skyhooks engineering

The Holmfirth Picturedrome Limited

Picturedrome PVs

Structural Note

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Project title	Picturedrome PVs	Job number	24-267
Client	The Holmfirth Picturedrome Limited	File reference	
Prepared by	Jack Firth (Skyhooks Engineering)	Date	23 January 2025
Subject	Solar PVs Structural Note		

1 Introduction

This Structural Note has been prepared by Skyhooks Engineering on behalf of The Holmfirth Picturedrome Limited to support their proposal to install a solar PV panel array on the roof of The Picturedrome, Holmfirth. Skyhooks Engineering has been appointed to conduct a technical review of the roof structure.

The review has been undertaken following a site inspection of the existing roof on 2nd December 2024 and following the confirmation of the proposed solar PV panel type by Environmental Energy Limited.

The existing roof build-up used in the assessment is based on the information obtained during the site visit. The inspection was a visual non-intrusive survey taken from floor level within the roof space.

Note: this review does not consider the suitability of the existing or proposed roof finishes or their fixings.

2 Existing Roof Finishes

The roof is constructed off timber rafters, supported off timber purlins spanning between steel trusses at regular centres. The trusses were noted to be formed from particularly slender elements which are possibly near capacity.

Slate tiles cover the full extent of the roof to be modified. The exact slate size, thickness, and lap could not be verified however based on a typical slate of 4-5mm thick with a 75mm lap, this would equate to 35kg/m².

During the visual inspection, it was observed that the roof was uninsulated with a vapour control barrier between the rafters and battens.

The existing roof finishes were determined to be:

- Vaper control barrier (negligible)
- Timber battens – assume 25x50mm @ 200mm c/c (3kg/m²)
- Slate – assumed 4-5mm thick with 75mm lap (35kg/m²)
- **Total:** 38kg/m²

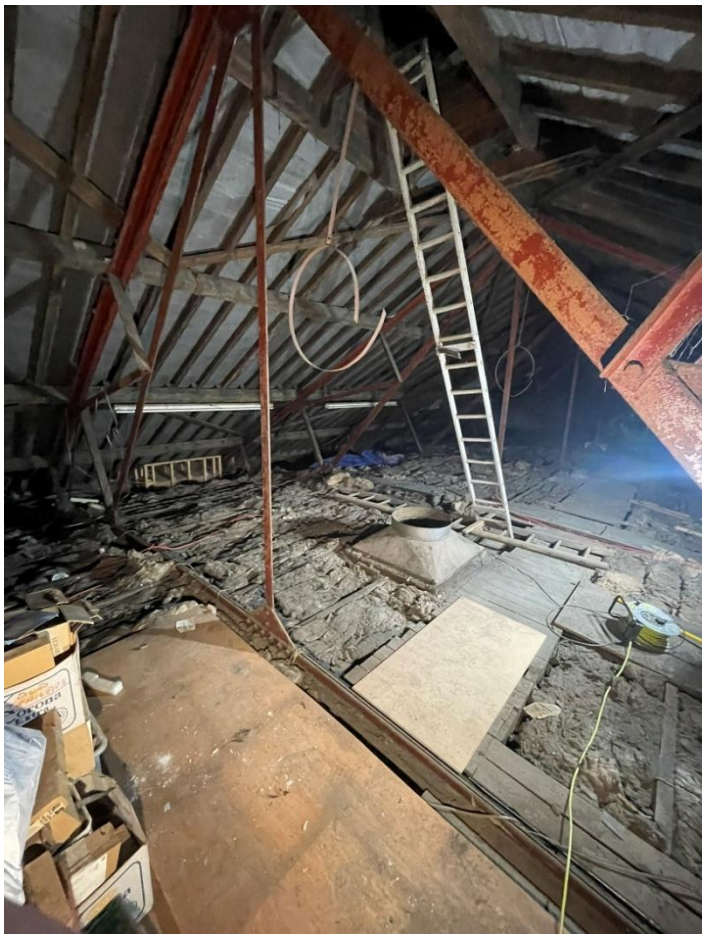


Figure 1 Existing roof view from within loft space

3 Proposed Roof Finishes

Option 1: Surface mounted solar PV panels

The roof is to remain as existing with the addition of solar PV panels to the south elevation, which will be surface mounted onto rail system. As such the load of the panels will be in addition to the existing roof finishes.

The proposed roof finishes build-up in the location of the solar PVs is as follows:

- Vaper control barrier (negligible)
- Timber battens – assumed 25x50mm @ 200mm c/c (3kg/m²)
- Slate – assumed 4-5mm thick with 75mm lap (35kg/m²)
- Solar PV panels including mounting (approx. 20kg/m²)
- **Total:** 58kg/m²

The proposed roof finishes build-up is calculated to give a net increase in dead load to the roof of approx. 52%.

Given the age and construction of the roof, which would have been designed under permissible stress limits and not modern design codes, this represents a significant increase to the load on the roof is not acceptable structurally.

Option 2: Recessed solar PV panels

The roof is to remain as existing except where installing solar PV panels to the south elevation.

The exact layout of the solar PV panels is to be confirmed by Environmental Energy Limited however the proposed product has been confirmed as Viridian Solar Clearline Fusion. The panels are recessed into the roof and therefore the load of the panel is offset by the removal of slate.

The proposed roof finishes build-up in the location of the solar PVs is as follows:

- Vaper control barrier (negligible)
- Timber battens – assumed 25x50mm @ 200mm c/c (3kg/m²)
- Viridian Solar Clearline Fusion solar PV panels (13kg/m²) *[data sheet appended]*
- **Total:** 16kg/m²

The proposed roof finishes build-up is calculated to give a net reduction in dead load to the roof.

4 Conclusion

The review finds that Option 1, utilising surface mounted solar PV panels increases the load on the roof excessively and is not acceptable structural in this instance. It is therefore recommended that this option is discounted.

The review finds that Option 2, utilising recessed solar PV panels is acceptable from a structural capacity perspective as this presents an overall reduction in loading to the roof structure. Given the roof was observed to be performing adequately with no obvious defects, the roof should be capable of continuing to perform adequately following the modifications to the roof finishes and installation of the solar PVs.

Note: If any of the assumptions made in this assessment are incorrect, Skyhooks Engineering is to be informed.

Safe working methods are to be adopted by all contractors undertaking works on the site prior to commencing and any temporary works required to undertake the modifications are beyond the scope of this note.

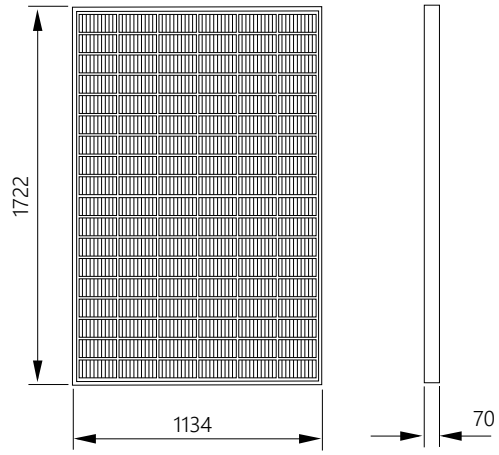
Appendix

EN

M10 Solar Photovoltaic Panels

Clearline fusion

- Simple roof integration with clean, low-profile aesthetic for new build and retrofit
- Rapid installation times of less than 45 min/kWp easily achieved
- Compatible with the widest range of slate and tile including special fixings for different batten thickness
- Fitted during the normal roofing programme, enabling clarity of responsibility and safe working practices
- Achieves highest fire rating and wind resistance without modifications to the roof



PV16-405-M10

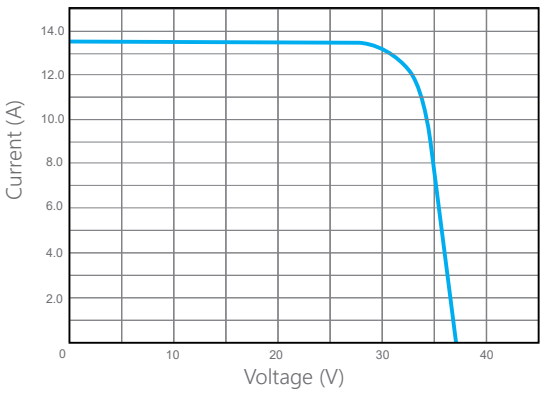
Mechanical Specification

Model		PV16-xxx-M10
Aperture Area	m^2	1.885
Width	mm	1,134
Length	mm	1,722
Thickness	mm	70
Weight	kg	25.0
Static roof loading (distributed)	kg /m^2	12.8
Characteristic Wind Resistance	kPa	4.24
Ultimate Design Load [1]	kPa	4.24
Positive Design Load	IEC 61215	5.40
Roofing System Fire Rating	EN 13501-5	B_{ROOF} (T1, T2, T3, T4)
Power Warranty	% rated	90%10 years, 80% 25 years
Product Warranty		15 years
Standards		IEC61215, 61730, TUV, MCS05 , MCS12, BBA
Structural Durability		Equivalent to roof structure

Electrical Specification

Model		Clearline fusion PV16-XXX-M10
Peak Power [2]	Wp	405
Module Efficiency [3]	%	21.5
Number of Cells		54x2
Maximum Power Voltage (V_{mpp})	V	31.02
Maximum Power Current (I_{mpp})	A	13.06
Open Circuit Voltage (V_{oc})	V	37.05
Short Circuit Current (I_{sc})	A	13.62
NOCT [4]	°C	45.0
Cell Type		Monocrystalline Silicon
Power Temperature Coefficient	% / °C	-0.35
Current Temperature Coefficient	% / °C	0.05
Voltage Temperature Coefficient	% / °C	-0.28
Maximum System Voltage	VDC	1,000
Maximum Fuse Rating	A	25
Safety Classification		Class II
Electrical Connectors		Genuine Stäubli MC4 PV-KST4, PV-KBT4

I-V Curve



1 Design resistance to ultimate loads includes a partial material safety factor of 1.0
2 Subject to a manufacturing tolerance of +/- 3 %.
3 Based on aperture area.
4 Nominal Operating Cell Temperature
Electrical specification measured under standard test conditions: Irradiation 1 kW/m^2 with light spectrum AM 1.5 and a cell temperature of 25°C.

viridian solar ®

80048 2.0

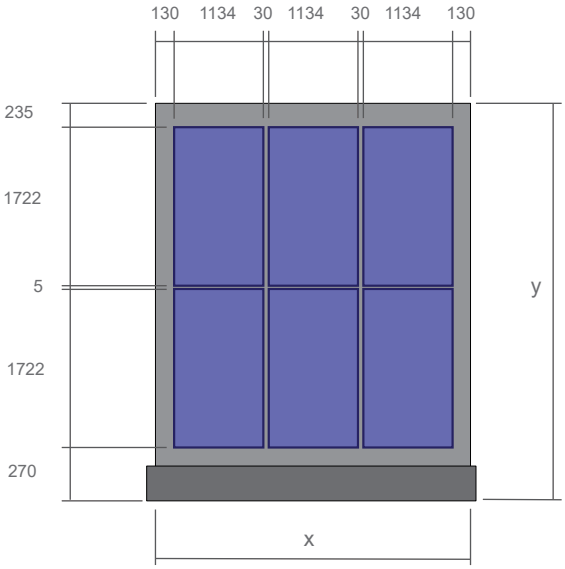
M10 Solar Photovoltaic Panels

Clearline fusion

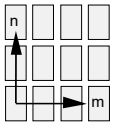
Pitched Roof Integration

Sleek, low-profile integrated solar that replaces the roof covering for an improved aesthetic and for simple roof maintenance, now at similar cost to above-roof panels. Simple, beautiful, durable.

Solar never looked so good.

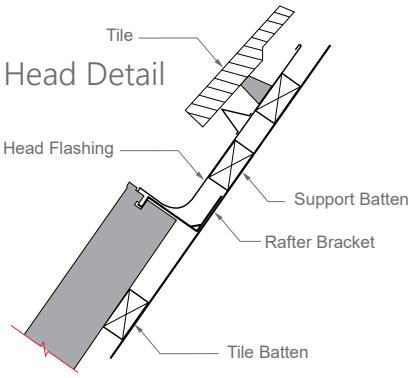


n x m

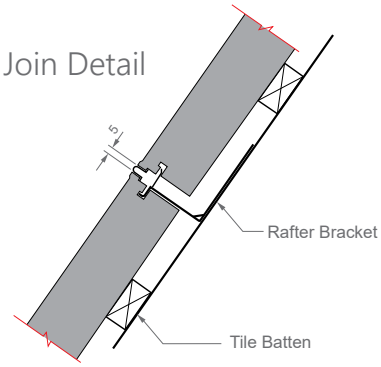


x = (m x 1164) + 230

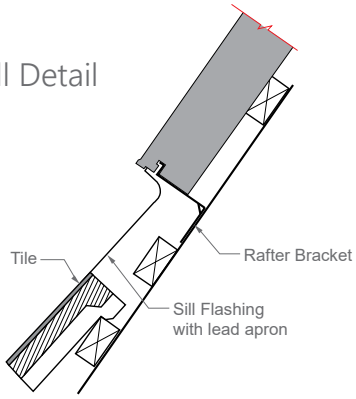
y = (n x 1727) + 500



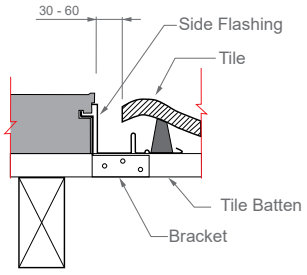
Head Detail



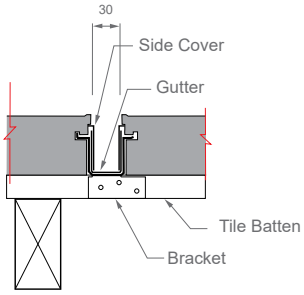
Join Detail



Sill Detail



Side Detail



Gutter Detail
(joined flashings)

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