Building Code Clause(s) B1

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on page 2)

ISSUED BY: **BVT CONSULTING LTD**
(Design Firm)

TO: YHI (New Zealand) Ltd
(Owner/Developer)

TO BE SUPPLIED TO: As Required - Product Technical Statement
(Building Consent Authority)

IN RESPECT OF: Ejot Purlin Bolts for Roof Mounted Solar Panel System, as per BVT file #16091455
(Description of Building Work)

AT: As Required
(Address)

…… **LOT**…… **DP** …… **SO** ……

We have been engaged by the owner/developer referred to above to provide design consultancy …… services in respect of the requirements of
(Extent of Engagement)

Clause(s) B1 ……..of the Building Code for
All ☑ or Part only ☐ (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☑ Compliance Documents issued by the Ministry of Business, Innovation & Employment B1/VM1 ……or
(verification method / acceptable solution)

☐ Alternative solution as per the attached schedule……

The proposed building work covered by this producer statement is described on the drawings titled Canterbury Power Solutions ……and numbered 16020202 sheet 1 ……;
together with the specification, and other documents set out in the schedule attached to this statement.
On behalf of the Design Firm, and subject to:
(i) Site verification of the following design assumptions see attached BVT report # 16020202, letter #16091455
(ii) All proprietary products meeting their performance specification requirements;

I **believe on reasonable grounds** that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:
☑CM1 ☐CM2 ☐CM3 ☐CM4 ☐CM5 (Engineering Categories) or ☐ as per agreement with owner/developer (Architectural)

I, Matt Bishop …… am:
(Name of Design Professional)

☑CPEng 243276 ……#

☐Reg Arch …… .#

I am a Member of : ☑ IPENZ ☐NZIA and hold the following qualifications: BE (Hons) ……
The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.
The Design Firm is a member of ACENZ: ☑

SIGNED BY Matt Bishop …… ON BEHALF OF BVT CONSULTING LTD
(Design Firm)

Date 7 / 10 / 16 ……..……..…… (signature)……

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

BVT Engineering Professional Services

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Job No. **16091455**
Date: **06 October 2016**

Brian Crum
YHI (New Zealand) Ltd
17 Ha Crescent
Wiri
Auckland

Certification for Ejot Purlin Bolt

Dear Brian Crum,

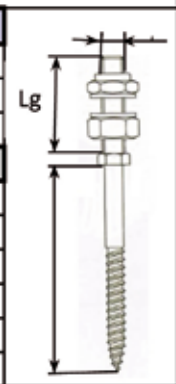
BVT has been requested to provide Chartered Engineer's certification for an Ejot Purlin Bolt anchorage on a solar panel design. We have reviewed the capacity of the anchorage based upon wind loads outlined in ANTRO Enterprises Ltd Project A242 TM-48, A242 TM-57 and BVT File 16020202.

As per the European Technical Approval report covering Ejot Fasteners, the 10mm diameter JA3-SB-10 fastener will meet the required capacity at 56mm embedment depth, when assessed against the strength requirements of NZS3603 - Timber Structures. The JA3-SB-8 8mm diameter bolt meets the required capacity at 70mm embedment depth.

Regards,

Matt Bishop
Senior Engineer
BE (Hons) MIPENZ, CPEng #243276
BVT Engineering Professional Services

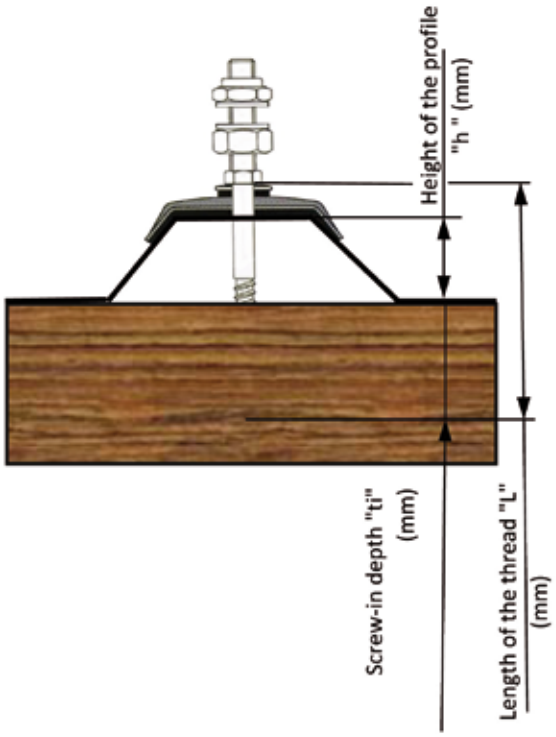
EJOT Solar Fastenings – Technical Data Sheet

Screw - Options				
Material of the substructure	Wood		Steel	
Recommended screw	JA3-SB		JZ3-SB	
Diameter (d) of the setscrew (mm)	M10		M10	
Length (Lg) of the setscrew (mm)	50		50	
	70		70	
	Special length *		Special length *	
Screw diameter (D) (mm)	8,0		8,0	
Length (L) of the screw (mm)	80		64	
	100		80	
	130		100	
	150		125	
	180		150	
	200		160	
	Special length *		Special length *	

* Special lengths on request possible

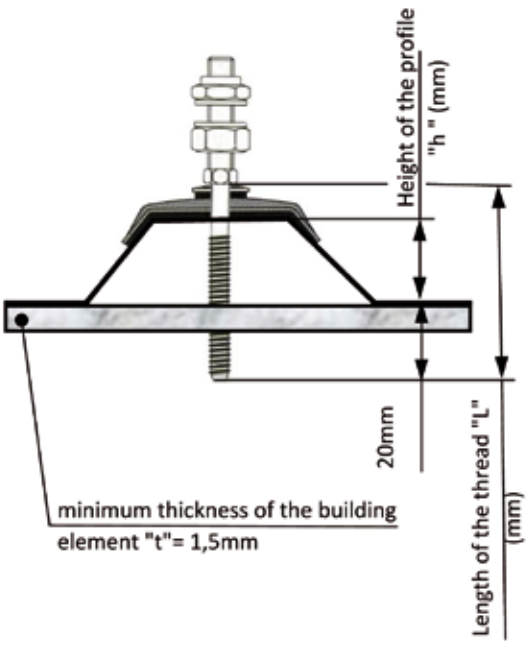
Determination of the screw length

Wood substructure



Length of the thread L = h + ti + 10mm

Steel substructure



Length of the thread L = h + 20mm

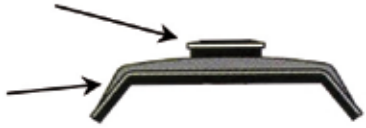
Recommended screw-in depths (ti) in wood substructure:
ti = 32mm - 96mm

Sealing - Options

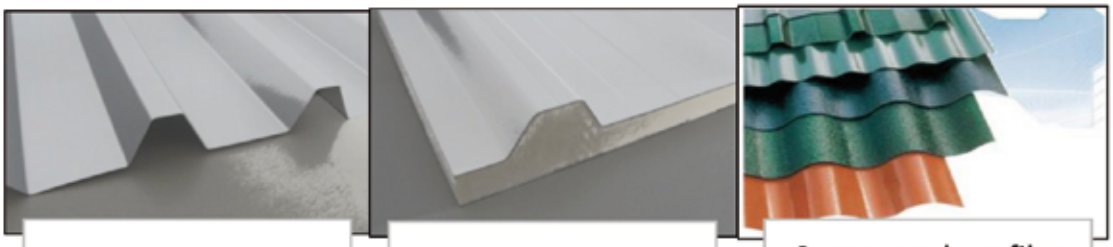
Sealing system: EJOT ORKAN Storm Washer + sealing washer E16

Sealing washer E16

EJOT ORKAN Storm Washer (aluminum storm washer + EPDM sealing stripe)



Recommended applications



Trapezoidal profiles

Sandwich elements

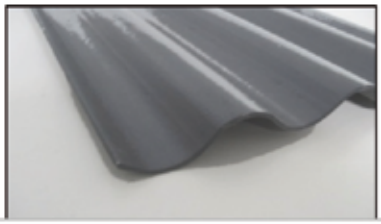
Corrugated profiles (steel)

Sealing system: Sealing element FZD

Compression washer (A2)

EPDM sealing element

Recommended applications



Fiber cement profiles

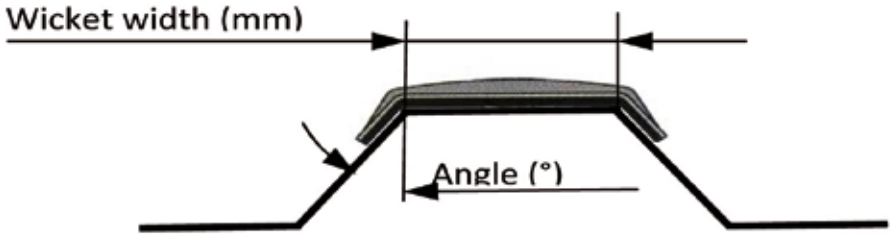
... also applicable for:

Trapezoidal metal profiles

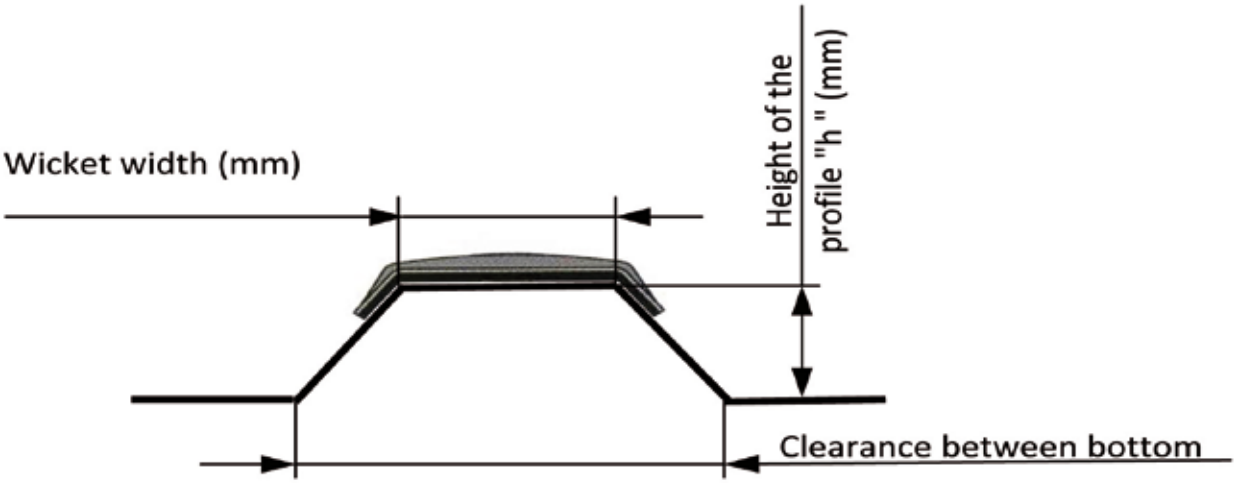
Sandwich elements

Corrugated profiles (steel)

Determination of the EJOT Orkan Storm Washer



The EJOT ORKAN Storm Washer is defined by "wicket width (mm)" and "angle (°)"



Is the angle of the trapezoidal profile unknown, it will be calculated using the following information:

- Wicket width (mm)
- Clearance between bottom booms (mm)
- Height of the profile (mm)

The EJOT ORKAN Storm Washer is defined as follows (example):

EJOT Orkan Storm Washer 41 - 32 RAL 9002

Article

Wicket width (mm)

Angle (°)

Color

EJOT®

Characteristic load-bearing values $N_{R,K}$ for the EJOT Solar Fastenings JA3-SB-8,0 x L (d=8mm) and JA3-SB-10 x L (d = 10mm) in soft wood (strength class C24, usage class 2)
Depending on the accumulated load duration and the screw-in depth l_{ef}

Screw-in depth l_{ef} in mm	Standard k_{mod} = 0,6 Longer than 10 years (usually intrinsic weight)		Long k_{mod} = 0,7 6 months to 10 years		Medium k_{mod} = 0,8 1 week to 6 months (usually snow)		Short k_{mod} = 0,9 Shorter than 1 week (usually wind)		Very Short k_{mod} = 1,1 Shorter than 1 minute	
	d = 8,0	d = 10	d = 8,0	d = 10	d = 8,0	d = 10	d = 8,0	d = 10	d = 8,0	d = 10
32	1,32	-	1,54	-	1,76	-	1,98	-	2,42	-
40	1,65	2,06	1,92	2,40	2,20	2,74	2,47	3,09	3,02	3,77
45	1,85	2,32	2,16	2,70	2,47	3,09	2,78	3,47	3,40	4,25
48	1,98	2,47	2,31	2,88	2,63	3,29	2,96	3,70	3,62	4,53
50	2,06	2,57	2,40	3,00	2,74	3,43	3,09	3,86	3,77	4,72
56	2,31	2,88	2,69	3,36	3,07	3,84	3,46	4,32	4,23	5,28
60	2,47	3,09	2,88	3,60	3,29	4,12	3,70	4,63	4,53	5,66
64	2,63	3,29	3,07	3,84	3,51	4,39	3,95	4,94	4,83	6,04
70	2,88	3,60	3,36	4,20	3,84	4,80	4,32	5,40	5,28	6,60
72	2,96	3,70	3,46	4,32	3,95	4,94	4,45	5,56	5,43	6,79
80	3,29	4,12	3,84	4,80	4,39	5,49	4,94	6,17	6,04	7,55
85	3,50	4,37	4,08	5,10	4,67	5,83	5,25	6,56	6,41	8,02
88	3,62	4,53	4,23	5,28	4,83	6,04	5,43	6,79	6,64	8,30
90	3,70	4,63	4,32	5,40	4,94	6,17	5,56	6,95	6,79	8,49
96	3,95	4,94	4,61	5,76	5,27	6,59	5,93	7,41	7,24	9,06
100	4,12	5,15	4,80	6,00	5,49	6,86	6,17	7,72	7,55	9,43
104	4,28	5,35	4,99	6,24	5,71	7,13	6,42	8,03	7,85	9,81
110	4,53	5,66	5,28	6,60	6,04	7,55	6,79	8,49	8,30	10,38
112	4,61	5,76	5,38	6,72	6,15	7,68	6,92	8,64	8,45	10,57
120	4,94	6,17	5,76	7,20	6,59	8,23	7,41	9,26	9,06	11,32

Characteristic values of the tensile compressive strength NR,k of the EJOT Solar Fastening JZ3-SB-8.0 x L in steel:

	Thickness of the substructure (steel) [mm]			
	1,50	2,00	3,00	≥ 4
nr,k [kN]	2,20	3,40	5,80	6,80

For intermediate values of the thickness of the substructure, NR,K for the smaller component thickness must be selected.

In the case of thin-walled (tII ≤ 2,00 mm), un-symmetrical substructures (e.g. C or Z profiles), the characteristic load-bearing values NR,k must be reduced by 30%.

Pre-drilling diameter in mm for profiled metal sheets and substructure

EJOT Solar Fastening	Thickness of the substructure: [mm]					
	Steel				Wood	
	1,5 ...<5,0	5,0...<7,5	7,5 ...< 10	≥ 10	≥ 32	≥ 40
JZS-SB-8,0 x L	6,8	7,0	7,2	7,4	-	-
JA3-SB-8.0 x L	-	-	-	-	5,5	5,5
JA3-SB-10,0 x L	-	-	-	-	-	7,0

Pre-drilling diameter in the profiled metal sheets = Pre-drilling diameter in the substructure

The pre-drilling diameter in roofings with fiber cement profiles always has to be bigger than the diameter of the EJOT Solar Fastening!

The pre-drilling diameter in the substructure corresponds to the indications from the table above.

Pre-drilling diameter in fiber cement profiles	
	Pre-drilling Ø [mm]
JZS-SB-8,0 x L	11,0
JA3-SB-8.0 x L	11,0
JA3-SB-10,0 x L	14,0

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fax +49 2752 908-731
e-mail: bau@ejot.de
Internet: www.ejot.com

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Represented by
ATF, Inc.
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Internet: http://www.ejot.com

IPENZ ENGINEERS NEW ZEALAND | NEW ZEALAND INSTITUTE OF ARCHITECTS INCORPORATED | ACENZ

Building Code Clause(s) B1

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on page 2)

ISSUED BY: **BVT CONSULTING LTD**
(Design Firm)

TO: CPS Solar Ltd
(Owner/Developer)

TO BE SUPPLIED TO: As Required
(Building Consent Authority)

IN RESPECT OF: Roof Mounted Solar Panel System
(Description of Building Work)

AT: As Required
(Address)

..... **LOT** ..... **DP** ..... **SO** .....

We have been engaged by the owner/developer referred to above to provide design consultancy
..... services in respect of the requirements of
(Extent of Engagement)

Clause(s) .....of the Building Code for
All ☑ or Part only ☐ (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☐ Compliance Documents issued by the Ministry of Business, Innovation & Employment.....or
(verification method / acceptable solution)

☐ Alternative solution as per the attached schedule.....

The proposed building work covered by this producer statement is described on the drawings titled Canterbury Power Solutions .....and numbered 16020202 sheet 1.....;
together with the specification, and other documents set out in the schedule attached to this statement.
On behalf of the Design Firm, and subject to:
(i) Site verification of the following design assumptions see attached BVT report, No.: 16020202.....
(ii) All proprietary products meeting their performance specification requirements;

I **believe on reasonable grounds** that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:
☑CM1 ☐CM2 ☐CM3 ☐CM4 ☐CM5 (Engineering Categories) or ☐ as per agreement with owner/developer (Architectural)

I, Sam Adshead ..... am:
(Name of Design Professional)

☑CPEng 1021235 .....#

☐Reg Arch ..... .#

I am a Member of : ☑ IPENZ ☐NZIA and hold the following qualifications: BE (Hons).....
The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.
The Design Firm is a member of ACENZ: ☑

SIGNED BY Sam Adshead..... ON BEHALF OF BVT CONSULTING LTD
(Design Firm)

Date 01 April 2016 (signature).....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

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Report No.: **16020202**
Date: **04/03/2016**

CPS Solar Ltd
Solar Panel Mounting System PS-1 Report

1. Overview

BVT have been requested by Murray Marquet of CPS Solar Ltd to Provide a Chartered Professional Engineer's design review and Producer Statement - PS-1 - Design for a Solar Panel Mounting System.

The mounting system consists of extruded aluminium rails and struts which are typically fixed to the roof structure of a timber framed house using extruded aluminium brackets.

The design has been checked for resistance to wind actions, up to and including Extra High wind zones as per NZS 3604: 2011.

The design is as detailed in BVT drawings 16020202 - 01.

2. Methodology

2.1 Loading

2.1.1 Wind Loads

Wind loads on the structure have been calculated in accordance with AS 1170.2 as outlined below to suit wind speeds up to Extra High wind zone as defined by NZS 3604: 2011:

Maximum Design Wind Speed: V_{des} = 57 m/s

Pressure coefficients from 1170.2 Table D4(A)

Wind at 0^O, C_{pw} =	-2.7 (uplift)
Wind at 180^O, C_{pw} =	1.6 (downwards)

For K_a = 1, K_1 = 1, K_p = 1, C_{dyn} = 1, C_{fig} = $C_{pw}(K_aK_1)$:

$p_{uplift} = (0.5\rho_{air})[V_{des}]^2C_{fig}C_{dyn}$ =	-5.26 kPa
$p_{down} = (0.5\rho_{air})[V_{des}]^2C_{fig}C_{dyn}$ =	3.12 kPa

Force on rails for panels of 1000mm x 1664mm (A_{panel} = 1.64m^2) or smaller:

f_{Uplift} = (½) p_{uplift} x L_{panel} =	-4.31 kN/m
f_{down} = (½)p_{down} x L_{panel} =	2.56 kN/m

2.1.2 Dead loads

Maximum individual panel load:	186 N (19kg)
Load on rail from panel:	93 N/m
Dead load due to rail:	8.4 N/m

2.1.3 Load Combinations

From NZS 1170.0: 2002

Uplift:	Ed = [0.9G + W_u]
Downwards:	Ed = [1.2G + W_u]

2.2 Analysis Parameters

The following material properties were used in the analysis

Neuton Power Rail (Aluminium):

Yield Strength:	F_y = 241 MPa
Shear Strength:	F_s = 205 MPa

*Material and dimensional properties were taken from the supplied ANTRO report.

Purlin (SG8):

Characteristic Bending Strength:	F_b = 14 MPa

2.3 Analysis Assumptions

- The roof on which the panels are installed can be up to 10m high
- The panels can be installed in a extra high wind zone as defined by Section 5 of NZS 3604:2011
- The roof structure is compliant with NZS 3604:2011
- The maximum panel tilt can not exceed 30^O from the roof slope
- Snow loads must be verified by the structural engineer
- the following panels have been considered: Rene Sola, Santellite Black, Virtus II.

3. Results

3.1 Maximum Support Spacing due to bending in the rail

For the maximum allowable bending moment in the rail (M_{bx}), the maximum allowable support spacing was calculated.

$M_{bx} = Z_x(f_y) = 3604\ mm^3(241MPa) = 868{,}564\ Nmm$

Ed = [0.9G + W_u]

d_{max} = 1,600mm

Ed = [1.2G + W_u]

d_{max} = 1,200mm **-Limiting load case**

3.2 Compression in 35 SHS 2 Strut

For the loading at the maximum spacing calculated above in section 3.1, the axial compressive stress was calculated.

f_{ac} =23.6 << F_y = 241

Based on the low l/r value and the low calculated stress, Euler buckling was not expected to be a critical design consideration.

3.3 Pullout in fastener

For the loading at the maximum spacing calculated above in section 3.1, the connections were checked for two 12g wood screws and one M10 coach screw.

2x 12g x 65mm wood screw:
N* = 3.2 < ΦQ_n = 6.0 kN **- Compliant**

M10 x 55mm coach screw:
N* = 3.2 < ΦQ_n = 4.9 kN **- Compliant**

3.4 Bolted Connections

For the loading at the maximum spacing calculated above in section 3.1, the connections were checked for a M8 Stainless steel A2-70 bolt in single shear.

V* =3.2 kN < ΦV = 17.4 kN **- Compliant**

3.5 Load on Purlins

For the loading at the maximum spacing calculated above in section 3.1, the purlins were checked for a 70x45 SG8 timber rafter supported at 900mm centers.

M* = 0.72 kNm > ΦM_n = 0.26 kNm **- Not Compliant**

4. Conclusions

The maximum allowable spacing of the supports along the neuton power rail rail must not exceed 1,200mm.

Each support must be fastened to the rafters (not the purlins) with either two 12g x 65mm wood screws or a single 10mm x 65mm coach screw. Where the rafter spacing is less than 1,200mm, the rafter spacing becomes the maximum allowable support spacing.

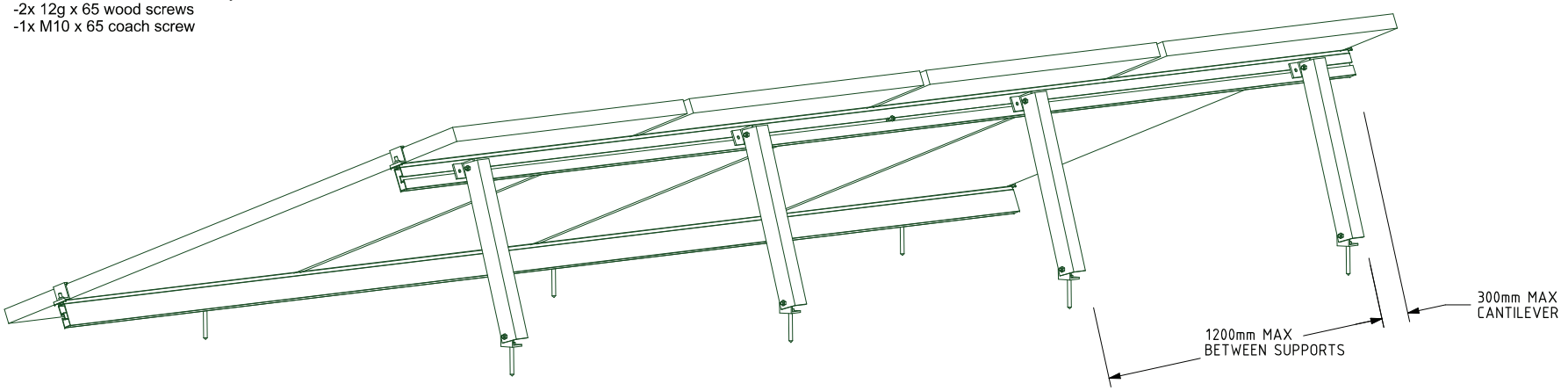
Report Completed By

Liam Ferguson
Engineer, BVT Engineering Professional Services

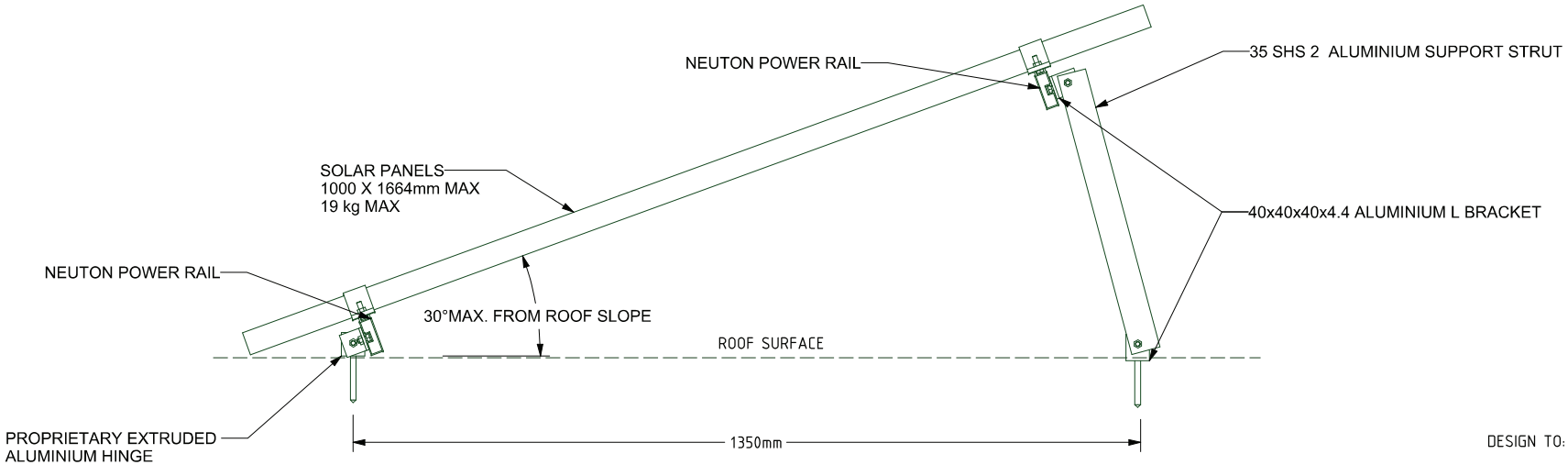
Report Approved By

Sam Adshead, CPEng, MIPENZ
Senior Engineer, BVT Engineering Professional Services

NOTES:
1. Supports must be fixed to rafters or truss members only
2. Fixings to be either: -2x 12g x 65 wood screws
-1x M10 x 65 coach screw



PERSPECTIVE VIEW FROM BEHIND PANELS



ELEVATION VIEW

DESIGN TO: NZS 1170.2:2011,
AS/NZS 1664.2:1997,
NZS 3604:2011

SUITABLE FOR WIND ZONES UP TO
EXTRA HIGH AS PER NZS 3604:2011
FOR BUILDING HEIGHTS UP TO 10 m

Revision	Description	Initial	Date
A	FOR DESIGN REVIEW		29/02/16

492 Moorhouse Ave
Christchurch
www.bvt.co.nz
Ph: 03 371 7593
Fax: 03 371 7593

		Date
Designed	CPS	
Drawn	LRF	29/02/16
Checked	SJA	29/02/16
Approved		

Tolerances (unless specified)	1-100	<1000	>1000
	± 0.5	± 1	± 2

All dim. in mm

CANTERBURY POWER SOLUTIONS
Solar Panel System

Project 16020202 | Scale Do not Scale | Sheet 1
DRG No. 16020202 | Date 29/02/16 | BVTA3