

Structural Design Documentation

Foundation Analysis for Solar Terrace III All Wind Regions

For:
Clenergy Australia

Job Number: 24007
Date: August 3, 2012



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Our Ref: 24007
3 August 2012

Clenergy Australia
18/20 Duerdin Street
Clayton North VIC 3168

RE: Foundation Analysis for Solar Terrace III

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of the *Solar Terrace III* Foundation within Australia. The design check has been based on the information in the *PV-ezRack Solar Terrace III Planning and Installation Guide* and schematic drawings of the system components by Xiamen Clenergy co.,Ltd, provide by Clenergy Australia.

Please refer Foundation Schedule for Solar Terrace III (24007-SK01).

The foundation analysis carried out based on the following conditions:

- Wind Loads to AS/NZ1170.2:2011
- Wind Terrain Categories 2
- Wind average recurrence interval of 100 years
- Wind region A, B, C & D
- Maximum Panel size 1800mm
- Minimum soil bearing pressure 100 KPA and concrete strength 25 MPa

This work was designed in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd



Martin Gamble
Director
Gamcorp (Melbourne) Pty Ltd



Milan Bjelobrk
MIEAust No. 2210984
CPEng. NPER

STRUCTURAL NOTES

NOTE 1: DRAWING TO BE READ IN CONJUNCTION WITH
GEOTECHNICAL REPORT

NOTE 2: MIN. REINFORCEMENT BOTTOM COVER 50MM.
TOP COVER 30 MM

NOTE 3: FOUNDATION MINIMUM BEARING PRESSURE 100 KPA

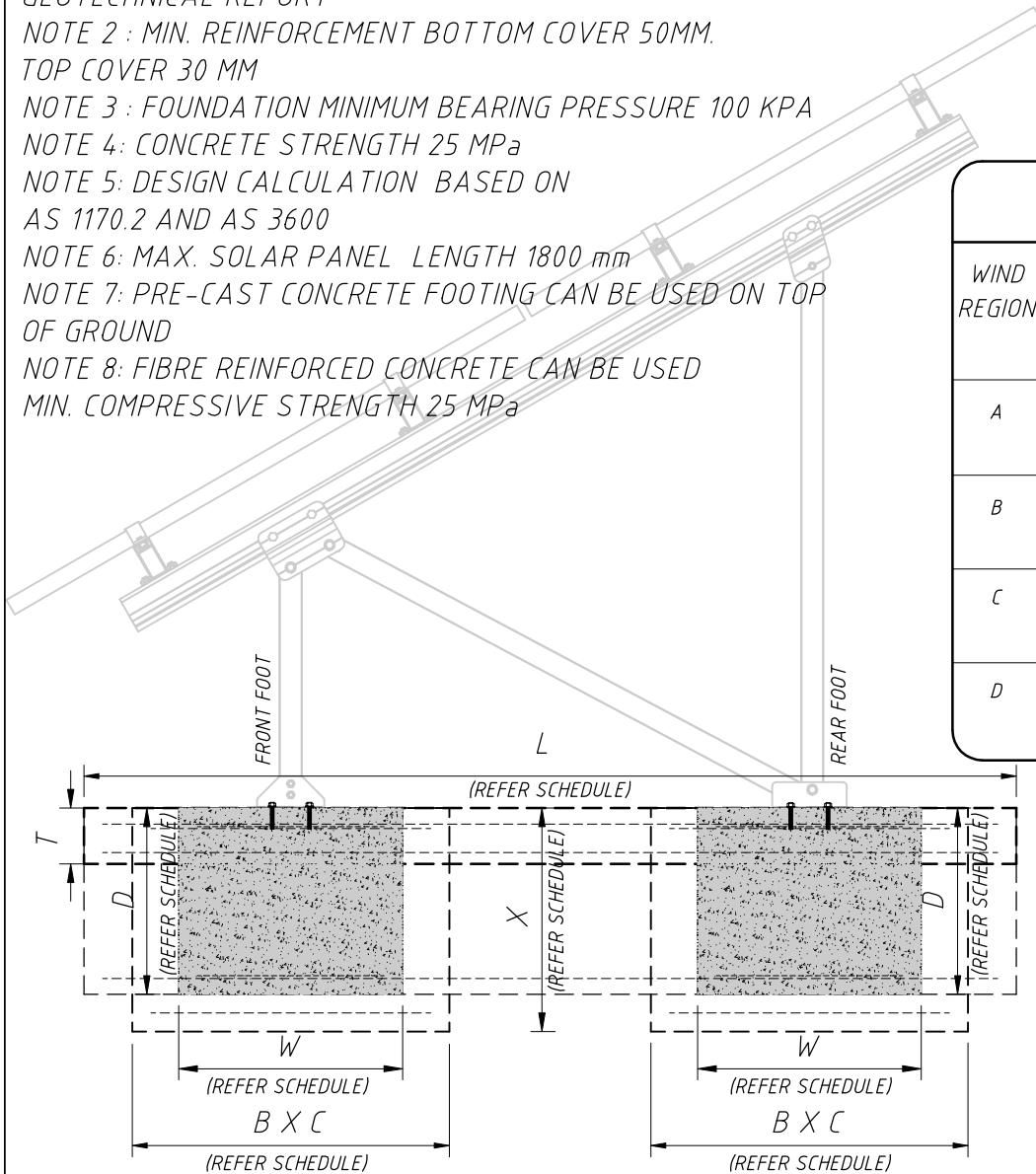
NOTE 4: CONCRETE STRENGTH 25 MPa

NOTE 5: DESIGN CALCULATION BASED ON
AS 1170.2 AND AS 3600

NOTE 6: MAX. SOLAR PANEL LENGTH 1800 mm

NOTE 7: PRE-CAST CONCRETE FOOTING CAN BE USED ON TOP
OF GROUND

NOTE 8: FIBRE REINFORCED CONCRETE CAN BE USED
MIN. COMPRESSIVE STRENGTH 25 MPa



FOUNDATION SCHEDULE

WIND REGION	FRAME SPACING (mm)	CONTINUOUS STRIP FOOTING WIDTH (W) x DEPTH (D) x THICKNESS (T)	CONTINUOUS PAVING SLAB LENGTH (L)	TRANSVERSE STRIP FOOTING LENGTH (L) x WIDTH (A) x DEPTH (D)	INDIVIDUAL PAD FOOTING PER LEG LENGTH (B) x WIDTH (C)
A	3100	600 x 500 PROVIDE SL 82 @ TOP & BOTTOM	2500 x 150 PROVIDE SL 92 @ BOTTOM	2500 x 800 x 500 PROVIDE SL 92 @ TOP & BOTTOM	850 x 850 x 600 PROVIDE RL 718 @ TOP & BOTTOM
B	2800	600 x 500 PROVIDE SL 82 @ TOP & BOTTOM	2500 x 150 PROVIDE SL 92 @ BOTTOM	2500 x 800 x 500 PROVIDE SL 92 @ TOP & BOTTOM	850 x 850 x 600 PROVIDE RL 718 @ TOP & BOTTOM
C	2200	600 x 500 PROVIDE SL 82 @ TOP & BOTTOM	2500 x 200 PROVIDE SL 102 @ BOTTOM	2500 x 800 x 500 PROVIDE SL 92 @ TOP & BOTTOM	850 x 850 x 600 PROVIDE RL 718 @ TOP & BOTTOM
D	1500	600 x 500 PROVIDE SL 82 @ TOP & BOTTOM	2500 x 200 PROVIDE SL 102 @ BOTTOM	2500 x 800 x 500 PROVIDE SL 92 @ TOP & BOTTOM	850 x 850 x 600 PROVIDE RL 718 @ TOP & BOTTOM

UP-LIFT FORCES

WIND REGION	FRAME SPACING (mm)	FRONT FOOT (KN)	REAR FOOT (KN)
A	3100	5.3	7.3
B	2800	6.9	9.4
C	2200	7.6	10.3
D	1500	7.3	10

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Issue	Amendment	Date

gamcorp

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"DO NOT SCALE DRAWINGS" USE FIGURED DIMENSIONS. REFER COVER SHEET FOR NOTES UNLESS NOTED OTHERWISE

Project:
**FOUNDATION FOR SOLAR
TERRACE 111**

Client:
CLENERGY AUSTRALIA

Designed:	M.S	Date:	AUGUST 2012
Drawn:	M.S	A4 Scale:	AS SHOWN
Sheet No.	1 OF 1	Rev.	REV C
Job No:	24007	DRAWING No	SK01
Plot Date	03.08.2012		

Job No: 24007

Client: Clenergy Australia

Project: Foundation Analysis for Solar Terrace III

Address: All Wind Region

Australian Standards

AS 1170 – Structural Design Actions

Part 0 – General Principles

Part 1 – Permanent imposed and other actions

Part 2 – Wind Actions

Part 3 – Snow and Ice Actions

AS 3600 – Concrete Structures

AS 4100 – Steel Structures

	Bearing Pressures:	Concrete Strengths:
Strips:	100 kPa	25 MPa
Pads:	100 kPa	25 MPa
Slabs:	100 kPa	25 MPa

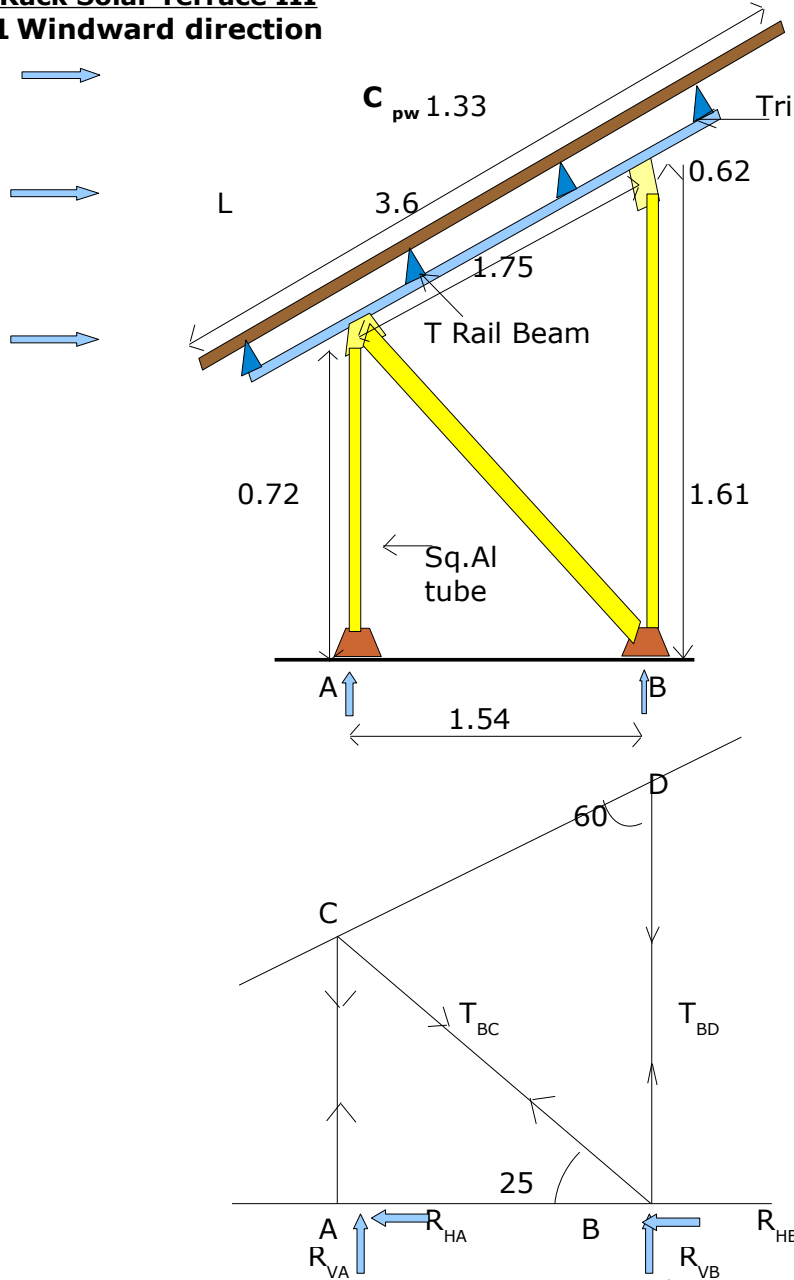
Wind Terrain Category: WTC 2

Designed: M.S

Date: Aug-12

Client: **Clenergy Australia**
 Project: **Structural Analysis for SolarTerrace III**
 Address: **18/20 Duerdin Street, Clayton, VIC 3168**
 Design: **Murali**

Job: **24007**
 Date: **June '11**

Ref	Calculation	Results
	<p>FOUNDATION ANALYSIS Cyclonic & Non cyclonic condition for region A,B, C, D PV-ezRack Solar Terrace III Case - 1 Windward direction</p>  <p>The diagram illustrates the structural analysis of a solar terrace rack under windward conditions. It shows a side view of the rack with a Tri groove beam supported by a T Rail Beam, which is in turn supported by a Sq. Al tube. The rack is anchored to a foundation at points A and B. Key dimensions include a height of 1.61m, a horizontal distance of 1.54m, and a windward length of 3.6m. The wind pressure coefficient C_{pw} is 1.33. A secondary diagram shows a truss structure with nodes A, B, C, and D, with angles of 60 and 25 degrees, and reaction forces R_{HA}, R_{HB}, R_{VA}, and R_{VB}.</p>	<p>$h/d = 0.5$</p>

S							
1170	Governing equation,						
Table 3.1	V_{sit}	$= V_R * M_d * (M_{z,cat} * M_s * M_t)$					
For	V_{100}	= 41		Non- cyclonic region A			
Non-cyclonic	V_{100}	= 48		Non- cyclonic region B			
Table 3.2	V_{100}	= 56		Cyclonic region	F_C	1	
	V_{100}	= 66		Cyclonic region	F_D	1	
			M_d	1			Any direction
	V_A	= 37.31	m/s	$M_{z,cat}$	0.91		Categ 2, z<=3
	V_B	= 43.68	m/s	M_s	1		
	V_C	= 50.96		M_h	1		
	V_D	= 60.06		K_a	1		
Ref	P	$= 0.5 * \rho_{air} * \{V_{des,\theta}\}^2 * C_c$		K_c	1		
Table D4(A)	C_{fig} -uphill	$= C_{pn} * K_a * K_l$		K_l	1.5		considered on
Net pressure		= 2		K_p	1		
coefficient				ρ_{air}	1.2		N/m ³
AS/NZ							
S		Design P Basic P					
1170	Pressure on Upl	= 1.67	1.11	Non- cyclonic region A			KN/m ²
	Pressure on Upl	= 2.28	1.52	Non- cyclonic region B			KN/m ²
	Pressure on Upl	= 3.11	2.07	Cyclonic region C			KN/m ²
	Pressure on Upl	= 4.32	2.88	Cyclonic region D			KN/m ²
	Panel self weight =	0.17	KN/m2				

Results							
Wind Zone				A	B	C	D
Wind speed (m/s)				41	48	56	66
Site wind speed (m/s)				37.31	43.68	50.96	60.06
Maximum spacing (mm)				3.1	2.8	2.2	1.5
Self weight							
R_{VA}	-KN	Down ward		5.36	6.36	6.59	6.08
R_{VB}	-KN	Down ward		7.34	8.71	9.02	8.33
R_{HA}	-KN			3.67	4.35	4.51	4.16
R_{VA}	-KN	Uplift		-5.3	-6.84	-7.53	-7.29
R_{VB}	-KN	Uplift		-7.26	-9.36	-10.31	-9.97
Continuous Strip footing							
Up-lift force				-7.26	-9.36	-10.31	-9.97
W- Wid	600	D-Depth	500	22.32	20.16	15.84	10.8
Bearing pressure (KPA)				20.39	24.19	25.06	23.14
Reinforcement							
Min A_{st}	0.22*(D/d) ² *(f _{cf} /f _{sy})			421	421	421	421
Provide 2 layer of SL 82 at top and bottom							
A_{st} – provided				454	454	454	454
Self weight							
Continuous Transverse Strip footing							
Up-lift force				-12.56	-16.2	-17.83	-17.26
W- Wid	800	D-Depth	500	19.2	19.2	19.2	19.2
Bearing pressure (KPA)				7.94	9.42	9.76	9.01
Reinforcement							
Min A_{st}	0.22*(D/d) ² *(f _{cf} /f _{sy})			562	562	562	562
Provide 2 layer of SL 92 at top and bottom							
A_{st} – provided				580	580	580	580
Self weight							
Individual pad footing							
Up-lift force				-7.26	-9.36	-10.31	-9.97
Down-ward force				7.34	8.71	9.02	8.33
W- Wid	850	D-Depth	600	10.4	10.4	10.4	10.4
Bearing pressure (KPA)				10.16	12.05	12.49	11.53
Reinforcement							
Min A_{st}	0.22*(D/d) ² *(f _{cf} /f _{sy})			709	709	709	709
Provide 2 layer of RL 718 at top and bottom							
A_{st} – provided				716	716	716	716
Self weight							
Continuous Paving slab							
Up-lift force				-12.56	-16.2	-17.83	-17.26
Slab thickness – t	150			22.32	20.16	21.12	18
	200						
	250						
Reinforcement							
Min A_{st}	0.22*(D/d) ² *(f _{cf} /f _{sy})			248	248	311	375
SL 92 SL 92 SL 102 2xSL 82							
A_{st} – provided				290	290	354	454