

# **STRUCTURAL DESIGN CALCULATIONS**

# GAZEBO DESIGN (3.0x3.0m)

## CLIENT: GALE PACIFIC LIMITED

### 145 WOODLANDS DRIVE, BRAESIDE, VICTORIA 3195, AUSTRALIA

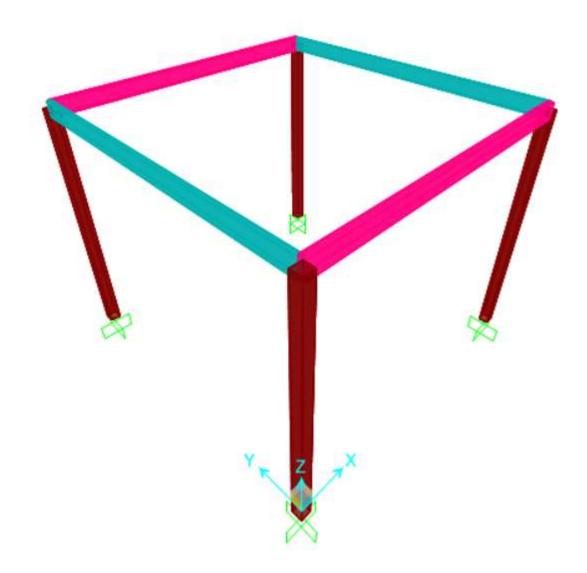
PREPARED BY:

Engr. Salman Amjad



## **1. 3D VIEW OF ANALYSIS MODEL**







# **2. INPUT PARAMETERS**

## 2.1. DESIGN LOADINGS & LOAD COMBINATIONS

Following floor loadings have considered for design;

**Dead Loadings:** Self-weight of Elements

**Construction Live Loadings:**  $= 0.250 \text{ kN/m}^2$ 

**Wind Loadings:** Design Wind loads  $= 0.78 \text{ kN/m}^2$ 

Service Wind loads =  $0.365 \text{ kN/m}^2$ 

Above values includes pressure coefficient (C<sub>pn</sub>)

### (Refer to below Wind Calculations)

Load Combinations:	Dead Load
	Dead Load + Wind Load
	1.35 x Dead Load
	1.2 x Dead Load + 1.5 x Live Load
	1.20 x Dead Load + 1.0 x Wind Load

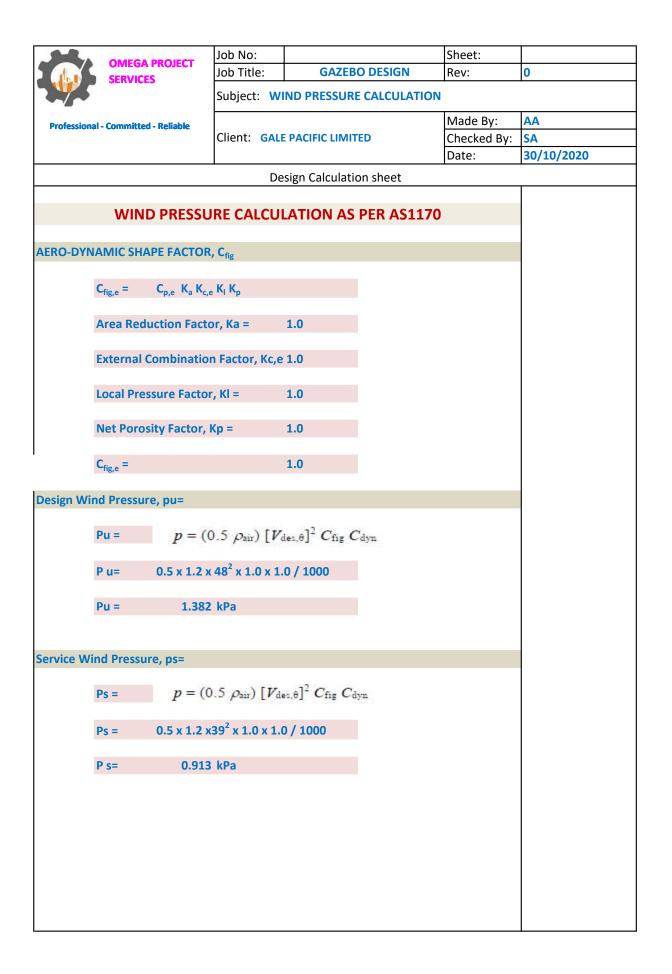
		Job No:		Sheet:	
	OMEGA PROJECT SERVICES	Job Title:	GAZEBO DESIGN	Rev:	0
	JERVICEJ		IND PRESSURE CALCULATION		
				-	AA
Professional	- Committed - Reliable	Client: GAL	E PACIFIC LIMITED	Made By: Checked By:	SA
	Cheft. GAL			Date:	30/10/2020
		De	sign Calculation sheet		•
	WIND PRE			IS	

	EGA PROJECT	Job No:			Sheet:	1
	/ICES	Job Title	e:	GAZEBO DESIG	N Rev:	0
		Subject:	WIND PF	RESSURE CALCUI	ATION	
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Professional - Committed - Reliable		Client	GALE PACIE		Made By: Checked By:	
					Date:	30/10/2020
					Date.	50/10/2020
			Design C	alculation sheet		
W	IND PRES	SURE CAL	CULATIC	ON AS PER AS	51170	
esign Wind Pre	ssure=	p = (0,	$.5 \rho_{air})$ [1	$V_{{ m des}, heta}]^2 C_{ m fig} C_{ m fig}$	lyn	
esign Forces o	n Surface=	$F = \sum_{i=1}^{n} (i - i)$	$(p_z A_z)$			
vhere						
Clause 2.4				e to forces town	ds the surface for	
NOTE: The positive pre	ssures and for e area, in so	rces away fro	m the surfac	ce for negative pre		
NOTE: The positive pre A <sub>z</sub> = a referenc	ssures and fo e area, in sc ) acts	rces away fro juare metres	m the surfac	ce for negative pre	ssures.	
NOTE: The positive pre $A_z =$ a referenc height $(p_z)$	ssures and fo e area, in sc ) acts	rces away fro juare metres	m the surfac s, at height BLE 3.1	ce for negative pre z, upon which t	ssures.	
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NOTE: The positive pre $A_z = a$ referenc height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$	A (1 to 7) 30 32	rces away fro juare metres TA REGIONAI Non-cyclonic W 34 39	m the surfaces, at height BLE 3.1 L WIND SP Region B 26 28	EEDS C C C C C C C C	the pressure at that $\overline{\mathbf{D}}$ $\overline{\mathbf{D}}$ $\overline{23 \times F_{\mathrm{D}}}$ $\overline{35 \times F_{\mathrm{D}}}$	
NOTE: The positive pre $A_z =$ a referenc height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$ $V_{10}$	ssures and for e area, in sc ) acts SPEED A (1 to 7) 30 32 34	rces away fro juare metres TAT REGIONAI Non-cyclonic W 34 39 41	m the surfaces, at height BLE 3.1 L WIND SP Region B 26 28 33	EEDS C C C C C C C C	ssures. the pressure at that $\overline{\mathbf{D}}$ $\underline{23 \times F_{D}}$ $\underline{35 \times F_{D}}$ $\underline{43 \times F_{D}}$	
NOTE: The positive pre $A_z = a$ referenc height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$ $V_{10}$ $V_{20}$	ssures and for         e area, in sc         ) acts         SPEED         A (1 to 7)         30         32         34         37	rces away fro juare metres TAT REGIONAI Non-cyclonic W 34 39 41 43	m the surfaces, at height BLE 3.1 L WIND SP Region B 26 28 33 38	EEDS C C C C C C C C	ssures. the pressure at that $\begin{array}{c} \hline \mathbf{D} \\ \hline 23 \times F_{\rm D} \\ \hline 35 \times F_{\rm D} \\ \hline 43 \times F_{\rm D} \\ \hline 51 \times F_{\rm D} \\ \hline \end{array}$	
NOTE: The positive pre $A_z = a$ referenc height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$ $V_{10}$ $V_{20}$ $V_{25}$	ssures and for         e area, in sc         ) acts         SPEED         A (1 to 7)         30         32         34         37         37	rces away fro luare metres TA REGIONAI Non-cyclonic W 34 39 41 43 43	m the surfaces, at height BLE 3.1 L WIND SP: Region 28 33 38 39	EEDS C $23 \times F_C$ $39 \times F_C$ $45 \times F_C$ $47 \times F_C$	onic D $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$	
NOTE: The positive pre $A_z = a$ referenc height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$ $V_{10}$ $V_{20}$ $V_{25}$ $V_{50}$	A (1 to 7) 30 32 34 37 39	rces away fro luare metres TA REGIONAI Non-cyclonic W 34 39 41 43 43 43 43	m the surfaces, at height BLE 3.1 L WIND SP Regio B 26 28 33 38 39 44	EEDS C C $23 \times F_{C}$ $39 \times F_{C}$ $45 \times F_{C}$ $47 \times F_{C}$ $52 \times F_{C}$	the pressure at that $\overline{D}$ $35 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$	
NOTE: The positive pre $A_z = a$ referenc height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_2$ $V_1$ $V_2$ $V_2$ $V_2$ $V_2$ $V_3$ $V_1$ $V_2$ $V_2$ $V_2$ $V_3$ $V_1$	A (1 to 7) 30 32 34 37 39 41	rces away fro luare metres TA REGIONAI Non-cyclonic W 34 39 41 43 43 43 43 43 43 43	m the surfaces, at height BLE 3.1 L WIND SP2 Regio B 26 28 33 38 39 44 48	EEDS C $Z_3 \times F_C$ $Z_3 \times$	the pressure at that $\overline{D}$ $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $66 \times F_D$	
NOTE: The positive pre $A_z = a \text{ referenc} \\ \text{height } (p_z)$ EGIONAL WIND EGIONAL WIND $\frac{V_1}{V_1}$ $\frac{V_1}{V_2}$ $\frac{V_1}{V_{20}}$ $\frac{V_{20}}{V_{20}}$ $\frac{V_{100}}{V_{200}}$	A (1 to 7) 30 32 34 37 39 41 43	rces away fro luare metres TA REGIONAI Non-cyclonic W 34 39 41 43 43 43 43 43 45 47 49	m the surface s, at height BLE 3.1 L WIND SP Region B 26 28 33 38 39 44 48 52	EEDS C C $23 \times F_{C}$ $33 \times F_{C}$ $39 \times F_{C}$ $45 \times F_{C}$ $47 \times F_{C}$ $52 \times F_{C}$ $56 \times F_{C}$ $61 \times F_{C}$	the pressure at that $\overline{D}$ $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $60 \times F_D$ $60 \times F_D$ $60 \times F_D$ $72 \times F_D$	
NOTE: The positive pre $A_z = a \text{ referenc} \\ \text{height } (p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_3$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$	A (1 to 7) 30 32 34 37 37 39 41 43 43	rces away fro puare metres TA REGIONAI Non-cyclonic W 34 39 41 43 43 43 43 43 43 43 43 43 43 43 43 43	m the surface s, at height BLE 3.1 L WIND SP Region B 26 28 33 38 39 44 48 52 53	EEDS C C C $23 \times F_{C}$ $33 \times F_{C}$ $39 \times F_{C}$ $45 \times F_{C}$ $47 \times F_{C}$ $52 \times F_{C}$ $56 \times F_{C}$ $61 \times F_{C}$ $62 \times F_{C}$	conic D 23× $F_D$ 35× $F_D$ 43× $F_D$ 51× $F_D$ 51× $F_D$ 60 × $F_D$ 60 × $F_D$ 72 × $F_D$ 74 × $F_D$	
NOTE: The positive pre $A_z = a \text{ referenc} \\ \text{height } (p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$	<b>A</b> (1 to 7)         30         32         34         37         39         41         43         45	Weight of the second state           Non-cyclonic           W           34           39           41           43           443           443           443           443           45           47           49           51	m the surface s, at height BLE 3.1 L WIND SP Region B 26 28 33 38 39 44 48 52 53 57	EEDS C (yell of the second state of the se	conic D $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $60 \times F_D$ $72 \times F_D$ $74 \times F_D$ $80 \times F_D$	
NOTE: The positive pre $A_{z} = a \text{ referenc} \\ \text{height } (p_{z})$ EGIONAL WIND EGIONAL WIND $V_{1}$ $V_{1}$ $V_{5}$ $V_{10}$ $V_{20}$ $V_{20}$ $V_{20}$ $V_{200}$	<b>A</b> (1 to 7)         30         32         34         37         39         41         43         45         46	Non-cyclonic           W         34         39         41         43         43         43         45         47         49         49         51         53         53         53         53         53         53         53         53         53         53         50	m the surface s, at height BLE 3.1 L WIND SP Regio B 26 28 33 38 39 44 48 52 53 57 60	EEDS The for negative pre- z, upon which the EEDS The form the form of th	conic D 23× $F_D$ 35× $F_D$ 43× $F_D$ 51× $F_D$ 53× $F_D$ 60× $F_D$ 60× $F_D$ 66× $F_D$ 72× $F_D$ 74× $F_D$ 80× $F_D$ 85× $F_D$	
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NOTE: The positive pre $A_z = a \text{ referenc}$ height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$ $V_1$ $V_2$ V	ssures and for         e area, in sc         ) acts         SPEED         A (1 to 7)         30         32         34         37         39         41         43         43         45         46         48	rces away fro [uare metres <b>TA</b> <b>REGIONAL</b> Non-cyclonic W 34 39 41 43 43 43 43 43 43 43 43 43 43	m the surface s, at height BLE 3.1 L WIND SP Regio B 26 28 33 38 39 44 48 52 53 57 60 63	EEDS The for negative pre- z, upon which the EEDS The formation of the formation of th	conic D 23× $F_D$ 35× $F_D$ 35× $F_D$ 43× $F_D$ 51× $F_D$ 51× $F_D$ 60 × $F_D$ 60 × $F_D$ 60 × $F_D$ 72 × $F_D$ 74 × $F_D$ 80 × $F_D$ 85 × $F_D$ 90 × $F_D$	

OMEGA PROJECT	Job No:			Sheet:	
SERVICES	Job Title:		GAZEBO DESIGN	Rev:	0
	Subject: V		RESSURE CALCULATIC	N	
rofessional - Committed - Reliable		Made By:	AA		
	Client: GA	LE PACIF		Checked By:	SA
				Date:	30/10/2020
	C	esign C	alculation sheet		
		0			
WIND PRESSU	JRE CALCU	JLATIC	ON AS PER AS117	0	
	DESIGN W	'IND SP	EED		
	Con	stants			
Density of air		1.2	kg/m^3		
	Location &	Hazard			
Region Site Exposure Classi		В	Non-cyclonic		
Average Recurrence Interva		100	years		
errain category (TC)		1.00			
Probability of exceedance,	P=1/R	0.01			
Regional wind speed, V_R		48.0	m/s		
Site wind speed, V_site,β		48.0	m/s		
Design wind speed, V des,6	Э	48.0	m/s		
,,,,	Wind Spee				
		1.00	(Likely pos	sible)	
Vind direction multiplier, N	M_d	0.99	(Largest po		
annoin /haight multiplian			(8	/	
errain/neight multiplier. N	/ z.cat	1.00			
errain/height multiplier, N Shielding multiplier, M s	/I_z,cat	1.00			
errain/neight multiplier, M_s Fielding multiplier, M_s Ferrain multiplier, M_t	/l_z,cat	1.00 1.00 1.00			
hielding multiplier, M_s errain multiplier, M_t	N_z,cat	1.00 1.00	D SPEED		
hielding multiplier, M_s errain multiplier, M_t	RVICEIABILI	1.00 1.00			
hielding multiplier, M_s errain multiplier, M_t	RVICEIABILI	1.00 1.00			
hielding multiplier, M_s errain multiplier, M_t SEF	RVICEIABILI	1.00 1.00 TY WIN nstants 1.2	kg/m^3		
hielding multiplier, M_s errain multiplier, M_t SEF	RVICEIABILI Co Location 8	1.00 1.00 TY WIN nstants 1.2	kg/m^3		
hielding multiplier, M_s errain multiplier, M_t SEF	RVICEIABILI Co Location 8 sification	1.00 1.00 TY WIN nstants 1.2 Hazard	kg/m^3 d Design		
hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class	RVICEIABILI Co Location 8 sification	1.00 1.00 TY WIN nstants 1.2 Hazarc B	kg/m^3 d Design Non-cyclonic		
hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv	RVICEIABILI Co Location 8 sification ral, R	1.00 1.00 <b>TY WIN</b> nstants 1.2 Hazarc B 100	kg/m^3 d Design Non-cyclonic		
hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv Terrain category (TC)	RVICEIABILI Co Location & sification /al, R , P=1/R	1.00 1.00 <b>FY WIN</b> nstants 1.2 Hazarc B 100 1.00	kg/m^3 d Design Non-cyclonic		
hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv Terrain category (TC) Probability of exceedance	RVICEIABILI Co Location & sification /al, R , P=1/R	1.00 1.00 TY WIN Instants 1.2 Hazarc B 100 1.00 0.01	kg/m^3 d Design Non-cyclonic years		
hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv Terrain category (TC) Probability of exceedance Regional wind speed, V_R	RVICEIABILI Co Location 8 sification ral, R , P=1/R	1.00 1.00 TY WIN nstants 1.2 Hazarc B 100 1.00 0.01 39.0	kg/m^3 d Design Non-cyclonic years m/s		
hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv Terrain category (TC) Probability of exceedance Regional wind speed, V_R Site wind speed, V_site,β	RVICEIABILI Co Location 8 sification ral, R , P=1/R	1.00 1.00 <b>FY WIN</b> Instants 1.2 Hazarce B 100 1.00 0.01 39.0 39.0 39.0	kg/m^3 d Design Non-cyclonic years m/s m/s m/s		
hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv Terrain category (TC) Probability of exceedance Regional wind speed, V_R Site wind speed, V_site,β Design wind speed, V_des	RVICEIABILI Co Location 8 sification ral, R , P=1/R , $\Theta$ Wind Spe	1.00 1.00 <b>FY WIN</b> Instants 1.2 Hazarce B 100 1.00 0.01 39.0 39.0 39.0	kg/m^3 d Design Non-cyclonic years m/s m/s m/s	ssible)	
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hielding multiplier, M_s errain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv Terrain category (TC) Probability of exceedance Regional wind speed, V_R Site wind speed, V_site,β Design wind speed, V_des	RVICEIABILI Co Location 8 sification ral, R , P=1/R , $\Theta$ Wind Spe M_d	1.00 1.00 ry WIN nstants 1.2 Hazard B 100 1.00 0.01 39.0 39.0 39.0 d Muli 1.00	kg/m^3 d Design Non-cyclonic years m/s m/s m/s tipliers (Likely po		
bhielding multiplier, M_s Ferrain multiplier, M_t SEF Density of air Region Site Exposure Class Average Recurrence Interv Terrain category (TC) Probability of exceedance Regional wind speed, V_R Site wind speed, V_site,β Design wind speed, V_des Wind direction multiplier,	RVICEIABILI Co Location 8 sification ral, R , P=1/R , $\Theta$ Wind Spe M_d	1.00 1.00 ry win nstants 1.2 Hazarc B 100 1.00 0.01 39.0 39.0 39.0 39.0 d Mult 1.00 0.99	kg/m^3 d Design Non-cyclonic years m/s m/s m/s tipliers (Likely po		

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5	ENVICED		Subject	t: WIND	PRESSU	RE CALCU	JLATION		
essional - Co	ommitted -	Reliable						Made By:	AA
			Client:	GALE PA	CIFIC LIM	ITED	-	Checked By:	SA
								Date:	30/10/2020
				Desigr	n Calculat	tion shee	t		
	WIND	PRESS	URE CA	LCULA		S PER A	S1170		
DIRECT			PLIER, Mo						
DIRLCH				ABLE 3.	,				
		WINT				P (MA)			
	1417 A. 414	1/20/2011/202	DIRECT	0.5.10.2	18. 25.	100 100	24 50	Sec. 27	
Cardinal irections	Region Al	Region A2	Region A3	Region A4	Region A5	Region A6	Region A7	Region W	
N	0.90	0.80	0.85	0.90	1.00	0.85	0.90	1.00	
NE E	0.80	0.80	0.80	0.85	0.85	0.95	0.90	0.95 0.80	
SE	0.80	0.95	0.80	0.90	0.80	0.95	0.90	0.90	1
S	0.85	0.90	0.80	0.95	0.85	0.85	0.90	1.00	
SW W	0.95	0.95	0.85	0.95	0.90	0.95	0.90	1.00 0.90	
	0.95	0.95	1.00	0.90	0.95	0.95	1.00	0.95	
NW		62	1.00	1.00	1.00	1.00	1.00	1.00	
Any	1.00	1.00	1.00		200000	C DOLONOX	1	32	
	1.00	1.00	1.00	2020	12-242871			<u></u>	
Any		1.00 <b>1.0</b>	a and	1010	100000				
Any lirection			a and	1010	3				
Any lirection Mc	=	1.0	0		2000				
Any lirection Mc	=		0			17.00084			
Any lirection Mc	=	1.0	0 Mz,cat	ABLE 4.	1		1		
Any lirection Mo	= GHT MUI RRAIN/	1.0 LTIPLIER, HEIGHT	0 Mz,cat TA	ABLE 4. PLIERS	FOR GU		D SPEED	s	
Any lirection Mo	= GHT MUI RRAIN/	1.0 LTIPLIER, HEIGHT	0 Mz,cat T AULTI VELOPE	ABLE 4. PLIERS D TERR	FOR GU AINS—A	LL REG		s	
Any Any Any Any Any Any Any Any Any Any	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR.	FOR GU AINS—A	LL REG	IONS		
Any lirection Mo IN/HEIO TE	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR	FOR GU AINS—A ht multipli	LL REG	Ter	IS Train gory 4	
Any lirection Mc UN/HEIC TE Height ( m	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE Terrain	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. Terrain/heigh Terrain	FOR GU AINS—A ht multipli	LL REG er (M <sub>2,cat</sub> ) 'errain	Ter	rain gory 4	
Any lirection Mc IN/HEIC TE Height ( m ≤3 5	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE' Terrain category 1 0.99 1.05	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. Terrain/heigl Terrain ategory 2 0.91 0.91	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>z.cst</sub> ) errain tegory 3 0.83 0.83	Ter categ	rain gory 4 75 75	
Any lirection MC UN/HEIC TE Height ( m \$3 \$10	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE Terrain category 1 0.99 1.05 1.12	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR Terrain ategory 2 0.91 0.91 1.00	FOR GU AINS—A ht multipli	LL REG er (M <sub>s.cst</sub> ) 'errain tegory 3 0.83 0.83 0.83	Ter categ	rain gory 4 75 75 75 75	
Any irection IN/HEIC TE Height ( m 5 10 15	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE' Terrain category 1 0.99 1.05 1.12 1.16	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. Terrain ategory 2 0.91 0.91 1.00 1.05	FOR GU AINS—A ht multipli	LL REG er (M <sub>s.cst</sub> ) errain tegory 3 0.83 0.83 0.83 0.83 0.89	Ter cates 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75	
Any lirection Mc IN/HEIC TE Height ( m S 10	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE Terrain category 1 0.99 1.05 1.12 1.16 1.19	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. Terrain ategory 2 0.91 0.91 1.00 1.05 1.08	FOR GU AINS—A ht multipli	LL REG er (M <sub>s.cst</sub> ) 'errain tegory 3 0.83 0.83 0.83	Ter categ	rain gory 4 75 75 75 75 75	
Any tirection MC UN/HEIC TE Height ( m 23 5 10 15 20 30	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHI LLY DEV Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12	FOR GU AINS—A ht multipli	LL REG er (M <sub>2,cel</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.83 0.89 0.94 1.00	Ter categ 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 75 75 75 75 75 75	
Any irrection Mc UN/HEIC TE Height ( m 23 5 10 15 20 30 40 50	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. rrain/heighted Terrain ategory 2 0.91 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>r.c.s.</sub> ) errain tegory 3 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.07	Ter categ 0.7 0.7 0.7 0.7 0.7 0.7 0.5 0.5 0.5	rain gory 4 75 75 75 75 75 80 85 90	
Any irrection MC UN/HEIC TE Height ( m 23 5 10 15 20 30 40 50 75	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. rrain/heigl Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) ferrain tegory 3 0.83 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.07 1.12	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 80 85 80 88	
Any irrection MC IN/HEIC TE Height ( m 5 10 30 40 50 75 100	I = GHT MUI RRAIN/ IN FUI	1.0 TIPLIER, HEIGHI LLY DE' Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27 1.29	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. rrain/heighted Terrain ategory 2 0.91 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>r.c.s.</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.07 1.12 1.16	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 83 80 83 90 88 93	
Any irection IN/HEIC TE Height ( m ≤3 5 10 15 20 30 40 50 75 100 150	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. rrain/heigl Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>r.col</sub> ) errain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.07 1.12 1.16 1.21	Ter categ 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	
Any itrection MC UN/HEIC TE Height ( m 23 5 10 15 20 30 40 50 75 100 150 200	RRAIN/ IN FU	1.0 TIPLIER, HEIGHT LLY DE	0 Mz,cat TA MULTI VELOPE Te	ABLE 4. PLIERS D TERR. rrain/heigh Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24 1.27 1.29	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.00 1.04 1.07 1.12 1.16 1.21 1.24	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	
Any irrection MC IN/HEIC TE Height ( m 23 5 10 15 20 30 40 50 75 100 150 200	RRAIN/ IN FU	1.0 TIPLIER, HEIGHT LLY DE	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. rrain/heigh Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24 1.27 1.29	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.00 1.04 1.07 1.12 1.16 1.21 1.24	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	
Any lirection MC IN/HEIC TE Height ( m 23 5 10 15 20 30 40 50 100 155 200 00TE: For	I = GHT MUI RRAIN/ IN FUI (z) intermedia	1.0 LTIPLIER, HEIGHI LLY DEV Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27 1.29 1.31 1.32 te values of	0 Mz,cat TA TMULTI VELOPE Te 1 c	ABLE 4. PLIERS D TERR. rrain/heigh Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24 1.27 1.29	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.00 1.04 1.07 1.12 1.16 1.21 1.24	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	
Any hirection MC UN/HEIC TE Height ( m 23 5 10 15 20 30 40 50 75 100 150 200 OTE: For Ter	I = GHT MUI RRAIN/ IN FUI (2) intermedia rrain Cat	1.0 TIPLIER, HEIGHI LLY DEV Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27 1.29 1.31 1.32 te values of agorey=	0 Mz,cat TA TMULTI VELOPE Te 1 c	ABLE 4. PLIERS D TERR. rrain/heigh Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24 1.27 1.29	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.00 1.04 1.07 1.12 1.16 1.21 1.24	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	
Any hirection MC UN/HEIC TE Height ( m 23 5 10 15 20 30 40 50 75 100 150 200 OTE: For Ter	I = GHT MUI RRAIN/ IN FUI (z) intermedia	1.0 TIPLIER, HEIGHI LLY DEV Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27 1.29 1.31 1.32 te values of agorey=	0 Mz,cat TA TMULTI VELOPE Te 1 c	ABLE 4. PLIERS D TERR. rrain/heigh Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24 1.27 1.29	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.00 1.04 1.07 1.12 1.16 1.21 1.24	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	
Any hirection Mc IN/HEIC TE Height ( m 23 5 10 15 20 30 40 50 75 100 150 200 00TE: For Ter Height (	RRAIN/ IN FUI (z) intermedia	1.0 LTIPLIER, HEIGHT LLY DEV Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27 1.29 1.31 1.32 te values of agorey= n)=	0 Mz,cat TA TMULTI VELOPE Te 1 c	ABLE 4. PLIERS D TERR. rrain/heigh Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24 1.27 1.29	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.00 1.04 1.07 1.12 1.16 1.21 1.24	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	
Any lirection Mc IN/HEIC TE Height ( m ≤3 5 10 15 20 30 40 50 75 100 150 200 0TE: For Hei	RRAIN/ IN FUI (z) intermedia	1.0 TIPLIER, HEIGHI LLY DEV Terrain category 1 0.99 1.05 1.12 1.16 1.19 1.22 1.24 1.25 1.27 1.29 1.31 1.32 te values of agorey=	0 Mz,cat TA TMULTI VELOPE Te 1 c	ABLE 4. PLIERS D TERR. rrain/heigh Terrain ategory 2 0.91 0.91 1.00 1.05 1.08 1.12 1.16 1.18 1.22 1.24 1.27 1.29	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cen</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.89 0.94 1.00 1.04 1.00 1.04 1.07 1.12 1.16 1.21 1.24	Ter cates 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 80 85 80 85 80 85 80 98 93 11	

		OMEGA PF	OFCT	Job No:				1	Sheet:	
		SERVICES	OJECT	Job Title	2:	GAZEB	O DESIGN	J	Rev:	0
	5			Subject:	Subject: WIND PRESSURE CALCULATION					
Bro	forcional C	ommitted [	Poliabla					Made By:	AA	
	Professional - Committed - Reliable			Client:	Client: GALE PACIFIC LIMITED			-	Checked By:	SA
								-	Date:	30/10/2020
				•	Design	Calculati	on sheet			•
		WIND	PRESSU	JRE CAL	CULAT	ION AS	PER AS	1170		
SHIE		ULTIPLIEF	R, Ms							
	Ms	; =	1.00	)						
торс	OGRAPHI		PLIER, Mt							
	Mt	=	1.00	)						
DYN/	AMIC RES	PONSE F	ACTOR, C	dyn						
	Cdy	yn =	1.00	)						
EXTE	RNAL PR	ESSURE C	OEFFICE	NT						
					BLE D4					
				ESSURE O			(see Figur	re D2)		
		MONO	<b>DSLOPE</b>							
		MONO	8	S - 040		T	1936 - 1755 1946 - 1946	dagnaas		
Ŧ	Roof		$\theta = 0$ o	degrees	¢.,		$\theta = 180$		<u> </u>	
Ī,	pitch (a)	<i>C</i> 1	<b>θ</b> = 0 α	degrees C	p,ł		<b>θ</b> = 180			
Ī			$\theta = 0$ o	degrees	, p,/ Blocked under	C Empty under	$\theta = 180$		C <sub>p,ℓ</sub> Blocked under	
Ī	pitch (a) degrees	C Empty under -0.3, 0.4	θ = 0 c p.w Blocked under -1.0, 0.4	degrees C Empty under -0.4, 0.0	Blocked under -0.8, 0.4	Empty under -0.3, 0.4	θ = 180 p,w Blocked under -1.0, 0.4	Empty under -0.4, 0.0	Blocked under -0.8, 0.4	
Ĺ	pitch ( <i>a</i> ) degrees	C Empty under -0.3, 0.4 -1.0	θ = 0 c p,w Blocked under -1.0, 0.4 -1.5	degrees C Empty under -0.4, 0.0 -0.6, 0.0	Blocked under -0.8, 0.4 -1.0, 0.2	Empty under -0.3, 0.4 0.8	θ = 180 p,w Blocked under -1.0, 0.4 0.8	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
Ī	pitch (a) degrees	C Empty under -0.3, 0.4	θ = 0 c p.w Blocked under -1.0, 0.4	degrees C Empty under -0.4, 0.0	Blocked under -0.8, 0.4	Empty under -0.3, 0.4	θ = 180 p,w Blocked under -1.0, 0.4	Empty under -0.4, 0.0	Blocked under -0.8, 0.4	
	pitch ( <i>a</i> ) degrees	C Empty under -0.3, 0.4 -1.0	θ = 0 c p,w Blocked under -1.0, 0.4 -1.5	degrees C Empty under -0.4, 0.0 -0.6, 0.0	Blocked under -0.8, 0.4 -1.0, 0.2	Empty under -0.3, 0.4 0.8	θ = 180 p,w Blocked under -1.0, 0.4 0.8	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30	C Empty under -0.3, 0.4 -1.0 -2.2	<b>θ</b> = 0 c p,w Blocked under −1.0, 0.4 −1.5 −2.7	degrees C Empty under -0.4, 0.0 -0.6, 0.0 -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6	θ = 180 d p,w Blocked under -1.0, 0.4 0.8 1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30	C Empty under -0.3, 0.4 -1.0 -2.2	<b>θ</b> = 0 c p,w Blocked under −1.0, 0.4 −1.5 −2.7	degrees C Empty under -0.4, 0.0 -0.6, 0.0	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8	θ = 180 d p,w Blocked under -1.0, 0.4 0.8 1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p,w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	degrees C Empty under -0.4, 0.0 -0.6, 0.0 -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6	θ = 180 d p,w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p,w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p.w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p.w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p.w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p.w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p.w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	
	pitch (α) degrees 0 15 30 <b>Ro</b>	C Empty under -0.3, 0.4 -1.0 -2.2	θ = 0 d p,w Blocked under -1.0, 0.4 -1.5 -2.7 re Coefficient	Empty under           -0.4, 0.0           -0.6, 0.0           -1.1, -0.2	Blocked under -0.8, 0.4 -1.0, 0.2 -1.3, 0.0	Empty under -0.3, 0.4 0.8 1.6 -0.4, 0.4)	θ = 180 d p,w       Blocked under       -1.0, 0.4       0.8       1.6	Empty under -0.4, 0.0 0.4	Blocked under -0.8, 0.4 -0.2	



	Job No:			Sheet:	
OMEGA PROJECT SERVICES	Job Title:	GAZEBO E	DESIGN	Rev:	0
	Subject: W	IND PRESSURE C	ALCULATION		
Professional - Committed - Reliable				Made By:	AA
	Client: GAL	E PACIFIC LIMITE	D	Checked By:	SA
				Date:	30/10/2020
	De	esign Calculation	sheet		
WIND PRESSU	JRE CALCU	LATION AS PE	R AS1170		
Applied Ultimate Wind Pressure	e, Wu=				
Wu, roof = 1.382 x 0.	4 = 0.55 kPa				
Wu, wall = 1.3 x 1.38	2 = 1.80 kPa				
Applied Service Wind Pressure,	Ws=				
Ws, roof = 0.913 x 0.	4 = 0.365 kPa			I	
Ws, wall = 0.913 x 1.	3 = 1.19 kPa				
Applied Member Loadings					
Column Section=		100 x 100 x 1.4			
Main Beam Section=		150 x 62 x 1.3			
Secondary Beam Sec	ction=	33 x 125 x 1.1			
a) Applied Ultimate	Wind Loading	gs			
Line Loading on Colu	mn =	1.80 x 0.1 =0.18	kN/m		
Line Loading on Mair	i Beam =	0.55 x 0.062 =0.	0341 kN/m		
Side Line Loading on	Main Beam =	0.55 x 0.15 =0.0	82 kN/m		
Line Loading on Seco	ndary Beam =	0.55 x 0.125 =0.	069 kN/m		
b) Applied Service V	Vind Loading	JS			
Line Loading on Colu	mn =	1.19 x 0.1 =0.11	9 kN/m		
Line Loading on Mair	i Beam =	0.365 x 0.062 =0	).02262 kN/m	I	
Side Line Loading on	Main Beam =	0.365 x 0.15 =0.	055 kN/m		
Line Loading on Seco	ndary Beam =	0.365 x 0.125 <u>=0</u>	).046 kN/m		



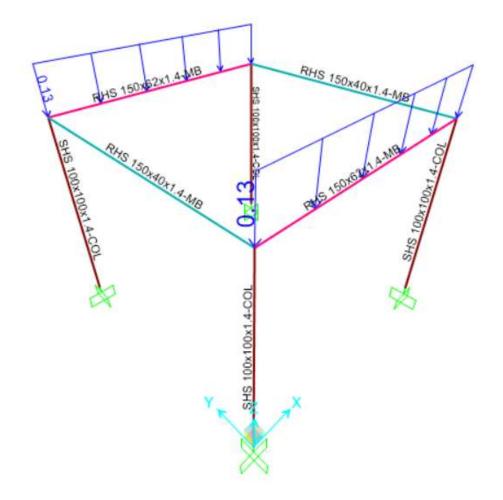
#### 2.2. **MATERIAL STRENGTH**

Following material strength have considered for design;

Material Properties of:	Alloy 6063-T5
Compressive Yield Strength,	f <sub>cy</sub> = 110 MPa
Tensile Yield Strength,	f <sub>ty</sub> = 110 MPa
Tensile Ultimate Strength,	f <sub>tu</sub> = 152 MPa
Shear Ultimate Strength,	f <sub>su</sub> = 90 MPa
Refer to AS1664.1 table 3.3A	
Design Code:	AS1664

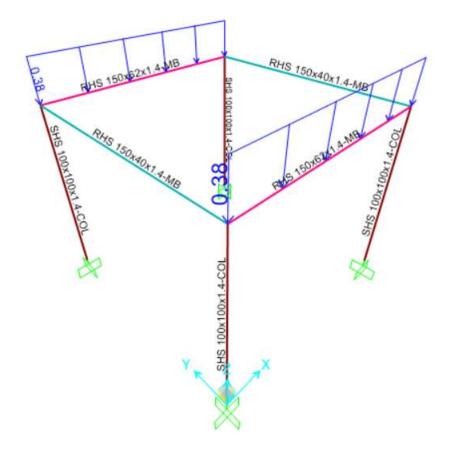


# 2.3. APPLIED LOADING



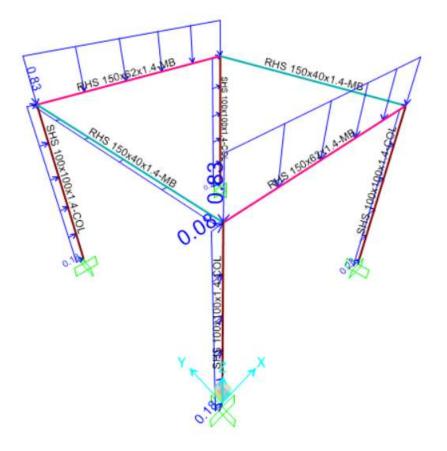
## **Applied Dead Loadings**





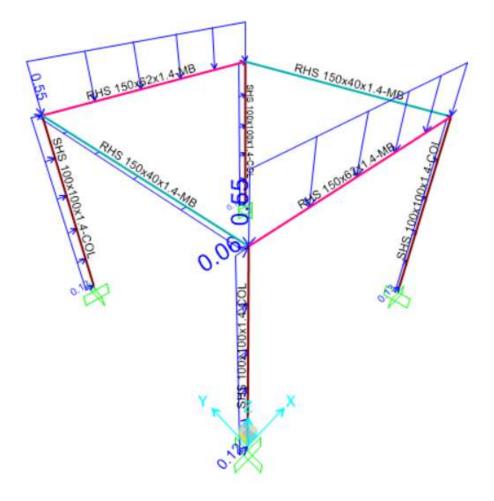
## **Applied Live Loadings**





## **Ultimate Wind Loadings**





## **Service Wind Loadings**



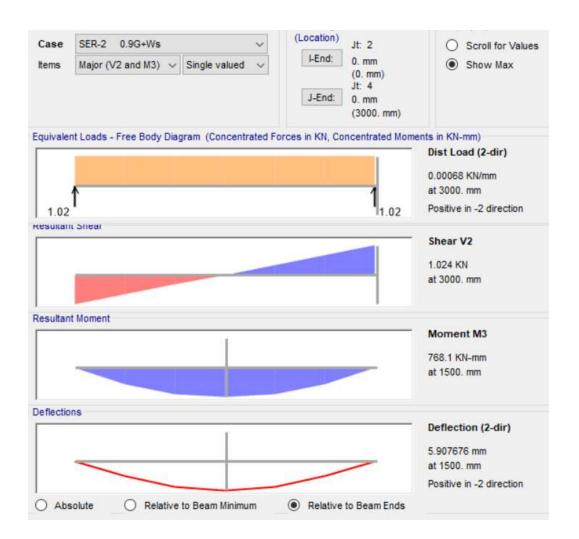
# **3. CRITICAL ELEMENTS DESIGN**

## 3.1. BEAM DESIGN

Member Size	= 150 x 62 x 1.4				
Member Span	= 3.0m				
Panel Distributary Width	= 1.50m				
Dead Load	$= 0.09 \text{ kN/m}^2$				
	(From Self-weight of 33.9 x 125 x 1.1)				
	= 0.09 x 1.5 = 0.135 kN/m				
Live Load	$= 0.25 \text{ kN/m}^2$				
	= 0.25 x 1.5 = 0.375 kN/m				
Ultimate Line Loading	= 0.55 x 1.5 = 0.825 kN/m				
Service Line Loading	= 0.365 x 1.5 = 0.55 kN/m				



## A) DEFLECTION CHECK



Maximum Deflection Value,  $\delta = 5.91$ mm

Calculated Deflection Limit = 3000/180 = 16.66mm

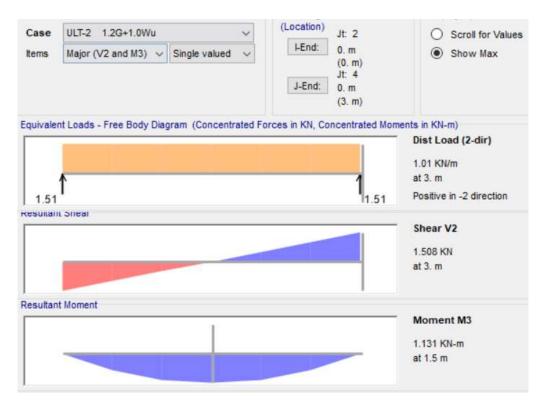
Allowable Deflection Limit = L/180

#### Therefore, member size (150 x 62 x 1.4) is adequate.

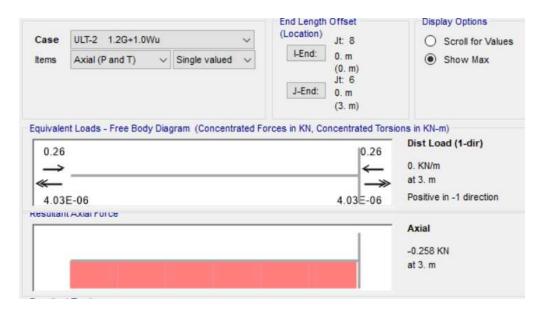


### B) STRENGTH CHECK

#### MAJOR DIRECTION BENDING MOMENT AND SHEAR FORCE



#### **AXIAL FORCE DIAGRAM**





In conclusion, following are the design forces	
Ultimate Bending Moment (Major Direction), Mu	= 1.130 kN-m
Ultimate Shear Force (Major Direction), Vu	= 1.508 kN
Ultimate Axial Force, Pu	= 0.26 kN
C) Design Stresses Check	
Bending Stress Check	
Gross sectional area, Ag	= 586 mm <sup>2</sup>
In plane Elastic Section Modulus, Zy	= 22702 mm <sup>3</sup>
Stress from axial force = $fa = P/Ag$	= 260 /586
	= 0.44 MPa
Stress from in-plane fby $= My/Zy$	$= 1.13 \times 10^{6}/22702$
	= 49.71 MPa
Compression in beam Eq 3.4.15	
Unsupported Length of Member, major = Lmaj	= 3.000 m
Unsupported Length of Member, minor = Lmin	= 3.000/30 = 0.10m
Effective length factor $= k$	= 1
Radius of gyration about buckling axis (Y) = $r_y$	= 53.90mm
Radius of gyration about buckling axis $(z) = rz$	= 27.22mm
Slenderness ratio = $kLb/r_y$ = 3000/53.9 = 55.65	
Slenderness ratio = $kLb/rz = 133/27.22 = 4.88$	
Bc = 119.3 MPa REFER AS1664.1 TABLE 3.3D	



Dc = 0.492 MPa REFER AS1664.1 TABLE 3.3D Cc = 99.38 REFER AS1664.1 TABLE 3.3D S1 = 21.51 S2 = 3857.96 J = 1085373 mm<sup>4</sup> Iy = 1702603 mm<sup>4</sup> Zc = 14002 mm<sup>3</sup> Lb x Zc/[0.5 x (Iy x J)<sup>1/2</sup>] = 2.740 < S1 Therefore  $\phi$ FL =  $\phi_b$  x Fcy = 0.85 x 110 = 93.5 MPa > 50.16 MPa Utilization Ratio = 50.16 / 93.5 = 0.53

#### **Shear Stress Check**

Clear depth = $h$	= 150mm
Thickness = t	= 1.4mm
h/t = 150/1.4	= 107.2
Bs = 75.83 REFER AS1664.1 TABLE 3.3	
Ds = 0.242 REFER AS1664.1 TABLE 3.3	
Cs = 128.47 REFER AS1664.1 TABLE 3.3	
S1 =34.31 REFER AS1664.1 TABLE 3.3	
φFL = φyFsy = 0.95 x 62 = 58.9 MPa	



Shear Stress,  $v_u = 1508 / (150 \times 1.4 \times 2) = 3.59$  MPa

As Shear Stress,  $vu < \phi FL$  Therefore, the provided section is adequate.

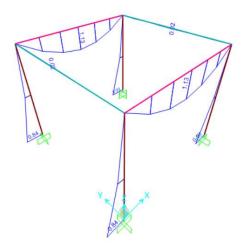
# **3.2. COLUMN DESIGN**

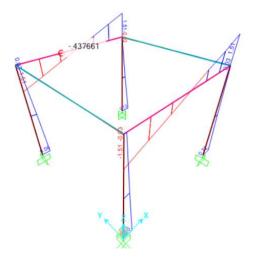
Member Size  $= 100 \times 100 \times 1.4$ 

Member Span = 2.50 m

#### **Design Forces**

Ultimate Bending Moment (Major Direction), Mu	= 0.84 kN-m
Ultimate Shear Force (Major Direction), Vu	= 0.56 kN
Ultimate Axial Force, Pu	= 1.58 kN





#### BENDING MOMENT DIAGRAM

SHEAR FORCE DIAGRAM

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### **Bending Stress Check**

Gross sectional area, Ag	$= 552 \text{ mm}^2$
In plane Elastic Section Modulus, Zy	$= 17897 \text{ mm}^3$
Stress from axial force = $fa = P/Ag$	= 1580 /552
	= 2.86 MPa
Stress from in-plane fby $= My/Zy$	$= 0.844 \times 10^{6} / 17897$
	= 47.16 MPa
Compression in beam Eq 3.4.15	
Unsupported Length of Member, major = Lmaj	= 2.50 m
Unsupported Length of Member, minor = Lmin	= 2.50m
Effective length factor $= k$	= 1
Radius of gyration about buckling axis (Y) = $r_y$	= 40.25mm
Radius of gyration about buckling axis $(z) = rz$	= 40.25mm
Slenderness ratio = $kLb/r_y$ = 2500/40.25 = 62.81	
Slenderness ratio = kLb/rz 2500/40.25 = 62.81	
Bc = 119.3 MPa REFER AS1664.1 TABLE 3.3D	
Dc = 0.492 MPa REFER AS1664.1 TABLE 3.3D	
Cc = 99.38 REFER AS1664.1 TABLE 3.3D	
S1 = 21.51	
S2 = 3857.96	
$J = 1342019 \text{ mm}^4$	



Iy = 894860 mm<sup>4</sup> Zc = 17897 mm<sup>3</sup> Lb x Zc/[0.5 x (Iy x J)<sup>1/2</sup>] = S2 > 81.66 > S1 Therefore  $\phi$ FL =  $\phi_b$  x Fcy  $\phi$ FL =  $\phi_b$  x (Bc - 1.6Dc x (Lb x Zc/0.5 x (Iy x J)<sup>1/2</sup>)  $\phi$ FL = 0.85 x 61.01 = 51.85 MPa Total Stresses = 2.86 + 47.16 = 50.02 MPa < 51.85 MPa Therefore, the provided section is adequate.

#### **Shear Stress Check**

Clear depth = h = 100mm Thickness = t = 1.4mm h/t = 100/1.4 = 71.42 Bs = 75.83 REFER AS1664.1 TABLE 3.3 Ds = 0.242 REFER AS1664.1 TABLE 3.3 Cs = 128.47 REFER AS1664.1 TABLE 3.3 S1 = 34.31 REFER AS1664.1 TABLE 3.3  $\phi$ FL =  $\phi$ yFsy = 0.95 x 62 = 58.9 MPa Shear Stress, vu = 560 / (100 x 1.4 x 2) = 2.00 MPa As Shear Stress, vu <  $\phi$ FL Therefore, the provided section is adequate.



## 3.3. PIER DESIGN

Vertical Compression Load, Pu	= 1.58 kN
Horizontal Shear, Vu	= 0.56 kN
Bending Moment, Mu	= 0.84 kN-m

#### **Bearing Stress Check**

Try \$450 x 600 Pier

Stresses due to Axial Forces = 1.58 / (0.159) = 9.93 kPa

Stresses due to Bending Moment =  $0.84 \times 0.225 / 2.01 \times 10^{-03}$ 

= 94.02 kPa

Total Bearing Stress = 9.93 +94.02 = 103.96 kPa < Allowable Ultimate

Bearing Pressure = 150 kPa

#### **Uplift Check**

Maximum Uplift Pressure = 0.365 kPa

Total Area =  $3.0 \times 3.0 \text{m}$ 

Total Uplift Force = 3.0 x 3.0 x 0.365 = 3.28 kN

Force on One Pier = 0.825 kN

Self-weight of Single Pier =  $0.159 \times 0.6 \times 24 = 2.289 \text{ kN} > 0.825 \text{ kN}$ 

Therefore  $\phi$ 450 x 600 Pier is Adequate to Bear The Loadings.