Solar PV Reference Design

Approved 1st November 2023

This reference design was approved at the Cedar Chase AGM on 1st November 2023, subject to some caveats. The adopted motion was:

> The Society approves the installation of Solar PV systems in accordance with the Reference Design presented at the AGM on 1st November 2023. Cables must be routed down the back of the house wherever possible, to minimise the visual impact. Any householder wishing to install such a system must first submit drawings to the Committee showing how and where the various components of the system will be placed. The plans will be circulated to all residents for comment. Installation work must not start until the Committee has approved the plans.

Solar PV Reference Design

Version 1.0 20/10/2023

Design Principles

Appearance and consistency from one house to the next is extremely important. We recognise that solar panels cannot be made invisible, but the installation should look *right* on these houses.

The roofs have fibre-cement slates: Marley Eternit (now Cedral) Thrutone Blue-Black. Most have been re-roofed in the past few years and have a clean and consistent appearance. The most appropriate solar PV panels are all-black mounted on black frames.

We would expect every house installing solar PV to put identical arrays on both the south-facing and west-facing roof slopes. The size and alignment of the arrays should be the same on all houses: see plans below.

Cedar Chase is built on a slope and there are five blocks of houses. The way that they join varies to account for alignment and slope. This affects the available cable routes to connect the roof arrays to the inverters. Similarly, the way each house has developed its garden, loft, and utility/bin-store areas will affect the choice of location for inverters and (optionally) batteries. The guiding principle here is that inverters and batteries should not be visible from public space, and that cable-runs should be non-obtrusive. This will require per-house design approval.

We expect high-quality design and installation, using high-quality products produced with proper consideration to environmental issues.

Panels and Mounting

This part of the design is the same for all houses.

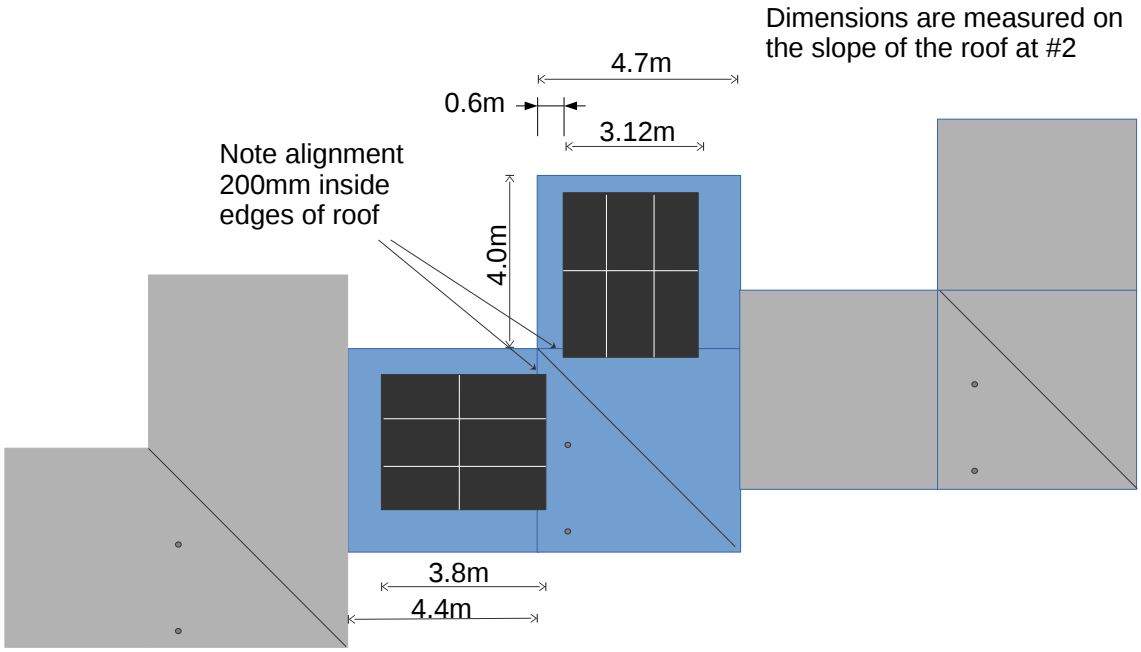
The panels must be all-black, with black frames. They should be mounted on black rails as close to the existing roof surface as possible. Birds and animals must be excluded from the space under the panels.

As Cedar Chase is in a Conservation Area, no part of the installation may project above the ridge-line.

This design is based on REC TwinPeak 5 Black panels. Each has a peak output of 405W and is 1040mm x 1900mm. An array of six such panels, mounted in landscape orientation, will be 3.8m wide and 3.12m high.

Every manufacturer produces panels to different dimensions, and they also seem to be getting bigger with each new generation. We must get every installation to look similar even if some of them use panels that have not been designed yet. Therefore the placement of the panels is referenced to the lower edge of each face of the roof. If future panels are a slightly different size the most visible part will still be in the same place.

Placement of solar panel arrays: REC TwinPeak 5 (landscape)



Per-House variations

The roof-mounted panels must be the same for every house, but other parts of the system will vary. **Anyone wishing to install a solar system must submit drawings to the Committee for discussion and approval before starting the installation work.**

Choice and placement of inverters and batteries

Inverters convert the DC electricity from the panels into AC at 230V to match the mains. There are many to choose from and this should be discussed with your chosen contractor. For the purposes of this design we assume a GivEnergy GIV-HY3.6 hybrid inverter. This is a dual-string inverter so it handles the south-facing and west-facing arrays separately (this is more efficient than connecting all panels into a single string as the output of an array is limited by the least-illuminated panel).

This inverter is 440mm high, 480mm wide, and 260mm deep. It needs at least 300mm of free space all around it (500mm at the bottom) so the installation space must be at least 1080mm wide and 940mm high.

If you choose to install a battery it should be compatible with the inverter and preferably supplied by the same manufacturer. In this design we assume a GivEnergy GIV-BAT-5.2 which is a LiFePO

design storing 5.2kWh. Batteries are heavy (this one is 63kg) and they should be installed close to the inverter as they have to be linked by thick cables.

The battery is 515mm high, 480mm wide, and 223mm deep. It needs some free space each side for access and cables. It can stand on the floor but must be firmly fixed to a wall.

These inverters and batteries can be installed indoors or outdoors, but they should be protected from direct rainfall and sunshine (so there must be a roof above the equipment and possibly a screening fence in front of it). The inverter needs space around it for air movement as it generates heat.

The inverter needs a connection to a dedicated circuit-breaker in the house consumer unit (main fuse box). It may be necessary to expand the consumer unit or to install an extra one. In Cedar Chase houses the consumer unit is in the kitchen near the bin-store door. Some houses have moved it to the ‘outside’ wall in the bin-store/utility room.

There has to be a DC isolating switch between the panels and the inverter. This is likely to be mounted near the inverter. It is very important to make sure that a proper DC switch is fitted and that its enclosure is water-tight (rated IP66+, no upward-facing cable glands, only one cable through each gland, and no extra holes drilled in the back of the box for mounting).

Placement will depend on the layout of each individual house. **Plans must be drawn and submitted to the Committee for approval before starting work.** Here are some ideas:

Utility Room

The original bin-stores were roofed many years ago for use as utility rooms (and in fact on our sister estate at Marsham Lodge they were built that way). They are close to the main fuse-box so this is an obvious location for inverters and batteries. In some houses this space can get very hot in summer which might reduce the working life of the equipment unless the heat is controlled.

See Utility Room drawing at the end of this document.

Rear Patio

Equipment could be fixed to the wall under the kitchen window or to an adjacent wall where there is one. It must be screened from direct sunshine and sheltered from rain. See drawing for Outdoor Installation.

Bin Area

The fence-screened bin area at the front of the house might house the inverter but there would not be space for a battery as well. Equipment must be screened from direct sunshine and sheltered from rain. It must also be protected from tampering by passing children. This placement would compromise the area available for bins, so it is not recommended.

Loft

There is just about enough height in the loft space above the front bedroom, but there are several problems to be considered:

- The inverter and battery are quite large and the battery is very heavy. It would be difficult to get them up there.
- There is no easy cable-route to the main fuse-box.
- This can be quite a warm space, and the equipment would add more heat.
- If your loft is not completely lined with plasterboard there would be a much greater fire risk especially as it would be ‘out of sight, out of mind’.
- Inspection and servicing would be hard so it might not get done properly.

Cable routes

There will be either 2 or 4 cables between the panels and the inverter, plus an earth wire. Each cable is about 6mm diameter. Installers are not keen on running these cables inside the house: they are not allowed to use the cavity so there would have to be conduit down through a bedroom. The normal approach is to put the cables on the outside. This needs very careful design and attention to detail, and is likely to be different from one house to the next to achieve minimum visual impact. **Plans must be drawn and submitted to the Committee for approval before starting work.**

Some general principles:

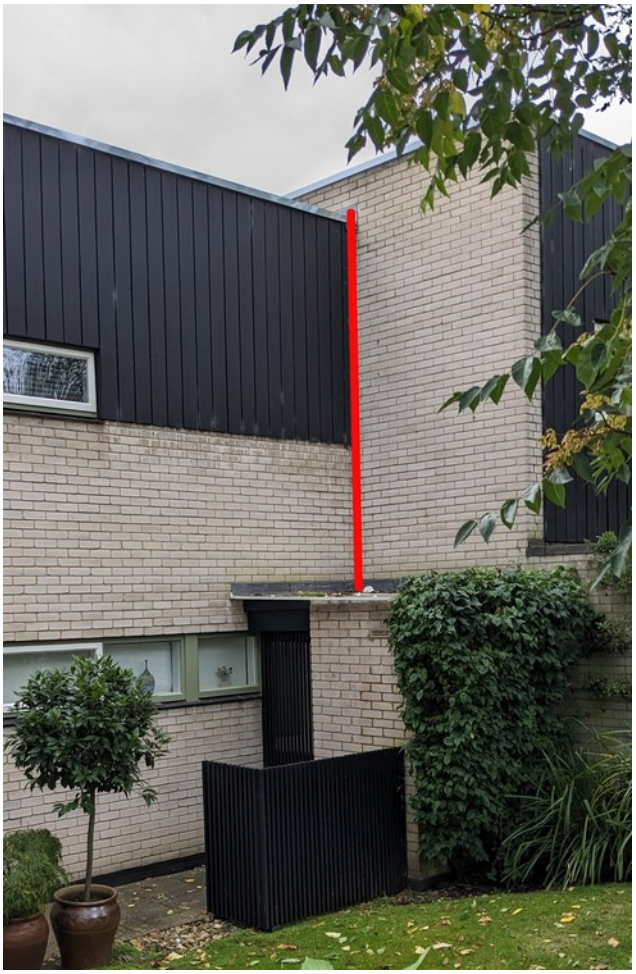
- Cables should be enclosed in conduit, which should be black or ‘Cedar Chase Green’ (British Standard 12 B 21) depending on where it is.
- Conduit should not run across an open expanse of brickwork: it must closely follow an existing feature.

Here are some photos showing a few possible cable routes. In each case there is one with the route in bright red and a copy showing what it might look like in practice.

This would be suitable for putting the inverter under the kitchen window, or for running a conduit behind the kitchen cupboards to the utility room.

This route is most useful for the house on the right as it goes straight down to the utility room

This is most useful for the house on the left

 This is most useful for the house on the left as it goes direct to the utility room	

Choice of contractor

The installer must hold a current MCS (Microgeneration Certificate Scheme) qualification. They should also be registered with appropriate competent person schemes for electrical and roofing work.

You are free to choose your own contractor provided they meet the requirements above and will follow this design document and any other conditions imposed by the Society. The Society will hold a list of contractors that residents have used successfully and will make this available on request.

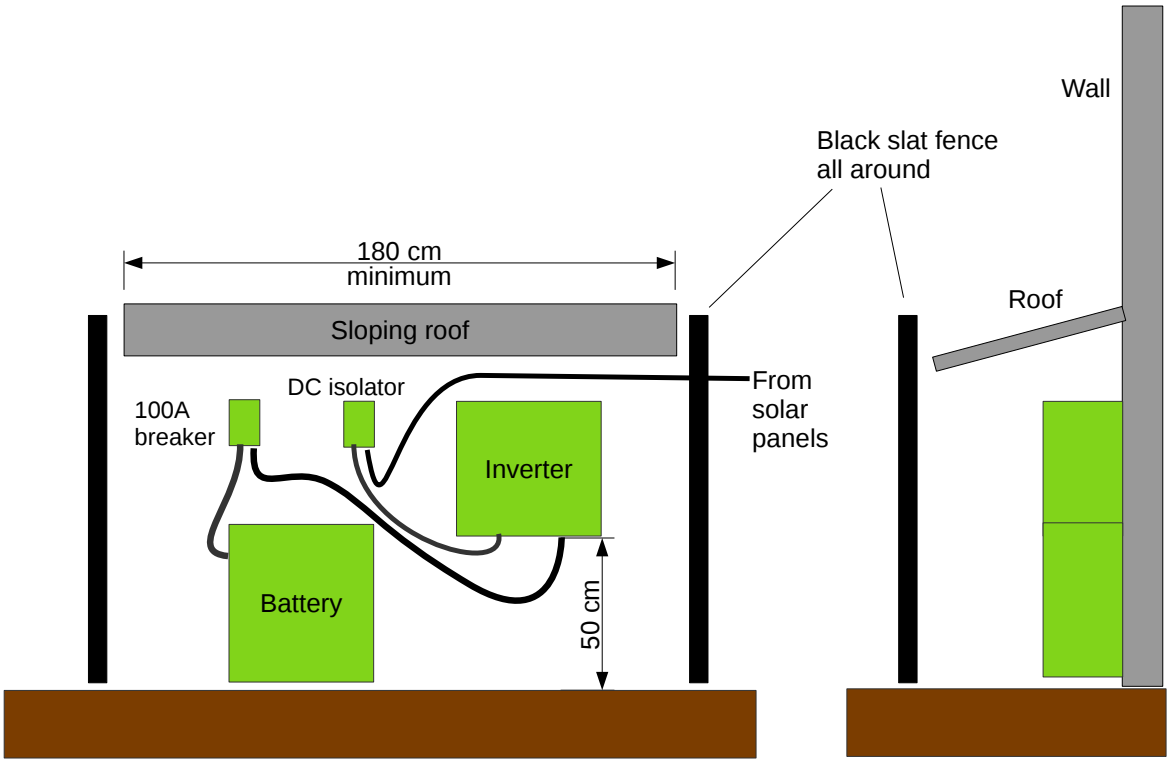
Maintenance

Householders should inspect the inverters and cables at least once per year in case of damage or overheating.

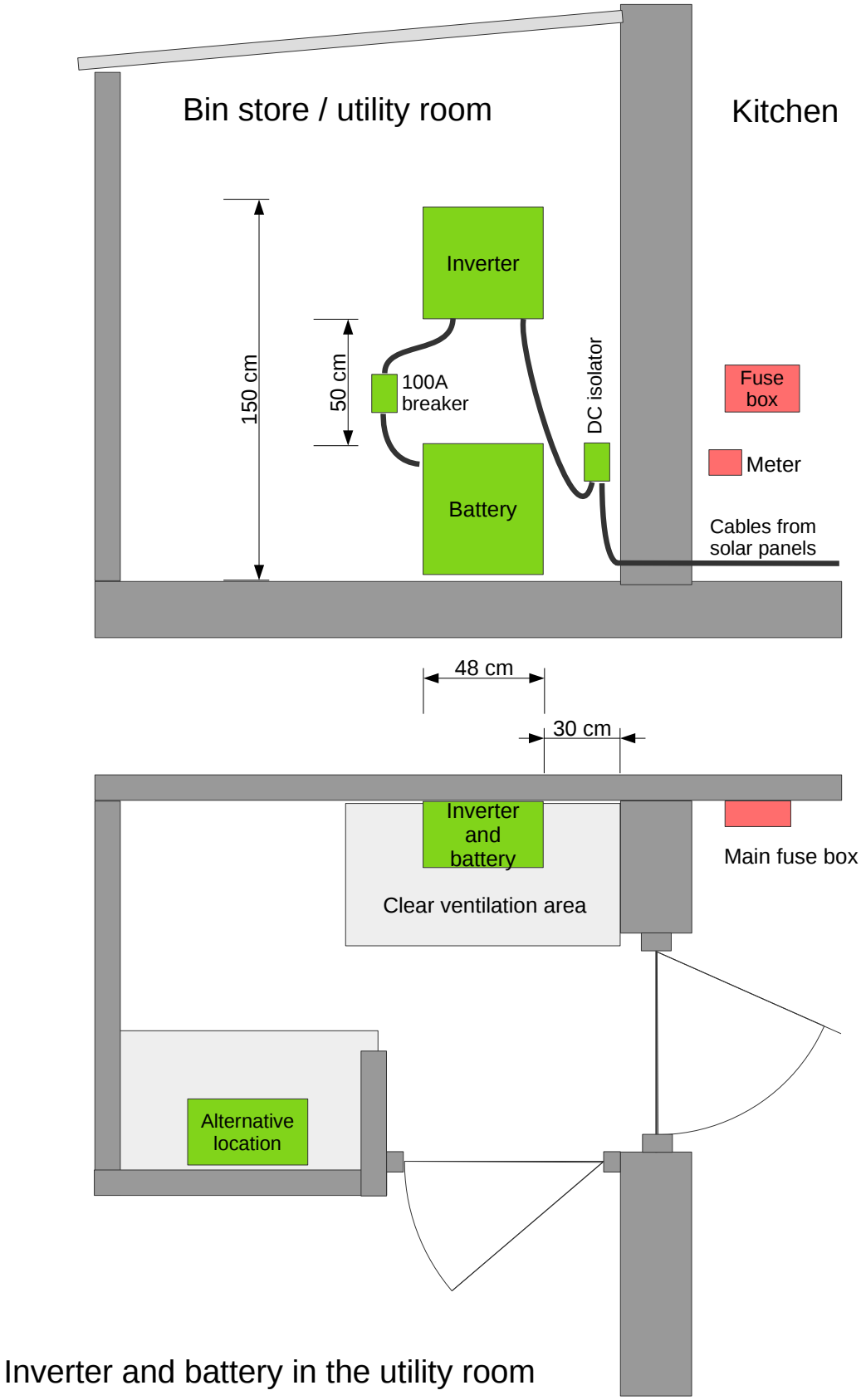
The whole installation should be inspected by a competent electrician every 5 years.

Drawings

Here are some ideas for mounting the inverter and battery:



Outdoor installation



Inverter and battery in the utility room