Civil & Structural Engineering Design Services Pty. Ltd.

Client: **EXTREME MARQUEES PTY. LTD.**
Project: Design check – 6m, 8m, 9m, 10m, 12m Function Deluxe Tents (3m Bay) for **80km/hr** Wind Speed.
Reference: Extreme Marquees Pty Ltd Technical Data

Report by: KZ
Checked by: EAB
Date: 17/11/2016

JOB NO: E-11-264962-1

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1 Introduction

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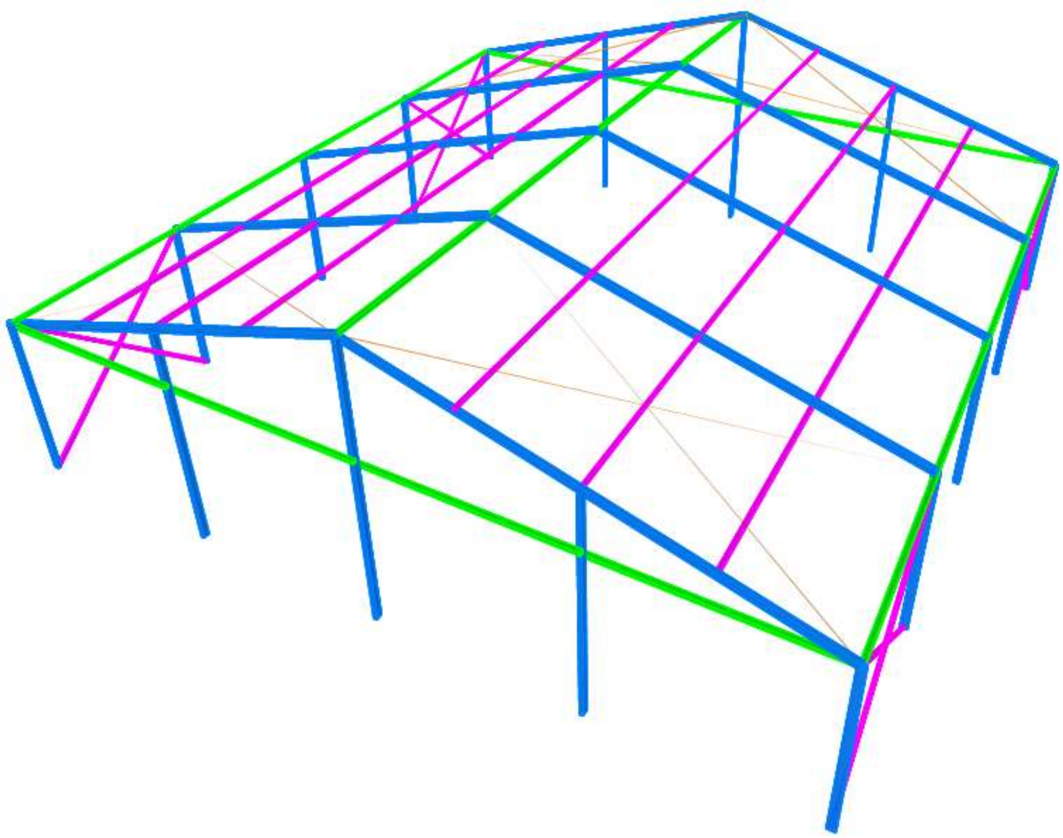
The following structural drawings and calculations are for the transportable tents supplied by Extreme Marquees.

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 80 km/hr on 12m × 12m Function 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.



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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 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 40x40x2 profile for all intermediate purlins with spacing not exceeding 1500mm. This means 6 intermediate purlins are required per bay for the 12m tent structure (as illustrated).

2.11 It is important to use 100x48x3 profile for all gable poles.

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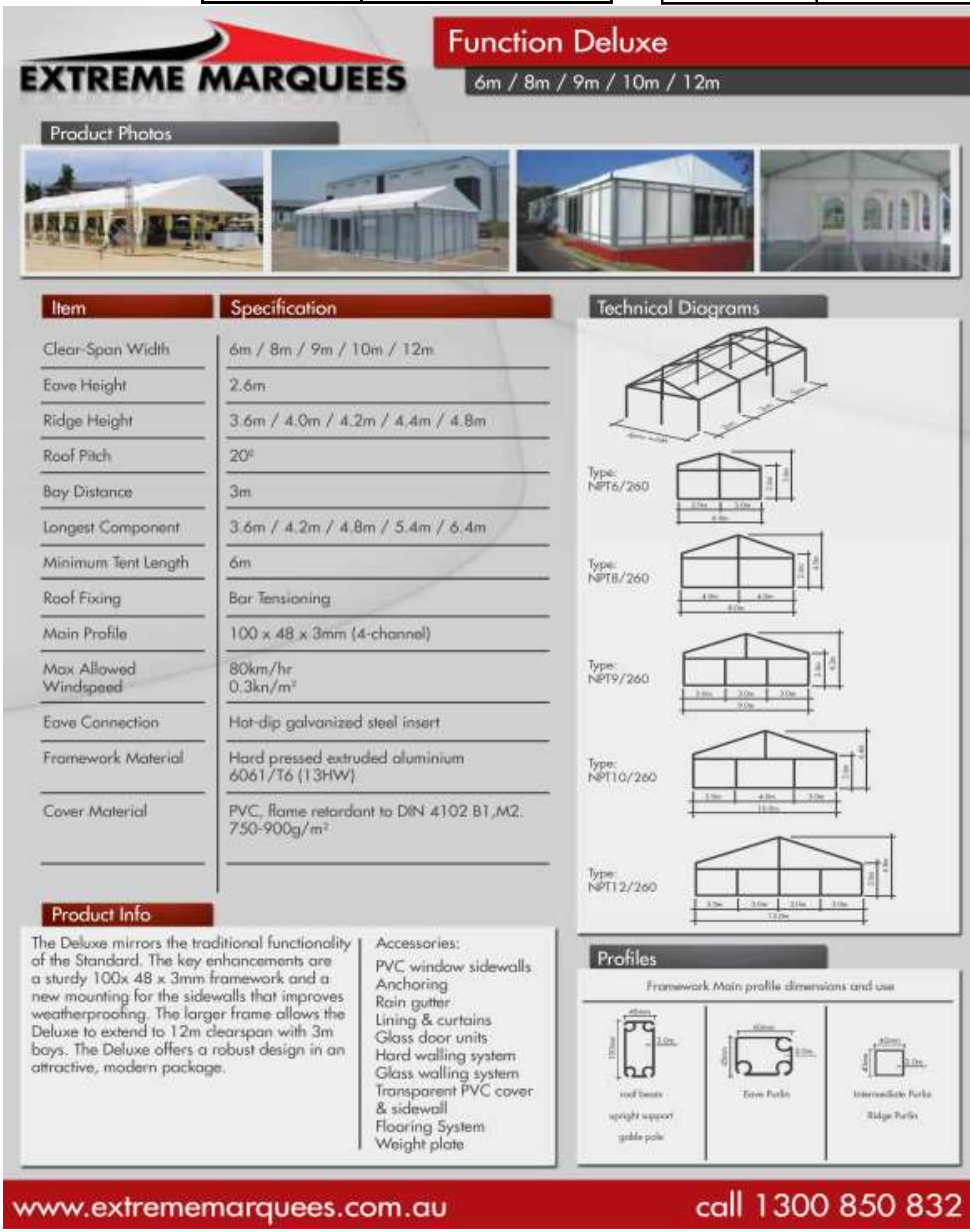
3 Specifications

3.1 General

Tent category	
Material	Aluminum 6061-T6

Size	Model
12m x 12m	Function Deluxe



EXTREME MARQUEES

Function Deluxe

6m / 8m / 9m / 10m / 12m

Product Photos

Item	Specification
Clear-Span Width	6m / 8m / 9m / 10m / 12m
Eave Height	2.6m
Ridge Height	3.6m / 4.0m / 4.2m / 4.4m / 4.8m
Roof Pitch	20°
Bay Distance	3m
Longest Component	3.6m / 4.2m / 4.8m / 5.4m / 6.4m
Minimum Tent Length	6m
Roof Fixing	Bar Tensioning
Main Profile	100 x 48 x 3mm (4-channel)
Max Allowed Windspeed	80km/hr 0.3kn/m²
Eave Connection	Hot-dip galvanized steel insert
Framework Material	Hard pressed extruded aluminium 6061/T6 (13HW)
Cover Material	PVC, flame retardant to DIN 4102 B1,M2. 750-900g/m²

Technical Diagrams

Type: NPT6/260

Type: NPT8/260

Type: NPT9/260

Type: NPT10/260

Type: NPT12/260

Product Info

The Deluxe mirrors the traditional functionality of the Standard. The key enhancements are a sturdy 100x 48 x 3mm framework and a new mounting for the sidewalls that improves weatherproofing. The larger frame allows the Deluxe to extend to 12m clearspan with 3m bays. The Deluxe offers a robust design in an attractive, modern package.

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

roof beam, upright support, gable pole — Eave Purlin — Intermediate Purlin, Ridge Purlin

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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)	φy	0.95
Capacity factor (ultimate)	φu	0.85
Capacity factor (bending)	φb	0.85
Capacity factor (elastic shear buckling)	φv	0.8
Capacity factor (inelastic shear buckling)	φvp	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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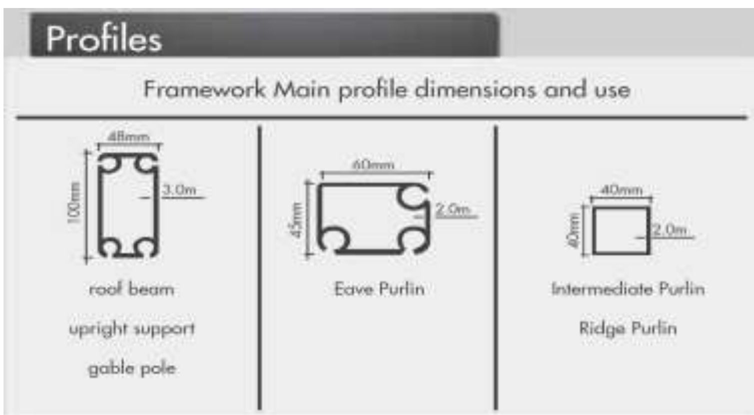
3.4 Section Properties

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*	*mm²*	*mm³*	*mm³*	*mm³*	*mm³*	*mm⁴*	*mm⁴*	*mm⁴*	*mm*	*mm*
Rafter	100x48x3	48	100	3	50.0	852.0	21859.1	14218.5	27222.0	16146.0	1092956.0	341244.0	805065.8	35.8	20.0
Upright Support	100x48x3	48	100	3	50.0	852.0	21859.1	14218.5	27222.0	16146.0	1092956.0	341244.0	805065.8	35.8	20.0
Gable Pole	100x48x3	48	100	3	50.0	852.0	21859.1	14218.5	27222.0	16146.0	1092956.0	341244.0	805065.8	35.8	20.0
Ridge & Eave Purlin	45x60x2	60	45	2	22.5	404.0	5955.3	6999.3	6841.0	8356.0	133993.7	209978.7	246338.1	18.2	22.8
Gable Beam	45x60x2	60	45	2	22.5	404.0	5955.3	6999.3	6841.0	8356.0	133993.7	209978.7	246338.1	18.2	22.8
Intermediate Purlin	40x40x2	40	40	2	20.0	304.0	3668.3	3668.3	4336.0	4336.0	73365.3	73365.3	109744.0	15.5	15.5
Brace	40x40x2	40	40	2	20.0	304.0	3668.3	3668.3	4336.0	4336.0	73365.3	73365.3	109744.0	15.5	15.5



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}

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4.2 Load Combinations

4.2.1 Serviceability

Gravity = $1.0 \times G$

Wind = $1.0 \times G + 1.0 \times W$

4.2.2 Ultimate

Downward = $1.35 \times G$
= $1.2 \times G + W_u$
= $1.2 \times G + W_u + W_{IS}$

Upward = $0.9 \times G + W_u$
$0.9 \times G + W_u + W_{IP}$

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 = 22.22m/s (80 km/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)*

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

Height of structure (h) = 3.5 m *(mid of peak and eave)*
Width of structure (w) = 12 m
Length of structure (l) = 12 m

Pressure (P) = $0.5\rho_{air} (V_{sit,\beta})^2 C_{fig} C_{dyn}$
= $0.245 C_{fig}$ 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			*Table 3.3*
Regional gust wind speed		**80**	Km/hr		Table 3.1
Regional gust wind speed	V_R	**22.22**	m/s		

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Wind Direction Multipliers	M_d	1			*Table 3.2 (AS1170.2)* Table 4.1
Terrain Category Multiplier	$M_{Z,Cat}$	0.91			
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	20	Deg		
Pitch	α	0.349	rad		
Width	B	12	m		
Width Span	S_w	3	m		
Length	D	12	m		
Height	Z	3.5	m		
Bay Span		3	m		
Purlin Spacing		1.5	m		
Number of Intermediate Purlin		6			
	h/d	0.29			
	h/b	0.29			

Wind Pressure

ρair	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 (Perpendicular to Length)

Internal Pressure

Opening Assumption: With Dominant Opening (Cpi= nCpe

Internal Pressure Coefficient (Without Dominant) **MIN**	-0.1	Table 5.1 A
Internal Pressure Coefficient (Without Dominant) **MAX**	0.2	

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Internal Pressure Coefficient (With Dominant) **MIN**		-0.1			Table 5.1B
Internal Pressure Coefficient (With Dominant) **MAX**		0.2			
N		**0.7**		*Cpi= N*Cpe*	
Combination Factor	$K_{C,i}$	1			
Internal Pressure Coefficient **MIN**	$C_{p,i}$	0.70			
Internal Pressure Coefficient **MAX**	$C_{p,i}$	0.70			

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	**0.14**	**kPa**	
Edge Column Force	F	**0.21**	**kN/m**	
Intermediate Column Force	F	**0.41**	**kN/m**	

2. Leeward Wall

External Pressure Coefficient	$C_{P,e}$	-0.4		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	$C_{fig,e}$	-0.32		
Lee Wall Pressure	P	**-0.08**	**kPa**	
Edge Column Force	F	**-0.12**	**kN/m**	
Intermediate Column Force	F	**-0.24**	**kN/m**	

Table 5.2 C

3. Side Wall

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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			
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	**-0.13**	**kPa**	*0 to 1h*	
Side Wall Pressure	P	**-0.10**	**kPa**	*1h to 2h*	
Side Wall Pressure	P	**-0.06**	**kPa**	*2h to 3h*	
Side Wall Pressure	P	**-0.04**	**kPa**	*>3h*	
4. Roof Up Wind Slope				*α>10°*	
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**	$C_{P,e}$	-0.32			Table 5.3 B
External Pressure Coefficient **MAX**	$C_{P,e}$	0.17			
aerodynamic shape factor **MIN**	$C_{fig,e}$	-0.26			
aerodynamic shape factor **MAX**	$C_{fig,e}$	0.14			
Pressure **MIN**	P	**-0.06**	**kPa**		
Pressure **MAX**	P	**0.03**	**kPa**		
Edge Rafter Force **MIN**	F	**-0.09**	**kN/m**		
Edge Rafter Force **Max**	F	**0.05**	**kN/m**		
Intermediate Rafter Force **MIN**	F	**-0.19**	**kN/m**		
Intermediate Rafter Force **MAX**	F	**0.10**	**kN/m**		
5. Roof Down Wind Slope					
Area Reduction Factor	K_a	1			
combination factor applied to internal pressures	$K_{C,e}$	0.8			

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local pressure factor	K_l	1			
porous cladding reduction factor	K_p	1			Table 5.3C
External Pressure Coefficient	$C_{P,e}$	-0.6			
aerodynamic shape factor	$C_{fig,e}$	-0.48			
Pressure **MIN**	P	**-0.12**	**kPa**		
Pressure **MAX**	P	**-0.12**	**kPa**		
Edge Rafter Force **MIN**	F	**-0.18**	**kN/m**		
Edge Rafter Force **MAX**	F	**-0.18**	**kN/m**		
Intermediate Rafter Force **MIN**	F	**-0.35**	**kN/m**		
Intermediate Rafter Force **MAX**	F	**-0.35**	**kN/m**		

WIND DIRECTION 2 (Parallel to Length)

Internal Pressure

Opening Assumption: With Dominant Opening (Cpi= nCpe

Internal Pressure Coefficient (Without Dominant) **MIN**		-0.1			Table 5.1A
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		**0.7**		*Cpi= N*Cpe*	
Combination Factor	$K_{C,i}$	1			
Internal Pressure Coefficient **MIN**	$C_{p,i}$	0.70			
Internal Pressure Coefficient **MAX**	$C_{p,i}$	0.70			

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*

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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			
aerodynamic shape factor	$C_{fig,e}$	0.56			
Wind Wall Pressure	P	**0.14**	**kPa**		
Edge Column Force	F	**0.21**	**kN/m**		
Intermediate Column Force	F	**0.41**	**kN/m**		

2. Leeward Wall

					Table 5.2 B
External Pressure Coefficient	$C_{P,e}$	-0.5			
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	$C_{fig,e}$	-0.4			
Lee Wall Pressure	P	**-0.10**	**kPa**		
Edge Column Force	F	**-0.15**	**kN/m**		
Intermediate Column Force	F	**-0.29**	**kN/m**		

3. Side Wall

					Table 5.2 C
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			
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*	

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Side Wall Pressure	**P**	**-0.13**	**kPa**	*0 to 1h*	
Side Wall Pressure	**P**	**-0.10**	**kPa**	*1h to 2h*	
Side Wall Pressure	**P**	**-0.06**	**kPa**	*2h to 3h*	
Side Wall Pressure	**P**	**-0.04**	**kPa**	*>3h*	
4. Roof				*α<10°*	
Area Reduction Factor	K_a	1			Table 5.3 A
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		*0 to 0.5h*	
External Pressure Coefficient **MIN**	$C_{P,e}$	-0.90		*0.5 to 1h*	
External Pressure Coefficient **MIN**	$C_{P,e}$	-0.50		*1h to 2h*	
External Pressure Coefficient **MIN**	$C_{P,e}$	-0.30		*2h to 3h*	
External Pressure Coefficient **MIN**	$C_{P,e}$	-0.20		*>3h*	
External Pressure Coefficient **MAX**	$C_{P,e}$	-0.40		*0 to 0.5h*	
External Pressure Coefficient **MAX**	$C_{P,e}$	-0.40		*0.5 to 1h*	
External Pressure Coefficient **MAX**	$C_{P,e}$	0.00		*1h to 2h*	
External Pressure Coefficient **MAX**	$C_{P,e}$	0.10		*2h to 3h*	
External Pressure Coefficient **MAX**	$C_{P,e}$	0.20		*>3h*	
aerodynamic shape factor **MIN**	$C_{fig,e}$	-0.72		*0 to 0.5h*	
aerodynamic shape factor **MIN**	$C_{fig,e}$	-0.72		*0.5 to 1h*	
aerodynamic shape factor **MIN**	$C_{fig,e}$	-0.4		*1h to 2h*	
aerodynamic shape factor **MIN**	$C_{fig,e}$	-0.24		*2h to 3h*	
aerodynamic shape factor **MIN**	$C_{fig,e}$	-0.16		*>3h*	
aerodynamic shape factor **MAX**	$C_{fig,e}$	-0.32		*0 to 0.5h*	
aerodynamic shape factor **MAX**	$C_{fig,e}$	-0.32		*0.5 to 1h*	

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aerodynamic shape factor **MAX**	$C_{fig,e}$	0		*1h to 2h*
aerodynamic shape factor **MAX**	$C_{fig,e}$	0.08		*2h to 3h*
aerodynamic shape factor **MAX**	$C_{fig,e}$	0.16		*>3h*
Pressure **MIN**	**P**	**-0.18**	**kPa**	*0 to 0.5h*
Pressure **MIN**	**P**	**-0.18**	**kPa**	*0.5 to 1h*
Pressure **MIN**	**P**	**-0.10**	**kPa**	*1h to 2h*
Pressure **MIN**	**P**	**-0.06**	**kPa**	*2h to 3h*
Pressure **MIN**	**P**	**-0.04**	**kPa**	*>3h*
Pressure **MAX**	**P**	**-0.08**	**kPa**	*0 to 0.5h*
Pressure **MAX**	**P**	**-0.08**	**kPa**	*0.5 to 1h*
Pressure **MAX**	**P**	**0.00**	**kPa**	*1h to 2h*
Pressure **MAX**	**P**	**0.02**	**kPa**	*2h to 3h*
Pressure **MAX**	**P**	**0.04**	**kPa**	*>3h*
Edge Purlin Force **MIN**	**F**	**-0.13**	**kN/m**	*0 to 0.5h*
Edge Purlin Force **MIN**	**F**	**-0.13**	**kN/m**	*0.5 to 1h*
Edge Purlin Force **MIN**	**F**	**-0.07**	**kN/m**	*1h to 2h*
Edge Purlin Force **MIN**	**F**	**-0.04**	**kN/m**	*2h to 3h*
Edge Purlin Force **MIN**	**F**	**-0.03**	**kN/m**	*>3h*
Edge Purlin Force MAX	**F**	**-0.06**	**kN/m**	*0 to 0.5h*
Edge Purlin Force MAX	**F**	**-0.06**	**kN/m**	*0.5 to 1h*
Edge Purlin Force MAX	**F**	**0.00**	**kN/m**	*1h to 2h*
Edge Purlin Force MAX	**F**	**0.01**	**kN/m**	*2h to 3h*
Edge Purlin Force MAX	**F**	**0.03**	**kN/m**	*>3h*
Intermediate Purlin Force **MIN**	**F**	**-0.26**	**kN/m**	*0 to 0.5h*
Intermediate Purlin Force **MIN**	**F**	**-0.26**	**kN/m**	*0.5 to 1h*
Intermediate Purlin Force **MIN**	**F**	**-0.15**	**kN/m**	*1h to 2h*
Intermediate Purlin Force **MIN**	**F**	**-0.09**	**kN/m**	*2h to 3h*
Intermediate Purlin Force **MIN**	**F**	**-0.06**	**kN/m**	*>3h*
Intermediate Purlin Force **MAX**	**F**	**-0.12**	**kN/m**	*0 to 0.5h*
Intermediate Purlin Force **MAX**	**F**	**-0.12**	**kN/m**	*0.5 to 1h*
Intermediate Purlin Force **MAX**	**F**	**0.00**	**kN/m**	*1h to 2h*
Intermediate Purlin Force **MAX**	**F**	**0.03**	**kN/m**	*2h to 3h*
Intermediate Purlin Force **MAX**	**F**	**0.06**	**kN/m**	*>3h*

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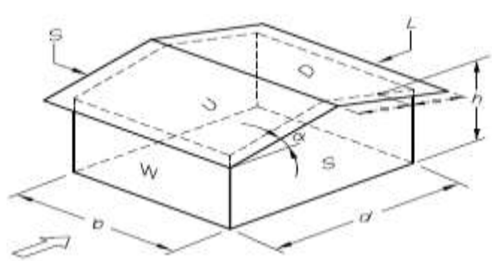
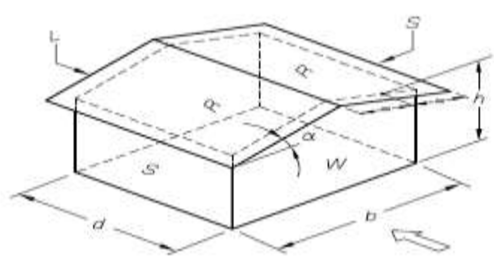
5.2.1 Pressure summary

<table>
<tr><td colspan="3">WIND EXTERNAL PRESSURE</td><td colspan="2">Direction1 (Perpendicular to Length)</td><td colspan="5">Direction2 (Parallel to Length)</td></tr>
<tr><td colspan="3">Windward (kPa)</td><td colspan="2">0.14</td><td colspan="5">0.14</td></tr>
<tr><td colspan="3">Leeward (kPa)</td><td colspan="2">-0.08</td><td colspan="5">-0.10</td></tr>
<tr><td rowspan="5">Sidewall (m)</td><td>Length</td><td>(m)</td><td>(m)</td><td>(Kpa)</td><td colspan="5">(Kpa)</td></tr>
<tr><td>0 - 1h</td><td>0</td><td>3.5</td><td>-0.13</td><td colspan="5">-0.13</td></tr>
<tr><td>1h - 2h</td><td>3.5</td><td>7</td><td>-0.10</td><td colspan="5">-0.10</td></tr>
<tr><td>2h - 3h</td><td>7</td><td>10.5</td><td>-0.06</td><td colspan="5">-0.06</td></tr>
<tr><td>>3h</td><td>10.5</td><td>-</td><td>-0.04</td><td colspan="5">-0.04</td></tr>
<tr><td rowspan="6">Roof</td><td colspan="2"></td><td>Min (Kpa)</td><td>Max (Kpa)</td><td>Length</td><td>(m)</td><td>(m)</td><td>Min (Kpa)</td><td>Max (Kpa)</td></tr>
<tr><td colspan="2">Upwind Slope</td><td>-0.06</td><td>0.03</td><td>0-0.5h</td><td>0.00</td><td>1.75</td><td>-0.18</td><td>-0.08</td></tr>
<tr><td colspan="2">Downwind Slope</td><td>-0.12</td><td>-0.12</td><td>0.5h-1h</td><td>1.75</td><td>3.50</td><td>-0.18</td><td>-0.08</td></tr>
<tr><td colspan="4" rowspan="3"></td><td>1h-2h</td><td>3.50</td><td>7.00</td><td>-0.10</td><td>0.00</td></tr>
<tr><td>2h-3h</td><td>7.00</td><td>10.50</td><td>-0.06</td><td>0.02</td></tr>
<tr><td>>3h</td><td>10.50</td><td>-</td><td>-0.04</td><td>0.04</td></tr>
<tr><td colspan="3" rowspan="2">Wind Internal Pressure (kPa)</td><td>Min (kPa)</td><td>Max (kPa)</td><td colspan="3">Min (kPa)</td><td colspan="2">Max (kPa)</td></tr>
<tr><td>Proportion of Cpe</td><td>Proportion of Cpe</td><td colspan="3">Proportion of Cpe</td><td colspan="2">Proportion of Cpe</td></tr>
</table>



Direction 1



Direction 2

AS1170.2

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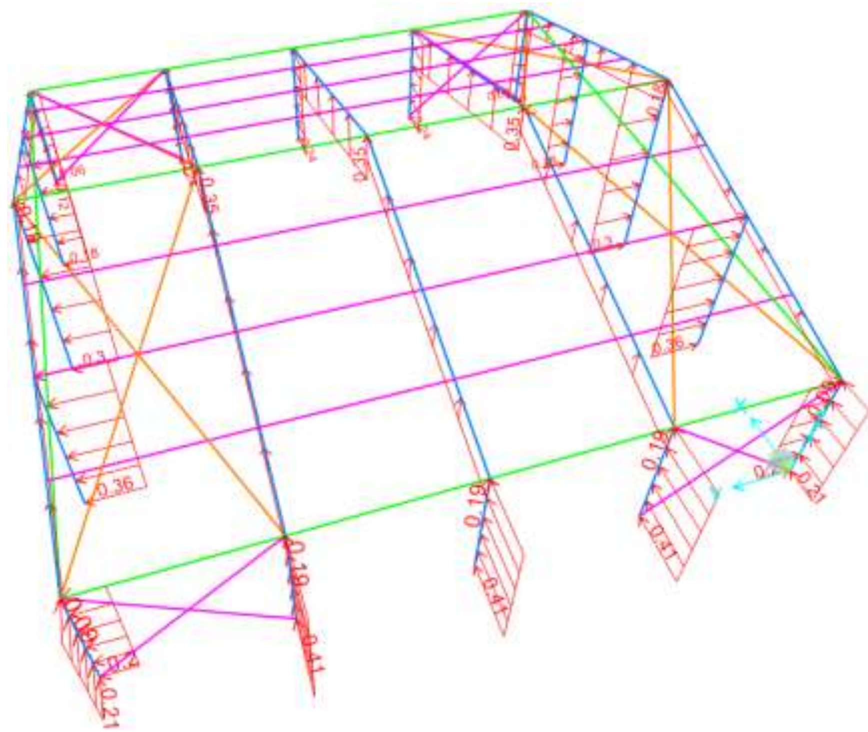
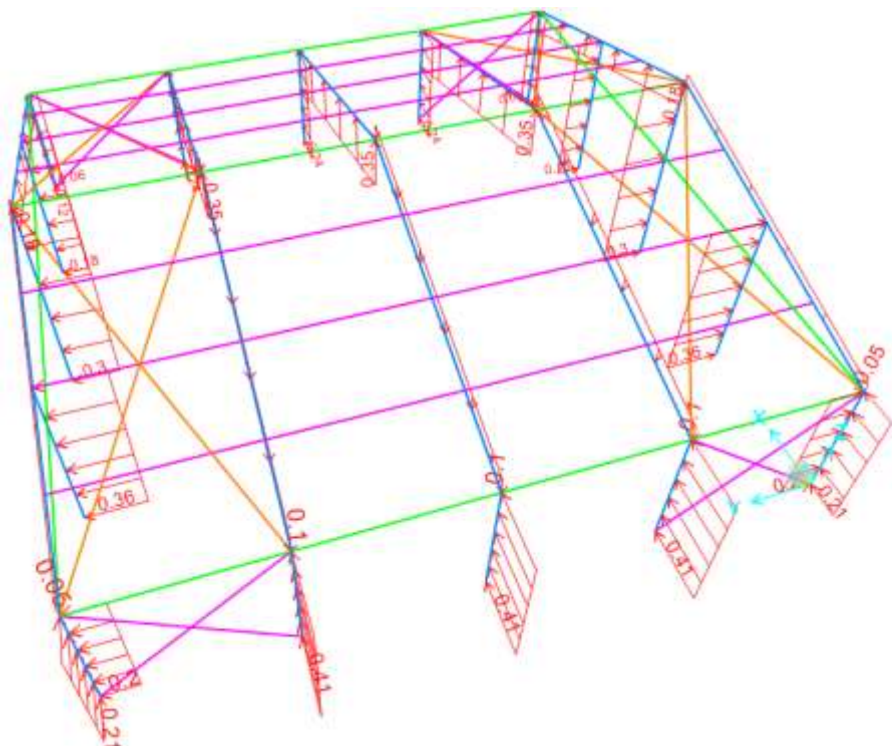
5.3 Wind Load Diagrams

5.3.1 Wind 1(case 1)



5.3.2 Wind 1(case 2)



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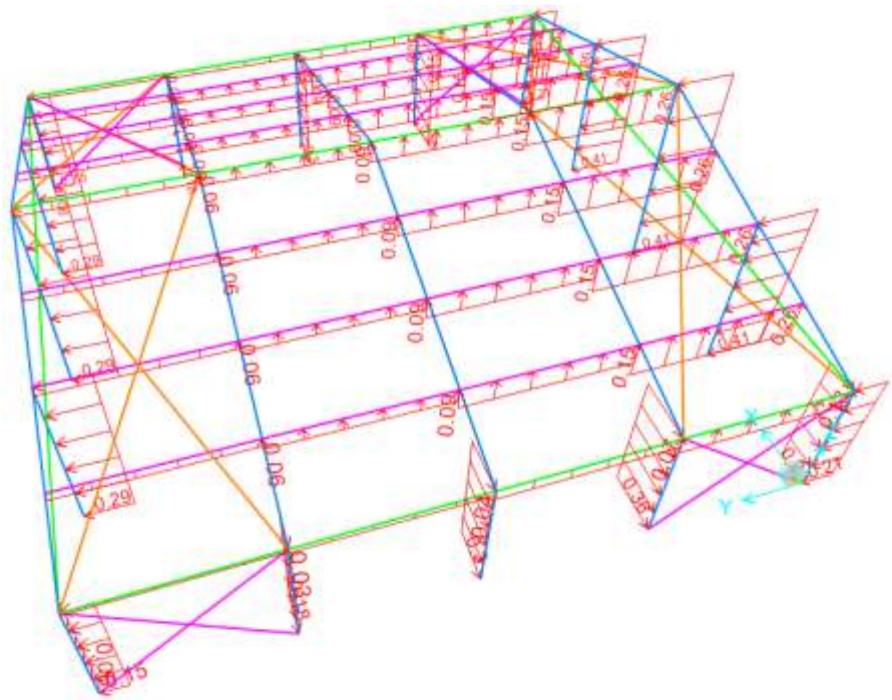
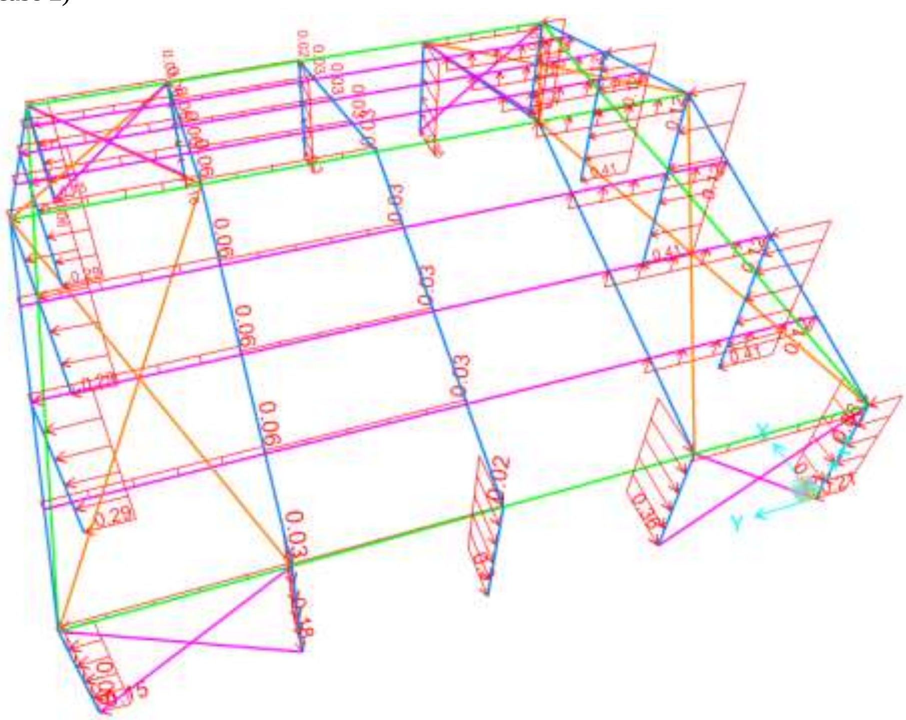
5.3.3 Wind 2(Case1)



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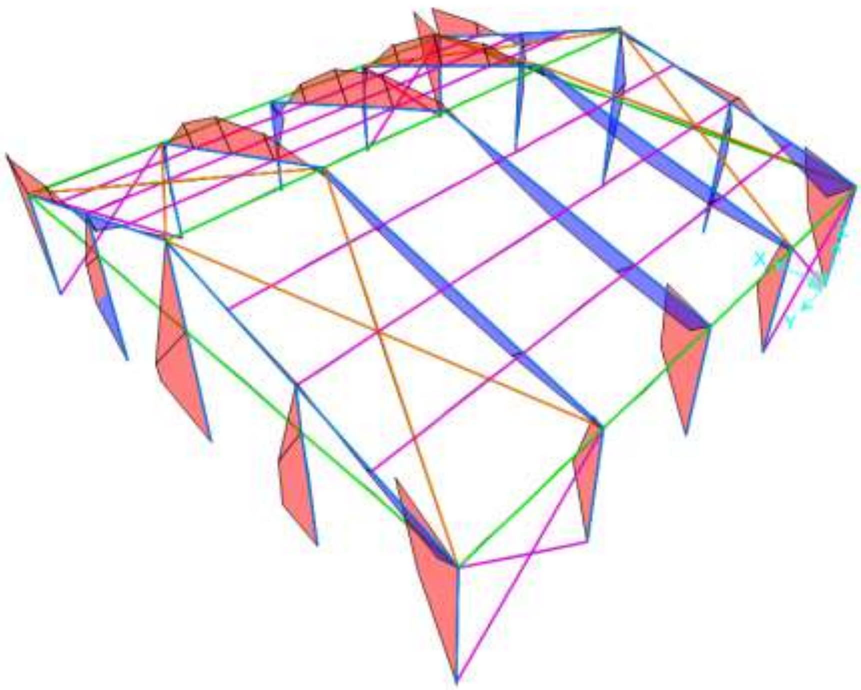
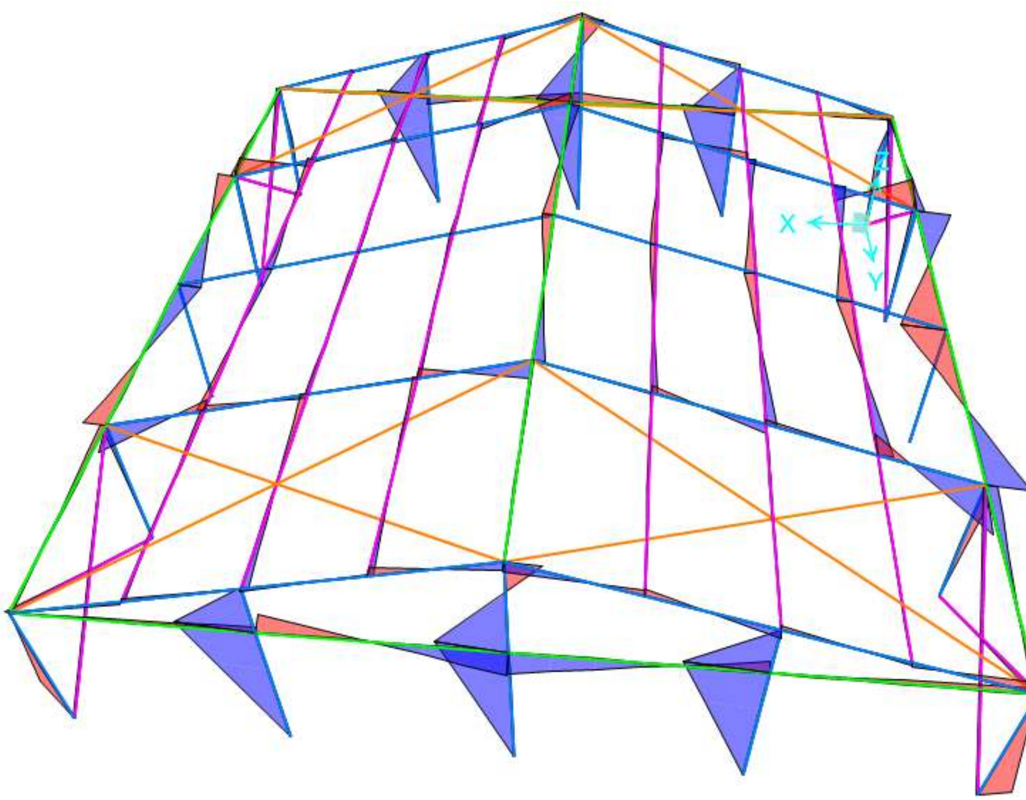
5.3.5 Max Bending Moment due to critical load combination in major axis



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



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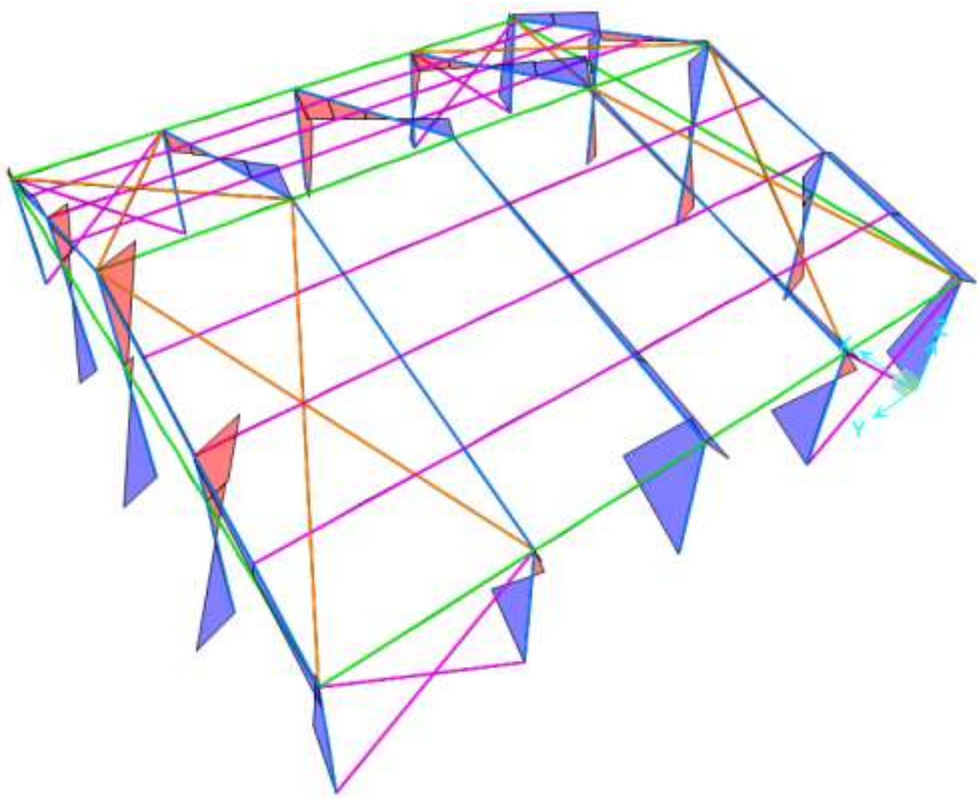
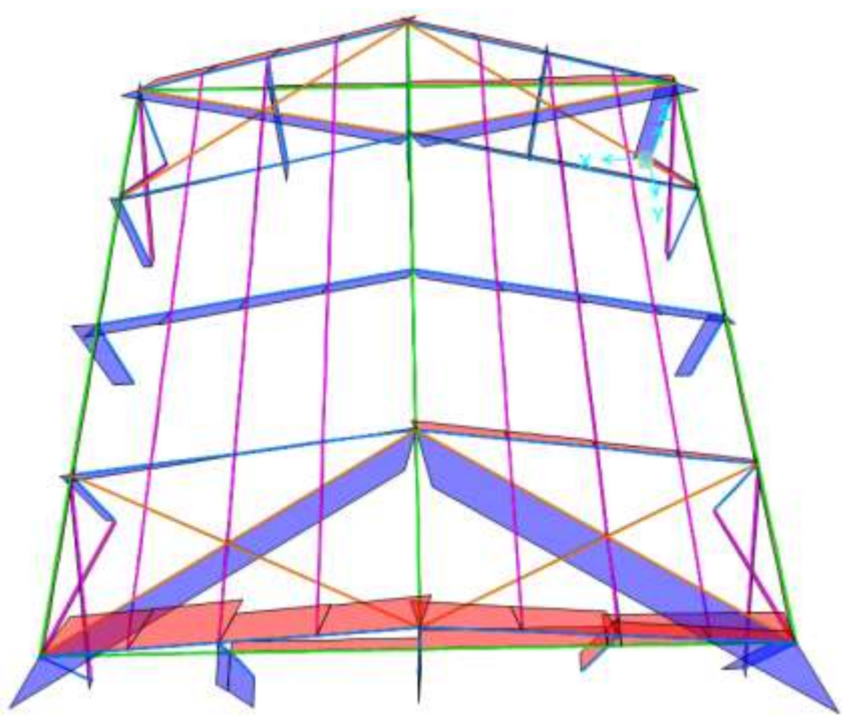
5.3.7 Max Shear in due to critical load combination



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



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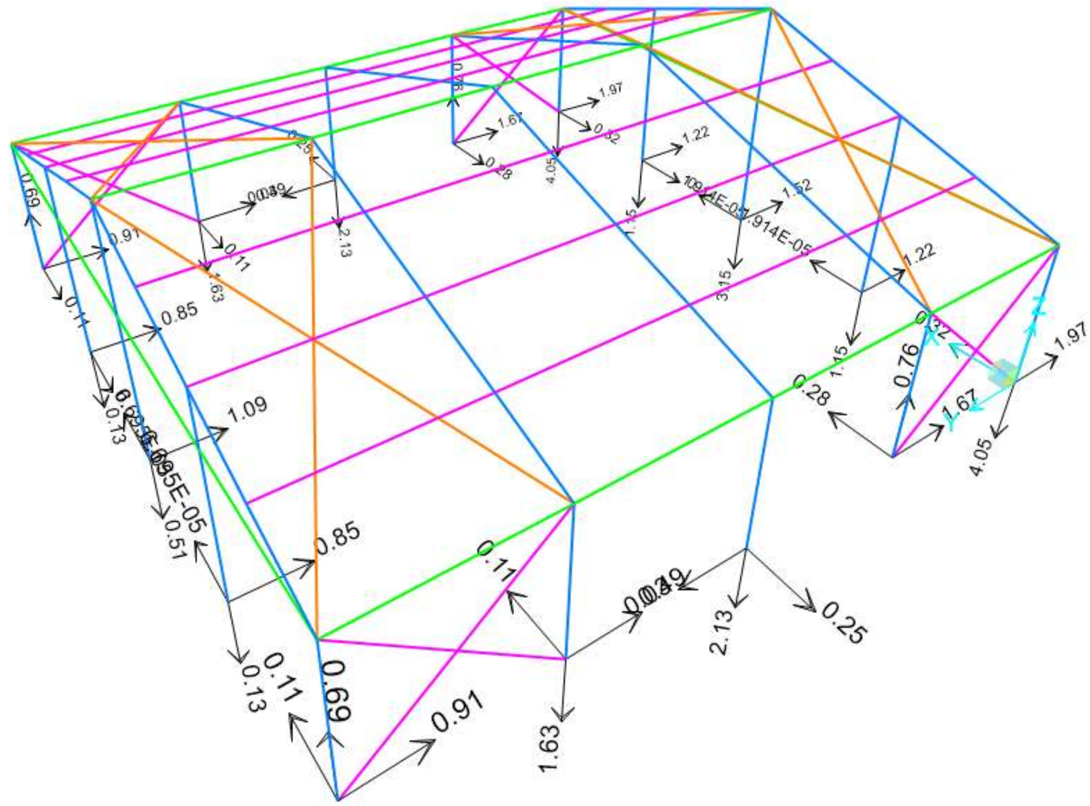
5.3.9 Max reactions



Max Reaction (Bearing) N^* = 2.6 kN
Max Reaction (Uplift) N^* = 4.1 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	100x48x3	48	100	3	1.793	-0.00266	2.025	4.0262	-0.0031
Upright Support	100x48x3	48	100	3	0.641	-0.00057	2.27	-4.0233	0.0015
Gable Pole	100x48x3	48	100	3	0.509	-0.423	-2.019	0.7455	1.0996
Ridge & Eave Purlin	45x60x2	60	45	2	0.015	0.374	-1.39	-6.939E-18	-0.5987
Gable Beam	45x60x2	60	45	2	0.047	0.012	-3.333	-0.0989	-0.0007684
Intermediate Purlin	40x40x2	40	40	2	-0	0.014	-0.333	-0.4891	0.0189
Brace	40x40x2	40	40	2	0.011	0.01	-1.903	6.939E-18	-0.0288

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6 Checking Members Based on AS1664.1 ALUMINIUM LSD

6.1 Rafter

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
100x48x3	**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	=	2.025	kN	*Tension*	
In plane moment	M_x	=	4.0262	kNm		
Out of plane moment	M_y	=	0.0031	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	**=**	852	mm^2		
In-plane elastic section modulus	Z_x	**=**	21859.12	mm^3		
Out-of-plane elastic section mod.	Z_y	**=**	14218.5	mm^3		
Stress from axial force	$\mathbf{f_a}$	**=**	P/A_g			
		=	**0.00**	**MPa**	*compression*	
		=	**2.38**	**MPa**	*Tension*	
Stress from in-plane bending	$\mathbf{f_{bx}}$	**=**	M_x/Z_x			
		=	**184.19**	**MPa**	*compression*	
Stress from out-of-plane bending	$\mathbf{f_{by}}$	**=**	M_y/Z_y			
		=	**0.22**	**MPa**	*compression*	
Tension						
3.4.3 *Tension in rectangular tubes*						

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	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	=	6260	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	20.01	mm		
Radius of gyration about buckling axis (X)	r_x	=	35.82	mm		
Slenderness ratio	kLb/ry	=	74.95			
Slenderness ratio	kL/rx	=	174.78			
Slenderness parameter	λ	=	3.264			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.950			
Factored limit state stress	**ϕF_L**	**=**	**21.49**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	**=**	174.78			
***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'	**=**	42			
	t	**=**	3	mm		
Slenderness	b/t	**=**	14			
Limit 1	S_1	**=**	12.34			
Limit 2	S_2	**=**	32.87			
Factored limit state stress	**ϕF_L**	**=**	**224.30**	**MPa**		

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Most adverse compressive limit state stress	F_a	=	21.49	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.01		PASS	
BENDING - IN-PLANE						
***3.4.15** Compression in beams, extreme fibre, gross section rectangular tubes, box sections*						
Unbraced length for bending	L_b	=	1500	mm		
Second moment of area (weak axis)	I_y	=	3.41E+05	mm^4		
Torsion modulus	J	=	8.05E+05	mm^3		
Elastic section modulus	Z	=	21859.12	mm^3		
Slenderness	S	=	125.11			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**204.73**	**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'	=	42	mm		
	t	=	3	mm		
Slenderness	b/t	=	14			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**224.30**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	204.73	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.90		PASS	
BENDING - OUT-OF-PLANE						
NOTE: Limit state stresses, ϕF_L are the same for out-of-plane bending (doubly symmetric section)						

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Factored limit state stress	**ϕF_L**	=	**204.73**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	204.73	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	=	21.49	MPa		… 3.4.8
	F_{ao}	=	224.30	MPa		… 3.4.10
	F_{bx}	=	204.73	MPa		… 3.4.17
	F_{by}	=	204.73	MPa		… 3.4.17
	f_a/F_a	=	0.011			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.91	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	94	mm		
	t	=	3	mm		
Slenderness	h/t	=	31.333333			
Limit 1	S_1	=	29.01			
Limit 2	S_2	=	59.31			
Factored limit state stress	**ϕF_L**	=	**128.74**	**MPa**		
Stress From Shear force	**f_{sx}**	=	V/A_w			
			3.18	**MPa**		
***3.4.25** Shear in webs (Minor Axis)*						
Clear web height	b	=	42	mm		
	t	=	3	mm		
Slenderness	b/t	=	14			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sy}**	=	V/A_w			

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0.01	MPa		

6.2 Upright Supports

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
100x48x3	**Upright Support**					
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	=	2.27	kN	*Tension*	
In plane moment	M_x	=	4.0233	kNm		
Out of plane moment	M_y	=	0.0015	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	**=**	852	mm^2		
In-plane elastic section modulus	Z_x	**=**	21859.12	mm^3		
Out-of-plane elastic section mod.	Z_y	**=**	14218.5	mm^3		
Stress from axial force	$\mathbf{f_a}$	**=**	P/A_g			
		=	**0.00**	**MPa**	*compression*	
		=	**2.66**	**MPa**	*Tension*	
Stress from in-plane bending	$\mathbf{f_{bx}}$	**=**	M_x/Z_x			
		=	**184.06**	**MPa**	*compression*	
Stress from out-of-plane bending	$\mathbf{f_{by}}$	**=**	M_y/Z_y			
		=	**0.11**	**MPa**	*compression*	
Tension						

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***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	=	4000	mm	
Effective length factor	k	=	1		
Radius of gyration about buckling axis (Y)	r_y	=	20.01	mm	
Radius of gyration about buckling axis (X)	r_x	=	35.82	mm	
Slenderness ratio	kLb/ry	=	199.87		
Slenderness ratio	kL/rx	=	111.68		
Slenderness parameter	λ	=	3.73		
	D_c*	=	90.3		
	S_1*	=	0.33		
	S_2*	=	1.23		
	ϕ_{cc}	=	0.950		
Factored limit state stress	**ϕF_L**	**=**	**16.43**	**MPa**	
2. Sections not subject to torsional or torsional-flexural buckling					… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	**=**	199.87		
***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'	**=**	42		
	t	**=**	3	mm	
Slenderness	b/t	**=**	14		
Limit 1	S_1	**=**	12.34		
Limit 2	S_2	**=**	32.87		

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Factored limit state stress	**ϕF_L**	=	**224.30**	**MPa**		
Most adverse compressive limit state stress	F_a	=	16.43	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.01		PASS	
BENDING - IN-PLANE						
***3.4.15** Compression in beams, extreme fibre, gross section rectangular tubes, box sections*						
Unbraced length for bending	L_b	=	4000	mm		
Second moment of area (weak axis)	I_y	=	3.41E+05	mm^4		
Torsion modulus	J	=	8.05E+05	mm^3		
Elastic section modulus	Z	=	21859.12	mm^3		
Slenderness	S	=	333.64			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**188.49**	**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'	=	42	mm		
	t	=	3	mm		
Slenderness	b/t	=	14			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**224.30**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	188.49	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**	=	**188.49**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	188.49	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	=	16.43	MPa		… 3.4.8
	F_{ao}	=	224.30	MPa		… 3.4.10
	F_{bx}	=	188.49	MPa		… 3.4.17
	F_{by}	=	188.49	MPa		… 3.4.17
	f_a/F_a	=	0.012			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.99	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	94	mm		
	t	=	3	mm		
Slenderness	h/t	=	31.33333 3			
Limit 1	S_1	=	29.01			
Limit 2	S_2	=	59.31			
Factored limit state stress	**ϕF_L**	=	**128.74**	**MPa**		
Stress From Shear force	**f_{sx}**	=	V/A_w			
			1.14	**MPa**		
***3.4.25** Shear in webs (Minor Axis)*						
Clear web height	b	=	42	mm		
	t	=	3	mm		
Slenderness	b/t	=	14			
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**		

6.3 Gable Pole

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
100x48x3	**Gable Pole**					
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	=	2.019	kN	*compression*	
	P	=	0	kN	*Tension*	
In plane moment	M_x	=	0.7455	kNm		
Out of plane moment	M_y	=	1.0996	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	=	852	mm^2		
In-plane elastic section modulus	Z_x	=	21859.12	mm^3		
Out-of-plane elastic section mod.	Z_y	=	14218.5	mm^3		
Stress from axial force	f_a	=	P/A_g			
		=	**2.37**	**MPa**	*compression*	
		=	**0.00**	**MPa**	*Tension*	
Stress from in-plane bending	f_{bx}	=	M_x/Z_x			
		=	**34.10**	**MPa**	*compression*	
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y			
		=	**77.34**	**MPa**	*compression*	

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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	=	4400	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	20.01	mm		
Radius of gyration about buckling axis (X)	r_x	=	35.82	mm		
Slenderness ratio	kLb/ry	=	149.90			
Slenderness ratio	kL/rx	=	122.85			
Slenderness parameter	λ	=	2.80			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.950			
Factored limit state stress	**ϕF$_L$**	**=**	**29.21**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	**=**	149.90			
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'	**=**	42			
	t	**=**	3	mm		
Slenderness	b/t	**=**	14			
Limit 1	S_1	**=**	12.34			

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Limit 2	S_2	=	32.87			
Factored limit state stress	**ϕF_L**	=	**224.30**	**MPa**		
Most adverse compressive limit state stress	F_a	=	29.21	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.08		PASS	
BENDING - IN-PLANE						
3.4.15 *Compression in beams, extreme fibre, gross section rectangular tubes, box sections*						
Unbraced length for bending	L_b	=	3000	mm		
Second moment of area (weak axis)	I_y	=	341244	mm^4		
Torsion modulus	J	=	805065.85	mm^3		
Elastic section modulus	Z	=	21859.12	mm^3		
Slenderness	S	=	250.23			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**194.10**	**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'	=	42	mm		
	t	=	3	mm		
Slenderness	b/t	=	14			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**224.30**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	194.10	MPa		

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Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.18		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	=	**194.10**	**MPa**		
Most adverse out-of-plane bending limit state stress	F_{by}	=	194.10	MPa		
Most adverse out-of-plane bending capacity factor	f_{by}/F_{by}	=	0.40		PASS	
COMBINED ACTIONS						
***4.1.1** Combined compression and bending*						… 4.1.1(2)
	F_a	=	29.21	MPa		… 3.4.8
	F_{ao}	=	224.30	MPa		… 3.4.10
	F_{bx}	=	194.10	MPa		… 3.4.17
	F_{by}	=	194.10	MPa		… 3.4.17
	f_a/F_a	=	0.081			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.66	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	94	mm		
	t	=	3	mm		
Slenderness	h/t	=	31.333333			
Limit 1	S_1	=	29.01			
Limit 2	S_2	=	59.31			
Factored limit state stress	ϕF_L	=	**128.74**	**MPa**		
Stress From Shear force	f_{sx}	=	V/A_w			
			0.90	**MPa**		
***3.4.25** Shear in webs (Minor Axis)*						
Clear web height	b	=	42	mm		

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	t	=	3	mm		
Slenderness	b/t	=	14			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sy}**	=	V/A_w			
			1.68	**MPa**		

6.4 Ridge & Eave Purlin

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
45x60x2	**Ridge & Eave Purlin**					
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	=	1.39	kN	*compression*	
	P	=	0	kN	*Tension*	
In plane moment	M_x	=	6.939E-18	kNm		
Out of plane moment	M_y	=	0.5987	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	=	404	mm^2		
In-plane elastic section modulus	Z_x	=	5955.2741	mm^3		
Out-of-plane elastic section mod.	Z_y	=	6999.2889	mm^3		
Stress from axial force	**f_a**	=	P/A_g			
		=	**3.44**	**MPa**	*compression*	
		=	**0.00**	**MPa**	*Tension*	

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Stress from in-plane bending	f_{bx}	=	M_x/Z_x			
		=	**0.00**	**MPa**	*compression*	
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y			
		=	**85.54**	**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	=	3000	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	22.80	mm		
Radius of gyration about buckling axis (X)	r_x	=	18.21	mm		
Slenderness ratio	kLb/ry	=	131.59			
Slenderness ratio	kL/rx	=	164.73			
Slenderness parameter	λ	=	3.08			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.950			
Factored limit state stress	**ϕF_L**	**=**	**24.19**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						... 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	**=**	164.73			
***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'	=	56			
	t	=	2	mm		
Slenderness	b/t	=	28			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	32.87			
Factored limit state stress	**ϕF_L**	=	**185.00**	**MPa**		
Most adverse compressive limit state stress	F_a	=	24.19	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.14		PASS	
BENDING - IN-PLANE						
***3.4.15** Compression in beams, extreme fibre, gross section rectangular tubes, box sections*						
Unbraced length for bending	L_b	=	3000	mm		
Second moment of area (weak axis)	I_y	=	209978.67	mm^4		
Torsion modulus	J	=	246338.06	mm^3		
Elastic section modulus	Z	=	5955.2741	mm^3		
Slenderness	S	=	157.11			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**201.63**	**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'	=	56	mm		
	t	=	2	mm		

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Slenderness	b/t	=	28			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**185.00**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	185.00	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.00		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**	=	**185.00**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	185.00	MPa		
Most adverse out-of-plane bending capacity factor	**f_{by}/F_{by}**	=	0.46		PASS	
COMBINED ACTIONS						
***4.1.1** Combined compression and bending*						… 4.1.1(2)
	F_a	=	24.19	MPa		… 3.4.8
	F_{ao}	=	185.00	MPa		… 3.4.10
	F_{bx}	=	185.00	MPa		… 3.4.17
	F_{by}	=	185.00	MPa		… 3.4.17
	f_a/F_a	=	0.142			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.60	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	41	mm		
	t	=	2	mm		
Slenderness	h/t	=	20.5			
Limit 1	S_1	=	29.01			

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Limit 2	S_2	=	59.31			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sx}**	=	V/A_w			
			0.09	**MPa**		
***3.4.25** Shear in webs (Minor Axis)*						
Clear web height	b	=	56	mm		
	t	=	2	mm		
Slenderness	b/t	=	28			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sy}**	=	V/A_w			
			1.67	**MPa**		

6.5 Gable Beam

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
45x60x2	**Gable Beam**					
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	=	3.333	kN	*compression*	
	P	=	0	kN	*Tension*	
In plane moment	M_x	=	0.0989	kNm		
Out of plane moment	M_y	=	0.0007684	kNm		

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DESIGN STRESSES						
Gross cross section area	A_g	=	404	mm^2		
In-plane elastic section modulus	Z_x	=	5955.2741	mm^3		
Out-of-plane elastic section mod.	Z_y	=	6999.2889	mm^3		
Stress from axial force	f_a	=	P/A_g			
		=	**8.25**	**MPa**	*compression*	
		=	**0.00**	**MPa**	*Tension*	
Stress from in-plane bending	f_{bx}	=	M_x/Z_x			
		=	**16.61**	**MPa**	*compression*	
Stress from out-of-plane bending	f_{by}	=	M_y/Z_y			
		=	**0.11**	**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	=	3000	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	22.80	mm		
Radius of gyration about buckling axis (X)	r_x	=	18.21	mm		
Slenderness ratio	kLb/ry	=	131.59			
Slenderness ratio	kL/rx	=	164.73			
Slenderness parameter	λ	=	3.08			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.950			
Factored limit state stress	ϕF_L	=	**24.19**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	164.73			

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***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'	=	56			
	t	=	2	mm		
Slenderness	b/t	=	28			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	32.87			
Factored limit state stress	**ϕF_L**	=	**185.00**	**MPa**		
Most adverse compressive limit state stress	F_a	=	24.19	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.34		PASS	

BENDING - IN-PLANE

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

Unbraced length for bending	L_b	=	3000	mm		
Second moment of area (weak axis)	I_y	=	209978.67	mm^4		
Torsion modulus	J	=	246338.06	mm^3		
Elastic section modulus	Z	=	5955.2741	mm^3		
Slenderness	S	=	157.11			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**201.63**	**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)

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Max. distance between toes of fillets of supporting elements for plate	b'	=	56	mm		
	t	=	2	mm		
Slenderness	b/t	=	28			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**185.00**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	185.00	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.09		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**	=	**185.00**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	185.00	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	=	24.19	MPa		… 3.4.8
	F_{ao}	=	185.00	MPa		… 3.4.10
	F_{bx}	=	185.00	MPa		… 3.4.17
	F_{by}	=	185.00	MPa		… 3.4.17
	f_a/F_a	=	0.341			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.43	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	41	mm		

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	t	=	2	mm		
Slenderness	h/t	=	20.5			
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			
			0.29	**MPa**		
***3.4.25** Shear in webs (Minor Axis)*						
Clear web height	b	=	56	mm		
	t	=	2	mm		
Slenderness	b/t	=	28			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sy}**	=	V/A_w			
			0.05	**MPa**		

6.6 Intermediate Purlin

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
40x40x2	**Intermediate Purlin**					
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	=	0.333	kN	*compression*	
	P	=	0	kN	*Tension*	

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In plane moment	M_x	=	0.4891	kNm		
Out of plane moment	M_y	=	0.0189	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	**=**	304	mm²		
In-plane elastic section modulus	Z_x	**=**	3668.2667	mm³		
Out-of-plane elastic section mod.	Z_y	**=**	3668.2667	mm³		
Stress from axial force	$\mathbf{f_a}$	**=**	P/A_g			
		=	**1.10**	**MPa**	*compression*	
		=	**0.00**	**MPa**	*Tension*	
Stress from in-plane bending	$\mathbf{f_{bx}}$	**=**	M_x/Z_x			
		=	**133.33**	**MPa**	*compression*	
Stress from out-of-plane bending	$\mathbf{f_{by}}$	**=**	M_y/Z_y			
		=	**5.15**	**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	=	3000	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	15.53	mm		
Radius of gyration about buckling axis (X)	r_x	=	15.53	mm		
Slenderness ratio	kLb/ry	=	193.11			
Slenderness ratio	kL/rx	=	193.11			
Slenderness parameter	λ	=	3.61			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.950			

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Factored limit state stress	**ϕF_L**	=	**17.60**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	193.11			
***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'	=	36			
	t	=	2	mm		
Slenderness	b/t	=	18			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	32.87			
Factored limit state stress	**ϕF_L**	=	**213.07**	**MPa**		
Most adverse compressive limit state stress	F_a	=	17.60	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	=	3000	mm		
Second moment of area (weak axis)	I_y	=	73365.33 3	mm^4		
Torsion modulus	J	=	109744	mm^3		
Elastic section modulus	Z	=	3668.266 7	mm^3		
Slenderness	S	=	245.29			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**194.46**	**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'	=	36	mm		
	t	=	2	mm		
Slenderness	b/t	=	18			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**213.07**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	194.46	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.69		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**	=	**194.46**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	194.46	MPa		
Most adverse out-of-plane bending capacity factor	**f_{by}/F_{by}**	=	0.03		PASS	

COMBINED ACTIONS

***4.1.1** Combined compression and bending* … 4.1.1(2)

	F_a	=	17.60	MPa		… 3.4.8
	F_{ao}	=	213.07	MPa		… 3.4.10
	F_{bx}	=	194.46	MPa		… 3.4.17
	F_{by}	=	194.46	MPa		… 3.4.17
	f_a/F_a	=	0.062			

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Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.77	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	36	mm		
	t	=	2	mm		
Slenderness	h/t	=	18			
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	=	36	mm		
	t	=	2	mm		
Slenderness	b/t	=	18			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sy}**	=	V/A_w			
			0.10	**MPa**		

6.7 Brace

NAME	SYMBOL		VALUE	UNIT	NOTES	REF
40x40x2	**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}	=	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			T3.4(B)
	k_c	=	1.0			
FEM ANALYSIS RESULTS						
Axial force	P	=	1.903	kN	*compression*	
	P	=	0	kN	*Tension*	
In plane moment	M_x	=	6.939E-18	kNm		
Out of plane moment	M_y	=	0.0288	kNm		
DESIGN STRESSES						
Gross cross section area	A_g	**=**	304	mm^2		
In-plane elastic section modulus	Z_x	**=**	3668.266 7	mm^3		
Out-of-plane elastic section mod.	Z_y	**=**	3668.266 7	mm^3		
Stress from axial force	$\mathbf{f_a}$	**=**	P/A_g			
		=	**6.26**	**MPa**	*compression*	
		=	**0.00**	**MPa**	*Tension*	
Stress from in-plane bending	$\mathbf{f_{bx}}$	**=**	M_x/Z_x			
		=	**0.00**	**MPa**	*compression*	
Stress from out-of-plane bending	$\mathbf{f_{by}}$	**=**	M_y/Z_y			
		=	**7.85**	**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	=	4000	mm		
Effective length factor	k	=	1			
Radius of gyration about buckling axis (Y)	r_y	=	15.53	mm		
Radius of gyration about buckling axis (X)	r_x	=	15.53	mm		
Slenderness ratio	kLb/ry	=	257.48			
Slenderness ratio	kL/rx	=	257.48			

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Slenderness parameter	λ	=	4.81			
	D_c*	=	90.3			
	S_1*	=	0.33			
	S_2*	=	1.23			
	ϕ_{cc}	=	0.950			
Factored limit state stress	**ϕF_L**	**=**	**9.90**	**MPa**		
2. Sections not subject to torsional or torsional-flexural buckling						… 3.4.8.2
Largest slenderness ratio for flexural buckling	kL/r	=	257.48			
***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'	=	36			
	t	=	2	mm		
Slenderness	b/t	=	18			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	32.87			
Factored limit state stress	**ϕF_L**	**=**	**213.07**	**MPa**		
Most adverse compressive limit state stress	F_a	=	9.90	MPa		
Most adverse tensile limit state stress	F_a	=	222.70	MPa		
Most adverse compressive & Tensile capacity factor	f_a/F_a	=	0.63		PASS	
BENDING - IN-PLANE						
***3.4.15** Compression in beams, extreme fibre, gross section rectangular tubes, box sections*						
Unbraced length for bending	L_b	=	4000	mm		
Second moment of area (weak axis)	I_y	=	73365.333	mm^4		
Torsion modulus	J	=	109744	mm^3		
Elastic section modulus	Z	=	3668.2667	mm^3		

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Slenderness	S	=	327.05			
Limit 1	S_1	=	0.39			
Limit 2	S_2	=	1695.86			
Factored limit state stress	**ϕF_L**	=	**188.90**	**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'	=	36	mm		
	t	=	2	mm		
Slenderness	b/t	=	18			
Limit 1	S_1	=	12.34			
Limit 2	S_2	=	46.95			
Factored limit state stress	**ϕF_L**	=	**213.07**	**MPa**		
Most adverse in-plane bending limit state stress	F_{bx}	=	188.90	MPa		
Most adverse in-plane bending capacity factor	f_{bx}/F_{bx}	=	0.00		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**	=	**188.90**	**MPa**		
Most adverse out-of-plane bending limit state stress	**F_{by}**	=	188.90	MPa		
Most adverse out-of-plane bending capacity factor	**f_{by}/F_{by}**	=	0.04		PASS	
COMBINED ACTIONS						
4.1.1 *Combined compression and bending*						… 4.1.1(2)
	F_a	=	9.90	MPa		… 3.4.8
	F_{ao}	=	213.07	MPa		… 3.4.10

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	F_{bx}	=	188.90	MPa		… 3.4.17
	F_{by}	=	188.90	MPa		… 3.4.17
	f_a/F_a	=	0.632			
Check:	$f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} \leq 1.0$					… 4.1.1 (3)
i.e.	0.67	≤	1.0		PASS	
SHEAR						
***3.4.24** Shear in webs (Major Axis)*						… 4.1.1(2)
Clear web height	h	=	36	mm		
	t	=	2	mm		
Slenderness	h/t	=	18			
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	=	36	mm		
	t	=	2	mm		
Slenderness	b/t	=	18			
Factored limit state stress	**ϕF_L**	=	**131.10**	**MPa**		
Stress From Shear force	**f_{sy}**	=	V/A_w			
			0.07	**MPa**		

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7 Summary

7.1 Conclusions

a. The 12m x 12m Function Deluxe Tent 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** – 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 third bay in between to resist against lateral movement due to wind direction2.

d. For uplift due to 80km/hr, 4.5 kN (450kg) holding down weight/per leg for upright support is required.

e. For uplift due to 80km/hr, 3.5 kN (350kg) hold down weight/ per leg for gable pole is required.

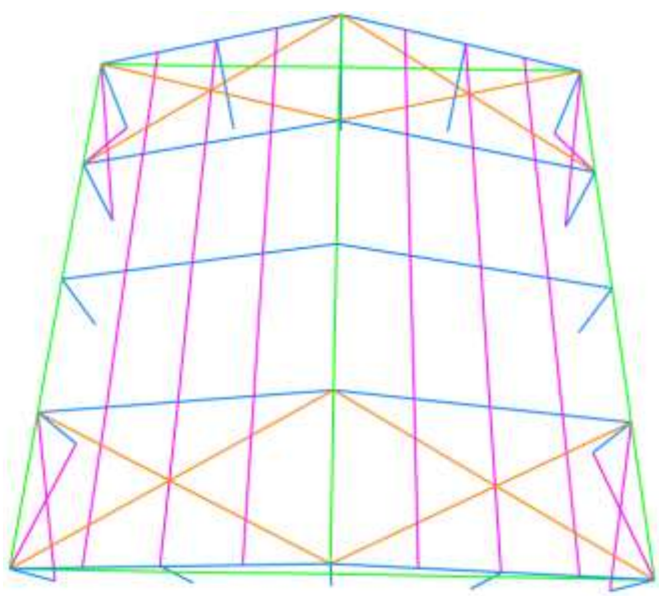
f. The bearing pressure of soil should be clarified and checked by an engineer prior to any construction for considering foundation and base plate.

g. Bracing Cables are required to have the minimum tensile strength (SWL) equal to 10kN.

h. It is important to use 40x40x2 profile for all intermediate purlins with spacing not exceeding 1500mm. This means 6 intermediate purlins are required per bay (as illustrated below).

i. It is important to use 100x48x3 profile for all gable poles.

MEMBER(S)	Section	b	d	t
		mm	mm	mm
Rafter	100x48x3	48	100	3
Upright Support	100x48x3	48	100	3
Gable Pole	100x48x3	48	100	3
Ridge & Eave Purlin	45x60x2	60	45	2
Gable Beam	45x60x2	60	45	2
Intermediate Purlin	40x40x2	40	40	2
Brace	40x40x2	40	40	2



Yours faithfully,

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8 Appendix A – Base Anchorage Requirements

12m x 12m Function Deluxe Tent:

Tent Span	Sile Type	Required Weight Per Leg
12 m	A	450kg
	B	450kg
	C	450kg
	D	450kg
	E	450kg
10 m	A	450kg
	B	450kg
	C	450kg
	D	450kg
	E	450kg
9 m	A	380kg
	B	380kg
	C	380kg
	D	380kg
	E	380kg
8 m	A	350kg
	B	350kg
	C	350kg
	D	350kg
	E	350kg
6 m	A	300kg
	B	300kg
	C	300kg
	D	300kg
	E	300kg

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.

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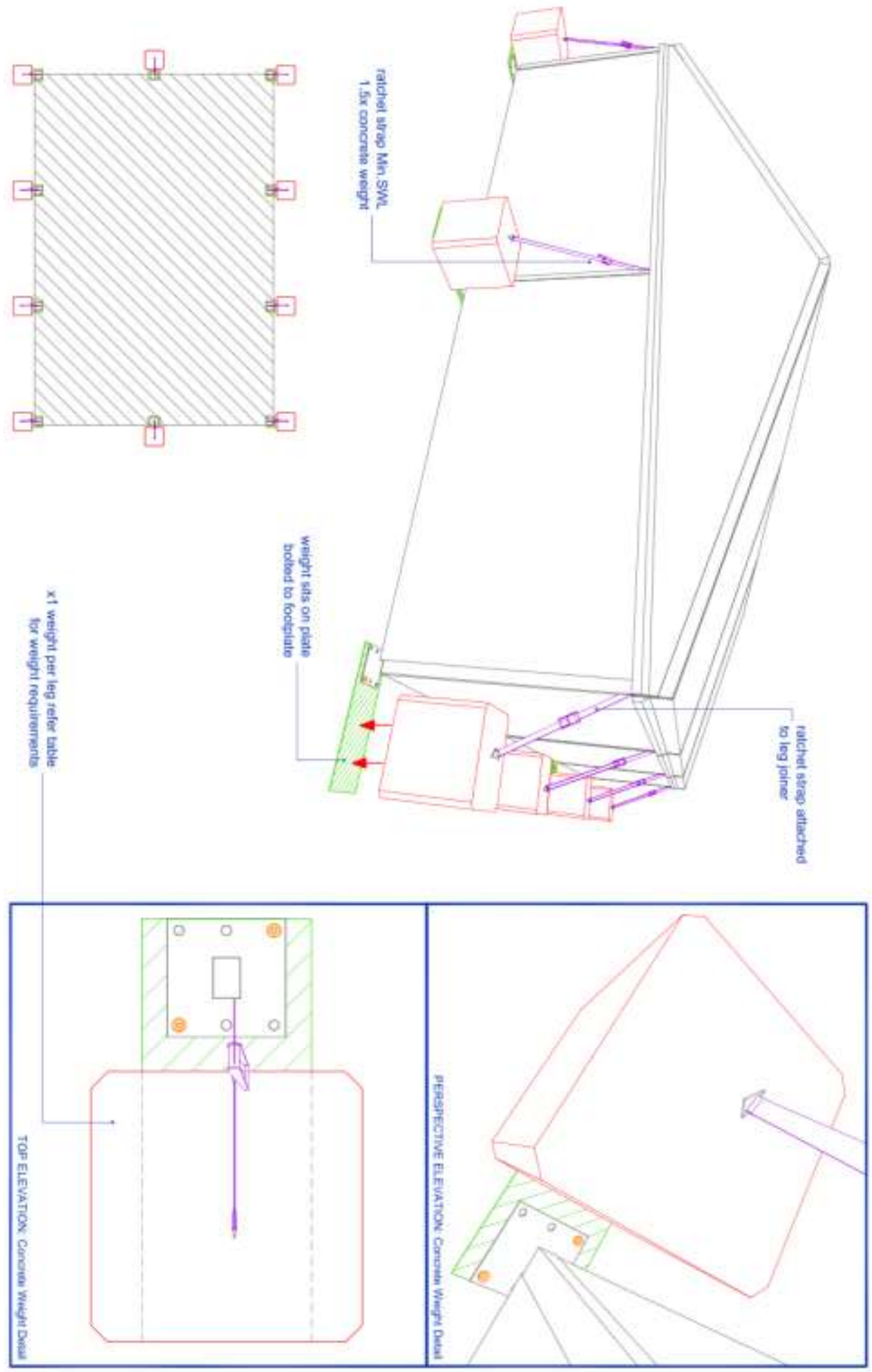
9 Appendix B – Hold Down Method Details



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