

# **STRUCTURAL DESIGN CALCULATIONS**

# GAZEBO DESIGN (3.0x4.0m)

## CLIENT: GALE PACIFIC LIMITED

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

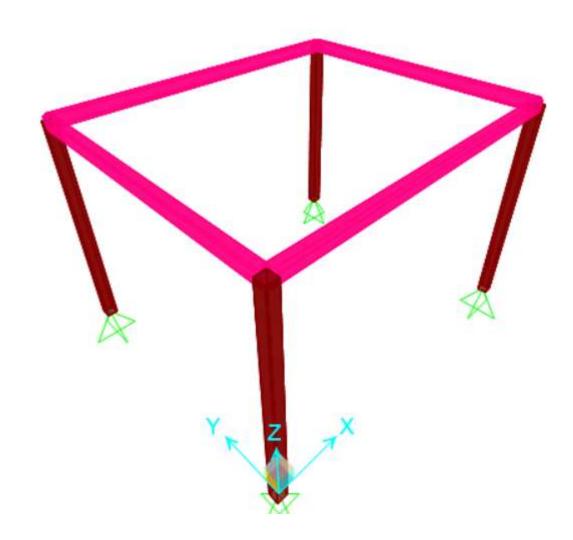
Dated: 19-10-2020

### 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

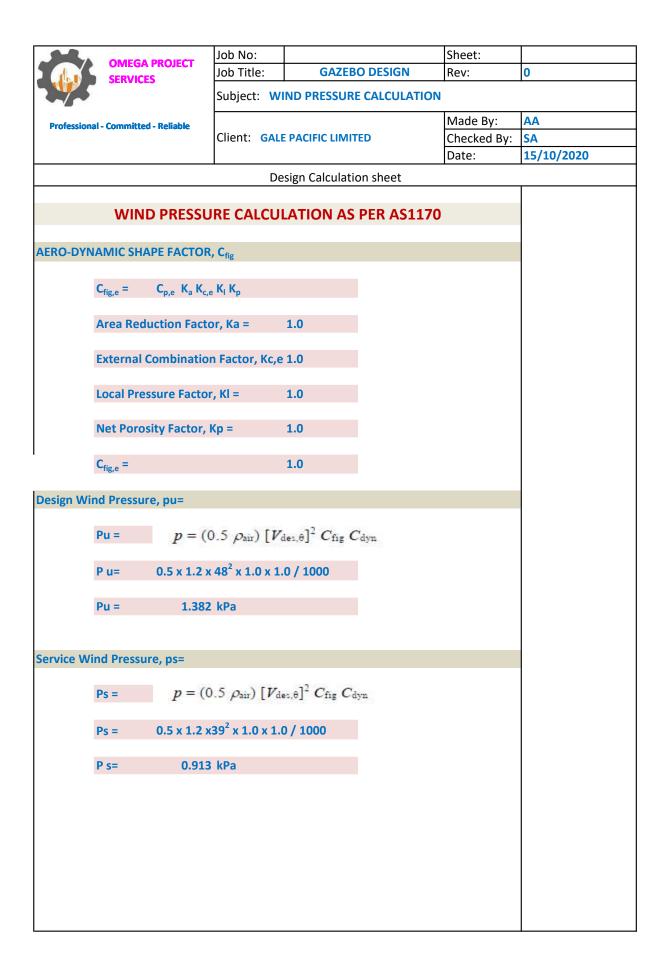
		Job No:		Sheet:	
	OMEGA PROJECT SERVICES	Job Title:	GAZEBO DESIGN	Rev:	0
	JERVICEJ		IND PRESSURE CALCULATION		
				-	AA
Professional	- Committed - Reliable	Client: GAL	E PACIFIC LIMITED	Made By: Checked By:	SA
				Date:	15/10/2020
		De	sign Calculation sheet		•
	WIND PRE			IS	

		Job No:			Sheet:	
	/ILED	Job Title	e:	GAZEBO DESIG	N Rev:	0
		Subject:			ATION	
Brofossional Comm	Defected for which peticks				Made By:	AA
Protessional - Comm	Professional - Committed - Reliable		GALE PACIE		Checked By:	
					Date:	15/10/2020
					Date.	13/10/2020
			Design C	alculation sheet		1
W	IND PRES	SURE CAL	CULATIC	ON AS PER AS	51170	
esign Wind Pre	ssure=	p = (0,	$.5 \rho_{air})$ [1	$V_{\text{des},\theta}]^2 C_{\text{fig}} C_{\theta}$	lyn	
esign Forces o	n Surface=	$F = \sum_{i=1}^{n} (i - i)$	$(p_z A_z)$			
/here						
Clause 2.4.		ntion for pre-			rds the surface for	
positive pre	ssures and for e area, in so	rces away fro		ce for negative pre z, upon which	the pressure at that	
positive pre $A_z = a$ reference	ssures and fo e area, in sc ) acts	rces away fro juare metres	s, at height			
positive pre $A_z = a$ reference height $(p_z)$	ssures and fo e area, in sc ) acts	rces away fro juare metres	s, at height BLE 3.1 L WIND SP	z, upon which		
positive pre $A_z$ = a reference height ( $p_z$ ) EGIONAL WIND	ssures and fo e area, in sc ) acts	rces away fro juare metres TA REGIONAI	s, at height BLE 3.1	z, upon which EEDS	the pressure at that	
positive pre $A_z = a$ reference height $(p_z)$	e area, in sc acts SPEED	rces away fro juare metres TA REGIONAI Non-cyclonic	s, at height BLE 3.1 L WIND SP Regio	z, upon which EEDS on Cycl	the pressure at that	
positive pre $A_z = a$ reference height $(p_z)$ EGIONAL WIND Regional wind speed (m/s)	e area, in sc acts SPEED A (1 to 7)	rces away fro juare metres TA REGIONAI Non-cyclonic W	s, at height BLE 3.1 L WIND SP Regio	z, upon which EEDS on Cycl	onic D	
positive pre $A_z = a \text{ reference}$ height $(p_z)$ EGIONAL WIND Regional wind speed (m/s) $V_1$	A (1 to 7) 30	rces away fro juare metres TA REGIONAI Non-cyclonic	s, at height BLE 3.1 L WIND SP Regio	z, upon which EEDS on Cycl 23× Fc	onic D 23× F <sub>D</sub>	
positive pre $A_z = a \text{ reference}$ 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	s, at height BLE 3.1 L WIND SP Regio B 26 28	EEDS on Cycl 23× Fc 33× Fc	the pressure at that onic D $23 \times F_D$ $35 \times F_D$	
positive pre $A_z = a$ reference 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	BLE 3.1 L WIND SP B 26 28 33	EEDS C C C C C C C C	the pressure at that onic D $23 \times F_D$ $35 \times F_D$ $43 \times F_D$	
positive pre $A_z = a$ reference height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_2$ $V_1$ $V_2$ $V_1$ $V_2$	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	BLE 3.1 EVIND SP Regio B 26 28 33 38	EEDS C C $23 \times F_C$ $33 \times F_C$ $39 \times F_C$ $45 \times F_C$	the pressure at that D $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$	
positive pre $A_z = a reference height (p_z)EGIONAL WINDEGIONAL WINDV_1V_1V_5V_{10}V_{20}V_{25}$	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	s, at height BLE 3.1 L WIND SP: Region 26 28 33 38 39	EEDS C C $23 \times F_{C}$ $33 \times F_{C}$ $39 \times F_{C}$ $45 \times F_{C}$ $47 \times F_{C}$	the pressure at that	
positive pre $A_z = a reference height (p_z)EGIONAL WINDEGIONAL WINDV_1V_1V_5V_{10}V_{20}V_{25}V_{50}$	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	BLE 3.1 E 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	
positive pre $A_z = a reference height (p_z)EGIONAL WINDEGIONAL WINDV_1V_1V_2V_1V_2$	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	BLE 3.1 E WIND SP Regio B 26 28 33 38 39 44 48	EEDS C $23 \times F_{C}$ $39 \times F_{C}$ $45 \times F_{C}$ $47 \times F_{C}$ $52 \times F_{C}$ $56 \times F_{C}$	the pressure at that	
positive pre $A_z = a$ reference height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_2$ $V_1$ $V_2$	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	BLE 3.1 L WIND SP Regio B 26 28 33 38 39 44 48 52	EEDS C $23 \times F_{C}$ $39 \times F_{C}$ $39 \times F_{C}$ $45 \times F_{C}$ $47 \times F_{C}$ $52 \times F_{C}$ $56 \times F_{C}$ $61 \times F_{C}$	the pressure at that	
positive pre $A_z = a reference height (p_z)EGIONAL WINDEGIONAL WINDV_1V_1V_2V_1V_2$	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	BLE 3.1 EVIND SP Region B 26 28 33 38 39 44 48 52 53	<i>EEDS</i> <i>Cycl</i> <i>C</i> <i>23× Fc</i> <i>33× Fc</i> <i>33× Fc</i> <i>39× Fc</i> <i>45× Fc</i> <i>47× Fc</i> <i>52× Fc</i> <i>56× Fc</i> <i>61× Fc</i> <i>62× Fc</i>	the pressure at that $\overline{D}$ $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $51 \times F_D$ $60 \times F_D$ $60 \times F_D$ $66 \times F_D$ $72 \times F_D$ $74 \times F_D$	
positive pre $A_z = a$ reference height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$ $V_1$ $V_2$ $V_1$ $V_2$ $V_3$ $V_2$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_2$ $V_3$ $V_2$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_2$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_2$ $V_3$ $V_2$ $V_3$ $V_2$ $V_3$	<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	s, at height BLE 3.1 L WIND SP Regic B 26 28 33 38 39 44 48 52 53 57	<i>EEDS</i> <i>Cycl</i> <i>C</i> <i>23× Fc</i> <i>33× Fc</i> <i>33× Fc</i> <i>39× Fc</i> <i>45× Fc</i> <i>47× Fc</i> <i>52× Fc</i> <i>56× Fc</i> <i>61× Fc</i> <i>62× Fc</i> <i>66× Fc</i> <i>66× Fc</i>	the pressure at that $\overline{D}$ $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $60 \times F_D$ $72 \times F_D$ $74 \times F_D$ $80 \times F_D$	
positive pre $A_z = a$ reference height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_5$ $V_{10}$ $V_{20}$ $V_{25}$ $V_{50}$ $V_{100}$ $V_{250}$ $V_{250}$ $V_{500}$ $V_{1000}$ $V_{250}$ $V_{1000}$ $V_{250}$ $V_{1000}$ $V_{250}$ $V_{1000}$ $V_{250}$ $V_{1000}$ $V_{250}$ $V_{1000}$ $V_{250}$ $V_{1000}$ $V_{25}$ $V_{25}$ $V_{25}$	<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	s, at height BLE 3.1 L WIND SP B 26 28 33 38 39 44 48 52 53 57 60	EEDS The second state of the second state of	the pressure at that $D$ $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $60 \times F_D$ $66 \times F_D$ $72 \times F_D$ $74 \times F_D$ $80 \times F_D$ $85 \times F_D$	
positive pre $A_z = a \text{ reference} height (p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_2$ $V_1$ $V_2$	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	s, at height BLE 3.1 L WIND SP B C C B C C B C C B C C C B C C C C C	EEDS The second state of the second state of	the pressure at that $\overline{D}$ $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $60 \times F_D$ $66 \times F_D$ $72 \times F_D$ $74 \times F_D$ $80 \times F_D$ $85 \times F_D$ $90 \times F_D$	
positive pre $A_z = a reference height (p_z)EGIONAL WINDEGIONAL WINDV_1V_1V_2$	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 TAI REGIONAL Non-cyclonic W 34 39 41 43 43 43 43 43 43 43 43 43 43	BLE 3.1 BLE 3.1 L WIND SP: Regio B 26 28 33 38 39 44 48 52 53 57 60 63 64	EEDS C C $23 \times F_C$ $33 \times F_C$ $39 \times F_C$ $45 \times F_C$ $45 \times F_C$ $47 \times F_C$ $52 \times F_C$ $56 \times F_C$ $61 \times F_C$ $62 \times F_C$ $66 \times F_C$ $70 \times F_C$ $73 \times F_C$ $74 \times F_C$	the pressure at that D $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $60 \times F_D$ $60 \times F_D$ $72 \times F_D$ $74 \times F_D$ $80 \times F_D$ $80 \times F_D$ $90 \times F_D$ $91 \times F_D$	
positive pre $A_z =$ a reference height $(p_z)$ EGIONAL WIND EGIONAL WIND $V_1$ $V_1$ $V_2$ $V_1$ $V_2$	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	s, at height BLE 3.1 L WIND SP B C C B C C B C C B C C C B C C C C C	EEDS The second state of the second state of	the pressure at that $\overline{D}$ $23 \times F_D$ $35 \times F_D$ $43 \times F_D$ $51 \times F_D$ $53 \times F_D$ $60 \times F_D$ $60 \times F_D$ $66 \times F_D$ $72 \times F_D$ $74 \times F_D$ $80 \times F_D$ $85 \times F_D$ $90 \times F_D$	

OMEGA PROJECT	Job No:			Sheet:	
SERVICES	Job Title:		GAZEBO DESIGN	Rev:	0
	Subject: V	VIND PF	RESSURE CALCULATIO	N	
rofessional - Committed - Reliable				Made By:	AA
	Client: GA	LE PACIF		Checked By:	SA
				Date:	15/10/2020
	C	esign C	alculation sheet		
WIND PRESSI	URE CALCU	JLATIC	ON AS PER AS117	0	
	DESIGN W				
	Con	stants			
Density of air	CON	1.2	kg/m^3		
	Location &				
Region Site Exposure Classi		B	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, $\beta$		48.0	m/s		
Design wind speed, V_des,	θ	48.0	m/s		
	Wind Spee	d Multi	pliers		
Mind direction multipline	Md	1.00	(Likely pos	sible)	
Wind direction multiplier, I	w_u	0.99	(Largest po	ssible)	
arrain /haight multiplier	4 +	1 00		1	
errain/height multiplier, N	vi_z,cat	1.00			
bielding multiplier, M_s	vi_z,cat	1.00			
	vi_z,cat				
bhielding multiplier, M_s	vi_z,cat	1.00			
hielding multiplier, M_s errain multiplier, M_t	RVICEIABILI	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 SEF	RVICEIABILI	1.00 1.00			
hielding multiplier, M_s errain multiplier, M_t	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 SER	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 val, 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) Probability of exceedance Regional wind speed, V_R	RVICEIABILI Co Location & sification val, R e, 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 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 val, R e, P=1/R	1.00 1.00 <b>TY WIN</b> nstants 1.2 Hazarc B 100 1.00 0.01 39.0 39.0	kg/m^3 d Design Non-cyclonic years 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	RVICEIABILI Co Location 8 sification val, R e, 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	RVICEIABILI Co Location 8 sification val, R e, P=1/R	1.00 1.00 <b>FY WIN</b> nstants 1.2 Hazarc B 100 1.00 0.01 39.0 39.0 39.0 ed Mul	kg/m^3 d Design Non-cyclonic years m/s m/s m/s tipliers		
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 val, R e, P=1/R s, <del>0</del> Wind Spe	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 val, R e, P=1/R s, <del>O</del> 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		
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 val, R e, P=1/R s, <del>O</del> 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		

			Job No	:				Sheet:	
Y	DMEGA P ERVICES	RUJECI	Job Titl	e:	GAZE	BO DESIG	SN	Rev:	0
5	ENVICEJ		Subject	t: WIND	PRESSU	RE CALCU	JLATION		
- essional - Co	ommitted -	Reliable						Made By:	AA
			Client:	GALE PA		ITED	Ī	Checked By:	SA
								Date:	15/10/2020
				Desigr	n Calculat	tion shee	t		·
	WIND	PRESS	URE CA	LCULA	FION AS	S PER A	S1170		
DIRECT			PLIER, Mo	ł					
				ABLE 3	2				
		WINT	DIRECT		-	R			
		1/20/2011/202	1.1111	0.5.1052	12 22	100 100	2 8	1920 - 20	
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 0.90	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	
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	
	0.95	0.95	1.00	0.90	0.95	0.95	1.00	0.95	
NW		0	1.00	1.00	1.00	1.00	1.00	1.00	
Any	1.00	1.00	1.00	20000		in the second second		8 82	
	1.00	1.00	1.00	1010					
Any		1.00 <b>1.0</b>	a and	1415			<u> </u>		
Any lirection			a and				1		
Any lirection Mc	=	1.0	0						
Any lirection Mc	=		0				1		
Any lirection Mc	=	1.0	0 Mz,cat	ABLE 4	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 MN/HEIC TE	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT	0 Mz,cat T A T MULTI VELOPE	ABLE 4. PLIERS	FOR GU AINS—A	LL REG		ıs	
Any lirection Mo	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	LL REG	IONS	S Tain	
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 ht multipli	LL REG	Ter		
Any lirection MC MN/HEIC TE Height ( m ≤3	I = GHT MUI RRAIN/ IN FUI	1.0 LTIPLIER, HEIGHT LLY DE Terrain category 1 0.99	0 Mz,cat T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR Terrain/heig Terrain ategory 2 0.91	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>z.cst</sub> ) errain tegory 3 0.83	Ter categ	rain gory 4 75	
Any lirection MC MN/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 errain/heig 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 Prrain/heig 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 lirection Mc IN/HEIC TE Height ( m \$3 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 errain/heig 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 MM MM MM HEIGHT M M S 3 5 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 Prrain/heig 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 75	
Any lirection Mc IN/HEIC TE Height ( m 23 5 10 15 20	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. rrrain/heig Terrain ategory 2 0.91 0.91 1.00 1.05 1.08	FOR GU AINS—A ht multipli ca	LL REG er (M <sub>2,cet</sub> ) cerrain tegory 3 0.83 0.83 0.83 0.83 0.83 0.83 0.89 0.94	Ter cates 0.7 0.7 0.7 0.7	rain gory 4 75 75 75 75 75 75 75 75 75 75 75	
Any tirection 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. errain/heig Terrain ategory 2 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. errain/heig 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	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 rrection MC IN/HEIC TE Height ( m 23 5 10 20 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. errain/heig 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	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 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. errain/heig 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	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 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 T A T MULTI VELOPE Te	ABLE 4. PLIERS D TERR. errain/heig 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	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 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. errain/heig 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	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 75 100 150 200 OTE: 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 MULTI VELOPE Te	ABLE 4. PLIERS D TERR. errain/heig 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	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. errain/heig 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	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. errain/heig 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	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. errain/heig 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	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 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. errain/heig 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	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	OIECT	Job No:					Sheet:	
			COJECT	Job Title	:	GAZEB	O DESIGN	J	Rev:	0
	75			Subject:	WIND					
Bro	fercional - C	ommitted - F	Poliable	Ma				Made By:	AA	
	Professional - Committed - Reliable			Client: GALE PACIFIC LIMITED			F	Checked By:	SA	
									Date:	15/10/2020
					Design	Calculati	n sheet			
<u> </u>					Design	calculati	Shisheet			
		WIND	PRESSU	RE 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						
	Cd	yn =	1.00							
EXTE	RNAL PR	ESSURE C	OEFFICEN	іт						
				TA	BLE D4	(A)				
			NET PR	ESSURE (	OEFFIC	IENTS (C	p,n) FOR			
		MONO	OSLOPE F	REE ROO	OFS-0.2	$5 \le h/d \le 1$	(see Figur	re D2)		
			$\theta = 0 d$	egrees			$\theta = 180$	degrees		
	Roof pitch (a)	C	p,w	C	p, <i>l</i>	C	p,w		C <sub>p,\ell</sub>	
	degrees	Empty under	Blocked under	Empty under	Blocked under	Empty under	Blocked under	Empty under	Blocked under	
	0	-0.3, 0.4	-1.0, 0.4	-0.4, 0.0	-0.8, 0.4	-0.3, 0.4	-1.0, 0.4	-0.4, 0.0	-0.8, 0.4	
	15	-1.0	-1.5	-0.6, 0.0	-1.0, 0.2	0.8	0.8	0.4	-0.2	
	30	-2.2	-2.7	-1.1, -0.2	-1.3, 0.0	1.6	1.6	0.8	0.0	
	Ro	of Pressu	re Coeffi	cent, Cpe	= (	-0.4, 0.4)				
		ernal Pre	essure Co	efficent,	Сре	1.30				
1	Ext									
	Ext									
	Ext									
	Ext									
	Ext									
	Ext									
	Ext									
	Ext									
	Ext									



	Job No:			Sheet:	
OMEGA PROJECT SERVICES	Job Title:	GAZEBC	DESIGN	Rev:	0
	Subject: W	IND PRESSURE	CALCULATION	I	
Professional - Committed - Reliable				Made By:	AA
	Client: GAL	E PACIFIC LIMI	TED	Checked By:	SA
		sign Calculatio	n choot	Date:	15/10/2020
		esign Calculatio	il sheet		
WIND PRESSU	IRE CALCU	LATION AS I	PER 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			1	
Ws, wall = 0.913 x 1.	3 = 1.19 kPa			ļ	
Applied Member Loadings					
Column Section=		100 x 100 x 1.4	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 =0.1	.8 kN/m		
Line Loading on Mair	Beam =	0.55 x 0.062 =	0.0341 kN/m		
Side Line Loading on	Main Beam =	0.55 x 0.15 =0	.082 kN/m		
Line Loading on Seco	ndary Beam =	= 0.55 x 0.125 =	0.069 kN/m		
b) Applied Service V	Vind Loading	IS			
Line Loading on Colu	mn =	1.19 x 0.1 =0.1	.19 kN/m		
Line Loading on Mair	i Beam =	0.365 x 0.062	=0.02262 kN/n	n	
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	=0.046 kN/m		



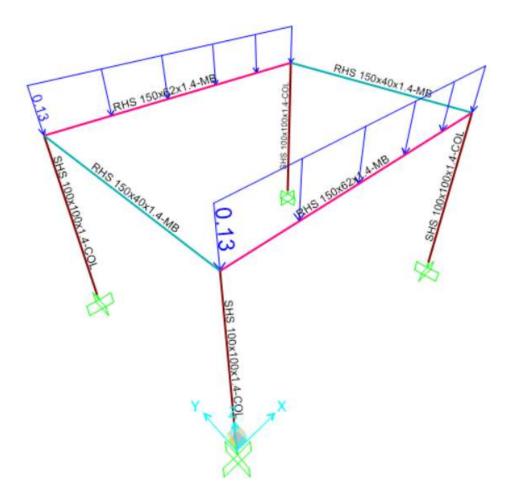
#### 2.2. **MATERIAL STRENGTH**

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

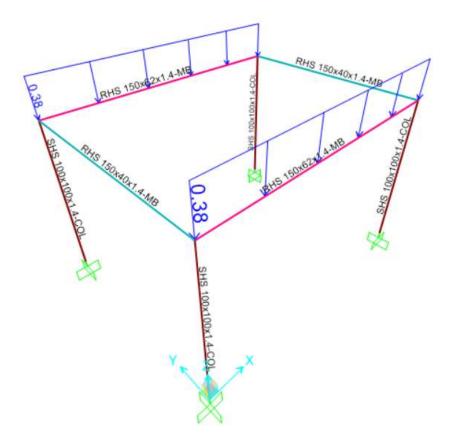


# 2.3. APPLIED LOADING



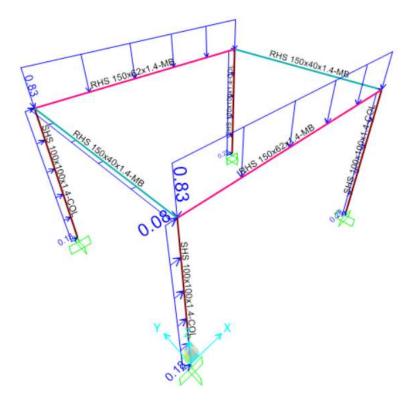
## **Applied Dead Loadings**





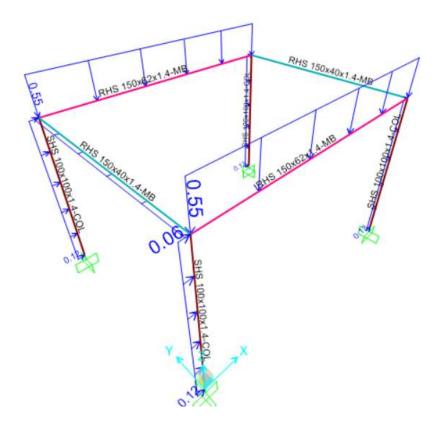
## **Applied Live Loadings**





## **Ultimate Wind Loadings**





## Service Wind Loadings



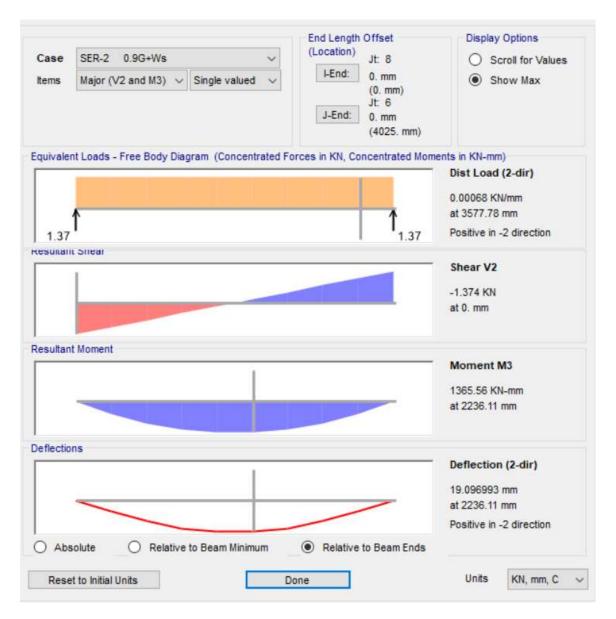
# **3. CRITICAL ELEMENTS DESIGN**

## 3.1. BEAM DESIGN

Member Size	= 150 x 62 x 1.4				
Member Span	= 4.0m				
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,  $\delta = 19.09$ mm

Calculated Deflection Limit = 4000/180 = 22.22mm

Allowable Deflection Limit = L/180

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

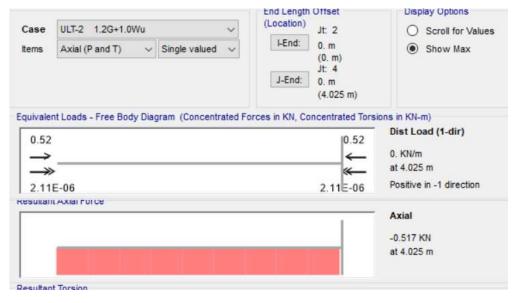


### B) STRENGTH CHECK

#### MAJOR DIRECTION BENDING MOMENT AND SHEAR FORCE



#### **AXIAL FORCE DIAGRAM**





In conclusion, following are the design forces	
Ultimate Bending Moment (Major Direction), Mu	= 2.016 kN-m
Ultimate Shear Force (Major Direction), Vu	= 2.023 kN
Ultimate Axial Force, Pu	= 0.520 kN
C) Design Stresses Check	
Bending Stress Check	
Gross sectional area, Ag	= 586 mm <sup>2</sup>
In plane Elastic Section Modulus, Zy	$= 22702 \text{ mm}^3$
Stress from axial force = $fa = P/Ag$	= 517 /586
	= 0.882 MPa
Stress from in-plane fby $= My/Zy$	$= 2.023 \times 10^{6}/22702$
	= 89.01 MPa
Compression in beam Eq 3.4.15	
Unsupported Length of Member, major = Lmaj	= 4.000 m
Unsupported Length of Member, minor = Lmin	= 4.000/30 = 0.133m
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 = $kLb/r_y$ = 4000/53.9 = 74.21	
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 > 89.89 MPa Utilization Ratio = 89.89 / 93.5 = 0.961

#### **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,  $v_u = 2023 / (150 \times 1.4 \times 2) = 4.82$  MPa

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

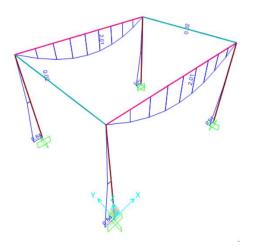
# **3.2. COLUMN DESIGN**

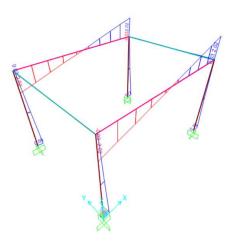
Member Size  $= 100 \times 100 \times 1.4$ 

Member Span = 2.50 m

#### **Design Forces**

Ultimate Bending Moment (Major Direction), Mu	= 0.844 kN-m
Ultimate Shear Force (Major Direction), Vu	= 0.56 kN
Ultimate Axial Force, Pu	= 2.023 kN





#### **BENDING MOMENT DIAGRAM**

#### SHEAR FORCE DIAGRAM

OMEGA Project Services Professional - Committed - Reliable

### **Bending Stress Check**

Gross sectional area, Ag	= 552 mm <sup>2</sup>
In plane Elastic Section Modulus, Zy	= 17897 mm <sup>3</sup>
Stress from axial force = $fa = P/Ag$	= 2023 /552
	= 3.66 MPa
Stress from in-plane fby $= My/Zy$	= 0.844x 10 <sup>6</sup> /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 = 3.66 + 47.16 = 50.82 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	= 2.023 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 = 2.023 / (0.159) = 12.72 kPa

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

= 94.02 kPa

Total Bearing Stress = 12.72 +94.02 = 106.74 kPa < Allowable Ultimate

Bearing Pressure = 150 kPa

### **Uplift Check**

Maximum Uplift Pressure = 0.365 kPa

Total Area =  $3.0 \times 4.0 \text{m}$ 

Total Uplift Force = 3.0 x 4.0 x 0.365 = 4.38 kN

Force on One Pier = 1.095 kN

Self-weight of Single Pier =  $0.159 \times 0.6 \times 24 = 2.289 \text{ kN} > 1.095 \text{ kN}$ 

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