6237a

RAWLINGS LIMITED
structural design

BARN FOR CONVERSION
WESTFIELD FARM
MILL LANE
GREAT BRICKHILL
MILTON KEYNES
MK19 9BG

VISUAL INSPECTION

January 2024

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6236 – Barn for conversion, Westfield Farm, Mill Lane, Great Brickhill, Milton Keynes

1. Introduction

Rawlings Structural Design Ltd was appointed by Mr and Mrs Cox of Westfield Farm, Mill Lane, Great Brickhill, Milton Keynes, MK19 9BG, to carry out a visual inspection of a redundant agricultural barn on their premises.

The purpose of the inspection was to consider the condition of the structure in support of the conversion of the building into a residential unit as part of a application for prior approval under Schedule 2 Part 3 Class Q of the Town and Country Planning (General Permitted Development) Order 2015.

It should be remembered that any such visual inspection can only be considered a snapshot of the condition of the building at the time of the inspection, although I have no reason to consider that this condition should alter, providing there is no change in the ambient conditions of the property. I should also advise you that the copyright of this report rests with Rawlings Structural Design Ltd and is prepared only for those to whom this letter is addressed. Therefore, it is not to be relied upon by any third party without the express agreement, in writing, of Rawlings Structural Design Ltd.

2. Description of the building

The building consists of 4No frames spanning 9.5m at 5.7m spacing. The building is approximately 3.5m to the eaves and 4.8m to the ridge.

The structure consists of steel portal frames consisting of 178 x 102 UB rafters and 203 x 133 UB30 columns, with a small haunch at the eaves. The purlins are 200mm metal Z section, similar to the Metsec Purlins, supporting profiled metal sheeting. The external walls are also profiled metal sheets supported by sheeting rails at approximately 1000mm vertical centres.

The concrete slab is competent and intact and has been subjected to agricultural loading throughout the life of the building.

3. Impact of proposals

The proposal is to create a single-storey dwelling within the shell of the existing building. The cladding to the roof will be replaced with lightweight insulated sheeting, which will be of a similar weight to the existing material. Similarly, the external walls will be overclad on the inside with insulation. A ceiling is to be provided creating a loft void over.

Both floors will have the necessary partitions to make up the rooms. The ground floor slab is adequate to support the ground floor partitions and then be used to support the ceiling joists.

New doors and windows are proposed for the external elevations, which can be formed using secondary steel sections similar to the sheeting rails. Additional structure is not required.

4. Conclusion

The building has robust superstructure capable of supporting lightweight roof loads and providing lateral restraint. The monolithic concrete slab is capable of supporting an additional inner leaf as required to bring the buildings up to the insulation levels required by Building Regulations and the internal partitions.

The building does not require structural intervention other than that required to create doors and windows.

KEITH RAWLINGS BSc CEng FIStructE
RAWLINGS STRUCTURAL DESIGN LTD
10 JANUARY 2024
Revision A 22 January 2024

APPENDIX 1

PHOTOGRAPHS

6236 – Barn for conversion, Westfield Farm, Mill Lane, Great Brickhill, Milton Keynes

6236 – Barn for conversion, Westfield Farm, Mill Lane, Great Brickhill, Milton Keynes

APPENDIX 2

CALCULATIONS

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Dimensions used are for calculation purposes only. The actual overall dimensions of beams should be determined by the Contractor on site.

PROPOSAL

Consider the existing structure in support of the conversion of the building into a residential unit as part of a application for prior approval under Schedule 2 Part 3 Class Q of the Town and Country Planning (General Permitted Development) Order 2015.

LOADS

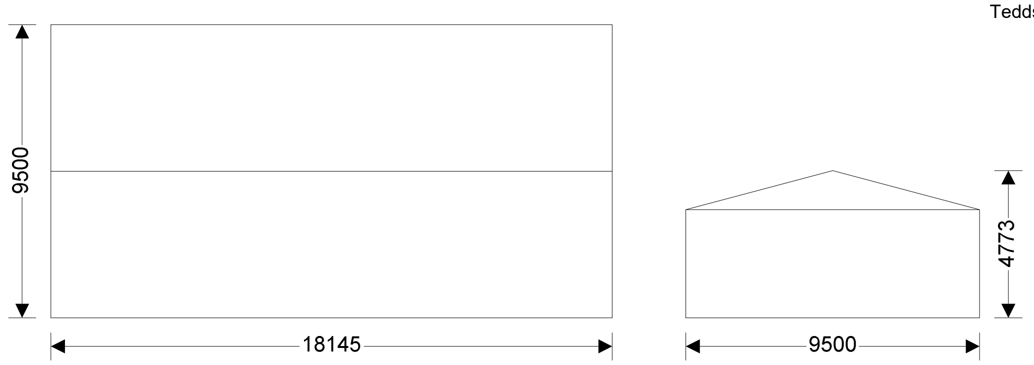
Roof dead load = **0.30** kN/m^2
Roof live load = **0.75** kN/m^2

WIND LOADS

WIND LOADING (BS6399)

In accordance with BS6399

Tedds calculation version 3.0.18



Plan Elevation

Building data

Type of roof;	Duopitch
Length of building;	L = **18145** mm
Width of building;	W = **9500** mm
Height to eaves;	H = **3500** mm
Pitch of roof;	α_0 = **15.0** deg
Reference height;	H_r = **4773** mm

Dynamic classification

Building type factor (Table 1);	K_b = **2.0**
Dynamic augmentation factor (1.6.1);	$C_r = [K_b \times (H_r / (0.1\ m))^{0.75}] / (800 \times \log(H_r / (0.1\ m))) =$ **0.03**

Site wind speed

Location;	Bedford
Basic wind speed (Figure 6 BS6399:Pt 2)	V_b = **21.5** m/s
Site altitude	Δs = **31** m
Upwind distance from sea to site	d_{sea} = **126** km
Direction factor	S_d =**1.00**
Seasonal factor	S_s = **1.00**
Probability factor	S_p = **1.00**
Critical gap between buildings;	g = **5000** mm
Topography not significant	
Altitude factor;	$S_a = 1 + 0.001 \times \Delta s / 1m =$ **1.03**
Site wind speed	$V_s = V_b \times S_a \times S_d \times S_s \times S_p =$ **22.2** m/s
Terrain category;	Country
Displacement height (sheltering effect excluded);	H_d = 0mm

The velocity pressure for the windward face of the building with a 0 degree wind is to be considered as 1 part as the height h is less than b (cl.2.2.3.2)
The velocity pressure for the windward face of the building with a 90 degree wind is to be considered as 1 part as the height h is less than b (cl.2.2.3.2)

Dynamic pressure - windward wall - Wind 0 deg and roof

Reference height (at which q is sought); H_{ref} = **3500**mm
Effective height; $H_e = max(H_{ref} – H_d, 0.4 \times H_{ref})$ = **3500**mm
Fetch factor (Table 22); S_c = **0.803**
Turbulence factor (Table 22); S_t = **0.204**
Gust peak factor; g_t = **3.44**
Terrain and building factor; $S_b = S_c \times (1 + (g_t \times S_t) + S_h)$ = **1.36**
Effective wind speed; $V_e = V_s \times S_b$ = **30.2** m/s

Dynamic pressure; $q_s = 0.613\ kg/m^3 \times V_e^2$ = 0.561 kN/m²

Dynamic pressure - windward wall - Wind 90 deg and roof

Reference height (at which q is sought); H_{ref} = **4773**mm
Effective height; $H_e = max(H_{ref} – H_d, 0.4 \times H_{ref})$ = **4773**mm
Fetch factor (Table 22); S_c = **0.870**
Turbulence factor (Table 22); S_t = **0.194**
Gust peak factor; g_t = **3.44**
Terrain and building factor; $S_b = S_c \times (1 + (g_t \times S_t) + S_h)$ = **1.45**
Effective wind speed; $V_e = V_s \times S_b$ = **32.1** m/s

Dynamic pressure; $q_s = 0.613\ kg/m^3 \times V_e^2$ = 0.633 kN/m²

Size effect factors

Diagonal dimension for gablewall; a_{eg} = **10.1** m
External size effect factor gablewall; C_{aeg} = **0.947**
Diagonal dimension for side wall; a_{es} = **18.5** m
External size effect factor side wall; C_{aes} = **0.901**
Diagonal dimension for roof; a_{er} = **18.8** m
External size effect factor roof; C_{aer} = **0.900**
Room/storey volume for internal size effect factor; V_i = **0.125** m³
Diagonal dimension for internal size effect factors; $a_i = 10 \times (V_i)^{1/3}$ = **5.000** m
Internal size effect factor; C_{ai} = **1.000**

Pressures and forces

Net pressure; $p = q_s \times c_{pe} \times C_{ae} - q_s \times c_{pi} \times C_{ai}$;
Net force; $F_w = p \times A_{ref}$;

Roof load case 1 - Wind 0, c_{pi} 0.20, $-c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m²)	External size factor, C_{ae}	Net Pressure, p (kN/m²)	Area, A_{ref} (m²)	Net force, F_w (kN)
A (-ve)	-1.10	0.63	0.900	-0.75	9.43	-7.11
B (-ve)	-0.80	0.63	0.900	-0.58	8.50	-4.95
C (-ve)	-0.40	0.63	0.900	-0.35	71.30	-25.28
E (-ve)	-1.30	0.63	0.900	-0.87	9.43	-8.18
F (-ve)	-0.90	0.63	0.900	-0.64	8.50	-5.43
G (-ve)	-0.50	0.63	0.900	-0.41	71.30	-29.34

Total vertical net force; $F_{w,v}$ = **-77.55** kN
Total horizontal net force; $F_{w,h}$ = **1.45** kN

Walls load case 1 - Wind 0, c_{pi} 0.20, $-c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m²)	External size factor, C_{ae}	Net Pressure, p (kN/m²)	Area, A_{ref} (m²)	Net force, F_w (kN)
A	-1.59	0.63	0.947	-1.08	7.17	-7.72
B	-0.90	0.63	0.947	-0.66	32.13	-21.30
w	0.71	0.56	0.901	0.25	63.51	15.57
l	-0.50	0.56	0.901	-0.36	63.51	-23.17

Overall loading
Equiv leeward net force for overall section; $F_l = F_{w,wl}$ = **-23.2** kN
Net windward force for overall section; $F_w = F_{w,ww}$ = **15.6** kN
Overall loading overall section; $F_{w,w} = 0.85 \times (1 + C_r) \times (F_w - F_l + F_{w,h})$ = **35.1** kN

Roof load case 2 - Wind 0, c_{pi} -0.3, $+c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m²)	External size factor, C_{ae}	Net Pressure, p (kN/m²)	Area, A_{ref} (m²)	Net force, F_w (kN)
A (+ve)	0.20	0.63	0.900	0.30	9.43	2.87
B (+ve)	0.20	0.63	0.900	0.30	8.50	2.58
C (+ve)	0.20	0.63	0.900	0.30	71.30	21.67
E (+ve)	-1.30	0.63	0.900	-0.55	9.43	-5.20
F (+ve)	-0.90	0.63	0.900	-0.32	8.50	-2.74
G (+ve)	-0.50	0.63	0.900	-0.09	71.30	-6.77

Total vertical net force; $F_{w,v}$ = **11.98** kN
Total horizontal net force; $F_{w,h}$ = **10.83** kN

Walls load case 2 - Wind 0, c_{pi} -0.3, $+c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m²)	External size factor, C_{ae}	Net Pressure, p (kN/m²)	Area, A_{ref} (m²)	Net force, F_w (kN)
A	-1.59	0.63	0.947	-0.76	7.17	-5.45
B	-0.90	0.63	0.947	-0.35	32.13	-11.14
w	0.71	0.56	0.901	0.53	63.51	33.37
l	-0.50	0.56	0.901	-0.08	63.51	-5.36

Overall loading
Equiv leeward net force for overall section; $F_l = F_{w,wl}$ = **-5.4** kN
Net windward force for overall section; $F_w = F_{w,ww}$ = **33.4** kN
Overall loading overall section; $F_{w,w} = 0.85 \times (1 + C_r) \times (F_w - F_l + F_{w,h})$ = **43.3** kN

Roof load case 3 - Wind 90, c_{pi} 0.20, $-c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m²)	External size factor, C_{ae}	Net Pressure, p (kN/m²)	Area, A_{ref} (m²)	Net force, F_w (kN)
A (-ve)	-1.60	0.63	0.900	-1.04	4.67	-4.85
B (-ve)	-1.50	0.63	0.900	-0.98	4.67	-4.58
C (-ve)	-0.60	0.63	0.900	-0.47	37.37	-17.51
D (-ve)	-0.40	0.63	0.900	-0.35	131.74	-46.70

Total vertical net force; $F_{w,v}$ = **-71.14** kN
Total horizontal net force; $F_{w,h}$ = **0.00** kN

Walls load case 3 - Wind 90, c_{pi} 0.20, $-c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m²)	External size factor, C_{ae}	Net Pressure, p (kN/m²)	Area, A_{ref} (m²)	Net force, F_w (kN)
A	-1.47	0.56	0.901	-0.86	4.90	-4.19
B	-0.86	0.56	0.901	-0.55	19.60	-10.69
C	-0.73	0.56	0.901	-0.48	39.01	-18.73
w	0.62	0.63	0.947	0.24	39.30	9.54
l	-0.50	0.63	0.947	-0.43	39.30	-16.75

Overall loading
Equiv leeward net force for overall section; $F_l = F_{w,wl}$ = **-16.8** kN
Net windward force for overall section; $F_w = F_{w,ww}$ = **9.5** kN
Overall loading overall section; $F_{w,w} = 0.85 \times (1 + C_r) \times (F_w - F_l + F_{w,h})$ = **23.0** kN

Roof load case 4 - Wind 90, c_{pi} -0.3, $-c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m^2)	External size factor, C_{ae}	Net Pressure, p (kN/m^2)	Area, A_{ref} (m^2)	Net force, F_w (kN)
A (-ve)	-1.60	0.63	0.900	-0.72	4.67	-3.37
B (-ve)	-1.50	0.63	0.900	-0.66	4.67	-3.11
C (-ve)	-0.60	0.63	0.900	-0.15	37.37	-5.68
D (-ve)	-0.40	0.63	0.900	-0.04	131.74	-5.00

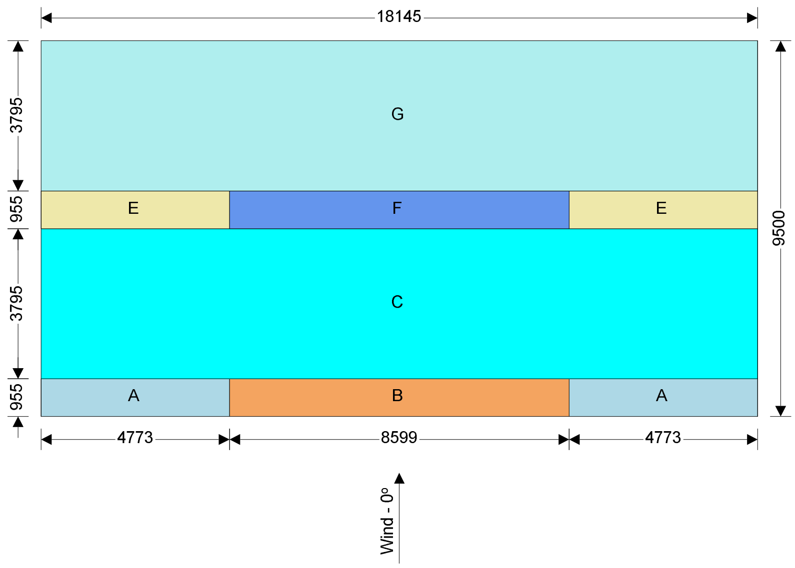
Total vertical net force; $F_{w,v}$ = **-16.58** kN
Total horizontal net force; $F_{w,h}$ = **0.00** kN

Walls load case 4 - Wind 90, c_{pi} -0.3, $-c_{pe}$

Zone	Ext pressure coefficient, c_{pe}	Dynamic pressure, q_s (kN/m^2)	External size factor, C_{ae}	Net Pressure, p (kN/m^2)	Area, A_{ref} (m^2)	Net force, F_w (kN)
A	-1.47	0.56	0.901	-0.58	4.90	-2.82
B	-0.86	0.56	0.901	-0.26	19.60	-5.19
C	-0.73	0.56	0.901	-0.20	39.01	-7.80
w	0.62	0.63	0.947	0.56	39.30	21.98
l	-0.50	0.63	0.947	-0.11	39.30	-4.31

Overall loading

Equiv leeward net force for overall section; $F_l = F_{w,wl}$ = **-4.3** kN
Net windward force for overall section; $F_w = F_{w,ww}$ = **22.0** kN
Overall loading overall section; $F_{w,w} = 0.85 \times (1 + C_r) \times (F_w - F_l + F_{w,h})$ = **23.0** kN



Plan view - Duopitch roof

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Westfield Farm
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			Sheet	Rev
KRR	January 2024	6236	5	

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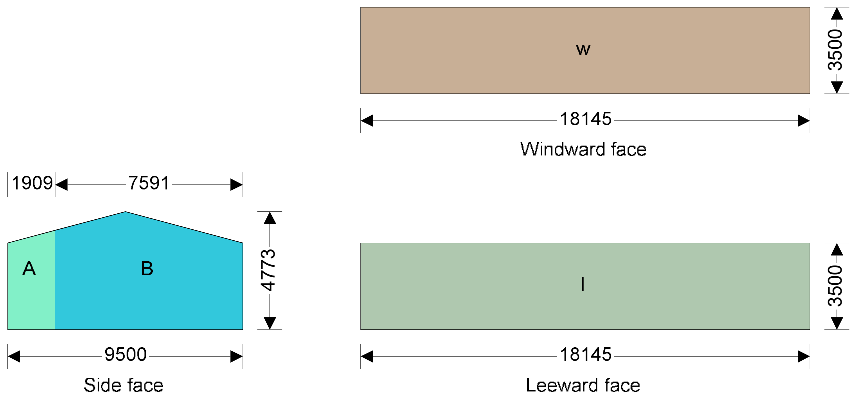

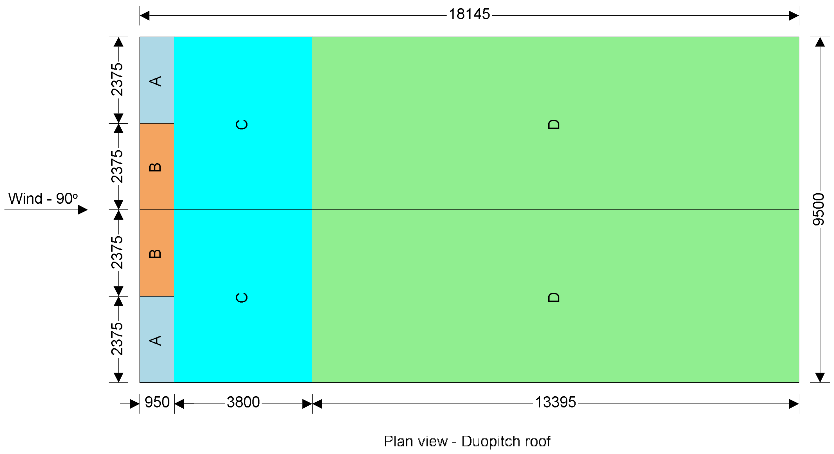

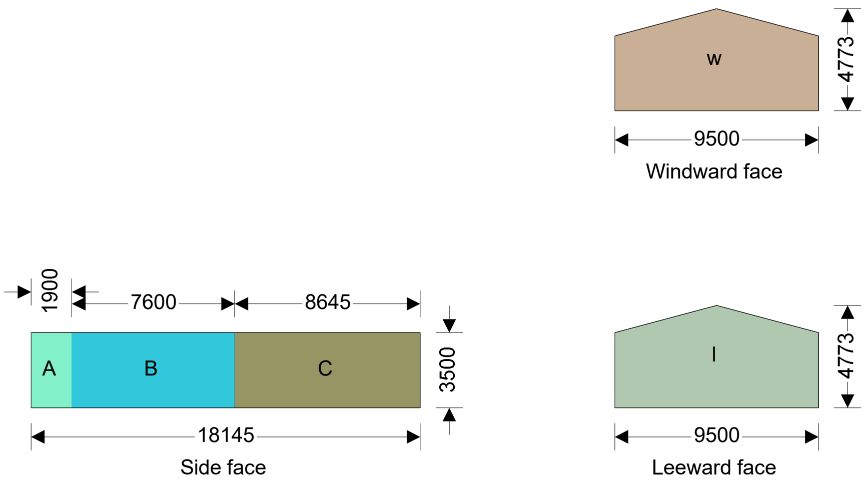

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RAWLINGS LIMITED structural design

			Sheet	Rev
KRR	January 2024	6236	6	

FRAME LOADS

Roof dead load	= 0.30 x 5.7m	= **1.7** kN/m
Roof live load	= 0.75 x 5.7m	= **4.3** kN/m

Wind Case 1 – Wind at 0 degrees, negative coefficient

Windward wall	= 0.25 x 5.7m	= **1.4** kN/m
Windward roof	= -0.35 x 5.7m	= **-2.0** kN/m
Leeward roof	= -0.41 x 5.7m	= **-2.3** kN/m
Leeward wall	= -0.36 x 5.7m	= **-2.1** kN/m

Wind case 2 – Wind at 0 degrees, positive coefficient

Windward wall	= 0.53 x 5.7m	= **3.0** kN/m
Windward roof	= 0.3 x 5.7m	= **1.7** kN/m
Leeward roof	= -0.09 x 5.7m	= **-0.5** kN/m
Leeward wall	= -0.08 x 5.7m	= **-0.5** kN/m

Wind case 3 – Wind at 90 degrees, negative coefficient

Windward wall	= 0.24 x 5.7m	= **1.4** kN/m
Windward roof	= -0.35 x 5.7m	= **-2.0** kN/m
Leeward roof	= -0.35 x 5.7m	= **-2.0** kN/m
Leeward wall	= -0.43 x 5.7m	= **-2.5** kN/m

Wind case 4 – Wind at 90 degrees, positive coefficient

Windward wall	= 0.56 x 5.7m	= **3.2** kN/m
Windward roof	= -0.04 x 5.7m	= **0.2** kN/m
Leeward roof	= -0.04 x 5.7m	= **-0.2** kN/m
Leeward wall	= -0.11 x 5.7m	= **-0.6** kN/m

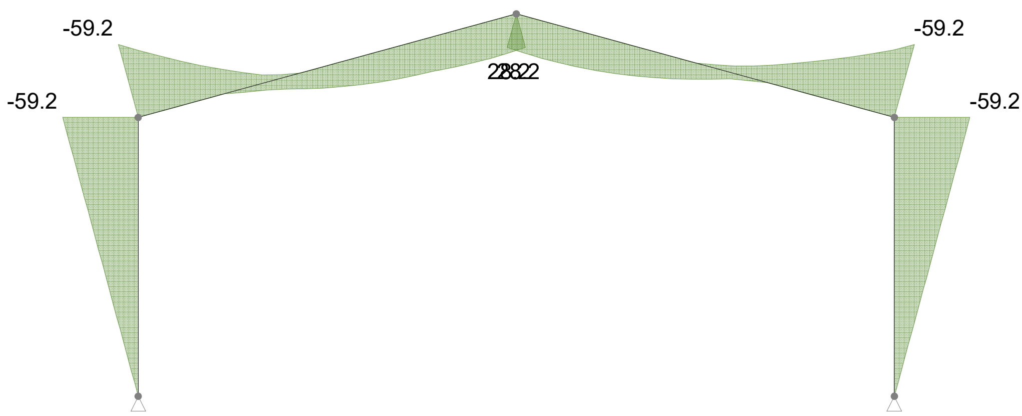
FRAME ANALYSIS

ANALYSIS

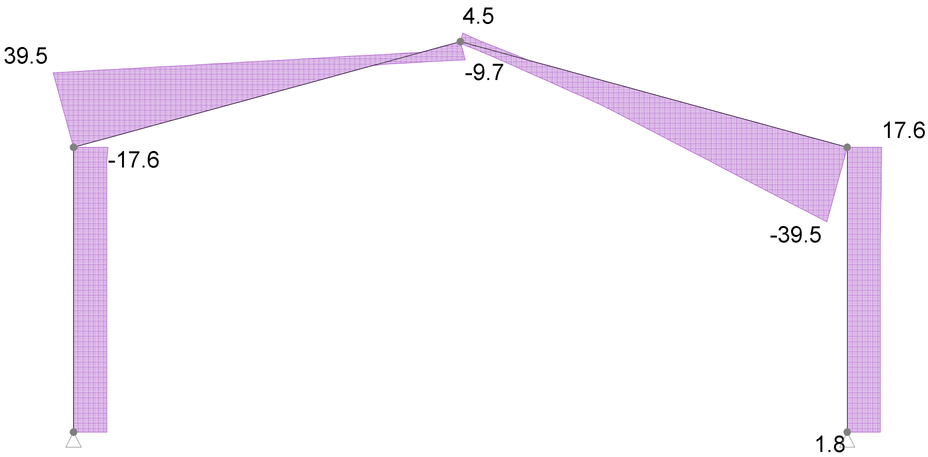
Tedds calculation version 1.0.37

Results
Forces

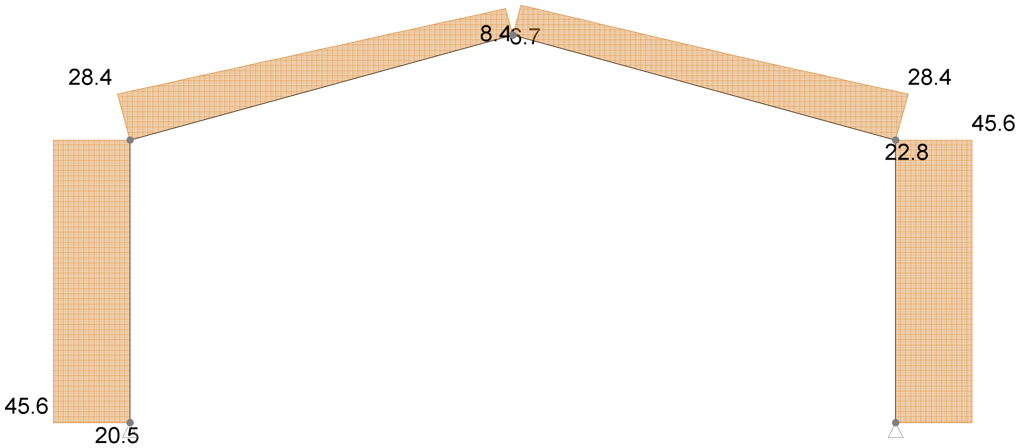
Strength combinations - Moment envelope (kNm)



Strength combinations - Shear envelope (kN)



All combinations - Axial force envelope (kN)



Element results
Envelope - Strength combinations

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	3.5	-17.6	0	0	3.5	-59.2 (min)
2	0	39.5 (max abs)	4.425	28.2 (max)	0	-59.2 (min)
3	4.925	-39.5	0.5	28.2 (max)	4.925	-59.2 (min)
4	0	17.6	3.5	0	0	-59.2 (min)

Envelope - All combinations

Element	Axial force			
	Pos (m)	Max (kN)	Pos (m)	Min (kN)
1	0	45.6 (max)	0	20.5
2	0	28.4	4.925	6.7 (min)
3	4.925	28.4	0	8.4
4	0	45.6 (max)	0	22.8

;

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RAFTER CHECK

Design moment at eaves = **59.2** kNm
Design moment at ridge = **28.2** kNm

Change across length of rafter = 59.2 + 28.2 = **87.4** kNm

Length of rafters = **4.95** m
Length of haunch = **0.5** m

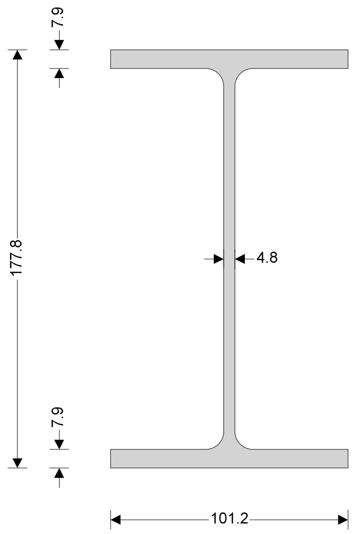
Drop in moment across haunch = 87.4 x 0.5 / 4.95 = **50.0** kNm

STEEL MEMBER DESIGN (BS5950)
In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07

Section details
Section type; **UB 178x102x19 (British Steel Section Range 2022 (BS4-1))**
Steel grade; **S275**

From table 9: Design strength p_y
Thickness of element; max(T, t) = **7.9** mm
Design strength; p_y = **275** N/mm^2
Modulus of elasticity; E = **205000** N/mm^2



Lateral restraint
Distance between major axis restraints; L_x = **1000** mm
Distance between minor axis restraints; L_y = **0** mm

Effective length factors
Effective length factor in major axis; K_x = **0.70**
Effective length factor in minor axis; K_y = **0.70**
Effective length factor for lateral-torsional buckling; K_{LT} = **1.00**;

Classification of cross sections - Section 3.5
$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]}$ = **1.00**

Internal compression parts - Table 11
Depth of section; d = **146.8** mm
$d / t = 30.6 \times \varepsilon <= 80 \times \varepsilon$; Class 1 plastic

Outstand flanges - Table 11
Width of section; b = B / 2 = **50.6** mm
$b / T = 6.4 \times \varepsilon <= 9 \times \varepsilon$; Class 1 plastic

Section is class 1 plastic

Moment capacity - Section 4.2.5
Design bending moment; M = **50** kNm
Moment capacity low shear - cl.4.2.5.2; $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx})$ = **47.1** kNm

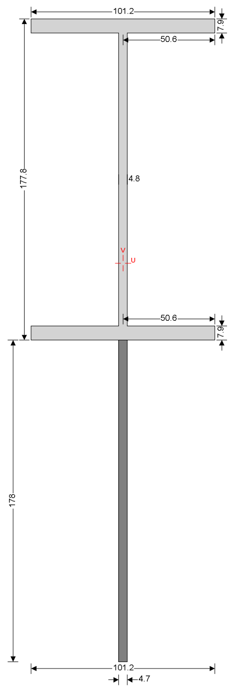
ACCEPT 6% overstress

Existing rafter adequate

HAUNCH CHECK

CALCULATION OF SECTION PROPERTIES

Tedds calculation version 2.0.07



Area
A = **32.13** cm^2
2nd moment of area

I_{uu} = **3.50×10^3** cm^4	I_{vv} = **137.** cm^4	I_{xx} = **3.50×10^3** cm^4	I_{yy} = **137.** cm^4

Radius of gyration

r_{uu} = **104.4** mm	r_{vv} = **20.6** mm	r_{xx} = **10.4** cm	r_{yy} = **2.1** cm

Plastic section modulus (only shapes with all rectangles at 90 degs)
S_{xx} = **280.** cm^3 S_{yy} = **42.4** cm^3
Distance to combined centroid
X_e = **0.0** mm Y_e = **0.0** mm
Distance to equal axis area (only shapes with all rectangles at 90 degs)
X_p = **0.0** mm Y_p = **-35.0** mm
Elastic section modulus
Z_{xx} = **159.** cm^3 Z_{yy} = **27.0** cm^3
;

Capacity of haunch = 280 x 275 / 1000 = **77.0** kNm

Haunch is adequate

COLUMN CHECK

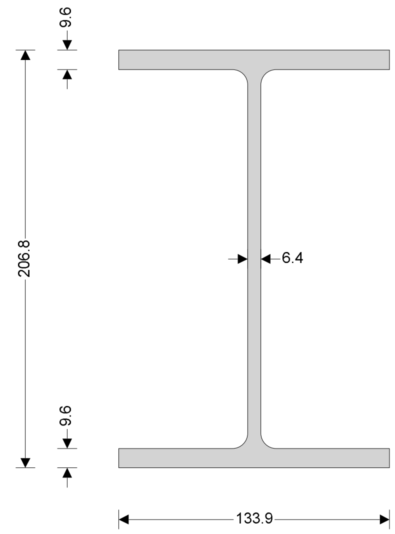
Design moment = **59.2** kNm
Design axial force = **45.6** kN

STEEL MEMBER DESIGN (BS5950)
In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07

Section details
Section type; **UB 203x133x30 (British Steel Section Range 2022 (BS4-1))**
Steel grade; **S275**

From table 9: Design strength p_y
Thickness of element; max(T, t) = **9.6** mm
Design strength; p_y = **275** N/mm^2
Modulus of elasticity; E = **205000** N/mm^2



Lateral restraint
Distance between major axis restraints; L_x = **3500** mm
Distance between minor axis restraints; L_y = **0** mm

Effective length factors
Effective length factor in major axis; K_x = **1.00**
Effective length factor in minor axis; K_y = **1.00**
Effective length factor for lateral-torsional buckling; K_{LT} = **1.00**;
Classification of cross sections - Section 3.5
$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]}$ = **1.00**

Internal compression parts - Table 11
Depth of section; d = **172.4** mm
Stress ratios; $r1 = \min(F_c / (d \times t \times p_{yw}), 1)$ = **0.15**
$r2 = F_c / (A \times p_{yw})$ = **0.043**
$d / t = 26.9 \times \varepsilon <= \max(80 \times \varepsilon / (1 + r1), 40 \times \varepsilon)$; Class 1 plastic

Outstand flanges - Table 11
Width of section; b = B / 2 = **67** mm
$b / T = 7.0 \times \varepsilon <= 9 \times \varepsilon$; Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3
Design shear force; $F_{y,v}$ = **100** kN
$d / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area; $A_v = t \times D$ = **1324** mm^2
Design shear resistance; $P_{y,v} = 0.6 \times p_y \times A_v$ = **218.4** kN

PASS - Design shear resistance exceeds design shear force

Shear capacity - Section 4.2.3
Design shear force; $F_{x,v}$ = **0** kN

Moment capacity - Section 4.2.5
Design bending moment; M = **59.2** kNm
Moment capacity low shear - cl.4.2.5.2; $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx})$ = **86.5** kNm

PASS - Moment capacity exceeds design bending moment

Compression members - Section 4.7
Design compression force; F_c = **45.6** kN

Effective length for major (x-x) axis buckling - Section 4.7.3
Effective length for buckling; $L_{Ex} = L_x \times K_x$ = **3500** mm
Slenderness ratio - cl.4.7.2; $\lambda_x = L_{Ex} / r_{xx}$ = **40.206**

Compressive strength - Section 4.7.5
Limiting slenderness; $\lambda_0 = 0.2 \times (\pi^2 \times E / p_y)^{0.5}$ = **17.155**
Strut curve - Table 23; a
Robertson constant; α_x = **2.0**
Perry factor; $\eta_x = \alpha_x \times (\lambda_x - \lambda_0) / 1000$ = **0.046**
Euler stress; $p_{Ex} = \pi^2 \times E / \lambda_x^2$ = **1251.6** N/mm^2
$\phi_x = (p_y + (\eta_x + 1) \times p_{Ex}) / 2$ = **792.1** N/mm^2
Compressive strength - Annex C.1; $p_{cx} = p_{Ex} \times p_y / (\phi_x + (\phi_x^2 - p_{Ex} \times p_y)^{0.5})$ = **259.9** N/mm^2

Compression resistance - Section 4.7.4
Compression resistance - cl.4.7.4; $P_{cx} = A \times p_{cx}$ = **993** kN

PASS - Compression resistance exceeds design compression force

Compression members with moments - Section 4.8.3
Comb.compression & bending check - cl.4.8.3.2; $F_c / (A \times p_y) + M / M_c$ = **0.728**

PASS - Combined bending and compression check is satisfied

Member buckling resistance - Section 4.8.3.3
Max major axis moment governing M_b; $M_{LT} = M_x$ = **59.20** kNm
Equiv uniform mnt factor - major axis flex buckling; m_x = **1.000**
Buckling resistance check - cl.4.8.3.3.2; $F_c / P_{cx} + m_x \times M / M_c \times (1 + 0.5 \times F_c / P_{cx})$ = **0.746**

PASS - Member buckling resistance checks are satisfied

Column is adequate

PURLINS

Roof dead load = 0.3 x 1.0m = **0.3** kN/m
Roof live load = 0.75 x 1.0m = **0.8** kN/m
Roof wind load = 0.3 x 1.0m = **0.3** kN/m

Span = **5.7** m

Load from dead + live = ((1.4 x 0.3) + (1.6 x 0.8)) x 5.7m
= (0.42 + 1.28) x 5.7m = **9.7** kN

Load from dead + live + wind = (0.3 + 0.8 + 0.3) x 1.2 x 5.7m
= 1.4 x 1.2 x 5.7 = **9.6** kN

Capacity of 2000mm Z purlin over 6.0m = **19.57** kN

Purlins are adequate