

Regulation 1507: Certificate of Compliance—Design

To Victorian Building Authority

Relevant building surveyor:

Postal address: PO Box 536 Melbourne VIC 3001

From

Building practitioner: Edward Arthur Bennett

Category and class: Engineer - Civil

Registration No: EC 25923

Postal address: 3 Wanniti Road Belrose NSW 2085:

Property details (if applicable) STATEWIDE VICTORIA

Number: Street/road: City/suburb/town:

Lot/s: LP/PS: Volume: Folio:

Crown allotment: Section: Parish: County:

Municipal District:

Structure Type:

Folding Marquees

Activity Type: Wind – Various Speed Limits – 80km/hr in region A and Terrain Category 2

Compliance I, Edward A Bennett, did prepare the design and I certify that the part of the design described as 3m x 3m & 3m x 6m Folding Marquees complies with the following provisions of the Regulations:

Australian Standards **AS/NZS 1170.2:2011, AS4100:1998, AS1664.1:1997, National Construction Code Volume 1 2016, Temporary Structures 2015 Standard, Building Interim Regulations 2017**

Design documents

Computations: Refer document U-21-266019-2 (page 2-25) Dated 20/02/201

Hold down requirements: Refer to Summary

Minimum Ground Bearing Capacity: 100kPa

Evacuation wind speed limits: 80 km/hr

Maximum allowable super imposed loads: Refer to Summary

Prepared by: E.A. Bennett of Civil & Structural Engineering Design Services Pty. Ltd. Date: 20/02/2018

Test reports: N/A

Other documentation:

BCA Volume 1 Part B

ABCB Part 3

AS/NZS 1170.0:2002

AS/NZS 1170.1:2002

AS/NZS 1170.2:2011

AS/NZS 1664.1:1997

National Construction Code Volume 1 2016

Temporary Structures 2015 Standard

Signature

Signed:



E.A. Bennett M.I.E. Aust. BPB NSW-0282 & BPB VIC – EC 25923, NT - 38496ES & RPEQ 4541

Date: 20/02/2018



JOB NO. A-21-266019-2
Date: 20/02/2018

Civil & Structural Engineering Design Services Pty. Ltd.



Civil & Structural Engineering Design Services Pty. Ltd.

Client: Gazebo Guys

Project: Design check – 3m × 3m & 3m × 6m Folding Marquees for 80km/hr Wind Speed

Reference: Gazebo Guys Technical Data

Report by: KZ
Checked by: EAB
Date: 20/02/2018

JOB NO: A-21-266019-2



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1 Introduction

This Certification is the sole property for copyright of Mr. Ted Bennett of Civil & Structural Engineering Design Services Pty. Ltd. and the license holder for the exclusive use of this Certification, Gazebo Guys.

The following structural drawings and calculations are for the applicable transportable Folding marquees supplied by Gazebo Guys.

The report examines the effect of 3s gust wind of 80 km/hr on 3m x 6m Folding Marquees 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 Aluminum Limit State Design.



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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.
- 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

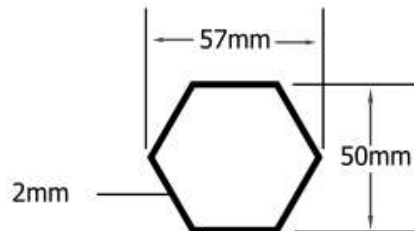
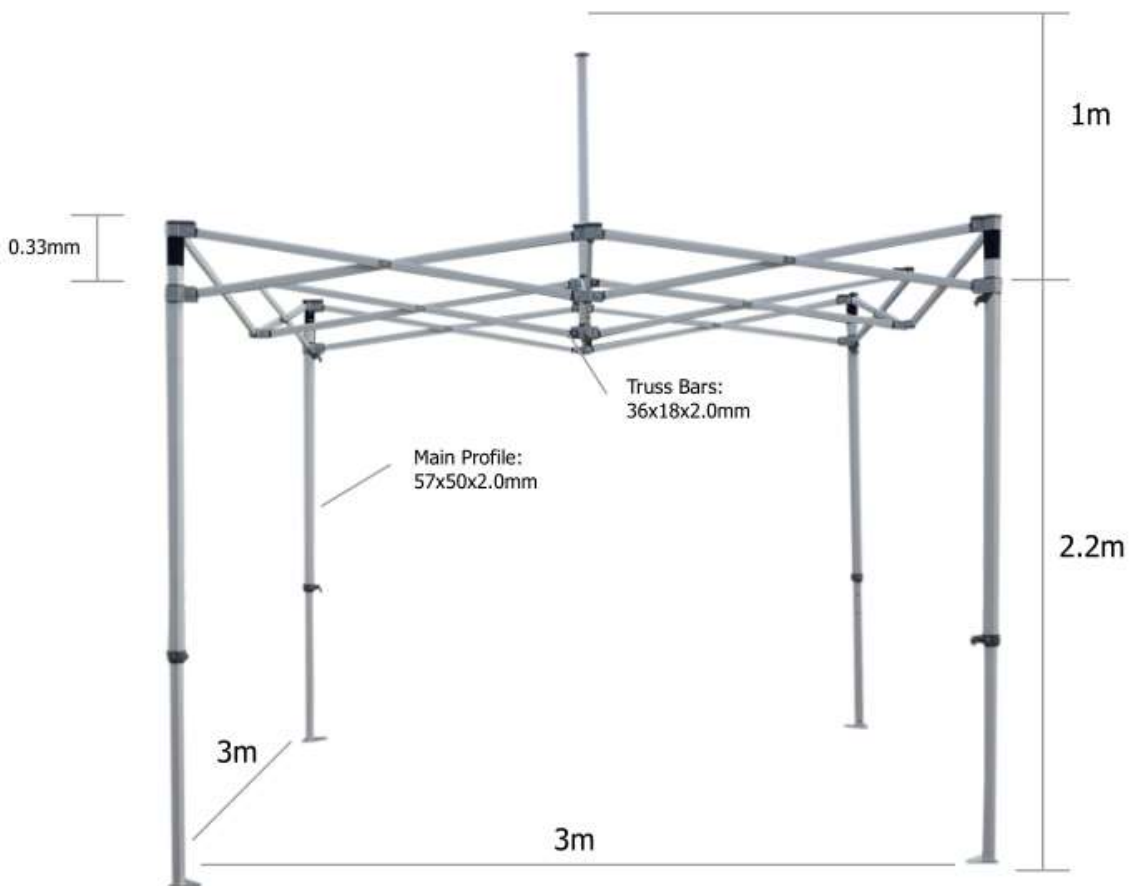
3.1 General

Frame Specifications 3x3m:

Height: 3.20m
Clearance: 2.2m
Frame Hexagon: 57 x 50 x 2mm
Truss Bars: 36 x 18mm
Material: Aluminium Frame
Weight: 33Kg

Tent category	
Material	Aluminum 6061T6

Size	Model
3m x 6m	Folding Marquees

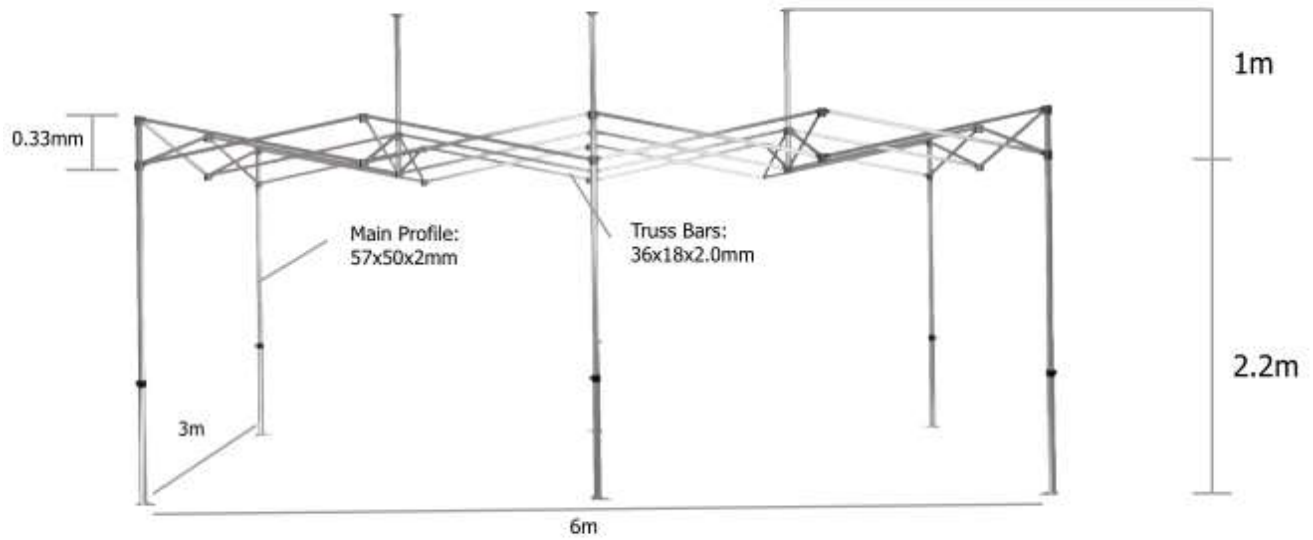




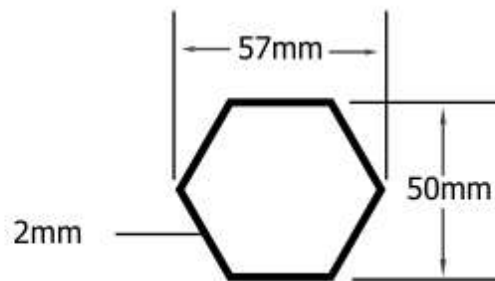
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Frame Specifications 3x6m:

- Height: 3.20m
- Clearance: 2.2m
- Frame Hexagon: 57x50x2mm
- Truss Bars: 36x18x2.0mm
- Material: Aluminium Frame
- Weight: 59Kg



Main Profile Outer Leg





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
Truss Bar	36x18x2	18	36	2	18.0	200.0	1764.1	1131.0	2248.0	1348.0	31754.7	10178.7	23674.9	12.6	7.1
Upright Support	HEX50x57x2	50	50	2	25.0	332.6	3692.8	3692.8	5323.9	5323.9	106602.0	106602.0	194193.0	17.9	17.9

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 80km/hr gust	W	0.245 C _{fig}	1.0	0.245 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 + W_u

Upward = 0.9 × G + W_u

5 Wind Analysis

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

5.1 Parameters

Terrain category = 2

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

$V_R = 22.22\text{m/s}$ (80km/hr)

(regional 3 s gust wind speed)

$M_d = 1$

$M_s = 1$

$M_t = 1$

$M_{z,cat} = 0.91$

(Table 4.1(B) AS1170.2)



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$$V_{sit,\beta} = 20.22 \text{ m/s}$$

Height of structure (h) = 2.8 m

(mid of peak and eave)

Width of structure (w) = 3 m

Length of structure (l) = 6 m

$$\begin{aligned} \text{Pressure (P)} &= 0.5\rho_{air} (V_{sit,\beta})^2 C_{fig} C_{dyn} \\ &= 0.245C_{fig} \text{ kPa} \end{aligned}$$

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			Table 3.3
Regional gust wind speed		80	Km/hr		Table 3.1 (AS1170.2)
Regional gust wind speed	V_R	22.22	m/s		
Wind Direction Multipliers	M_d	1			Table 3.2 (AS1170.2)
Terrain Category Multiplier	$M_{Z,Cat}$	0.91			Table 4.1 (AS1170.2)
Shield Multiplier	M_s	1			4.3 (AS1170.2)
Topographic Multiplier	M_t	1			4.4 (AS1170.2)
Site Wind Speed	$V_{Site,\beta}$	20.22	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	-	m		
Length	D	-	m		
Height	Z	2.8	m		
Wind Pressure					
ρ_{air}	ρ	1.2	Kg/m ³		
dynamic response factor	C_{dyn}	1			
Wind Pressure	$\rho * C_{fig}$	0.245	Kg/m ²	$\rho = 0.5\rho_{air} * (V_{des,\beta})^2 * C_{fig} * C_{dyn}$	2.4 (AS1170.2)
WIND DIRECTION 1 ($\theta=0$)					
External Pressure					



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4. Free Roof

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	$C_{P,w}$	0.8	
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	-0.07	kPa
Pressure Windward MAX	P	0.20	kPa
Pressure Leeward MIN	P	-0.17	kPa
Pressure Leeward MAX	P	0.00	kPa

$\alpha = 0^\circ$

D7

WIND DIRECTION 2 ($\theta=90$)

External Pressure

4. Free Roof

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	

$\alpha = 180^\circ$

D7



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Pressure MIN (Windward Side)	P	-0.07	kPa
Pressure MAX (Windward Side)	P	0.10	kPa
Pressure MIN (Leeward Side)	P	-0.10	kPa
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	-0.074	0.196	W	-0.074	0.098
L	-0.172	0.000	L	-0.098	0.000

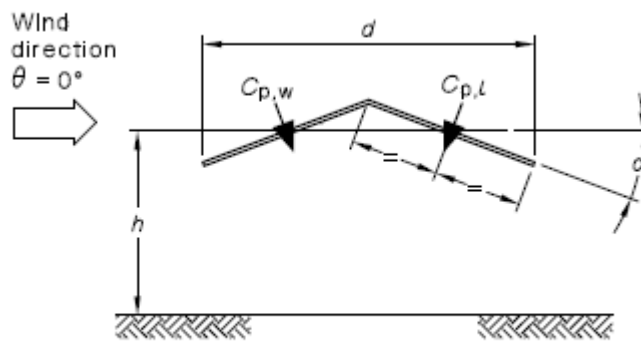
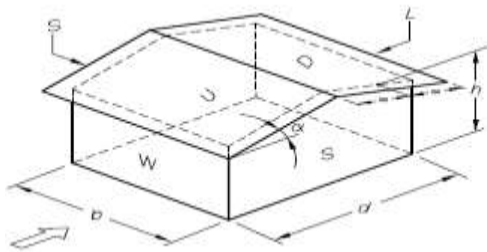
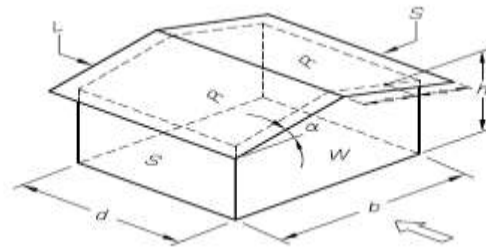


FIGURE D3 PITCHED FREE ROOFS



Direction 1



Direction 2

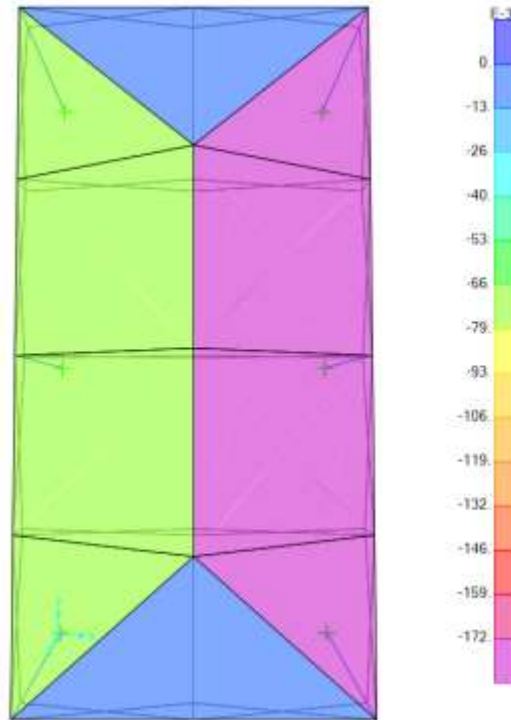
AS1170.2



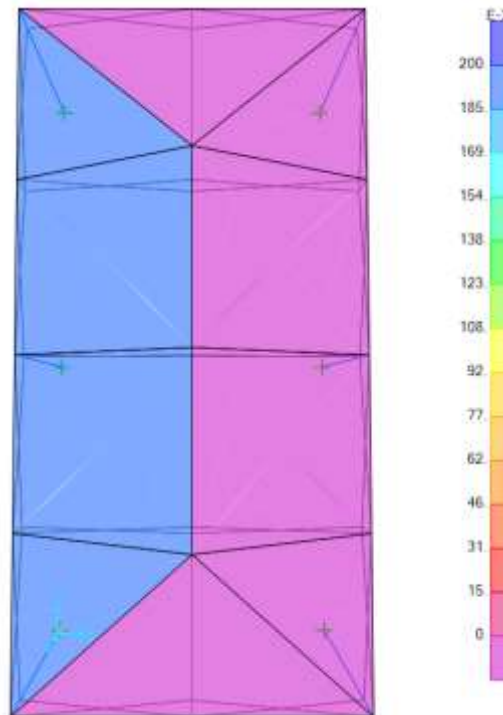
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5.3 Wind Load Diagrams

5.3.1 Wind 1(case 1)



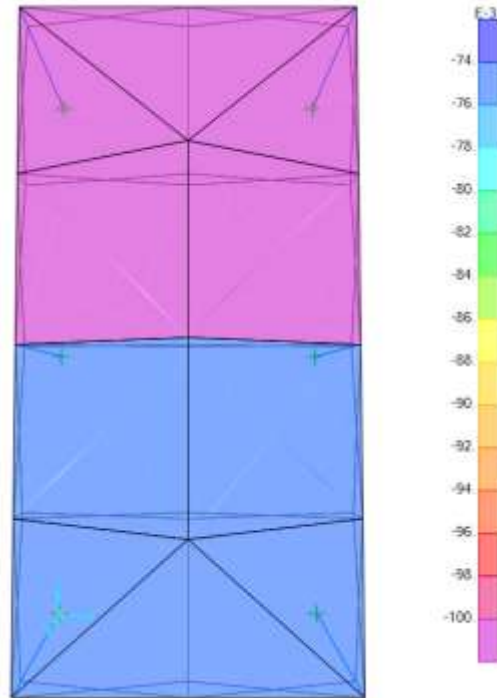
5.3.2 Wind 1(case 2)



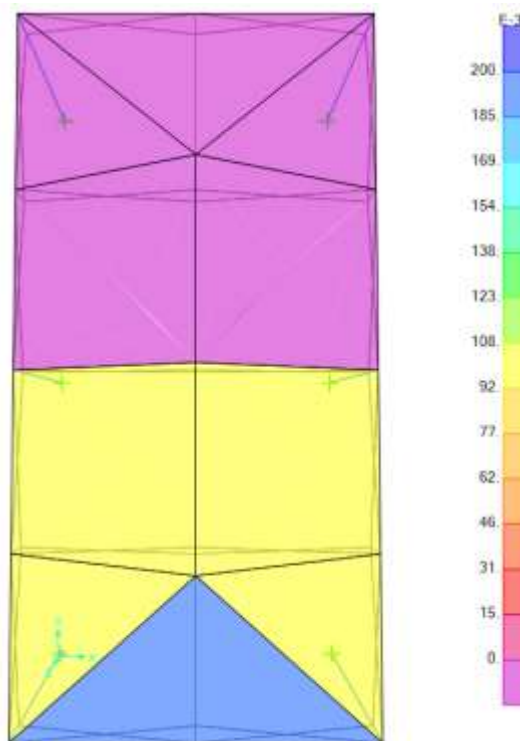


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5.3.3 Wind 2(Case1)



5.3.4 Wind 2(case 2)

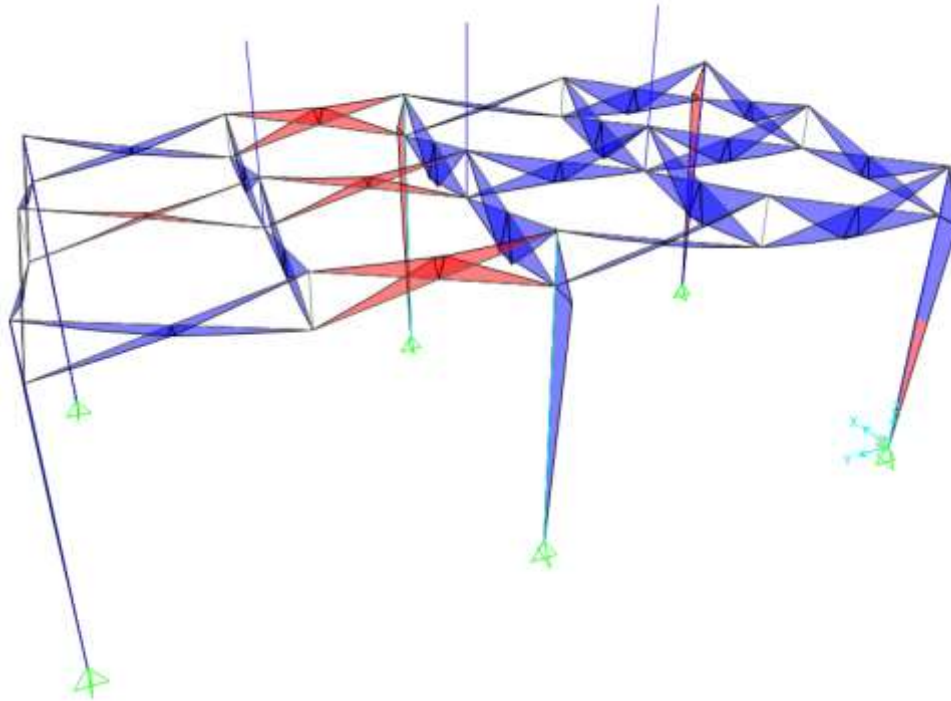


After 3D model analysis, each member is checked based on adverse load combination. In this regard the maximum bending moment, shear and axial force due to adverse load combinations for each member are presented as below:

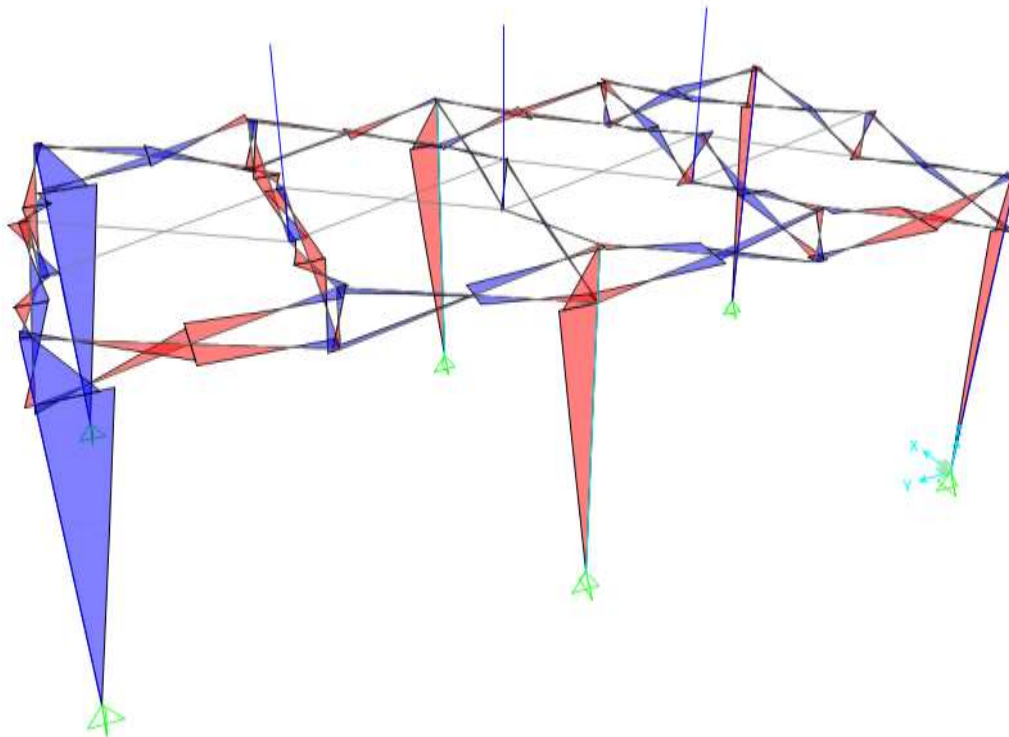


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5.3.5 Max Bending Moment due to critical load combination in major axis



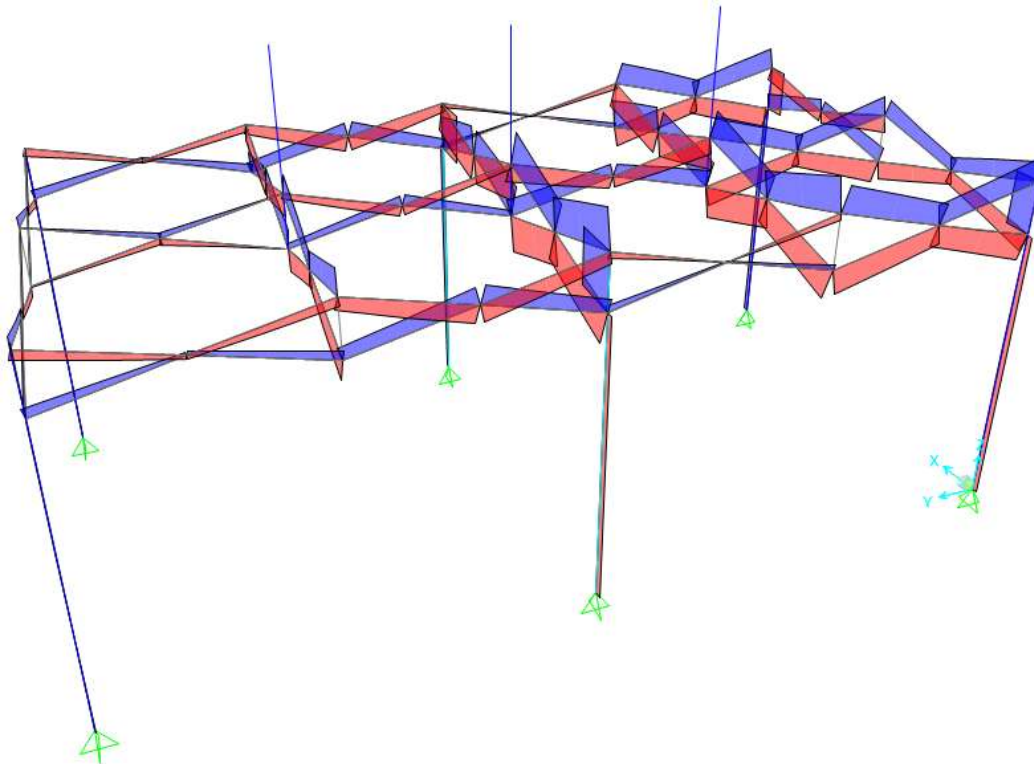
5.3.6 Max Bending Moment in minor axis due to critical load combination



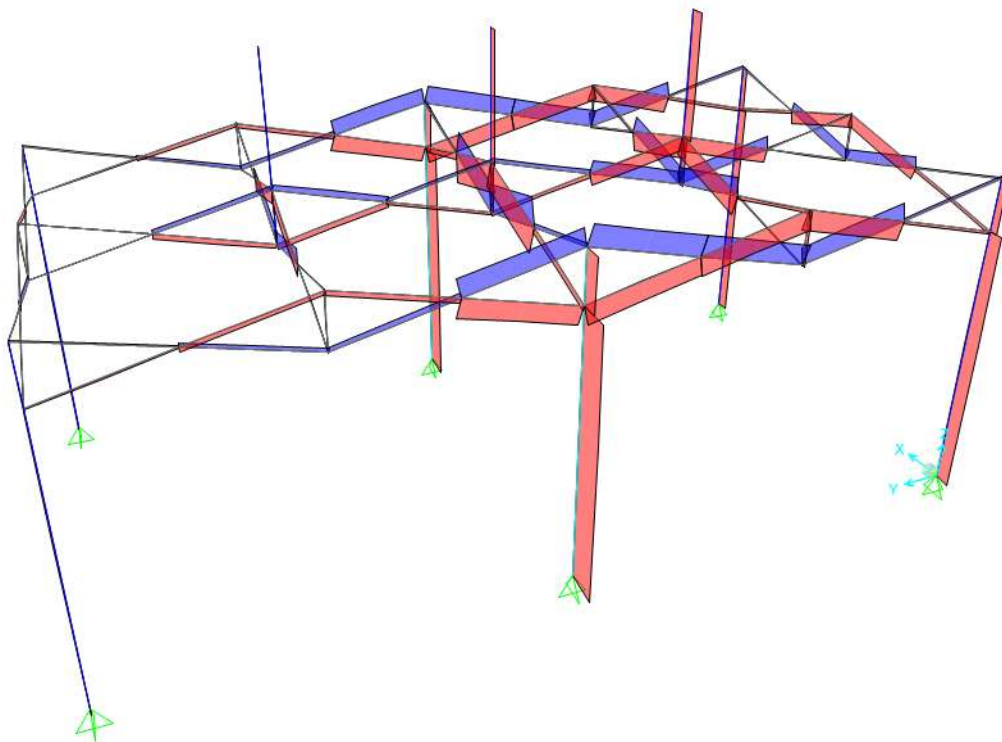


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5.3.7 Max Shear in due to critical load combination

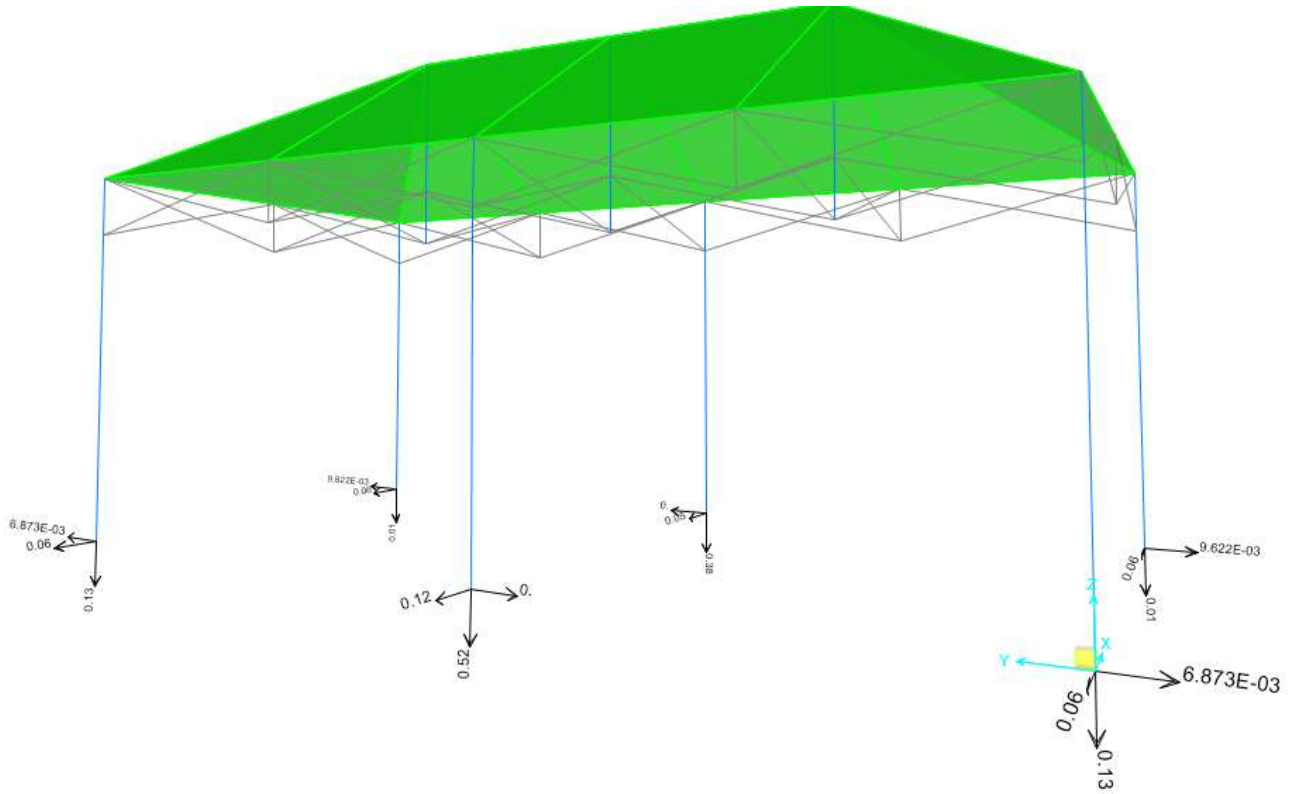


5.3.8 Max Axial force in upright support and roof beam due to critical load combination





5.3.9 Max reactions



Max Reaction N^* = 0.52kN

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

6.1 Scissors Beam

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
36x18x2	Truss				
	Bar				
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	



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	k_t	=	1.0		
	k_c	=	1.0		T3.4(B)
FEM ANALYSIS RESULTS					
Axial force	P	=	0.786 kN	<i>compression</i>	
	P	=	0 kN	<i>Tension</i>	
In plane moment	M_x	=	0.1099 kNm		
Out of plane moment	M_y	=	9.66E-15 kNm		
DESIGN STRESSES					
Gross cross section area	A_g	=	200 mm ²		
In-plane elastic section modulus	Z_x	=	1764.1481 mm ³		
Out-of-plane elastic section mod.	Z_y	=	1130.963 mm ³		
Stress from axial force	f_a	=	P/A_g		
		=	3.93 MPa	<i>compression</i>	
		=	0.00 MPa	<i>Tension</i>	
Stress from in-plane bending	f_{bx}	=	M_x/Z_x		
		=	62.30 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		
		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	=	1550 mm		
Effective length factor	k	=	1		
Radius of gyration about buckling axis (Y)	r_y	=	7.13 mm		
Radius of gyration about buckling axis (X)	r_x	=	12.60 mm		
Slenderness ratio	kLb/r_y	=	107.93		
Slenderness ratio	kL/r_x	=	123.01		
Slenderness parameter	λ	=	2.297		



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	D_c^*	=	90.3		
	S_1^*	=	0.33		
	S_2^*	=	1.23		
	ϕ_{cc}	=	0.902		
Factored limit state stress	ϕF_L	=	41.17	MPa	
<i>2. Sections not subject to torsional or torsional-flexural buckling</i>					
Largest slenderness ratio for flexural buckling	kL/r	=	123.01		... 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'	=	14		
	t	=	2	mm	
Slenderness	b/t	=	7		
Limit 1	S_1	=	12.34		
Limit 2	S_2	=	32.87		
Factored limit state stress	ϕF_L	=	228.95	MPa	
Most adverse compressive limit state stress	F_a	=	41.17	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.10		PASS
BENDING - IN-PLANE					
3.4.15 Compression in beams, extreme fibre, gross section rectangular tubes, box sections					
Unbraced length for bending	L_b	=	770	mm	
Second moment of area (weak axis)	I_y	=	1.02E+04	mm ⁴	
Torsion modulus	J	=	2.37E+04	mm ³	
Elastic section modulus	Z	=	1764.1481	mm ³	
Slenderness	S	=	175.01		
Limit 1	S_1	=	0.39		
Limit 2	S_2	=	1695.86		



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Factored limit state stress	ϕF_L	=	200.04	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'	=	14	mm		
	t	=	2	mm		
Slenderness	b/t	=	7			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	ϕF_L	=	228.95	MPa		
Most adverse in-plane bending limit state stress	F_{bx}	=	200.04	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.31		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	=	200.04	MPa		
Most adverse out-of-plane bending limit state stress	F_{by}	=	200.04	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	=	41.17	MPa		... 3.4.8
	F_{ao}	=	228.95	MPa		... 3.4.10
	F_{bx}	=	200.04	MPa		... 3.4.17
	F_{by}	=	200.04	MPa		... 3.4.17
	f_a/F_a	=	0.095			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by}$	\leq	1.0			... 4.1.1 (3)



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i.e. 0.41 ≤ 1.0

PASS

SHEAR

3.4.24 Shear in webs (Major Axis)

4.1.1(2)

Clear web height	h	=	32	mm
	t	=	2	mm
Slenderness	h/t	=	16	
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	
			0.84	MPa

3.4.25 Shear in webs (Minor Axis)

Clear web height	b	=	14	mm
	t	=	2	mm
Slenderness	b/t	=	7	
Factored limit state stress	ϕF_L	=	131.10	MPa
Stress From Shear force	f_{sy}	=	V/A _w	
			0.00	MPa

6.2 Upright Supports

NAME	SYMBOL	VALUE	UNIT	NOTES	REF
HEX50x57x2	Upright Support				
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)



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<i>FEM ANALYSIS RESULTS</i>				
Axial force	P	=	0.742 kN	<i>compression</i>
	P	=	0 kN	<i>Tension</i>
In plane moment	M _x	=	0.4382 kNm	
Out of plane moment	M _y	=	1.148E-13 kNm	
<i>DESIGN STRESSES</i>				
Gross cross section area	A _g	=	332.55 mm ²	
In-plane elastic section modulus	Z _x	=	3692.8 mm ³	
Out-of-plane elastic section mod.	Z _y	=	3692.8 mm ³	
Stress from axial force	f _a	=	P/A _g	
		=	2.23 MPa	<i>compression</i>
		=	0.00 MPa	<i>Tension</i>
Stress from in-plane bending	f _{bx}	=	M _x /Z _x	
		=	118.66 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	
		OR		
	φF _L	=	222.70 MPa	
<i>COMPRESSION</i>				
3.4.8 Compression in columns, axial, gross section				
1. General				
				... 3.4.8.1
Unsupported length of member	L	=	2370 mm	
Effective length factor	k	=	1	
Radius of gyration about buckling axis (Y)	r _y	=	17.90 mm	
Radius of gyration about buckling axis (X)	r _x	=	17.90 mm	
Slenderness ratio	kLb/ry	=	111.73	
Slenderness ratio	kL/rx	=	132.40	
Slenderness parameter	λ	=	2.47	
	D _c *	=	90.3	
	S ₁ *	=	0.33	



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	S_2^*	=	1.23		
	ϕ_{cc}	=	0.926		
Factored limit state stress	ϕF_L	=	36.50	MPa	
<i>2. Sections not subject to torsional or torsional-flexural buckling</i>					
Largest slenderness ratio for flexural buckling	kL/r	=	132.40		... 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'	=	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	=	36.50	MPa	
Most adverse tensile limit state stress	F_a	=	222.70	MPa	
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.06		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	=	1.07E+05	mm ⁴	
Torsion modulus	J	=	1.94E+05	mm ³	
Elastic section modulus	Z	=	3692.8	mm ³	
Slenderness	S	=	102.66		
Limit 1	S_1	=	0.39		
Limit 2	S_2	=	1695.86		
Factored limit state stress	ϕF_L	=	207.14	MPa	... 3.4.15(2)



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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}	=	0.60	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	=	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					
	F_a	=	36.50 MPa		... 4.1.1(2)
	F_{ao}	=	199.03 MPa		... 3.4.8
	F_{bx}	=	199.03 MPa		... 3.4.10
	F_{by}	=	199.03 MPa		... 3.4.17
	f_a/F_a	=	0.061		... 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.	0.66	\leq	1.0	PASS	
SHEAR					



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3.4.24 Shear in webs (Major Axis)

...
4.1.1(2)

Clear web height	h	=	46	mm
	t	=	2	mm
Slenderness	h/t	=	23	
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	
			0.51	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	
			0.00	MPa



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7 Summary

7.1 Conclusions

- a. The 3m x 3m & 3m x 6m Folding Marquees Structure as specified has been analyzed with a conclusion that it has the capacity to withstand wind speeds up to and including **80km/hr**.
- b. For forecast winds in excess of **80km/hr** – the structure should be completely folded.
- c. For uplift due to 80km/hr, 0.9 kN (90kg) holding down weight/per leg is required. Refer Appendix 'A' for weight requirements for various wind speeds
- d. The bearing pressure of soil should be clarified prior to any construction for considering foundation and base plate.
- e. **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.**

Yours faithfully,

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



8 Appendix A – Base Anchorage Requirements

3m x 6m & 3m x 3m Folding Marquees:

Wind Speed km/hr	Soil Type	Required Weight Per Leg	Total required weight for 3m x 3m Marquee	Total required weight for 3m x 4.5m Marquee	Total required weight for 3m x 6m Marquee
80	A - E	90kg	360kg	360kg	540kg
70	A - E	70kg	280kg	280kg	420kg
60	A - E	60kg	240kg	240kg	360kg
50	A - E	50kg	200kg	200kg	300kg
40	A - E	40kg	160kg	160kg	240kg

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 .