SOLARSTONE

Solar Carport Modern
Standard & Nordic & Extended

Installation Manual & Technical Specification

Version: 2.0 | November-2024

Table of Contents

Description

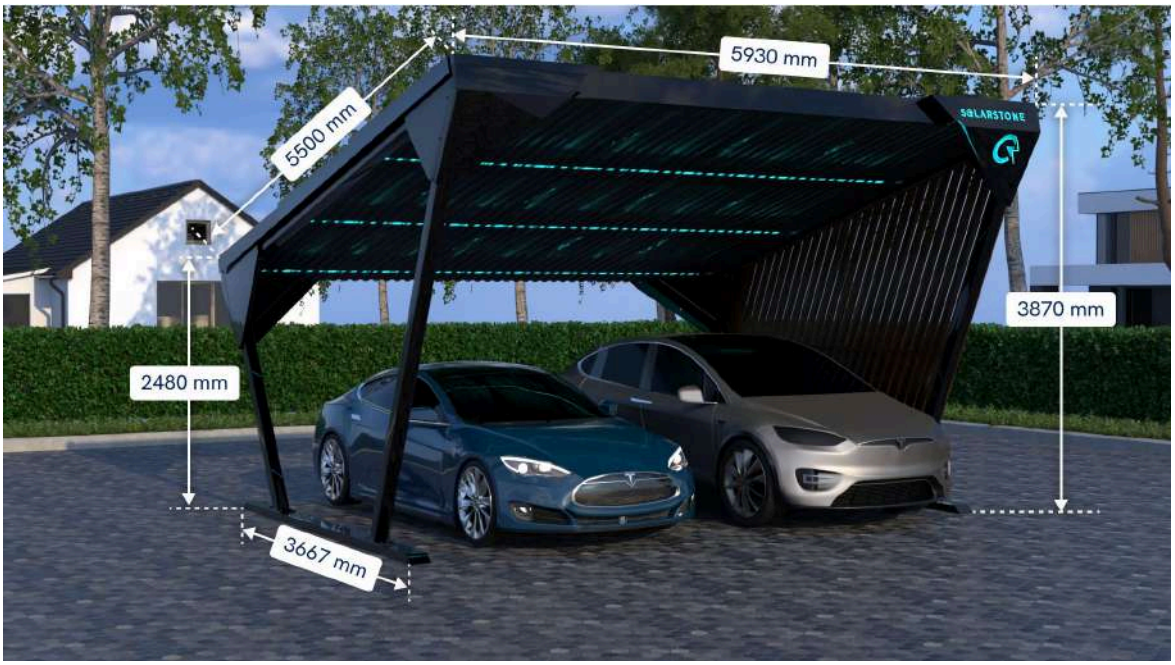
Solarstone Solar Carport produces electricity for self-consumption and can charge an electric car. Surplus energy can be sold back to the grid, allowing the carport to pay for itself. Solarstone's building-integrated solar panels ensure resource efficiency, an attractive appearance, and water-tightness. The most advanced components of the PV industry are used in the carports, which have passed safety tests.

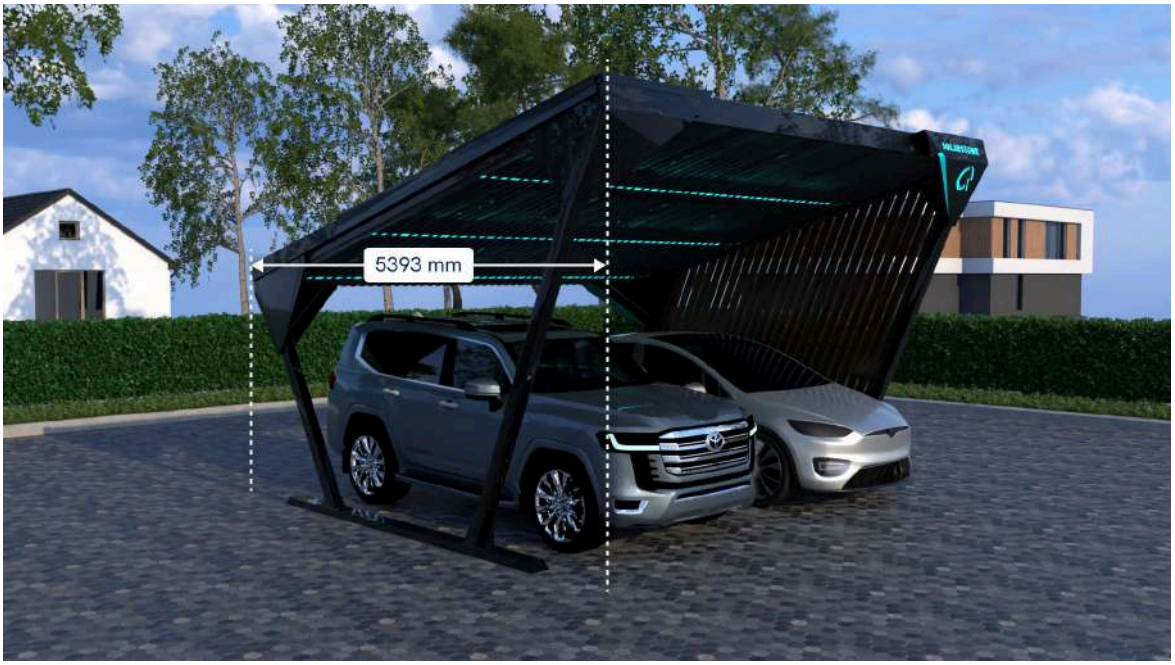
With Solarstone's innovative and patented **Click-on technology**, **FuturaSun** solar panels can be utilized to maximize productivity, even on compact roof spaces. The Solar Carport is designed to reliably generate electricity for at least 25 years. Engineered and rigorously tested for the Nordic market, the carport boasts exceptional durability.

Solarstone's Solar Carport comes with an optional **EV charger**. For optimal gains, the carport should be connected to the power grid. This allows you to use surplus energy for self-consumption or charge your electric car at any time of day. If desired, you can make a simple modification on your phone to charge your car with solar energy only, ensuring no additional electricity is purchased from the grid.

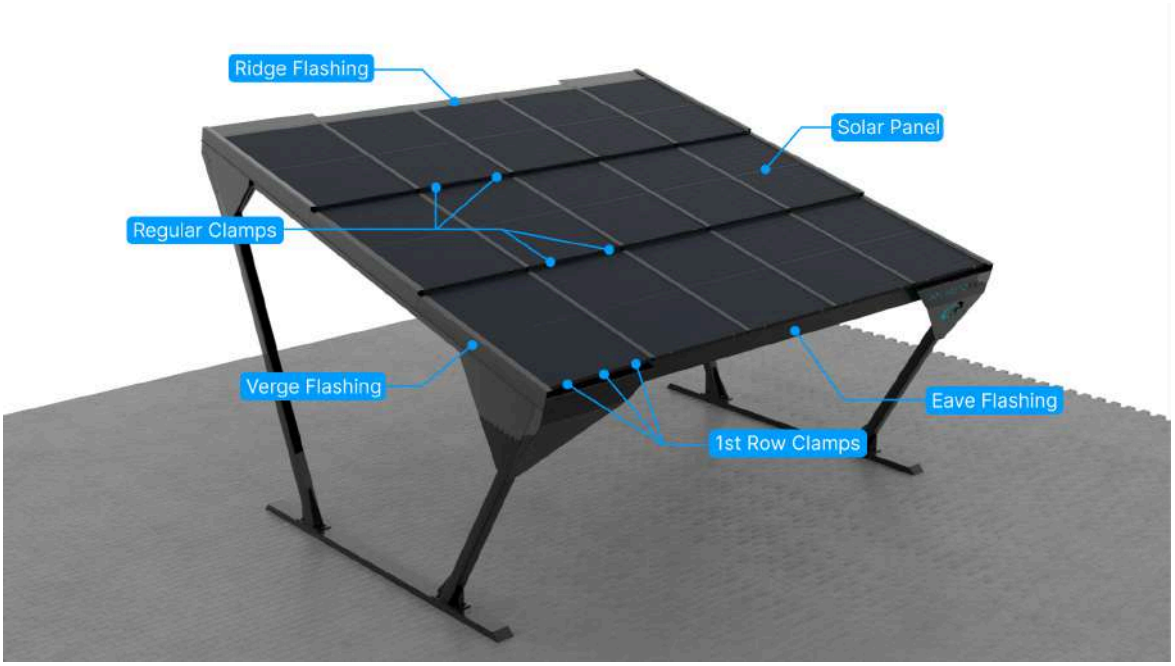
- Solar power for self-consumption
- Charge electric vehicles
- Reduce dependence on electricity prices
- Protects cars from direct sunlight
- Provides protection from the weather
- Offers functionality similar to that of a garage
- Earn credit by selling surplus energy

Carport Technical Specifications





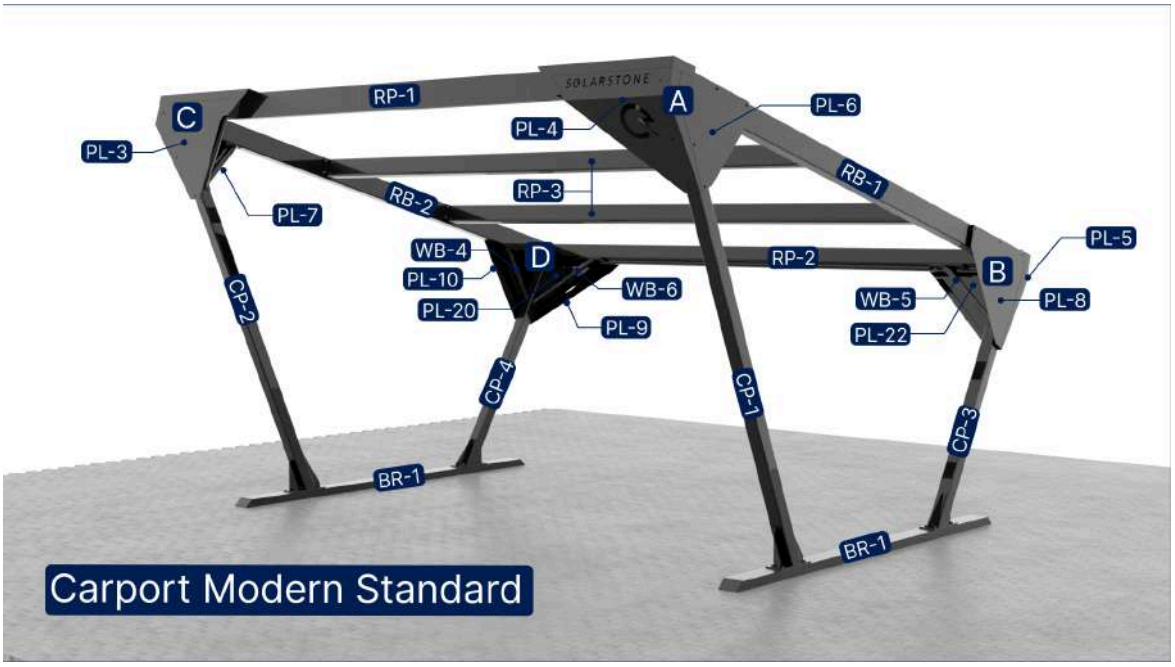

SOLARSTONE
2230 mm
5571 mm

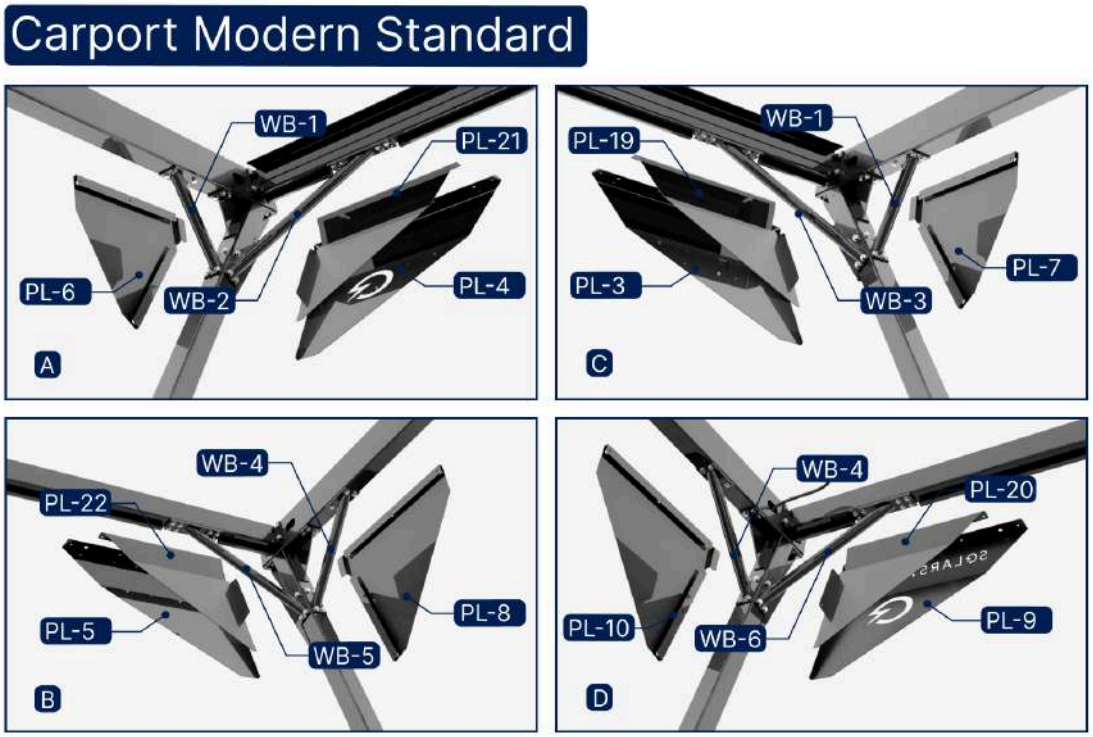

Ridge Flashing
Solar Panel
Regular Clamps
Verge Flashing
Eave Flashing
1st Row Clamps

Solar Carport Modern	
Total Output	6450 W
Pv-Module	FuturaSun 430W
Total Amount Of Pv Panels	15
Profile Material	S355 Galvanized steel
External Measurements (Mm)	5930x5392x3870 (WxLxH) 31.97 m^2
Roof Dimensions	5930x5500 (WxL) 32.61 m^2
BIPV Panel Dimensions	1203 x 1783 x 41.2 (WxLxH) (2.14 m^2)
BIPV Panel Weight	28.83 kg
Metal Sheet Ceiling Panel Dimensions	1040mm x 5310mm, 6 pcs
Inverter	Consult with the local sales partner
Charger	Consult with the local sales partner
Roof Slope	15°

Steel Profile Dimensions	Width	Length	Thickness
Posts (CP 1-CP 4) (mm)	120	120	6
Roof Beams (RB 1-RB 2) (mm)	200	120	6
Roof Purlin (RP 1-2) (mm)	150	100	6
Roof Purlin (RP 3) (mm)	180	100	8

CarPort Modern Standard component list



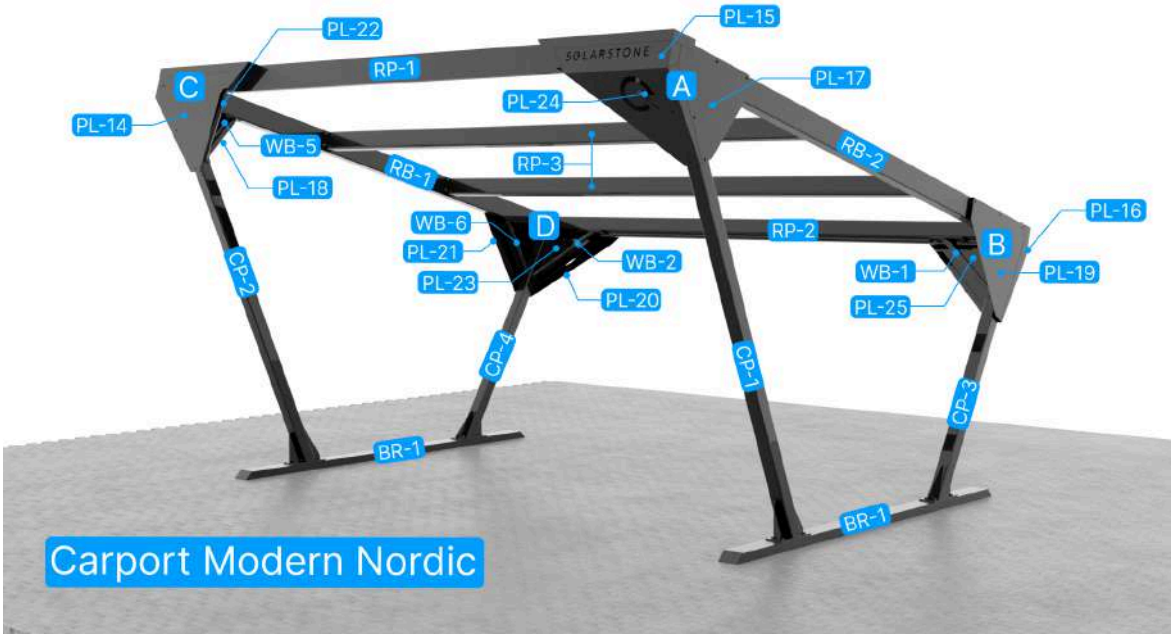


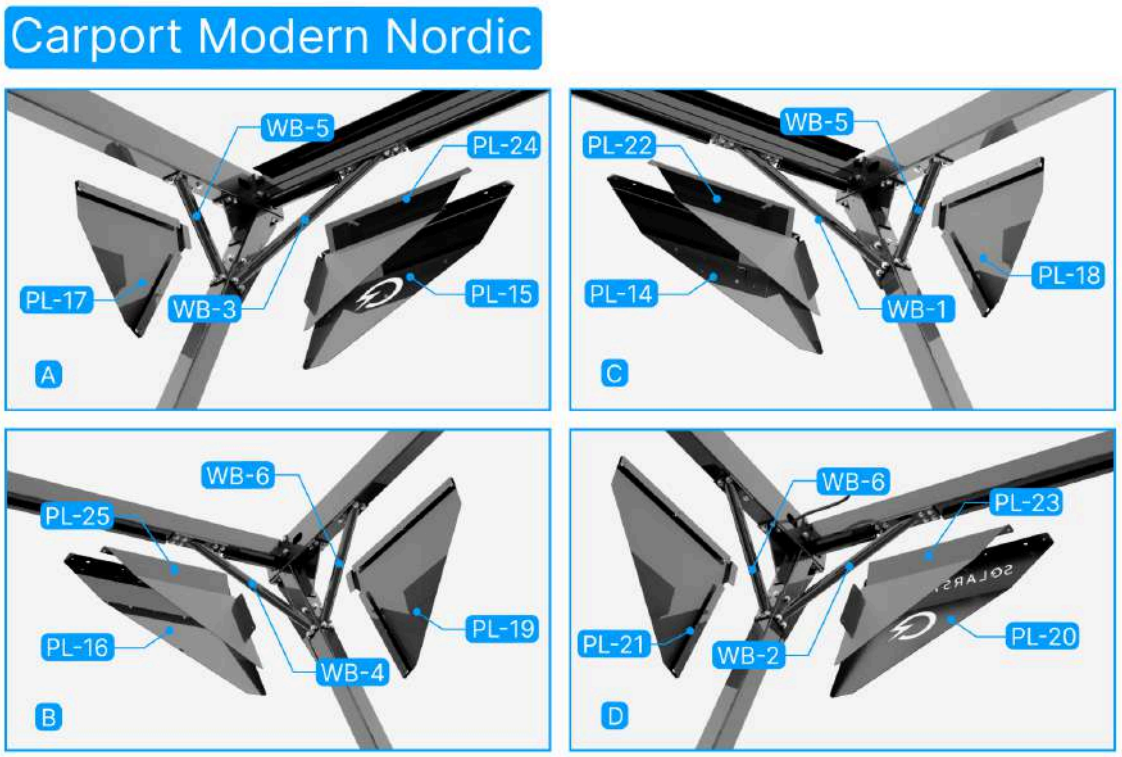
Metal Structure specification (Standard)		
Components	**Item**	**Quantity**
Base Rails	BR-1	2
Right Rear Corner Post	CP-3	1
Right Front Corner Post	CP-1	1
Left Rear Corner Post	CP-4	1
Left Front Corner Post	CP-2	1
Eave Purlin	RP-2	1
Ridge Purlin	RP-1	1
Purlin	RP-3	2
Left Roof Beam	RB-2	1
Right Roof Beam	RB-1	1
Right Rear Corner diagonal Plate Outside **Inside** **Side**	 PL-5 PL-22 PL-8	 1 1 1
Left Rear Corner diagonal Plate Outside **Inside** **Side**	 PL-9 PL-20 PL-10	 1 1 1
Right Front Corner diagonal Plate **Outside** **Inside** **Side**	 PL-4 PL-21 PL-6	 1 1 1
Left Front Corner diagonal Plate Outside **Inside** **Side**	 PL-3 PL-19 PL-7	 1 1 1
Wall Bracing	WB-(1-6)	8

Fastening components						
Item	**Diameter**	**Size**	**Standard**	**Strength**	**Material or surfacing**	**Number**
SFS TDBL-10,6	10,6	10,6			Hot-dipped galvanized	60
SFS TDBL-13,4	13,4	13,4			Hot-dipped galvanized	144
Bolt	10	M10*30	ISO4017	8.8	Hot-dipped galvanized	20
Bolt	20	M20*50	ISO4017	8.8	Hot-dipped galvanized	16
Nut	10	M10	ISO4032	8 või 10	Hot-dipped galvanized	20
Nut	20	M20	ISO4032	8 või 10	Hot-dipped galvanized	16
Washer	11	M10	ISO7091	HV100	Hot-dipped galvanized	20
Washer	22	M20	ISO7091	HV100	Hot-dipped galvanized	16
Flügel PIAS 65mm self-drilling screw	4,8			8.8	Ruspert 500 h (C3)	
DIN 7504-K 5.5x32mm Self-Drilling Screws, A2 + Ruspert (C3).	5,5				A2 stainless steel, Ruspert (C3)	
ESSVE 4.8x35 KAT.KR/6K BLACK-250-4	4,8				Ruspert (C3)	

Timber Cladding fastening screws						
WOOD SCREW ESS CS 5,0X90 CS	5				CorrSeal C4	
WOOD SCREW ESS CS 4,5X50 CS	4.5				CorrSeal C4	

CarPort Modern Nordic component list





Metal Structure specification (Nordic)		
Components	**Item**	**Quantity**
Base Rails	BR-1	2
Right Rear Corner Post	CP-3	1
Right Front Corner Post	CP-1	1
Left Rear Corner Post	CP-4	1
Left Front Corner Post	CP-2	1
Eave Purlin	RP-2	1
Ridge Purlin	RP-1	1
Purlin	RP-3	2
Left Roof Beam	RB-1	1
Right Roof Beam	RB-2	1
Right Rear Corner diagonal Plate Outside **Inside** **Side**	 PL-16 PL-25 PL-19	 1 1 1
Left Rear Corner diagonal Plate Outside **Inside** **Side**	 PL-20 PL-23 PL-21	 1 1 1
Right Front Corner diagonal Plate Outside **Inside** **Side**	 PL-15 PL-24 PL-17	 1 1 1
Left Front Corner diagonal Plate Outside **Inside** **Side**	 PL-14 PL-22 PL-18	 1 1 1
Wall Bracing	WB-(1-6)	8

Fastening Components						
Item	**Diameter**	**Size**	**Standard**	**Strength**	**Material or surfacing**	**Number**
SFS TDBL-10,6	10,6	10,6			Hot-dipped galvanized	124
SFS TDBL-13,4	13,4	13,4			Hot-dipped galvanized	80
Bolt	10	M10*30	ISO4017	8.8	Hot-dipped galvanized	20
Bolt	20	M20*50	ISO4017	8.8	Hot-dipped galvanized	16
Nut	10	M10	ISO4032	8 või 10	Hot-dipped galvanized	20
Nut	20	M20	ISO4032	8 või 10	Hot-dipped galvanized	16
Washer	11	M10	ISO7091	HV100	Hot-dipped galvanized	20
Washer	22	M20	ISO7091	HV100	Hot-dipped galvanized	16
Flügel PIAS 65mm self-drilling screw	4,8			8.8	Ruspert 500 h (C3)	
DIN 7504-K 5.5x32mm Self-Drilling Screws, A2 + Ruspert (C3).	5,5				A2 stainless steel, Ruspert (C3)	
ESSVE 4.8x35 KAT.KR/6K BLACK-250-4	4,8				Ruspert (C3)	

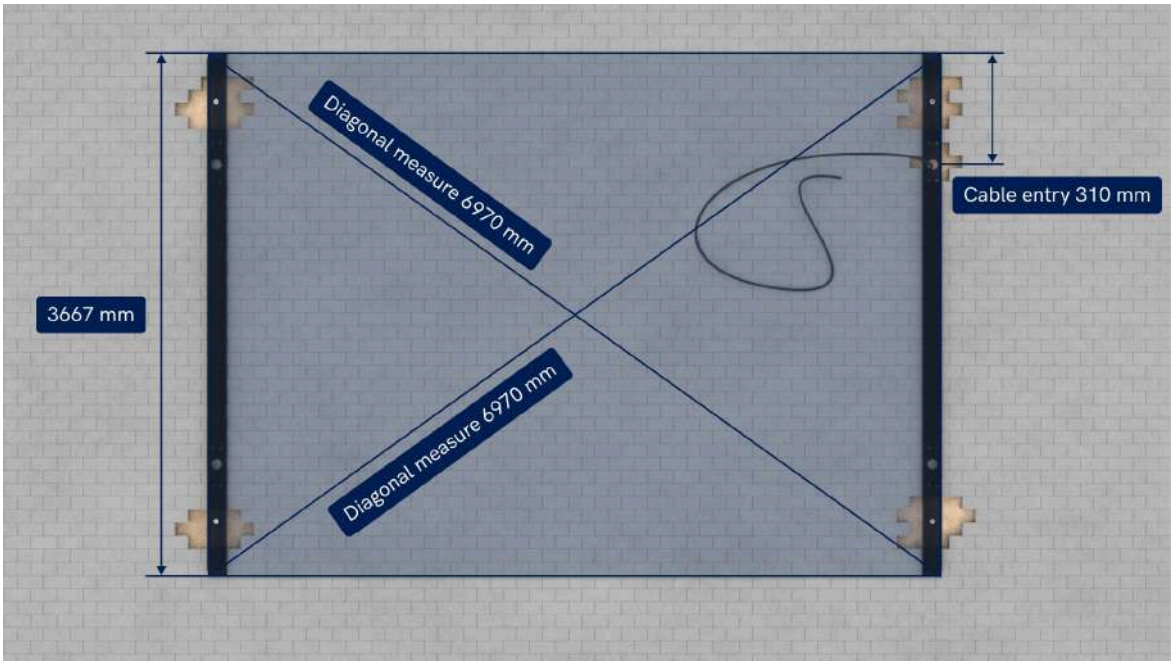
Timber Cladding fastening screws						
WOOD SCREW ESS CS 5,0X90 CS	5				CorrSeal C4	
WOOD SCREW ESS CS 4,5X50 CS	4.5				CorrSeal C4	

Steps 1 | Foundation

Step 1 | Prepare CarPort Foundation

- It is mandatory to determine the possible wind, snow and foundation loads affecting the area and Carport. Coordinate these with a local licensed specialist/engineer and compare them with the permissible values for the carport. It is permitted to use any other form of foundation solution than presented in the manual but the responsibility of the system integrity will lay on local engineer and installer. Familiarize with Carport engineering design raport, which will present the necessary loads for the Carport foundation, wind and snow loads. Raport can be downloaded from Solarstone website.

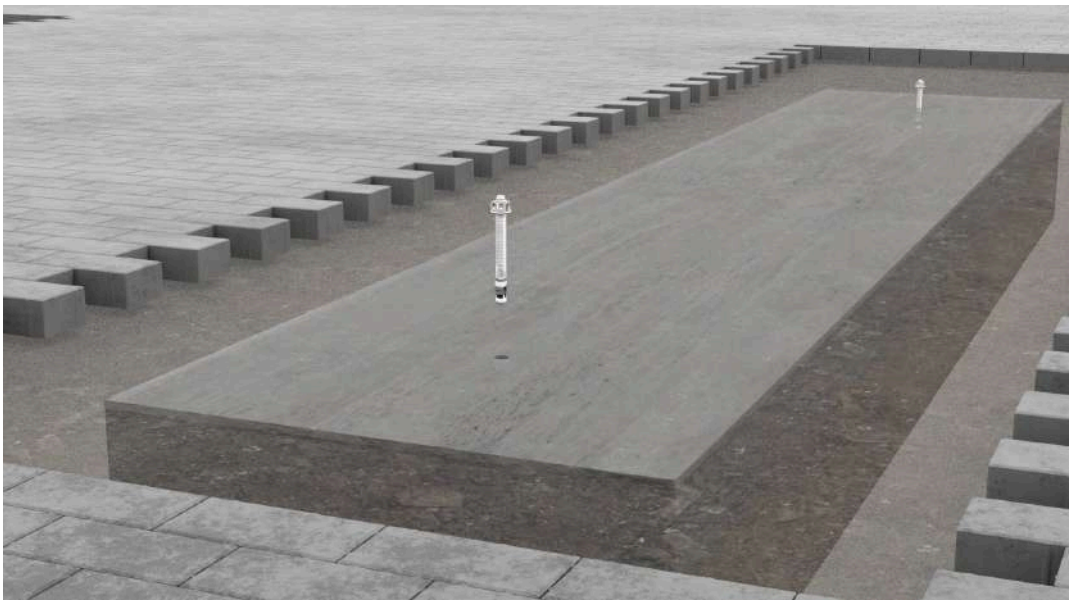
- The surface under the carport should be evenly leveled and stable (stone paving, asphalt, gravel, etc.). Soft soil or sand does not meet the necessary requirements. A maximum slope of 10 degrees is permissible for the surface, ensuring a minimum roof slope of 5 degrees. A reinforced concrete block foundation is one of the possible solutions, and its size depends on the potential wind loads.



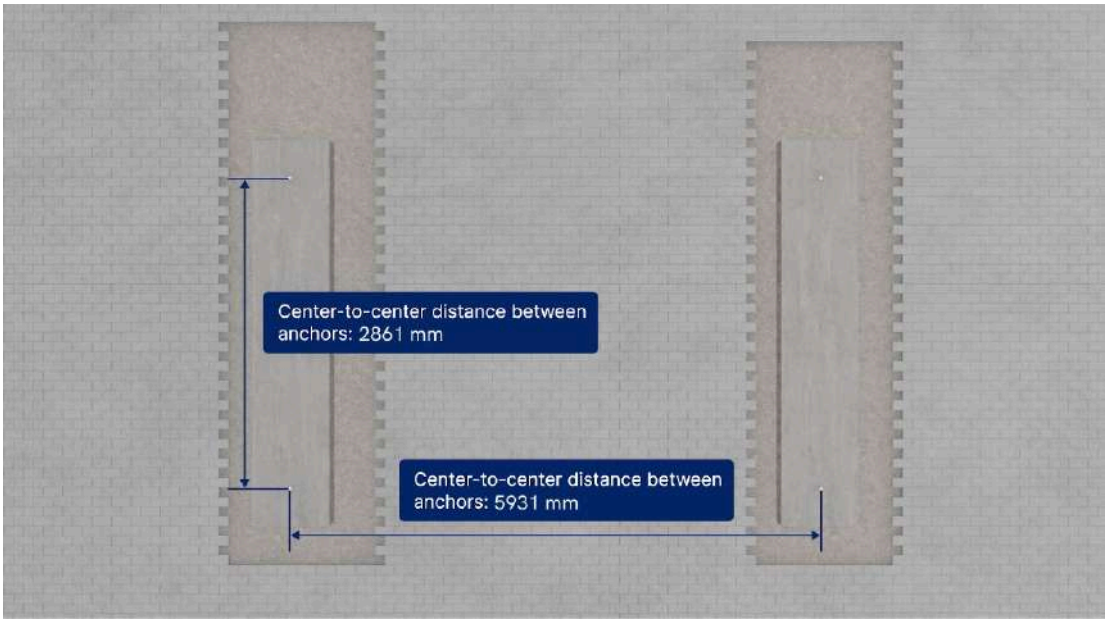
Version 1: Concrete slab foundation

- It is possible to use a concrete slab foundation. While using slab foundation make sure it is built evenly and leveled. It is advised to also consider rectangular prism shape for concrete as it might pose better characteristics. Familiarize yourself with the Carport design rapport, which will present the necessary vertical compression and tension forces for the foundation. The forces are different for Standard and Nordic models. Raport can be downloaded from Solarstone website.

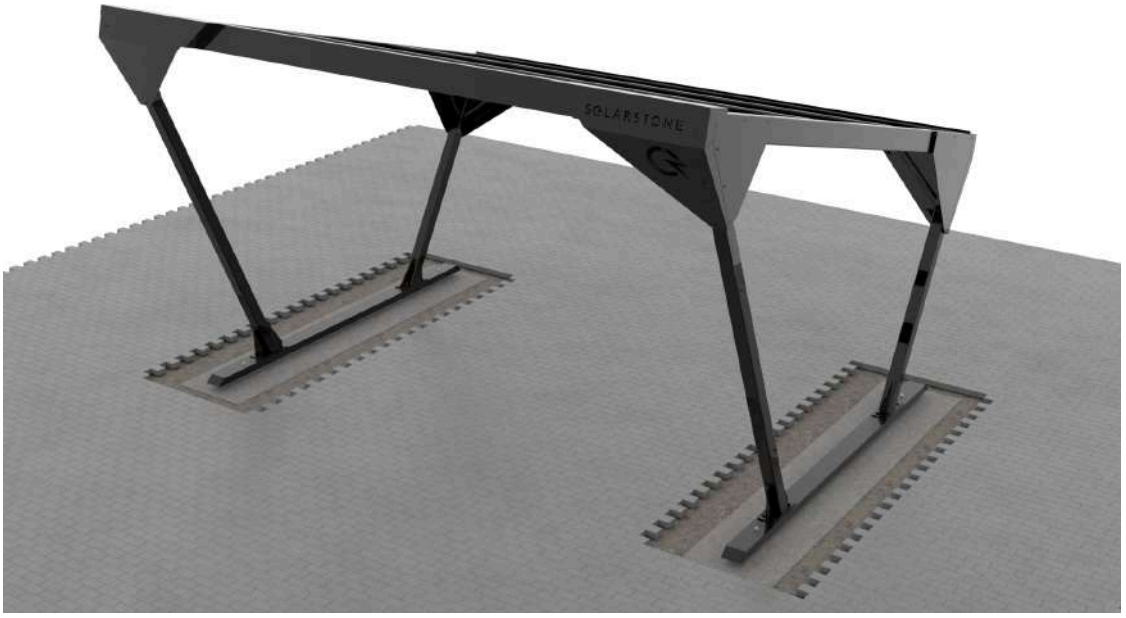
- Use wedge anchors to connect the concrete blocks onto base rails. Consult with a local engineer partner to find the correct size of anchor for the project.



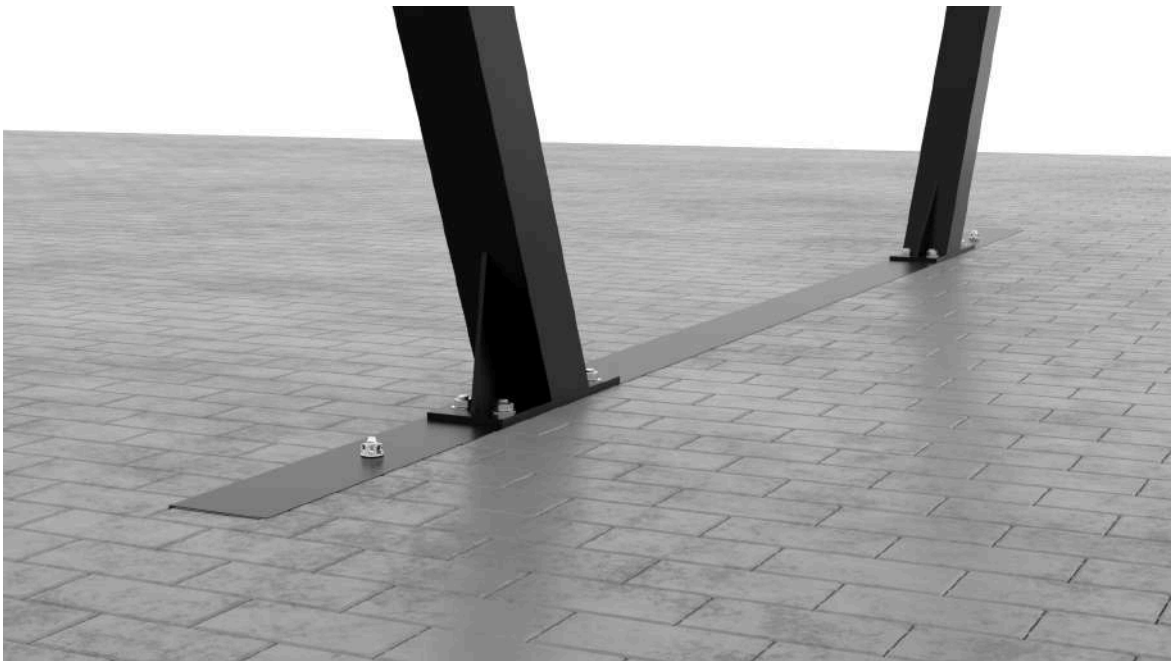
- For correct placement of wedge anchors, refer to the drawing below.



- Install the Carport on top of the foundation.



- After installing the base rails alongside the sides of the carport, raise the sides and secure the anchors with nuts.

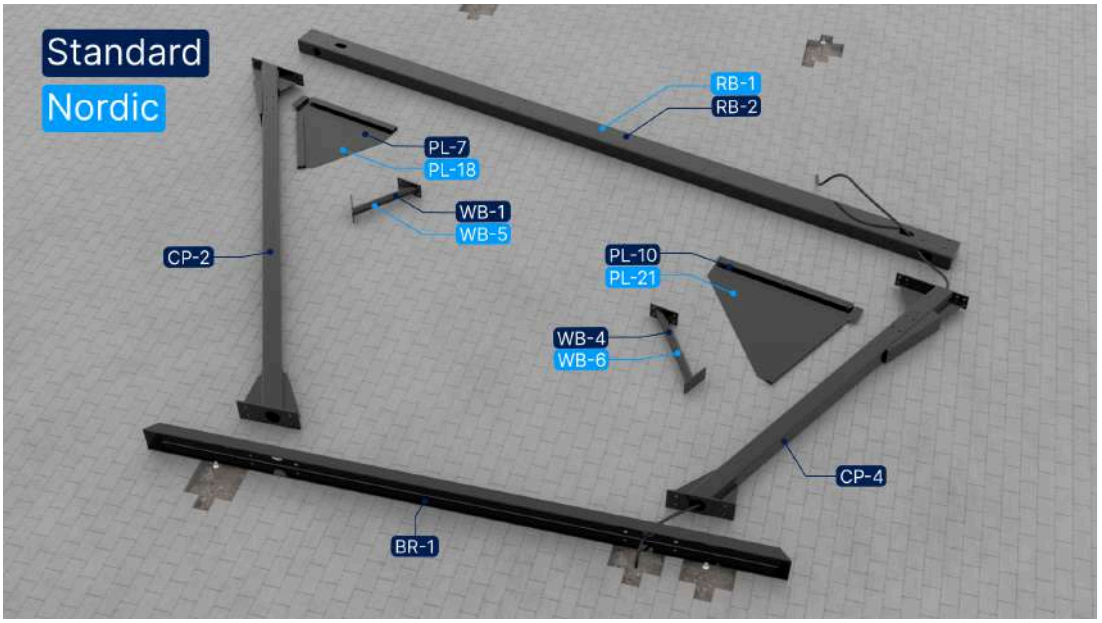


- **The ground rises and sags during the winter period due to freezing the anchor connections should be checked and tightened annually!**

Steps 3-11 | Metal frame assembly

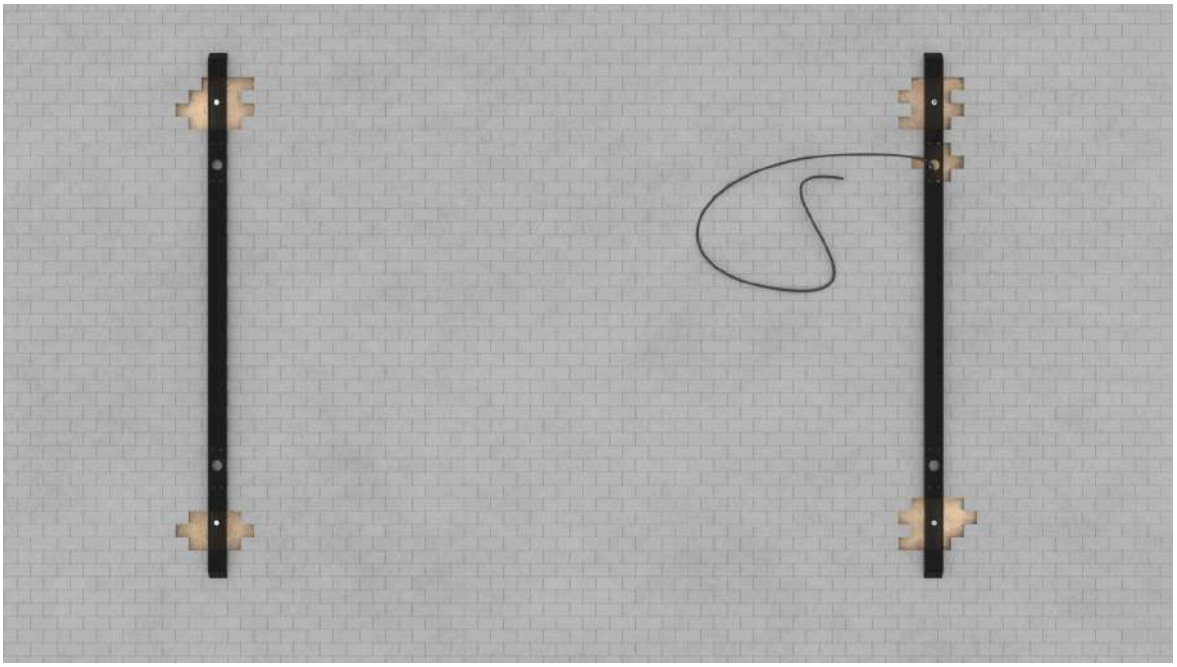
Step 3 - Assembly preparation

- Place one side of carport frame next to foundation connections. When placing a metal structure on the ground, it is recommended to use a protective material underneath the metal to avoid paint damage. Always use all safety measures.

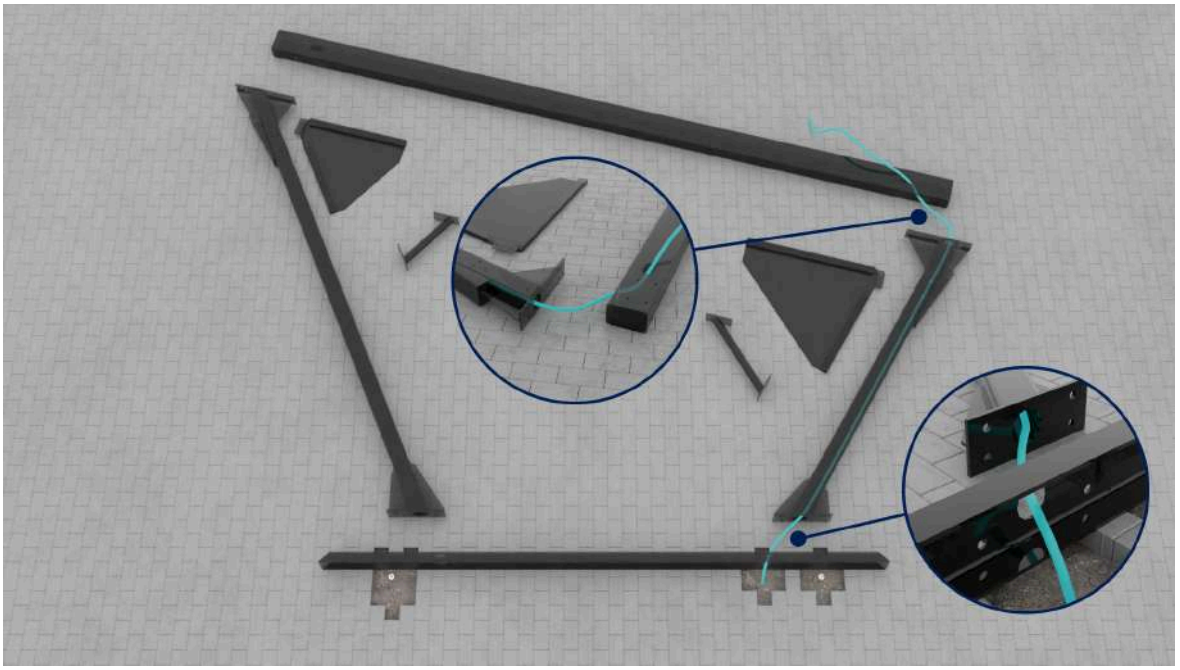


Step 4 - Install power cable

- When bringing the cables out of the ground leave a 4 meter reserve to do electrical connections later under the ceiling.

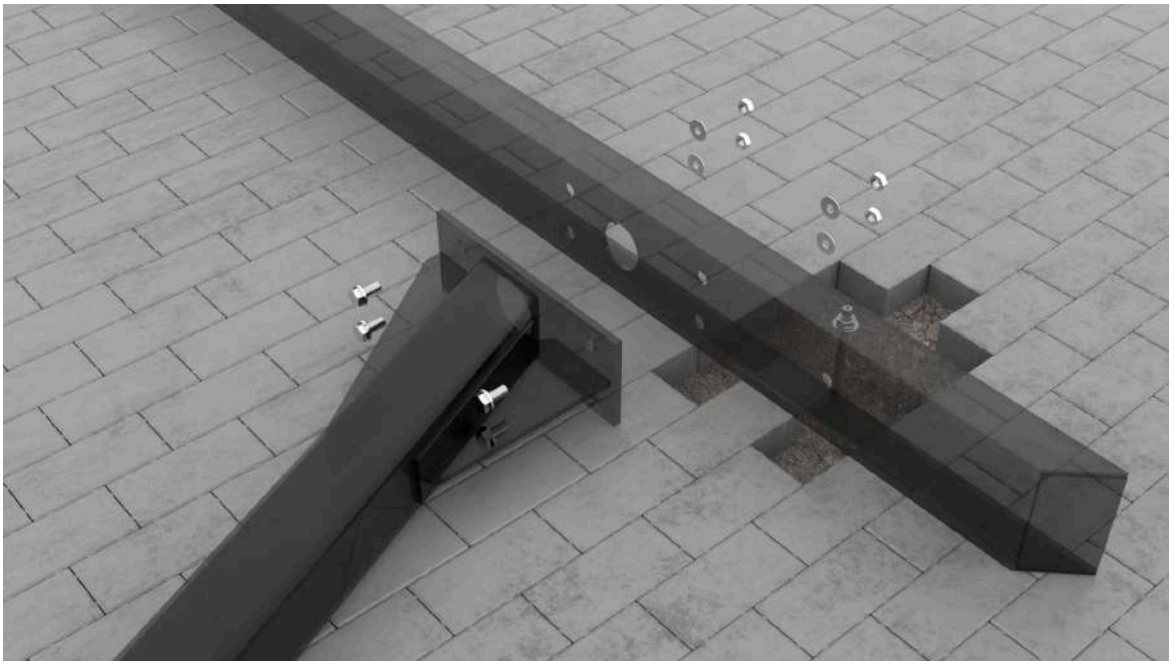


- Pull power cables through base rail (BR-1), corner post (CP-4) and roof beam (RB-1 or RB-2) before fastening the structural parts together.



Step 5 - Assemble corner posts and base rails

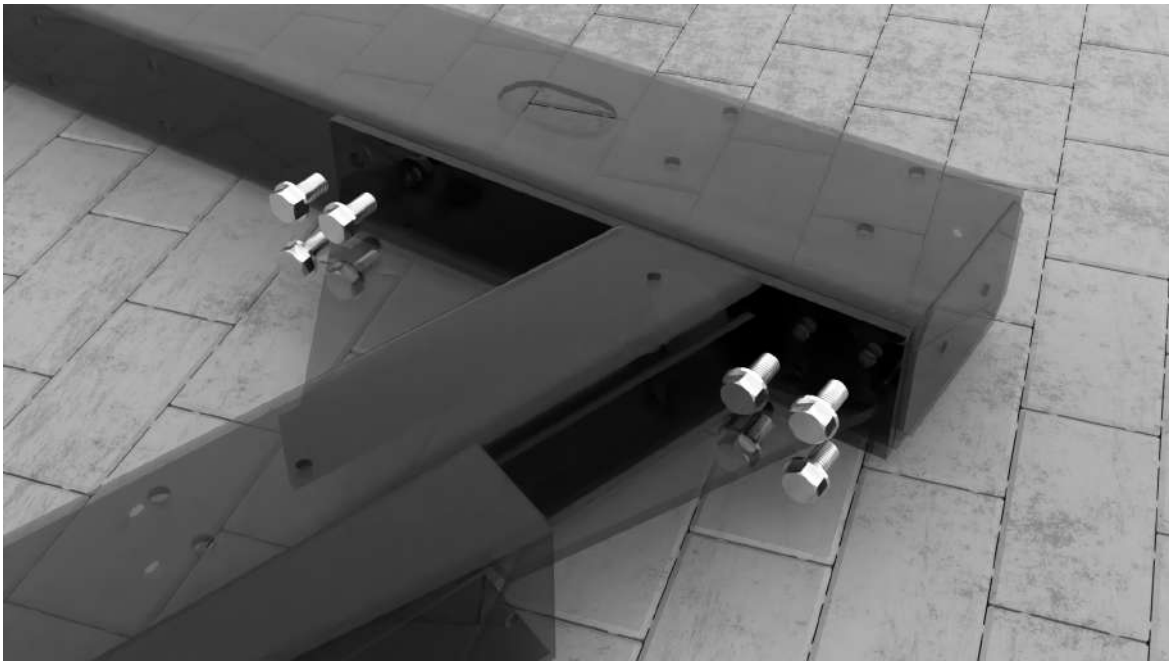
- Align the base rail holes with the corner post mounting holes carefully to avoid any paint damage.



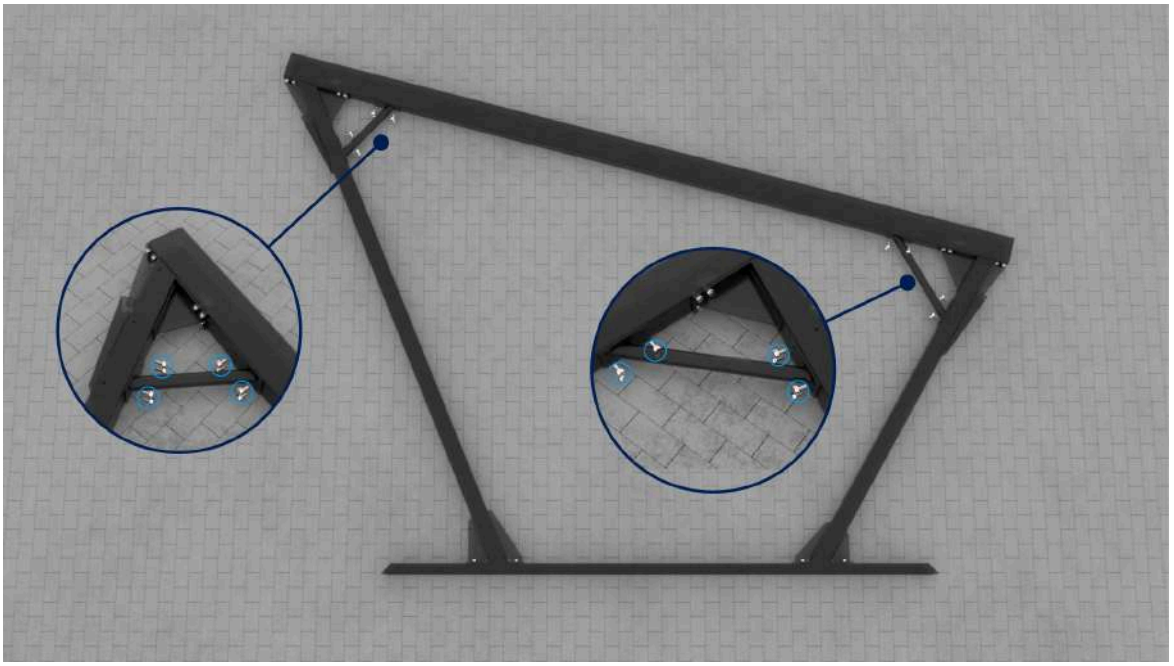
- Use M20 bolts, nuts, and washers to secure the connections, with 4 sets of each for every corner post (CP-1; CP-2; CP-3; CP-4).

Step 6 - Assemble corner posts and roof beams

- Secure the corner posts (CP-1; CP-2; CP-3; CP-4) to the roof beam (RB-1; RB-2) using 8 pcs of SFS TDBL-13.4 self-tapping bolts in each corner.



- Secure the wall diagonal braces (Standard and Nordic) using 8 pcs of SFS TDBL-13.4 self-tapping bolts for each brace.

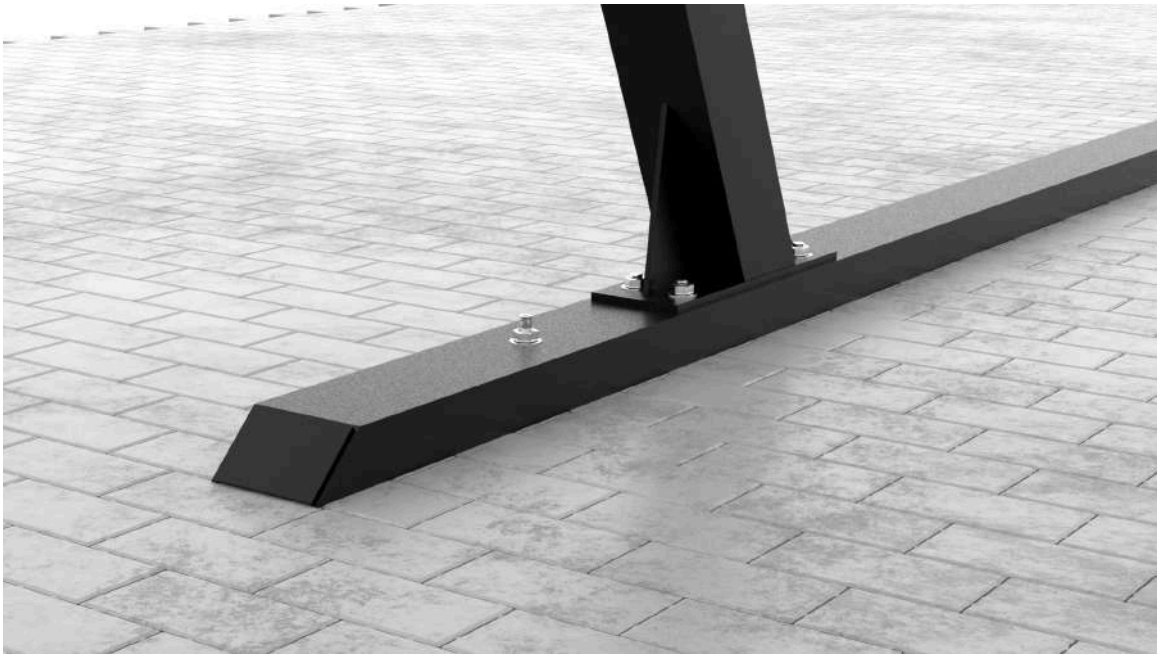


Step 7 - Lifting up Carport frames

- Lifting up CarPort both sides connect lifting belts around roof beams and use a lifting equipment, as one side frame weighs more than 350 kg. Always use safety measures.

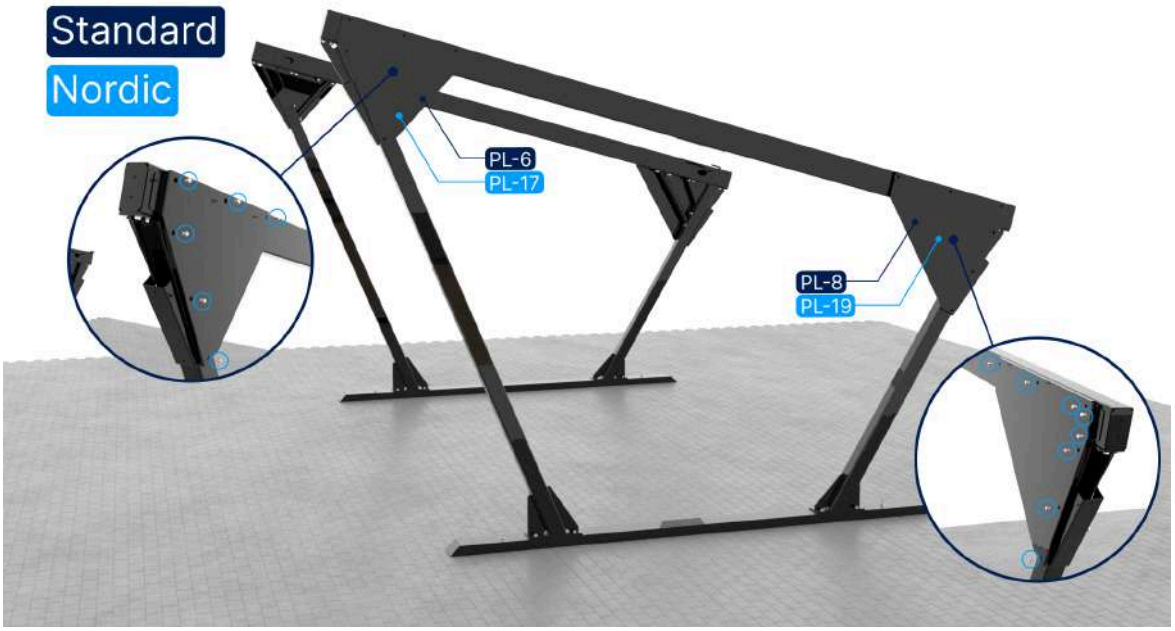
Step 8 - Connect foundation anchors

- Once the sides are lifted onto the foundation anchors, secure them with M20 nuts and washers.

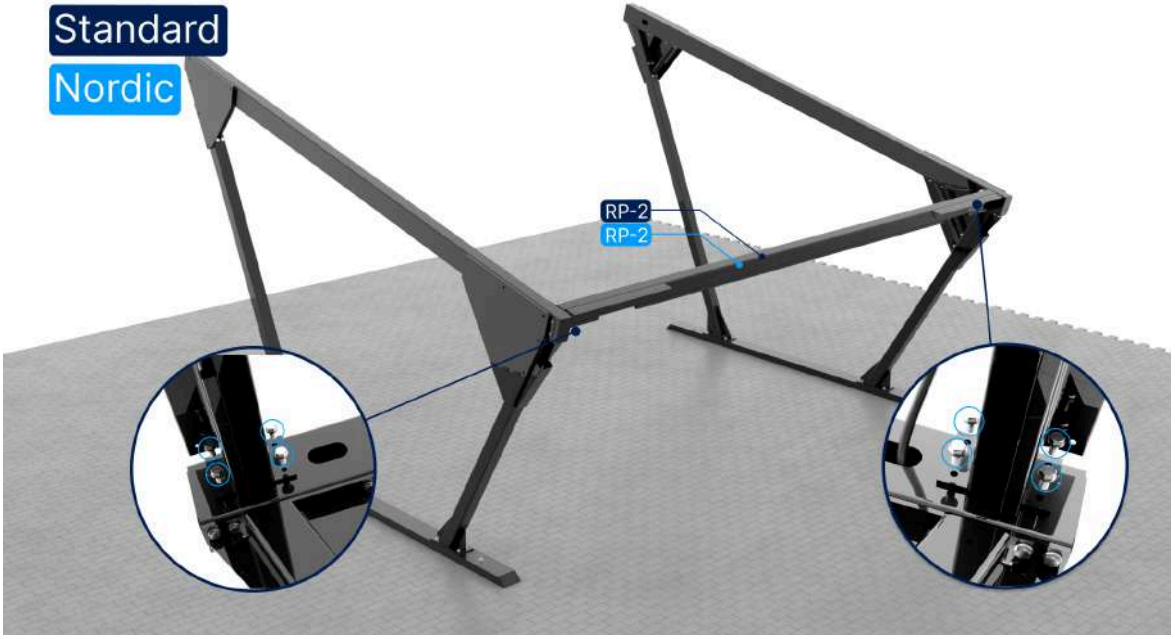


Step 9 - Install eave, ridge, and middle purlins.

- Install the wall diagonal plate braces onto the sides using 14 pcs of SFS TDBL-10.6 self-tapping bolts per side.



- Use lifting straps and lifting equipment to position the roof beam. Purlins weigh up to 200 kg.

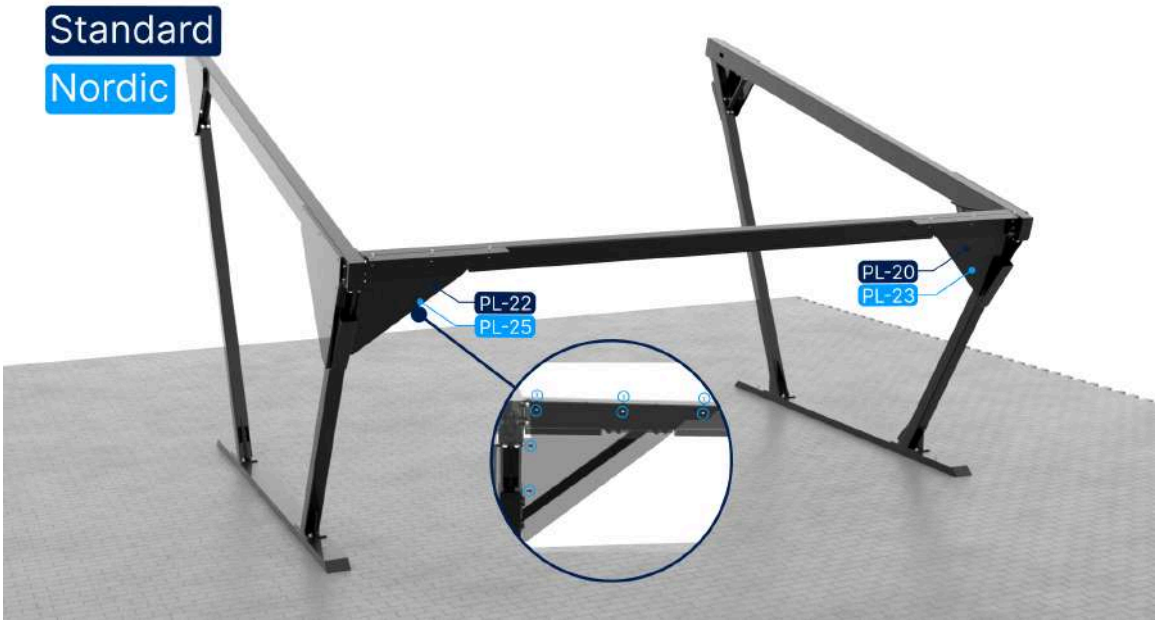


- Connect the eave purlin using 8 pcs of SFS TDBL-13.4 self-tapping bolts.

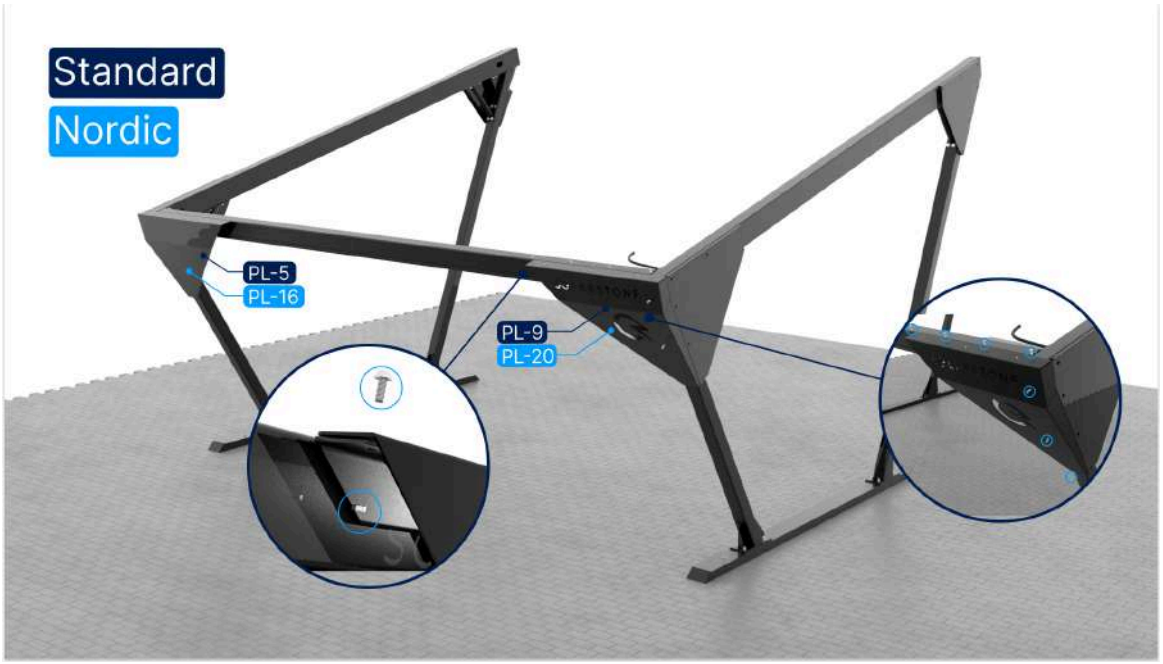
- Secure the eave purlin diagonal brace using 12 pcs of SFS TDBL-13.4 self-tapping bolts per brace.

Step 10 - Install diagonal plates

- While connecting diagonal plates, make sure to follow the markings. The inner, outer, and side diagonal plates have different PL markings.
- Secure the inner diagonal plate to the eave purlin using 3 pcs of M10x25 bolts and 2 pcs of SFS TDBL-10.6 self-tapping bolts to corner posts

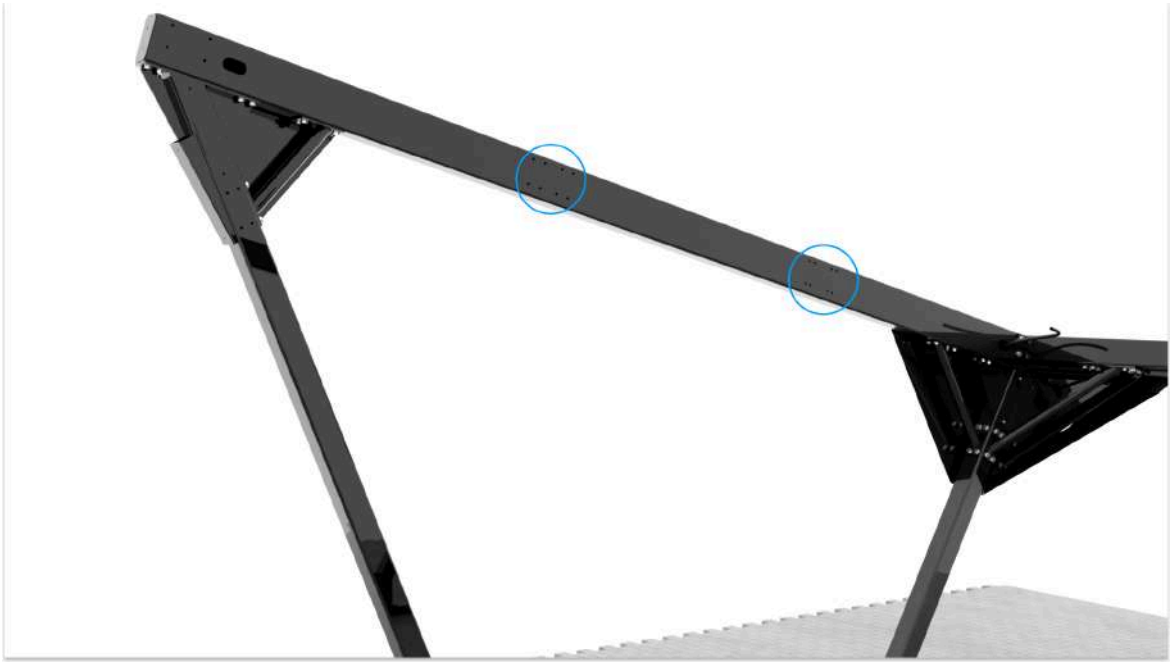


- Install the outer diagonal plates using 3 pcs of M10x25 bolts and 2 pcs of SFS TDBL-10.6 self-tapping bolts.

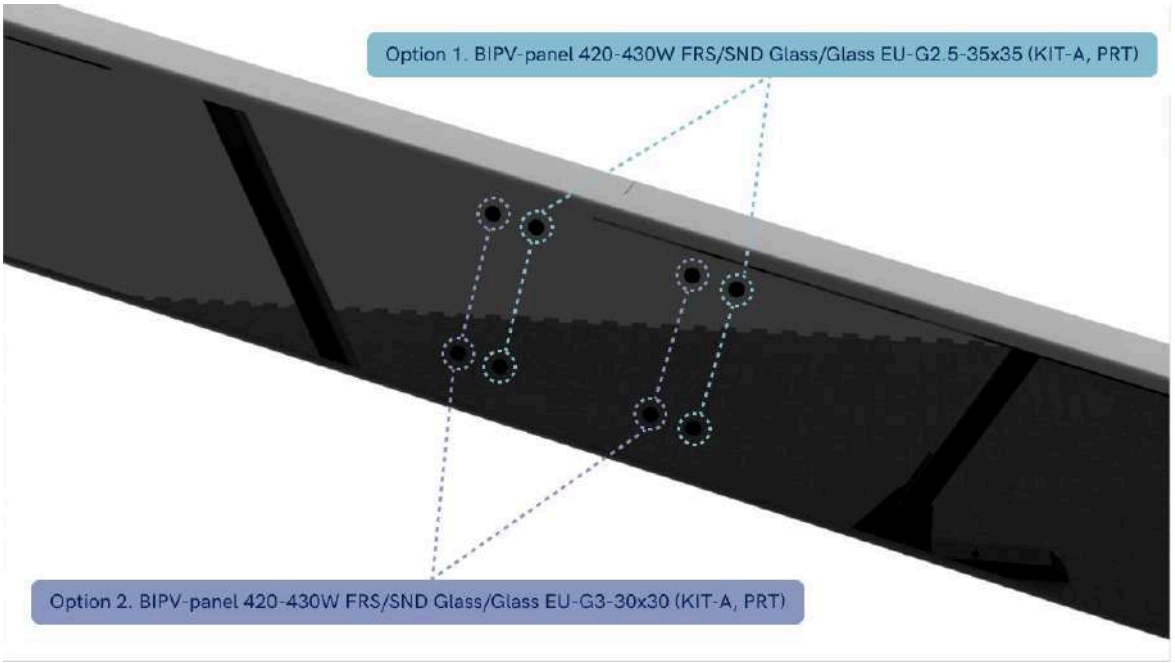


Step 11 - Install middle and ridge purlins

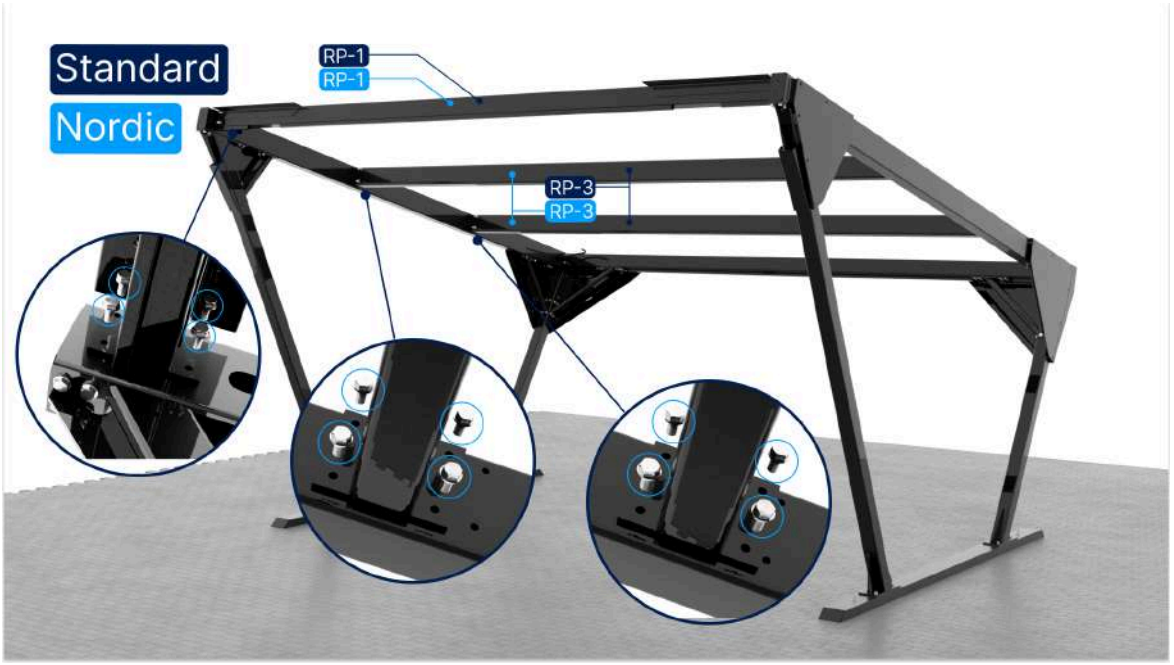
- The carport frame in this manual allows for the installation of two different sizes of BIPV. The attachment points of the middle purlins must be selected according to the size of the panel.



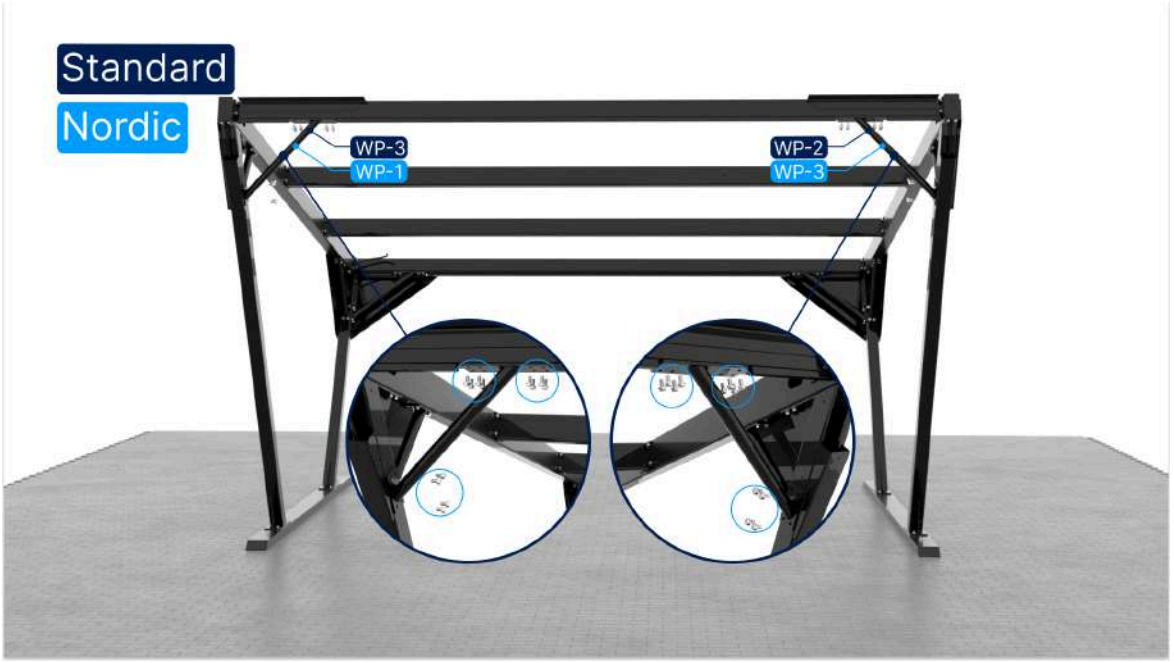
- For the FRS G2.5 BIPV panel, select the lower set of holes to secure the middle two purlins, and for the FRS G3 BIPV panel, select the upper set.



- Install the middle and ridge purlins using 8 pcs of SFS TDBL-13.4 self-tapping bolts per purlin.

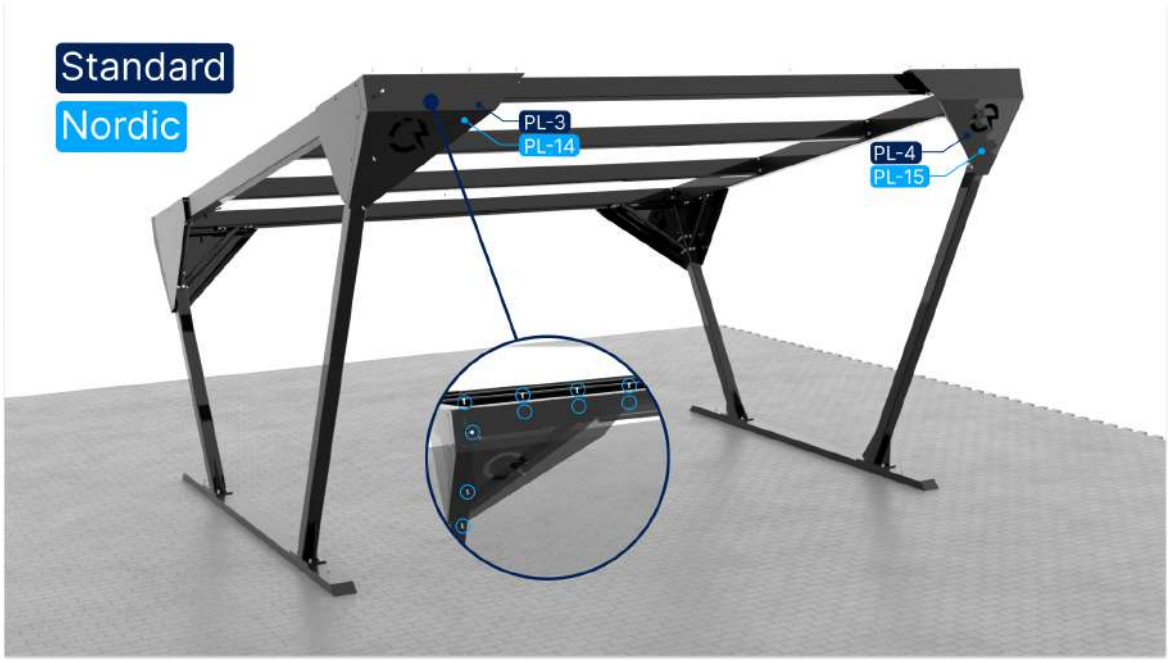


- Install the ridge diagonal braces with 12 pcs of SFS TDBL-13.4 self-tapping bolts per brace.



- Install the inner ridge diagonal plates using 3 pcs of M10x25 bolts and 2 pcs of SFS TDBL-10.6 self-tapping bolts per plate.

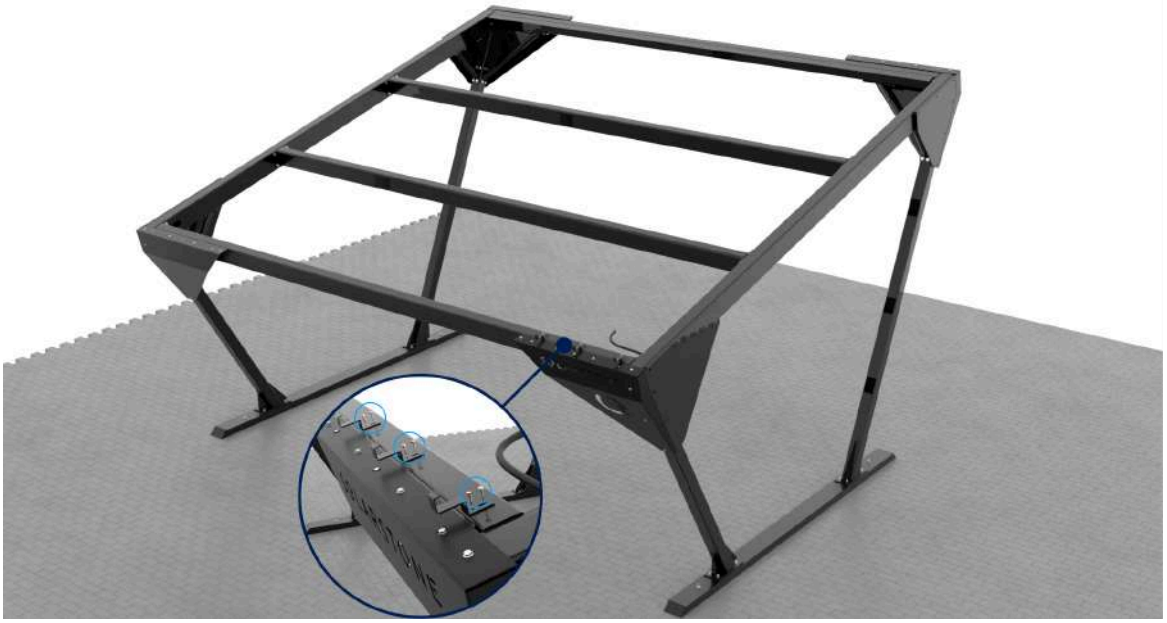
- Install the outer ridge diagonal plates using 3 pcs of M10x25 bolts and 4 pcs of SFS TDBL-10.6 self-tapping bolts per plate.



Steps 12-18 | Solar Full Roof™

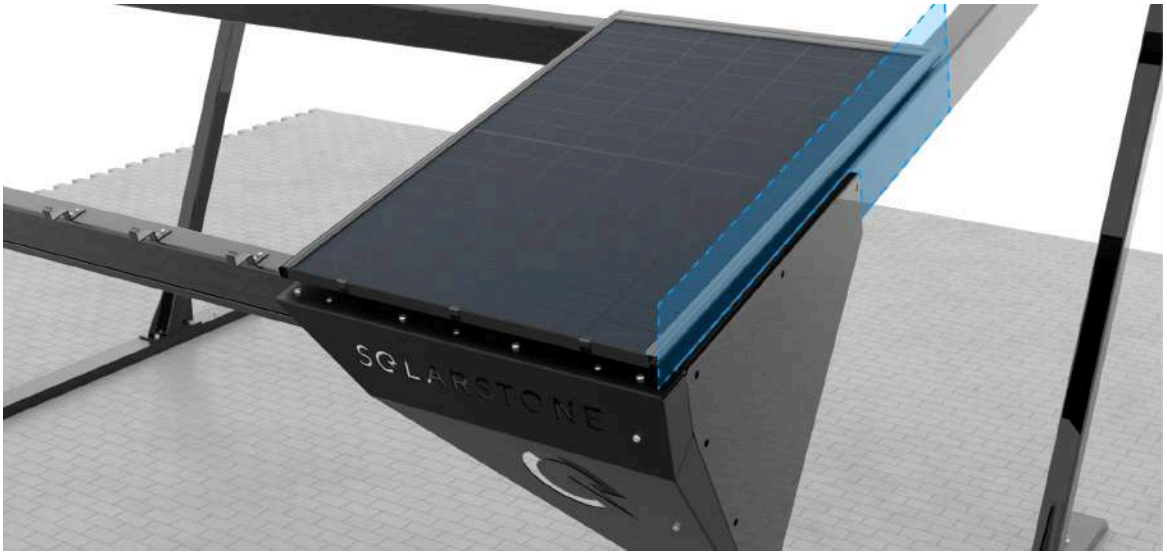
Step 12 - Install first row PV clamps S30

- There are 3 mm pre-drilled holes in the eave struts to attach the clamps. Attach 2 DIN 7504-K 5.5x32mm Self-Drilling Screw, A2 + Ruspert (C3) to each first row clamp.



Step 13 - Install first row PV panels

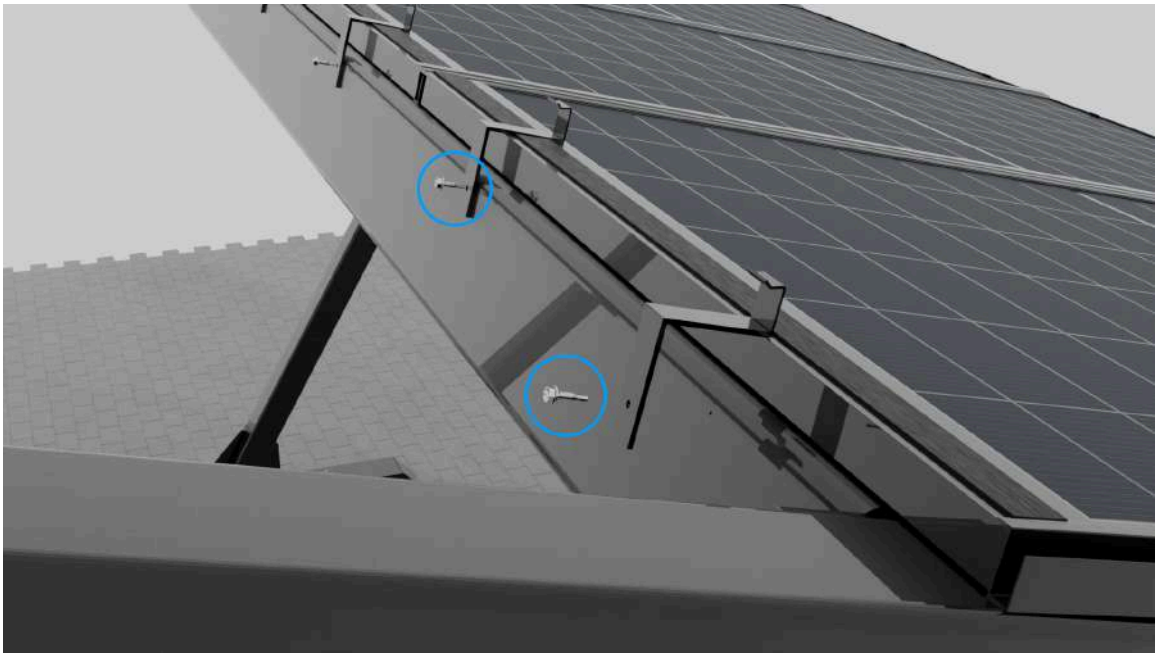
- Start by installing the first panel at the lower right corner, aligning it with the roof beam edge, and press the panel into the previously installed first-row clamps, ensuring it is securely in place.



- Install the next 4 first-row panels in the same way, following the first-row clamps, and ensure that the weather lock is in the closed position.The left edge of the panel row must end flush with the metal structure.

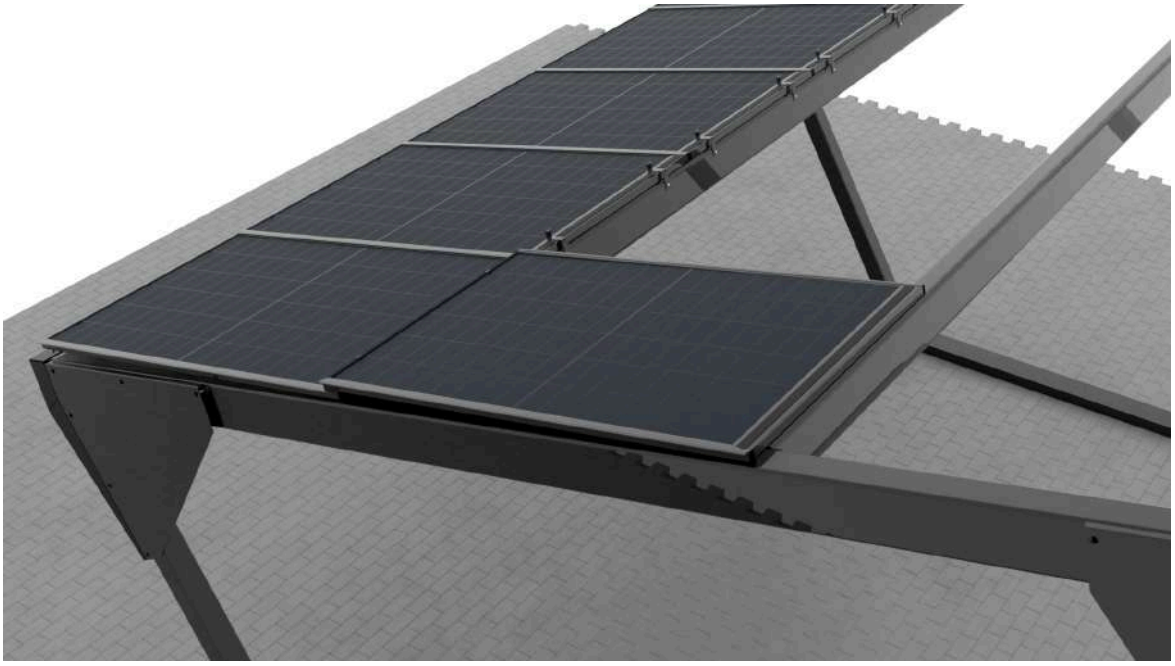
Step 14 - Install second row PV clamps C30

- Install the second-row panel clamps, following the pre-drilled holes in the purlin, and use DIN 7504-K 5.5x32mm Self-Drilling Screw, A2 + Ruspert (C3) screws for this.



Step 15 - Install second row PV panels

- Start by installing the second row panel at the top of the first row by aligning it with the first row.



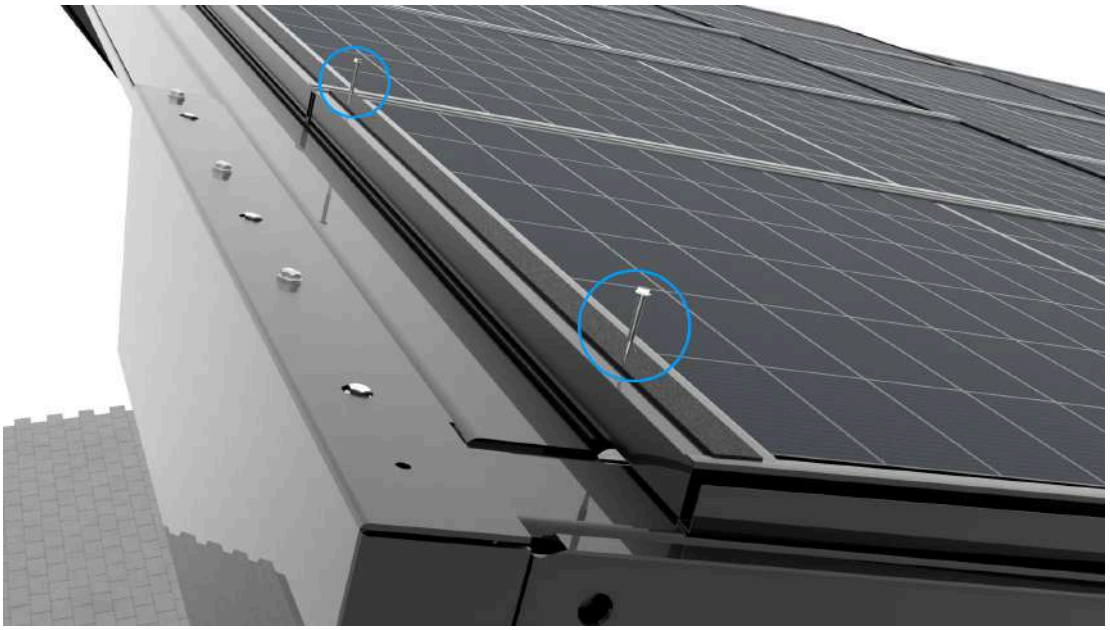
- Ensure that the installed panel rows are aligned both with the metal structure and with each other.

Step 16 - Install third row PV clamps C30

- There are 3 mm pre-drilled holes in the purlins to attach the clamps. DIN 7504-K 5.5x32mm Self-Drilling Screw, A2 + Ruspert (C3)

Step 17 - Install third row PV panels

- Install the third-row panels and ensure alignment with the previous rows. Secure the panels with Flügel PIAS 65mm self-drilling screw, Ruspert 500 h (C3) screws through the panel frame, making sure to fasten above the weather seal, into the ridge purlin.

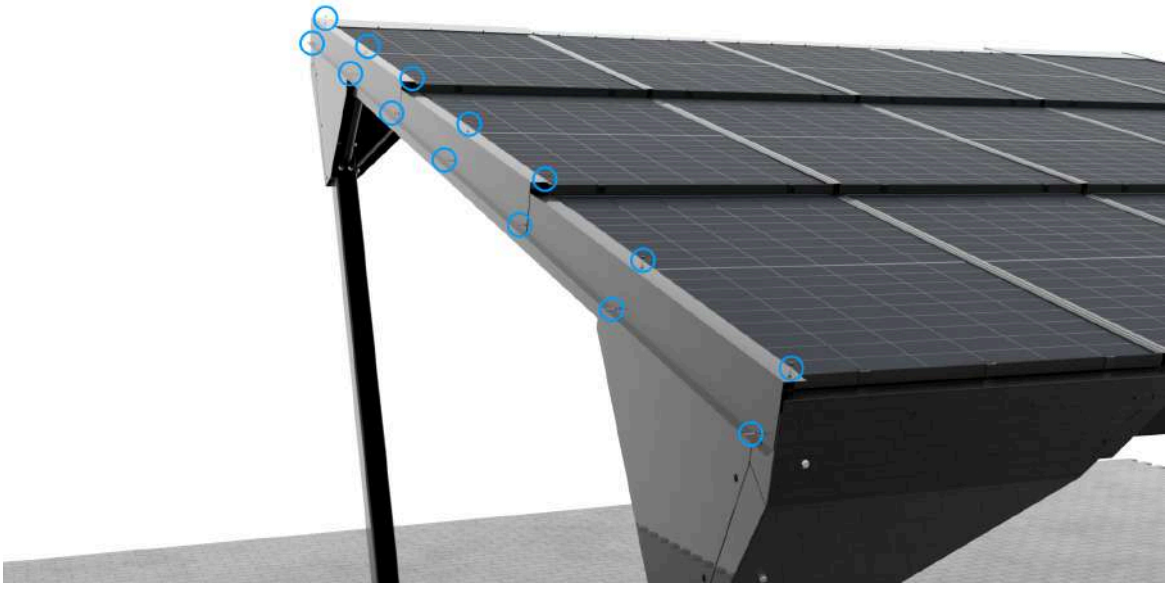


- Finished look, with installed Solar Full Roof.

Step 18 - Install verge flashings

- If there is no timber wall, use the following method: Drill 4mm holes through the side flashing and side diagonal plates, and secure from the top with 4.8x35 KAT.KR/6K BLACK-250-4. self-drilling screws with sealing washers for metal. If timber cladding is part of your project, skip this step for now and continue to step 19 - timber cladding installation.

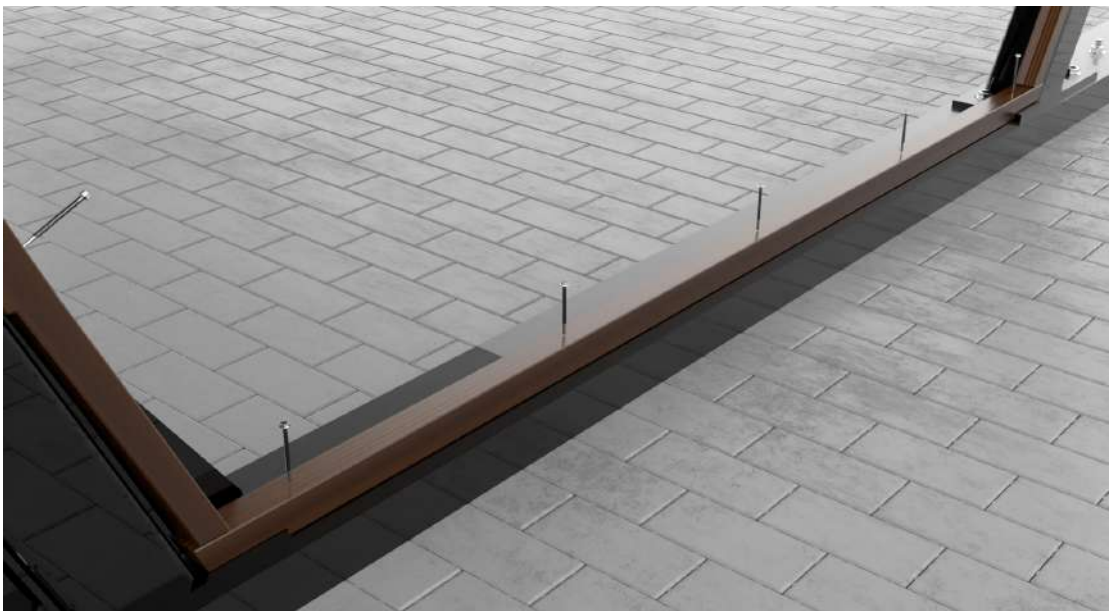
- Start the installation of the verge flashings from the edge of the lowest panel and work your way upwards.



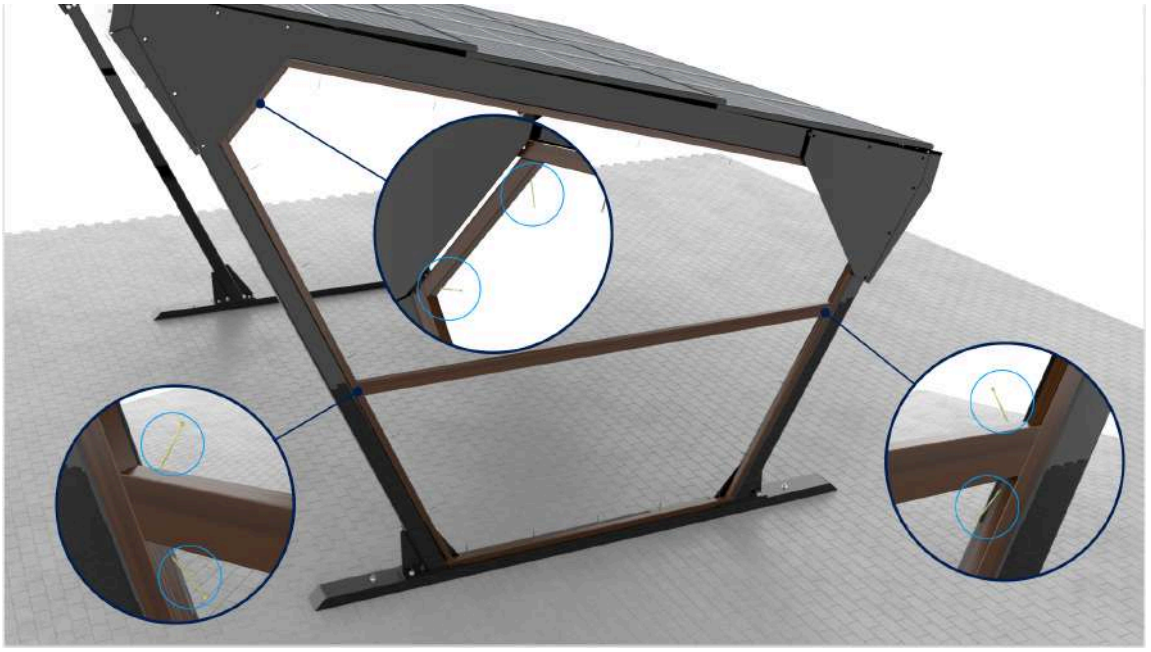
Steps 19-21 | Timber cladding

Step 19 - Install wooden batten onto the metal frame

- Install wooden battens (45x45 mm) along the inner perimeter of the metal frame. Start from the bottom and work your way around the perimeter. Use Flügel PIAS 65mm self-drilling screw, Ruspert 500 h (C3).



- Next, install the center wooden batten (45x95 mm), which can be screwed into the previously secured battens, and the short diagonal batten (45x45 mm) to secure the overhanging ends. Use 5x90 mm wood screws for fastening.



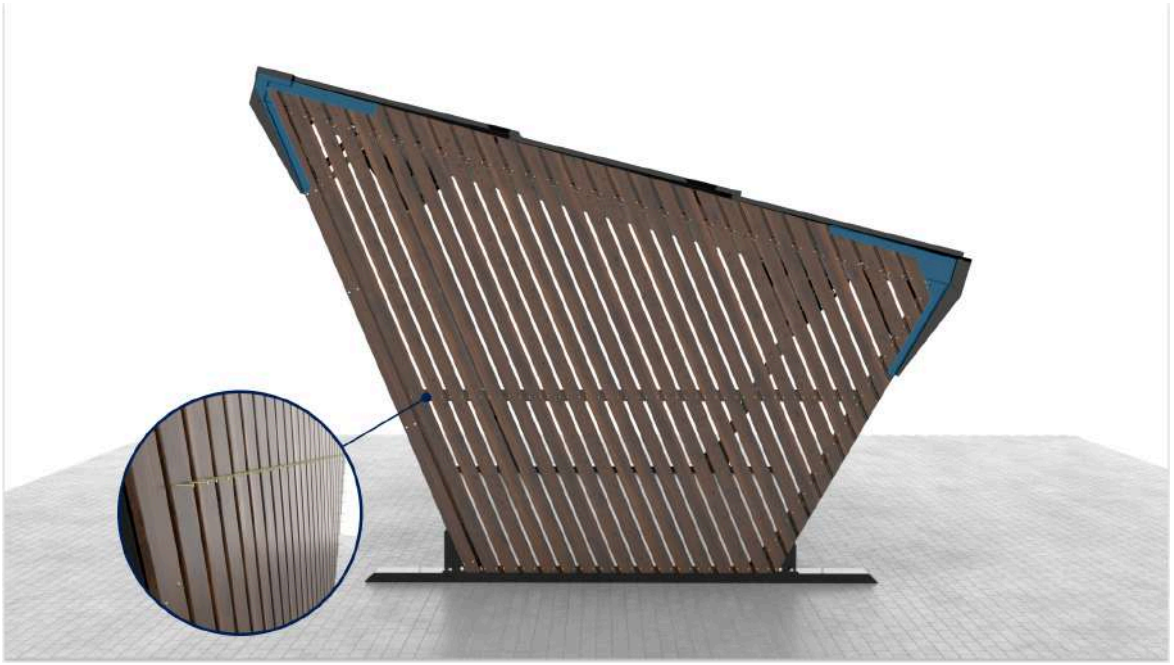
- Before installing the cladding boards, remove the diagonal plates on the corresponding side.

Step 20 - Install the cladding boards to the battens.

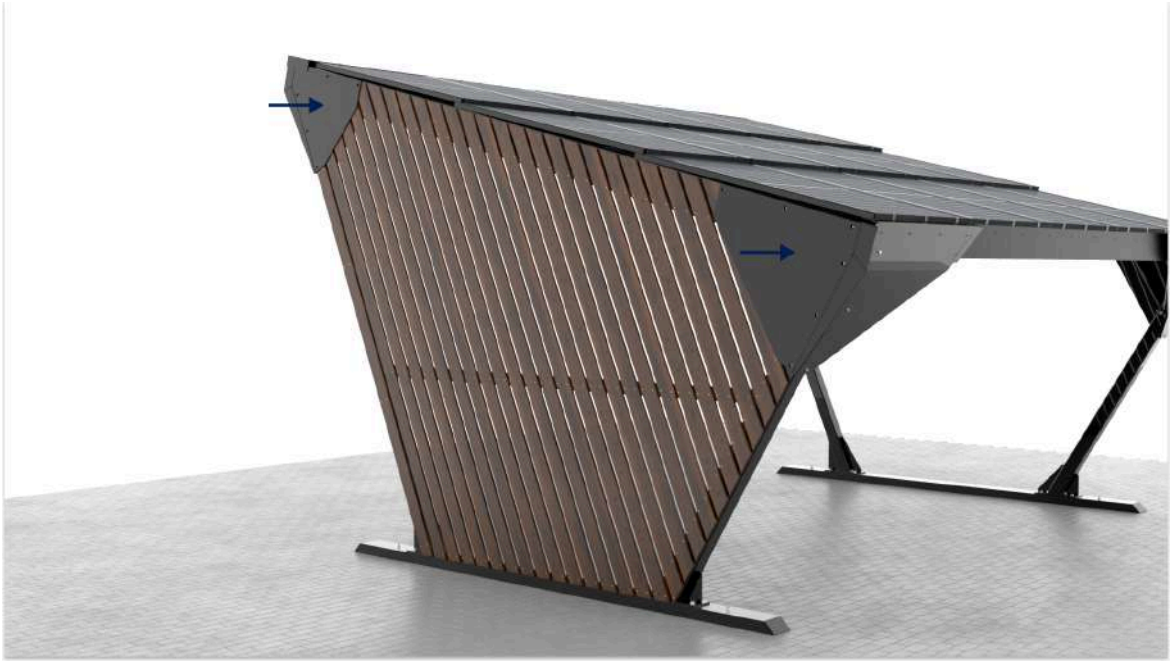
- Install the cladding board to the previously installed battens. Start from the left edge with the longer boards and proceed with progressively shorter boards. Secure the boards using 4.5x50mm screws. The boards should be evenly spaced for a visually appealing finish.
- Use the Flügel PIAS 65mm self-drilling screw, Ruspert 500 h (C3) only for securing the very first board.

- Install the remaining boards, leaving a 20 mm gap between them, and use 4.5x50 mm wood screws.

- Leave the areas marked in blue free for reinstalling the side diagonal plates



- Reinstall the side diagonal plates.



Step 21 - Install verge flashings

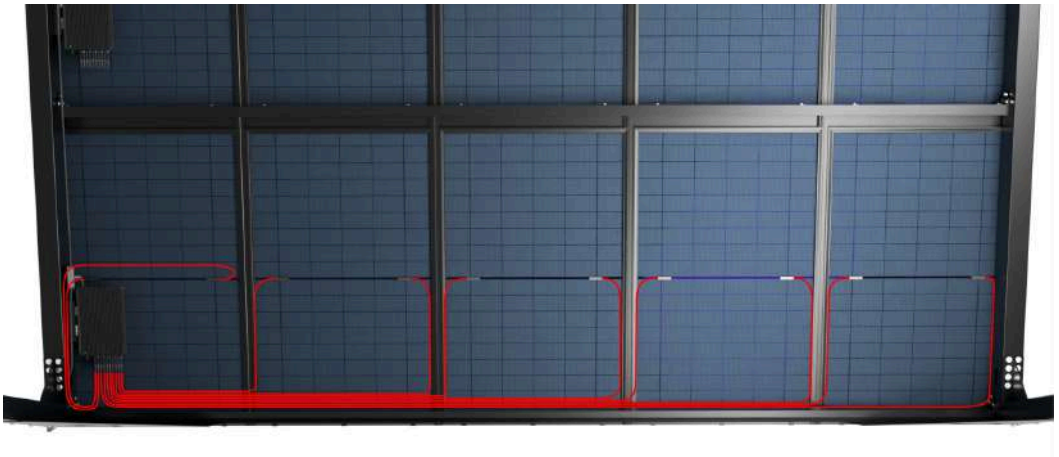
- If using wooden walls, install wider side flashing. If a wooden wall kit is included, secure the side flashings with 4.8x35 KAT.KR/6K BLACK-250-4.

- Connect the side flashing starting from the bottom corner. The edges of the upper side flashings must overlap the lower ones.

Step 22-23 | Inverter

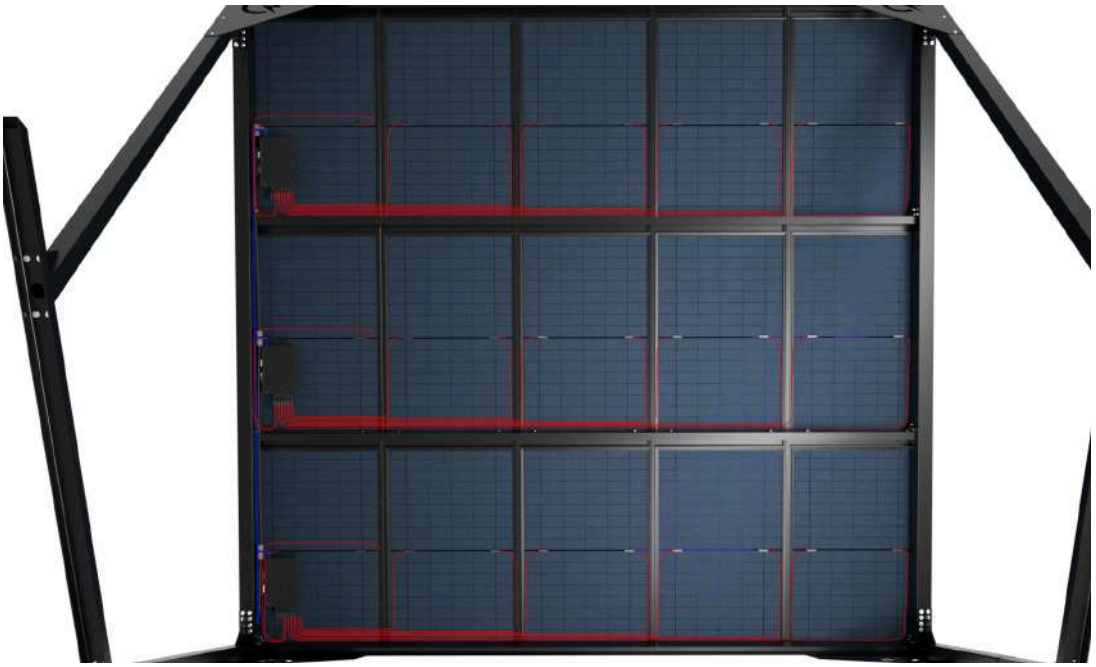
Step 22 | Version 1 - Install microinverters

- Connect PV cables onto metal frames using cable attachment. Make sure that cables are lining with purlins and click-on frames. Make sure that there will be no damaging objects on the way of cables.

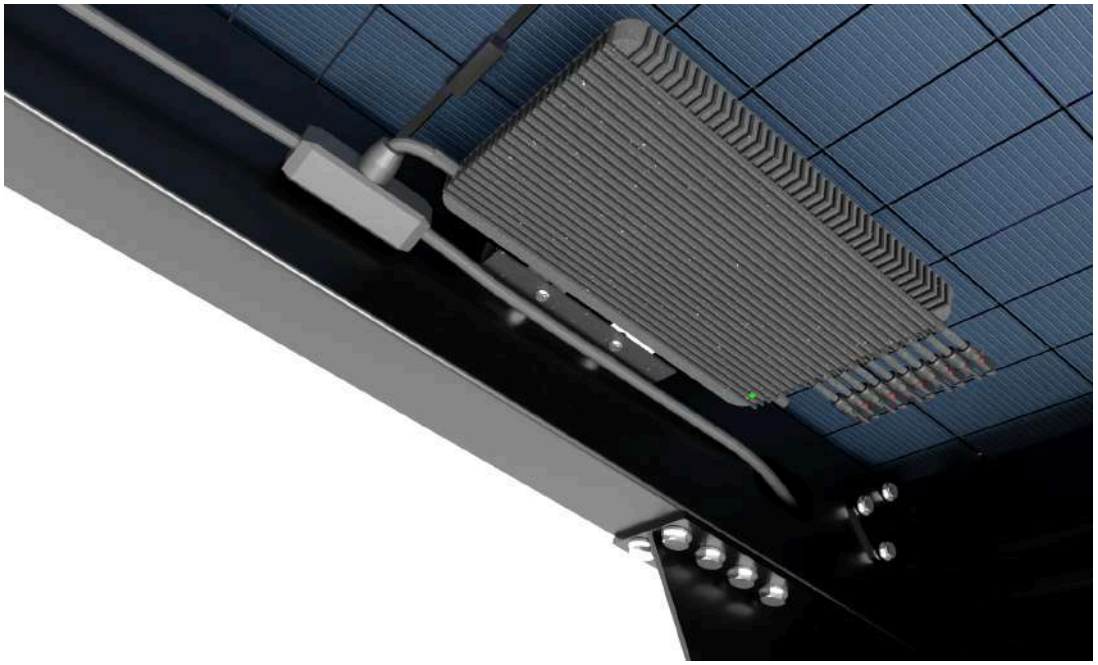


- To connect micro inverters onto metal frame use L-type hangers. L-type hangers will be added to the order regarding whether the Carport is installed with string or microinverters.

- Connect microinverters to each other using T-connector and power cables.



- Power cable attached to microinverters, which will be directed to fusebox. Follow the microinverter manual.



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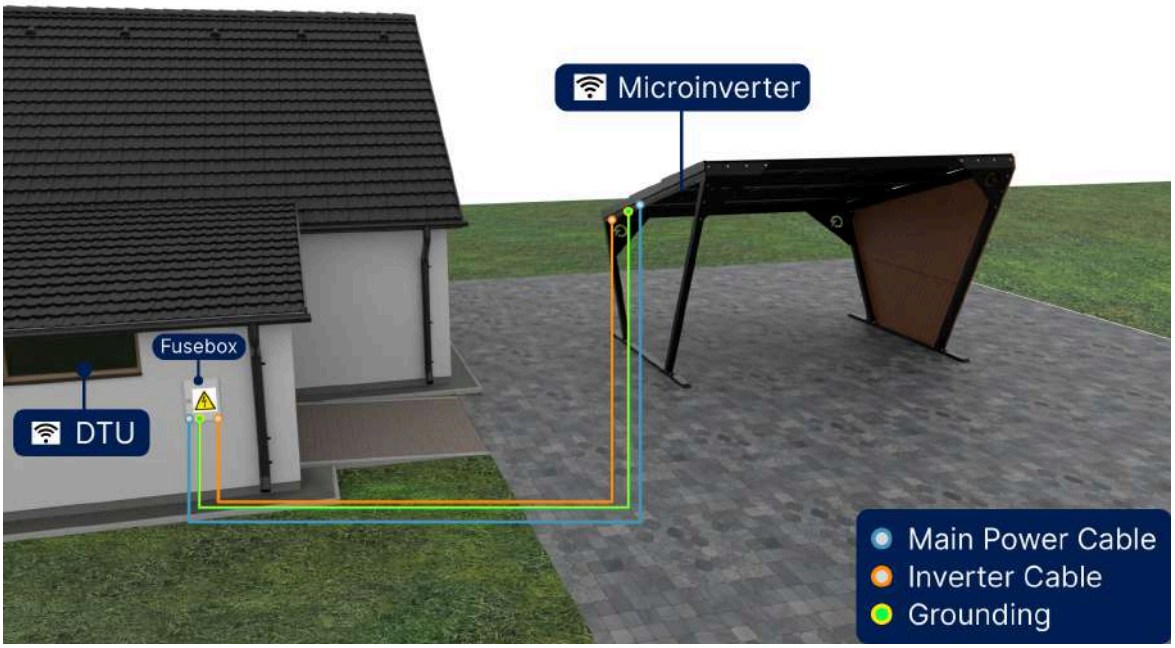
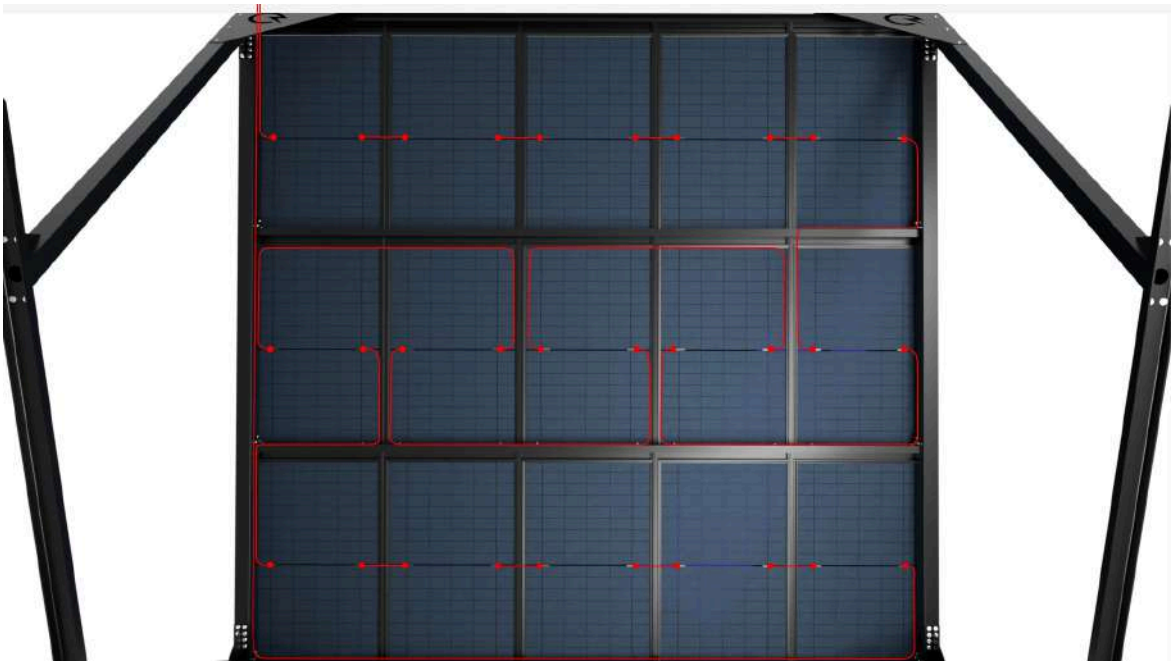
- Connect the Carport photovoltaic system to the fusebox with the help of a microinverter. If a microinverter has DTU (Data Unit System) connect these for online monitoring. Follow microinverter manual.

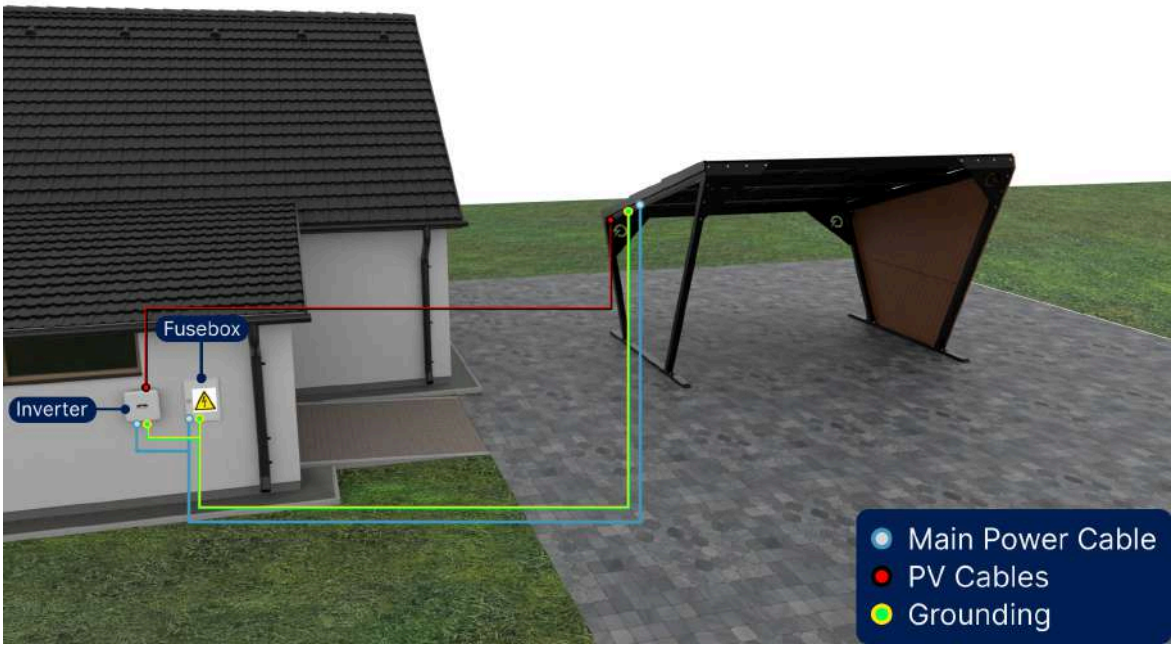


Step 23 | Version 2 - Install string inverter

- Connect PV-modules to each other and connect the cables to the string inverter. Follow string inverter manual.



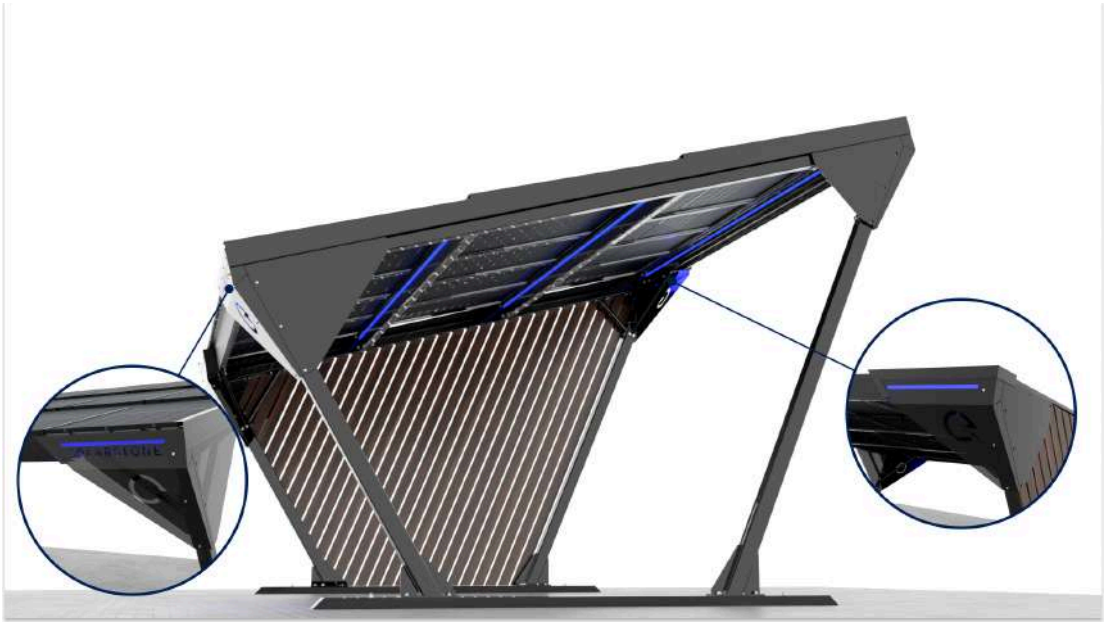
- Connect inverter to fusebox.



Steps 24-27 | Ceiling and lighting

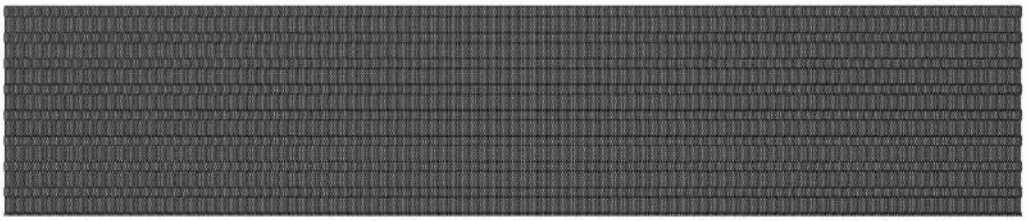
Step 24 - Install lighting

- Install five LED light strips: two shorter strips behind the logo plates and three longer ones on the purlins. Ensure the lights are securely installed inside moisture-resistant channels for added protection against the elements, ensuring durability and consistent performance. Integrate a twilight sensor that also functions as a controller, allowing the lights to automatically activate at dusk while offering manual control via a remote.



Step 25 - Install ceiling

- Carport ceiling consists of six perforated sheet panels. Begin installation from the right side, positioning the narrowest strip in front of the electrical connections for easy removal if necessary, such as for inspecting or servicing electrical connections. Ceiling might need custom modifications due to wall braces. Cover the sharp edges with PVC rubber sealant.

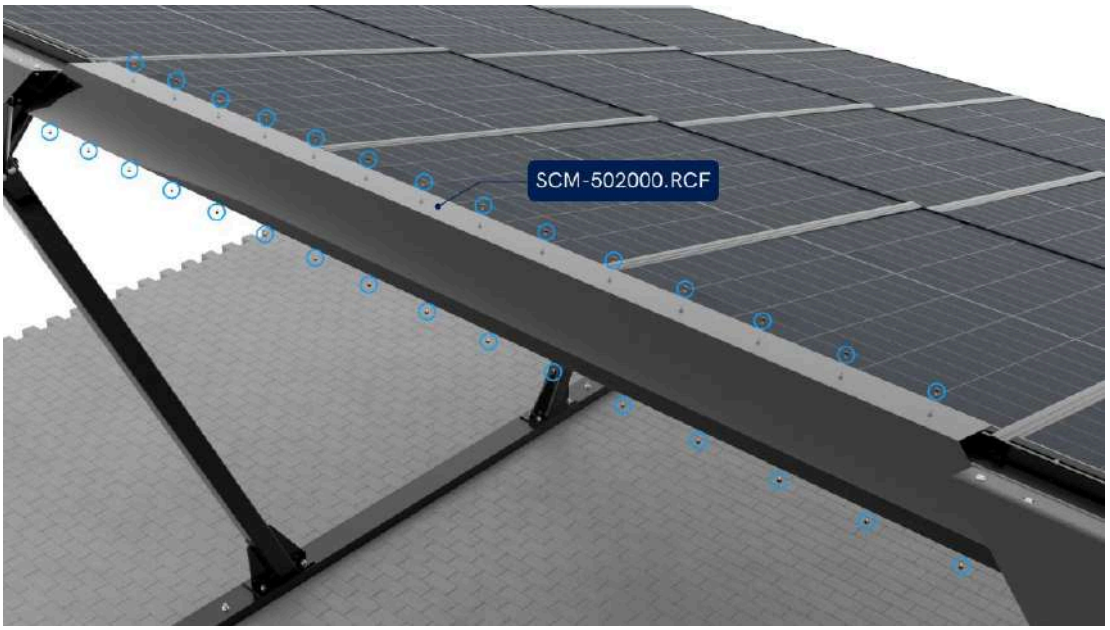


- For ceiling installation, use DIN 7504-K 5.5x32mm Self-Drilling Screw, A2 + Ruspert (C3). Secure the ceiling by screwing it into every other purlin through the lower section of the trapezoidal sheet.

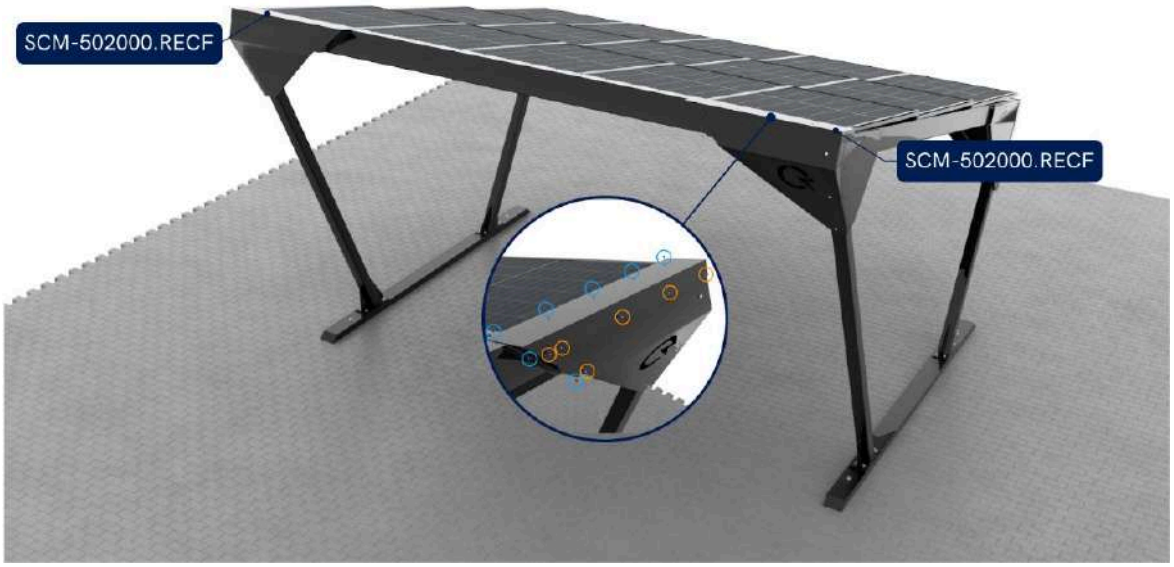
- Finished look of Carport with ceiling.

Step 26 - Install ridge flashing

- After installing the ceiling, the ridge cover flashing must be attached to cover the ceiling edges. For fastening from the top of the roof, use 4.8x35 KAT.KR/6K BLACK-250-4 screws, and for securing to the ceiling, use DIN 7504-K 5.5x32mm Self-Drilling Screws, A2 + Ruspert (C3).



- To cover the outer ridge diagonal plates, install the cover flashings. For fastening from the top of the roof, use 4.8x35 KAT.KR/6K BLACK-250-4. For securing to the diagonal plate, use DIN 7504-K 5.5x32mm Self-Drilling Screws, A2 + Ruspert (C3).



Step 27 - Install eave flashing

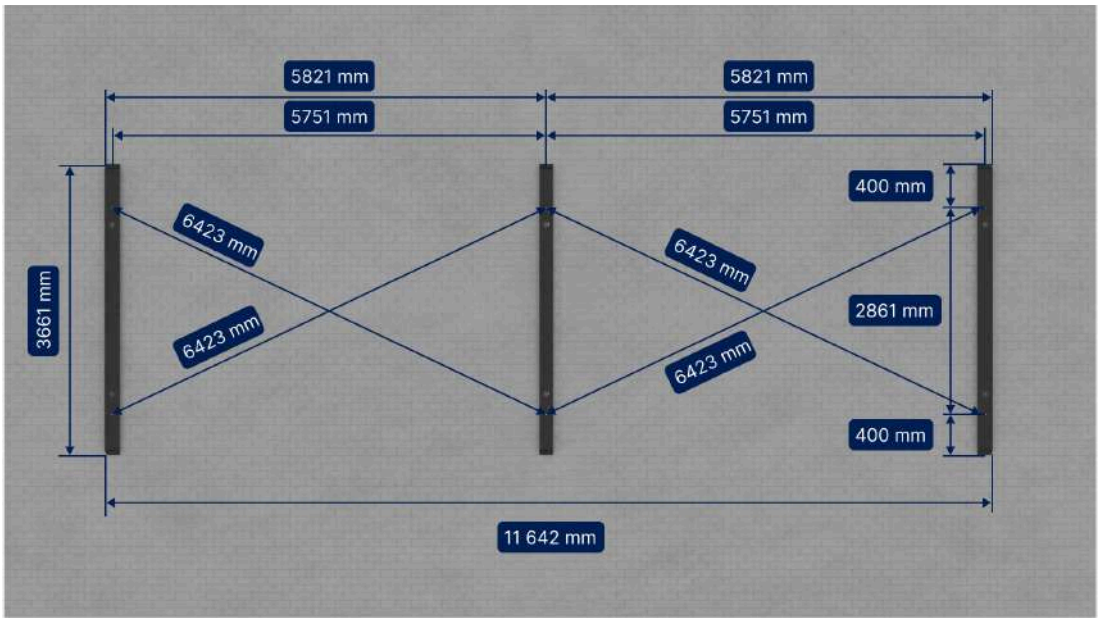
- The eave cover flashing should be installed to cover the lower edges of the ceiling. Install the ridge flashing and use 4.8x35 KAT.KR/6K BLACK-250-4 screws to secure it to the ceiling. To fasten the eave flashing to the purlin, use DIN 7504-K 5.5x32mm Self-Drilling Screws, A2 + Ruspert (C3).

- To cover the outer diagonal plates of the eave, install the cover flashings and secure them using DIN 7504-K 5.5x32mm Self-Drilling Screws, A2 + Ruspert (C3).

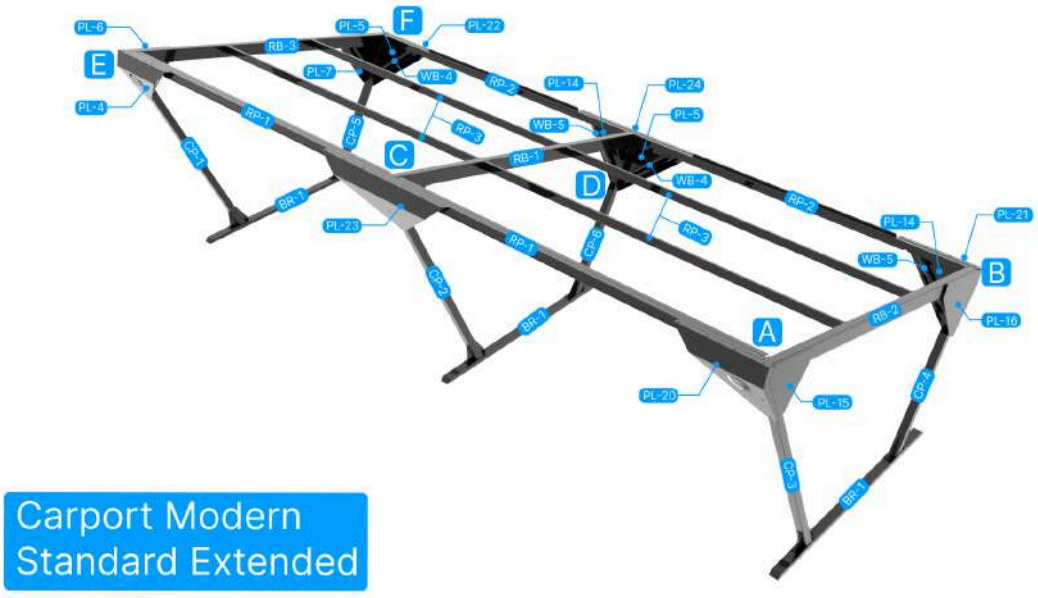
Step 28 | CarPort Extension

Step 28 - CarPort extension

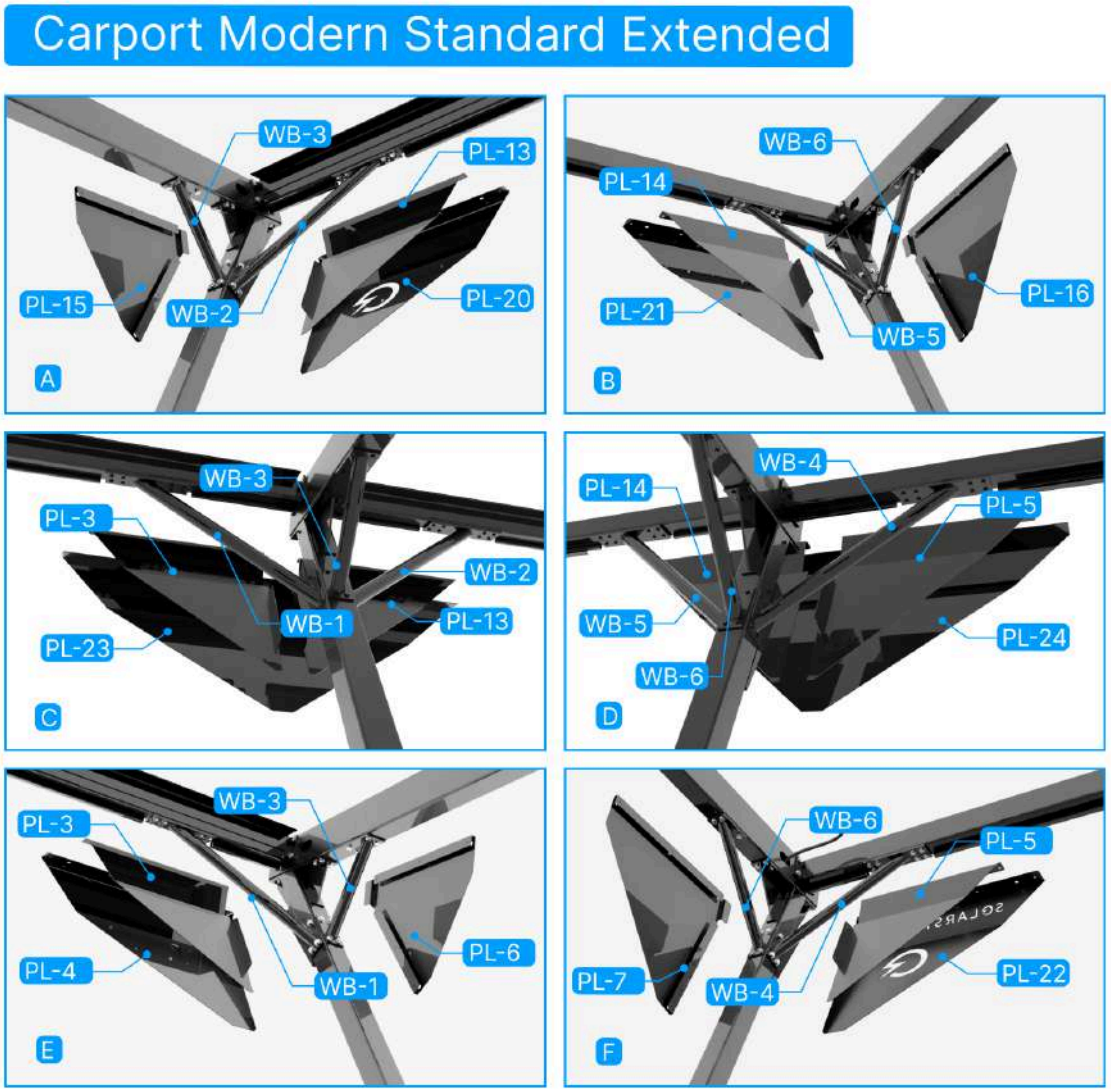
- Base plan.



- For the extended version installation, follow the same sequence and principles as with the single version.



- For the extended version installation, follow the same sequence and principles as with the single version.



Version

NO	DATE	DESCRIPTION	WHO
1.0	10.01.2023	Released version	Erkki Ehasalu
1.1	30.03.2023	Updated product name and formatting	Erkki Ehasalu
2.0	19.11.2024	Updated product design, names, installation, manufacturing.	Alari Merbach, Henri Lass

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