Easy PV

Solar design made simple

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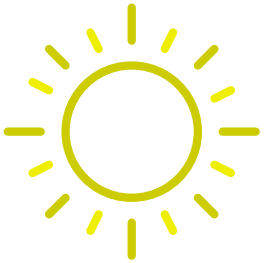
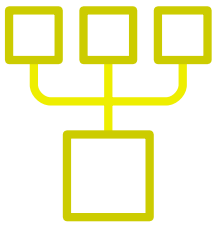
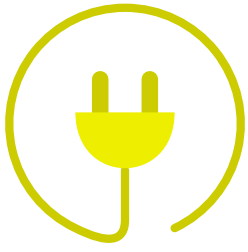
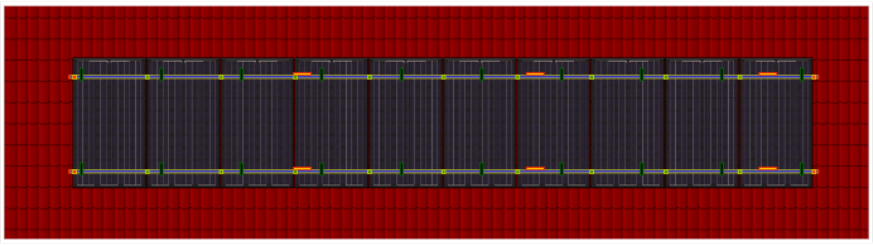


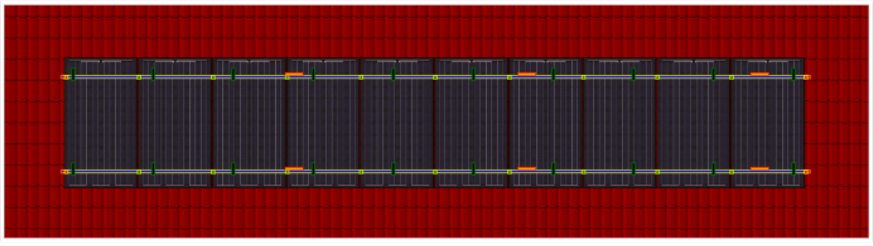



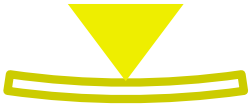
Roof Layout

Roof 1



Roof 2





Structural calculations

Weight loading calculations

For a traditional cut roof with rafters and purlins we recommend also using our rafter calculator to check the load-bearing capacity of the rafters. Even if the increase in loading is more than 15% the rafters may well be able to take the additional weight.

Please note that this method does not calculate the strength of the roof, and if a roof was badly constructed, does not meet existing building regulations, or is in poor condition then it may still not be appropriate to install an array.

Roof 1

Dead load from roof covering	0.44 kN/m^2
Imposed load	0.75 kN/m^2
Total loading without solar array	**1.19 kN/m^2**

Weight of solar panels and mounting	231.2 kg
Area covered by solar array	19 m^2
Loading imposed by solar array	0.12 kN/m^2
Total loading with solar array	**1.3 kN/m^2**

Increase in loading due to solar array: 10.1%

An increase of less than 15% in the load imposed on a roof is not considered to be a significant change (The Building Regulations 2000, Approved Document A).

Roof 2

Dead load from roof covering	0.44 kN/m^2
Imposed load	0.75 kN/m^2
Total loading without solar array	**1.19 kN/m^2**

Weight of solar panels and mounting	231.2 kg
Area covered by solar array	19 m^2
Loading imposed by solar array	0.12 kN/m^2
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Wind loading calculations

The maximum force acting on a solar array from wind loading is given by the following formula in BRE Digest 489:

$$F = q_p \times C_{p\,net} \times C_a \times C_t \times A_{ref}$$

Roof 1

Q_p	763 Pa
in From Fig 34 in Guide to the Installation of Photovoltaic Systems for a building 10 m high, windzone 1, in urban terrain, at a distance of greater than 20km from the sea	

$C_{p\,net}$	Roof Centre	Roof edge
Uplift	-1.3	-2.2
Pressure	1	1.1

C_a	1
At an altitude of 12m	

C_t	1
When there is no significant topography	

A_{ref}	18.95m^2

F	Roof Centre	Roof edge
Uplift	**-18798N**	**-31813N**
Pressure	**14460N**	**15906N**

With 20 roof hooks we should allow for an uplift force per hook in the central zone of **940N**, rising to **1591N** at the edges. If 2 screws are used per roof hook, this equates to **470N**per fixing in the central zone, and **795N** at the edges.

Pan tile roof hooks are fixed with screws that pass through the 5mm plate of the roof hook and are then buried fully into the rafter beneath. So there is approximately 75 mm of thread in the timber. The pull-out force in C16 timber is given by tables and formulae in BS5268 Part 2:

$$17.3 \times 1.25 \times 75 = \mathbf{1622N}$$

The pullout force on the fixings is less than the expected wind loading, even when the fixings are close to the edge of the roof. ✓

Roof 2

Q_p	763 Pa
in	From Fig 34 in Guide to the Installation of Photovoltaic Systems for a building 10 m high, windzone 1, in urban terrain, at a distance of greater than 20km from the sea

$C_{p\ net}$	Roof Centre	Roof edge
Uplift	-1.3	-2.2
Pressure	1	1.1

C_a	1
At an altitude of 12m	

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