HolaRoof

Safety and Installation Manual

Hybrid Solar Roof System

Patent application number: FI 20253755

Table of Contents

1 GENERAL INFORMATION

The HolaRoof® system is a universal in-roof photovoltaic mounting solution designed to integrate standard framed PV modules into a fully watertight, mechanically stable roofing structure. The system replaces traditional roofing materials in new buildings or can be installed as a retrofit layer on existing roofs.

HolaRoof is built around a patented metal batten and fastening system that supports PV modules without the need for special or proprietary panels. Its modular design allows compatibility with various PV module types and manufacturers, provided that each module is approved for in-roof installation.

The core of the system consists of:

- Metal battens (provide load transfer, ventilation, and integrated cable protection)
- Clamps and accessories
- Flashing components
- Filler panels

The system is compliant with EU construction and electrical standards (EN 50583, EN 13501-5, Eurocode EN 1991) and designed to achieve BROOF(t1) fire classification and structural stability for slopes from 10° to 90°.

HolaRoof can be used for:

- New roof installations on residential and commercial buildings,
- Retrofit applications (overlay systems),
- Carports, pergolas, and vertical façades.

Disclaimer of Liability

The information contained herein is for technical reference only and does not replace site-specific structural design or compliance with local building regulations. All work must comply with applicable construction codes, Eurocode EN 1991–1999, local electrical safety rules, and CE/DoP conformity requirements.

During installation, the specific installation manual and safety instructions of each PV panel manufacturer must always be followed. Installation of the HolaRoof system shall be performed only by qualified personnel trained in roofing safety, mechanical fixing, and photovoltaic wiring. Holaroof S.L. accepts no liability for damage, injury, or loss resulting from incorrect installation, modification of components, or deviation from the instructions provided in this manual. All mechanical and electrical connections must be inspected prior to commissioning.

Failure to follow these instructions may invalidate the HolaRoof warranty. For technical assistance, documentation, or component compatibility support, please contact: support@holaroof.com

Intellectual Property Notice

HolaRoof® is a registered trademark of Holaroof S.L. Use of the name or visual identity (incl. logo) requires written consent. The HolaRoof system, including its metal batten structure, fastening logic, and integrated waterproofing details, is a patented product protected under European and international intellectual property law (Patent application no. FI 20253755).

All product designs, drawings, and documentation are the exclusive property of Holaroof S.L. Unauthorized reproduction, modification, or use is prohibited. The system may only be used with original or approved components; unauthorized use voids warranties and may result in non-compliance with CE and DoP requirements.

Fire Safety Performance

HolaRoof is built entirely from non-combustible metal components, including all battens, flashings, filler panels and edge details. No plastic trays, composite housings or combustible sub-elements are used anywhere within the system assembly. **This design provides the highest level of inherent fire safety achievable** in BIPV roofing systems, as it minimises ignition risk and eliminates flame-spread pathways commonly associated with polymer-based in-roof systems.

❖ HolaRoof and BROOF(t1) Compatibility

The system is designed to work with PV modules that are certified to BROOF(t1) according to EN 13501-5. HolaRoof's metal-to-metal construction supports the fire behaviour expected of BROOF-class assemblies; however, the BROOF classification always applies to the PV module + roof system as tested, not to individual components. Therefore, **HolaRoof may be described as: "Compatible with PV modules certified to BROOF(t1), and engineered to support BROOF-class fire performance due to its fully non-combustible metal construction."**

❖ Fire-Safety Advantages of HolaRoof

HolaRoof provides the best fire safety that BIPV systems can offer due to its all-metal construction and controlled cable routing. HolaRoof eliminates the main fire-risk mechanisms:

- ➔ No combustible mounting trays, adapters or tile-replacements
- ➔ No polymer interfaces beneath or around the PV modules
- ➔ No contact between DC cables and timber or underlay (cables run inside metal channels)
- ➔ Fully enclosed metallic flashings around every structural node
- ➔ No air cavities where flames or hot gases could propagate
- ➔ No melting, dripping or heat-softening materials under fault conditions

❖ Cable Management – Fire Prevention by Design

All DC wiring runs inside internal metal cable channels, preventing contact with timber structure, roof underlay, insulation, and filler panel surfaces. This greatly reduces the risk of arc-fault ignition and meets the mechanical protection requirements of IEC 62548 and EN 50583.

Component List (Mounting Kit, Flashings & Accessories)

PV Modules & Filler Panels

Active solar (PV) module

Filler panel 1/2 – Visual filler panel

Cable & Flashing Components

Cable duct 1.2 m (DC cable channel)

Vertical flashing (Vertical seam cover)

Horizontal flashing 1.8 m

Clamps & Battens

Panel mounting clamp

Metal batten 1.8 m

Ridge Components

Ridge flashing 1.2 m

Ridge support rail 1.8 m

Hip Components

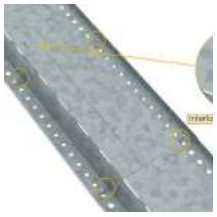
Hip flashing 1.2 m

Hip support rail 1 8 m

Hip sealing roll 5 m

Valley Components

Valley left flashing 1.2 m



Valley support flashing

Central valley flashing 1.8 m

Valley foam seal 1 m

Eave & Verge / Edge Components

Eave flashing 1.8 m

Edge / Verge flashing

Fixings & Fasteners

Clamp screw 6.3 × 25 mm – Self-drilling screw for panel clamps, carbon-steel coated

Batten screw 6 × 100 mm – Structural wood screw for fixing metal battens to rafters

Roofing screw 4.8 × 25 mm (EPDM) – Fastener for flashings and perimeter components

Grounding bolt M8 – Stainless-steel grounding bolt for batten grounding connection

Grounding screw M4/M5 – Stainless-steel screw for panel grounding lug

Cable clips / cable ties – UV-resistant cable management accessories for internal ducts

Necessary tools

Underlayment and Marking Out Tools

Cordless drill / impact driver

Nut driver bits (8 mm & 10 mm)

Screw bit set (Torx + Hex)

Circular metal saw

Roofing blade or utility knife

Tacker or stapler

Sheet metal scissors

Measuring tape

Electrical Tools

Digital multimeter and insulation tester

Clamp meter

MC4 solar PV cable crimping tool kit with stripper, cutter, spanner

Chalk line tools

Safety & Protective Equipment

We advise you to protect yourself with appropriate personal protective equipment (PPE) at all times and to follow all safety precautions described in this manual and required by local regulations. It is mandatory to use a safety harness, helmet, gloves, safety glasses, and other relevant protective gear during installation work at height or when handling metal components.

General roof safety harnesses

Safety glasses

Gloves

Safety shoes

Other personal protective equipment

WARNING!
Holaroof S.L. will not be held responsible for any injury, damage, or health concerns arising from failure to comply with safety procedures or from misuse of the system.

2 ROOF PREPARATION & PLANNING

2.1 Structural Analysis & Load Check

Before installing the HolaRoof system, the existing or planned roof structure must be evaluated to ensure it can safely support the additional loads from the metal battens, mounting components, and photovoltaic modules.

Elements to Verify

- Rafter spacing, height, and load-bearing capacity in accordance with Eurocode EN 1991-1-1 and EN 1991-1-3
- Roof slope and geometry, ensuring a minimum slope of 10° and a straight, properly aligned surface
- Underlayment and decking fixings capable of resisting static and dynamic loads
- Batten fixings using 6×100 mm A2 stainless steel screws, with sufficient embedment and no overstressed connections
- Wind and snow loads based on regional values per EN 1991-1-4 (wind) and EN 1991-1-3 (snow); adjust batten spacing or add support if required
- Vibration and deflection limits for light steel or timber roofs (recommended ≤ L/300)

Weight Category and Considerations

The total weight of the HolaRoof mounting hardware is approximately 3.5 kg/m², plus an average PV module weight of 10 kg/m², giving a **combined system load of roughly 13.5 kg/m².** This places the HolaRoof system within the same weight category as standard on-roof solar installations, and structural calculations should treat it as an equivalent static load.

2.2 Underlayment & Waterproofing Layer

The underlayment serves as a secondary waterproofing layer beneath the HolaRoof system, protecting the roof structure from incidental water, condensation, or wind-driven rain. Although the HolaRoof battens and panels form a watertight surface, the underlayment ensures backup protection in extreme weather conditions or in low-slope designs.

Requirements & Recommendations

The HolaRoof system has been **successfully tested at 10°,** but roofs with a 10-15° slope require a fully watertight underlayment (SBS, TPO, or PVC) with welded or sealed joints. From 15° and above, all breathable or water-draining membranes are suitable, provided they have a heat resistance of at least 120 °C and can effectively drain water at that slope.

- For 10–15° roofs or applications use fully watertight underlay (SBS/TPO/PVC).
- For slopes ≥15° use breathable W1-class underlay (e.g. Riwega, Isola Iso-D).

- Some underlayment products require taping of fixing points or manufacturer-specific sealing systems to prevent moisture ingress through screw holes.
- When HolaRoof is installed on top of an existing roofing material (e.g. metal, tile, or bitumen roofs), no underlayment is required. In this configuration, HolaRoof functions as a "roof-over-roof" system, acting as a fully independent watertight roofing layer.
- For carports or open structures with exposed sides, an underlayment is not required. In these cases, HolaRoof serves as a self-contained waterproof roofing system.
- A minimum 50 mm ventilation gap must be maintained between the underlayment and the metal batten structure to ensure proper airflow and drying of condensation. The underlayment may be fixed using:
  - timber counter-battens of at least 50 mm height, or
  - metal profiles of at least 50 mm height.
  - Battens or profiles must be aligned parallel to the slope and securely fixed to prevent membrane movement.
- Install horizontally from eaves upward with a minimum overlap of 100 mm (150 mm at valleys and ridges). Mechanically fix below battens.

CHECKLIST

- ☑ Complies with EN 13859-1 (W1 class)
- ☑ Heat resistance ≥ 120 °C
- ☑ Fully watertight for 10–15° roofs
- ☑ Overlap 100–150 mm
- ☑ Minimum 50 mm ventilation gap
- ☑ Fixed with timber battens or ≥ 50 mm metal profiles
- ☑ Fixings sealed or taped per manufacturer's guidance
- ☑ No underlayment required for existing roofs or open carports

2.3 Roof Geometry, Diagonals & Slope

For optimal installation, the HolaRoof system should be mounted on a roof that is as rectangular and symmetrical as possible, with equal distances between eaves and ridge on both sides. This ensures fast installation, consistent panel alignment, and a clean visual appearance.

❖ New Roofs (During Construction)

For new roofs, it is recommended to:

- ensure the roof is rectangular;
- keep equal eave-to-ridge dimensions on both sides;
- maintain equal slope and length for both roof planes.

A rectangular, symmetrical roof simplifies layout planning and minimizes the need for Filler panels.

❖ Existing Roofs & Irregular Shapes

Many existing roofs are not perfectly rectangular and may have irregular or uneven sides. There is no need to rebuild the roof; the HolaRoof system adapts to non-rectangular geometries. Enter the actual roof perimeter dimensions into the HolaRoof Partner Portal Roof Design Tool, which will:

- ➔ generate the batten and panel layout for irregular roof shapes;
- ➔ show the required Filler panel zones along the perimeter;
- ➔ and visualize any non-parallel edges or custom cut requirements.

❖ Filler Panels on Irregular Roofs

For roofs that are out of rectangular or have non-parallel sides, Filler panels must be installed along the entire perimeter.

- ➔ These panels are custom-cut to follow the actual roof geometry.
- ➔ Cut edges must be protected and sealed according to the Filler Panel Cutting instructions (see Section 5.3).
- ➔ The Partner Portal tool provides precise drawings of Filler panel cuts and placements.

2.4 Roof Planning & Batten Layout Design

Accurate planning of battens and PV module layout ensures fast installation and long-term serviceability of the HolaRoof system. For best results, it is **recommended to use the HolaRoof Partner Portal Design Tool.**

❖ Planning Using the HolaRoof Design Tool

1. Enter the roof dimensions and the selected PV module model into the Roof Design Tool in the Partner Portal.
2. The software automatically calculates the most optimal batten spacing and panel distribution according to the roof geometry.
3. The tool also defines Filler panel zones and provides a scaled installation layout.

❖ Manual Planning (Without the Online Tool)

If the Design Tool is not used, the batten spacing can be determined manually as follows:

1. Define the roof area where PV modules will be installed.
2. The batten spacing in this zone must be equal to the shorter side of the PV module + 15 mm.
    a. Example: For a module height of 1 140 mm, the batten spacing should be 1 155 mm.
    b. The extra 15 mm ensures that any panel can be removed later if replacement is needed - The panel moves upward by 15 mm and clears the clamp profile safely.

❖ Filler Panel Zones

In areas where the batten spacing or roof shape does not allow full-size module installation, Filler panels must be used.

- Filler panels are cut to follow the roof perimeter shape.
- Maintain a 15 mm gap between the top edge of the batten and the Filler panel to allow for thermal movement and removal clearance.
- Cut edges of Filler panels must be sealed and protected as described in Section 5.3 Filler Panel Cutting.

RECOMMENDATIONS

1. Always use the HolaRoof Design Tool to calculate accurate batten spacing and layout.
2. When planning manually, use batten spacing = module height + 15 mm.
3. Maintain a 15 mm gap between Filler panels and batten profiles.

2.5 Wind & Snow Load Requirements (EN 1991-1-3 / EN 1991-1-4)

The HolaRoof system must be installed on a roof structure capable of safely resisting the design wind uplift and snow loads defined by Eurocode EN 1991. Before installation, the installer must verify the project's wind zone, altitude, snow load region, terrain category, and roof geometry, as these factors directly influence the required fixing density and structural reinforcement.

Wind Load Requirements (EN 1991-1-4)

- Identify the local wind zone and basic wind velocity.
- Account for increased uplift in edge, corner, and ridge zones.
- Verify screw pull-out resistance and rafter strength.
- Reinforce battens or add fixings in exposed locations.
- Ensure battens are continuous and fixed through all pre-punched holes.

Snow Load Requirements (EN 1991-1-3)

- Determine the characteristic ground snow load (Sk) based on site altitude and regional maps.
- Apply appropriate shape coefficients (μi) for pitched roofs.
- Account for snow drift in valleys, against ridges, and at lower or discontinuous roof zones.
- Verify that filler panels, flashings, and battens withstand worst-case accumulation.
- Increase support or reduce batten spacing where required by local snow loads

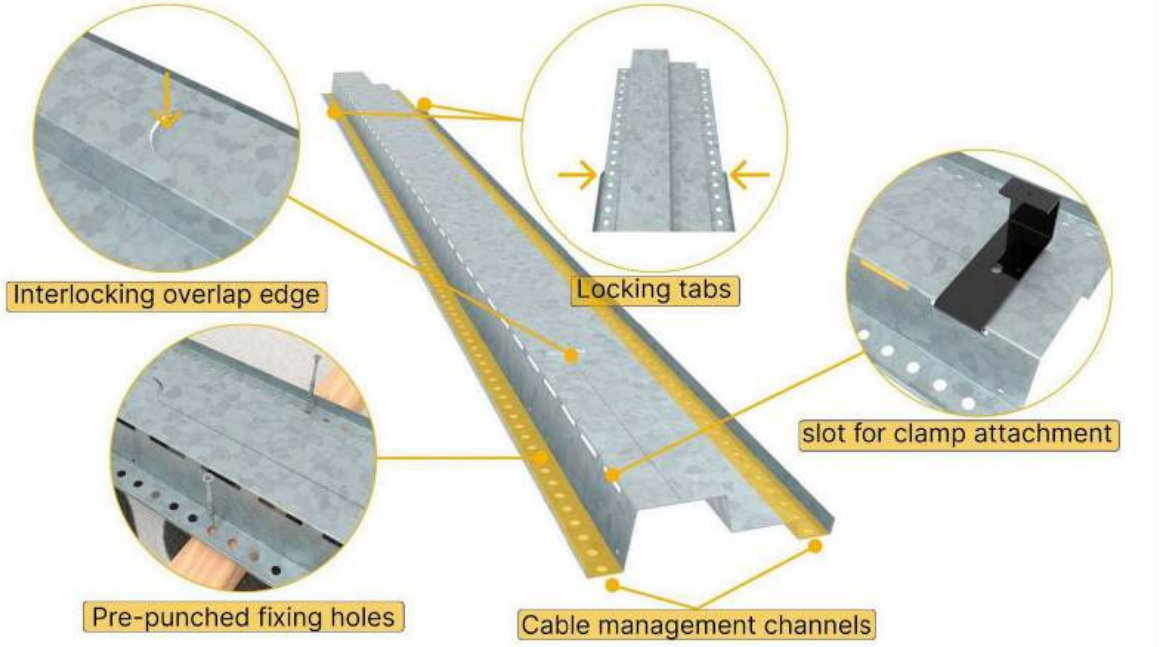
WIND & SNOW LOAD CHECKLIST

- ☑ Local wind zone identified (EN 1991-1-4)
- ☑ Local snow load region identified (EN 1991-1-3)
- ☑ Rafter spacing and structural capacity verified
- ☑ Batten spacing appropriate for local snow loads
- ☑ Screw pull-out resistance meets uplift requirements
- ☑ Edge, corner, ridge zones reinforced where necessary
- ☑ Valleys checked for drift-induced loading
- ☑ No expected deformation under maximum snow load
- ☑ Roof geometry measured and validated

3 METAL BATTEN SYSTEM INSTALLATION

3.1 Batten Functions

The HolaRoof metal batten acts simultaneously as a structural carrier, mounting platform, and cable management channel. It is made of galvanized or AluZinc steel (0.7–1.0 mm thick) and designed to be compact for transport, quick to assemble, and precisely aligned on site.



Main Features and Functions

Interlocking overlap edge:

- Each batten is produced in 2-meter sections to allow transport within a standard van together with PV panel packages.
- On site, battens are joined end-to-end using an interlocking overlap edge that slides securely into the next section.
- This creates a continuous, straight, and self-aligning batten line, eliminating the need for special transport or extra-long profiles.
- The extended batten remains structurally straight throughout its length, ensuring precise alignment during installation.

Locking tabs:

- Side locking tabs enable quick mechanical joining and pre-fixation of two battens before final screw fastening.
- This allows easy one-person handling and keeps the battens in position during assembly.

Pre-punched fixing holes:

- All battens include factory pre-punched fixing holes for accurate and time-efficient installation.

- ➔ No drilling is required on site, and the spacing of fixing points is pre-defined for structural safety.
- ➔ Recommended fixing screws: A2 stainless 6×100 mm or as specified in the project.

Slot for clamp attachment:

- ➔ The top surface includes precision clamp slots that hold the clamp firmly in place during installation.
- ➔ The clamp locks symmetrically on both sides of the batten, ensuring consistent pull-out strength and uniform fixation quality across all points.

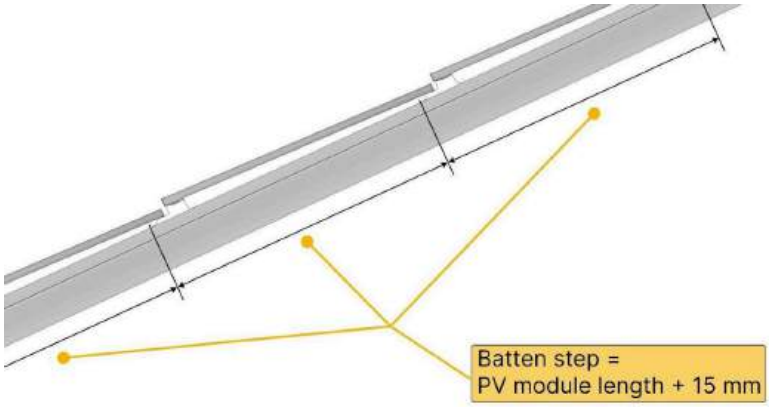
Cable management channels:

- ➔ Both edges of the batten include return folds that act as integrated cable management channels, allowing DC cables and connectors to be securely fixed to the metal structure.
- ➔ This prevents contact with combustible materials (such as timber), improving fire safety and compliance with IEC 62548 and EN 50583-2 standards.
- ➔ Cables should be fixed to the metal batten using cable clips or other manufacturer-approved fixings.

3.2 Batten Step Calculation Method

HolaRoof modules are installed in landscape orientation only. Therefore, the batten step (vertical distance between battens) is determined by the short side of the PV module (the panel height).

Formula: Batten step = PV module short side (height) + 15 mm



Rules

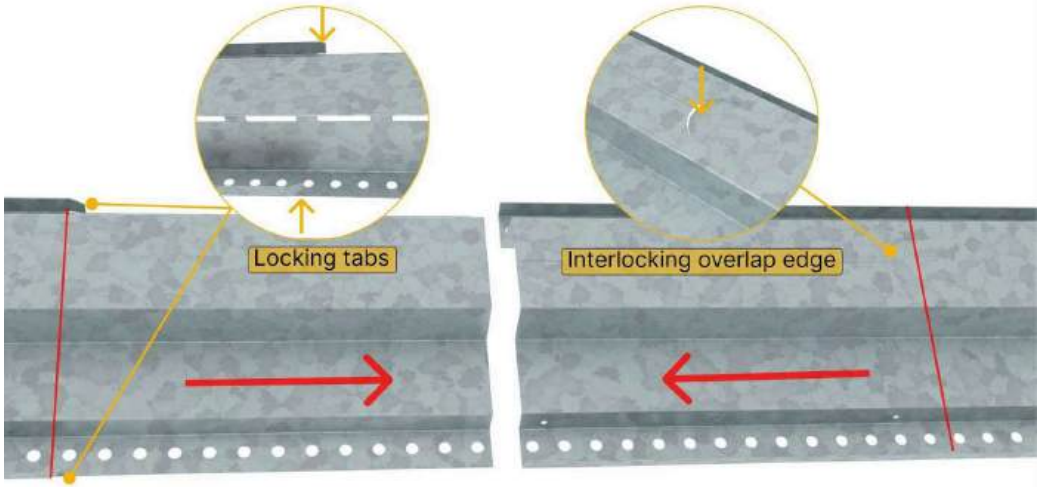
1. The minimum allowed step is module short side + 15 mm.
2. Ideal tolerance variation is ≤ 5 mm, but the spacing must not go below the minimum. In practice: the acceptable range is minimum … minimum + 5 mm.
3. Practical note: The starter batten defines the field. If the minimum step cannot be maintained near roof edges or obstacles, use Filler panels to adjust the layout.

3.3 Batten Extension / Splicing

Battens are supplied in standard 2 m lengths to simplify transport and handling. For longer roofs, battens must be connected to form continuous straight lines with full mechanical integrity.

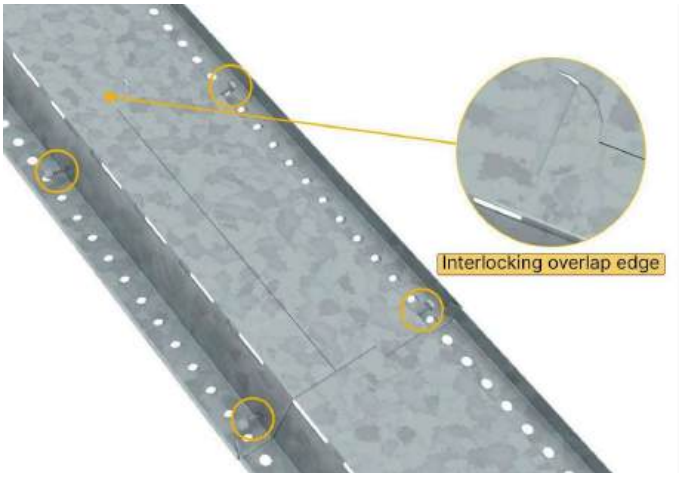
❖ Connection Method

Join battens using the locking tabs and interlocking overlap edge. Ensure that the locking tabs and overlap edges are fully aligned and tightly fitted against each other. This creates a straight and rigid joint that maintains alignment across the roof.



❖ Fixing

Make sure all pre-punched fixing holes at the joint are used and that screws are properly tightened. Screws must be fully fastened to prevent movement and ensure structural strength, even if the joint lies between two rafters. The joint does not need to align directly over a rafter – mid-span joints are acceptable when all screws are correctly installed. Additional screws may be used for reinforcement if necessary.



❖ Visual Check

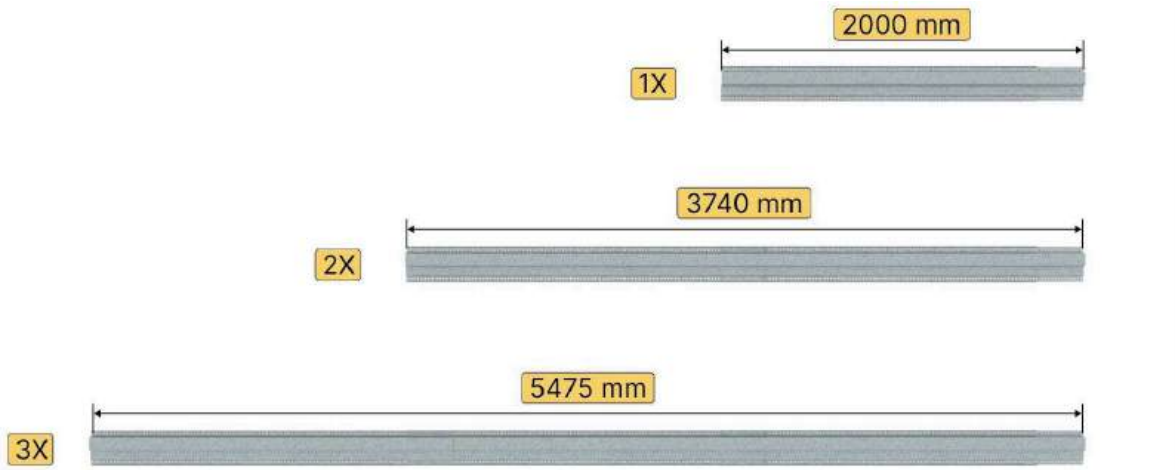
Confirm that the battens are straight and the locking mechanisms fully engaged. If any misalignment or gaps occur, correct the joint before installing the next section.

CHECKLIST

- ☑ Locking tabs and overlap edges fully connected.
- ☑ All pre-punched holes used and screws tightened.
- ☑ Joints may be located between rafters.
- ☑ Batten lines remain straight and rigid.

❖ Pre-Assembly on Ground

Pre-assembling battens on the ground speeds up installation and ensures straight alignment once lifted onto the roof.



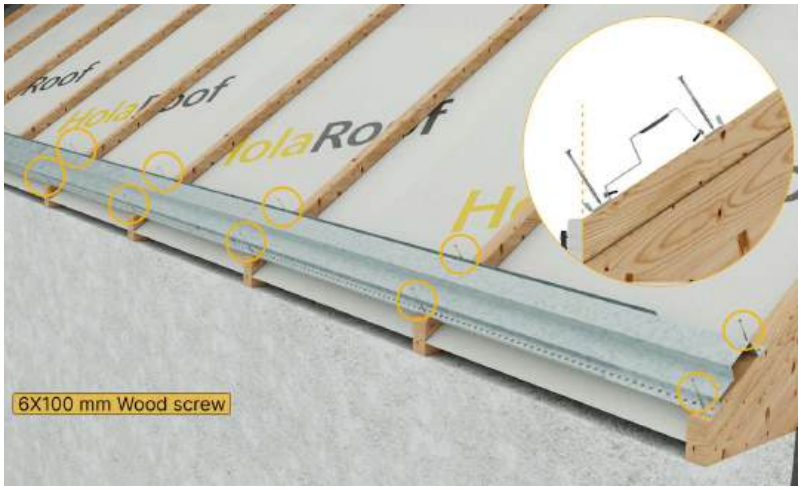
❖ Installation Recommendations

- ➔ Battens are supplied in 2 m nominal lengths, but the effective working length is approx. 1.75 m, as each overlap joint consumes around 250 mm.
- ➔ It is recommended to join 2 - 3 battens together before lifting, giving a working length of approximately 3.740 - 5.475 m.
- ➔ This ensures straight alignment and prevents bending or twisting during installation.
- ➔ Sections longer than 3 battens should not be lifted by one person – they may deflect if handled from one end.
- ➔ For longer sections, use two-person lifting or provide support every 3 m.
- ➔ Before lifting, verify that all locking tabs and interlocking overlaps are properly secured and aligned.

3.4 Batten Installation

3.4.1 Starter Batten Installation

Use two screws per rafter for each batten fixing point. Because the batten profile is wide, it must be fixed from both sides to ensure full contact and prevent twisting during installation.



ALIGNMENT DISCLAIMER

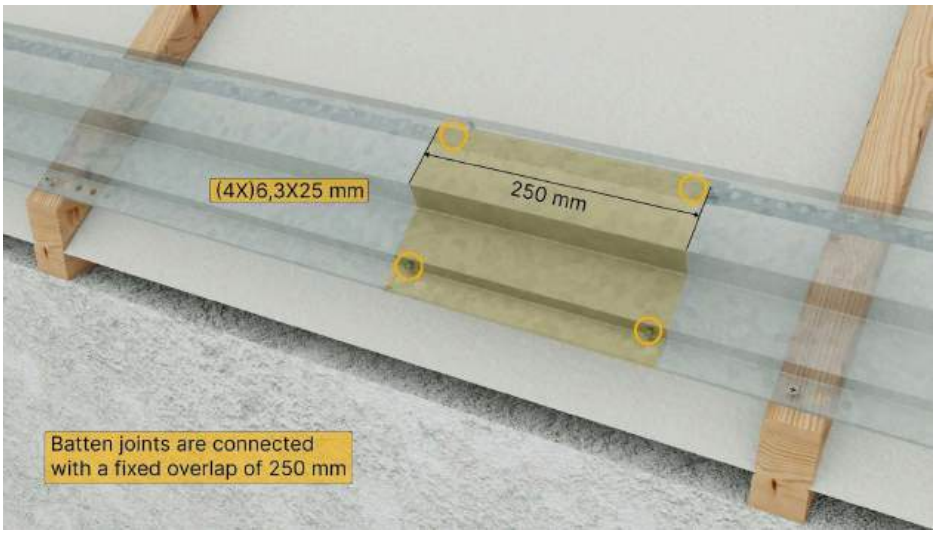
Always install the first (starter) batten flush with the eave cut line. This ensures that the panel field aligns correctly with the roof edge and that the eave flashings will fit properly. The dotted line shown in the illustration indicates the correct alignment position at the eave edge.

3.4.2 Continuing Battens Installation

After the starter batten has been fixed, the next battens are installed in sequence across the roof surface. Measure the batten step according to the PV module width + 15 mm tolerance and mark the next batten line.

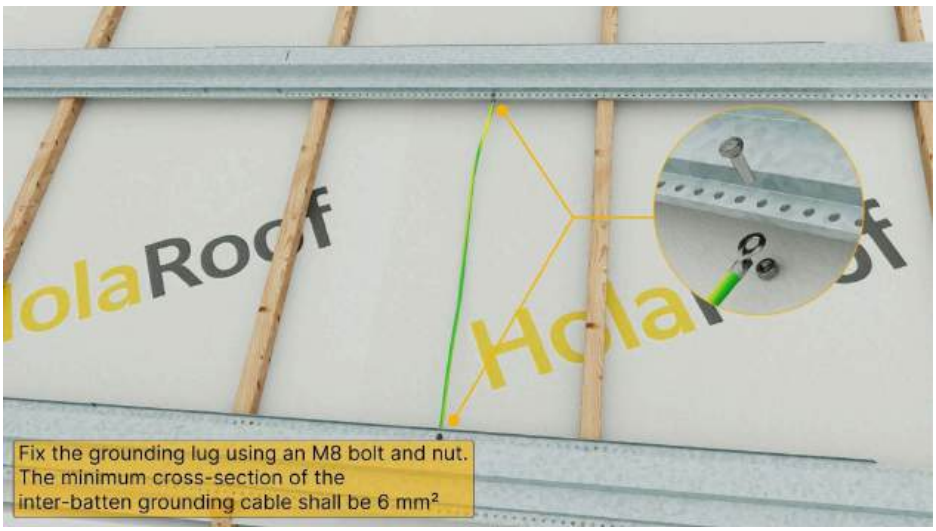
Ensure that each batten is parallel to the previous one and aligned accurately along the entire slope.

The batten joint may also be positioned between two rafters. When all screws are properly installed and the splice is fully secured, the connection is structurally strong and will not deflect or deform under normal walking load during installation.



3.5 Batten Grounding

Connect the grounding lug to each batten using an M8 bolt and nut. The minimum cross-section of the inter-batten grounding cable shall be 6 mm², and the cable must be attached to the metal batten with direct metallic contact (paint or coating must be removed at the contact point).



For extended batten lines consisting of multiple sections, ensure continuous electrical conductivity between sections using grounding straps or cables along the entire length.

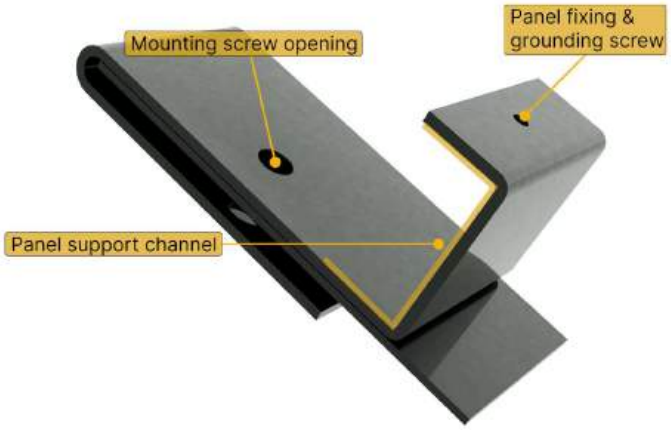
4 PV MODULE INSTALLATION & FLASHINGS

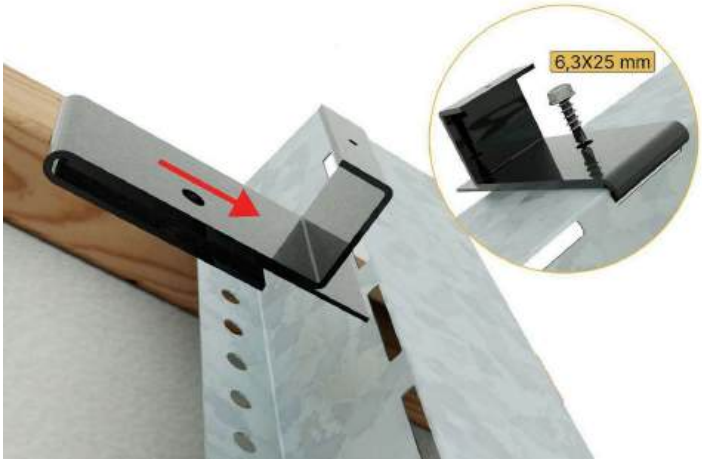
4.1 Clamp Installation

HolaRoof Clamp

The HolaRoof clamp is used for starter, regular, and filler panels, with one clamp type across the entire roof to simplify installation and reduce errors. **Each module is fixed with three clamps, meeting IEC 61215 requirements and wind and snow load standards (EN 1991-1-4 / EN 1991-1-3).**

The clamp ensures consistent fastening force in all positions and includes a grounding screw hole. Made of stainless steel (A2/A4), it works with the metal batten as an integrated grounding path, ensuring reliable electrical continuity and safety.

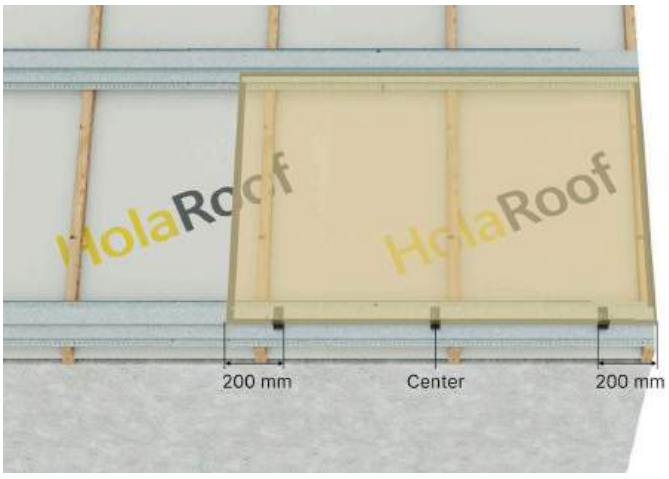




Clamp Fixing

Each clamp is fastened with **one screw per clamp.** The clamp design ensures that, when tightened, it automatically locks securely on both sides of the batten, providing a stable and uniform connection. This geometry guarantees proper clamping pressure, prevents rotation, and ensures long-term mechanical reliability under wind and snow loads.

Place three clamps per module; two outer clamps approximately 200 mm from each edge and one centered in the middle of the panel. This spacing provides even load distribution and secure fixation.



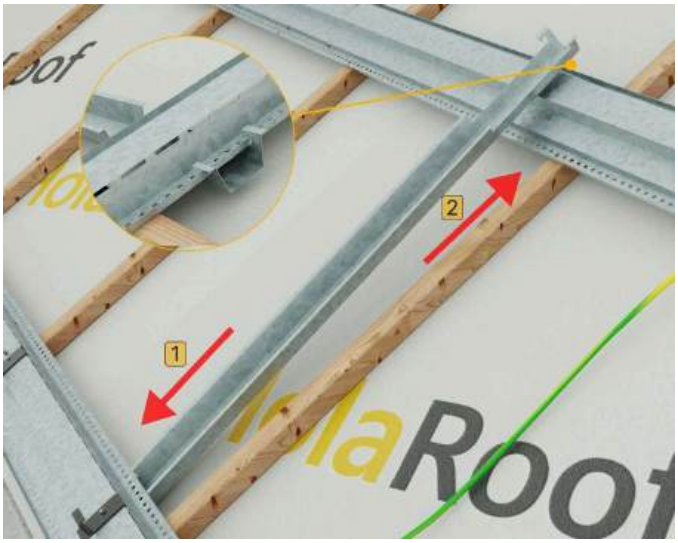
Clamps positioned 200 mm from edges and one in center for balanced support.

4.2 Cable Management Flashing Installation

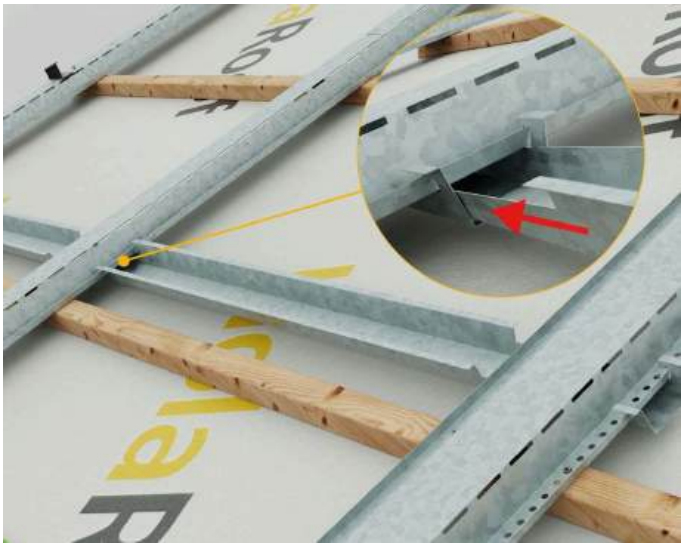
Installation Options for Cable Management Flashings

Cable management flashings may be installed either before module installation, requiring pre-planning and marking of junction box locations; or progressively during module mounting, which often saves time as positions are defined automatically. Both methods are acceptable and depend on installer preference.

Install the flashings between battens as shown. Insert the first flashing under the batten and slide it into position. The interlocking connection keeps the cable path sealed and mechanically stable along the entire row. Ensure all DC cables are routed inside the metal channel, fully protected from UV radiation and isolated from wooden or combustible materials.



Cable management flashing inserted beneath the batten and slid into position.



DC cables routed inside the metal channel, isolated from timber.

4.3 PV Module Installation Methods

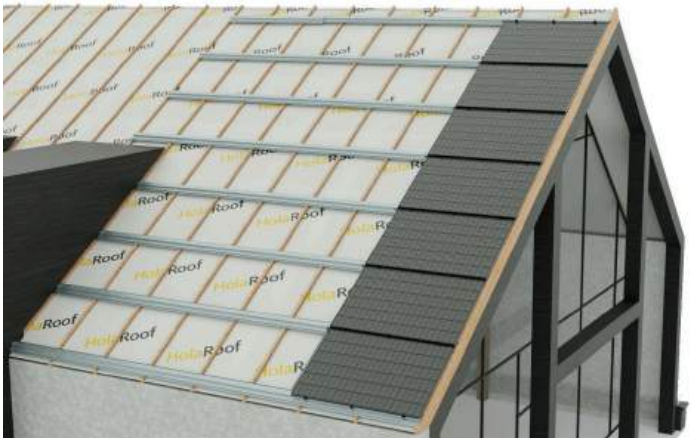
HolaRoof modules are installed in landscape orientation and can be arranged **either by columns** (from eave to ridge) **or by rows** (from one side of the roof to the other).

Both methods achieve the same watertight and structural performance. The choice depends mainly on the cable layout and connector positioning defined during the design phase.

Before installation, it is recommended to check the length and position of factory-fitted MC4 connectors to minimize the use of extension cables between rows and columns. A balanced cable plan ensures clean routing inside the cable management channels and reduces installation time on site.

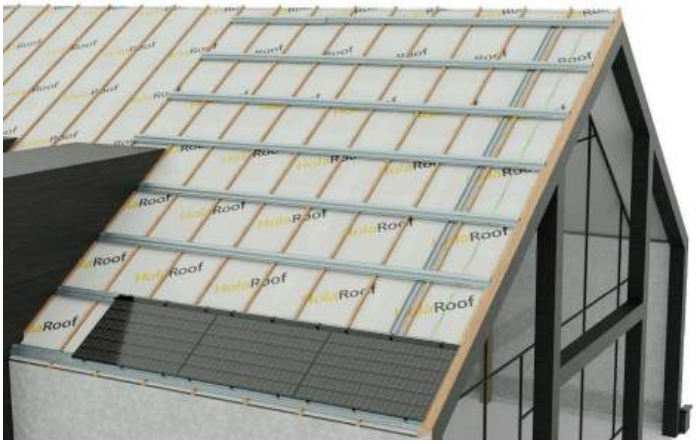
❖ Version 1 – Column Installation

Modules are installed vertically one above another, forming continuous columns from the eave up to the ridge. This method simplifies vertical cable routing and is optimal when string inverters are positioned near the ridge or attic area.



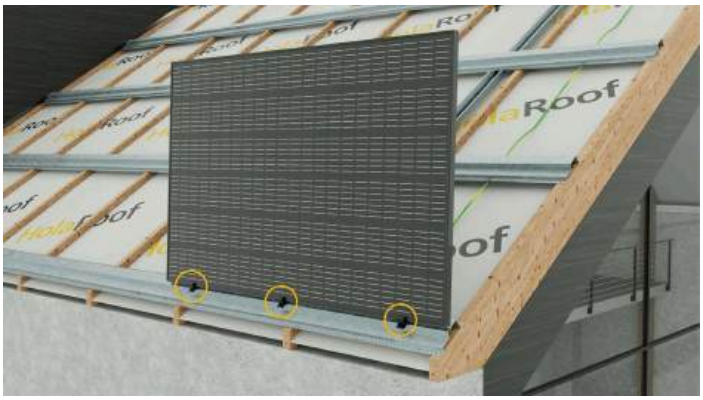
❖ Version 2 – Row Installation

Modules are installed horizontally side by side, forming complete rows from one gable to the opposite side. This configuration allows easier access during installation and is ideal when junction boxes or inverters are located near the eave.



4.4 Solar Module Installation

Place the lower edge of the solar module into the clamps so that it rests firmly on both outer and the center clamp. Ensure that the clamps are positioned according to the required spacing (200mm from each edge and one in the center).



The vertical flashing ensures that the vertical joints between panels remain watertight. It functions on a simple gutter principle, directing any water away from the panel connection area and safely down the roof surface. The integrated EPDM gasket provides a waterproof seal and supports the panel edge securely.

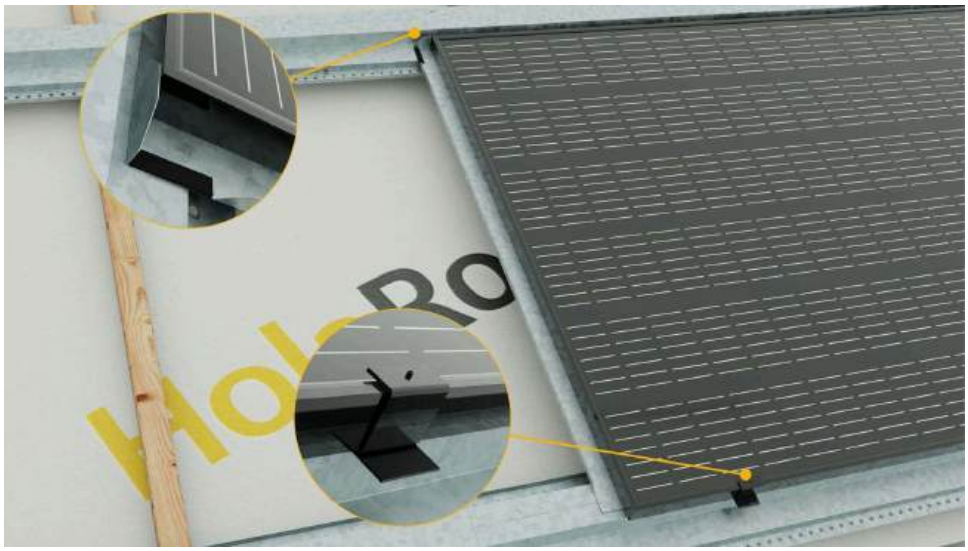
Install the vertical flashing once the upper edge of the panel is clear from the batten. Always position the EPDM sealing gasket facing upward, ensuring that the joint remains watertight and directs water away from the panel connection.

Ensure all DC cables are routed inside the metal channel, fully protected from UV radiation and isolated from wooden or combustible materials. Before lowering the panel into position, secure the MC4 connector and DC cable to the metal channel with a cable tie to prevent movement and ensure proper strain relief.

Vertical flashing installed once module upper edge clears the batten.

DC cables routed in metal channel; MC4 strain relief ensured before lowering the module.

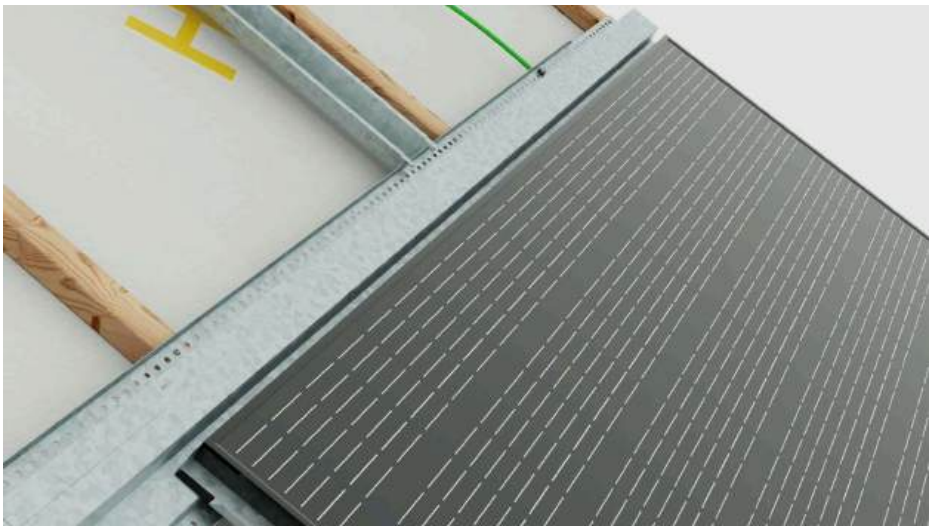
Install the vertical flashing once the upper edge of the panel is clear from the batten. Always position the EPDM sealing gasket facing upward, ensuring that the joint remains watertight and directs water away from the panel connection.



Horizontal flashing sealing the joint between panel rows.

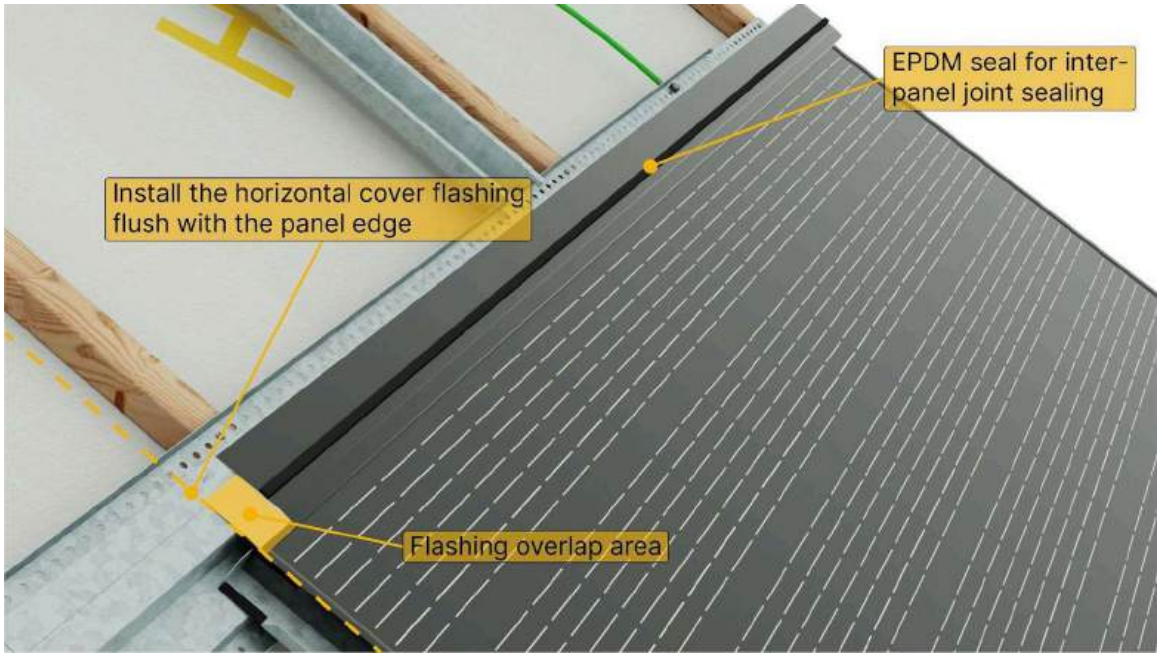
The horizontal flashing is designed to seal and protect the horizontal joints between panel rows. It directs rainwater away from the panel connections and prevents moisture from entering the roof structure. The EPDM seal ensures a watertight fit, while the overlap area between adjacent flashings provides continuous protection across the entire row.

Ensure that a 15 mm clearance is maintained above each panel. This spacing allows individual panels to be removed from the row later if maintenance or replacement is required.



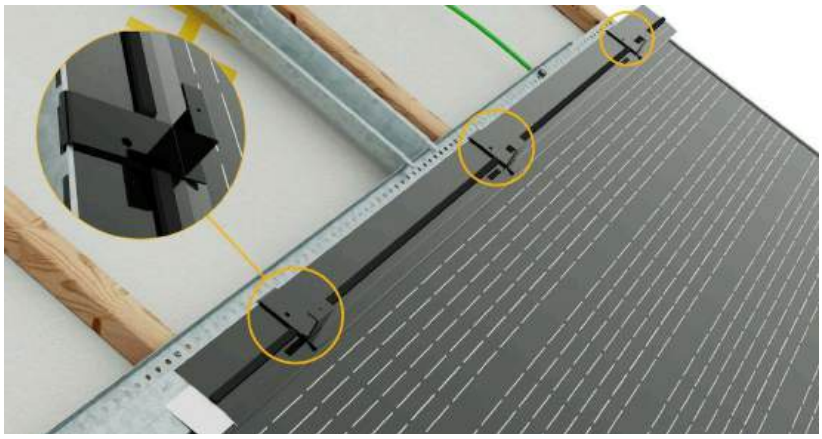
Install the horizontal cover flashing so that it sits flush with the upper edge of the panel.

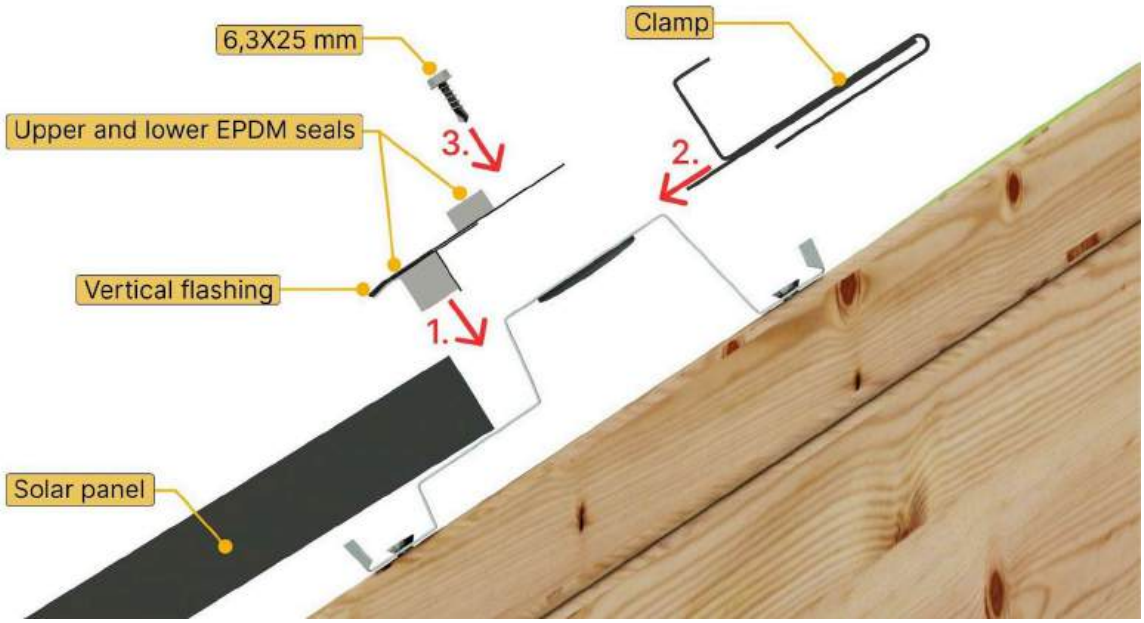
For most PV module types, a 15 mm overlap is suitable. Always check that the flashing does not cast a shadow on the solar cells, as even partial shading can reduce module performance. The EPDM seal provides waterproofing between panel rows, while the flashing overlap area ensures continuous protection against water ingress along the joint.



Horizontal cover flashing positioned flush with the panel edge.

Insert three clamps fully into the designated clamp slots on the metal batten. Secure each clamp using 6.3 × 25 mm self-drilling screws. Ensure all clamps are firmly tightened, as they determine the position of the next panel row.





Completed module row prepared for installation of next row.

4.5 Panel Grounding

All PV modules must be grounded through the HolaRoof clamp and metal batten system, ensuring a continuous and reliable protective earth (PE) connection across the entire array. The grounding system must comply with IEC 62548, EN 50583, and local electrical regulations.

❖ Grounding Path Overview

The HolaRoof system forms a complete metallic grounding chain:

PV module frame → grounding screw in clamp → metal batten → inter-batten bonding → main PE conductor → building grounding system.

This ensures that all conductive components maintain the same electrical potential and that fault currents are safely routed to earth.

❖ Module Grounding via Clamp

1. Each PV module must be bonded to the grounding system using the dedicated grounding screw hole at the lower end of at least one clamp.
2. Install the grounding screw (3-4 mm stainless steel) firmly into the clamp, ensuring direct metal-to-metal contact.
3. The clamp transfers the grounding connection into the metal batten through its dual-locking engagement surfaces.
4. Do not apply paint, sealant, or insulating material between the clamp and the batten as this will interrupt conductivity.

❖ Batten-to-Batten Electrical Continuity

1. All battens must maintain continuous grounding across their full length.
2. For spliced (joined) battens, the locking tabs and overlap surfaces provide direct conductive contact.
3. Where long batten lines consist of multiple joined sections, install inter-batten grounding straps or 6 mm² copper bonding cables to guarantee conductivity across all joints.
4. Clean any coated areas at the bonding screw location to ensure bare metal contact.

❖ Main PE Conductor Connection

1. Ground each batten row using an M8 bolt and nut through the designated grounding hole.
2. Connect a minimum 6 mm² copper conductor (or larger where required by local code) from the batten to the building's main protective earth (PE).
3. All grounding conductors must be routed in a mechanically protected route and secured at intervals according to electrical standards.

❖ Electrical Safety Requirements

- ➔ PV source circuits remain live whenever exposed to light; verify zero voltage before touching grounding components.
- ➔ Grounding connections must not rely solely on friction; all fasteners must be secured according to Appendix C (Torque Settings).
- ➔ A loose or missing ground connection can cause:
  - hazardous touch voltages,
  - inverter grounding alarms,
  - arc faults,
  - failure of surge protection devices (SPDs).

INSPECTION CHECKLIST BEFORE COMMISSIONING THE PV SYSTEM

- ☑ Grounding screw installed on every module row
- ☑ Clamp grounding screw tight and with clean metal contact
- ☑ Batten joints electrically continuous
- ☑ Each batten row connected to main PE
- ☑ No paint, sealant, oxidation, or debris under grounding points
- ☑ Ground conductors properly sized and mechanically protected
- ☑ SPD connections are bonded correctly to PE

WARNING!

Improper grounding can result in electric shock, fire hazards, inverter malfunction, and non-compliance with CE/IEC safety standards. Only qualified electricians may perform grounding work.

4.6 Cable Management Requirements (IEC 62548 / EN 50583)

This section highlights HolaRoof's key safety advantage: all DC wiring is contained inside metal channels and does not contact timber or underlayment materials.

Proper cable routing is essential for electrical safety, fire protection and long-term system reliability. HolaRoof integrates a dedicated internal metallic cable management channel into every batten, ensuring that all DC conductors are mechanically protected and isolated from combustible materials.

❖ Cable Routing Principles

- ➔ All DC cables must be routed inside the metal batten's cable channels.
- ➔ Cables must never contact underlayment, timber structure, insulation or filler panel surfaces.
- ➔ MC4 connectors must remain inside protected areas and must not be left behind modules or exposed to UV radiation.
- ➔ No cable loops may hang freely or run behind flashings or panels.
- ➔ Cable bundles must be secured using manufacturer-approved clips or ties that prevent movement and abrasion.
- ➔ Cables must not be routed through areas where mechanical compression can occur (e.g., panel supports, flashing overlaps).

❖ Fire Safety Requirements

HolaRoof's cable channel design ensures:

- ➔ Zero contact between DC wiring and combustible materials.
- ➔ Continuous metallic shielding, improving arc-fault resistance.
- ➔ Improved thermal dissipation compared to conventional on-roof cable routing.
- ➔ Compliance with IEC 62548 requirements for mechanical protection and fire separation.

❖ Connector Safety

- ➔ All MC4 connectors must be fully mated and locked.
- ➔ Do not open MC4 connectors under load (DC arc risk).
- ➔ Ensure all connectors are strain-relieved and do not rest on sharp edges.
- ➔ Maintain polarity consistency across strings.

CABLE MANAGEMENT CHECKLIST

- ☑ All DC cables routed inside metal channels
- ☑ No cable contact with underlayment or timber surfaces
- ☑ MC4 connectors fully locked and protected from UV
- ☑ All cables secured; no free-hanging loops
- ☑ No cables behind flashings or under modules
- ☑ Cable exit points sealed and mechanically protected
- ☑ No cable abrasion or sharp-edge risk
- ☑ All connectors strain-relieved
- ☑ Meets IEC 62548 & EN 50583 mechanical protection requirements

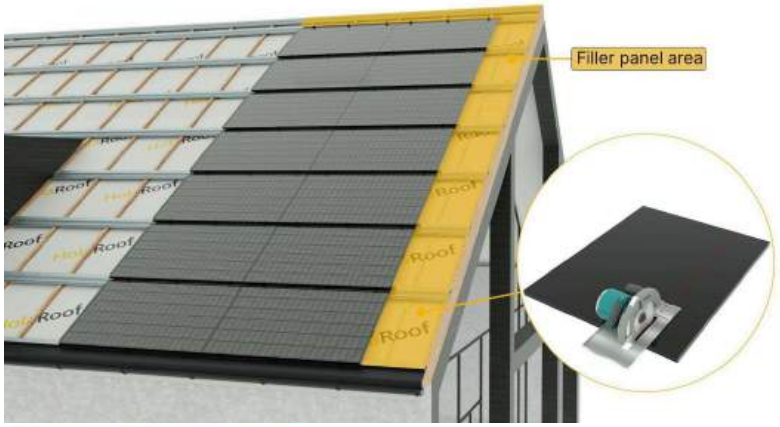
5 FILLER MODULE SYSTEM

The filler module system uses non-active panels to complete areas where standard PV modules cannot be installed. They ensure a uniform appearance, continuous waterproofing, and safe transitions, and are installed using the same battens, flashings, and sealing components as the main system. Function of filler panels:

- Maintain a uniform visual appearance across the roof
- Provide full waterproofing and wind-proof coverage
- Ensure safe spacing around heat sources, access zones, and structural elements
- Enable clean architectural transitions between PV and non-PV areas

5.1 Filler Panel Use Cases

Filler panels are installed in all roof areas where a standard PV module cannot be mounted due to geometry, obstacles, or safety requirements. Their purpose is to ensure continuous visual appearance, weather protection, and safe transitions between active PV rows and adjacent roof structures.



Typical locations where filler panels are required:

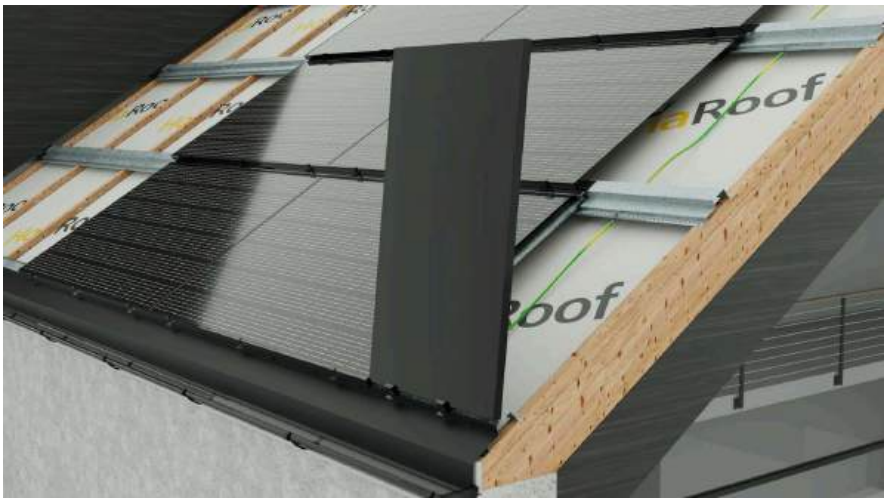
- Roof edges and perimeter zones
- Around roof windows and skylights
- Valleys
- Around chimneys and ventilation shafts
- Ridge ladder and maintenance walkway intersections
- Hips, pitch changes, and roof transitions
- Obstructed or non-rectangular areas where modules cannot be installed.

5.2 Filler Panel Installation Methods

Filler panels are installed using the same batten system, clamp interface and flashing logic as the PV modules. They are non-active modules designed to complete roof geometry while maintaining full waterproofing and visual uniformity.

❖ Filler Panel Positioning

Place the filler panel onto the metal battens so that its lower edge rests firmly against the batten line in the same manner as a PV module would. The filler module follows the same water-flow direction and integrates seamlessly with the adjacent flashings.



❖ Clamp Fixing

Insert two clamps into the designated clamp slots on the metal batten. Secure each clamp using one 6.3×25 mm self-drilling screw, identical to the clamp installation procedure described in Section 4.1 Clamp Installation. Ensure all clamps are fully tightened. Even though the filler panel is non-active, clamp engagement must maintain the same mechanical and wind-load stability as PV modules.

❖ Vertical Flashing Integration

Install the vertical flashing once the upper edge of the filler panel is clear from the batten. The flashing follows the same principles as described in 4.4 Solar Module Installation – EPDM gasket faces upward, ensuring a fully sealed and watertight vertical joint.

❖ Horizontal Flashing Integration

Install the horizontal cover flashing so that it sits flush with the filler panel's upper edge. Maintain the standard 15 mm overlap to match PV module rows and ensure future accessibility of adjacent modules. The EPDM seal and overlap zone provide continuous protection from water ingress.

FINAL CHECKS

- ☑ Confirm that the filler module sits flush with the adjacent PV modules
- ☑ Ensure all overlaps follow the water-flow direction
- ☑ Verify that no gaps or exposed edges remain around chimneys, skylights, valleys or roof transitions

5.3 Filler Panel Cutting and Edge Protection

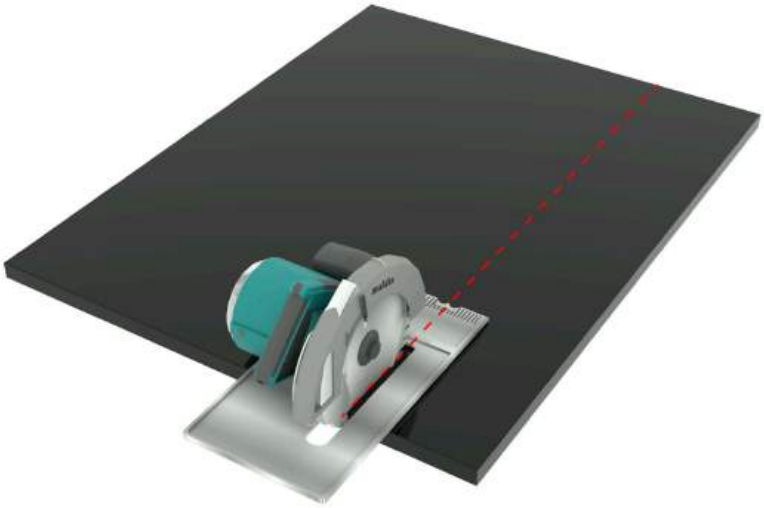
Filler panels may be cut to fit roof areas where full-size modules cannot be installed. Only non-active filler panels may be cut; PV modules must never be modified.

❖ Cutting Method

Filler panels are cut using a circular saw equipped with a metal-cutting blade. **Always cut from the back side of the panel** to maintain the visual surface quality and prevent coating damage on the front.

❖ Edge Protection

All cut edges must be covered with a sheet-metal edge trim which restores the protective coating and ensures long-term corrosion resistance. The edge trim also reinforces the structural integrity of the cut zone and ensures a clean visual finish.



❖ Cutting Rules

- ➔ Side and bottom edges may be trimmed to fit roof geometry or obstacle areas.
- ➔ Ensure cut edges are straight and suitable for correct flashing overlap.
- ➔ After cutting, immediately install the sheet-metal edge trim to seal and protect the exposed metal.

❖ Allowed Tools

- ➔ Circular saw with metal-cutting disc/blade (primary tool).
- ➔ Avoid abrasive discs, angle grinders or high-temperature tools that can burn coatings or create irregular edges.

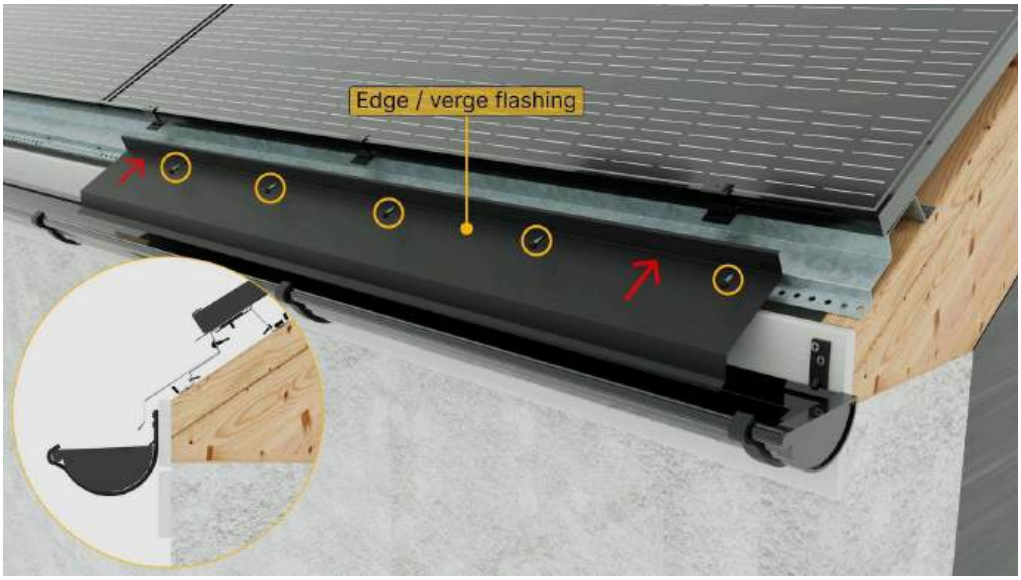
❖ Final Verification

- ➔ Ensure the trimmed panel fits without tension or distortion.
- ➔ Verify full overlap with vertical and horizontal flashings.
- ➔ Confirm that no exposed unprotected metal remains; all cuts must be covered with edge trim.

6 ROOF CONNECTIONS

The HolaRoof eaves flashing forms the lower drainage termination of the system and directs all water safely into the gutter. Because the clamp sits directly above the flashing, the flashing is fixed through the front flange, not the top.

6.1 Eaves & Gutter System



Install the first HolaRoof metal batten according to the design layout. Ensure the batten is straight and aligned with the eave line, as the battens define the full panel geometry and system alignment. Once the batten is fixed, the eaves area is ready for installing the HolaRoof eaves flashing.

Position the HolaRoof eaves flashing so that the lower drip edge directs water toward the gutter. Fix the flashing through the front vertical flange using roofing screws with sealing washers (4.8 × 25 mm) at approximately 300 mm spacing. The upper edge of the flashing slides around 7 mm under the PV module or filler panel, ensuring a clean and watertight overlap.

Before continuing with PV module installation, verify that:

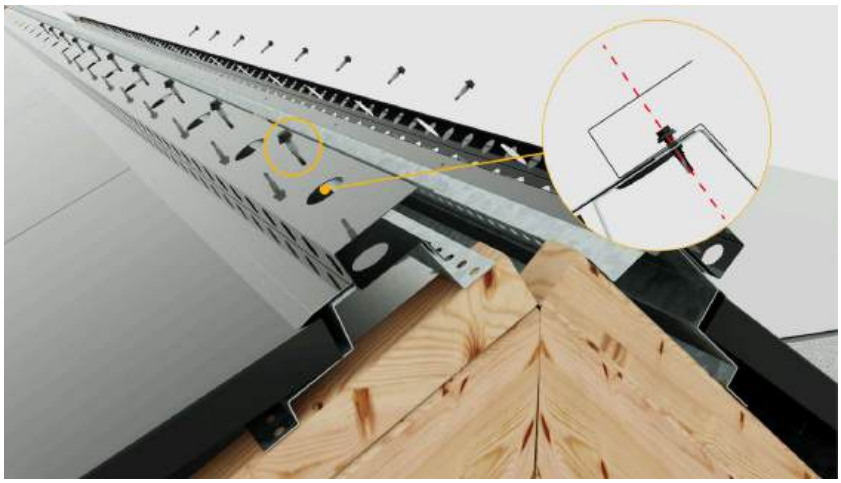
- ➔ the eaves flashing is fully secured at 300 mm spacing,
- ➔ the drip edge aligns correctly with the gutter,
- ➔ the flashing follows the metal batten line without twists or deformation,
- ➔ the upper overlap sits cleanly beneath the module or filler panel by ~7 mm.

6.2 Ridge

❖ Ridge Finishing – Installation of the Support Rail

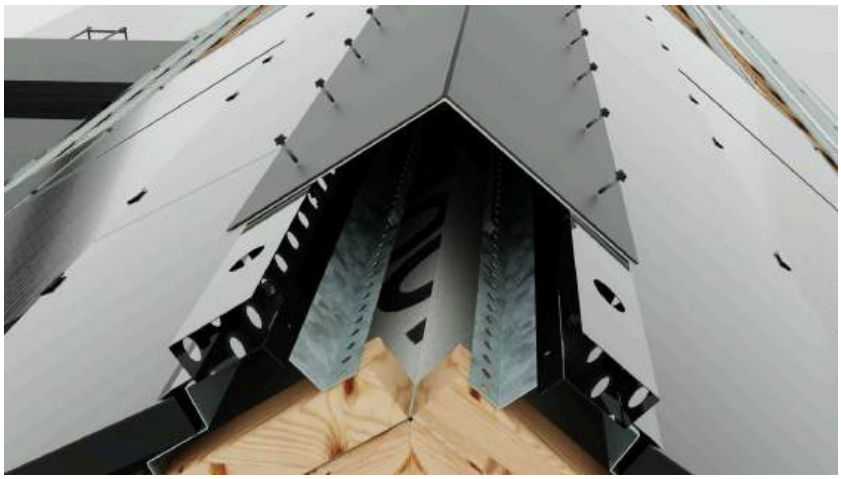
Install the ridge support rail directly behind the final metal batten. The support rail has the same roof pitch angle as the batten, which means it automatically aligns into the correct position when placed against it. Once positioned, the support rail rests firmly and consistently along the entire ridge line, ensuring exact alignment without additional adjustments.

Fasten the ridge support rail using 6.3 × 25 mm self-drilling screws, fixing through the pre-drilled laser-cut holes at approximately 300 mm spacing.



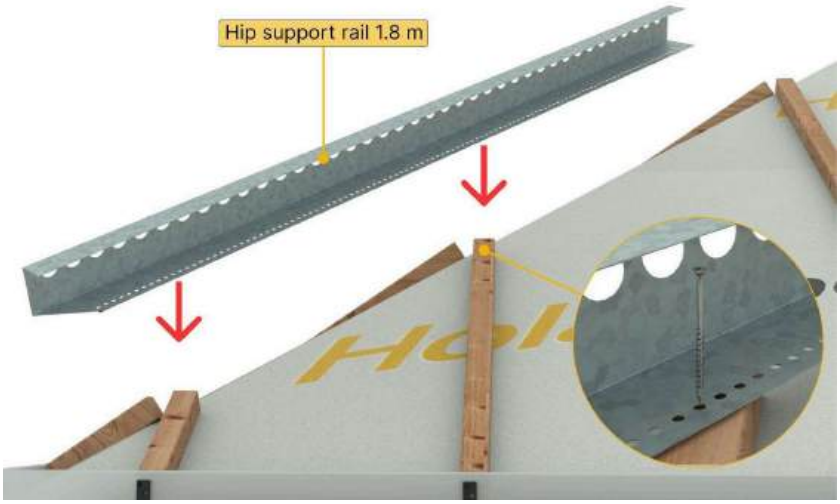
❖ Ridge Cap Installation

Bend the ridge cap to match the required roof pitch angle before installation. Position the ridge cap over the ridge support rail, ensuring full contact along the entire length. Fasten the ridge cap to the ridge support rail using 4.8 × 25 mm roofing screws with sealing washers, spaced at approximately 300 mm intervals. The sealing washer ensures a watertight connection and prevents moisture ingress at the fastening points.



6.3 Hip Ridge

❖ Hip Support Rail Installation

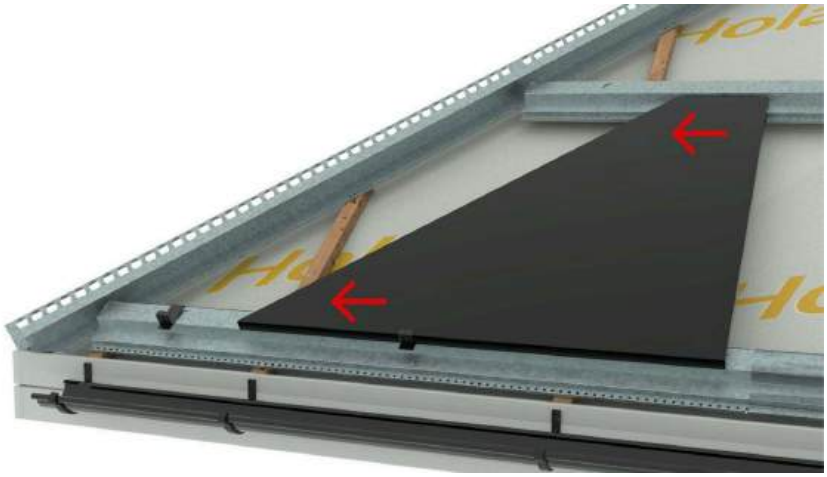


Install the hip support rail as close to the hip apex as possible, ensuring it follows the exact line of the hip. Before fixing the rail, establish a straight reference line by installing a string line or using a chalk line to mark the correct placement along the entire hip.

Once the line is marked, position the hip support rail accordingly and fasten it to the ventilation batten using 5 × 50 mm wood screws. Ensure the rail remains straight and fully supported along its entire length to provide a stable base for all subsequent hip flashing components.

Install the second hip support rail on the opposite side using the same procedure.

Ensure that the gap between both rails remains uniform along the entire hip to guarantee proper seating and alignment of the hip flashing components.



Insert the first filler panel into the hip support rail, making sure it sits firmly inside the profile. Cut the panel's upper edge so that it matches the exact angle of the hip rail, allowing the panel to sit as closely and cleanly as possible against the hip line. Proper angle-matching ensures a tight visual finish and creates a continuous waterproof surface along the hip.

Continue installing filler panels upward along the hip, progressing toward the apex. Ensure that each filler panel follows the correct angle and sits fully inside the hip support rail.

IMPORTANT

- ➔ Maintain a pyramid-shaped build-up so that the horizontal flashing always overlaps correctly and never interferes with the vertical flashing.
- ➔ If the filler buildup is not shaped correctly, the vertical flashing will collide with the horizontal flashing, preventing further module installation.
- ➔ Proper stepped geometry ensures the flashings interlock in the correct sequence and allows uninterrupted installation of the next PV module rows.

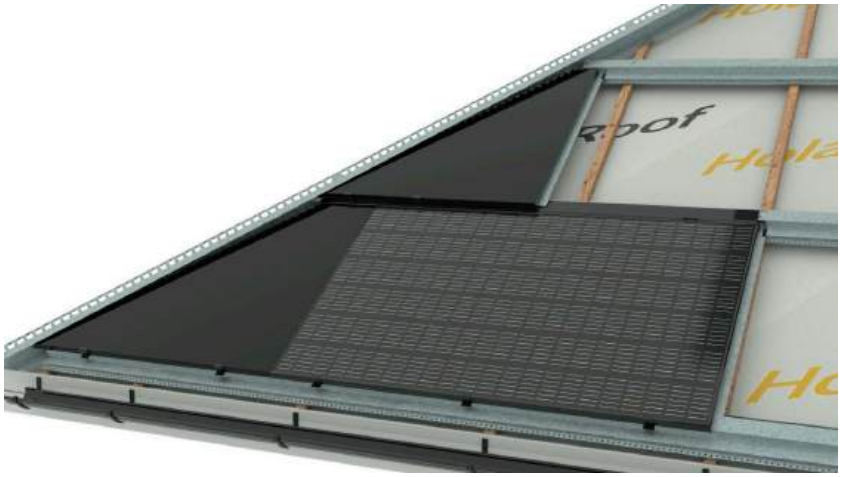
Once both sides of the hip have been fully filled with filler panels and the step geometry is complete, install the Hip sealing roll along the entire hip line.

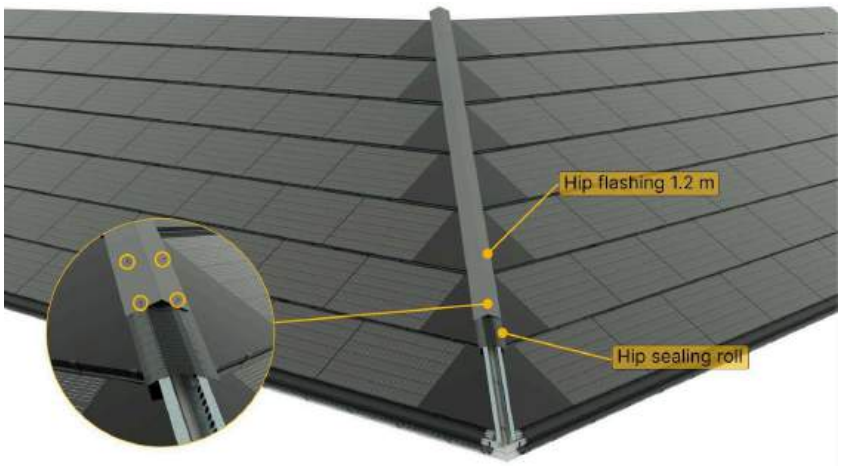
Ensure the sealing roll is centered and firmly pressed into place to create continuous ventilation control and waterproofing.

After the sealing roll is installed, position the Hip flashing on top of it.

Fasten the hip flashing using 4.8 mm roofing screws with sealing washers, spaced at approximately 300 mm intervals.

The sealing washer ensures a watertight fastening point and prevents moisture ingress at the hip connection.





6.4 Valley

Bend the valley support flashing along the pre-cut notches to match the exact roof slope on both sides of the valley. The notches ensure that the flashing forms the correct angle and sits tightly against the underlay without distortion. Position the valley support flashing into the valley line and fasten it to the ventilation battens using 5 × 50 mm wood screws. Ensure the flashing is fully supported along its entire length to provide a stable and continuous base for the valley covering components.

Install the next section of the valley support flashing above the previous one. This flashing has return folds at both ends, allowing the lower return to lock securely into the upper return of the flashing below (see figure below). This interlocking joint ensures a continuous, watertight connection along the entire valley.

After locking the flashing sections together, fasten each piece to the ventilation battens using 5 × 50 mm wood screws.

Continue installing additional valley support flashing sections upward in the same manner until reaching the ridge.

Place the central valley flashing directly on top of the installed valley support flashing.

Ensure the flashing sits flat and fully follows the valley line, with both side upstands forming a clean and continuous water channel.

Fasten the central valley flashing to the ventilation battens using roofing screws with sealing washers (4.8 × 25 mm or equivalent).

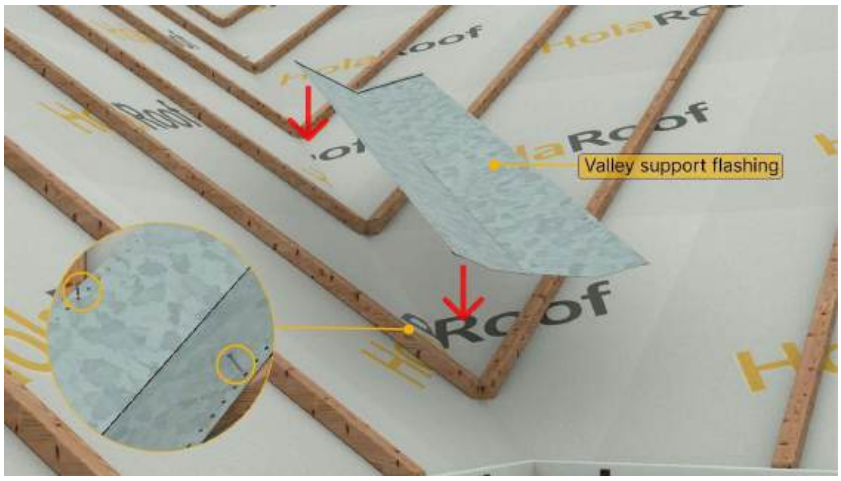
The sealing washer ensures a watertight fastening point and prevents moisture ingress along the valley edges.

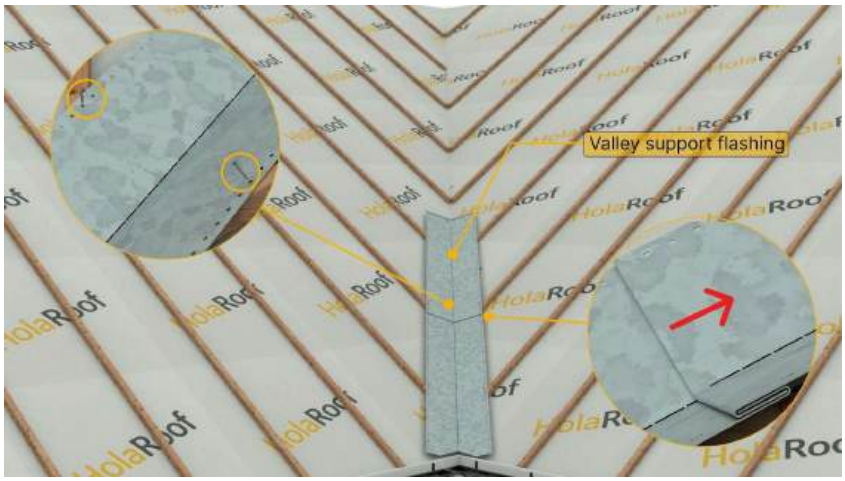
Continue fastening along the entire length of the valley to secure the flashing firmly in place.

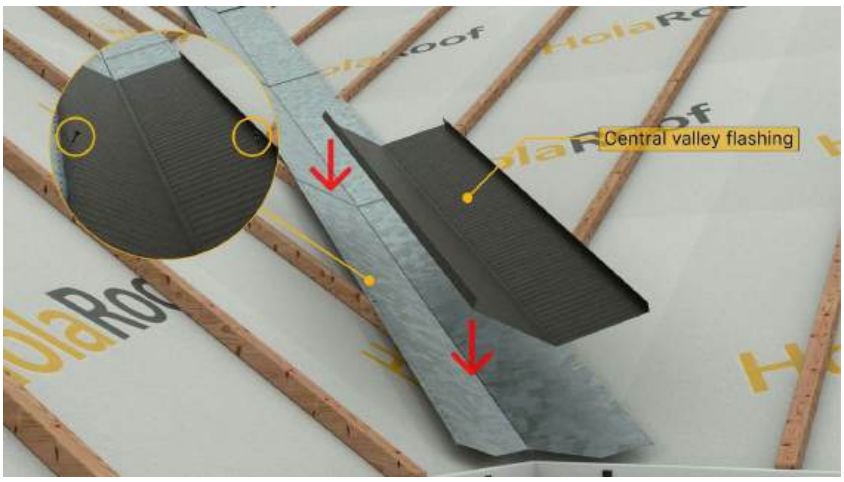
After the central valley flashing is in place, bend both of its edges upward by approximately 25 mm.

Form the upturns evenly along the entire length to create a defined water channel that prevents runoff from reaching the panel edges.

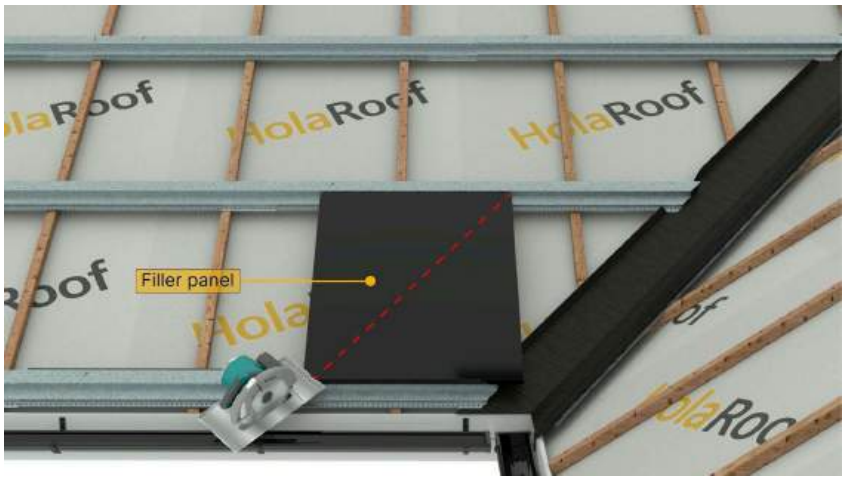
Once the edges are upturned, install the special adhesive foam seal inside the central valley flashing. Press the foam seal firmly into position to ensure a continuous and watertight connection along the valley.







Cut the filler panel parallel to the valley line to ensure a precise fit and clean transition between the panel edge and the valley flashing. After cutting, install the first filler panel into position along the valley.



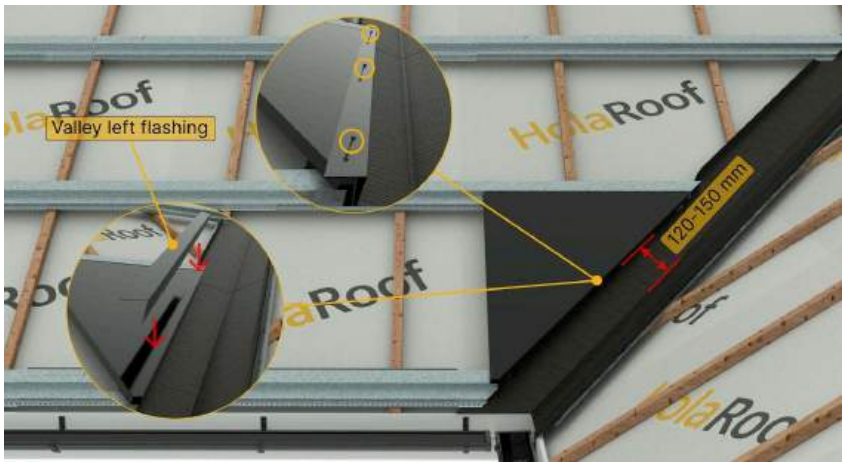
IMPORTANT

- ➔ If the filler panel does not have space underneath to add a clamp (due to the valley geometry), then the panel must be fastened from the top edge.
- ➔ In this case, secure the filler panel by installing a flat-head metal screw directly through the top edge of the filler and into the batten behind it.
- ➔ When doing so, make sure to match the height of the adjacent PV panel so that the surface remains even and visually aligned.

After installing the filler panel, cover the valley-side edge with the appropriate left or right valley side flashing. Position the flashing to maintain a 120-150 mm open valley channel for proper drainage.

Repeat this process for each panel moving toward the ridge: cut the filler panel parallel to the valley, fix it in place, and install the correct side flashing, ensuring the 120-150 mm clearance is maintained throughout.

Once completed, the assembled valley should appear as shown in the illustration: clean, continuous, and fully sealed along both sides.

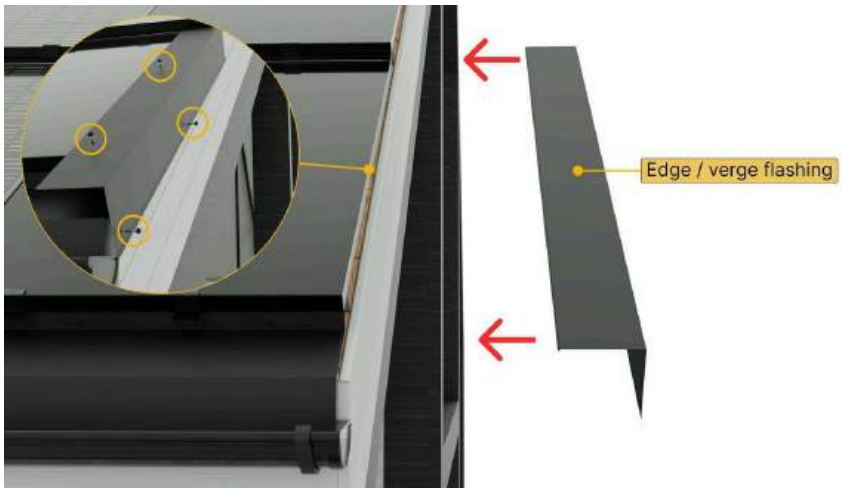


6.5 Edge / Verge

❖ Version 1: Flashing Installed Over Filler Panel

Position the verge flashing so that its lower edge sits flush with the bottom edge of the filler panel, creating a clean and aligned finish along the verge. Once the flashing is in the correct position, fasten it using 4.8 mm roofing screws with sealing washers:

- ➔ Two screws on the top surface of the flashing
- ➔ Two screws on the side face of the flashing



The sealing washers ensure a watertight connection and protect the verge area from wind-driven rain and moisture ingress.

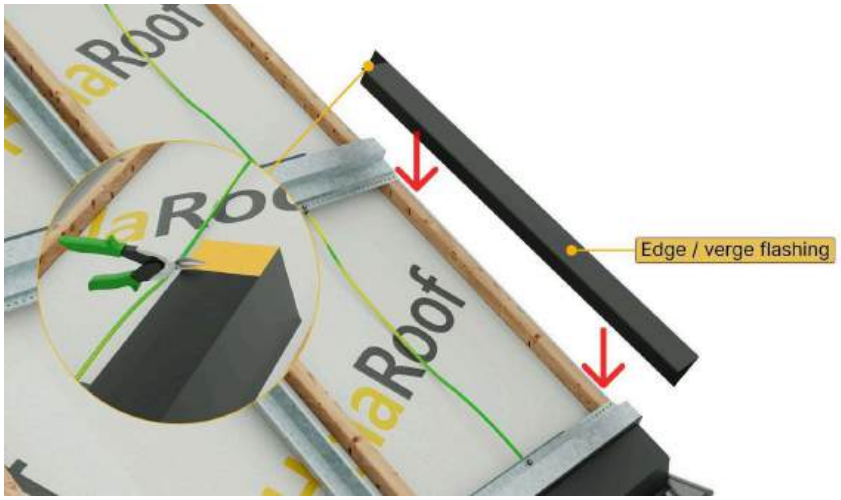
Install the next verge flashing section directly above the previous one, ensuring that the lower edge of the flashing remains flush with the bottom edge of the adjacent panel for a clean and continuous verge line.

Fasten the flashing using the same method as before. Continue this process for all remaining sections along the verge.

❖ Version 2: Flashing Installed Under the Panel

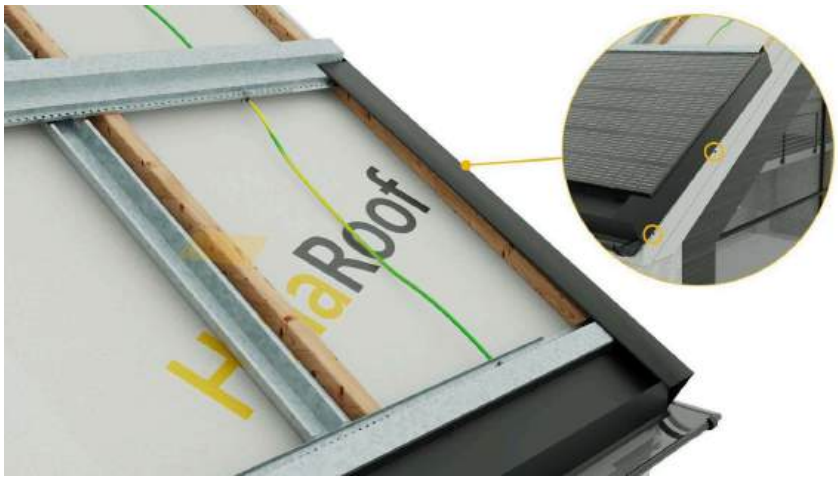
In situations where the roof is started with an active PV module and the verge cannot be covered from above, install the verge flashing directly onto the batten, underneath the panel.

Place the flashing in position and cut off the upper return/lip so that the flashing can sit on the same support plane as the PV module. This ensures the panel will rest flat and level without deformation.

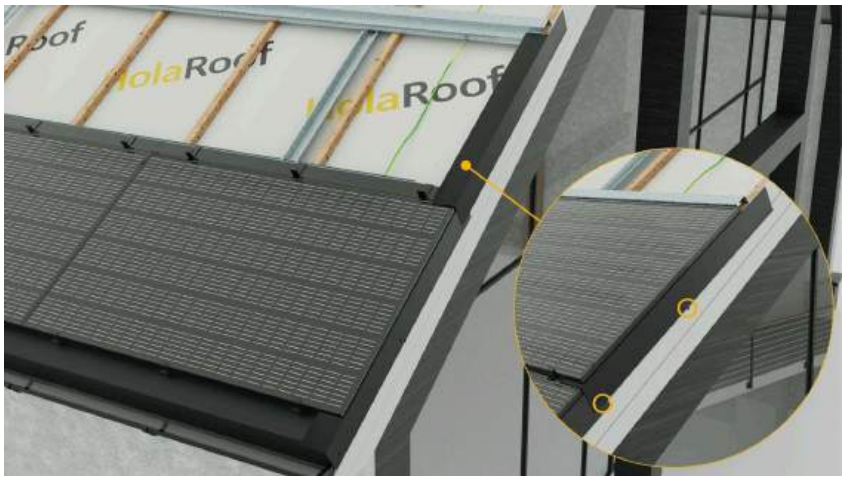


Before installing the PV module, secure the verge flashing with two screws on its outer vertical face only.

Do not place screws on the top surface, as the panel must sit on a smooth, unobstructed area. Install subsequent verge flashing sections the same way, trimming the notch as needed to suit the roof geometry so the flashing rests on the same plane as the PV module.



Align the lower edge so the flashing overlaps the batten by the same amount as the PV panel, ensuring a continuous verge line.



6.6 Wall Connection at Verge

For wall terminations, use the standard verge flashing bent in the opposite direction to create a sealed transition to the wall. When a filler panel is present, install the flashing on top of the filler, flush with its bottom edge for a uniform finish.

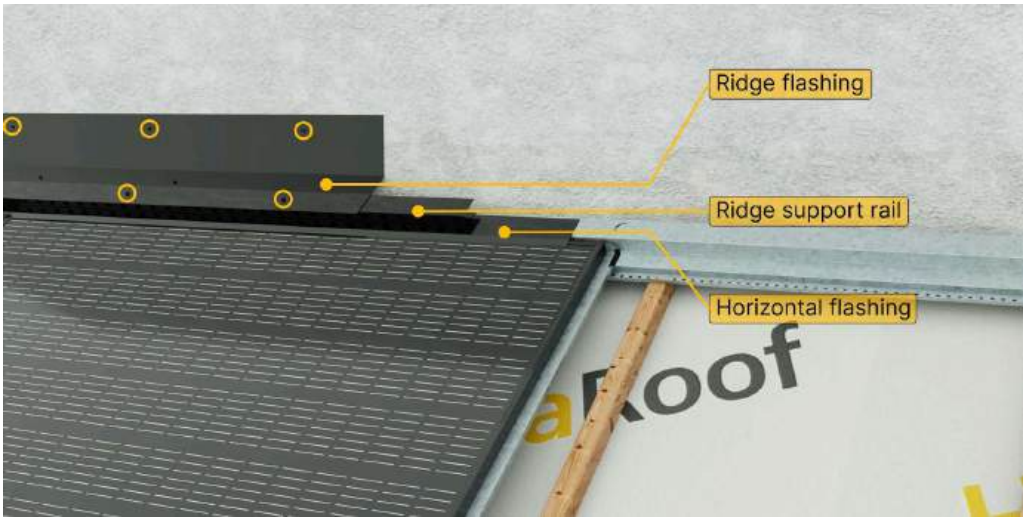
Fasten the flashing from the top using two roofing screws with sealing washers, and complete waterproofing with a wall termination profile or sealant suitable for the wall material. Continue installing sections upward, ensuring consistent alignment and overlap to the top of the wall connection.

6.7 Wall Connection at Ridge

Once the PV panel and vertical flashing are installed against the wall, position the ridge support rail in line with the ridge and secure it in place. Install the ridge flashing onto the support rail and bend it as required to match the roof pitch and wall geometry, ensuring it sits firmly against both the rail and the wall surface.

Fasten the ridge flashing to the ridge support rail using roofing screws with sealing washers at approximately 300 mm spacing. These fixings secure only the flashing-to-rail connection; wall sealing is completed separately. Finish the wall termination and waterproofing using the appropriate wall connection flashing or sealing method for the wall material, as described in the verge-to-wall detail.

The ridge flashing is installed onto the ridge support rail, bent to match the roof pitch and wall angle, and secured with sealing-washer roofing screws. The assembly forms a watertight transition between the final PV row and the vertical wall surface, supported by the horizontal flashing and sealed according to the wall material.



6.8 Transition to Standard Roof Covering

When transitioning from the HolaRoof system to standard roofing materials (e.g., tiles, metal standing seam, or bitumen), proper waterproofing continuity must be ensured.

- ➔ Ensure that the transition flashing directs water from the upper roof section onto the lower section without creating backflow risks.
- ➔ Use custom or standard transition flashings that are compatible with both the HolaRoof metal battens and the adjacent roof covering.
- ➔ Maintain a minimum overlap of 150 mm at all transition points.

7 ROOF ACCESSORIES & SAFETY COMPONENTS

7.1 Snow Guards & Roof Walkway Installation

Snow guards and roof walkways must be installed directly above rafters, so that all mechanical loads (snow retention, foot traffic, maintenance loads) are transferred safely into the structural timber framework of the roof. Both systems are fixed on top of the HolaRoof metal batten, using structural fasteners and a timber support block inside the batten to prevent deformation.

❖ Structural Support Block (45×45 mm timber)

Before installing any snow guard bracket or walkway support foot, place a 45 × 45 mm timber block inside the metal batten at each fixing point. The timber insert serves three critical functions:

- ➔ prevents the metal batten from deforming when tightening bolts or screws,
- ➔ ensures long-term dimensional stability under snow loads and walking loads,
- ➔ provides a solid fixing base for safe transfer of load into the rafter.

❖ Fixing to Rafters

Use structural timber screws or bolts of sufficient length and load capacity (according to local snow-load and access requirements). Do not use thin sheet-metal screws as they are not designed for snow retention or step/walkway loads. Both, snow guards and walkway supports must be fixed:

- ➔ through the metal batten,
- ➔ through the 45×45 mm support block,
- ➔ directly into the rafter below.

❖ Snow Guard Installation

- ➔ Install brackets in a continuous row, aligned above rafters.
- ➔ Bracket spacing must follow local building code snow-load requirements (EN 1991-1-3).
- ➔ In heavy snow regions, multiple rows may be required.
- ➔ Ensure that snow guard rails do not cast shadows on PV modules (adjust bracket height if needed).

❖ Walkway Installation

Roof walkways must be installed:

- ➔ above rafters,
- ➔ on top of a metal batten with 45×45 mm timber inside,
- ➔ using structural screws/bolts through the walkway support foot.

ENSURE THAT

- ➔ The walkway is level
- ➔ Support feet rest firmly on the batten
- ➔ Walkway length is supported by the required number of rafters
- ➔ The walkway does not load the PV modules in any direction

Follow the manufacturer's spacing rules (common standard: support feet every 600-900 mm depending on walkway type).

❖ Safety Notes

- ➔ Never fix snow guards or walkways directly into metal battens without rafter support.
- ➔ Never rely on filler panels or PV modules to carry any part of the load.
- ➔ Ensure all fixings are stainless steel (A2/A4) for long-term durability.
- ➔ Verify load category and spacing according to local regulations.

7.2 Roof Ladder Installation

Roof ladders must be installed in accordance with European access and fall-prevention standards, ensuring that all climbing and maintenance loads are safely transferred into the primary roof structure.

Just like snow guards and walkways, the roof ladder brackets are mounted on top of the HolaRoof metal batten, but all fixing points must align with the rafters for structural load transfer.

❖ Structural Support Block (45×45 mm) – Continuous Section

At the ladder installation zone, install a continuous 45 × 45 mm timber support block inside the metal batten from rafter to rafter. This means that the entire section where the ladder will rest or be fixed must be fully filled with timber to prevent deformation. The timber insert ensures:

- ➔ safe transfer of climbing/walking loads into rafters,
- ➔ battens will not deform under bolt compression,
- ➔ long-term durability of the ladder bracket connection,
- ➔ compliance with roof access safety standards.

❖ Ladder Bracket Installation

HolaRoof supports roof ladders that use standard roof-access mounting brackets (e.g., Monier/BMI–type brackets). Bracket positioning must follow the ladder manufacturer's spacing and safety requirements. Install each ladder bracket as follows:

1. Position the bracket directly above a rafter.
2. Fix through the metal batten into the 45×45 mm timber insert.

3. Use structural wood screws or bolts suitable for access and fall-arrest loads (not sheet-metal screws).
4. Ensure the bracket height and angle match the ladder's attachment points.
5. The ladder must remain clear of PV modules and filler panels and may not transfer load onto them.

❖ Continuous Support Requirement

For added safety, the entire segment of the metal batten underlying the ladder must be completely filled with 45×45 timber between all rafters in that zone, ensuring no hollow batten sections remain underneath the ladder.

This prevents point-load bending, improves screw pull-out strength, and guarantees secure ladder fixation across the whole area.

❖ Load Transfer Requirements

Roof ladders are load-bearing safety components and must be fixed so that:

- ➔ Load → bracket → metal batten → 45×45 timber → rafter.
- ➔ NO load may be transferred to PV modules, filler panels, or empty metal battens.
- ➔ NO fixing is allowed off-rafter.

Proper installation ensures compliance with EN 12951 / EN 516 access-safety standards.

FINAL CHECKS

- ☑ Verify all brackets are fully tightened
- ☑ Confirm that the ladder sits level and has no rocking motion
- ☑ Check that no bracket or bolt interferes with PV modules, flashings, or snow guards
- ☑ Confirm the ladder load path goes into rafters only

8 SPECIAL ROOF ELEMENTS

8.1 Roof Windows

Roof windows must always be installed according to the manufacturer's official manual, including all waterproofing components, insulation collars, flashing kits, and structural fixings. The HolaRoof system integrates with roof windows using dedicated support battens, filler panels, and the window's own flashing.

To ensure proper waterproofing and prevent shading losses, maintain an **800 mm buffer zone** around the window where no active PV modules are installed. This zone is completed using:

- ➔ Filler panels
- ➔ Side and top flashings
- ➔ The window's factory flashing kit

Note: This ensures unobstructed water drainage, safe snow handling, and optimal PV performance.

❖ Bottom Connection

The bottom of the roof window must be integrated with the HolaRoof system following the same principle as clay/concrete tile roofs, where the window requires a dedicated support batten below it.

The installation rules are:

1. Do not place the window's apron flashing between two HolaRoof battens; it must land on a solid support to ensure proper drainage.
2. Install a dedicated support batten ~100 mm above the HolaRoof metal batten supporting the filler panel row below the window.
3. Align the dedicated batten so that:
   a. the window's bottom flashing rests directly on it.
   b. the tinfoil/apron flashing can be shaped downward onto the filler panel step.
4. The apron flashing must extend over the filler panel, guiding water onto the roof surface–not behind it.
5. Filler panels below the window form a step, like tile courses, ensuring the apron bonds properly and seals against water entry.

Note: This lower connection is the most critical waterproofing element when combining HolaRoof with any roof window.

❖ Side Flashings

- ➔ Install filler panels on both sides of the window.
- ➔ Fit the window's side flashings to overlap the filler panels, forming a vertical drainage channel.
- ➔ HolaRoof vertical flashings can be used together with the window's flashing kit if needed.
- ➔ Maintain clearance between PV module edges and window sides to ensure proper drainage and airflow.

❖ Top Connection

The top connection follows a simple sequence:

1. Install filler panels above the roof window.
2. Install the top flashing from the window manufacturer.
3. Ensure the top flashing drains onto:
   a. the filler panel below it, or
   b. the HolaRoof horizontal flashing, depending on the window's vertical position.
4. Maintain proper overlap according to water-flow direction (top → bottom).
5. Avoid creating cavities where water could be trapped behind flashings or between filler panels.

❖ Integration With HolaRoof Metal Battens

When placing a roof window into a HolaRoof field:

- ➔ The window frame must sit on the same support plane as the HolaRoof panels.
- ➔ Support battens must be added or adjusted so that the window's bottom and side flashings align with HolaRoof filler panel levels.
- ➔ Never cut or notch active PV modules to fit around a window.
- ➔ Only filler panels may be modified as needed (see Section 5.3).

KEY SAFETY AND WATERPROOFING RULES

- ➔ Always follow the window manufacturer's flashing instructions
- ➔ Ensure all overlaps follow natural drainage directions
- ➔ The apron flashing must lie on top of the filler panels, never behind them
- ➔ Avoid placing PV modules within 800 mm of any roof window
- ➔ Ensure structural support beneath the window frame is adequate, especially in retrofits

8.2 Roof Access Hatch

Roof access hatches used with the HolaRoof system are typically surface-mounted metal hatches designed to sit on top of the roofing layer. **The hatch must always be installed into filler panel zones only,** never through active PV modules.

❖ Positioning and Filler Panel Preparation

1. Mark the hatch location on the filler panel.
2. Cut an opening into the filler panel so that the hatch's lower frame can sit correctly on the roof surface.
3. The opening must be dimensioned according to the hatch manufacturer's requirements.

❖ Upper Integration (Important!)

The upper part of the hatch frame – the portion that sits higher on the slope – must be installed:

- ➔ between two filler panel rows, and
- ➔ under the HolaRoof horizontal flashing.

This placement ensures that all rainwater flowing from above reaches the horizontal flashing and drains freely over the hatch and filler panel without obstruction or backflow. This detail is essential for waterproofing.

❖ Lower Integration

The lower edge of the hatch must:

- ➔ end exactly at the upper edge of the filler panel below,
- ➔ and sit on top of that filler panel surface.

This creates the necessary "step," similar to a roof window or tile installation, allowing water to drain onto the filler panel cleanly.

Sealing and Fixing

After the hatch is positioned:

1. Apply a continuous bead of roof-grade sealing compound (UV-resistant, permanently elastic) between the hatch flange and the filler panel surface.
2. Fix the hatch using roofing screws with sealing washers (4.8 × 25 mm) directly through the hatch flange into the filler panel and the support batten below.
3. Ensure the sealant fills the entire perimeter without gaps.

KEY RULES

- ➔ Install the hatch only in filler panel zones
- ➔ The bottom of the hatch must always sit onto the filler panel, never in a gap between battens
- ➔ The upper part must always go between filler rows, under the horizontal flashing, to ensure free water flow
- ➔ Maintain a safe distance from active PV modules (recommended 800 mm)
- ➔ Never rely on panel surfaces or vertical flashings to support the hatch load

8.3 Chimneys

Chimneys must always be integrated into the HolaRoof system using filler panels, dedicated chimney flashings, and roof-grade sealants. **PV modules may not be cut or installed against chimney surfaces.**

❖ Marking and Cutting the Filler Panel

1. Measure the exact chimney dimensions on the roof.
2. Transfer the outline onto the filler panel–never onto PV modules.
3. Cut the filler panel carefully around the chimney footprint so that:
    c. the filler sits tight against the chimney walls,
    d. no large gaps remain,
    e. the panel follows the chimney perimeter.

This creates a clean base for proper flashing installation.

❖ Installing the Vertical (Side) Chimney Flashings

The vertical flashings form the main waterproofing channel along the chimney sides.

- ➔ Install left and right chimney side flashings directly onto the chimney wall.
- ➔ Use the appropriate fixing method for the chimney material (masonry screws, adhesive, profiles).
- ➔ The vertical flashing must overlap the cut filler panel edge, not sit behind it.
- ➔ Ensure the flashing is tall enough to prevent lateral water ingress.

❖ Bottom Chimney Flashing

The bottom flashing is the most important drainage element. Install as follows:

1. Shape the flexible bottom apron flashing (tinfoil or pleated aluminium) to match the chimney width.
2. Lay the apron on top of the filler panel surface.
3. Ensure the apron slopes downward, guiding all water away from the chimney base.
4. Fix the apron into the filler panel with roofing screws and sealing washers (4.8 × 25 mm) if required by the design.

❖ Seal all joints

Apply roof-grade sealant between the chimney wall and the upper edge of the apron flashing. This prevents capillary backflow.

❖ Upper Chimney Flashing

Install the top chimney flashing behind the chimney to block water coming from the upper roof area.

- ➔ The back-pan must guide water onto the filler panel below, never behind the chimney.
- ➔ Overlap the filler panel or horizontal flashing sufficiently depending on roof pitch (typically ≥150 mm).
- ➔ Fix as required using roof screws 4.8 × 25 mm with sealing washers.

❖ Final Sealing and Inspection

- ➔ Seal all perimeter joints with roof sealant.
- ➔ Ensure all overlaps follow the water-flow direction (top → bottom).
- ➔ Verify that all flashing edges sit on top of the filler panels, not under them.
- ➔ Confirm that no PV modules are within 800 mm of the chimney (fire safety + no shading).

8.4 Ventilation Outlets

Ventilation outlets such as plumbing vents, mechanical ventilation stacks, extractor ducts and air exhausts must always be installed according to the manufacturer's official instructions. The HolaRoof system integrates with these components using filler panels, sealants and standard roof-grade fixings.

Note: Ventilation outlets must be installed only through filler panels. Never cut or penetrate active PV modules.

Version 1: Surface-Mounted Vent Outlets (Most Common)

These are vents that sit on top of the roof surface with a wide base/flange.

Installation Steps

1. Mark the vent position on the filler panel.
2. Cut the required opening through the filler panel.
3. Place the vent base on the filler panel surface.
4. Apply a continuous bead of roof-grade sealant between the vent base and filler panel.
5. Fix the vent using roofing screws with sealing washers (4.8 × 25 mm) into the filler panel and support batten below.

Version 2: Factory Flashing Kits (EPDM Boots, Pipe Flashings, Adjustable Cones)

If the vent comes with a factory flashing:

- ➔ install according to the manufacturer's instructions,
- ➔ mount the flashing flange on top of the filler panel,
- ➔ shape the flexible base to the panel profile,
- ➔ seal the upper edge to the vent body as required.

This is identical to industry-standard tile or metal roof vent flashing protocols

GENERAL WATERPROOFING RULES

- ➔ All overlaps must direct water onto the filler panels, never under them
- ➔ Sealant must be roof-grade, UV-resistant and permanently elastic
- ➔ Fixing screws must have sealing washers (4.8 × 25 mm)
- ➔ Maintain proper clearances from PV modules to avoid shading and ensure access

9 MAINTENANCE & SERVICE

Because the HolaRoof system forms a fully watertight roofing surface, water does not enter under the PV modules in the same way as with conventional on-roof systems. Maintenance requirements are therefore similar to other high-quality metal/BIPV roofing systems and focus mainly on visual inspection, cleaning and electrical checks.

9.1 Maintenance & Cleaning

❖ Inspection intervals

Perform a visual inspection at least once per year. Additional inspections are recommended after severe storms, heavy snowfall, or hail events.

INSPECTION CHECKLIST

- ☑ PV modules and filler panels for crack, chips, or visible damage
- ☑ Flashings at eaves, ridges, hips, valleys and wall junctions
- ☑ Snow guards, walkways and roof ladders for deformation or loose fixings
- ☑ Cable outlets and penetrations for intact seals and grommets

Because the HolaRoof system itself is watertight, there is no need to inspect tiles or secondary roofing layers under the modules, except where local regulations require periodic checks of the underlayment.

❖ Cleaning

In most climates, normal rainfall is sufficient to keep the modules clean. Cleaning is only required if visible soiling (dust, pollen, bird droppings, industrial pollution) causes a measurable loss of energy yield. When cleaning is necessary:

- → Use soft brushes or non-abrasive sponges and clean water (preferably de-mineralised).
- → Do not use high-pressure cleaners, steam cleaners, abrasive powders, strong alkalis, solvents or metal tools.
- → Cleaning should be carried out from walkways, ladders or access areas, not by walking on the modules.
- → If stepping on modules is unavoidable, step only where load is transferred through the frame and battens, and never on junction boxes or cable areas.

Note: All cleaning must comply with the PV module manufacturer's instructions.

9.2 Module Replacement

Module replacement must always be carried out by a qualified PV technician, following all electrical safety procedures.

❖ Safety preparation

- ➔ Isolate the PV circuit according to electrical standards:
  - ◆ switch off DC isolators,
  - ◆ switch off the AC side of the inverter,
  - ◆ verify absence of voltage using a suitable meter.
- ➔ Use required PPE (insulated gloves, safety glasses, fall protection).
- ➔ Do not walk on PV modules. Access the module only using walkways, ladders, or designated support areas.

WARNING – DC ARC FLASH RISK!

- ➔ PV modules generate DC voltage whenever they are exposed to light.
- ➔ DC connectors and cables remain live even when the inverter is switched OFF.
- ➔ Never disconnect MC4 connectors under load – this can cause a dangerous DC arc.
- ➔ Always isolate the string using approved DC isolators and verify zero voltage before opening any connectors.
- ➔ Use appropriate arc-flash PPE and follow local electrical safety rules.

❖ Removal procedure

1. Locate the module that needs replacing.
2. Remove the horizontal flashing above the affected row to expose the upper clamp line. This provides access to the clamps securing the module.
3. Lift the module upward by approximately 15 mm. This is the service clearance built into the HolaRoof system and allows the frame to clear the clamp geometry.
4. While holding the module in the raised position, slide it slightly forward to disengage it from all three clamps.
5. Once the module is free from the clamps, carefully access the DC connectors behind it.
6. Disconnect the MC4 connectors carefully, ensuring no moisture or dirt enters the plugs.
7. Remove the module from the roof.

❖ Installing the replacement module

1. Verify that the replacement module matches the required:
   a. frame size,
   b. clamp zone,
   c. electrical rating,
   d. connector type.

2. Connect the MC4 plugs and sockets according to polarity. Ensure connectors lock securely and that cables are not under mechanical tension.
3. Slide the module back into position and lower it into the three clamps.
4. Tighten each clamp with one 6.3 × 25 mm self-drilling screw according to the torque guidelines in Section 4.1.
5. Reinstall the horizontal flashing above the row, restoring the original overlap and watertightness.
6. Re-energise the PV circuit and, where required, record the replacement in the installation documentation.

9.3 Lightning Protection

Lightning protection must be installed according to the selected manufacturer's system, following all local building codes, electrical standards and lightning protection regulations (e.g. EN 62305 series or national equivalents).

All lightning protection components (air terminals, down conductors, bonding) must be installed per the manufacturer's instructions and integrated into the building's main equipotential bonding and grounding network. Required separation from active PV modules must be maintained, and all conductive parts must be properly bonded.

Note: The design must be performed by a qualified lightning protection specialist or electrical engineer.

❖ Separation Distance From PV Modules

Active PV modules are conductive surfaces and must maintain the required separation distance (s) from any lightning protection air-termination or conductor according to EN 62305 rules.

Typical guidelines:

- ➔ Maintain the manufacturer-defined minimum clearance between PV panels and lightning conductors.
- ➔ If the required separation distance cannot be maintained, the PV array must be bonded to the lightning protection system following the system designer's instructions.
- ➔ Bonding must be done at designated grounding points, not ad hoc locations.

This prevents dangerous flashovers and ensures compliance with lightning protection standards.

ATTENTION

- ➔ HolaRoof metal battens, clamps, rails and panel frames are conductive and must be properly integrated into the building's PE network.
- ➔ Surge protection devices (SPDs) must be installed on both DC and AC sides of the inverter according to local requirements.
- ➔ The final lightning protection layout must be confirmed by a certified installer or engineer.

10 FINAL CHECKS & DOCUMENTATION

Prior to commissioning the system, a comprehensive mechanical and electrical inspection must be performed to ensure compliance with installation standards and safety regulations.

MECHANICAL INTEGRITY CHECK

- ☑ Randomly check at least 10% of all clamp screws to ensure they are tightened to the specified torque (4.0–5.0 Nm). If loose clamps are found, check the entire array.
- ☑ Verify that all metal battens are securely fixed to rafters with 6×100 mm screws and that no battens are loose or deformed.
- ☑ Inspect all perimeter flashings (Ridge, Eaves, Verge, Valley). Ensure all roofing screws with EPDM washers are properly compressed (not bulging) and spaced correctly (~300 mm).
- ☑ Confirm that all cut filler panels have edge protection installed and are mechanically secure.

ELECTRICAL SAFETY CHECK (IEC 62446)

- ☑ Verify the electrical continuity of the protective earth (PE) path from the furthest PV module frame to the main earthing terminal. Resistance must be < 1 Ohm.
- ☑ Ensure no DC cables are hanging loose or touching the roof underlayment. All cables must be routed inside the metal batten channels.
- ☑ Test the polarity and Open Circuit Voltage (Voc) of every string before connecting to the inverter.
- ☑ Perform an ISO test (Riso) to ensure there are no faults in the cabling or connectors.

11 APPENDICES

Appendix A – HolaRoof Installation Checklist

To be completed by the Lead Installer upon project completion.

Project Details Project Name / Client: _____
Installation Address: _____ Installation Date: _____ System Size (kWp): _____ PV Module Model: _____
Total Module Count: _____

1. Roof Preparation & Batten Structure [ ] Underlayment: Installed with correct overlap (100–150 mm) and is watertight. [ ] Ventilation: Minimum 50 mm air gap ensured below the metal battens. [ ] Alignment: Starter batten is aligned perfectly parallel with the eave line. [ ] Fixation: All battens secured with 2 screws per rafter (6x100 mm) to prevent twisting. [ ] Joints: Batten splices (joints) are fully locked and screwed tight through pre-punched holes.
2. Grounding, Bonding & Torque [ ] Module Grounding: Every module row has a grounding connection via the clamp grounding screw (Torque: 2.0–2.5 Nm). [ ] Batten Continuity: All metal battens are electrically bonded together. [ ] Main Earthing: Main PE conductor (min 6 mm2) is connected to each batten row (M8 bolt torque: 14–18 Nm). [ ] Clamp Torque: Random check performed; mounting screws tightened to 4.0–5.0 Nm.
3. PV Module & Flashing Installation [ ] Clamping: Each PV module is secured with 3 clamps (2 edges + 1 center). [ ] Vertical Flashing: Installed with the EPDM gasket facing UP. [ ] Horizontal Flashing: Overlaps the row below by 15 mm and sits flush with the panel edge. [ ] Maintenance Gap: A 15 mm clearance gap is maintained above every module row for future access. [ ] Valleys: Valley channels are open (120–150 mm width) and unobstructed.
4. Final Finishing & Safety [ ] Filler Panels: All cut edges of filler panels are protected with sheet-metal edge trim. [ ] Cleaning: Roof is clean; all metal shavings (swarf) and debris removed to prevent rust. [ ] Aesthetics: Any scratches on flashings have been touched up with matching paint. [ ] Cabling: No cables are resting on the underlayment; all routed in batten channels. [ ] Documentation: Photos of the completed installation and cable management have been taken.

Installer Declaration I hereby certify that the HolaRoof system has been installed in accordance with the manufacturer's installation manual (v1.0) and local building regulations.

Lead Installer Name: _____

Signature: _____ Date: _____

Appendix B – System Error Form / Reporting Procedure

If a system fault, component defect, or performance issue is detected during installation or operation, it must be reported immediately to the manufacturer.

Reporting Procedure:

1. Document the issue with clear photos (wide angle and close-up).
2. Note the serial numbers of affected modules (if applicable).
3. Describe the installation conditions and any error codes observed.
4. Send all information to: support@holaroof.com

WARNING!
Do not attempt to disassemble or repair sealed components without written authorization from HolaRoof support, as this may void the warranty.

Appendix C -Torque Settings

All fasteners used in the HolaRoof system must be tightened according to the torque values listed below. Incorrect torque can result in insufficient clamping force, component deformation or stainless steel galling (cold welding). Use a torque-controlled driver for all structural fixings.

❖ PV & Mounting Components

Fastener	Application	Material	Torque
6.3 × 25 mm self-drilling screw	PV clamp → metal batten	Carbon steel (coated)	4.0 – 5.0 Nm
Clamp grounding screw (3–4 mm)	Grounding point on clamp	Stainless steel	2.0 – 2.5 Nm
M8 grounding bolt	Batten grounding lug	A2 / A4 stainless	14 – 18 Nm

❖ Battens & Structural Fasteners

Fastener	Application	Material	Torque
6 × 100 mm wood screw	Metal batten → rafters	Carbon steel	6 – 8 Nm
5 × 50 mm wood screw	Hip / valley / support rails	Carbon steel	3.5 – 4.5 Nm
4.8 × 25 mm roofing screw (EPDM washer)	Flashings (ridge, hip, valley, verge, eaves)	Carbon steel	3.5 – 4.0 Nm

❖ Safety Notes

- ➔ Do not exceed 5 Nm for small stainless steel screws (risk of galling / cold welding).
- ➔ When working with A2/A4 stainless fasteners, use low-speed screwdrivers and steady torque.
- ➔ EPDM-washer screws must be tightened until the washer is compressed but not bulging.
- ➔ Recheck torque annually for safety-critical components (snow guards, roof walkway, ladder systems).
- ➔ Replace any fastener showing corrosion, thread damage or deformation.

❖ Recommended Tools

- ➔ Adjustable torque-controlled driver (2–20 Nm range)
- ➔ ¼” and ⅜” torque wrenches for grounding bolts
- ➔ Low-speed drilling mode for stainless steel fixings