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Our Ref: 1850

3 September 2015

Xiamen Antai New Energy Tech. Co., Ltd. Room 402, No.21 Wanghai Road, Software Park II Siming District, Xiamen, China 361008

Array Frame Engineering Certificate

Installation of flush mounted solar array frame on Tin Roof

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of the Xiamen Antai New Energy Tech. Co., Ltd. solar flush mount frame for the use within Australia. The design check has been based on the information provided by Xiamen Antai New Energy Tech. Co., Ltd.

We find the Installation of flush mounted solar array frame on tin roof to be structurally sufficient for Australian use based on the following conditions:

- Wind Loads to AS/NZ1170.2:2011 Admt 3-2012
- Wind Region A, B, C, D
- Wind Terrain Category 2 & 3
- Wind average recurrence interval of 100 years region A and B
- Wind average recurrence interval of 500 years region C and D
- PV panels to be installed flat on the roof
- Timber with Joint Type classification J5 and J6 are excluded unless tested for Screw capacity
- Maximum Building height 20 m
- Max. Solar Panel Dimensions 2000×1000
- Regional Wind speed:

Wind Zone	А	В	С	D
Wind Speed (m/s)	41	48	69	88

Refer to attached summary table for interface spacing.

Construction is to be carried out strictly in accordance with the manufacturers instructions. 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 Managing Director MAICD

clobe

Milan Bjelobrk MIEAust, CPEng, NPER 2210984, RPEQ 12090, RBP EC-38461, NT BPB 139671ES

Page 1 of 1 ISO 9001:2008 Registered Firm Certificate No: AU1222



Gamcorp (Melbourne) Pty Ltd Consulting Structural & Civil Engineers A.C.N 141 076 904 A.B.N 73 015 060 240

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Structural Design Documentation

Solar Roof Interface Spacing Table According to AS/NZS 1170.2-2011 Amdt 3-2012 Within Australia Terrain Category 2

For: Xiamen Antai New Energy Tech. Co., Ltd.



Job Number: 1850 Date: September 3, 2015

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ISO 9001:2008 Registered Firm Certificate No: AU1222

Job No: 1850

Client: Xiamen Antai New Energy Tech. Co., Ltd.

Project: Solar Roof Interface Spacing Table

Address: Within Australia

Australian Standards

AS 1170. 2011 – Structural Design Actions Part 0 – General Principles Part 1 – Permanent imposed and other actions Part 2 – Wind Actions

AS 1664.1 - Aluminium structures - Limit state design

Wind Terrain Category:

WTC 2

Designed: B.C

Date: Sep-15



Client: Xiamen Antai New Energy Tech. Co., Ltd. Project: Solar Array Interface Spacing Table Address: Within Australia Designed: B.C

	Type of Rail		Rail II				
	Type of Interface		ATL-FWNY-0)5			
	Solar Panel Dimensi	ion	2mx1m				
	Terrain category		2				
	Roof Angle (Φ) –		Φ < 5°				
Wind			Building He				
Region		H	≤10	10<	H≤15	15<	1≤20
		.w & .w	Middle	D.W & U.W	Middle	D.W & U.W	Middle
А		125	1386	1014	1247	955	1174
В		806	989	728	892	686	841
С		226	276	205	250	193	236
D		142	174	129	157	122	148
Wind Region	Roof Angle (Φ) –		$\frac{5^{\circ} \le \Phi \le 30}{\text{Building He}}$		m) H≤15	15 <f< th=""><th>1≤20</th></f<>	1≤20
-		.w & .w	Middle	D.W & U.W	Middle	D.W & U.W	Middle
A		125	1640	1014	1474	955	1386
В		806	1165	728	1050	686	989
		226	324	205	293	193	276
С							



 Client:
 Xiamen Antai New Energy Tech. Co., Ltd.

 Project:
 Solar Array Interface Spacing Table

 Address:
 Within Australia

 Designed:
 B.C

	Type of Rail		Rail III				
	Type of Interface		ATL-FWNY-	05			
	Solar Panel Dimen	sion	2mx1m				
	Terrain category		2				
	Roof Angle (Φ) –		Φ < 5°				
Wind			Building H	eight – H (I	m)		
Region		H	≤10		H≤15	15<	1≤20
		D.W & U.W	Middle	D.W & U.W	Middle	D.W & U.W	Middle
А	_	1125	1386	1014	1247	955	1174
A	-	1125	1380	1014	1247	555	11/4
В	-	806	989	728	892	686	841
С	_	226	276	205	250	193	236
D	_	142	174	129	157	122	148
	Roof Angle (Φ) –		$5^{\circ} \le \Phi \le 30$		\		
Wind				eight – H (I		1.5.4	1<20
Region		D.W &	≤10	D.W &	H≤15	D.W &	1≤20
		U.W	Middle	U.W	Middle	U.W	Middle
А	-	1125	1640	1014	1474	955	1386
В	_	806	1165	728	1050	686	989
С	_	226	324	205	293	193	276
C	-	220	324	205	295	193	2/0
					184	122	-



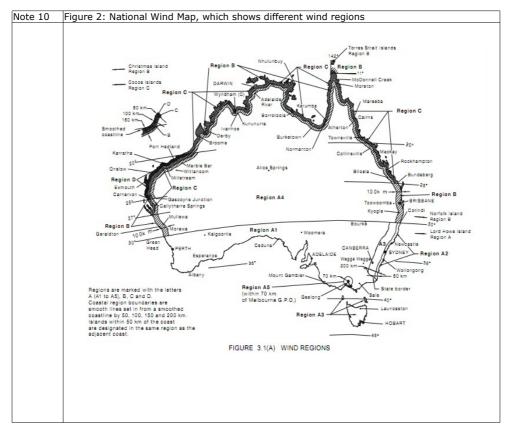
	Type of Rail Type of Interface Solar Panel Dimensi Terrain category	on	Rail IV ATL-FWNY- 2mx1m 2	-05			
	Roof Angle (Φ) –		Φ < 5°				
Wind				leight – H (I		45.4	1 4 2 0
Region		.w &	≤10	D.W &	H≤15	D.W &	
	U	.w	Middle	U.W	Middle	U.W	Middle
A	1	125	1277	1014	1227	955	1174
В		806	989	728	892	686	841
С		226	276	205	250	193	236
D		142	174	129	157	122	148
	Doof Angle (A)		5°≤Φ ≤ 30				
Wind	Roof Angle (Φ) –			leight – H (I	m)		
Region		H	≤10		H≤15	15<	841 236 148 H≤20 Middle
		.w & .w	Middle	D.W & U.W	Middle	D.W & U.W	Middle
A	1	125	1361	1014	1307	955	1277
В		806	1165	728	1050	686	989
С		226	324	205	293	193	276
D		142	203	129	184	122	174



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Client:	Xiamen Antai Ne	w En	ergy Te	ch. Co.,	Ltd.				Job:	1850			
Project:	Solar Array Inte	rface	Spacing	g Table					Date:	Sep-15	;		
Address:													
Designed:													
Note 1	General Notes All holes must be p	nro dri	المط سنة	h minim	um cor	aw omb	odmor	t of 25	mm in	to timb)r		
NOLE I	All holes hust be	Je un	neu, wit		um sci	ew emb	eumei	11 01 33					
Note 2	Recommended screws												
	Metal Purlins/Ba			Fastene	ers to	use							
	0.75 mm – 1.2 mr			14g-10 TPI Teks screws									
	1.5 mm			14g-10 -	TPI Tel	ks screw	/S						
	1.9 mm and Above	9		14g-10 ⁻	14g-10 TPI Teks screws								
	Wreoshpurthingvan		i e n	Fasteners to use									
	embedment and a			14g-10 ⁻	ГРІ								
	Unseasoned Pine (Joint											
Note 3	Group4) Above Spacing calculated based on 1.5 mm steel purlin.												
NOLE 3	For material thickr							lin cnar	inac c	bould			
	be reduced as follo		0.55 11	111 10 1.2			ei pui	iiii, spac	ings s	louiu			
	Material Thickne		Region A		Rec	ion B	Rec	jion C	Reg	ion D			
			Up/		Up/		Up/		Up/				
	0.75 mm – 1.2	mm	Down	Central	Down	Central	Down	Central	Down	Central			
			50%	50%		50%		50%	50%				
	0.55mm Batt	en	64%	64%		64%		64%	64%	64%			
	Timber		12%	12%	12%	12%	12%	12%	12%	12%			
Note 4	Following compone	ents a	re satisf	ied to us	e acco	rdina to	AS117	70.2011					
			Numbe					Descrip	tion				
	L foot	A	TL-FWN	Y-05	Tin Ro	of inter	face						
	Inter Clamp	Δ.	TL-FWN	v_00	Internal fixing between rail and Solar Planel								
							·						
	End Clamp		ALT-TYN			-		rail and	Solar I	Planel			
	Splice		TL-TYN			onnectic		005-T5	、				
	Antai Rail II T Module		ATL-TYN			bolt co)				
	Antai Rail III		ATL-TYN ATL-TYN					005-T5)				
H	Antai Rail IV	,	CG-01					005-T5					
			00 01	•			<u>(</u>		,				
Note 5	Terrain category 2 obstructions havin per obstructions p	g heig	hts gen										
Note 6	Splice connection must placed quarter length of the spacing of the L foot. No Splice connection should be placed at the centre of spacing or over the L foot.												
	CONNECTION												
								/					
	Н			L/4			H						
		L			L								
Noto 7	For the definition	f D	له زر رور	المحابيدها ا		d	.1						
Note 7	For the definition of refer attached figure							012					
	perer attached ligu	16 09	nom As		10.2-2	JII AII	iut Z-Z						
Note 9	Figure 1: Shows lo	cation	of the	Upwind/0	Central	& Dowr	nwind	end.					
	Floreb												
	Flush mounted arrays			> 600 mm		S		-					
	EXCLUS			\times		L	I			T			
	/		\times	1		X			0	1	7		
		//	END END	11/		1							
		CE	NTRAL ZON		GHT								
		END	1	18/3 ±	E HEIL								
		1	1 813		ERAG	_					-		
		18/3	+		M	Pane	I Must	be insta	alled fla	at to the	roof		
	$\langle \rangle$		/	/									
	0	/	18										
			/										
		X											
	1												



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Structural Design Documentation

Solar Roof Interface Spacing Table According to AS/NZS 1170.2-2011 Amdt 3-2012 Within Australia Terrain Category 3

For: Xiamen Antai New Energy Tech. Co., Ltd.



Job Number: 18

1850

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ISO 9001:2008 Registered Firm Certificate No: AU1222

- Job No: 1850
- Client: Xiamen Antai New Energy Tech. Co., Ltd.

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- Project: SolarRoof Interface Spacing Table
- Address: Within Australia

Australian Standards

AS 1170. 2011 – Structural Design Actions Part 0 – General Principles Part 1 – Permanent imposed and other actions Part 2 – Wind Actions

AS 1664.1 – Aluminium structures - Limit state design

Wind Terrain Category:

WTC 3

Designed: B.C

Date: Sep-15



	Type of Rail		Rail II				
	Type of Interface		ATL-FWNY-05				
	Solar Panel Dimens						
	Terrain category		3				
	Roof Angle (Φ) –		Φ < 5°				
Wind			Building H	eight – H	(m)		
Region		Hs	≤10	10<	H≤15	15<	H≤20
		9.W &	Central	D.W & U.W	Central	D.W & U.W	Central
A		1684	1780	1446	1680	1284	1586
В	-	1196	1475	1031	1268	918	1128
С		332	406	287	351	257	314
D		208	254	181	220	162	197
Wind	Roof Angle (Φ) –		<u>5°≤Φ ≤ 30</u> Building H	eight – H	(m)		
Region		H≤10		10 <h≤15< td=""><td colspan="2">15<h≤20< td=""></h≤20<></td></h≤15<>		15 <h≤20< td=""></h≤20<>	
		9.W &	Central	D.W & U.W	Central	D.W & U.W	Central
A	-	1684	1820	1446	1790	1284	1750
	1						
		1196	1620	1031	1423	918	1331
В						1	1
B C		332	477	287	412	257	368



	Type of Rail Type of Interface Solar Panel Dimer		Rail III ATL-FWNY-05 2mx1m				
	Terrain category		3				
	Roof Angle (Ф) –		Φ < 5°				
Wind		1	Building He	-			
Region			≤10	-	H≤15		H≤20
		D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central
A	-	1650	1750	1446	1660	1284	1586
В	_	1196	1475	1031	1268	918	1128
С		332	406	287	351	257	314
D	_	208	254	181	220	162	197
Wind	Roof Angle (Φ) –		$5^{\circ} \le \Phi \le 30$ Building He	viaht – H	(m)		4
Region		H	≤10		H≤15	15<	H≤20
		D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central
А	_	1673	1853	1446	1772	1284	1750
В		1196	1610	1031	1423	918	1331
С	_	332	477	287	412	257	368
D		208	297	181	258	162	230



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Client: Project: Address: Designed:	Within Australia									
	Solar Array Inte	rface	spacing	g Table	for Tin	Roof				
	Type of Rail Type of Interface Solar Panel Dimer Terrain category		Rail IV ATL-FW 2mx1m 3							
	Roof Angle (Φ) –		Φ < 5°							
			Bui	lding Hei	ght – H	(m)				
Wind Region		H	≤10		10 <h≤15< td=""><td>15</td><td><h≤2< td=""><td>20</td></h≤2<></td></h≤15<>		15	<h≤2< td=""><td>20</td></h≤2<>	20	
		D.W & U.W	Central		D.W & U.W	Central	D.W & U.W		ntral	
A	_	1375	1493		1297	1407	124	0 1	344	
В	_	1196	1407		1031	1268	918	; 1	128	
С	_	332	406		287	351	257	, 3	314	
D	_	208	254		181	220	162	2 :	197	
	Roof Angle (Φ) –		5°≤Φ ≤	≤ 30						
Wind			Bui	lding Hei	ght – H	(m)			-	
Region		H	≤10		10<	H≤15	15	<h≤2< td=""><td>20</td></h≤2<>	20	
		D.W &			D.W &		D.W &			

1850 Sep-15

Region	H	≤10	10<	H≤15	15<	H≤20
	D.W & U.W	Central	D.W & U.W	Central	D.W & U.W	Central
A	1375	1596	1297	1502	1240	1434
В	1196	1503	1031	1416	918	1331
С	332	477	287	412	257	368
D	208	297	181	258	162	230

Note: The above spaces are based on 1.5mm purlin only



Solar Array Inte Within Australia	ew Ene rface	ergy Te		Ltd.				Job: Date:	1850 Sep-15	
	pre dri	illed, wi	th minim	um screv	w embed	ment o	f 35 mm	into tir	nber.	
Recommended scr										
		6	Fastene	ers to us	se 🛛					
	n									
-				-						
		tor								
			rastene		e					
			14g-10 ⁻	TPI						
Group4)										
For material thickr	ness of					ıs shoul	d			
Material Thickne	ss	Reg	jion A	Reg	ion B	Reg	ion C	Reg	ion D	
		Up/	Central	Up/	Central	Up/	Central	Up/	Central	
0.75 mm – 1.2	mm									
0.55 mm Batt	en					64%				
Timber		15%	15%	15%	15%	15%	15%	15%	15%	
				e accord	ing to AS			on		
L foot	A	TL-FWN	Y-05	Tin Roof	interfac	e		-		
Inter Clamp	A	TL-FWN	Y-09	Internal	fixing be	etween	rail and s	Solar Pl	anel	
End Clamp	Å	ALT-TYN	-14	End fixir	ng betwe	en rail a	and Sola	r Planel		
Splice	ŀ	ATL-TYN	-21	Rail Con	nection					
Antai Rail II				-			-T5)			
	ŀ									
		CG-01	.0	Alumini		ALUUUJ	-15)			
from 3 m to 10 m.	. For e	xample	suburba	n housin	g or ligh	t indust	rial esta	tes.		nerally
		•	•	ver the L f	oot.	L foot.	No Splice	connec	tion	
			•			t 2-201	2.			
Figure 1: Shows lo	ocatior	of the	Upwind/	Central 8	k Downw	ind end	•			
		entrant entrant	$\langle \cdot \rangle$	WERAGE HEIGHT	st					
	Solar Array Inte Within Australia B.C General Notes All holes must be Recommended scr Metal Purlins/Ba 0.75 mm - 1.2 mi 1.5 mm 1.9 mm and Abov. Weodngurlinswap embedment and a Unseasoned Pine (Group4) Above Spacing cal For material thick be reduced as fol Material Thickne 0.75 mm - 1.2 0.75 mm - 1.2 0.75 mm Batt Timber Following components L foot Inter Clamp End Clamp Splice Antai Rail II T Module Antai Rail III T Module Antai Rail III Terrain category 3 from 3 m to 10 m Splice connection mushould be placed at 1 For the definition of refer attached figure Flush mounted arrays	Solar Array Interface Within Australia B.C General Notes All holes must be pre dri Recommended screws Metal Purlins/Battens 0.75 mm – 1.2 mm 1.5 mm 1.9 mm and Above Mood-purlins/oad (Saff embedment and above) Unseasoned Pine (Joint Group4) Above Spacing calculate For material thickness of be reduced as follows, Material Thickness 0.75 mm – 1.2 mm 0.55 mm Batten Timber Following components an Components Part I L foot A Inter Clamp A End Clamp A Splice A Antai Rail II Terrain category 3(TC3) from 3 m to 10 m. For e Splice connection must plac should be placed at the cen Category 3(TC3) from 3 m to 10 m. For e Splice connection must place should be placed at the cen Category 3(TC3) from 3 m to 10 m. For e	Solar Array Interface Spacin Within Australia B.C General Notes All holes must be pre drilled, wi Recommended screws Metal Purlins/Battens 0.75 mm – 1.2 mm 1.5 mm 1.9 mm and Above Wood gurlies and (Bafter embedment and above) Unseasoned Pine (Joint Group4) Above Spacing calculated based For material thickness of 0.55 m be reduced as follows, Material Thickness Reg 0.75 mm – 1.2 mm 50% 0.55 mm Batten 64% Timber 15% Following components are satisf Components Part Numbe L foot ATL-FWN Inter Clamp ATL-FWN End Clamp ATL-FWN End Clamp ATL-TYN Antai Rail II ATL-TYN Antai Rail III ATL-TYN Antai Rail III ATL-TYN Antai Rail III ATL-TYN Antai Rail III ATL-TYN Antai Rail III ATL-TYN Antai Rail III ATL-TYN Antai Rail III For the definition of Downwind, refer attached figure D9 from A Figure 1: Shows location of the Flush mounted arrays: Contents Components Part Spice Components Compo	Solar Array Interface Spacing Table Within Australia B.C General Notes All holes must be pre drilled, with minim Recommended screws Metal Purlins/Battens 0.75 mm - 1.2 mm 14g-10 1.5 mm 1.5 mm 1.4g-10 1.9 mm and Above 14g-10 Meochgurtängwood (Baften Fastene embedment and above) Unseasoned Pine (Joint Group4) Above Spacing calculated based on 1.5 m For material thickness of 0.55 mm to 1.2 be reduced as follows, Material Thickness Region A 0.75 mm - 1.2 mm 0.75 mm - 1.2 mm 0.75 mm - 1.2 mm 0.75 mm - 1.2 mm 0.75 mm - 1.2 mm 50% 50% 0.55 mm Batten 64% 64% Timber 15% 15% Following components are satisfied to us Components Part Number L foot ATL-FWNY-09 End Clamp ATL-FWNY-09 End Clamp ATL-TYN-14 Splice ATL-TYN-28 T Module ATL-TYN-28 T Module ATL-TYN-28 T Module ATL-TYN-28 Splice connection must placed quarter length should be placed at the centre of spacing or or RAIL Figure 1: Shows location of the Upwind/r Flush mounted arrays: Component arrays: Componen	Within Australia B.C General Notes All holes must be pre drilled, with minimum screet Recommended screws Metal Purlins/Battens Fasteners to us 0.75 mm - 1.2 mm 14g-10 TPI Teks 1.9 mm and Above 14g-10 TPI Teks 1.9 mm and Above 14g-10 TPI Teks Weodegutäves and @after Fasteners to us embedment and above) 14g-10 TPI Unseasoned Pine (Joint 14g-10 TPI Group4) Above Spacing calculated based on 1.5 mm steel For material thickness of 0.55 mm to 1.2 mm and be reduced as follows, Material Thickness Up/ Central 0.75 mm - 1.2 mm Down Central 0.75 mm - 1.2 mm 50% 50% 0.55 mm Batten 64% 64% 64% 64% 64% 15% 15% 15% 160t ATL-FWNY-05 Tin Roof Inter Clamp ATL-TYN-21 Rail Cor Antai Rail II ATL-TYN-28 Aluminin Antai Rail III ATL-TYN-28 Aluminii Antai Rail III	Solar Array Interface Spacing Table Within Australia B.C General Notes All holes must be pre drilled, with minimum screw embed Recommended screws Metal Purlins/Battens I.5 mm I4g-10 TPI Teks screws I.9 mm and Above I4g-10 TPI Teks screws Wood-gurdingwood (Raften Fasteners to use embedment and above) Unseasoned Pine (Joint Group4) Above Spacing calculated based on 1.5 mm steel purlin. For material thickness of 0.55 mm to 1.2 mm and timber be reduced as follows, Material Thickness Region A Region B 0.75 mm - 1.2 mm 0.75 mm 0.7	Solar Array Interface Specing Table Within Australia B.C General Notes All holes must be pre drilled, with minimum screw embedment of Recommended screws Metal Purlins/Battens Fasteners to use 0.75 mm - 1.2 mm 149-10 TPI Teks screws 1.9 mm and Above 149-10 TPI Teks screws 1.9 mm and Above 149-10 TPI Teks screws Metaf Purliave.aod (Raftex Fasteners to use embedment and above) 149-10 TPI Unseasoned Pine (Joint 149-10 TPI Group4) Above Spacing calculated based on 1.5 mm steel purlin. For material thickness of 0.55 mm to 1.2 mm and timber purlins be reduced as follows, Region B Region B Material Thickness Region A UP/ Over Central UP/ Over Central UP/ Over Central Down Components 0.75 mm - 1.2 mm 15% 15% 15% 15% 15% 15% 15% 15% Following components are satisfied to use according to AS1170.2 Components Part Number I L foot ATL-FWNY-05 Tin Roof interface Inter Clamp ATL-FWNY-03 Internal fixing between ral i Splice ATL-TYN-28 Aluminium Rail (AL6005 </th <th>Solar Array Interface Spacing Table Within Australia B.C General Notes JAll holes must be pre drilled, with minimum screw embedment of 35 mm Recommended screws Metal Purlins/Battens Fasteners to use 0.75 mm - 1.2 mm 14g-10 TPI Teks screws 1.5 mm 14g-10 TPI Teks screws 1.9 mm and Above 14g-10 TPI Teks screws Wood gutdieswapd (Bafter Fasteners to use embedment and above) 14g-10 TPI Unseasoned Pine (Joint Genup4) Above Spacing calculated based on 1.5 mm steel purlin. 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For material thickness of 0.55 mm to 1.2 mm and timber purlins, spacings shoul be reduced as follows, Material Thickness Region A Region C Region C Region C 0.75 mm - 1.2 mm Down Central Down</th> <th>Solar Array Interface Spacing Table Date: Sep-15 Within Australia B.C General Notes All holes must be pre drilled, with minimum screw embedment of 35 mm into timber. Recommended screws Metal Purlins/Battens Metal Purlins/Battens Fasteners to use 0.75 mm -1.2 mm 149-10 TPI Teks screws 1.9 mm and Above 149-10 TPI Teks screws Wood gutlies.aod (Batten Fasteners to use embedment and above) 149-10 TPI Unseasoned Pine (Joint 149-10 TPI Group4) Above Spacing calculated based on 1.5 mm steel purlin. 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