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28/03/2020

JA Solar Australia Pty Ltd
Melbourne, Victoria

Asset Services Pty Ltd
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Attention: Mr Andrew Zhai

**RE: Wind Pressure Testing of JA Solar Crystalline Silicon Photovoltaic Modules
Type JAM60S10 – 330/PR (330 W)
Design Certification**

Dear Sir,

This Report certifies the Design Wind Pressure for the JA Solar Type JAM60S10 – 330/PR PV Module for wind loads in Cyclonic Region C. We verify that the PV Module is capable of withstanding a design wind load as specified in Table 1.

A pressure test was conducted and observed by this office on the 26th March 2020 in Darwin, Northern Territory. The testing officer was Michael Hatton from this office.

The test module (serial number 19CM6C6024174193) was mounted front side up in a test bed. The size of the module was measured as 1.0m wide x 1.69m long. The fixing of the module was fixed using the Clenergy mounting brackets and rails. The fixings were spaced at 1200 mm centres giving a maximum cantilever overhang of 245mm of the module. The rails were fixed to the test bed. The perimeter frame of the module is 35 x 35 x 1.2 mm aluminium angle all round.

An air bag was used to apply constant pressure to the back of the module. The air bag was inflated with pressure to the required design pressure until failure occurred with the glass fracturing.

A calibrated deflection meter was used to measure deflection at mid panel and was recorded at 1 kPa intervals. The electrical continuity of the panels was not measured during the pressure test. The behaviour of the module and supporting fixtures were observed and recorded. Photographs were taken before and at maximum pressure of the test.

A design maximum pressure that was adopted was 12 kPa. This figure was chosen on past tests and it also allows the modules to be placed on the roofs of multi storey buildings subject to the variability factor. The applied factor of variability, for single test specimen and adopting a coefficient of variation of structural characteristics of 10 percent, from AS 1170.0 Table B1 when applying to the allowable design wind capacity is 1.46.


The module sustained a test pressure of 8.5 kPa (short of the design pressure) with the glass protective covering fracturing at this pressure. A deflection of 73 mm was recorded at mid panel at the failure test pressure. The module was removed from the test bed for further inspection. From our inspection the cross member at the end of the panels had started to yield. We consider that even though the frame started to yield and the glass protective covering fracturing, the panel remained on the test rails with no further damage. We consider the maximum pressure of the module can sustain 8.5 kPa without forming a debris hazard.

Table 1

Module Sn	Support Points	Max Applied Load	Variability Factor AS 1170.0 Table B1	Ultimate Strength Limit State Design Capacity
19CM6C6024174193	1200 mm	8.5 kPa	1.46	5.8 kPa

We hereby certify the JA Solar Type JAM60S10 – 330/PR PV Module with support points located at 1200 mm is suitable for a cyclonic design wind pressure of 5.8 kPa. Note that the test is for the PV module only and its support fixings and rails are not part of this test.

This certification excludes the module fixing clamps, the support rail or fixing to the roof as this may limit the maximum design wind pressure.

<u>CERTIFICATION BY STRUCTURAL ENGINEER</u>			
Company Name if certification issued on behalf of a corporation Asset Services Pty Ltd		Company NT Registration Number 152941ES	
I certify that reasonable care has been taken to ensure that the structural engineering aspects of the works as described above have been designed in accordance with the requirements of the Building Code of Australia and the Northern Territory Building Regulations.			
Name (see *below) Michael Hatton Nominee for Asset Services Pty Ltd	Nominee/Individual NT Registration Number 14704ES	Signature 	Date 28/03/2019

Should you require any further information in relation to this report please contact this office.

Yours faithfully,



Michael Hatton
Senior Structural Engineer | Senior Building Surveyor
Asset Services Pty Ltd