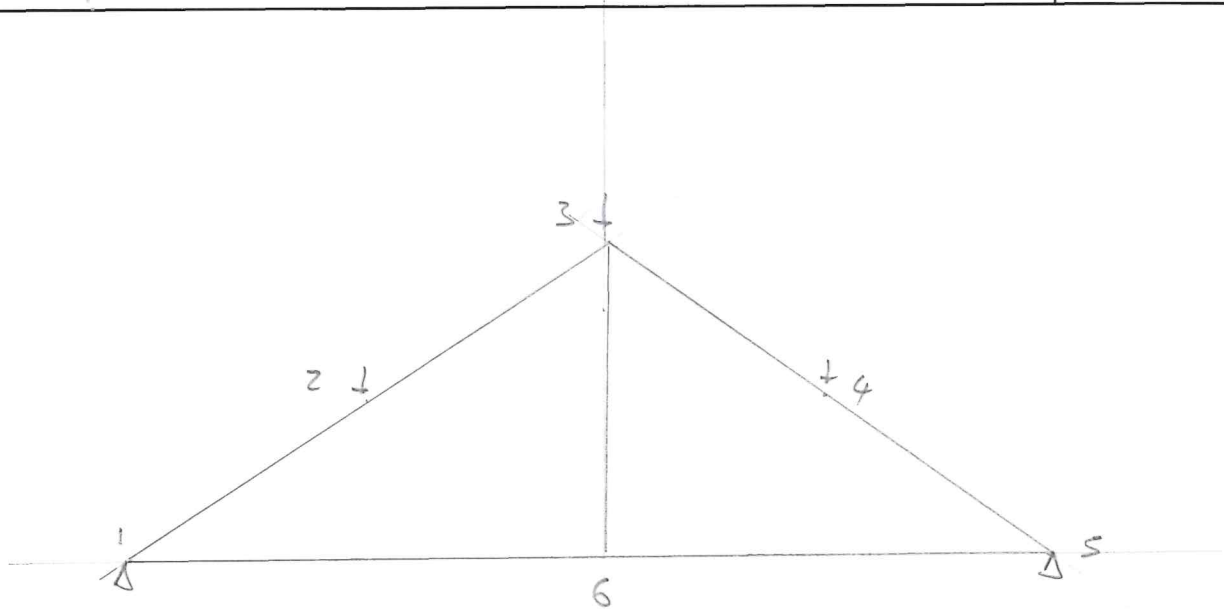
Permanent $\times 1.35$
Variable $\times 1.50$

Span 1

Permanent $\times 1.35$

Project 69 High Street, West Lavington		Sheet no./rev. ADL84/ 7
Existing Purlin Analysis – with addition of solar panels		By/Date MM / Jun-26
		Variable $\times 1.50$ Permanent $\times 1.35$ Variable $\times 1.50$
Support B		
Analysis results		
Maximum moment	$M_{\max} = 3.475 \text{ kNm}$	$M_{\min} = 0.000 \text{ kNm}$
Design moment	$M = \max(\text{abs}(M_{\max}), \text{abs}(M_{\min})) = 3.475 \text{ kNm}$	
Maximum shear	$F_{\max} = 4.484 \text{ kN}$	$F_{\min} = -4.484 \text{ kN}$
Design shear	$F = \max(\text{abs}(F_{\max}), \text{abs}(F_{\min})) = 4.484 \text{ kN}$	
Total load on beam	$W_{\text{tot}} = 8.969 \text{ kN}$	
Reactions at support A	$R_{A_{\max}} = 4.484 \text{ kN}$	$R_{A_{\min}} = 4.484 \text{ kN}$
Unfactored permanent load reaction at support A		$R_{A_{\text{Permanent}}} = 2.013 \text{ kN}$
Unfactored variable load reaction at support A	$R_{A_{\text{Variable}}} = 1.178 \text{ kN}$	
Reactions at support B	$R_{B_{\max}} = 4.484 \text{ kN}$	$R_{B_{\min}} = 4.484 \text{ kN}$
Unfactored permanent load reaction at support B		$R_{B_{\text{Permanent}}} = 2.013 \text{ kN}$
Unfactored variable load reaction at support B	$R_{B_{\text{Variable}}} = 1.178 \text{ kN}$	
 		
Timber section details		
Breadth of timber sections	$b = 75 \text{ mm}$	
Depth of timber sections	$h = 150 \text{ mm}$	
Number of timber sections in member	$N = 1$	
Overall breadth of timber member	$b_b = N \times b = 75 \text{ mm}$	
Timber strength class - EN 338:2016 Table 1	C24	
Member details		
Load duration - cl.2.3.1.2	Medium-term	
Service class of timber - cl.2.3.1.3	1	
Length of span	$L_{s1} = 3100 \text{ mm}$	
Length of bearing	$L_b = 100 \text{ mm}$	
Section properties		
Cross sectional area of member	$A = N \times b \times h = 11250 \text{ mm}^2$	
Section modulus	$W_y = N \times b \times h^2 / 6 = 281250 \text{ mm}^3$	
	$W_z = h \times (N \times b)^2 / 6 = 140625 \text{ mm}^3$	
Second moment of area	$I_y = N \times b \times h^3 / 12 = 21093750 \text{ mm}^4$	
	$I_z = h \times (N \times b)^3 / 12 = 5273437 \text{ mm}^4$	

Project 69 High Street, West Lavington		Sheet no./rev. ADL84/ 8	
Existing Purlin Analysis – with addition of solar panels		By/Date MM / Jun-26	
Radius of gyration $r_y = \sqrt{(I_y / A)} = 43.3 \text{ mm}$ $r_z = \sqrt{(I_z / A)} = 21.7 \text{ mm}$			
Partial factor for material properties and resistances			
Partial factor for material properties - Table 2.3 $\gamma_M = 1.300$			
Modification factors			
Modification factor for load duration and moisture content - Table 3.1 $k_{mod} = 0.800$			
Deformation factor for service classes - Table 3.2		$k_{def} = 0.600$	
Depth factor for bending - exp.3.1	$k_{h,m} = 1.000$		
Depth factor for tension - exp.3.1	$k_{h,t} = 1.000$		
Bending stress re-distribution factor - cl.6.1.6(2)	$k_m = 0.700$		
Crack factor for shear resistance - cl.6.1.7(2)	$k_{cr} = 0.670$		
Load configuration factor - exp.6.4	$k_{c,90} = 1.500$		
System strength factor - cl.6.6	$k_{sys} = 1.000$		
Lateral buckling factor - cl.6.3.3(5)	$k_{crit} = 1.000$		
Compression perpendicular to the grain - cl.6.1.5			
Design compressive stress	$\sigma_{c,90,d} = R_{A_max} / (N \times b \times (L_b + \min(L_b, 30 \text{ mm}))) = 0.460 \text{ N/mm}^2$		
Design compressive strength	$f_{c,90,d} = k_{mod} \times k_{sys} \times k_{c,90} \times f_{c,90,k} / \gamma_M = 2.308 \text{ N/mm}^2$ $\sigma_{c,90,d} / f_{c,90,d} = 0.199$		
PASS - Design compressive strength exceeds design compressive stress at bearing			
Bending - cl 6.1.6			
Design bending stress	$\sigma_{m,d} = M / W_y = 12.357 \text{ N/mm}^2$		
Design bending strength	$f_{m,d} = k_{h,m} \times k_{mod} \times k_{sys} \times k_{crit} \times f_{m,k} / \gamma_M = 14.769 \text{ N/mm}^2$ $\sigma_{m,d} / f_{m,d} = 0.837$		
PASS - Design bending strength exceeds design bending stress			
Shear - cl.6.1.7			
Applied shear stress	$\tau_d = 3 \times F / (2 \times k_{cr} \times A) = 0.892 \text{ N/mm}^2$		
Permissible shear stress	$f_{v,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = 2.462 \text{ N/mm}^2$ $\tau_d / f_{v,d} = 0.363$		
PASS - Design shear strength exceeds design shear stress			



Nodes

x

y

MEMBERS

1	0	0
2	1.190	0.773
3	2.380	1.546
4	3.570	0.773
5	4.760	0
6	2.380	0

BATTEN 70x150 DP

CEILING CHALK 75x180 DP

SPACING = 3.2m

NOTE: VERTICAL TIE IS SPEC'D BUT
AS ANALYSIS IS 2D-TIMBER
USE EQUIVALENT SECTION

Roof Loading

DEAD	BOARDING	15 kg/m ²
	BATTENS	5 kg/m ²
	TILES.	40 kg/m ²
		60 kg/m ²

Solar Panel = 20 kg/m² (CONSIDER 70° GAVAGE)

$$\text{LIVE} \quad 0.60 \text{ kg/m}^2 \times \left(\frac{60-33}{30} \right) \times \cos 38^\circ = 0.45 \text{ kg/m}^2$$

EXISTING TRUSS ANALYSIS - WITH ADDITION OF SOLAR PANELS

ANALYSIS OF EXISTING TRUSSES

Reactions D 1.63 kN

L 1.18 kN

ADDITION OF SOLAR PANELS ON BOTH SIDES OF ROOF RESULTS IN INCREASED DEFLECTION BUT STILL WITHIN ACCEPTABLE LIMITS OF SPANS.

Reactions D 2.01 kN

L 1.18 kN

RAFTER ELEMENT WOULD NEED TO BE STRENGTHENED BY ADDING TOTAL OF 47×147 CGS TO SIDE. THIS COULD BE $2/25 \times 147$ SECTIONS, 1 EACH SIDE

IE. EXISTING 70×150

+ ADDITIONAL 45×150

COMBINED 115×150 .

Project 69 High Street, West Lavington	Sheet no./rev. ADL84 / 11
Existing Roof Truss with additional load of Solar Panels	By/Date MM / Jun-26

TIMBER 2D ANALYSIS & DESIGN (EN1995)

TIMBER MEMBER 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
2.2.23

Rafter 1 results summary	Unit	Capacity	Maximum	Utilisation	Result
Compressive stress	N/mm ²	12.4	1.0	0.083	PASS
Bearing stress	N/mm ²	2.2	0.7	0.324	PASS
Bending stress	N/mm ²	14.2	11.5	0.812	PASS
Shear stress	N/mm ²	2.4	0.5	0.195	PASS
Bending and axial force				0.819	PASS
Column stability check				0.933	PASS
Beam stability check				0.738	PASS
Rafter 2 results summary	Unit	Capacity	Maximum	Utilisation	Result
Compressive stress	N/mm ²	12.4	1.0	0.083	PASS
Bearing stress	N/mm ²	2.2	0.7	0.324	PASS
Bending stress	N/mm ²	14.2	11.5	0.812	PASS
Shear stress	N/mm ²	2.4	0.5	0.195	PASS
Bending and axial force				0.819	PASS
Column stability check				0.933	PASS
Beam stability check				0.738	PASS
Collar results summary	Unit	Capacity	Maximum	Utilisation	Result
Tensile stress	N/mm ²	7.8	0.9	0.119	PASS
Bearing stress	N/mm ²	2.0	1.4	0.680	PASS
Bending stress	N/mm ²	12.9	0.3	0.023	PASS
Shear stress	N/mm ²	2.2	0.0	0.010	PASS
Bending and axial force				0.142	PASS

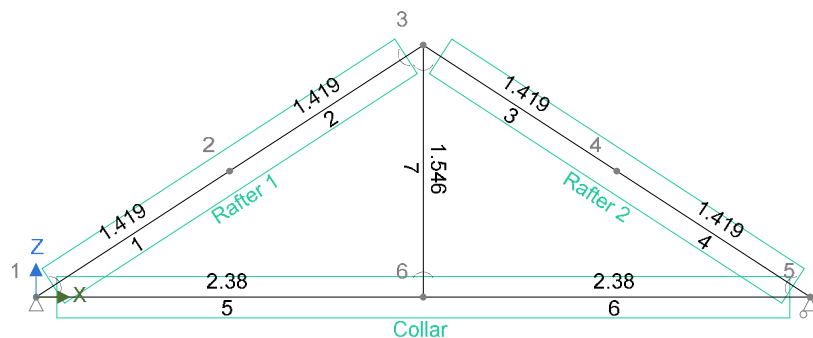
Project 69 High Street, West Lavington				Sheet no./rev. ADL84 / 12	
Existing Roof Truss with additional load of Solar Panels				By/Date MM / Jun-26	
Beam stability check				0.023	PASS
Deflection	mm	19	0.9	0.046	PASS

ANALYSIS

Tedds calculation version
1.0.38

Geometry

Geometry (m) - C24 (EC5)



Materials

Name	Density (kg/m ³)	Youngs Modulus kN/mm ²	Shear Modulus kN/mm ²	Thermal Coefficient °C ⁻¹
C24 (EC5)	420	11	0.69	0

Sections

Name	Area (cm ²)	Moment of inertia		Shear area parallel to	
		Major (cm ⁴)	Minor (cm ⁴)	Minor (cm ²)	Major (cm ²)
70x150	105	1968.8	428.8	87.5	87.5
75x180	135	3645	632.8	112.5	112.5
100x100	100	833.3	833.3	83.3	83.3
2/60x150	180	3375	2160	150	150

Nodes

Node	Co-ordinates		Freedom			Coordinate system		Spring		
	X (m)	Z (m)	X	Z	Rot.	Name	Angle (°)	X (kN/m)	Z (kN/m)	Rot. kNm/°
1	0	0	Fixed	Fixed	Free		0	0	0	0

Project 69 High Street, West Lavington								Sheet no./rev. ADL84 / 13		
Existing Roof Truss with additional load of Solar Panels								By/Date MM / Jun-26		

Node	Co-ordinates		Freedom			Coordinate system		Spring		
	X (m)	Z (m)	X	Z	Rot.	Name	Angle (°)	X (kN/m)	Z (kN/m)	Rot. kNm/°
2	1.19	0.773	Free	Free	Free		0	0	0	0
3	2.38	1.546	Free	Free	Free		0	0	0	0
4	3.57	0.773	Free	Free	Free		0	0	0	0
5	4.76	0	Free	Fixed	Free		0	0	0	0
6	2.38	0	Free	Free	Free		0	0	0	0

Elements

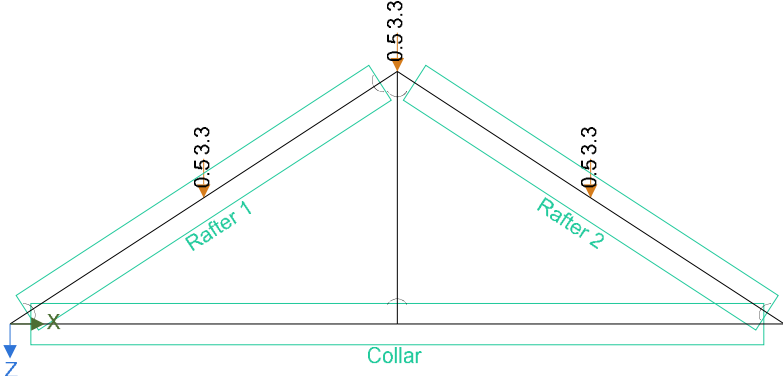
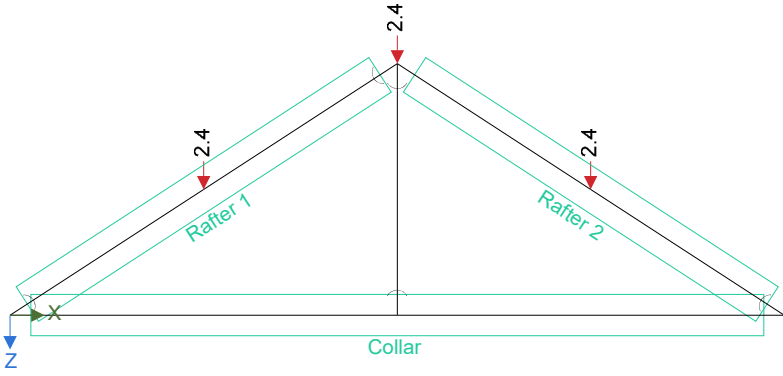
Element	Length (m)	Nodes		Section	Material	Releases			Rotated
		Start	End			Start moment	End moment	Axial	
1	1.419	1	2	2/60x150	C24 (EC5)	Free	Fixed	Fixed	
2	1.419	2	3	2/60x150	C24 (EC5)	Fixed	Free	Fixed	
3	1.419	3	4	2/60x150	C24 (EC5)	Fixed	Fixed	Fixed	
4	1.419	4	5	2/60x150	C24 (EC5)	Fixed	Free	Fixed	
5	2.38	1	6	75x180	C24 (EC5)	Fixed	Fixed	Fixed	
6	2.38	6	5	75x180	C24 (EC5)	Fixed	Fixed	Fixed	
7	1.546	3	6	100x100	C24 (EC5)	Free	Free	Fixed	

Members

Name	Elements	
	Start	End
Rafter 1	1	2
Rafter 2	3	4
Collar	5	6

Loading

Self weight included

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 14	
Existing Roof Truss with additional load of Solar Panels		By/Date	MM / Jun-26	
Permanent - Loading (kN)  Imposed - Loading (kN) 				
Load combination factors				
Load combination		Self Weight	Permanent	Imposed
1.35G + 1.5Q + 1.5RQ (Strength)		1.35	1.35	1.50
1.0G + 1.0Q + 1.0RQ (Service)		1.00	1.00	1.00
Node loads				
Node	Load case	Force		Moment
		X	Z	
		(kN)	(kN)	(kNm)
2	Permanent	0	3.3	0
3	Permanent	0	3.3	0

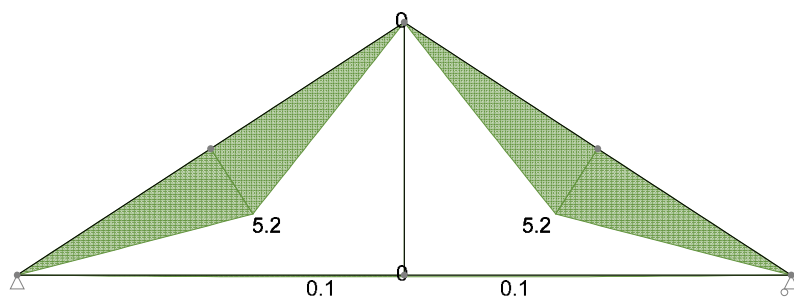
Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 15
Existing Roof Truss with additional load of Solar Panels		By/Date	MM / Jun-26

Node	Load case	Force		Moment (kNm)
		X (kN)	Z (kN)	
4	Permanent	0	3.3	0
2	Imposed	0	2.4	0
3	Imposed	0	2.4	0
4	Imposed	0	2.4	0
2	Permanent	0	0.5	0
3	Permanent	0	0.5	0
4	Permanent	0	0.5	0

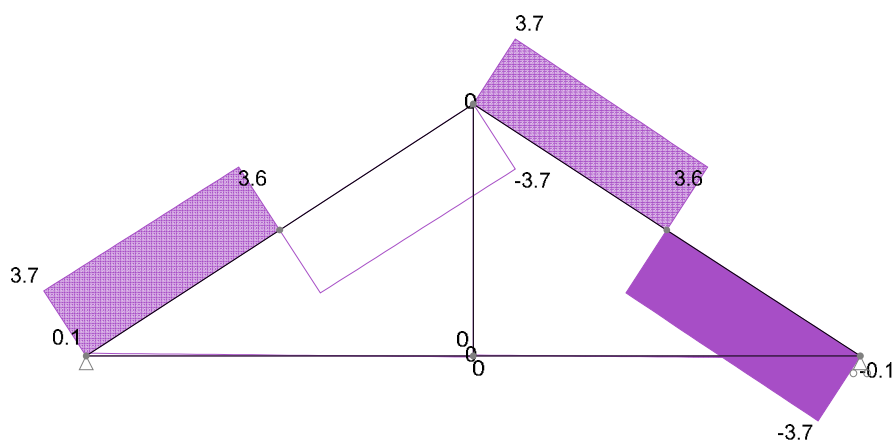
Results

Forces

Strength combinations - Moment envelope (kNm)



Strength combinations - Shear envelope (kN)

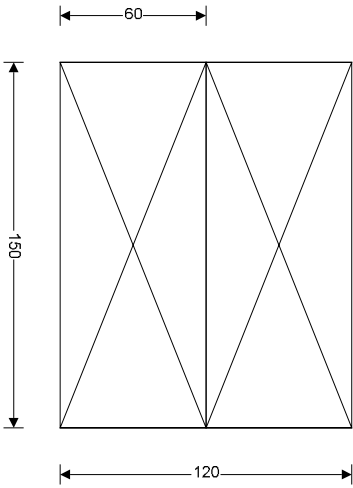


Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 17
	Existing Roof Truss with additional load of Solar Panels	By/Date	MM / Jun-26
Span details Bearing length $L_b = 100$ mm <u>Consider Combination 1 - 1.35G + 1.5Q + 1.5RQ (Strength)</u> Modification factors Duration of load and moisture content - Table 3.1 $k_{mod} = 0.7$ Deformation factor - Table 3.2 $k_{def} = 0.6$ Bending stress re-distribution factor - cl.6.1.6(2) $k_m = 0.7$ Crack factor for shear resistance - cl.6.1.7(2) $k_{cr} = 0.67$ Load configuration factor - cl.6.1.5(4) $k_{c,90} = 1.5$ System strength factor - cl.6.6 $k_{sys} = 1.1$ Check compression parallel to the grain - cl.6.1.4 Design axial compression $P_d = 18.606$ kN Design compressive stress $\sigma_{c,0,d} = P_d / A = 1.034$ N/mm² Design compressive strength $f_{c,0,d} = k_{mod} \times k_{sys} \times f_{c,0,k} / \gamma_M = 12.438$ N/mm² $\sigma_{c,0,d} / f_{c,0,d} = 0.083$ PASS - Design parallel compression strength exceeds design parallel compression stress <u>Check design at start of span</u> Check compression perpendicular to the grain - cl.6.1.5 Design perpendicular compression - major axis $F_{c,y,90,d} = 11.228$ kN Effective contact length $L_{b,ef} = L_b + \min(2838 \text{ mm} / 2, L_b, 30 \text{ mm}) = 130$ mm Design perpendicular compressive stress - exp.6.4 $\sigma_{c,y,90,d} = F_{c,y,90,d} / (N \times b \times L_{b,ef}) = 0.720$ N/mm² Design perpendicular compressive strength $f_{c,y,90,d} = k_{mod} \times k_{sys} \times f_{c,90,k} / \gamma_M = 1.481$ N/mm² $\sigma_{c,y,90,d} / (k_{c,90} \times f_{c,y,90,d}) = 0.324$ PASS - Design perpendicular compression strength exceeds design perpendicular			

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 18
	Existing Roof Truss with additional load of Solar Panels	By/Date	MM / Jun-26
compression stress Check shear force - Section 6.1.7 Design shear force $F_{y,d} = 3.72$ kN Design shear stress - exp.6.60 $\tau_{y,d} = 1.5 \times F_{y,d} / (k_{cr} \times N \times b \times h) = 0.463$ N/mm² Design shear strength $f_{v,y,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = 2.369$ N/mm² $\tau_{y,d} / f_{v,y,d} = 0.195$ PASS - Design shear strength exceeds design shear stress Check columns subjected to either compression or combined compression and bending - cl.6.3.2 Effective length for y-axis bending $L_{e,y} = 0.9 \times 2838$ mm = 2554 mm Slenderness ratio $\lambda_y = L_{e,y} / i_y = 58.987$ Relative slenderness ratio - exp. 6.21 $\lambda_{rel,y} = \lambda_y / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 1$ Effective length for z-axis bending $L_{e,z} = 0$ mm Slenderness ratio $\lambda_z = L_{e,z} / i_z = 0$ Relative slenderness ratio - exp. 6.22 $\lambda_{rel,z} = \lambda_z / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 0$ $\lambda_{rel,y} > 0.3$ column stability check is required Straightness factor $\beta_c = 0.2$ Instability factors - exp.6.25, 6.26, 6.27 & 6.28 $k_y = 0.5 \times (1 + \beta_c \times (\lambda_{rel,y} - 0.3) + \lambda_{rel,y}^2) = 1.070$ $k_z = 0.5 \times (1 + \beta_c \times (\lambda_{rel,z} - 0.3) + \lambda_{rel,z}^2) = 0.470$ $k_{c,y} = 1 / (k_y + \sqrt{(k_y^2 - \lambda_{rel,y}^2)}) = 0.689$ $k_{c,z} = 1 / (k_z + \sqrt{(k_z^2 - \lambda_{rel,z}^2)}) = 1.064$ Column stability checks - exp.6.23 & 6.24 $\sigma_{c,0,d} / (k_{c,y} \times f_{c,0,d}) = 0.121$ $\sigma_{c,0,d} / (k_{c,z} \times f_{c,0,d}) = 0.078$ PASS - Column stability is acceptable			

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 19
	Existing Roof Truss with additional load of Solar Panels	By/Date	MM / Jun-26
<u>Check design 1419 mm along span</u> Check shear force - Section 6.1.7 Design shear force $F_{y,d} = 3.601$ kN Design shear stress - exp.6.60 $\tau_{y,d} = 1.5 \times F_{y,d} / (k_{cr} \times N \times b \times h) = 0.448$ N/mm² Design shear strength $f_{v,y,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = 2.369$ N/mm² $\tau_{y,d} / f_{v,y,d} = 0.189$ PASS - Design shear strength exceeds design shear stress Check bending moment - Section 6.1.6 Design bending moment $M_{y,d} = 5.195$ kNm Design bending stress $\sigma_{m,y,d} = M_{y,d} / W_y = 11.544$ N/mm² Design bending strength $f_{m,y,d} = k_{mod} \times k_{sys} \times f_{m,k} / \gamma_M = 14.215$ N/mm² $\sigma_{m,y,d} / f_{m,y,d} = 0.812$ PASS - Design bending strength exceeds design bending stress Check combined bending and axial tension - Section 6.2.3 Combined loading checks - exp.6.19 & 6.20 $(\sigma_{c,0,d} / f_{c,0,d})^2 + \sigma_{m,y,d} / f_{m,y,d} = 0.819$ $(\sigma_{c,0,d} / f_{c,0,d})^2 + k_m \times \sigma_{m,y,d} / f_{m,y,d} = 0.575$ PASS - Combined bending and axial compression utilisation is acceptable Check columns subjected to either compression or combined compression and bending - cl.6.3.2 Effective length for y-axis bending $L_{e,y} = 0.9 \times 2838$ mm = 2554 mm Slenderness ratio $\lambda_y = L_{e,y} / i_y = 58.987$ Relative slenderness ratio - exp. 6.21 $\lambda_{rel,y} = \lambda_y / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 1$ Effective length for z-axis bending $L_{e,z} = 0$ mm Slenderness ratio $\lambda_z = L_{e,z} / i_z = 0$			

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 20
	Existing Roof Truss with additional load of Solar Panels	By/Date	MM / Jun-26
Relative slenderness ratio - exp. 6.22 $\lambda_{rel,z} = \lambda_z / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 0$ $\lambda_{rel,y} > 0.3$ column stability check is required Straightness factor $\beta_c = 0.2$ Instability factors - exp.6.25, 6.26, 6.27 & 6.28 $k_y = 0.5 \times (1 + \beta_c \times (\lambda_{rel,y} - 0.3) + \lambda_{rel,y}^2) = 1.070$ $k_z = 0.5 \times (1 + \beta_c \times (\lambda_{rel,z} - 0.3) + \lambda_{rel,z}^2) = 0.470$ $k_{c,y} = 1 / (k_y + \sqrt{(k_y^2 - \lambda_{rel,y}^2)}) = 0.689$ $k_{c,z} = 1 / (k_z + \sqrt{(k_z^2 - \lambda_{rel,z}^2)}) = 1.064$ Column stability checks - exp.6.23 & 6.24 $\sigma_{c,0,d} / (k_{c,y} \times f_{c,0,d}) + \sigma_{m,y,d} / f_{m,y,d} = 0.933$ $\sigma_{c,0,d} / (k_{c,z} \times f_{c,0,d}) + k_m \times \sigma_{m,y,d} / f_{m,y,d} = 0.647$ PASS - Column stability is acceptable Check beams subjected to either bending or combined bending and compression - cl.6.3.3 Lateral buckling factor - exp.6.34 $k_{crit} = 1.000$ Beam stability check - exp.6.35 $(\sigma_{m,y,d} / (k_{crit} \times f_{m,y,d}))^2 + \sigma_{c,0,d} / (k_{c,z} \times f_{c,0,d}) = 0.738$ PASS - Beam stability is acceptable <u>Consider Combination 2 - 1.0G + 1.0Q + 1.0RQ (Service)</u> <u>Check design 1419 mm along span</u> Check y-y axis deflection - Section 7.2 Instantaneous deflection $\delta_y = 7.3$ mm Quasi-permanent variable load factor $\psi_2 = 0.3$ Final deflection with creep $\delta_{y,Final} = \delta_y \times (1 + k_{def}) = 11.7$ mm <u>Rafter 2 - Span 1</u> 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 Long-term Service class - cl.2.3.1.3 1			

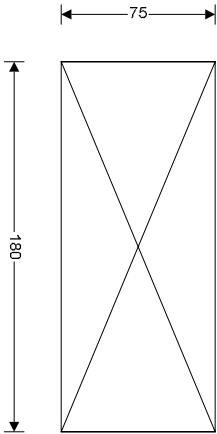
Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 21
Existing Roof Truss with additional load of Solar Panels		By/Date	MM / Jun-26
Timber section details Number of timber sections in member $N = 2$ Breadth of sections $b = 60 \text{ mm}$ Depth of sections $h = 150 \text{ mm}$ Timber strength class - EN 338:2016 Table 1 C24  2/60x150 timber sections Cross-sectional area, A, 18000 mm² Section modulus, W_y, 450000 mm³ Section modulus, W_z, 180000 mm³ Second moment of area, I_y, 33750000 mm⁴ Second moment of area, I_z, 5400000 mm⁴ Radius of gyration, i_y, 43.3 mm Radius of gyration, i_z, 17.3 mm Timber strength class C24 Characteristic bending strength, $f_{m,k}$, 24 N/mm² Characteristic shear strength, $f_{v,k}$, 4 N/mm² Characteristic compression strength parallel to grain, $f_{c,0,k}$, 21 N/mm² Characteristic compression strength perpendicular to grain, $f_{c,90,k}$, 2.5 N/mm² Characteristic tension strength parallel to grain, $f_{t,0,k}$, 14.5 N/mm² Mean modulus of elasticity, $E_{0,mean}$, 11000 N/mm² Fifth percentile modulus of elasticity, $E_{0,05}$, 7400 N/mm² Shear modulus of elasticity, G_{mean}, 690 N/mm² Characteristic density, ρ_k, 350 kg/m³ Mean density, ρ_{mean}, 420 kg/m³			
Span details Bearing length $L_b = 100 \text{ mm}$ <u>Consider Combination 1 - 1.35G + 1.5Q + 1.5RQ (Strength)</u> Modification factors Duration of load and moisture content - Table 3.1 $k_{mod} = 0.7$ Deformation factor - Table 3.2 $k_{def} = 0.6$ 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 compression parallel to the grain - cl.6.1.4 Design axial compression $P_d = 18.606 \text{ kN}$ Design compressive stress $\sigma_{c,0,d} = P_d / A = 1.034 \text{ N/mm}^2$ Design compressive strength $f_{c,0,d} = k_{mod} \times k_{sys} \times f_{c,0,k} / \gamma_M = 12.438 \text{ N/mm}^2$ $\sigma_{c,0,d} / f_{c,0,d} = 0.083$ PASS - Design parallel compression			

Project 69 High Street, West Lavington	Sheet no./rev. ADL84 / 22
Existing Roof Truss with additional load of Solar Panels	By/Date MM / Jun-26
strength exceeds design parallel compression stress <u>Check design at start of span</u> Check shear force - Section 6.1.7 Design shear force $F_{y,d} = 3.72$ kN Design shear stress - exp.6.60 $\tau_{y,d} = 1.5 \times F_{y,d} / (k_{cr} \times N \times b \times h) = 0.463$ N/mm² Design shear strength $f_{v,y,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = 2.369$ N/mm² $\tau_{y,d} / f_{v,y,d} = 0.195$ PASS - Design shear strength exceeds design shear stress Check columns subjected to either compression or combined compression and bending - cl.6.3.2 Effective length for y-axis bending $L_{e,y} = 0.9 \times 2838$ mm = 2554 mm Slenderness ratio $\lambda_y = L_{e,y} / i_y = 58.987$ Relative slenderness ratio - exp. 6.21 $\lambda_{rel,y} = \lambda_y / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 1$ Effective length for z-axis bending $L_{e,z} = 0$ mm Slenderness ratio $\lambda_z = L_{e,z} / i_z = 0$ Relative slenderness ratio - exp. 6.22 $\lambda_{rel,z} = \lambda_z / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 0$ $\lambda_{rel,y} > 0.3$ column stability check is required Straightness factor $\beta_c = 0.2$ Instability factors - exp.6.25, 6.26, 6.27 & 6.28 $k_y = 0.5 \times (1 + \beta_c \times (\lambda_{rel,y} - 0.3) + \lambda_{rel,y}^2) = 1.070$ $k_z = 0.5 \times (1 + \beta_c \times (\lambda_{rel,z} - 0.3) + \lambda_{rel,z}^2) = 0.470$ $k_{c,y} = 1 / (k_y + \sqrt{(k_y^2 - \lambda_{rel,y}^2)}) = 0.689$ $k_{c,z} = 1 / (k_z + \sqrt{(k_z^2 - \lambda_{rel,z}^2)}) = 1.064$ Column stability checks - exp.6.23 & 6.24 $\sigma_{c,0,d} / (k_{c,y} \times f_{c,0,d}) = 0.121$ $\sigma_{c,0,d} / (k_{c,z} \times f_{c,0,d}) = 0.078$ PASS - Column stability is acceptable	

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 23
	Existing Roof Truss with additional load of Solar Panels	By/Date	MM / Jun-26
<u>Check design 1419 mm along span</u> Check shear force - Section 6.1.7 Design shear force $F_{y,d} = 3.601$ kN Design shear stress - exp.6.60 $\tau_{y,d} = 1.5 \times F_{y,d} / (k_{cr} \times N \times b \times h) = 0.448$ N/mm² Design shear strength $f_{v,y,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = 2.369$ N/mm² $\tau_{y,d} / f_{v,y,d} = 0.189$ PASS - Design shear strength exceeds design shear stress Check bending moment - Section 6.1.6 Design bending moment $M_{y,d} = 5.195$ kNm Design bending stress $\sigma_{m,y,d} = M_{y,d} / W_y = 11.544$ N/mm² Design bending strength $f_{m,y,d} = k_{mod} \times k_{sys} \times f_{m,k} / \gamma_M = 14.215$ N/mm² $\sigma_{m,y,d} / f_{m,y,d} = 0.812$ PASS - Design bending strength exceeds design bending stress Check combined bending and axial tension - Section 6.2.3 Combined loading checks - exp.6.19 & 6.20 $(\sigma_{c,0,d} / f_{c,0,d})^2 + \sigma_{m,y,d} / f_{m,y,d} = 0.819$ $(\sigma_{c,0,d} / f_{c,0,d})^2 + k_m \times \sigma_{m,y,d} / f_{m,y,d} = 0.575$ PASS - Combined bending and axial compression utilisation is acceptable Check columns subjected to either compression or combined compression and bending - cl.6.3.2 Effective length for y-axis bending $L_{e,y} = 0.9 \times 2838$ mm = 2554 mm Slenderness ratio $\lambda_y = L_{e,y} / i_y = 58.987$ Relative slenderness ratio - exp. 6.21 $\lambda_{rel,y} = \lambda_y / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 1$ Effective length for z-axis bending $L_{e,z} = 0$ mm Slenderness ratio $\lambda_z = L_{e,z} / i_z = 0$			

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 24
	Existing Roof Truss with additional load of Solar Panels	By/Date	MM / Jun-26
Relative slenderness ratio - exp. 6.22 $\lambda_{rel,z} = \lambda_z / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 0$ $\lambda_{rel,y} > 0.3$ column stability check is required Straightness factor $\beta_c = 0.2$ Instability factors - exp.6.25, 6.26, 6.27 & 6.28 $k_y = 0.5 \times (1 + \beta_c \times (\lambda_{rel,y} - 0.3) + \lambda_{rel,y}^2) = 1.070$ $k_z = 0.5 \times (1 + \beta_c \times (\lambda_{rel,z} - 0.3) + \lambda_{rel,z}^2) = 0.470$ $k_{c,y} = 1 / (k_y + \sqrt{(k_y^2 - \lambda_{rel,y}^2)}) = 0.689$ $k_{c,z} = 1 / (k_z + \sqrt{(k_z^2 - \lambda_{rel,z}^2)}) = 1.064$ Column stability checks - exp.6.23 & 6.24 $\sigma_{c,0,d} / (k_{c,y} \times f_{c,0,d}) + \sigma_{m,y,d} / f_{m,y,d} = 0.933$ $\sigma_{c,0,d} / (k_{c,z} \times f_{c,0,d}) + k_m \times \sigma_{m,y,d} / f_{m,y,d} = 0.647$ PASS - Column stability is acceptable Check beams subjected to either bending or combined bending and compression - cl.6.3.3 Lateral buckling factor - exp.6.34 $k_{crit} = 1.000$ Beam stability check - exp.6.35 $(\sigma_{m,y,d} / (k_{crit} \times f_{m,y,d}))^2 + \sigma_{c,0,d} / (k_{c,z} \times f_{c,0,d}) = 0.738$ PASS - Beam stability is acceptable <u>Check design at end of span</u> Check compression perpendicular to the grain - cl.6.1.5 Design perpendicular compression - major axis $F_{c,y,90,d} = 11.228$ kN Effective contact length $L_{b,ef} = \min(2838 \text{ mm} / 2, L_b, 30 \text{ mm}) + L_b = 130$ mm Design perpendicular compressive stress - exp.6.4 $\sigma_{c,y,90,d} = F_{c,y,90,d} / (N \times b \times L_{b,ef}) = 0.720$ N/mm² Design perpendicular compressive strength $f_{c,y,90,d} = k_{mod} \times k_{sys} \times f_{c,90,k} / \gamma_M = 1.481$ N/mm² $\sigma_{c,y,90,d} / (k_{c,90} \times f_{c,y,90,d}) = 0.324$ PASS - Design perpendicular compression strength exceeds design perpendicular compression stress			

Project 69 High Street, West Lavington	Sheet no./rev. ADL84 / 25
Existing Roof Truss with additional load of Solar Panels	By/Date MM / Jun-26
Check shear force - Section 6.1.7 Design shear force $F_{y,d} = 3.72$ kN Design shear stress - exp.6.60 $\tau_{y,d} = 1.5 \times F_{y,d} / (k_{cr} \times N \times b \times h) = 0.463$ N/mm² Design shear strength $f_{v,y,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = 2.369$ N/mm² $\tau_{y,d} / f_{v,y,d} = 0.195$ PASS - Design shear strength exceeds design shear stress Check columns subjected to either compression or combined compression and bending - cl.6.3.2 Effective length for y-axis bending $L_{e,y} = 0.9 \times 2838$ mm = 2554 mm Slenderness ratio $\lambda_y = L_{e,y} / i_y = 58.987$ Relative slenderness ratio - exp. 6.21 $\lambda_{rel,y} = \lambda_y / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 1$ Effective length for z-axis bending $L_{e,z} = 0$ mm Slenderness ratio $\lambda_z = L_{e,z} / i_z = 0$ Relative slenderness ratio - exp. 6.22 $\lambda_{rel,z} = \lambda_z / \pi \times \sqrt{(f_{c,0,k} / E_{0.05})} = 0$ $\lambda_{rel,y} > 0.3$ column stability check is required Straightness factor $\beta_c = 0.2$ Instability factors - exp.6.25, 6.26, 6.27 & 6.28 $k_y = 0.5 \times (1 + \beta_c \times (\lambda_{rel,y} - 0.3) + \lambda_{rel,y}^2) = 1.070$ $k_z = 0.5 \times (1 + \beta_c \times (\lambda_{rel,z} - 0.3) + \lambda_{rel,z}^2) = 0.470$ $k_{c,y} = 1 / (k_y + \sqrt{(k_y^2 - \lambda_{rel,y}^2)}) = 0.689$ $k_{c,z} = 1 / (k_z + \sqrt{(k_z^2 - \lambda_{rel,z}^2)}) = 1.064$ Column stability checks - exp.6.23 & 6.24 $\sigma_{c,0,d} / (k_{c,y} \times f_{c,0,d}) = 0.121$ $\sigma_{c,0,d} / (k_{c,z} \times f_{c,0,d}) = 0.078$ PASS - Column stability is acceptable <u>Consider Combination 2 - 1.0G + 1.0Q + 1.0RQ (Service)</u> <u>Check design 1419 mm along span</u> Check y-y axis deflection - Section 7.2 Instantaneous deflection $\delta_y = 7.2$ mm	

Project	69 High Street, West Lavington	Sheet no./rev.	ADL84 / 26
Existing Roof Truss with additional load of Solar Panels		By/Date	MM / Jun-26
Quasi-permanent variable load factor $\psi_2 = 0.3$ Final deflection with creep $\delta_{y,Final} = \delta_y \times (1 + k_{def}) = 11.5 \text{ mm}$ <u>Collar - Span 1</u> 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 Long-term Service class - cl.2.3.1.3 1 Timber section details Number of timber sections in member $N = 1$ Breadth of sections $b = 75 \text{ mm}$ Depth of sections $h = 180 \text{ mm}$ Timber strength class - EN 338:2016 Table 1 C24  75x180 timber section Cross-sectional area, A, 13500 mm² Section modulus, W_y, 405000 mm³ Section modulus, W_z, 168750 mm³ Second moment of area, I_y, 36450000 mm⁴ Second moment of area, I_z, 6328125 mm⁴ Radius of gyration, i_y, 52 mm Radius of gyration, i_z, 21.7 mm Timber strength class C24 Characteristic bending strength, $f_{m,k}$, 24 N/mm² Characteristic shear strength, $f_{v,k}$, 4 N/mm² Characteristic compression strength parallel to grain, $f_{c,0,k}$, 21 N/mm² Characteristic compression strength perpendicular to grain, $f_{c,90,k}$, 2.5 N/mm² Characteristic tension strength parallel to grain, $f_{t,0,k}$, 14.5 N/mm² Mean modulus of elasticity, $E_{0,mean}$, 11000 N/mm² Fifth percentile modulus of elasticity, $E_{0,05}$, 7400 N/mm² Shear modulus of elasticity, G_{mean}, 690 N/mm² Characteristic density, ρ_k, 350 kg/m³ Mean density, ρ_{mean}, 420 kg/m³			
Span details Bearing length $L_b = 100 \text{ mm}$ <u>Consider Combination 1 - 1.35G + 1.5Q + 1.5RQ (Strength)</u> Modification factors Duration of load and moisture content - Table 3.1 $k_{mod} = 0.7$ Deformation factor - Table 3.2 $k_{def} = 0.6$ Depth factor for tension - exp.3.1 $k_{h,t} = 1$ Bending stress re-distribution factor - cl.6.1.6(2) $k_m = 0.7$			

Project 69 High Street, West Lavington	Sheet no./rev. ADL84 / 27
Existing Roof Truss with additional load of Solar Panels	By/Date MM / Jun-26
Crack factor for shear resistance - cl.6.1.7(2) $k_{cr} = 0.67$ Load configuration factor - cl.6.1.5(4) $k_{c,90} = 1.5$ Check tension parallel to the grain - Section 6.1.2 Axial tension $P_d = 13.576$ kN Design tensile stress $\sigma_{t,0,d} = P_d / (b \times \min(h_{ef_e1}, h_{ef_e2})) = 0.928$ N/mm² Design tensile strength $f_{t,0,d} = k_{h,t} \times k_{mod} \times f_{t,0,k} / \gamma_M = 7.808$ N/mm² $\sigma_{t,0,d} / f_{t,0,d} = 0.119$ PASS - Design tensile strength exceeds design tensile stress Check design at start of span Check compression perpendicular to the grain - cl.6.1.5 Design perpendicular compression - major axis $F_{c,y,90,d} = 13.389$ kN Effective contact length $L_{b,ef} = L_b + \min(4760 \text{ mm} / 2, L_b, 30 \text{ mm}) = 130$ mm Design perpendicular compressive stress - exp.6.4 $\sigma_{c,y,90,d} = F_{c,y,90,d} / (b \times L_{b,ef}) = 1.373$ N/mm² Design perpendicular compressive strength $f_{c,y,90,d} = k_{mod} \times f_{c,90,k} / \gamma_M = 1.346$ N/mm² $\sigma_{c,y,90,d} / (k_{c,90} \times f_{c,y,90,d}) = 0.680$ PASS - Design perpendicular compression strength exceeds design perpendicular compression stress Check shear force - Section 6.1.7 Design shear force $F_{y,d} = 0.134$ kN Design shear stress - exp.6.60 $\tau_{y,d} = 1.5 \times F_{y,d} / (k_{cr} \times b \times h) = 0.022$ N/mm² Design shear strength $f_{v,y,d} = k_{mod} \times f_{v,k} / \gamma_M = 2.154$ N/mm² $\tau_{y,d} / f_{v,y,d} = 0.010$ PASS - Design shear strength exceeds design shear stress	

Project 69 High Street, West Lavington	Sheet no./rev. ADL84 / 28
Existing Roof Truss with additional load of Solar Panels	By/Date MM / Jun-26
<u>Check design 2977 mm along span</u> Check bending moment - Section 6.1.6 Design bending moment $M_{y,d} = 0.119 \text{ kNm}$ Design bending stress $\sigma_{m,y,d} = M_{y,d} / W_y = 0.295 \text{ N/mm}^2$ Design bending strength $f_{m,y,d} = k_{mod} \times f_{m,k} / \gamma_M = 12.923 \text{ N/mm}^2$ $\sigma_{m,y,d} / f_{m,y,d} = 0.023$ PASS - Design bending strength exceeds design bending stress Check combined bending and axial tension - Section 6.2.3 Combined loading checks - exp.6.17 & 6.18 $\sigma_{t,0,d} / f_{t,0,d} + \sigma_{m,y,d} / f_{m,y,d} = 0.142$ $\sigma_{t,0,d} / f_{t,0,d} + k_m \times \sigma_{m,y,d} / f_{m,y,d} = 0.135$ PASS - Combined bending and axial tension utilisation is acceptable Check beams subjected to either bending or combined bending and compression - cl.6.3.3 Lateral buckling factor - exp.6.34 $k_{crit} = 1.000$ Beam stability check - exp.6.33 $\sigma_{m,y,d} / (k_{crit} \times f_{m,y,d}) = 0.023$ PASS - Beam stability is acceptable <u>Check design at end of span</u> Check compression perpendicular to the grain - cl.6.1.5 Design perpendicular compression - major axis $F_{c,y,90,d} = 13.389 \text{ kN}$ Effective contact length $L_{b,ef} = \min(4760 \text{ mm} / 2, L_b, 30 \text{ mm}) + L_b = 130 \text{ mm}$ Design perpendicular compressive stress - exp.6.4 $\sigma_{c,y,90,d} = F_{c,y,90,d} / (b \times L_{b,ef}) = 1.373 \text{ N/mm}^2$ Design perpendicular compressive strength $f_{c,y,90,d} = k_{mod} \times f_{c,90,k} / \gamma_M = 1.346 \text{ N/mm}^2$ $\sigma_{c,y,90,d} / (k_{c,90} \times f_{c,y,90,d}) = 0.680$ PASS - Design perpendicular compression strength exceeds	

