



Civil & Structural Engineering Design Services Pty. Ltd.

Client: EXTREME MARQUEES PTY. LTD.

Project: Design check – 8m, 9m, 10m, 12m, 15m, 16m, 18m Event Deluxe Tents (5m Bay) for **100km/hr** Wind Speed.

Reference: Extreme Marquees Pty Ltd Technical Data

Report by: KZ
Checked by: EAB
Date: 21/11/2016

JOB NO: E-11-264962-3



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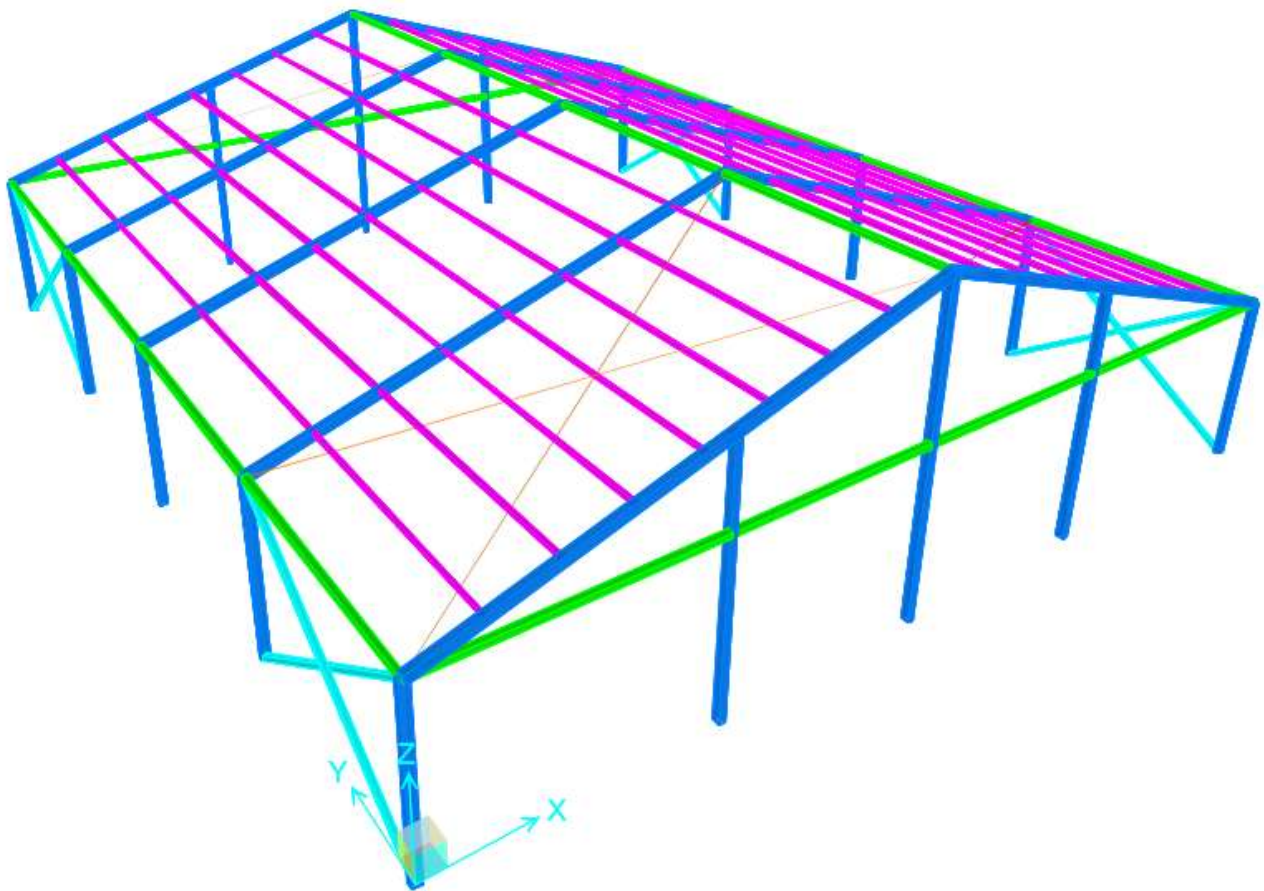
1 Introduction

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The following structural drawings and calculations are for the transportable tents supplied by Extreme Marquees.

The frame consists principally of extruded '6061-T6' aluminium components with hot dipped galvanized steel ridge and knee connection inserts and base plate.

The report examines the effect of 3s gust wind of 100 km/hr on 18m × 20m Event Deluxe Tent as the worst-case scenario. The relevant Australian Standards AS1170.0:2002 General principles, AS1170.1:2002 Permanent, imposed and other actions and AS1170.2:2011 Wind actions are used. The design check is in accordance with AS/NZS 1664.1:1997 Aluminum limit state design.





2 Design Restrictions and Limitations

- 2.1 The erected structure is for temporary use only.
- 2.2 It should be noted that if high gust wind speeds are anticipated or forecast in the locality of the tent, the temporary erected structure should be dismantled.
- 2.3 For forecast winds in excess of (**refer to summary**) – all fabric shall be removed from the frames, and the structure should be completely dismantled.

(Please note that the locality squall or gust wind speed is affected by factors such as terrain exposure and site elevations.)
- 2.4 The structure may only be erected in regions with wind classifications no greater than the limits specified on the attached wind analysis.
- 2.5 The wind classifications are based upon Terrain Category 2. Considerations have also been made to the regional wind terrain category, topographical location and site shielding from adjacent structures. Please note that in many instances topographical factors such as a location on the crest of a hill or on top of an escarpment may yield a higher wind speed classification than that derived for a higher wind terrain category in a level topographical region. For this reason, particular regard shall be paid to the topographical location of the structure. For localities which do not conform to the standard prescribed descriptions for wind classes as defined above, a qualified Structural Engineer may be employed to determine an appropriate wind class for that the particular site.
- 2.6 The structures in no circumstances shall ever be erected in tropical or severe tropical cyclonic condition as defined on the Map of Australia in AS 1170.2-2011, Figure 3.1.
- 2.7 The tent structure has not been designed to withstand snow and ice loadings such as when erected in alpine regions.
- 2.8 For the projects, where the site conditions approach the design limits, extra consideration should be given to pullout tests of the stakes and professional assessment of the appropriate wind classification for the site.
- 2.9 The tents are stabilized as using roof/wall cross bracing at end bays and every third bay in between as shown on the drawings.
- 2.10 It is important to use 60x60x2.5 profile for all intermediate purlins with spacing not exceeding 1200mm. This means 14 intermediate purlins are required per bay for the 18m tent structure (as illustrated).
- 2.11 It is important to use 152x119x4 profile for all gable poles.
- 2.12 It is important to use 80x80x2.5 profile (or equivalent) for all wall cross-bracings.



3 Specifications

3.1 General

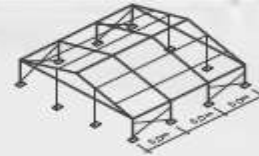
Tent category	Aluminum 6061-T6
Material	Aluminum 6061-T6

Size	Model
18m x 20m	Event Deluxe

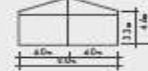


Item	Specification					
Clear-Span Width	8m	10m	12m	15m	16m	18m
Eave Height	3.3m					
Ridge Height	4.6m	4.9m	5.2m	5.7m	5.9m	6.2m
Roof Pitch	18°					
Bay Distance	5m					
Longest Component	4.6m	5.2m	6.3m	7.4m	8.4m	9.3m
Minimum Tent Length	15m					
Maximum Tent Length	No Limit					
Main Profile	152 x 119 x 4mm (4-channel)					
Max Allowed Windspeed	100km/hr 0.5kn/m2					
Eave Connection	Hot-dip galvanized twin steel plate					
Framework Material	Hard pressed extruded aluminium 6061/T6 (13HV)					
Cover Material	PVC textile, flame retardant to DIN 4102 B1, M2. 750-900g/m²					
Engineer Certification	Engineer Structural Certificate, Fire Action Analysis					

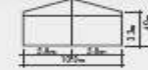
Technical Diagrams



Type: ET8/330



Type: ET10/330



Type: ET12/330



Type: ET15/330



Type: ET16/330



Type: ET18/330



Crest Range
Standard PVC & Custom Printed

690gsm 100% PVC Standard White Roof & Walls
690gsm 10.0% PVC Custom Printed Roof & Wall Panels

Product Info

The Event Deluxe is a robust large marquee available in 8m, 10m, 12m, 15m, 16m & 18m widths with a minimum of 15m length (3x5m bays).

The Deluxe employs massive 152 x 119 x 4mm profile frame that allows a wind loading of 100kmh.

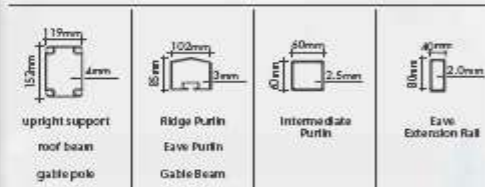
With a 3.3m eave height the Event Deluxe is ideal for outdoor temporary exhibition, business promotions, sports events, temporary warehouse, workshop and emergency relief work.

Accessories:

- PVC window sidewalls
- Anchoring
- Rain gutter
- Lining & curtains
- Glass door units
- Hard walling system
- Glass walling system
- Transparent PVC cover & sidewall
- Flooring System
- Weight plate

Profiles

Framework Main profile dimensions and use





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3.2 Aluminium Properties

Aluminium Properties		
Compressive yield strength	Fcy	241 MPa
Tensile yeild strength	Fty	241 MPa
Tensile ultimate strength	Ftu	262 MPa
Shear yield strength	Fsy	138 MPa
Bearing yeild strength	Fby	386 MPa
Bearing ultimate strength	Fbu	552 MPa
Yield stress (min{Fcy:Fty})	Fy	241 MPa
Elastic modulus	E	70000 MPa
Shear modulus	G	26250 MPa
Value of coefficients	kt	1.00
	kc	1.00
Capacity factor (general yield)	ϕ_y	0.95
Capacity factor (ultimate)	ϕ_u	0.85
Capacity factor (bending)	ϕ_b	0.85
Capacity factor (elastic shear buckling)	ϕ_v	0.8
Capacity factor (inelastic shear buckling)	ϕ_{vp}	0.9

3.3 Buckling Constants

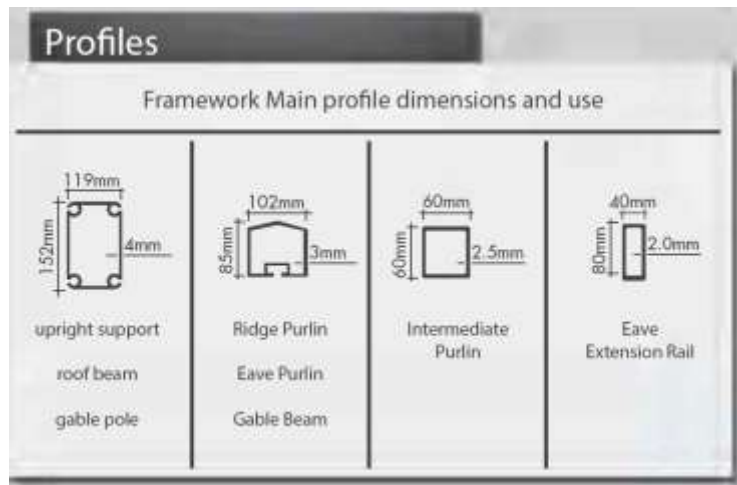
Type of member and stresses	Intercept, MPa	Slope, MPa	Intersection
Compression in columns and beam flanges	BC= 242.87	Dc= 1.43	Cc= 69.61
Compression in flat plates	Bp= 310.11	Dp= 2.06	Cp= 61.60
Compressive bending stress in solid rectangular bars	Bbr= 459.89	Dbr= 4.57	Cbr= 67.16
Compressive bending stress in round tubes	Btb= 250.32	Dtb= 14.18	Ctb= 183.52
Shear stress in flat plates	Bs= 178.29	Ds= 0.90	Cs= 81.24



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3.4 Section Properties

MEMBER(S)	Section	b	d	t	y _c	A _g	Z _x	Z _y	S _x	S _y	I _x	I _y	J	r _x	r _y
		mm	mm	mm	mm	mm ²	mm ³	mm ³	mm ³	mm ³	mm ⁴	mm ⁴	mm ⁴	mm	mm
Rafter	152x119x4	119	152	4	76.0	2104.0	94803.6	82920.6	111920.0	94562.0	7205077.3	4933775.3	8811571.1	58.5	48.4
Upright Support	152x119x4	119	152	4	76.0	2104.0	94803.6	82920.6	111920.0	94562.0	7205077.3	4933775.3	8811571.1	58.5	48.4
Gable Pole	152x119x4	119	152	4	76.0	2104.0	94803.6	82920.6	111920.0	94562.0	7205077.3	4933775.3	8811571.1	58.5	48.4
Ridge & Eave Purlin	85X102X3	102	85	3	42.5	1086.0	30017.7	33183.9	34453.5	39069.0	1275750.5	1692378.0	2184594.2	34.3	39.5
Gable Beam	85X102X3	102	85	3	42.5	1086.0	30017.7	33183.9	34453.5	39069.0	1275750.5	1692378.0	2184594.2	34.3	39.5
Intermediate Purlin	60x60x2.5	60	60	2.5	30.0	575.0	10581.6	10581.6	12406.3	12406.3	317447.9	317447.9	475273.4	23.5	23.5
Brace	80x80x2.5	80	80	2.5	40.0	775.0	19415.4	19415.4	22531.3	22531.3	776614.6	776614.6	1163710.9	31.7	31.7



4 Design Loads

4.1 Ultimate

		Distributed load (kPa)	Design load factor (-)	Factored imposed load (kPa)
Live	Q	-	1.5	-
Self weight	G	self weight	1.35, 1.2, 0.9	1.2 self weight, 0.9 self weight
3s 100km/hr gust	W	0.383 C _{fig}	1.0	0.383 C _{fig}



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4.2 Load Combinations

4.2.1 Serviceability

$$\text{Gravity} = 1.0 \times G$$

$$\text{Wind} = 1.0 \times G + 1.0 \times W$$

4.2.2 Ultimate

$$\begin{aligned} \text{Downward} &= 1.35 \times G \\ &= 1.2 \times G + W_u \\ &= 1.2 \times G + W_u + W_{IS} \end{aligned}$$

$$\begin{aligned} \text{Upward} &= 0.9 \times G + W_u \\ &= 0.9 \times G + W_u + W_{IP} \end{aligned}$$

5 Wind Analysis

Wind towards surface (+ve), away from surface (-ve)

5.1 Parameters

Terrain category = 2

Site wind speed ($V_{\text{sit},\beta}$) = $V_R M_d (M_{z,\text{cat}} M_s M_t)$

$V_R = 27.78 \text{ m/s}$ (100 km/hr)

(regional 3 s gust wind speed)

$M_d = 1$

$M_s = 1$

$M_t = 1$

$M_{z,\text{cat}} = 0.91$

(Table 4.1(B) AS1170.2)

$V_{\text{sit},\beta} = 25.28 \text{ m/s}$

Height of structure (h) = 4.75 m

(mid of peak and eave)

Width of structure (w) = 18 m

Length of structure (l) = 20 m

Pressure (P) = $0.5 \rho_{\text{air}} (V_{\text{sit},\beta})^2 C_{\text{fig}} C_{\text{dyn}}$
 = 0.383 C_{fig} kPa

5.2 Pressure Coefficients (C_{fig})

Name	Symbol	Value	Unit	Notes	Ref.
Input					
Importance level		2			Table 3.1 - Table 3.2 (AS1170.0)
Annual probability of exceedance		Temporary			
Regional gust wind speed		100	Km/hr		Table 3.3
Regional gust wind speed	V_R	27.78	m/s		Table 3.1



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Wind Direction Multipliers	M_d	1			Table 3.2 (AS1170.2)
Terrain Category Multiplier	$M_{z,Cat}$	0.91			Table 4.1
Shield Multiplier	M_s	1			4.3 (AS1170.2)
Topographic Multiplier	M_t	1			4.4 (AS1170.2)
Site Wind Speed	$V_{Site,\beta}$	25.28	m/s	$V_{Site,\beta} = V_R * M_d * M_{z,cat} * M_s * M_t$	
Pitch	α	18	Deg		
Pitch	α	0.314	rad		
Width	B	18	m		
Width Span	S_w	4.5	m		
Length	D	20	m		
Height	Z	4.75	m		
Bay Span		5	m		
Purlin Spacing		1.18	m		
Number of Intermediate Purlin		14			
	h/d	0.24			
	h/b	0.26			

Wind Pressure

ρ_{air}	ρ	1.2	Kg/m ³		
dynamic response factor	C_{dyn}	1			
Wind Pressure	$\rho * C_{fig}$	0.383	Kg/m ²	$\rho = 0.5 \rho_{air} * (V_{des,\beta})^2 * C_{fig} * C_{dyn}$	2.4 (AS1170.2)

**WIND DIRECTION 1 (Perpendicular to Length)
Internal Pressure**

Opening Assumption	<input type="text" value="With Dominant Opening (Cpi= nCpe"/>				
Internal Pressure Coefficient (Without Dominant) MIN		-0.1			Table 5.1 A



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Internal Pressure Coefficient (Without Dominant) MAX		0.2			
Internal Pressure Coefficient (With Dominant) MIN		-0.1			Table 5.1B
Internal Pressure Coefficient (With Dominant) MAX		0.2			
N		0.5		$C_{pi} = N * C_{pe}$	
Combination Factor	$K_{C,i}$	1			
Internal Pressure Coefficient MIN	$C_{p,i}$	0.50			
Internal Pressure Coefficient MAX	$C_{p,i}$	0.50			
External Pressure					
1. Windward Wall					
External Pressure Coefficient	$C_{P,e}$	0.7			Table 5.2 A
Area Reduction Factor	K_a	1			Table 5.4
combination factor applied to internal pressures	$K_{C,e}$	0.8			
local pressure factor	K_l	1			
porous cladding reduction factor	K_p	1			
aerodynamic shape factor	$C_{fig,e}$	0.56			
Wind Wall Pressure	P	0.21	kPa		
Edge Column Force	F	0.54	kN/m		
Intermediate Column Force	F	1.07	kN/m		
2. Leeward Wall					
External Pressure Coefficient	$C_{P,e}$	-0.35			Table 5.2 B
Area Reduction Factor	K_a	1			Table 5.4
combination factor applied to internal pressures	$K_{C,e}$	0.8			
local pressure factor	K_l	1			
porous cladding reduction factor	K_p	1			
aerodynamic shape factor	$C_{fig,e}$	-0.28			
Lee Wall Pressure	P	-0.11	kPa		
Edge Column Force	F	-0.27	kN/m		
Intermediate Column Force	F	-0.54	kN/m		
					Table 5.2 C



3. Side Wall

Area Reduction Factor	K_a	1		
combination factor applied to internal pressures	$K_{C,e}$	0.8		
local pressure factor	K_l	1		
porous cladding reduction factor	K_p	1		
External Pressure Coefficient	$C_{P,e}$	-0.65		0 to 1h
External Pressure Coefficient	$C_{P,e}$	-0.5		1h to 2h
External Pressure Coefficient	$C_{P,e}$	-0.3		2h to 3h
External Pressure Coefficient	$C_{P,e}$	-0.2		>3h
aerodynamic shape factor	$C_{fig,e}$	-0.52		0 to 1h
aerodynamic shape factor	$C_{fig,e}$	-0.4		1h to 2h
aerodynamic shape factor	$C_{fig,e}$	-0.24		2h to 3h
aerodynamic shape factor	$C_{fig,e}$	-0.16		>3h
Side Wall Pressure	P	-0.20	kPa	0 to 1h
Side Wall Pressure	P	-0.15	kPa	1h to 2h
Side Wall Pressure	P	-0.09	kPa	2h to 3h
Side Wall Pressure	P	-0.06	kPa	>3h

Table 5.4

4. Roof Up Wind Slope

Area Reduction Factor	K_a	1		
combination factor applied to internal pressures	$K_{C,e}$	0.8		
local pressure factor	K_l	1		
porous cladding reduction factor	K_p	1		
External Pressure Coefficient MIN	$C_{P,e}$	-0.4		
External Pressure Coefficient MAX	$C_{P,e}$	0.1		
aerodynamic shape factor MIN	$C_{fig,e}$	-0.32		
aerodynamic shape factor MAX	$C_{fig,e}$	0.08		
Pressure MIN	P	-0.12	kPa	
Pressure MAX	P	0.03	kPa	
Edge Rafter Force MIN	F	-0.31	kN/m	
Edge Rafter Force Max	F	0.08	kN/m	
Intermediate Rafter Force MIN	F	-0.61	kN/m	
Intermediate Rafter Force MAX	F	0.15	kN/m	

$\alpha > 10^\circ$

Table 5.3 B

5. Roof Down Wind Slope

Area Reduction Factor	K_a	1		
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combination factor applied to internal pressures	$K_{C,e}$	0.8	
local pressure factor	K_l	1	
porous cladding reduction factor	K_p	1	
External Pressure Coefficient	$C_{P,e}$	-0.55	
aerodynamic shape factor	$C_{fig,e}$	-0.44	
Pressure MIN	P	-0.17	kPa
Pressure MAX	P	-0.17	kPa
Edge Rafter Force MIN	F	-0.42	kN/m
Edge Rafter Force MAX	F	-0.42	kN/m
Intermediate Rafter Force MIN	F	-0.84	kN/m
Intermediate Rafter Force MAX	F	-0.84	kN/m

Table 5.3C

WIND DIRECTION 2 (Parallel to Length)
Internal Pressure

Opening Assumption With Dominant Opening ($C_{pi} = nC_{pe}$) ▼

Internal Pressure Coefficient (Without Dominant) MIN		-0.1	
Internal Pressure Coefficient (Without Dominant) MAX		0.2	
Internal Pressure Coefficient (With Dominant) MIN		-0.1	
Internal Pressure Coefficient (With Dominant) MAX		0.2	
N		0.5	
Combination Factor	$K_{C,i}$	1	
Internal Pressure Coefficient MIN	$C_{p,i}$	0.50	
Internal Pressure Coefficient MAX	$C_{p,i}$	0.50	

$C_{pi} = N * C_{pe}$

Table 5.1A

Table 5.1B

External Pressure

1. Windward Wall

External Pressure Coefficient	$C_{P,e}$	0.7	
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Table 5.2 A



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Area Reduction Factor	K_a	1		
combination factor applied to internal pressures	$K_{C,e}$	0.8		
local pressure factor	K_l	1		
porous cladding reduction factor	K_p	1		
aerodynamic shape factor	$C_{fig,e}$	0.56		
Wind Wall Pressure	P	0.21	kPa	
Edge Column Force	F	0.48	kN/m	
Intermediate Column Force	F	0.97	kN/m	

Table 5.4

2. Leeward Wall

External Pressure Coefficient	$C_{P,e}$	-0.5		
Area Reduction Factor	K_a	1		
combination factor applied to internal pressures	$K_{C,e}$	0.8		
local pressure factor	K_l	1		
porous cladding reduction factor	K_p	1		
aerodynamic shape factor	$C_{fig,e}$	-0.4		
Lee Wall Pressure	P	-0.15	kPa	
Edge Column Force	F	-0.35	kN/m	
Intermediate Column Force	F	-0.69	kN/m	

Table 5.2 B

Table 5.4

3. Side Wall

Area Reduction Factor	K_a	1		
combination factor applied to internal pressures	$K_{C,e}$	0.8		
local pressure factor	K_l	1		
porous cladding reduction factor	K_p	1		
External Pressure Coefficient	$C_{P,e}$	-0.65		0 to 1h
External Pressure Coefficient	$C_{P,e}$	-0.5		1h to 2h
External Pressure Coefficient	$C_{P,e}$	-0.3		2h to 3h
External Pressure Coefficient	$C_{P,e}$	-0.2		>3h
aerodynamic shape factor	$C_{fig,e}$	-0.52		0 to 1h
aerodynamic shape factor	$C_{fig,e}$	-0.4		1h to 2h

Table 5.2 C

Table 5.4



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Side Wall Pressure	P	-0.20	kPa	<i>0 to 1h</i>
Side Wall Pressure	P	-0.15	kPa	<i>1h to 2h</i>
Side Wall Pressure	P	-0.09	kPa	<i>2h to 3h</i>
Side Wall Pressure	P	-0.06	kPa	<i>>3h</i>

4. Roof

$\alpha < 10^\circ$

Area Reduction Factor	K_a	1		
combination factor applied to internal pressures	$K_{C,e}$	0.8		
local pressure factor	K_l	1		
porous cladding reduction factor	K_p	1		
External Pressure Coefficient MIN	$C_{P,e}$	-0.90		<i>0 to 0.5h</i>
External Pressure Coefficient MIN	$C_{P,e}$	-0.90		<i>0.5 to 1h</i>
External Pressure Coefficient MIN	$C_{P,e}$	-0.50		<i>1h to 2h</i>
External Pressure Coefficient MIN	$C_{P,e}$	-0.30		<i>2h to 3h</i>
External Pressure Coefficient MIN	$C_{P,e}$	-0.20		<i>>3h</i>
External Pressure Coefficient MAX	$C_{P,e}$	-0.40		<i>0 to 0.5h</i>
External Pressure Coefficient MAX	$C_{P,e}$	-0.40		<i>0.5 to 1h</i>
External Pressure Coefficient MAX	$C_{P,e}$	0.00		<i>1h to 2h</i>
External Pressure Coefficient MAX	$C_{P,e}$	0.10		<i>2h to 3h</i>
External Pressure Coefficient MAX	$C_{P,e}$	0.20		<i>>3h</i>
aerodynamic shape factor MIN	$C_{fig,e}$	-0.72		<i>0 to 0.5h</i>
aerodynamic shape factor MIN	$C_{fig,e}$	-0.72		<i>0.5 to 1h</i>
aerodynamic shape factor MIN	$C_{fig,e}$	-0.4		<i>1h to 2h</i>
aerodynamic shape factor MIN	$C_{fig,e}$	-0.24		<i>2h to 3h</i>
aerodynamic shape factor MIN	$C_{fig,e}$	-0.16		<i>>3h</i>
aerodynamic shape factor MAX	$C_{fig,e}$	-0.32		<i>0 to 0.5h</i>
aerodynamic shape factor MAX	$C_{fig,e}$	-0.32		<i>0.5 to 1h</i>

Table 5.3 A



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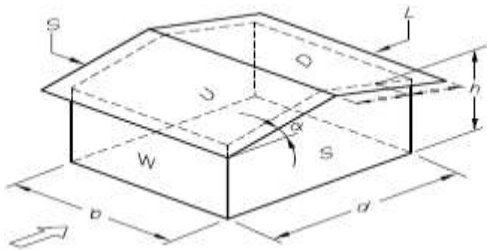
aerodynamic shape factor MAX	$C_{fig,e}$	0		<i>1h to 2h</i>
aerodynamic shape factor MAX	$C_{fig,e}$	0.08		<i>2h to 3h</i>
aerodynamic shape factor MAX	$C_{fig,e}$	0.16		<i>>3h</i>
Pressure MIN	P	-0.28	kPa	<i>0 to 0.5h</i>
Pressure MIN	P	-0.28	kPa	<i>0.5 to 1h</i>
Pressure MIN	P	-0.15	kPa	<i>1h to 2h</i>
Pressure MIN	P	-0.09	kPa	<i>2h to 3h</i>
Pressure MIN	P	-0.06	kPa	<i>>3h</i>
Pressure MAX	P	-0.12	kPa	<i>0 to 0.5h</i>
Pressure MAX	P	-0.12	kPa	<i>0.5 to 1h</i>
Pressure MAX	P	0.00	kPa	<i>1h to 2h</i>
Pressure MAX	P	0.03	kPa	<i>2h to 3h</i>
Pressure MAX	P	0.06	kPa	<i>>3h</i>
Edge Purlin Force MIN	F	-0.16	kN/m	<i>0 to 0.5h</i>
Edge Purlin Force MIN	F	-0.16	kN/m	<i>0.5 to 1h</i>
Edge Purlin Force MIN	F	-0.09	kN/m	<i>1h to 2h</i>
Edge Purlin Force MIN	F	-0.05	kN/m	<i>2h to 3h</i>
Edge Purlin Force MIN	F	-0.04	kN/m	<i>>3h</i>
Edge Purlin Force MAX	F	-0.07	kN/m	<i>0 to 0.5h</i>
Edge Purlin Force MAX	F	-0.07	kN/m	<i>0.5 to 1h</i>
Edge Purlin Force MAX	F	0.00	kN/m	<i>1h to 2h</i>
Edge Purlin Force MAX	F	0.02	kN/m	<i>2h to 3h</i>
Edge Purlin Force MAX	F	0.04	kN/m	<i>>3h</i>
Intermediate Purlin Force MIN	F	-0.33	kN/m	<i>0 to 0.5h</i>
Intermediate Purlin Force MIN	F	-0.33	kN/m	<i>0.5 to 1h</i>
Intermediate Purlin Force MIN	F	-0.18	kN/m	<i>1h to 2h</i>
Intermediate Purlin Force MIN	F	-0.11	kN/m	<i>2h to 3h</i>
Intermediate Purlin Force MIN	F	-0.07	kN/m	<i>>3h</i>
Intermediate Purlin Force MAX	F	-0.14	kN/m	<i>0 to 0.5h</i>
Intermediate Purlin Force MAX	F	-0.14	kN/m	<i>0.5 to 1h</i>
Intermediate Purlin Force MAX	F	0.00	kN/m	<i>1h to 2h</i>
Intermediate Purlin Force MAX	F	0.04	kN/m	<i>2h to 3h</i>
Intermediate Purlin Force MAX	F	0.07	kN/m	<i>>3h</i>



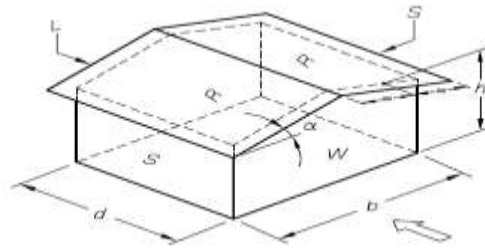
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5.2.1 Pressure summary

WIND EXTERNAL PRESSURE			Direction1 (Perpendicular to Length)		Direction2 (Parallel to Length)				
Windward (kPa)			0.21		0.21				
Leeward (kPa)			-0.11		-0.15				
Sidewall (m)	Length	(m)	(m)	(Kpa)	(Kpa)				
	0 - 1h	0	4.75	-0.20	-0.20				
	1h - 2h	4.75	9.5	-0.15	-0.15				
	2h - 3h	9.5	14.25	-0.09	-0.09				
	>3h	14.25	-	-0.06	-0.06				
Roof			Min (Kpa)	Max (Kpa)	Length	(m)	(m)	Min (Kpa)	Max (Kpa)
	Upwind Slope		-0.12	0.03	0-0.5h	0.00	2.38	-0.28	-0.12
	Downwind Slope		-0.17	-0.17	0.5h-1h	2.38	4.75	-0.28	-0.12
					1h-2h	4.75	9.50	-0.15	0.00
					2h-3h	9.50	14.25	-0.09	0.03
					>3h	14.25	-	-0.06	0.06
Wind Internal Pressure (kPa)			Min (kPa)	Max (kPa)	Min (kPa)			Max (kPa)	
			Proportion of Cpe	Proportion of Cpe	Proportion of Cpe			Proportion of Cpe	



Direction 1



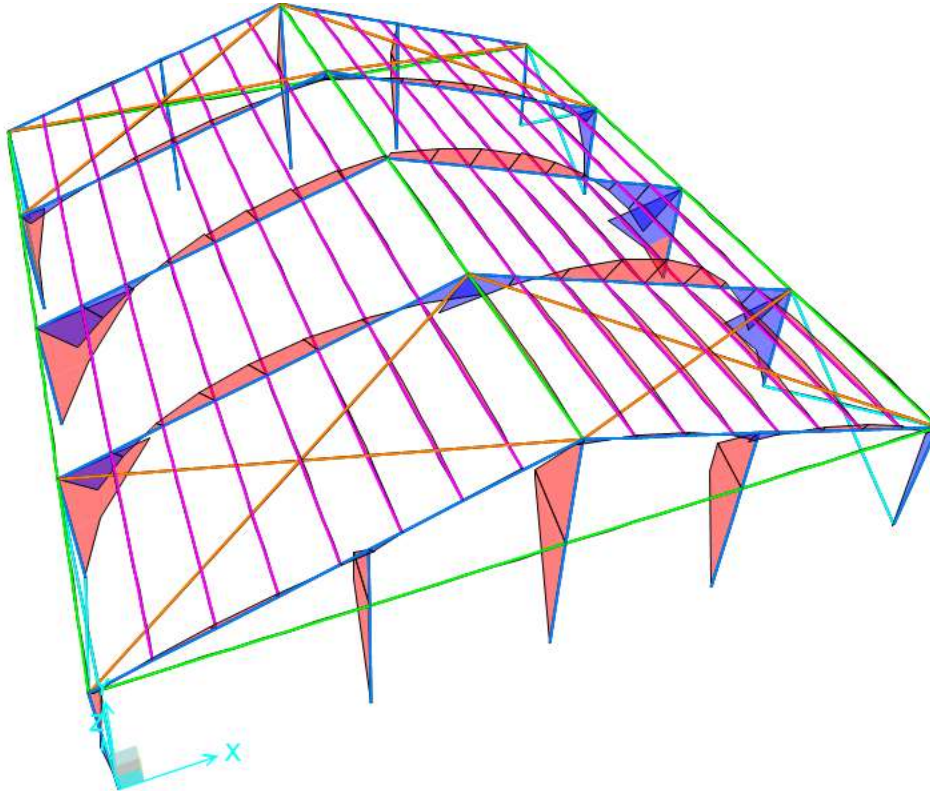
Direction 2

AS1170.2

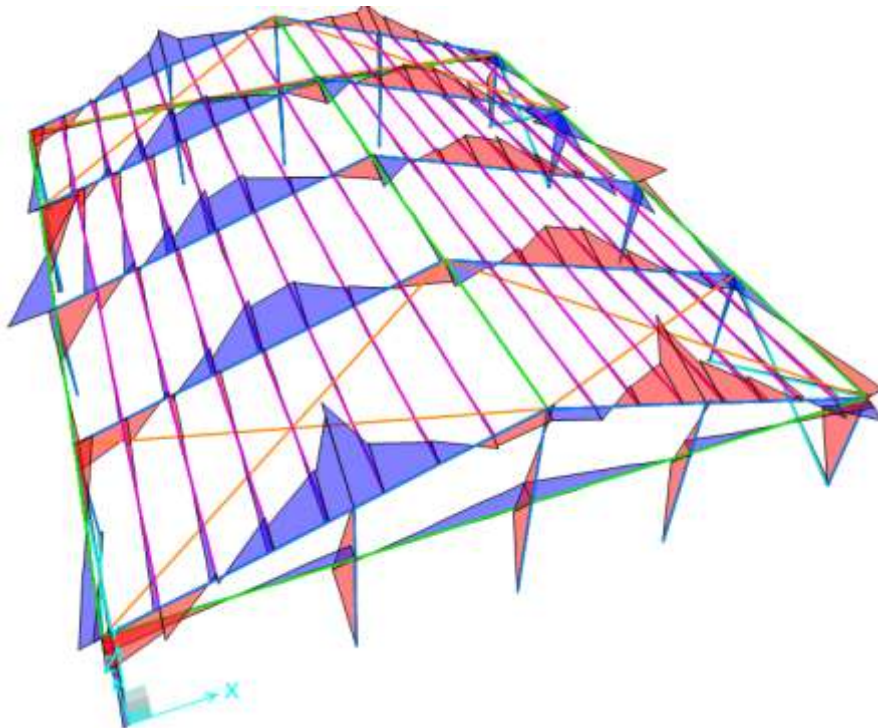


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5.3.5 Max Bending Moment due to critical load combination in major axis

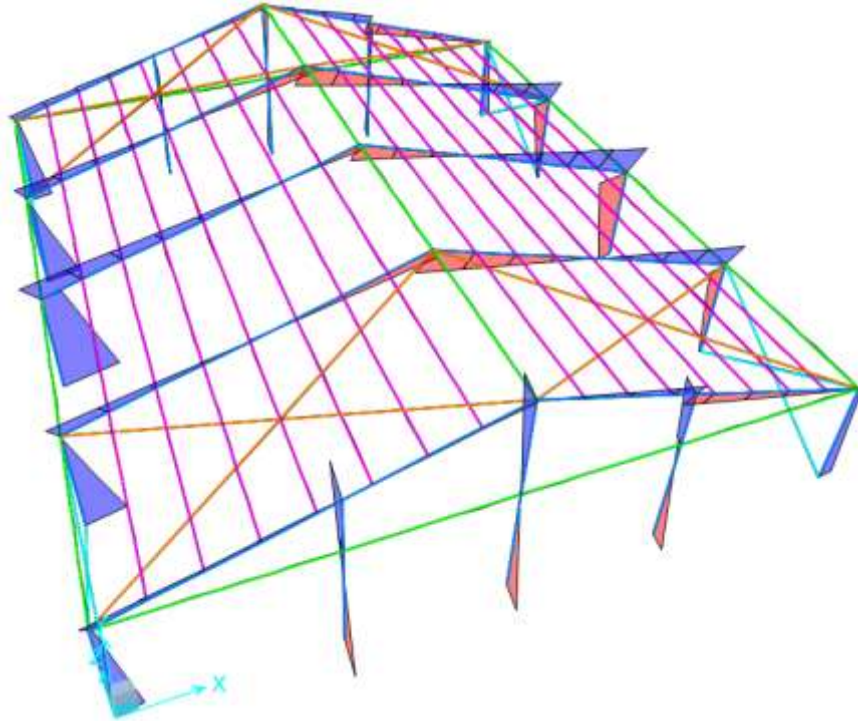


5.3.6 Max Bending Moment in minor axis due to critical load combination

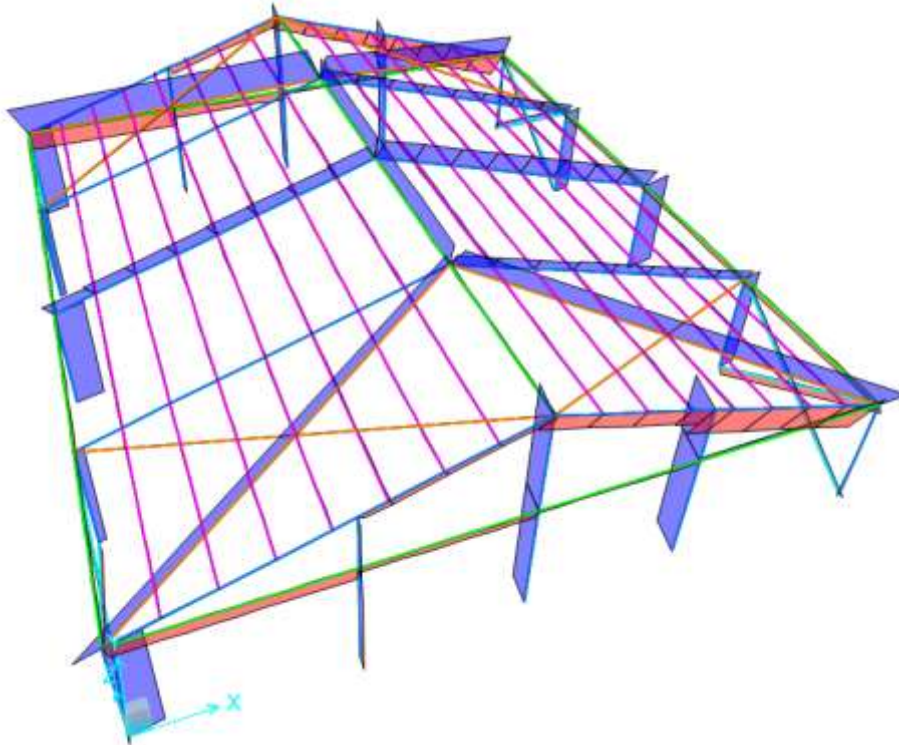




5.3.7 Max Shear in due to critical load combination



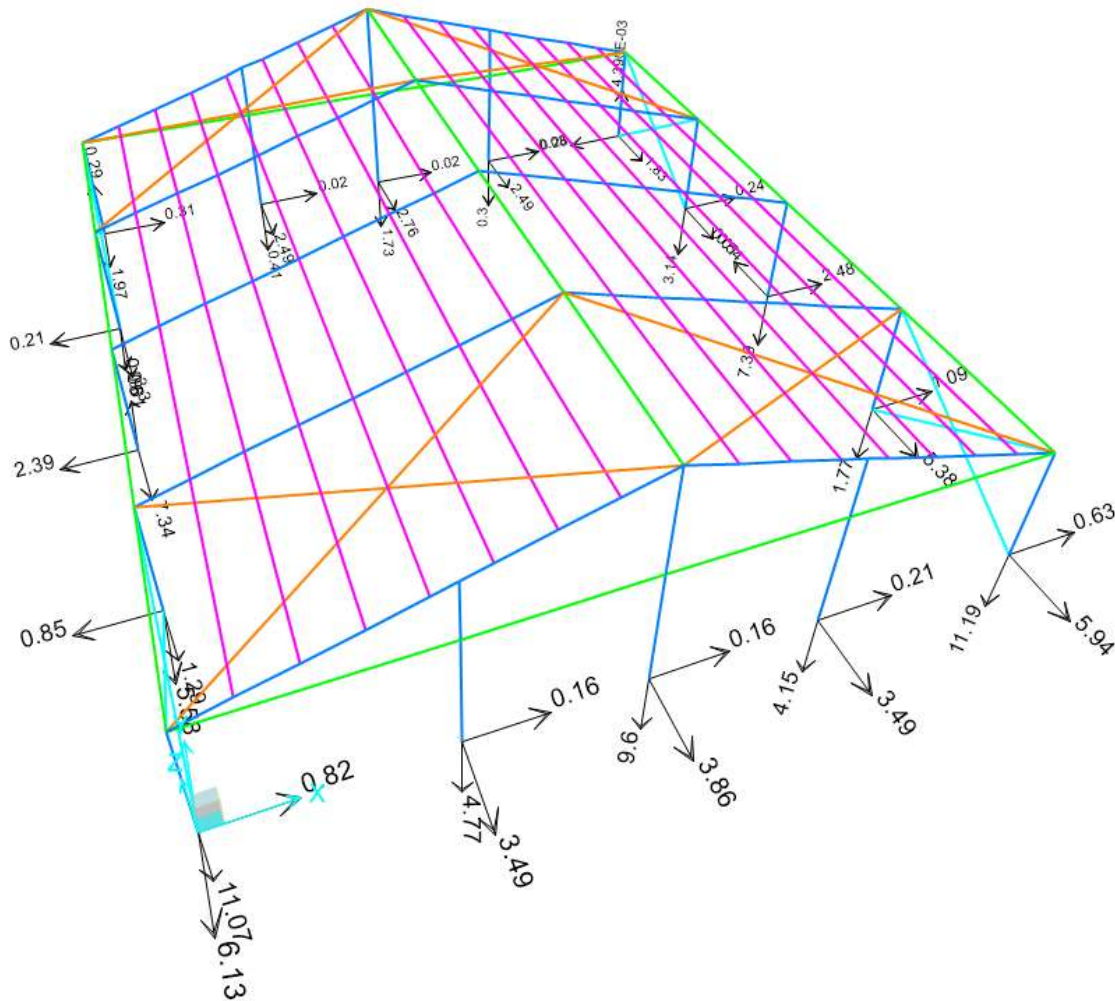
5.3.8 Max Axial force in upright support and roof beam due to critical load combination





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5.3.9 Max reactions



Max Reaction (Bearing) $N^* = 8.2 \text{ kN}$

Max Reaction (Uplift) $N^* = 11.2 \text{ kN}$

5.3.10 Summary Table:

MEMBER(S)	Section	b	d	t	Vx	Vy	P (Axial) Negative -> Compression Positive -> Tension	Mx	My
		mm	mm	mm	kN	kN	kN	kN.m	kN.m
Rafter	152x119x4	119	152	4	6.313	5.1E-15	7.034	17.3	5.94E-15
Upright Support	152x119x4	119	152	4	2.89	1.1E-15	8.036	-17.28	-3.516E-15
Gable Pole	152x119x4	119	152	4	1.067	7.159	-7.897	3.2368	11.1564
Ridge & Eave Purlin	85X102X3	102	85	3	0.065	0.935	-5.257	-5.551E-17	-2.4447
Gable Beam	85X102X3	102	85	3	-0.04	0.041	-16.261	0.052	0.088
Intermediate Purlin	60x60x2.5	60	60	2.5	-0	-0.029	-1.382	-1.5039	0.0071
Brace	80x80x2.5	80	80	2.5	-0.05	0.071	-7.063	0	0.2385



6 Checking Members Based on AS1664.1 ALUMINIUM LSD

6.1 Rafter

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
152x119x4	Rafter				
Alloy and temper	6061-T6				AS1664.1
Tension	F_{tu}	= 262	MPa	Ultimate	T3.3(A)
	F_{ty}	= 241	MPa	Yield	
Compression	F_{cy}	= 241	MPa		
Shear	F_{su}	= 165	MPa	Ultimate	
	F_{sy}	= 138	MPa	Yield	
Bearing	F_{bu}	= 551	MPa	Ultimate	
	F_{by}	= 386	MPa	Yield	
Modulus of elasticity	E	= 70000	MPa	Compressive	
	k_t	= 1.0			T3.4(B)
	k_c	= 1.0			
FEM ANALYSIS RESULTS					
Axial force	P	= 0	kN	compression	
	P	= 7.034	kN	Tension	
In plane moment	M_x	= 17.3	kNm		
Out of plane moment	M_y	= 5.94E-15	kNm		
DESIGN STRESSES					
Gross cross section area	A_g	= 2104	mm ²		
In-plane elastic section modulus	Z_x	= 94803.64	mm ³		
Out-of-plane elastic section mod.	Z_y	= 82920.59	mm ³		
Stress from axial force	f_a	= P/ A_g			
		= 0.00	MPa	compression	
		= 3.34	MPa	Tension	
Stress from in-plane bending	f_{bx}	= M_x/Z_x			
		= 182.48	MPa	compression	
Stress from out-of-plane bending	f_{by}	= M_y/Z_y			
		= 0.00	MPa	compression	
Tension					
3.4.3 Tension in rectangular tubes					



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	ϕF_L	=	228.95	MPa		
		O				
		R				
	ϕF_L	=	222.70	MPa		
COMPRESSION						
3.4.8 Compression in columns, axial, gross section						
<i>1. General</i>						
						... 3.4.8.1
Unsupported length of member	L	=	9500	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	48.42	mm		
Radius of gyration about buckling axis (X)	r_x	=	58.52	mm		
Slenderness ratio	kLb/ry	=	24.78			
Slenderness ratio	kL/rx	=	162.34			
Slenderness parameter	λ	=	3.032			
	D_c^*	=	90.3			
	S_1^*	=	0.33			
	S_2^*	=	1.23			
	ϕ_{cc}	=	0.950			
Factored limit state stress	ϕF_L	=	24.90	MPa		
<i>2. Sections not subject to torsional or torsional-flexural buckling</i>						
						... 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	162.34			
3.4.10 Uniform compression in components of columns, gross section - flat plates						
<i>1. Uniform compression in components of columns, gross section - flat plates with both edges supported</i>						
						...
						3.4.10.1
						T3.3(D)
	k_1	=	0.35			
Max. distance between toes of fillets of supporting elements for plate	b'	=	111			
	t	=	4	mm		
Slenderness	b/t	=	27.75			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	32.87			
Factored limit state stress	ϕF_L	=	185.70	MPa		



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Most adverse compressive limit state stress	F_a	=	24.90	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.02		PASS	
BENDING - IN-PLANE						
3.4.15 Compression in beams, extreme fibre, gross section rectangular tubes, box sections						
Unbraced length for bending	L_b	=	1200	mm		
Second moment of area (weak axis)	I_y	=	4.93E+06	mm ⁴		
Torsion modulus	J	=	8.81E+06	mm ³		
Elastic section modulus	Z	=	94803.64	mm ³		
Slenderness	S	=	34.51			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	ϕF_L	=	216.91	MPa		3.4.15(2)
3.4.17 Compression in components of beams (component under uniform compression), gross section - flat plates with both edges supported						
	k_1	=	0.5			T3.3(D)
	k_2	=	2.04			T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	111	mm		
	t	=	4	mm		
Slenderness	b/t	=	27.75			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	ϕF_L	=	185.70	MPa		
Most adverse in-plane bending limit state stress	F_{bx}	=	185.70	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.98		PASS	
BENDING - OUT-OF-PLANE						



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NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)

Factored limit state stress	ϕF_L	=	185.70	MPa		
Most adverse out-of-plane bending limit state stress	F_{by}	=	185.70	MPa		
Most adverse out-of-plane bending capacity factor	f_{by}/F_{by}	=	0.00		PASS	
COMBINED ACTIONS						
4.1.1 Combined compression and bending						
	F_a	=	24.90	MPa		... 4.1.1(2)
	F_{ao}	=	185.70	MPa		... 3.4.8
	F_{bx}	=	185.70	MPa		... 3.4.10
	F_{by}	=	185.70	MPa		... 3.4.17
	f_a/F_a	=	0.015			... 3.4.17
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by}$	\leq	1.0			... 4.1.1 (3)
i.e.	1.00	\leq	1.0		PASS	
SHEAR						
3.4.24 Shear in webs (Major Axis)						
						... 4.1.1(2)
Clear web height	h	=	144	mm		
	t	=	4	mm		
Slenderness	h/t	=	36			
Limit 1	S_1	=	29.01			
Limit 2	S_2	=	59.31			
Factored limit state stress	ϕF_L	=	124.02	MPa		
Stress From Shear force	f_{sx}	=	V/A_w			
			5.48	MPa		
3.4.25 Shear in webs (Minor Axis)						
Clear web height	b	=	111	mm		
	t	=	4	mm		
Slenderness	b/t	=	27.75			
Factored limit state stress	ϕF_L	=	131.10	MPa		



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Stress From Shear force	f_{sy}	=	V/A_w	
			0.00	MPa

6.2 Upright Supports

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
152x119x4	Upright Support				
Alloy and temper	6061-T6				AS1664.1
Tension	F_{tu}	=	262	MPa	<i>Ultimate</i>
	F_{ty}	=	241	MPa	<i>Yield</i>
Compression	F_{cy}	=	241	MPa	
Shear	F_{su}	=	165	MPa	<i>Ultimate</i>
	F_{sy}	=	138	MPa	<i>Yield</i>
Bearing	F_{bu}	=	551	MPa	<i>Ultimate</i>
	F_{by}	=	386	MPa	<i>Yield</i>
Modulus of elasticity	E	=	70000	MPa	<i>Compressive</i>
	k_t	=	1.0		
	k_c	=	1.0		T3.4(B)
FEM ANALYSIS RESULTS					
Axial force	P	=	0	kN	<i>compression</i>
	P	=	8.036	kN	<i>Tension</i>
In plane moment	M_x	=	17.28	kNm	
Out of plane moment	M_y	=	3.516E-15	kNm	
DESIGN STRESSES					
Gross cross section area	A_g	=	2104	mm ²	
In-plane elastic section modulus	Z_x	=	94803.64 9	mm ³	
Out-of-plane elastic section mod.	Z_y	=	82920.59 4	mm ³	
Stress from axial force	f_a	=	P/A_g		
		=	0.00	MPa	<i>compression</i>
		=	3.82	MPa	<i>Tension</i>
Stress from in-plane bending	f_{bx}	=	M_x/Z_x		
		=	182.27	MPa	<i>compression</i>
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y		
		=	0.00	MPa	<i>compression</i>



<i>Tension</i>					
3.4.3 Tension in rectangular tubes					
	ϕF_L	=	228.95	MPa	
		O			
		R			
	ϕF_L	=	222.70	MPa	
COMPRESSION					
3.4.8 Compression in columns, axial, gross section					
1. General					
					... 3.4.8.1
Unsupported length of member	L	=	3300	mm	
Effective length factor	k	=	1		
Radius of gyration about buckling axis (Y)	r_y	=	48.42	mm	
Radius of gyration about buckling axis (X)	r_x	=	58.52	mm	
Slenderness ratio	kLb/ry	=	68.15		
Slenderness ratio	kL/rx	=	56.39		
Slenderness parameter	λ	=	1.27		
	D_c^*	=	90.3		
	S_1^*	=	0.33		
	S_2^*	=	1.23		
	ϕ_{cc}	=	0.758		
Factored limit state stress	ϕF_L	=	112.79	MPa	
2. Sections not subject to torsional or torsional-flexural buckling					
					... 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	68.15		
3.4.10 Uniform compression in components of columns, gross section - flat plates					
1. Uniform compression in components of columns, gross section - flat plates with both edges supported					
					... 3.4.10.1 T3.3(D)
	k_1	=	0.35		
Max. distance between toes of fillets of supporting elements for plate	b'	=	111		
	t	=	4	mm	
Slenderness	b/t	=	27.75		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	32.87		



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Factored limit state stress	ϕF_L	=	185.70	MPa	
Most adverse compressive limit state stress	F_a	=	112.79	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.02		PASS
BENDING - IN-PLANE					
3.4.15 <i>Compression in beams, extreme fibre, gross section rectangular tubes, box sections</i>					
Unbraced length for bending	L_b	=	3300	mm	
Second moment of area (weak axis)	I_y	=	4.93E+06	mm ⁴	
Torsion modulus	J	=	8.81E+06	mm ³	
Elastic section modulus	Z	=	94803.64	mm ³	
			g		
Slenderness	S	=	94.90		
Limit 1	S_1	=	0.39		
Limit 2	S_2	=	1695.86		
Factored limit state stress	ϕF_L	=	208.04	MPa	3.4.15(2)
3.4.17 <i>Compression in components of beams (component under uniform compression), gross section - flat plates with both edges supported</i>					
	k_1	=	0.5		T3.3(D)
	k_2	=	2.04		T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	111	mm	
	t	=	4	mm	
Slenderness	b/t	=	27.75		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	46.95		
Factored limit state stress	ϕF_L	=	185.70	MPa	
Most adverse in-plane bending limit state stress	F_{bx}	=	185.70	MPa	
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.98		PASS



BENDING - OUT-OF-PLANE					
<i>NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)</i>					
Factored limit state stress	ϕF_L	=	185.70	MPa	
Most adverse out-of-plane bending limit state stress	F_{by}	=	185.70	MPa	
Most adverse out-of-plane bending capacity factor	f_{by}/F_{by}	=	0.00		PASS
COMBINED ACTIONS					
4.1.1 Combined compression and bending					
					...
					4.1.1(2)
	F_a	=	112.79	MPa	... 3.4.8
	F_{ao}	=	185.70	MPa	... 3.4.10
	F_{bx}	=	185.70	MPa	... 3.4.17
	F_{by}	=	185.70	MPa	... 3.4.17
	f_a/F_a	=	0.017		
	Check: $f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$... 4.1.1 (3)
	i.e. 1.00	\leq	1.0		PASS
SHEAR					
3.4.24 Shear in webs (Major Axis)					
					...
					4.1.1(2)
Clear web height	h	=	144	mm	
	t	=	4	mm	
Slenderness	h/t	=	36		
Limit 1	S_1	=	29.01		
Limit 2	S_2	=	59.31		
Factored limit state stress	ϕF_L	=	124.02	MPa	
Stress From Shear force	f_{sx}	=	V/A_w		
			2.51	MPa	
3.4.25 Shear in webs (Minor Axis)					
Clear web height	b	=	111	mm	
	t	=	4	mm	
Slenderness	b/t	=	27.75		



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Factored limit state stress	ϕF_L	=	131.10	MPa
Stress From Shear force	f_{sy}	=	V/A_w	
			0.00	MPa

6.3 Gable Pole

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
152x119x4	Gable Pole				
Alloy and temper	6061-T6				AS1664.1
Tension	F_{tu}	=	262	MPa	<i>Ultimate</i>
	F_{ty}	=	241	MPa	<i>Yield</i>
Compression	F_{cy}	=	241	MPa	
Shear	F_{su}	=	165	MPa	<i>Ultimate</i>
	F_{sy}	=	138	MPa	<i>Yield</i>
Bearing	F_{bu}	=	551	MPa	<i>Ultimate</i>
	F_{by}	=	386	MPa	<i>Yield</i>
Modulus of elasticity	E	=	70000	MPa	<i>Compressive</i>
	k_t	=	1.0		
	k_c	=	1.0		T3.4(B)
FEM ANALYSIS RESULTS					
Axial force	P	=	7.897	kN	<i>compression</i>
	P	=	0	kN	<i>Tension</i>
In plane moment	M_x	=	3.2368	kNm	
Out of plane moment	M_y	=	11.1564	kNm	
DESIGN STRESSES					
Gross cross section area	A_g	=	2104	mm ²	
In-plane elastic section modulus	Z_x	=	94803.649	mm ³	
Out-of-plane elastic section mod.	Z_y	=	82920.594	mm ³	
Stress from axial force	f_a	=	P/A_g		
		=	3.75	MPa	<i>compression</i>
		=	0.00	MPa	<i>Tension</i>
Stress from in-plane bending	f_{bx}	=	M_x/Z_x		
		=	34.14	MPa	<i>compression</i>
Stress from out-of-plane	f_{by}	=	M_y/Z_y		



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bending	=	134.54	MPa	<i>compression</i>	
<i>Tension</i>					
3.4.3 Tension in rectangular tubes					
	ϕF_L	=	228.95	MPa	
		OR			
	ϕF_L	=	222.70	MPa	
COMPRESSION					
3.4.8 Compression in columns, axial, gross section					
<i>1. General</i>					
					... 3.4.8.1
Unsupported length of member	L	=	4900	mm	
Effective length factor	k	=	1		
Radius of gyration about buckling axis (Y)	r_y	=	48.42	mm	
Radius of gyration about buckling axis (X)	r_x	=	58.52	mm	
Slenderness ratio	kLb/r_y	=	68.15		
Slenderness ratio	kL/r_x	=	83.73		
Slenderness parameter	λ	=	1.56		
	D_c^*	=	90.3		
	S_1^*	=	0.33		
	S_2^*	=	1.23		
	ϕ_{cc}	=	0.799		
Factored limit state stress	ϕF_L	=	78.73	MPa	
<i>2. Sections not subject to torsional or torsional-flexural buckling</i>					
					... 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	83.73		
3.4.10 Uniform compression in components of columns, gross section - flat plates					
<i>1. Uniform compression in components of columns, gross section - flat plates with both edges supported</i>					
					...
	k_1	=	0.35		3.4.10.1
					T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	111		
	t	=	4	mm	
Slenderness	b/t	=	27.75		
Limit 1	S_1	=	12.34		



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Limit 2	S_2	=	32.87		
Factored limit state stress	ϕF_L	=	185.70	MPa	
Most adverse compressive limit state stress	F_a	=	78.73	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.05		PASS
BENDING - IN-PLANE					
3.4.15 <i>Compression in beams, extreme fibre, gross section rectangular tubes, box sections</i>					
Unbraced length for bending	L_b	=	3300	mm	
Second moment of area (weak axis)	I_y	=	4933775.3	mm ⁴	
Torsion modulus	J	=	8811571.1	mm ³	
Elastic section modulus	Z	=	94803.649	mm ³	
Slenderness	S	=	94.90		
Limit 1	S_1	=	0.39		
Limit 2	S_2	=	1695.86		
Factored limit state stress	ϕF_L	=	208.04	MPa	3.4.15(2)
3.4.17 <i>Compression in components of beams (component under uniform compression), gross section - flat plates with both edges supported</i>					
	k_1	=	0.5		T3.3(D)
	k_2	=	2.04		T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	111	mm	
	t	=	4	mm	
Slenderness	b/t	=	27.75		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	46.95		
Factored limit state stress	ϕF_L	=	185.70	MPa	
Most adverse in-plane bending limit state stress	F_{bx}	=	185.70	MPa	



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Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.18		PASS	
BENDING - OUT-OF-PLANE						
<i>NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)</i>						
Factored limit state stress	ϕF_L	=	185.70	MPa		
Most adverse out-of-plane bending limit state stress	F_{by}	=	185.70	MPa		
Most adverse out-of-plane bending capacity factor	f_{by}/F_{by}	=	0.72		PASS	
COMBINED ACTIONS						
4.1.1 Combined compression and bending						
						...
						4.1.1(2)
	F_a	=	78.73	MPa		... 3.4.8
	F_{ao}	=	185.70	MPa		... 3.4.10
	F_{bx}	=	185.70	MPa		... 3.4.17
	F_{by}	=	185.70	MPa		... 3.4.17
	f_a/F_a	=	0.048			
	Check: $f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$... 4.1.1 (3)
	i.e. 0.96	\leq	1.0		PASS	
SHEAR						
3.4.24 Shear in webs (Major Axis)						
						...
						4.1.1(2)
Clear web height	h	=	144	mm		
	t	=	4	mm		
Slenderness	h/t	=	36			
Limit 1	S_1	=	29.01			
Limit 2	S_2	=	59.31			
Factored limit state stress	ϕF_L	=	124.02	MPa		
Stress From Shear force	f_{sx}	=	V/A_w			
			0.93	MPa		
3.4.25 Shear in webs (Minor Axis)						
Clear web height	b	=	111	mm		



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Slenderness	t	=	4	mm		
	b/t	=	27.75			
Factored limit state stress	ϕF_L	=	131.10	MPa		
Stress From Shear force	f_{sy}	=	V/A_w			
			8.06	MPa		

6.4 Ridge & Eave Purlin

NAME	SYMBOL	VALUE	UNIT	NOTES	REF	
85X102X3	Ridge & Eave Purlin					
Alloy and temper	6061-T6				AS1664.1	
Tension	F_{tu}	=	262	MPa	<i>Ultimate</i>	T3.3(A)
	F_{ty}	=	241	MPa	<i>Yield</i>	
Compression	F_{cy}	=	241	MPa		
Shear	F_{su}	=	165	MPa	<i>Ultimate</i>	
	F_{sy}	=	138	MPa	<i>Yield</i>	
Bearing	F_{bu}	=	551	MPa	<i>Ultimate</i>	
	F_{by}	=	386	MPa	<i>Yield</i>	
Modulus of elasticity	E	=	70000	MPa	<i>Compressive</i>	
	k_t	=	1.0			T3.4(B)
	k_c	=	1.0			
FEM ANALYSIS RESULTS						
Axial force	P	=	5.257	kN	<i>compression</i>	
	P	=	0	kN	<i>Tension</i>	
In plane moment	M_x	=	5.551E-17	kNm		
Out of plane moment	M_y	=	2.4447	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	=	1086	mm ²		
In-plane elastic section modulus	Z_x	=	30017.659	mm ³		
Out-of-plane elastic section mod.	Z_y	=	33183.882	mm ³		
Stress from axial force	f_a	=	P/A_g			
		=	4.84	MPa	<i>compression</i>	
		=	0.00	MPa	<i>Tension</i>	



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Stress from in-plane bending	f_{bx}	=	M_x/Z_x		
		=	0.00	MPa	<i>compression</i>
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y		
		=	73.67	MPa	<i>compression</i>
Tension					
3.4.3 Tension in rectangular tubes					
	ϕF_L	=	228.95	MPa	
		O			
		R			
	ϕF_L	=	222.70	MPa	
COMPRESSION					
3.4.8 Compression in columns, axial, gross section					
1. General					
					3.4.8.1
Unsupported length of member	L	=	5000	mm	
Effective length factor	k	=	1		
Radius of gyration about buckling axis (Y)	r_y	=	39.48	mm	
Radius of gyration about buckling axis (X)	r_x	=	34.27	mm	
Slenderness ratio	kLb/r_y	=	126.66		
Slenderness ratio	kL/r_x	=	145.88		
Slenderness parameter	λ	=	2.72		
	D_c^*	=	90.3		
	S_1^*	=	0.33		
	S_2^*	=	1.23		
	ϕ_{cc}	=	0.950		
Factored limit state stress	ϕF_L	=	30.84	MPa	
2. Sections not subject to torsional or torsional-flexural buckling					
					3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	145.88		
3.4.10 Uniform compression in components of columns, gross section - flat plates					
1. Uniform compression in components of columns, gross section - flat plates with both edges supported					
					3.4.10.1
	k_1	=	0.35		T3.3(D)



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Max. distance between toes of fillets of supporting elements for plate	b'	=	96		
	t	=	3	mm	
Slenderness	b/t	=	32		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	32.87		
Factored limit state stress	ϕF_L	=	173.77	MPa	
Most adverse compressive limit state stress	F_a	=	30.84	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.16		PASS
BENDING - IN-PLANE					
3.4.15 <i>Compression in beams, extreme fibre, gross section rectangular tubes, box sections</i>					
Unbraced length for bending	L_b	=	5000	mm	
Second moment of area (weak axis)	I_y	=	1692378	mm ⁴	
Torsion modulus	J	=	$\frac{2184594.}{2}$	mm ³	
Elastic section modulus	Z	=	$\frac{30017.65}{9}$	mm ³	
Slenderness	S	=	156.11		
Limit 1	S_1	=	0.39		
Limit 2	S_2	=	1695.86		
Factored limit state stress	ϕF_L	=	201.73	MPa	3.4.15(2)
3.4.17 <i>Compression in components of beams (component under uniform compression), gross section - flat plates with both edges supported</i>					
	k_1	=	0.5		T3.3(D)
	k_2	=	2.04		T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	96	mm	
	t	=	3	mm	



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Slenderness	b/t	=	32		
Limit 1	S ₁	=	12.34		
Limit 2	S ₂	=	46.95		
Factored limit state stress	ϕF_L	=	173.77	MPa	
Most adverse in-plane bending limit state stress	F _{bx}	=	173.77	MPa	
Most adverse in-plane bending capacity factor	f _{bx} /F _{bx}	=	0.00		PASS
BENDING - OUT-OF-PLANE					
<i>NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)</i>					
Factored limit state stress	ϕF_L	=	173.77	MPa	
Most adverse out-of-plane bending limit state stress	F _{by}	=	173.77	MPa	
Most adverse out-of-plane bending capacity factor	f _{by} /F _{by}	=	0.42		PASS
COMBINED ACTIONS					
4.1.1 Combined compression and bending					
	F _a	=	30.84	MPa	... 4.1.1(2)
	F _{ao}	=	173.77	MPa	... 3.4.8
	F _{bx}	=	173.77	MPa	... 3.4.10
	F _{by}	=	173.77	MPa	... 3.4.17
	f _a /F _a	=	0.157		... 3.4.17
	Check: f _a /F _a + f _{bx} /F _{bx} + f _{by} /F _{by} ≤ 1.0				... 4.1.1 (3)
	i.e.	0.58	≤	1.0	PASS
SHEAR					
3.4.24 Shear in webs (Major Axis)					
Clear web height	h	=	79	mm	...
	t	=	3	mm	4.1.1(2)
Slenderness	h/t	=	26.33333		
			3		



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Limit 1	S_1	=	29.01		
Limit 2	S_2	=	59.31		
Factored limit state stress	ϕF_L	=	131.10	MPa	
Stress From Shear force	f_{sx}	=	V/A_w		
			0.14	MPa	
3.4.25 Shear in webs (Minor Axis)					
Clear web height	b	=	96	mm	
	t	=	3	mm	
Slenderness	b/t	=	32		
Factored limit state stress	ϕF_L	=	128.07	MPa	
Stress From Shear force	f_{sy}	=	V/A_w		
			1.62	MPa	

6.5 Gable Beam

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
85X102X3	Gable Beam				
Alloy and temper	6061-T6				AS1664.1
Tension	F_{tu}	=	262	MPa	<i>Ultimate</i>
	F_{ty}	=	241	MPa	<i>Yield</i>
Compression	F_{cy}	=	241	MPa	
Shear	F_{su}	=	165	MPa	<i>Ultimate</i>
	F_{sy}	=	138	MPa	<i>Yield</i>
Bearing	F_{bu}	=	551	MPa	<i>Ultimate</i>
	F_{by}	=	386	MPa	<i>Yield</i>
Modulus of elasticity	E	=	70000	MPa	<i>Compressive</i>
	k_t	=	1.0		
	k_c	=	1.0		
FEM ANALYSIS RESULTS					
Axial force	P	=	16.261	kN	<i>compression</i>
	P	=	0	kN	<i>Tension</i>
In plane moment	M_x	=	0.052	kNm	
Out of plane moment	M_y	=	0.088	kNm	



DESIGN STRESSES					
Gross cross section area	A_g	=	1086 mm ²		
In-plane elastic section modulus	Z_x	=	30017.659 mm ³		
Out-of-plane elastic section mod.	Z_y	=	33183.882 mm ³		
Stress from axial force	f_a	=	P/A_g		
		=	14.97 MPa	compression	
		=	0.00 MPa	Tension	
Stress from in-plane bending	f_{bx}	=	M_x/Z_x		
		=	1.73 MPa	compression	
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y		
		=	2.65 MPa	compression	
Tension					
3.4.3 Tension in rectangular tubes					
	ϕF_L	=	228.95 MPa		
		OR			
	ϕF_L	=	222.70 MPa		
COMPRESSION					
3.4.8 Compression in columns, axial, gross section					
1. General					
					... 3.4.8.1
Unsupported length of member	L	=	5000 mm		
Effective length factor	k	=	1		
Radius of gyration about buckling axis (Y)	r_y	=	39.48 mm		
Radius of gyration about buckling axis (X)	r_x	=	34.27 mm		
Slenderness ratio	kLb/r_y	=	126.66		
Slenderness ratio	kL/r_x	=	145.88		
Slenderness parameter	λ	=	2.72		
	D_c^*	=	90.3		
	S_1^*	=	0.33		
	S_2^*	=	1.23		
	ϕ_{cc}	=	0.950		
Factored limit state stress	ϕF_L	=	30.84 MPa		
2. Sections not subject to torsional or torsional-flexural buckling					
					... 3.4.8.2



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Largest slenderness ratio for flexural buckling	kL/r	=	145.88		
3.4.10 Uniform compression in components of columns, gross section - flat plates					
<i>1. Uniform compression in components of columns, gross section - flat plates with both edges supported</i>					
	k_1	=	0.35		...
Max. distance between toes of fillets of supporting elements for plate	b'	=	96		3.4.10.1
	t	=	3	mm	T3.3(D)
Slenderness	b/t	=	32		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	32.87		
Factored limit state stress	ϕF_L	=	173.77	MPa	
Most adverse compressive limit state stress	F_a	=	30.84	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.49		PASS
BENDING - IN-PLANE					
3.4.15 Compression in beams, extreme fibre, gross section rectangular tubes, box sections					
Unbraced length for bending	L_b	=	5000	mm	
Second moment of area (weak axis)	I_y	=	1692378	mm ⁴	
Torsion modulus	J	=	2184594.2	mm ³	
Elastic section modulus	Z	=	30017.659	mm ³	
Slenderness	S	=	156.11		
Limit 1	S_1	=	0.39		
Limit 2	S_2	=	1695.86		
Factored limit state stress	ϕF_L	=	201.73	MPa	...
3.4.17 Compression in components of beams (component under uniform compression), gross section - flat plates with both edges supported					
					3.4.15(2)



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	k_1	=	0.5			T3.3(D)
	k_2	=	2.04			T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	96	mm		
	t	=	3	mm		
Slenderness	b/t	=	32			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	ϕF_L	=	173.77	MPa		
Most adverse in-plane bending limit state stress	F_{bx}	=	173.77	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.01		PASS	
BENDING - OUT-OF-PLANE						
<i>NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)</i>						
Factored limit state stress	ϕF_L	=	173.77	MPa		
Most adverse out-of-plane bending limit state stress	F_{by}	=	173.77	MPa		
Most adverse out-of-plane bending capacity factor	f_{by}/F_{by}	=	0.02		PASS	
COMBINED ACTIONS						
4.1.1 Combined compression and bending						
	F_a	=	30.84	MPa		... 4.1.1(2)
	F_{ao}	=	173.77	MPa		... 3.4.8
	F_{bx}	=	173.77	MPa		... 3.4.10
	F_{by}	=	173.77	MPa		... 3.4.17
	f_a/F_a	=	0.486			... 3.4.17
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$... 4.1.1 (3)
i.e.	0.51	\leq	1.0		PASS	
SHEAR						
3.4.24 Shear in webs (Major						
...						



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Axis)					4.1.1(2)
Clear web height	h	=	79	mm	
	t	=	3	mm	
Slenderness	h/t	=	26.333333		
Limit 1	S_1	=	29.01		
Limit 2	S_2	=	59.31		
Factored limit state stress	ϕF_L	=	131.10	MPa	
Stress From Shear force	f_{sx}	=	V/A_w		
			0.08	MPa	
3.4.25 Shear in webs (Minor Axis)					
Clear web height	b	=	96	mm	
	t	=	3	mm	
Slenderness	b/t	=	32		
Factored limit state stress	ϕF_L	=	128.07	MPa	
Stress From Shear force	f_{sy}	=	V/A_w		
			0.07	MPa	

6.6 Intermediate Purlin

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
60x60x2.5	Intermediate Purlin				
Alloy and temper	6061-T6				AS1664.1
Tension	F_{tu}	=	262	MPa	Ultimate
	F_{ty}	=	241	MPa	Yield
Compression	F_{cy}	=	241	MPa	
Shear	F_{su}	=	165	MPa	Ultimate
	F_{sy}	=	138	MPa	Yield
Bearing	F_{bu}	=	551	MPa	Ultimate
	F_{by}	=	386	MPa	Yield
Modulus of elasticity	E	=	70000	MPa	Compressive
	k_t	=	1.0		
	k_c	=	1.0		T3.4(B)
FEM ANALYSIS RESULTS					



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Axial force	P	=	1.382	kN	<i>compression</i>	
	P	=	0	kN	<i>Tension</i>	
In plane moment	M_x	=	1.5039	kNm		
Out of plane moment	M_y	=	0.0071	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	=	575	mm ²		
In-plane elastic section modulus	Z_x	=	10581.59 7	mm ³		
Out-of-plane elastic section mod.	Z_y	=	10581.59 7	mm ³		
Stress from axial force	f_a	=	P/A_g			
		=	2.40	MPa	<i>compression</i>	
		=	0.00	MPa	<i>Tension</i>	
Stress from in-plane bending	f_{bx}	=	M_x/Z_x			
		=	142.12	MPa	<i>compression</i>	
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y			
		=	0.67	MPa	<i>compression</i>	
<i>Tension</i>						
3.4.3 Tension in rectangular tubes						
	ϕF_L	=	228.95	MPa		
		O				
		R				
	ϕF_L	=	222.70	MPa		
COMPRESSION						
3.4.8 Compression in columns, axial, gross section						
1. General						
Unsupported length of member	L	=	5000	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	23.50	mm		
Radius of gyration about buckling axis (X)	r_x	=	23.50	mm		
Slenderness ratio	kLb/r_y	=	212.80			
Slenderness ratio	kL/r_x	=	212.80			
Slenderness parameter	λ	=	3.97			
	D_c^*	=	90.3			
	S_1^*	=	0.33			

... 3.4.8.1



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	S_2^*	=	1.23		
	ϕ_{cc}	=	0.950		
Factored limit state stress	ϕF_L	=	14.49	MPa	
<i>2. Sections not subject to torsional or torsional-flexural buckling</i>					... 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	212.80		
3.4.10 Uniform compression in components of columns, gross section - flat plates					
<i>1. Uniform compression in components of columns, gross section - flat plates with both edges supported</i>					... 3.4.10.1
	k_1	=	0.35		T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	55		
	t	=	2.5	mm	
Slenderness	b/t	=	22		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	32.87		
Factored limit state stress	ϕF_L	=	201.84	MPa	
Most adverse compressive limit state stress	F_a	=	14.49	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.17		PASS
BENDING - IN-PLANE					
3.4.15 Compression in beams, extreme fibre, gross section rectangular tubes, box sections					
Unbraced length for bending	L_b	=	5000	mm	
Second moment of area (weak axis)	I_y	=	317447.9 2	mm ⁴	
Torsion modulus	J	=	475273.4 4	mm ³	
Elastic section modulus	Z	=	10581.59 7	mm ³	
Slenderness	S	=	272.42		
Limit 1	S_1	=	0.39		



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Limit 2	S_2	=	1695.86		
Factored limit state stress	ϕF_L	=	192.53	MPa	3.4.15(2) ...
3.4.17 Compression in components of beams (component under uniform compression), gross section - flat plates with both edges supported					
	k_1	=	0.5		T3.3(D)
	k_2	=	2.04		T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	55	mm	
	t	=	2.5	mm	
Slenderness	b/t	=	22		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	46.95		
Factored limit state stress	ϕF_L	=	201.84	MPa	
Most adverse in-plane bending limit state stress	F_{bx}	=	192.53	MPa	
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.74		PASS
BENDING - OUT-OF-PLANE					
<i>NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)</i>					
Factored limit state stress	ϕF_L	=	192.53	MPa	
Most adverse out-of-plane bending limit state stress	F_{by}	=	192.53	MPa	
Most adverse out-of-plane bending capacity factor	f_{by}/F_{by}	=	0.00		PASS
COMBINED ACTIONS					
4.1.1 Combined compression and bending					
	F_a	=	14.49	MPa	4.1.1(2) ...
	F_{ao}	=	201.84	MPa	... 3.4.8
	F_{bx}	=	192.53	MPa	... 3.4.10
					... 3.4.17



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	F_{by}	=	192.53	MPa		... 3.4.17
	f_a/F_a	=	0.166			... 4.1.1 (3)
	Check: $f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					
	i.e. 0.91	\leq	1.0		PASS	
SHEAR						
3.4.24 Shear in webs (Major Axis)						
	Clear web height	h	=	55	mm	...
		t	=	2.5	mm	4.1.1(2)
	Slenderness	h/t	=	22		
	Limit 1	S_1	=	29.01		
	Limit 2	S_2	=	59.31		
	Factored limit state stress	ϕF_L	=	131.10	MPa	
	Stress From Shear force	f_{sx}	=	V/A_w		
			=	0.00	MPa	
3.4.25 Shear in webs (Minor Axis)						
	Clear web height	b	=	55	mm	
		t	=	2.5	mm	
	Slenderness	b/t	=	22		
	Factored limit state stress	ϕF_L	=	131.10	MPa	
	Stress From Shear force	f_{sy}	=	V/A_w		
			=	0.11	MPa	

6.7 Brace

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
60x60x2.5	Brace				
Alloy and temper	6061-T6				AS1664.1
Tension	F_{tu}	=	262	MPa	Ultimate
	F_{ty}	=	241	MPa	Yield
Compression	F_{cy}	=	241	MPa	
Shear	F_{su}	=	165	MPa	Ultimate
	F_{sy}	=	138	MPa	Yield



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Bearing	F_{bu}	=	551	MPa	<i>Ultimate</i>	
	F_{by}	=	386	MPa	<i>Yield</i>	
Modulus of elasticity	E	=	70000	MPa	<i>Compressive</i>	T3.4(B)
	k_t	=	1.0			
	k_c	=	1.0			
FEM ANALYSIS RESULTS						
Axial force	P	=	7.063	kN	<i>compression</i>	
	P	=	0	kN	<i>Tension</i>	
In plane moment	M_x	=	0	kNm		
Out of plane moment	M_y	=	0.2385	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	=	775	mm ²		
In-plane elastic section modulus	Z_x	=	19415.36 5	mm ³		
Out-of-plane elastic section mod.	Z_y	=	19415.36 5	mm ³		
Stress from axial force	f_a	=	P/A_g			
		=	9.11	MPa	<i>compression</i>	
		=	0.00	MPa	<i>Tension</i>	
Stress from in-plane bending	f_{bx}	=	M_x/Z_x			
		=	0.00	MPa	<i>compression</i>	
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y			
		=	12.28	MPa	<i>compression</i>	
Tension						
3.4.3 Tension in rectangular tubes						
	ϕF_L	=	228.95	MPa		
			O			
			R			
	ϕF_L	=	222.70	MPa		
COMPRESSION						
3.4.8 Compression in columns, axial, gross section						
1. General						
						... 3.4.8.1
Unsupported length of member	L	=	6000	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	31.66	mm		



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Radius of gyration about buckling axis (X)	r_x	=	31.66	mm	
Slenderness ratio	kLb/ry	=	189.54		
Slenderness ratio	kL/rx	=	189.54		
Slenderness parameter	λ	=	3.54		
	D_c^*	=	90.3		
	S_1^*	=	0.33		
	S_2^*	=	1.23		
	ϕ_{cc}	=	0.950		
Factored limit state stress	ϕF_L	=	18.27	MPa	
<i>2. Sections not subject to torsional or torsional-flexural buckling</i>					
Largest slenderness ratio for flexural buckling	kL/r	=	189.54		... 3.4.8.2
3.4.10 Uniform compression in components of columns, gross section - flat plates					
<i>1. Uniform compression in components of columns, gross section - flat plates with both edges supported</i>					
	k_1	=	0.35		... 3.4.10.1 T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	75		
	t	=	2.5	mm	
Slenderness	b/t	=	30		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	32.87		
Factored limit state stress	ϕF_L	=	179.38	MPa	
Most adverse compressive limit state stress	F_a	=	18.27	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.50		PASS
BENDING - IN-PLANE					
3.4.15 Compression in beams, extreme fibre, gross section rectangular tubes, box sections					
Unbraced length for bending	L_b	=	6000	mm	



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Second moment of area (weak axis)	I_y	=	776614.5 8	mm ⁴		
Torsion modulus	J	=	1163710. 9	mm ³		
Elastic section modulus	Z	=	19415.36 5	mm ³		
Slenderness	S	=	245.08			
Limit 1	S ₁	=	0.39			
Limit 2	S ₂	=	1695.86			
Factored limit state stress	ϕF_L	=	194.48	MPa		3.4.15(2)
3.4.17 Compression in components of beams (component under uniform compression), gross section - flat plates with both edges supported						
	k ₁	=	0.5			T3.3(D)
	k ₂	=	2.04			T3.3(D)
Max. distance between toes of fillets of supporting elements for plate	b'	=	75	mm		
	t	=	2.5	mm		
Slenderness	b/t	=	30			
Limit 1	S ₁	=	12.34			
Limit 2	S ₂	=	46.95			
Factored limit state stress	ϕF_L	=	179.38	MPa		
Most adverse in-plane bending limit state stress	F _{bx}	=	179.38	MPa		
Most adverse in-plane bending capacity factor	f _{bx} /F _{bx}	=	0.00		PASS	
BENDING - OUT-OF-PLANE						
<i>NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)</i>						
Factored limit state stress	ϕF_L	=	179.38	MPa		
Most adverse out-of-plane bending limit state stress	F _{by}	=	179.38	MPa		
Most adverse out-of-plane bending capacity factor	f _{by} /F _{by}	=	0.07		PASS	
COMBINED ACTIONS						



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4.1.1 Combined compression and bending				4.1.1(2)
	F_a	=	18.27 MPa	... 3.4.8
	F_{ao}	=	179.38 MPa	... 3.4.10
	F_{bx}	=	179.38 MPa	... 3.4.17
	F_{by}	=	179.38 MPa	... 3.4.17
	f_a/F_a	=	0.499	
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$... 4.1.1 (3)
i.e.	0.57	\leq	1.0	PASS
SHEAR				
3.4.24 Shear in webs (Major Axis)				4.1.1(2)
Clear web height	h	=	75 mm	
	t	=	2.5 mm	
Slenderness	h/t	=	30	
Limit 1	S_1	=	29.01	
Limit 2	S_2	=	59.31	
Factored limit state stress	ϕF_L	=	130.09 MPa	
Stress From Shear force	f_{sx}	=	V/A_w	
		=	0.12 MPa	
3.4.25 Shear in webs (Minor Axis)				
Clear web height	b	=	75 mm	
	t	=	2.5 mm	
Slenderness	b/t	=	30	
Factored limit state stress	ϕF_L	=	130.09 MPa	
Stress From Shear force	f_{sy}	=	V/A_w	
		=	0.19 MPa	



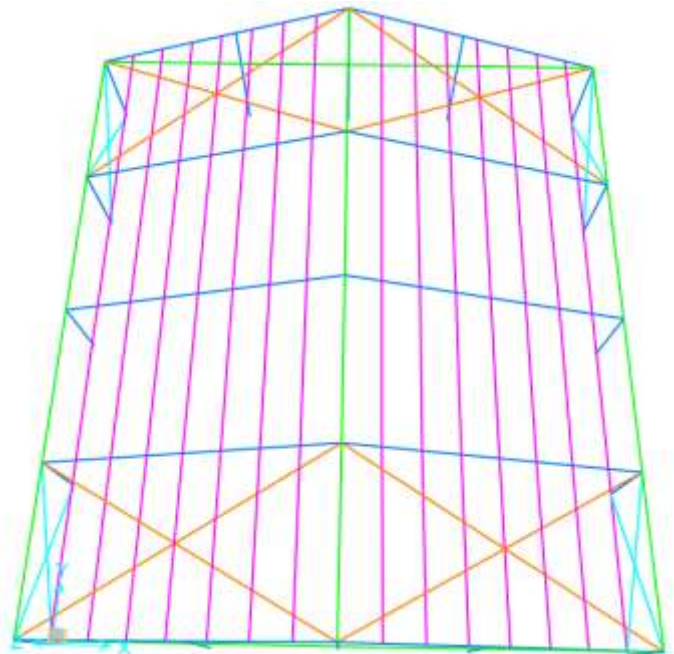
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7 Summary

7.1 Conclusions

- a. The 18m x 20m Event Deluxe Tent structure as specified has been analyzed with a conclusion that it has the capacity to withstand wind speeds up to and including **100km/hr**.
- b. For forecast winds in excess of **100km/hr** – all fabric shall be removed from the frames, and the structure should be completely dismantled.
- c. Wall cross bracing as well as roof cable bracing are required at each end bay and every second bay in between to resist against lateral movement due to wind direction2.
- d. For uplift due to 100km/hr, 12 kN (1.2T) holding down weight/per leg for upright support is required.
- e. For uplift due to 100km/hr, 10 kN (1T) hold down weight/ per leg for gable pole is required.
- f. The bearing pressure of soil should be clarified and checked by an engineer prior to any construction for considering foundation and base plate.
- g. Bracing Cables are required to have the minimum tensile strength (SWL) equal to 30kN.
- h. It is important to use 60x60x2.5 profile for all intermediate purlins with spacing not exceeding 1200mm. This means 14 intermediate purlins are required per bay (as illustrated below).**
- i. It is important to use 152x119x4 profile for all gable poles.**
- j. It is important to use 80x80x2.5 profile (or equivalent) for all wall cross-bracings.**

MEMBER(S)	Section	b	d	t
		mm	mm	mm
Rafter	152x119x4	119	152	4
Upright Support	152x119x4	119	152	4
Gable Pole	152x119x4	119	152	4
Ridge & Eave Purlin	85X102X3	102	85	3
Gable Beam	85X102X3	102	85	3
Intermediate Purlin	60x60x2.5	60	60	2.5
Brace	80x80x2.5	80	80	2.5



Yours faithfully,

E.A. Bennett M.I.E. Aust. NPER 198230



8 Appendix A – Base Anchorage Requirements

Event Deluxe Tent:

Tent Span	Sile Type	Required Weight Per Leg
18 m	A	1200kg
	B	1200kg
	C	1200kg
	D	1200kg
	E	1200kg
16 m	A	1100kg
	B	1100kg
	C	1100kg
	D	1100kg
	E	1100kg
15 m	A	1000kg
	B	1000kg
	C	1000kg
	D	1000kg
	E	1000kg
12 m	A	850kg
	B	850kg
	C	850kg
	D	850kg
	E	850kg
10 m	A	800kg
	B	800kg
	C	800kg
	D	800kg
	E	800kg
9 m	A	800kg
	B	800kg
	C	800kg
	D	800kg
	E	800kg
8 m	A	750kg
	B	750kg
	C	750kg
	D	750kg
	E	750kg

Definition of Soil Types:

Type A : Loose sand such as dunal sand. Uncompacted site filling may also be included in this soil type.

Type B : Medium to stiff clays or silty clays

Type C: Moderately compact sand or gravel eg. of alluvial origin.

Type D : Compact sand and gravel eg. Weathered sandstone or compacted quarry rubble hardstand

Type E : Concrete slab on ground. Number of dyna bolts and slab thickness to be designed.



9 Appendix B – Hold Down Method Details

