Civil & Structural Engineering Design Services Pty. Ltd.

Client: Easy Signs Pty. Ltd

Project: Design check –3m × 4.5m Folding Marquees for Pop-up Gazebos for 45km/hr Wind Speed

Reference: Easy Signs Pty. Ltd. Technical Data

Report by: TLP

Checked by: TB

Date: 07/02/2024

Amendment:

JOB NO: E-11-265829A

Table of Contents

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List of Figures

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1 Introduction

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The following structural drawings and calculations are for transportable tents supplied Easy Signs Pty Ltd.

The report examines the effect of 3s gust wind of 45 km/hr on 3m x 4.5 m Folding Marquees for Pop-up Gazebos 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 Aluminium 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 folded.

2.3 For forecast winds in excess of (refer to summary) the structure should be completely folded. (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 category 2 in AS. 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.

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 Design of fabric is by others.

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2.10 No Fabrics or doors should be used for covering the sides of unbraced Folding Marquees due to the lack of bracing within the system and insufficient out-of-plane stiffness of framing.

3 Specifications

3.1 General

Tent Category	
Material	Aluminum 6061T6

Size	Model
Material	Folding Marquees

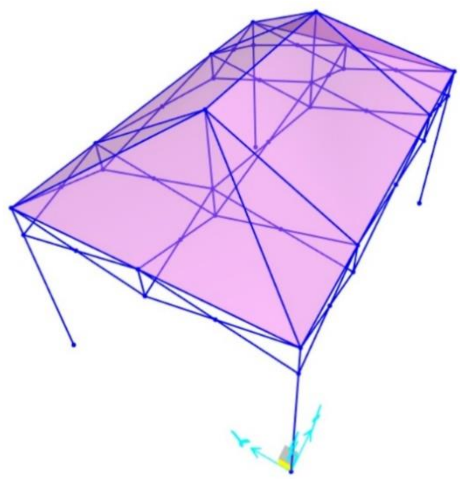
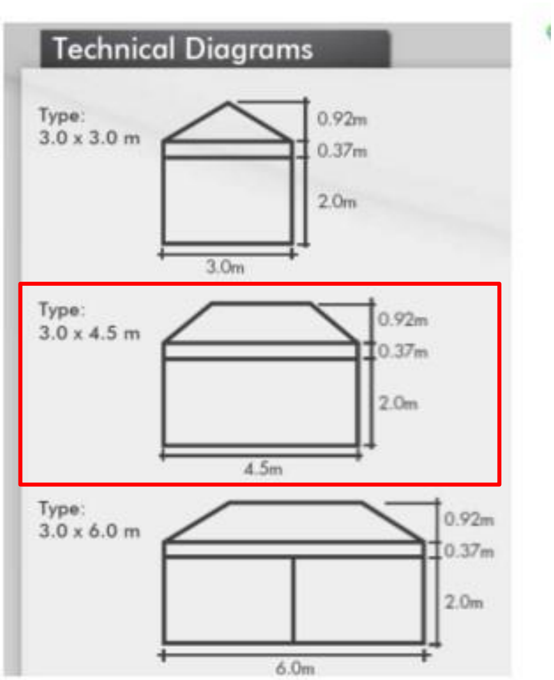


Figure 1: Aluminium Gazebo model



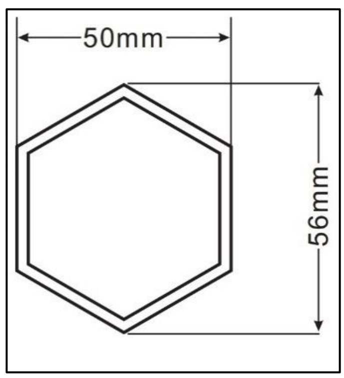


Figure 3: Leg outer cross section

Figure 2: Technical diagram of the gazebo structure

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3.2 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
Upright Support	50x56x1.8	50	56	1.8	28.0	368.6	6264.5	5884.6	7349.2	6796.2	175405.7	147114.9	239935.9	21.8	285.9
Brace	50x56x2	50	56	2	28.0	408.0	6883.4	6461.8	8104.0	7492.0	192736.0	161544.0	263469.2	21.7	284.2

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 45 km/hr gust	W	0.078 C_{fig}	1.0	0.138 C_{fig}

4.2 Load Combinations

4.2.1 Serviceability

Gravity = 1.0 × G

Wind = 1.0 × G + 1.0 × W

4.2.2 Ultimate

Downward = 1.35 × G

= 1.2 × G + Wu

Upward = 0.9 × G + Wu

5 Wind Analysis

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

5.1 Parameters

Terrain category = 2

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

VR = 12.50m/s (45 km/hr) (regional 3 s gust wind speed)

Md = 1

Ms = 1

Mt = 1

$M_{z,cat}$ = 0.91 (Table 4.1(B) AS1170.2)

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$V_{sit,\beta}$ = 11.38 m/s

Height of structure (h) = 2.8 m (mid of peak and eave)

Width of structure (w) = 3 m

Length of structure (l) = 4.5 m

Pressure $p = 0.5\rho_{air}(V_{sit,\beta})^2 C_{fig} C_{dyn} = 0.5 \times 1.2 \times 11.38^2 \times 1 \times 1 = 0.078kPa$

5.2 Pressure Coefficients (C_{fig})

Name	Symbol	Value	Unit	*Notes*	*Ref.*
		Input			
Importance level		5			*Table 3.1 - Table 3.2 (AS1170.0)*
Annual probability of exceedance		Temporary			*Table 3.3*
Regional gust wind speed		**45**	Km/hr		Table 3.1
Regional gust wind speed	V_R	**12.50**	m/s		
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	$V_{Site,\beta}$	**11.38**	m/s	$V_{Site,\beta}=V_R*M_d*M_{z,cat}*M_S,M_t$	
Pitch	α	30	Deg		
Pitch	α	0.52	rad		
Width	B	0	m		
Width Span	S_w	-	m		
Length	D	-	m		
Height	Z	2.8	m		
Bay Span		-	m		
Purlin Spacing		-	m		
Number of Intermediate Purlin		-			
		Wind Pressure			
ρair	ρ	1.2	Kg/m³		

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dynamic response factor	C_{dyn}	1			
Wind Pressure	ρ*C_{fig}	**0.078**	Kg/m^2	$\rho=0.5\rho_{air}*(V_{des,\beta})^2*C_{fig}*C_{dyn}$	*2.4 (AS1170.2)*

Wind DIRECTION 1 ((θ=0)
External Pressure

4. Free Roof				*α=0°*	
Area Reduction Factor	K_a	1			*D7*
local pressure factor	K_l	1			
porous cladding reduction factor	K_p	1			
External Pressure Coefficient **MIN**	$C_{P,w}$	-0.3			
External Pressure Coefficient **MAX**	$C_{P,w}$	0.8			
External Pressure Coefficient **MIN**	$C_{P,l}$	-0.7			
External Pressure Coefficient **MAX**	$C_{P,l}$	0			
aerodynamic shape factor **MIN**	$C_{fig,w}$	-0.30			
aerodynamic shape factor **MAX**	$C_{fig,w}$	0.80			
aerodynamic shape factor **MIN**	$C_{fig,l}$	-0.70			
aerodynamic shape factor **MAX**	$C_{fig,l}$	0.00			
Pressure Windward **MIN**	P	**-0.02**	**kPa**		
Pressure Windward **MAX**	P	**0.06**	**kPa**		
Pressure Leeward **MIN**	P	**-0.05**	**kPa**		
Pressure Leeward **MAX**	P	**0.00**	**kPa**		

WIND DIRECTION 2 (θ=90)

External Pressure

4. Free Roof				*α=180°*	*D7*
Area Reduction Factor	K_a	1			
local pressure factor	K_l	1			
porous cladding reduction factor	K_p	1			
External Pressure Coefficient **MIN**	$C_{P,w}$	-0.3			
External Pressure Coefficient **MAX**	$C_{P,w}$	0.4			
External Pressure Coefficient **MIN**	$C_{P,l}$	-0.4			
External Pressure Coefficient **MAX**	$C_{P,l}$	0			
aerodynamic shape factor **MIN**	$C_{fig,w}$	-0.30			
aerodynamic shape factor **MAX**	$C_{fig,w}$	0.40			
aerodynamic shape factor **MIN**	$C_{fig,l}$	-0.40			
aerodynamic shape factor **MAX**	$C_{fig,l}$	0.00			
Pressure **MIN (Windward Side)**	P	**-0.02**	**kPa**		
Pressure **MAX (Windward Side)**	P	**0.03**	**kPa**		
Pressure **MIN (Leeward Side)**	P	**-0.03**	**kPa**		

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5.2.1 Pressure Summary

Pressure **MAX (Leeward Side)**	P	**0.00**	**kPa**

5.2.1 Pressure summary

WIND EXTERNAL PRESSURE	Direction1		Direction2		
	Min (Kpa)	Max (Kpa)		Min (Kpa)	Max (Kpa)
W	-0.02	0.06	W	-0.02	0.03
L	-0.05	0.00	L	-0.03	0.00

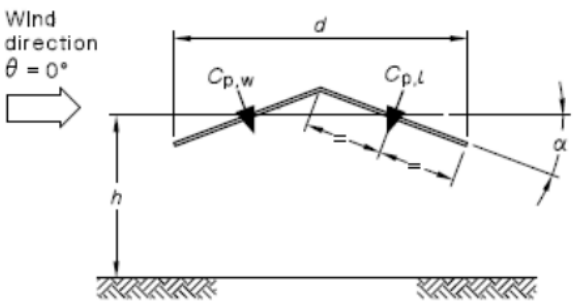
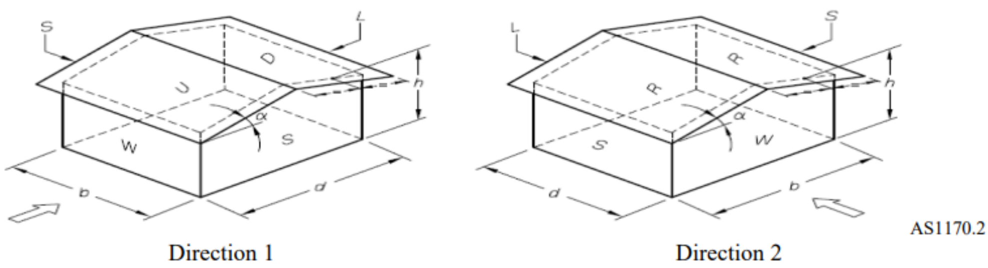


FIGURE D3 PITCHED FREE ROOFS



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5.3 Wind Load Diagrams

5.3.1 Wind 1(case 1)

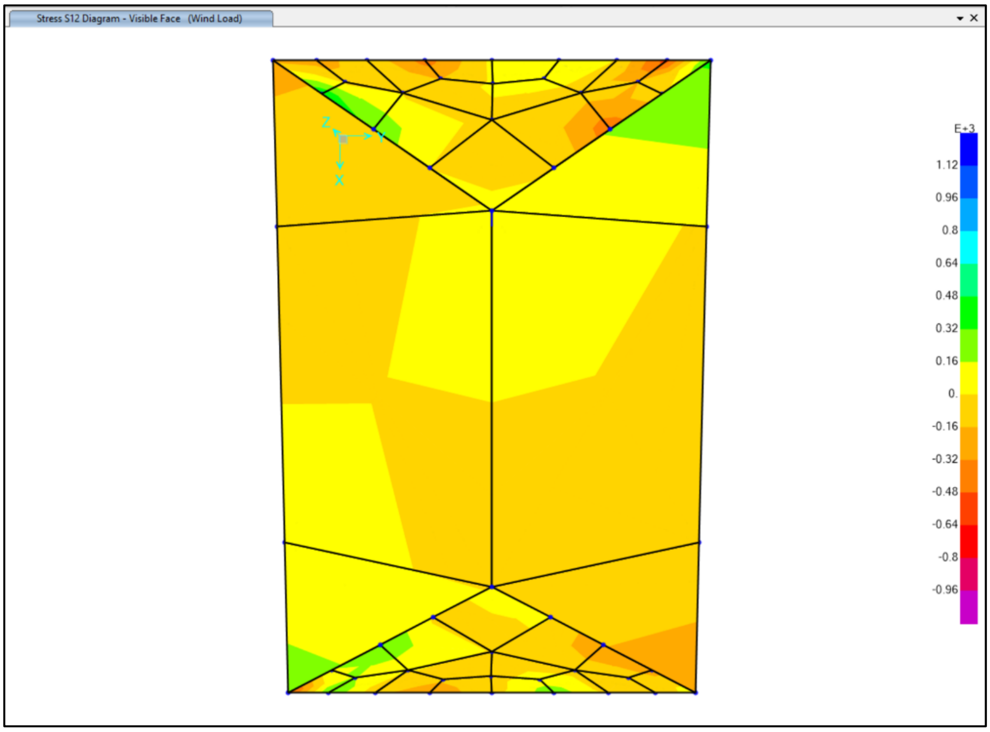

Figure 2: Stress distribution under wind 1 (case 1)

5.3.2 Wind 1(case 2)

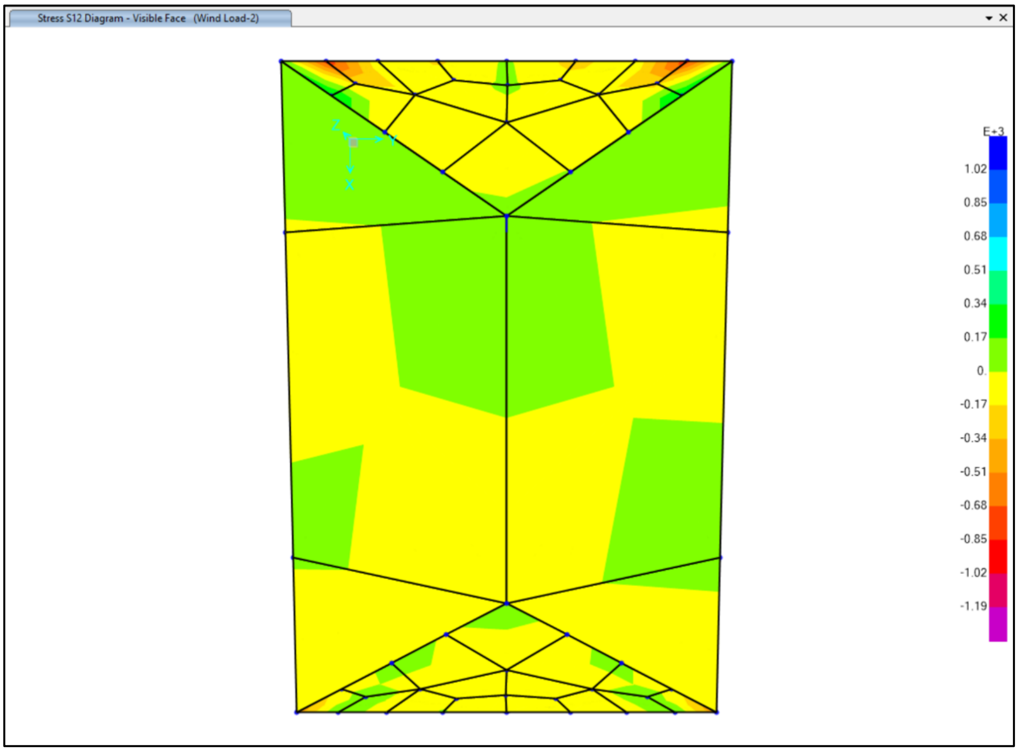

Figure 3: Stress distribution under wind 1 (case 2)

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5.3.3 Wind 2 (case 1)

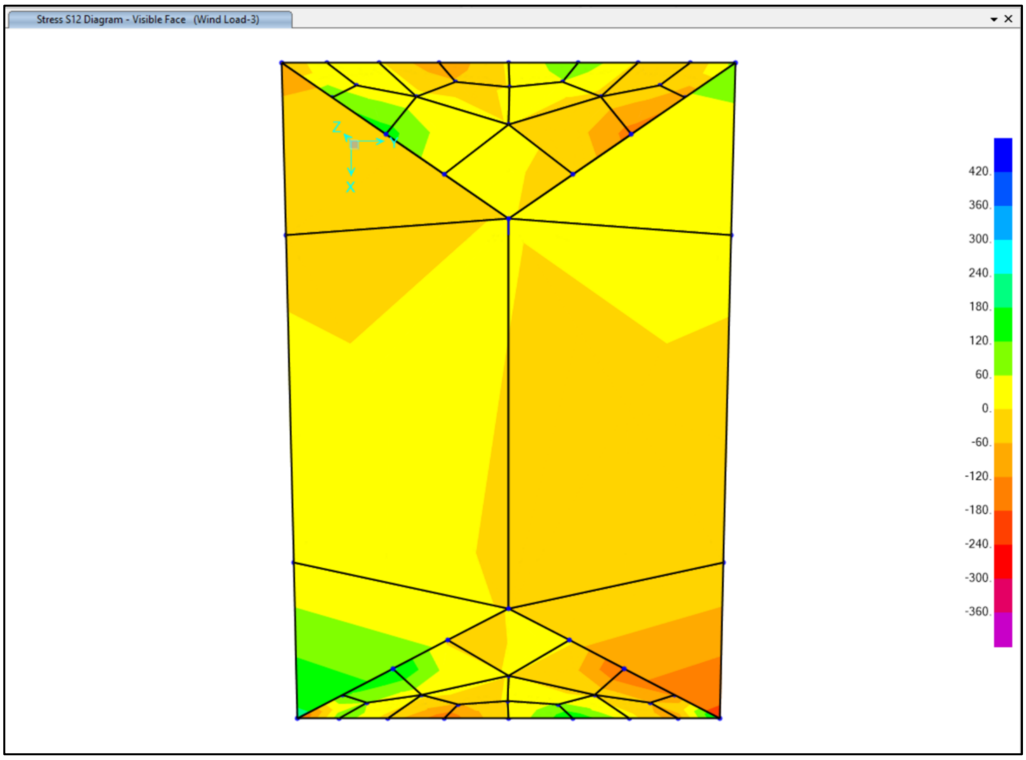

Figure 4: Stress distribution under wind 2 (case 1)

5.3.4 Wind 2 (case 2)

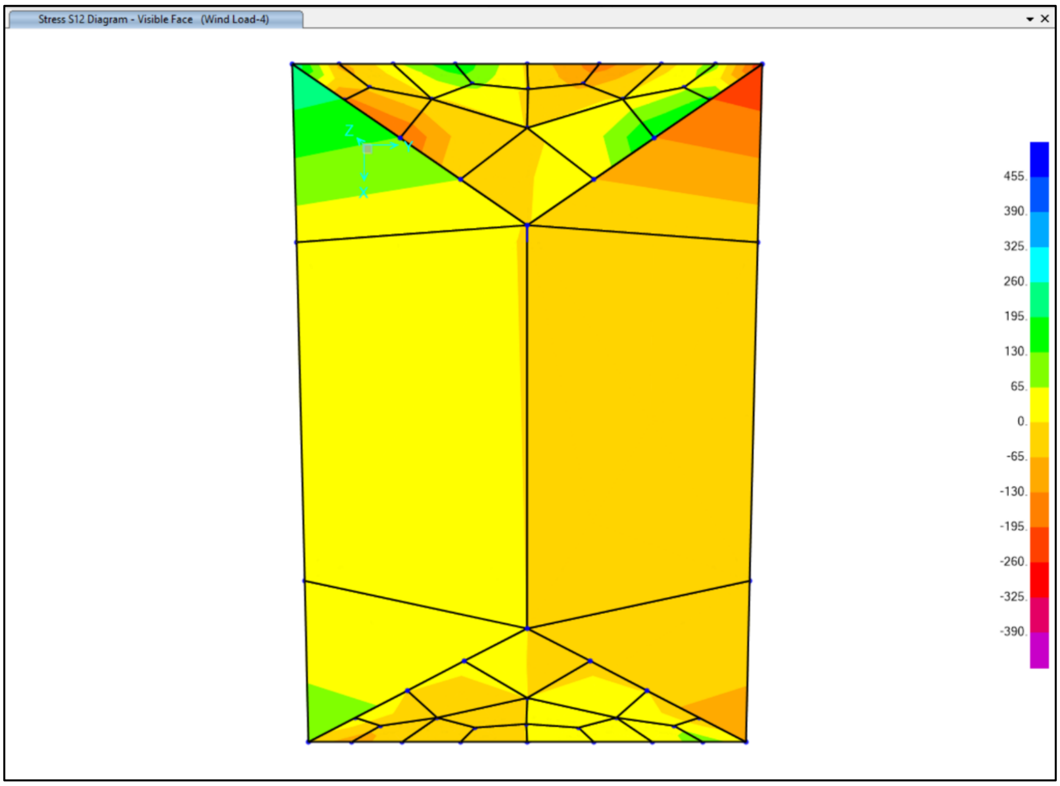

Figure 5: Stress distribution under wind 2 (case 2)

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

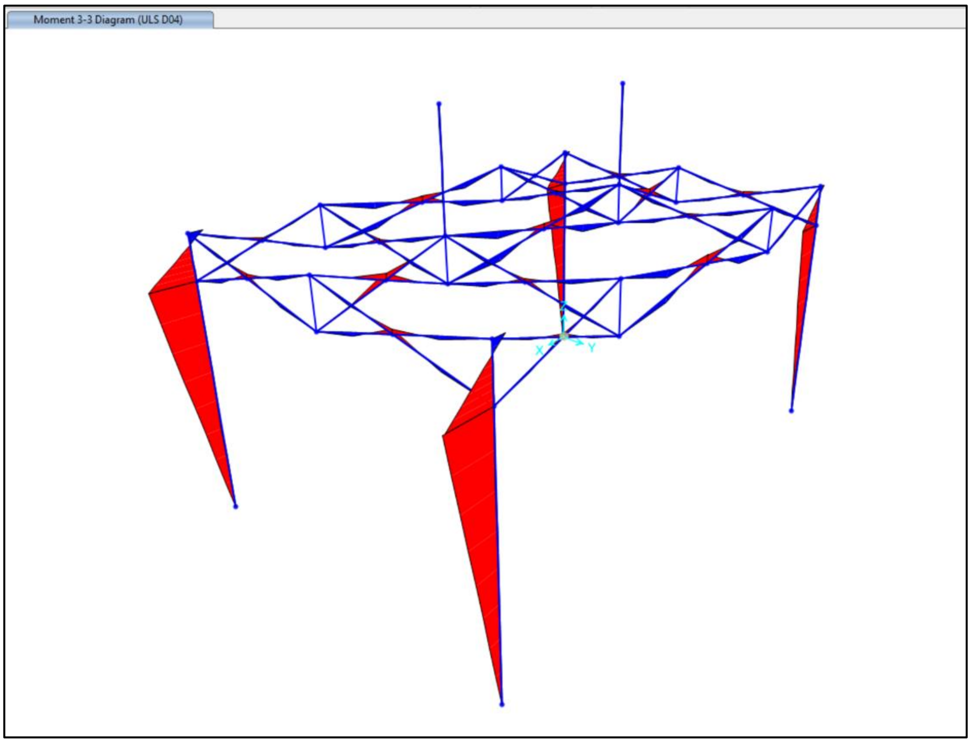

Figure 6: Max Bending Moment diagram due to critical load combination in major axis

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

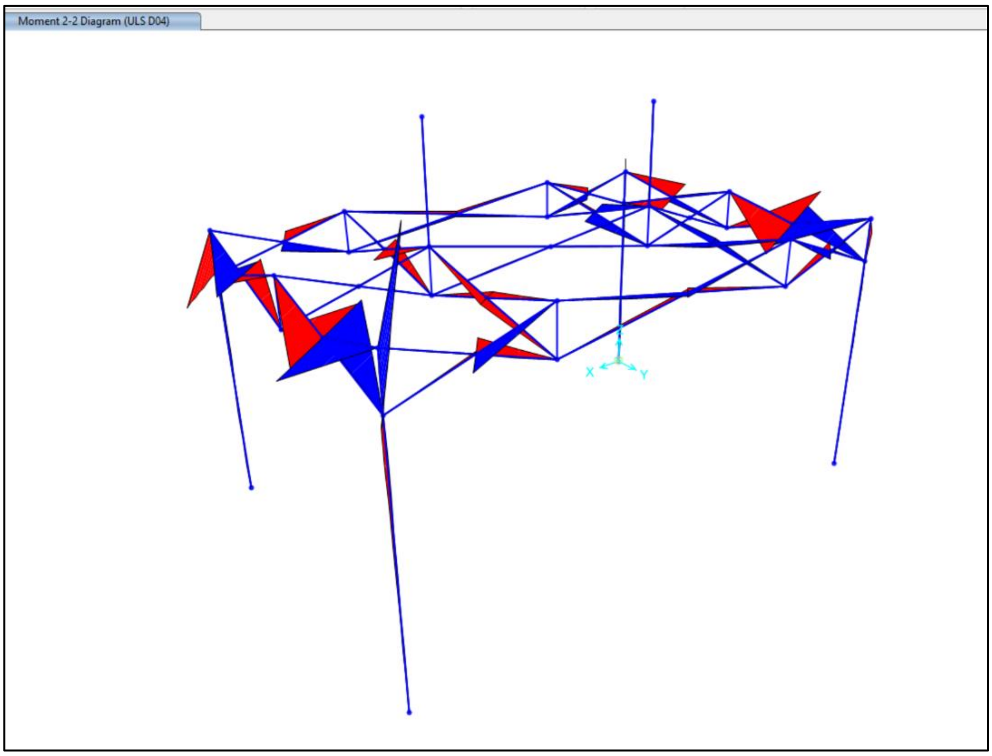

Figure 7: Max Bending Moment diagram due to critical load combination in minor axis

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5.3.7 Max Shear in due to critical load combination

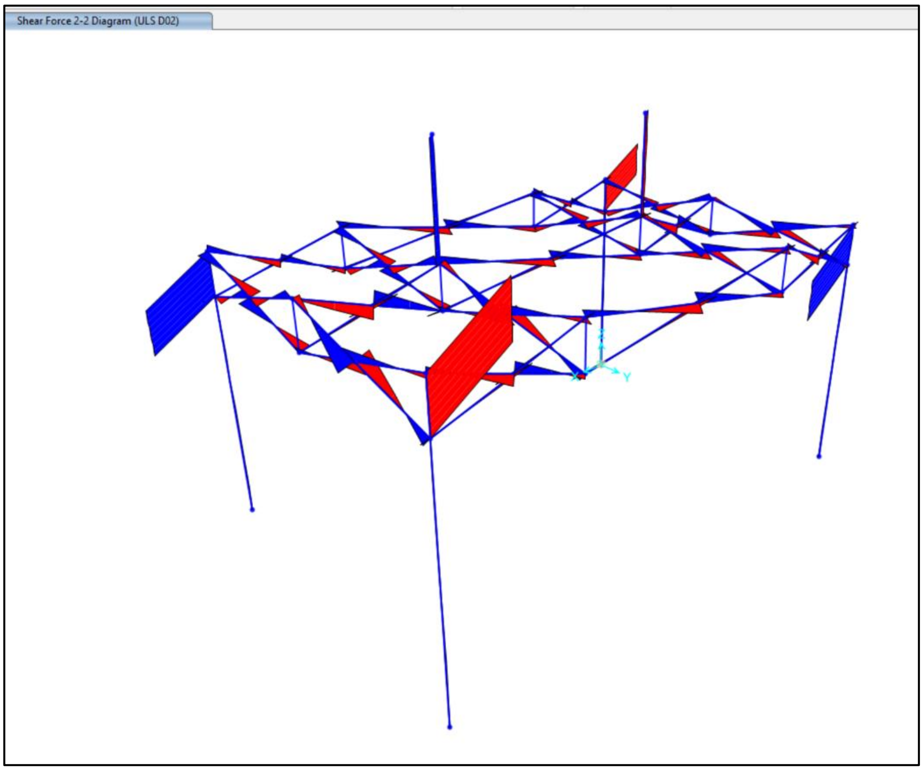

Figure 8: Max Shear force diagram due to critical load combination

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

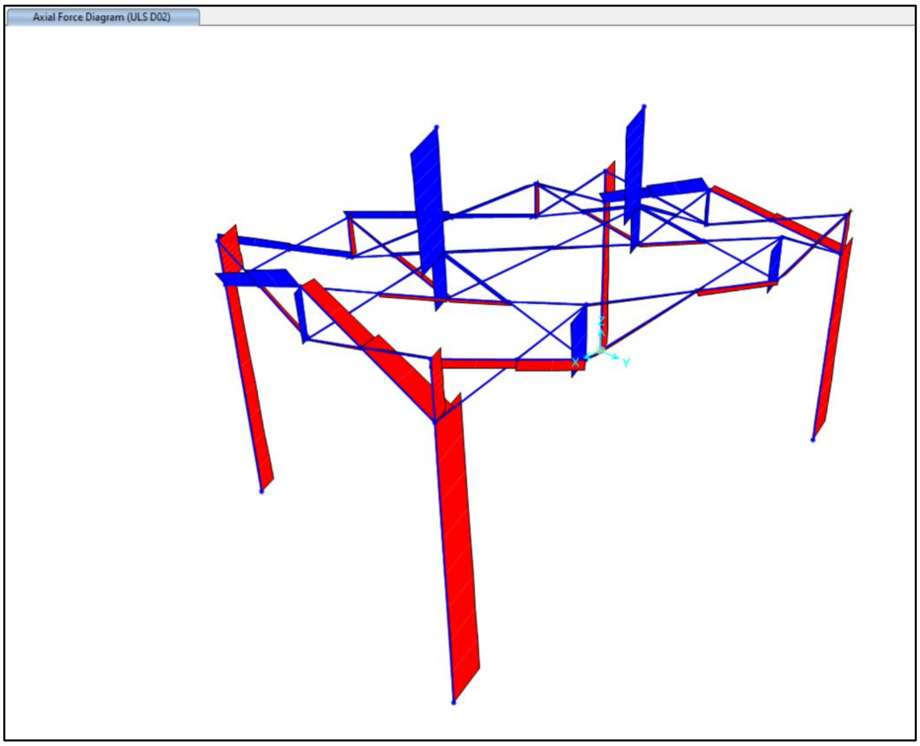

Figure 9: Max Axial force diagram in upright support and roof beam due to critical load combination

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5.3.9 Max reactions

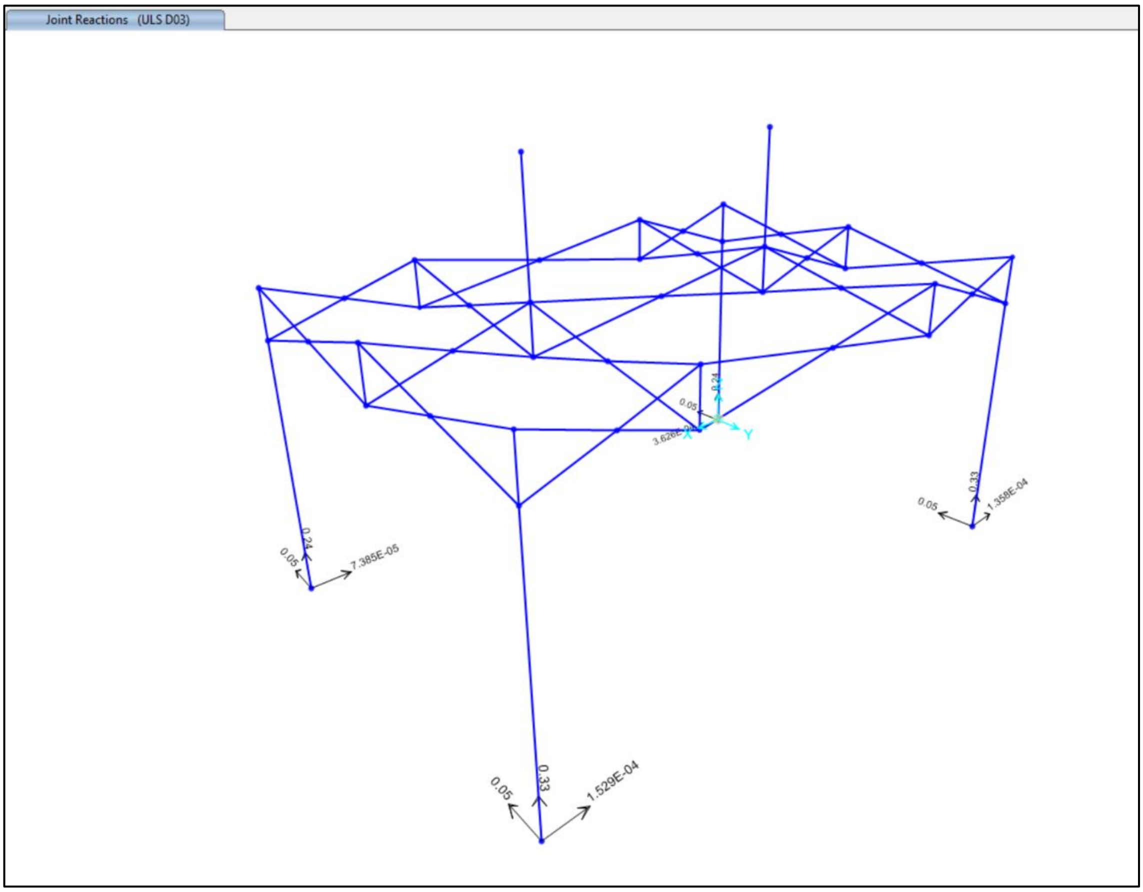

Figure 10: Max reactions at the supports

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6 Checking Members Based on AS1664.1 ALUMINUM LIMIT STATE DESIGN

6.1 Brace trust (scissor beam)

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
100x50x5	**Brace**					
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}	=	172	MPa	*Ultimate*	
	F_{sy}	=	138	MPa	*Yield*	
Bearing	F_{bu}	=	138	MPa	*Ultimate*	
	F_{by}	=	386	MPa	*Yield*	
Modulus of elasticity	E	=	70000	MPa	*Compressive*	
	k_t	=	1			T3.4(B)
	k_c	=	1			
FEM ANALYSIS RESULTS						
Axial force	P	=	0	kN	*compression*	
	P	=	0.41	kN	*Tension*	
In plane moment	M_x	=	0.01	kNm		
Out of plane moment	M_y	=	0	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	=	408	mm^2		
In-plane elastic section modulus	Z_x	=	6883.4286	mm^3		
Out-of-plane elastic section mod.	Z_y	=	6461.76	mm^3		
Stress from axial force	$\mathbf{f_a}$	=	P/A_g			
		=	**0.00**	**MPa**	*compression*	
		=	**1.00**	**MPa**	*Tension*	
Stress from in-plane bending	$\mathbf{f_{bx}}$	=	M_x/Z_x			
		=	**1.45**	**MPa**	*compression*	
Stress from out-of-plane bending	$\mathbf{f_{by}}$	=	M_y/Z_y			
		=	**0.00**	**MPa**	*compression*	
Tension						
3.4.3 *Tension in rectangular tubes*						
	$\mathbf{\phi F_L}$	**=**	**228.95**	**MPa**		
		OR				
	$\mathbf{\phi F_L}$	**=**	**222.70**	**MPa**		

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COMPRESSION						
3.4.8 *Compression in columns, axial, gross section*						
1. General						… 3.4.8.1
Unsupported length of member	L	=	773	mm		
Effective length factor	k	=	1.00			
Radius of gyration about buckling axis (Y)	r_y	=	19.90	mm		
Radius of gyration about buckling axis (X)	r_x	=	21.73	mm		
Slenderness ratio	kLb/ry	=	38.85			
Slenderness ratio	kL/rx	=	35.57			
Slenderness parameter	λ	=	0.73			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.848			
Factored limit state stress	**ϕF_L**	**=**	**174.21**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	38.85			
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)
Max. distance between toes of fillets of supporting elements for plate	b'	=	46			
	t	=	2	mm		
Slenderness	b/t	=	23			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	32.87			
Factored limit state stress	**ϕF_L**	**=**	**199.03**	**MPa**		
Most adverse compressive limit state stress	F_a	=	174.21	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.00		PASS	
BENDING - IN-PLANE						

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***3.4.15** Compression in beams, extreme fibre, gross section rectangular tubes, box sections*

Unbraced length for bending	L_b	=	773	mm		
Second moment of area (weak axis)	I_y	=	161544	mm^4		
Torsion modulus	J	=	263469.18	mm^3		
Elastic section modulus	Z	=	6883.4286	mm^3		
Slenderness	S	=	51.58			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**213.91**	**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'	=	46	mm		
	t	=	2	mm		
Slenderness	b/t	=	23			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**199.03**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	199.03	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.01		PASS	

BENDING - OUT-OF-PLANE

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

Factored limit state stress	**ϕF_L**	=	**199.03**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	199.03	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	=	174.21	MPa		… 3.4.8

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	F_{ao}	=	199.03	MPa		… 3.4.10
	F_{bx}	=	199.03	MPa		… 3.4.17
	F_{by}	=	199.03	MPa		… 3.4.17
	f_a/F_a	=	0.005			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.01	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	52	mm		
	t	=	2	mm		
Slenderness	h/t	=	26			
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			
			0.03	**MPa**		
***3.4.25** Shear in webs (Minor Axis)*						
Clear web height	b	=	46	mm		
	t	=	2	mm		
Slenderness	b/t	=	23			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sy}**	=	V/A_w			
			0.03	**MPa**		
Most adverseshear capacity factor (Major Axis)	f_{sx}/F_{sx}	=	0.00	**MPa**		
Most adverseshear capacity factor (Minor Axis)	f_{sy}/F_{sy}	=	0.00	**Mpa**	PASS	
COMBINED ACTIONS						
***4.4** Combined Shear, Compresion and bending*						
Check:	$f_a/F_a + f_b/F_b + (f_s/F_s)^2 \leq 1.0$					
i.e.	0.01	≤	1.0		PASS	

6.2 Upright supports (outer)

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
50x56x1.8	**Upright Support**				

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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}	=	172	MPa	*Ultimate*	
	F_{sy}	=	138	MPa	*Yield*	
Bearing	F_{bu}	=	138	MPa	*Ultimate*	
	F_{by}	=	386	MPa	*Yield*	
Modulus of elasticity	E	=	70000	MPa	*Compressive*	
	k_t	=	1			T3.4(B)
	k_c	=	1			
FEM ANALYSIS RESULTS						
Axial force	P	=	0.33	kN	*compression*	
	P	=	0	kN	*Tension*	
In plane moment	M_x	=	0.09	kNm		
Out of plane moment	M_y	=	0.02	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	**=**	368.64	mm^2		
In-plane elastic section modulus	Z_x	**=**	6264.491	mm^3		
Out-of-plane elastic section mod.	Z_y	**=**	5884.5972	mm^3		
Stress from axial force	$\mathbf{f_a}$	**=**	P/A_g			
		=	**0.90**	**MPa**	*compression*	
		=	**0.00**	**MPa**	*Tension*	
Stress from in-plane bending	$\mathbf{f_{bx}}$	**=**	M_x/Z_x			
		=	**14.37**	**MPa**	*compression*	
Stress from out-of-plane bending	$\mathbf{f_{by}}$	**=**	M_y/Z_y			
		=	**3.40**	**MPa**	*compression*	
Tension						
***3.4.3** Tension in rectangular tubes*						
	$\mathbf{\phi F_L}$	**=**	**228.95**	**MPa**		
		OR				
	$\mathbf{\phi F_L}$	**=**	**222.70**	**MPa**		
COMPRESSION						
***3.4.8** Compression in columns, axial, gross section*						
1. General						… 3.4.8.1
Unsupported length of member	L	=	2000	mm		
Effective length factor	k	=	1.00			
Radius of gyration about buckling axis (Y)	r_y	=	19.98	mm		

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Radius of gyration about buckling axis (X)	r_x	=	21.81	mm		
Slenderness ratio	kLb/ry	=	100.12			
Slenderness ratio	kL/rx	=	91.69			
Slenderness parameter	λ	=	1.87			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.842			
Factored limit state stress	**ϕF_L**	**=**	**58.02**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	100.12			
***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)
Max. distance between toes of fillets of supporting elements for plate	b'	=	46.4			
	t	=	1.8	mm		
Slenderness	b/t	=	25.777778			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	32.87			
Factored limit state stress	**ϕF_L**	**=**	**191.23**	**MPa**		
Most adverse compressive limit state stress	F_a	=	58.02	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	=	2000	mm		
Second moment of area (weak axis)	I_y	=	1.47E+05	mm^4		
Torsion modulus	J	=	2.40E+05	mm^3		
Elastic section modulus	Z	=	6264.491	mm^3		
Slenderness	S	=	133.37			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			

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Factored limit state stress	**ϕF_L**	=	**203.90**	**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'	=	46.4	mm		
	t	=	1.8	mm		
Slenderness	b/t	=	25.777778			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**191.23**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	191.23	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.08		PASS	
BENDING - OUT-OF-PLANE						
NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)						
Factored limit state stress	**ϕF_L**	=	**191.23**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	191.23	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*						… 4.1.1(2)
	F_a	=	58.02	MPa		… 3.4.8
	F_{ao}	=	191.23	MPa		… 3.4.10
	F_{bx}	=	191.23	MPa		… 3.4.17
	F_{by}	=	191.23	MPa		… 3.4.17
	f_a/F_a	=	0.015			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.11	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	52.4	mm		

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	t	=	1.8	mm	
Slenderness	h/t	=	29.111111		
Limit 1	S_1	=	29.01		
Limit 2	S_2	=	59.31		
Factored limit state stress	**ϕF_L**	=	**130.99**	**MPa**	
Stress From Shear force	**f_{sx}**	=	V/A_w		
			0.23	**MPa**	
3.4.25 *Shear in webs (Minor Axis)*					
Clear web height	b	=	46.4	mm	
	t	=	1.8	mm	
Slenderness	b/t	=	25.777778		
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**	
Stress From Shear force	**f_{sy}**	=	V/A_w		
			1.07	**MPa**	
Most adverseshear capacity factor (Major Axis)	f_{sx}/F_{sx}	=	0.00	**MPa**	
Most adverseshear capacity factor (Minor Axis)	f_{sy}/F_{sy}	=	0.01	**Mpa**	PASS

COMBINED ACTIONS

4.4 *Combined Shear, Compresion and bending*

Check: $f_a/F_a + f_b/F_b + (f_s/F_s)^2 \leq 1.0$

i.e. 0.09 $\leq$ 1.0 PASS

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7 Summary

7.1 Conclusions

a. The 3m x 4.5m Folding Marquees Structure as specified has been analyzed with a conclusion that it has the capacity to withstand wind speeds up to and including 45km/hr.

b. For forecast winds in excess of 45km/hr – the structure should be completely folded.

c. For uplift due to 45km/hr, 0.6 kN (60kg) holding down weight/per leg for upright support is required.

d. The bearing pressure of soil should be clarified and checked by an engineer prior to any construction for considering foundation and base plate.

e. No Fabrics or doors should be used for covering the sides of <u>unbraced</u> Folding Marquees due to the lack of bracing within the system and insufficient out-of-plane stiffness of framing.

Yours faithfully,

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

8 Appendix A – Base Anchorage Requirements

3m x 4.5m 45mm Folding Marquees:

Tent span	Soil Type	Required weight per leg (kg)
3m	A	60
	B	60
	C	60
	D	60
	E	60
2m	A	45
	B	45
	C	45
	D	45
	E	45

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

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