Easy PV

Solar design made simple

# Nick Hughes

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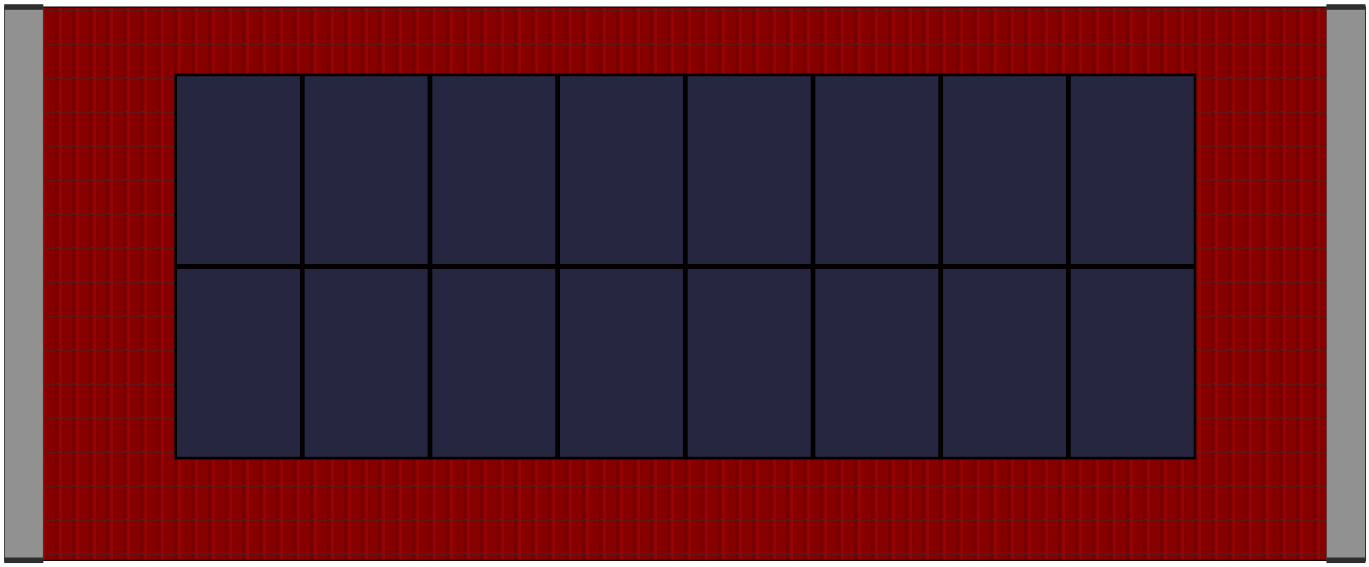
# Roof Layout

## West roof



# Structural calculations

## Weight loading calculations

### West roof

| | |
|---|---|
| Weight of solar panels and mounting | 390.9 kg |
| Area of solar array | 31.2 $m^2$ |
| Loading imposed by solar array | 0.12 $kN/m^2$ |
| Dead load from roof covering | 0.45 $kN/m^2$ |
| **Total dead load of solar array, mounting and roof covering** | **0.57 $kN/m^2$** |
| **Permitted dead load** | **0.785 $kN/m^2$** |

The solar array, mounting system, and roof covering are expected to impose a total dead load on the roof of **0.57kN/$m^2$**. This is less than the permitted dead load for the roof of **0.785kN/$m^2$**.

# Wind loading calculations

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

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

## West roof

| | |
|---|---|
| $Q_p$ | 1136 Pa |
| in | From Fig 34 in Guide to the Installation of Photovoltaic Systems for a building 10 m high, windzone 2, in country terrain, at a distance of between 2km and 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 | |

| | |
|---|---|
| $A_{ref}$ | 31.24m$^2$ |

| **F** | Roof Centre | Roof edge |
|---|---|---|
| **Uplift** | **-46141N** | **-78085N** |
| **Pressure** | **35493N** | **39042N** |

With 36 roof hooks we should allow for an uplift force per hook in the central zone of **1282N**, rising to **2169N** at the edges. If 2 screws are used per roof hook, this equates to **641N**per fixing in the central zone, and **1085N** at the edges.

Concrete 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 65 mm of thread in the timber. The pull-out force in C16 timber is given by tables and formulae in BS5268 Part 2:

$$17.3 \times 1.25 \times 65 = \mathbf{1406N}$$

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