SOLARSTONE

Roof Installation Guide

INSTRUCTIONS AND TIPS FOR INSTALLATION OF SOLARSTONE INTERLOCKING MODULES
FOR NEW BUILD AND RE-ROOFING WITH 1800MM AND 1500MM MODULES

Roof Installation Guide

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1. Health and Safety

1.1 General Guidance

- Anyone handling photovoltaic (PV) modules should be trained in correct manual handling practice.
- Safe working at heights training should be adhered to.
- All appropriate Health and Safety regulations should be followed correctly.
- Avoid installing the system in poor weather conditions, including strong wind, rain, ice or snow.
- The tile courses should be laid according to manufacturer's guidelines and best practises in construction.
- Install all components as specified within this guide to ensure weather tightness.

1.2 Electrical Hazards

You must be aware of the following:

- PV modules are pre-wired with touch-proof connectors to prevent an electrical shock during general handling. PV modules produce a DC voltage whenever exposed to light. This voltage cannot be switched off.
- PV modules do not present a risk as long as appropriate safety practices are followed at all times during installation.
- All work must be carried out with the Solarstone system disconnected from the mains electrical supply.

1.3 Preparation for Installation

Follow the guidance below to ensure the Solarstone modules are installed and handled correctly:

- Use this installation guide alongside your system design guide and roof schematic to determine the location and layout of the Solarstone system on the roof.
- Ensure all cable connectors are dry and free of dirt before making connections.
- Ensure no cable ends are left exposed to the weather during work breaks or after completion of works. Keep the Solarstone modules in a weatherproof environment before installation.
- Carry the Solarstone modules with both hands by the frame, and avoid scratching the glass.
- Only load as many Solarstone modules onto the roof as you expect to install during the session.
- Secure or remove any uninstalled modules before leaving the roof to avoid possible wind damage.

- If possible, avoid walking on the glass surface of the Solarstone modules. The modules are robust and withstand the pressure, but sharp objects (small rocks) attached to installer's workwear (eg. shoes) may damage the glass.
- Do not leave tools or unsecured materials above the Solarstone installation area, to avoid potential damage to the modules. Check workwear prior to installation to avoid possible foreign object damaging the panels.

2. Components

2.1 Equipment Required

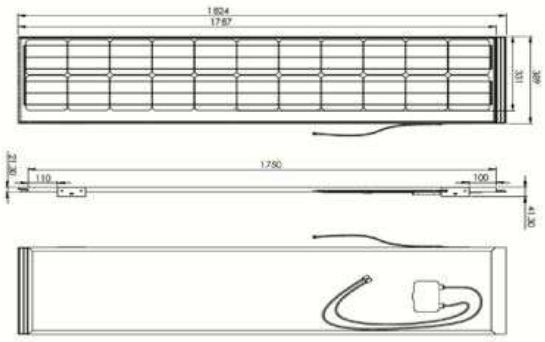
- Standard roofing tool kit.
- Solarstone specific tools:
  - Screwdriver with torx head.
  - String checker to check cable connections.

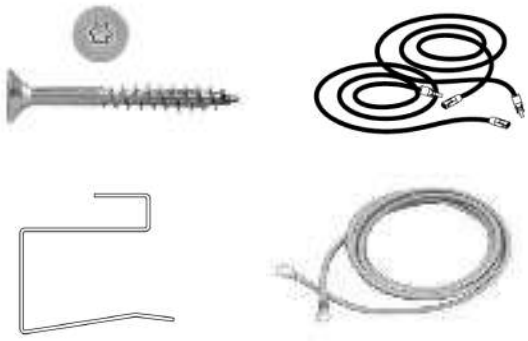
2.2 The Roof Accessories Box

When ordered as a complete system, the accessories box will contain the following components required for the on roof installation of the Solarstone modules.

Components included in the standard module pallet and accessories box :

- Solarstone modules (eg. 105W module = 6 Monier Tegalit tiles)
- Self-tapping torx screws 5x50 (2 per module)
- Mounting fittings (2 per module)
- Field cables (2 per string)
- Grounding wire





3. Pre-Installation Checks

Before you go on to the roof, check that:

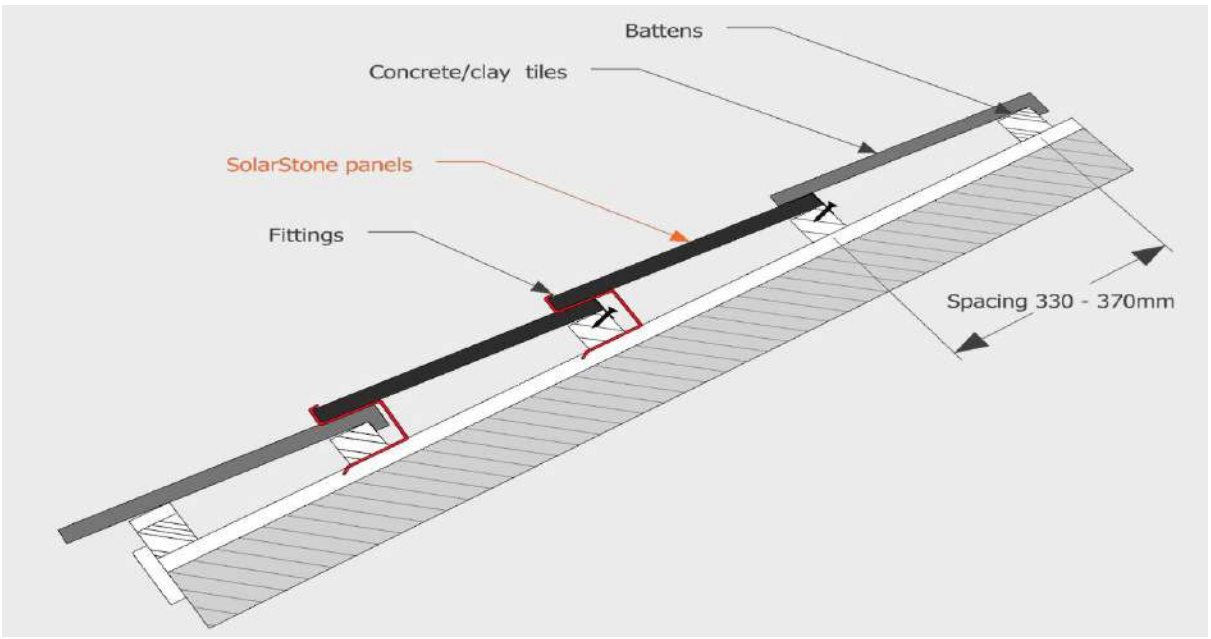
- Your roof tiles are compatible with the Solarstone modules. See the Solarstone datasheet, available at solarstone.ee for the up to date list of compatible tiles.
- Your accessories box contains the correct number of parts needed for your system size and layout.
- The Solarstone modules, particularly the glass surfaces, are undamaged.
- You have all the required tools including the string checker.
- All relevant site requirements have been checked and adhered to (including planning permission, building control or site rules).
- The Solarstone modules will be situated on a roof pitch facing south (between south east and south west). All other solutions must be treated as “custom installations” and clearly communicated with the Client.
- The Solarstone modules will be positioned in an unshaded location.
- You understand the roof schematic.
- You understand the string layout.

4. Roof Preparation

4.1 General Recommendations

A standard roof build-up is suitable for use with Solarstone modules, however we make the following recommendations:

- Use a breathable roofing membrane.
- Use 50mm x 50mm battens nailed to rafters. If other size battens are used, this must be communicated already in the design phase. This alters the modification of the fittings.
- Space the battens following the fixing specification for the conventional roof tiles (with a gauge no less than 330mm and no more than 370mm). Recommended spacing is **350mm** for best fit.
- For 'warm roofs' eaves to ridge ventilation (or equivalent) should be provided to ensure adequate air flow behind the Solarstone modules.
- The soffit and fascia boards should not be built airtight and gaps must be left between the wooden boards for additional airflow.



Side view. Solarstone modules and fittings

4.2 Marking the Area for the Solarstone System

To make sure the Solarstone system is installed in the correct position on the roof, you must mark the area out before you begin.

Refer to the data sheets and Architect's drawings to understand which layout to use and where the system will be located on the roof.

Basic Design Principles

- Determine the required space for installation. See product compatibility and data sheet as different tile manufacturers tiles match with different Solarstone products.
- Allow a minimum of one conventional tile between the edge Solarstone modules and the verge or equivalent obstruction.
- Allow at least one course of conventional tiles below the Solarstone area, and at least one course of conventional tiles above the Solarstone area
- Lay Solarstone modules either broken bond to match the fixing specification of the conventional tiles or in straight columns. (See Image 1 below).
- The system is central to the roof and not close to any vents.
- Good communication with System Designer, Roofer and Module Installer is essential for a successful completion.

Image 1. Broken Bond vs Straight Column design

When the layout and location of the Solarstone system has been identified, mark this area on the roof. Minium start distance from ridge/eaves = concrete tile course. At least 1 concrete tile width from each verge.

5. Module Installation

5.1 Laying the Bottom and Right Section of Roof Tiles

Lay the bottom courses of conventional roof tiles using standard practice from the eaves up to the area marked for the Solarstone system. Check the entire layout of the first row of tiles and do not yet cut the batten ends to size.

Before fixing the course of roof tiles below the marked area check the spacing. Each Solarstone module replaces 6 roof tiles (different Monier series flat tiles).

Install roof tiles to the right side of the Solarstone area as you would at a verge (i.e. using a whole tile or a half-size tile). This will ensure weather tightness and match the grain of the tiles below.

5.2 Fitting the First Solarstone Column

It is advised that the Solarstone modules are laid column by column. This allows the Solarstone cables to be connected and tested as you go.

Step 1. Lay the first row of panels to validate the design. There needs to be precise gap on the left verge for the finishing tile(s). Remove the panels from the first row once the test layout has been successful.

Step 2. Secure the first fittings (2 per panel) on top of the tiles ca 20 cm from the end of the panel. The lower section of the hook needs to “wrap” around the batten and the tile. Place the first module, which should begin on the lowest batten in the marked area and sit flush with the concrete tiles on the right.

Step 3. Fasten the first 5x50 screw on the left (when sitting on roof on top row) to the batten via metal plate attached onto the module.

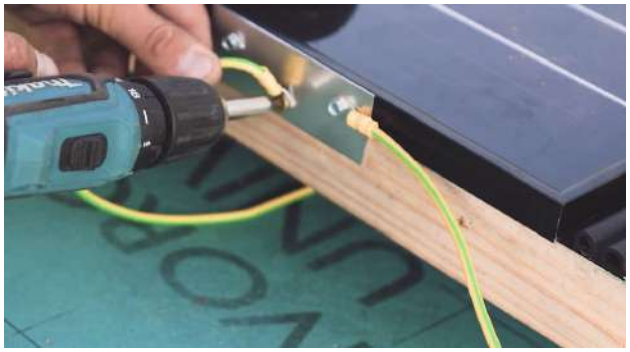
Step 4. Fasten the second 5x50 screw on the right by including the loop of the grounding wire attached on the panel below. Use chalk line to align the next panels in column and continue the same in completing the full column.

See next page for STEP by STEP instructions.

Step 1. Validate the full 1st row layout

Step 2. Place first panel and attach fittings

Step 3. Fasten screw on the left side



Step 4. Fasten screw on the right with grounding wire

5.3 Checking the Cables and Completion of the Roof installation

If all 4 previous steps have been completed move on to finalise the roof.

Step 5. Connect the first cable on Solarstone module with unconnected field cable. Use one end of field cable as extension for string testing purposes. Continue with the installation of next Solarstone panel. Ensure that there is no risk of the cables being trapped or damaged when the Solarstone module is fixed.

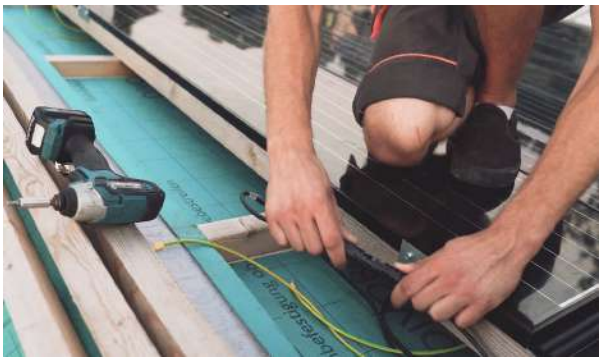
Step 6. Once the column is laid, check the Solarstone cables are loose. Pass one cable from first Solarstone panel under the batten above and firmly connect the cables to start a string. Start laying next column. Note that the gap between two adjacent interlocking Solarstone panels is maximum 1,5cm. Bigger gaps will eliminate the weatherproofing qualities on Solarstone system.

Step 7. Solarstone recommends that a string check is carried out for each column to check the cable connections. There are a maximum of 60 Solarstone panels in one string. Each string in an array should always have the same number of Solarstone modules. Uneven strings might cause the system to fail and invalidate the warranty. Check the inverter manual and validate the setup of MPP trackers to ensure maximum flexibility in system design. Cable protection tubes must be used for field cables that lead to the inverter.

Step 8. Lay down the remaining roof tiles (including ridge roll ventilation material and cap tiles) to complete the perimeter. On completion the Electrician shall finalize the works with the inverter.

Step 5. Connect the field cable with first panel

Step 6. Connect the panels to the top of the column



Step 7. Complete string testing, connect last field cable and grounding wire.

Step 8. Complete the roof space with tiles in perimeter