

CASE STUDY SOLAR PANEL FIXING SYSTEM



N.B. This case study considers only one possible approach, which will not be suitable for every church. Always seek professional advice.

Key Points

- Installing solar panels on metal church roofs is possible, even though copper and lead covered roofs (or those with steel replacement of similar appearance) cannot be drilled for fixing the panels. Clamping to roof standing seams may be possible in some circumstances (for example in more modern installations where seams have been pinned back to the roof structure), but lead is very soft and deforms over time.
- St Michael and All Angel's roof has only very small un-pinned seams at the copper panel joints, which do not offer the option of clamping, and so the church successfully used an alternative, self-weighted system.



1 St Michael and All Angels, Withington, installed 24 solar PV panels on its roof as part of a wider project to become zero carbon.

2 Clamping was not possible, so the solar panels are affixed to stainless steel Unistrut rails to which weights are clamped at each end. The solar panels contribute to St Michael's becoming a "net zero carbon" church.

The context

St Michael and All Angels, Withington, is a Grade I listed Norman church in a small village in the Diocese of Gloucester. The church has a copper roof.

For more information visit the church's [website](#) or its entry on the [Church Heritage Record](#).

The need for change

The church wished to attain net zero carbon dioxide output by becoming self sufficient in electricity (as well as installing a biomass boiler). They first conducted an energy audit, and, by implementing the efficiency measures recommended in it, reduced their energy consumption by 37%. They reduced floodlight operating times and converted to LED lighting. Future installation of LED floodlights saved a further 42%.

The solar panels provide renewable electricity to meet the church's remaining needs and contribute the spare 'clean' electricity to the grid.

What were the options?

Solar panels are typically anchored to a roof surface to ensure no movement during windy conditions. As the copper roof covering could not be disturbed an alternative was developed.

What was done?

- The church commissioned structural engineers to develop a self-weighted system, derived from roof ladders, following a detailed calculation of the strength of the roof.
- A 24m² system delivering 3.24kW peak (producing around 2,600 kWh electricity per year) was installed. This is a similar size to many domestic installations. The installation is not visible from the ground, being completely hidden behind a parapet. Cabling follows the route of the rainwater goods.

How well does it work?

Before the measures outlined above to tackle energy use, the original electrical consumption was 2,930kWh/year, costing £338 and emitting 1,594 kgCO₂e/year.

Following efficiency measures this has been reduced to 1,838 kWh/year.

The solar panels meet much of the electricity requirement of the church. They export the 'spare' electricity, and, when the church needs electricity but the panels are not generating enough (on winter evenings for example), the church imports electricity from the grid.

The overall "net" electricity outcome is that the church is exporting 754kW/year of clean, renewable electricity. This is equivalent to a carbon abatement of 410kg of greenhouse gasses per year; i.e. the church is more than meeting its "zero carbon" status.

Since no holes were drilled, at the end of its working life, the installation is reversible.

How much did it cost?

The solar PV equipment and installation cost plus structural engineers fees was £18,057.

Annual savings: the system will gain Feed in (Generation) Tariff of £1,070 per year and an estimated export of 80% providing a further £62/year, a further £60 will be saved by avoided purchase. The efficiency measures cost £510 to complete providing an annual saving of £125/year.

Overall these savings total £1,317 per year, giving a 14 year payback period. (Note; all these costs and income figures are based on the costs at the time of the project in 2010, both installation costs and feed in tariff income have significantly changed since that time).

The simple yet ingenious system for weighting down the solar panel system onto the roof was the key to unlock this project. The system designed was easy to install as it used standard building components, with the only specialised element being the pads between the framework and the roof, but even these were easy to have fabricated.

Once the fixing system was resolved the solar panels have continued to be a strong success in generating sufficient electricity for the church to be zero.

— Matt Fulford, Project Leader, St Michael and All Angels Church, Withington