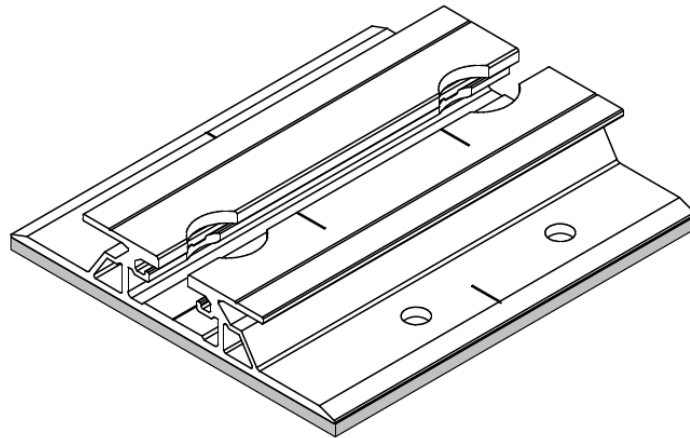


INSTALLATION MANUAL

RT-MINI II



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INSTALLATION MANUAL

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Introduction

Please review this manual thoroughly before installing your Roof-Tech system. Aside from reading this manual, please review the P.E. Stamped Engineering Letters for the RT-MINI II products for your State. The Roof Tech Structural Stamped letters are prepared based on 2 layers of shingles.

We recommend installer to carefully review the instructions provided by the other manufacturers of the products being installed with the RT-Mini II and become acquainted with OSHA's safety procedures prior to installing the PV system.

The installer is solely responsible for:

- Handling and installing the PV modules and rail system according to the manufacturer's instruction, with special attention for the suggested clamping locations on the frame.
- Complying with all applicable local or national building codes, standards and industry best practices including any code that may supersede this manual.
- Ensuring that Roof-Tech's and other products are appropriate for the particular installation and the installation location.
- Ensuring that the roof, its rafters, connections, and other structural support members can support the array under all code level loading conditions.
- Using only Roof-Tech parts and installer-supplied parts as specified by Roof-Tech. (Substitution of parts may void the warranty and invalidate the letters of certification.)
- Verifying the strength of any alternate mounting devices used in lieu of the anchoring screws.
- Maintaining the waterproof integrity of the roof.



Attention

**To maintain the flashing performance, avoid installation when the temperature is below 22F or above 176F.
RT Butyl must be installed on a dry surface.**

- Ensuring safe installation of all electrical and mechanical aspects of the PV array.
- PE Stamped letters for the rail option are available at <https://roof-tech.us/support/>
- Ensuring correct and appropriate design parameters are used in determining the design loading used for design of the specific installation. Parameters, such as snow loading, wind speed, exposure and topographic factor should be confirmed with the local building official or a licensed professional engineer.

- Roof Tech recommends a thermal splice (a gap between rails) every 14 Ft., however, it must be determined by the installer based on the rail system installation instructions. The installer must also determine the maximum allowed span and cantilever design parameters recommended by the rail system manufacturer. The RT-MINI II can be installed on low slope roofs (Metal, EPDM, TPO, SBS Modified Bitumen/Torch-on, Asphalt) and steep slope roofs (Asphalt shingles, Metal). For low slope roofs, make sure there is positive drainage. RT Butyl is also compatible with felt and synthetic underlayments.

Periodical Inspection

Roof Tech Inc. recommends inspecting installed racking system periodically for loose components, loose fasteners and any corrosion. If found, those components are to be re-tightened, or replaced immediately. When a PV module needs to be removed from the PV array for maintenance and/or replacement, the electric bonding system may need to be temporarily restored to maintain the electrical bonding path. Please make sure the system electrical circuits and disconnects are in the open position and the entire system is powered down. Cover the fronts of modules in the array with an opaque material to stop the production of electricity. Use appropriate safety equipment such as insulated tools and insulating gloves to protect yourself.

Maintenance of the PV modules should be carried out by licensed contractors, according to the PV manufacturer's installation/maintenance instructions and Roof Tech's installation instructions.

Maintenance should not be conducted under a wet and/or high wind conditions.

Tools Required for Assembly

Tools needed for installing the RT-MINI II

- Hex bit socket (8mm)
- Drill and ϕ 3 mm Drill Bit or Center punch for sheet metal (for Installation on Metal Roof)
- Measuring tape
- Chalk line
- Torque Wrench

※L-Foot mounting option

Item	Torque
RT2-04-FBN 25 SL-5/16 Flanged Bolt and Flanged Nut	15.8 N·m (140)

※Accessory mounting option

Item	Torque
W1/4 Carriage Bolt	6 N·m (53)

Technical Note

Proper torque values for a wood screw will vary depending on the rafter and/or deck characteristics; hardness, age, and moisture of the wood. Tighten the M5x60mm wood screws until the conical washer stop rotating.

Stainless hardware is soft and if dry torqued too quickly it may cause the nut and bolt to seize.

Roof Tech recommends all stainless steel threads be lubricated. This will make it easier to tighten nuts to bolts, avoid galling, and facilitate adjustments before the nut is properly torqued. Therefore, avoid the use of an impact driver.

When driving the RT 5x60mm or 5x90mm into the wood, always keep a hand pressure on the RT MINI II in order to avoid the base being pulled away from the roof surface.

Moisture Content

RT Butyl Flexible Flashing is to be installed on dry mounting surfaces.

Determining how wet is too wet:

First, remove the paper backing from an RT product exposing the clean RT Butyl.

Second, press the base, RT Butyl side down against the surface.

Third, pick up the base. If the base adheres to the roof, the roof is suitably dry for installation.

For Metal, EPDM and TPO remove water from the installation area with a cloth or squeegee before placing and affixing the base. A heat gun, Sodium Chloride or alcohol is suitable to remove ice from the roof surface.

Installation Safety

The installation process requires working on sloped and elevated building surfaces, in outdoor weather conditions, using tools and heavy components designed for the generation of electricity.

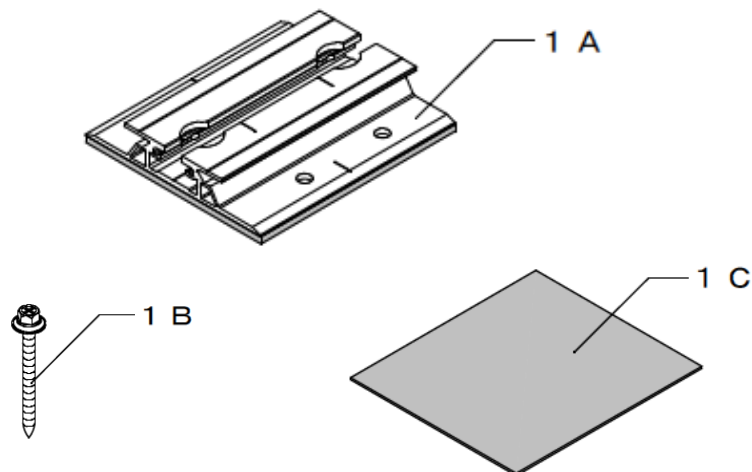
- Use properly anchored fall protection equipment.
- Use caution to prevent objects from falling or dropping off the roof area.
- Cordon off ground areas directly beneath the roof work area when possible.
- Always use personal protection equipment such as safety glasses, gloves, etc.
- Do not perform installation in excessively wet, windy, or inclement weather conditions.
- When working in hot weather, work crews should take care to prevent symptoms of over-heating or dehydration.
- Use proper lifting and carrying techniques when handling heavy components at the job site. If conditions are challenging for moving PV modules to the roof area, use a mechanical lift.
- Follow best practices when working around high-voltage electrical equipment.
- Do not anchor fall protection equipment to roof mounts, or any other inappropriate roof structure.

PART A: Materials

1. Items with RT-MINI II

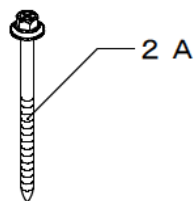
① RT-MINI II Bracket Set

	Item
1A	RT-MINI II
1B	Screw 5.0×60
1C	RT Butyl Flashing



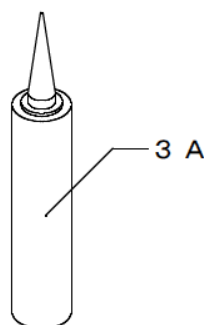
② Screw (Optional)

	Item
2A	Screw 5.0×90



③ Roof sealant

	Item
3A	Roof sealant



※Recommended Product

- Henry : 208R, 209, 925 (Black)
- Geocel: S2, S4 (Black)
- Sashco : Through the Roof
- Boss : 125 (Black)
- Top Industrial: Rain Buster 850, 900
- Chem Link: M1
- NPC Solar Seal 900
- GE All Purpose 100% Silicone

The Sealant adds a layer of UV protection to the Flexible Flashing.

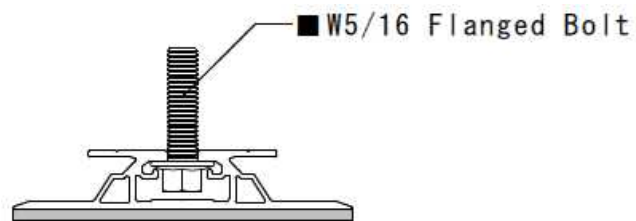
Note: Above sealants evaluated for asphalt roofs!

PART B: Bracket Installation

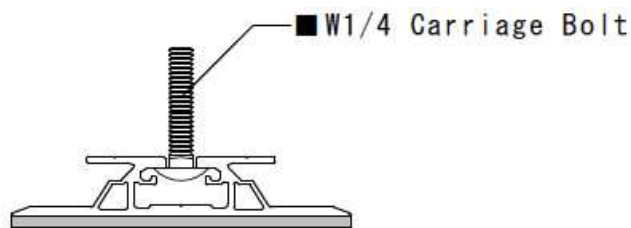
1. Installation of Brackets

(1) Bolt options

- a) For the RT2-04-FBN25SL 5/16" Flanged Bolt (**L-Foot mounting option**)



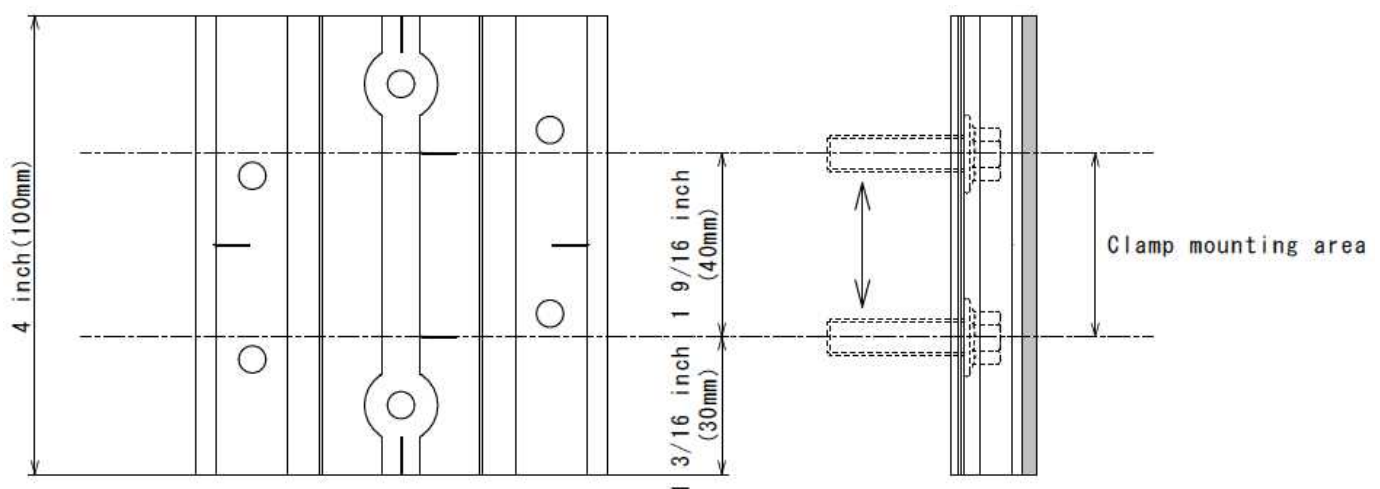
- b) For the 1/4" Carriage Bolt. (**EMT clamp mounting option**)



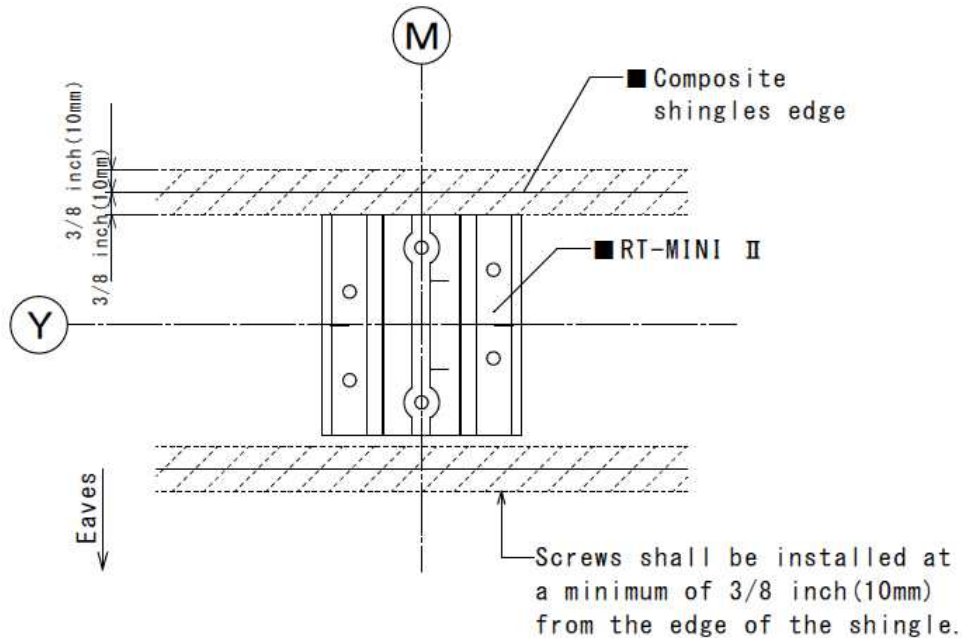
Note: M8 and M6 Bolt will not fit the RT-MINI II base.

(2) Brackets Layout

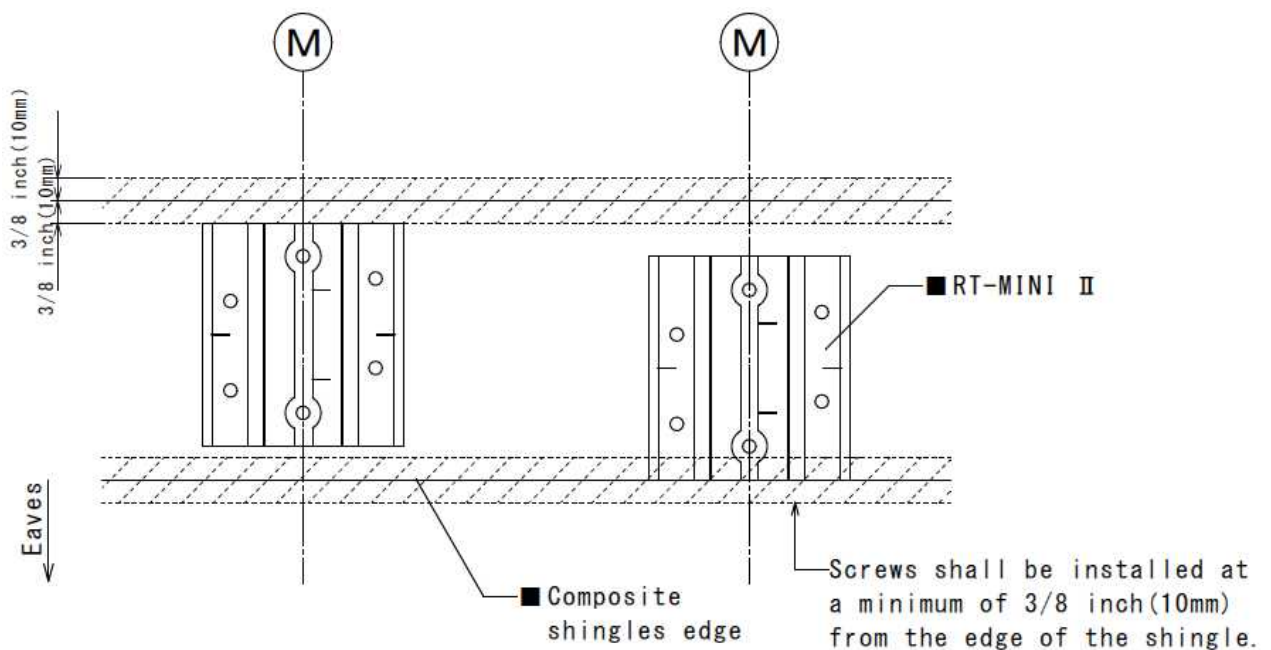
There is 1 9/16 inch (40mm) adjustability to secure the bolt.



- ① Locate and place MINI II base on the cross section of chalk line.



- ② Protecting the edge of the shingles.



Note: The MINI II base is structurally engineered to be mounted in the above position (structural). However if used for accessories such as junction boxes or EMT with no structural value, It can then be mounted on any orientation.

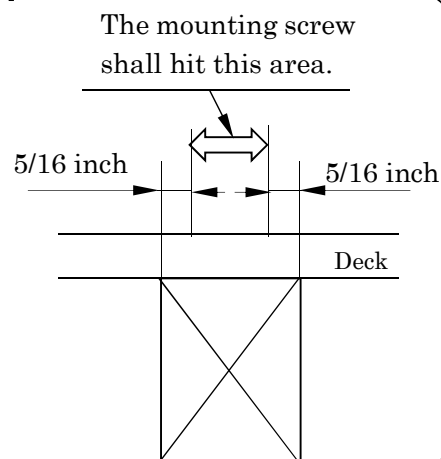
- ③ Chalk line according to the layout plans to indicate bracket's position.
- ④ Aligning the brackets. Choose the most suitable rafter, then mark the center.
 - (i) Line M: Vertical Bracket center line.
 - (ii) Line Y: Horizontal Bracket center line.

The Engineer of Record (EOR) shall verify the framing capacity and fastener installation for building code compliance including those of the National Design Specification for Wood Construction (NDS 2005/2012/2015) as applicable.

! Attention

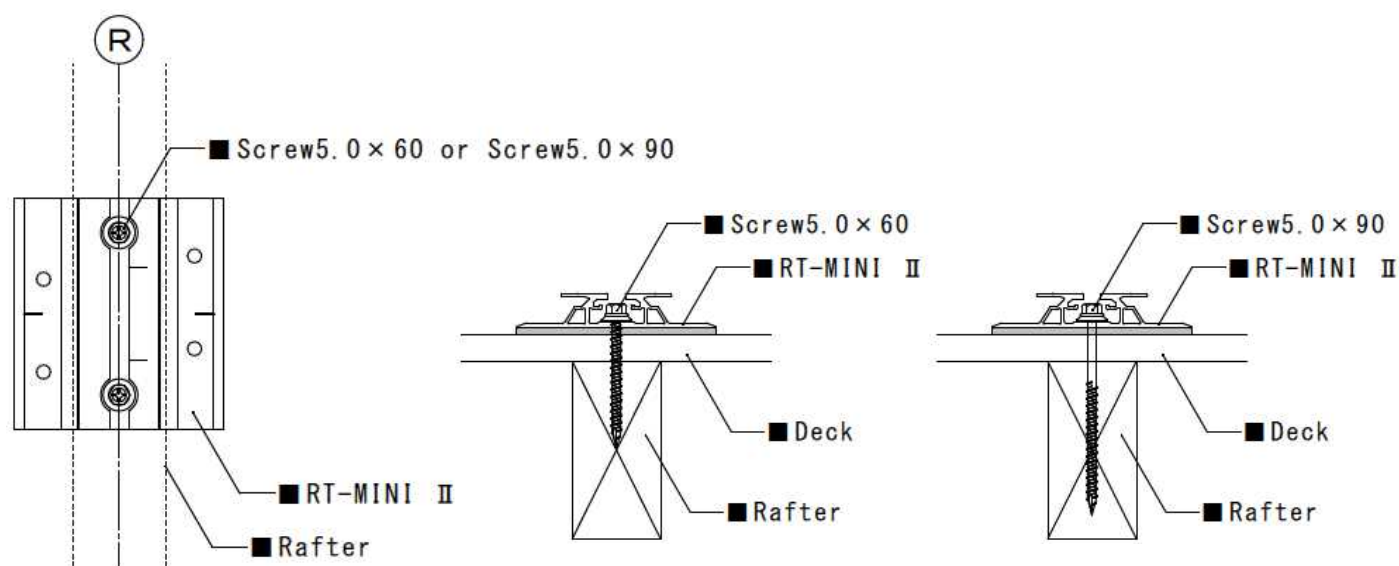
According to the NDS, the distance from the side edge of the rafter and the 5 mm diameter mounting screws for RT-MINI II shall be at least 5/16 inch (7.9 mm) from the edge.

Note: Minimum Edge Distance = $1.5D$
Where D is the Diameter of the screw.
Direction of Loading: Parallel to Grain
(See NDS 2015 Table 12.5.1c.)

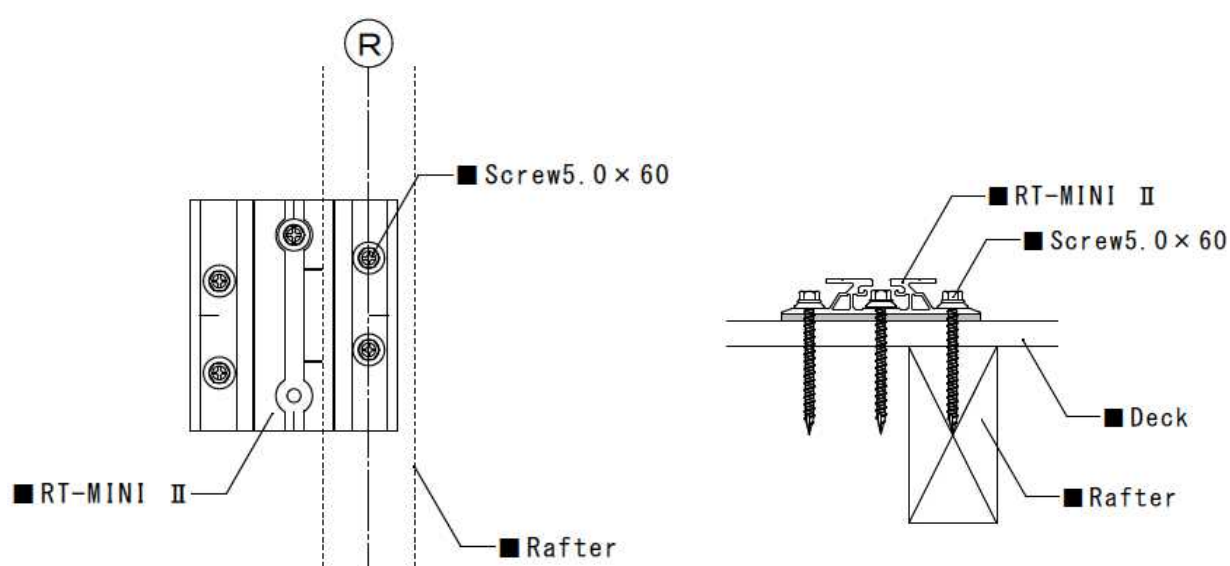


(3) RT-MINI II Mounting Options

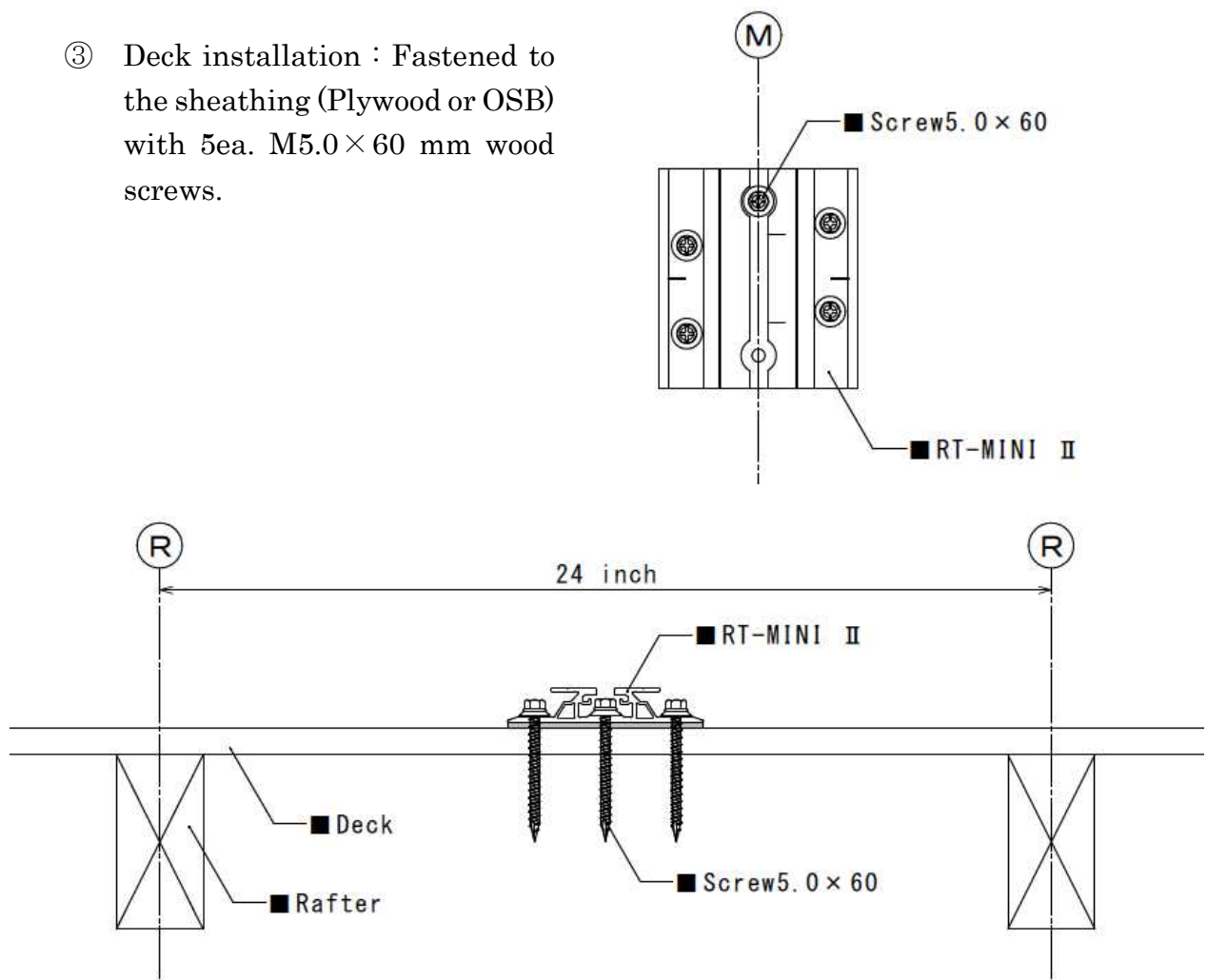
- ① Rafter installation (Center) : Fastened in the center to the Rafter with 2ea. M5.0×60 mm or M5.0×90 mm wood screws.



- ② Rafter installation (Offset) : Fastened to the Rafter offset with 2ea. M5.0 × 60 mm wood screws on either side and 3ea. M5.0 × 60 mm wood screws to the sheathing.



- ③ Deck installation : Fastened to the sheathing (Plywood or OSB) with 5ea. M5.0 × 60 mm wood screws.



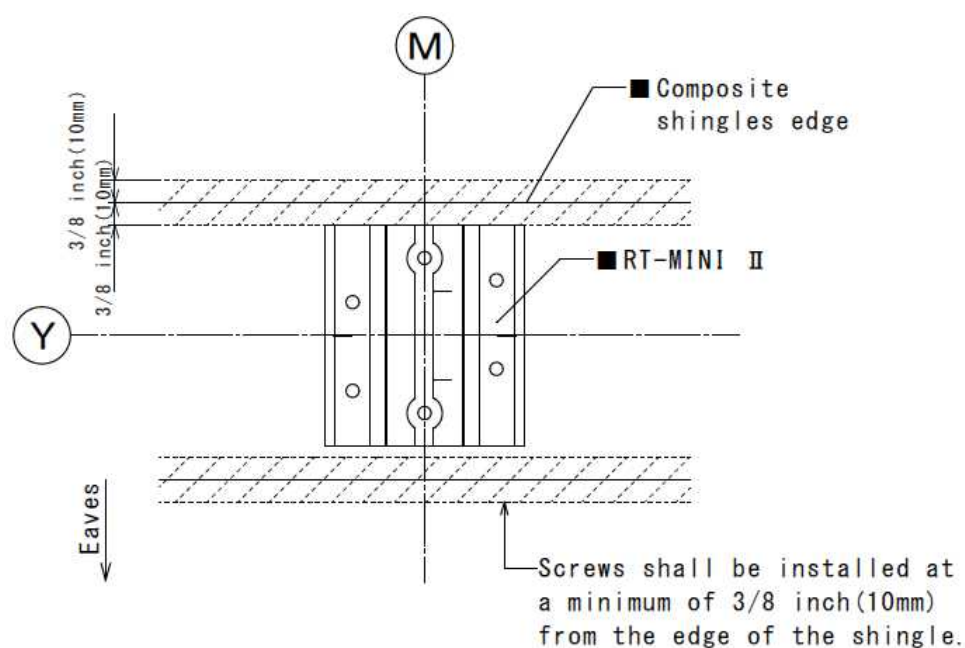
Note: Verify the PE stamped letters for maximum span values.

(4) Bracket Installation

! Attention

To maintain the flashing performance, avoid installation when the temperature is below 22F or above 176F. RT Butyl must be installed on a dry surface.

- ① Mark the location at the intersection of the Y Line and M Line.

**! Attention**

Minimum clearance between mounting screws and the edge of the roofing shingle shall be 3/8 inch (10 mm).

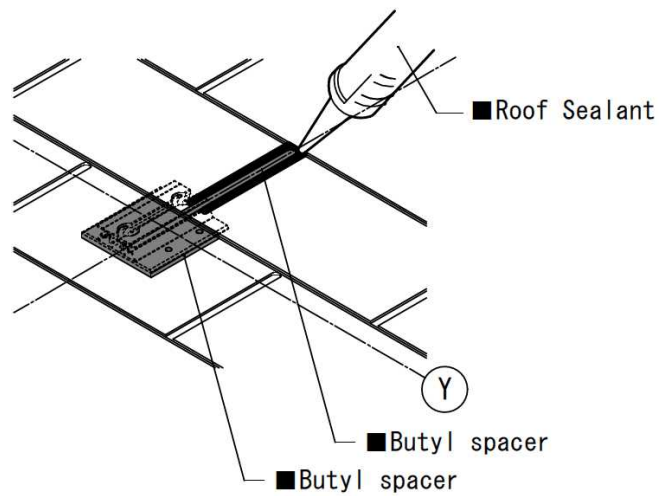
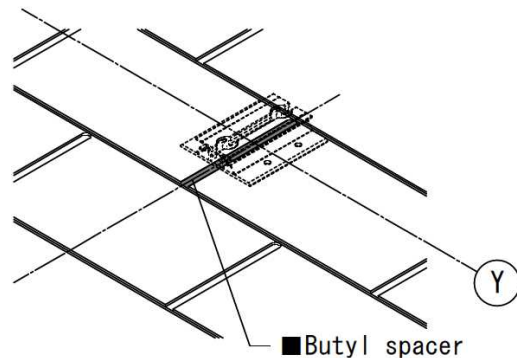
In case the stainless screw hit the nail underneath the shingle;

- 1) Tip the driver at an angle.
- 2) Use a 3 mm steel drill to make a hole.
- 3) If possible, remove the nail from underneath.

- ② Adjust the RT butyl tape to match the height of the upper shingle. When there is a gap, a slit, or a height difference at the mounting location of the bracket, use additional RT butyl tape.

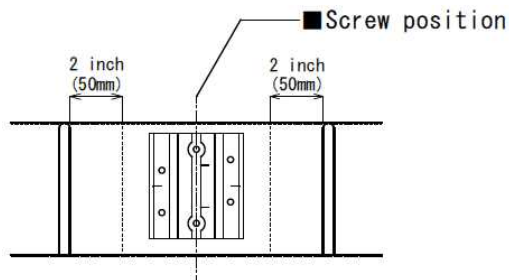
- When there is a slit at the installation spot, fill in with the additional RT butyl tape. The slit must be filled with RT butyl tape.

- When there is a slit above the bracket, fill it in with RT butyl tape to match its shape. Apply roof sealant around the RT butyl tape. Notice that the roof sealant is only used to add a protective layer to the RT butyl tape.



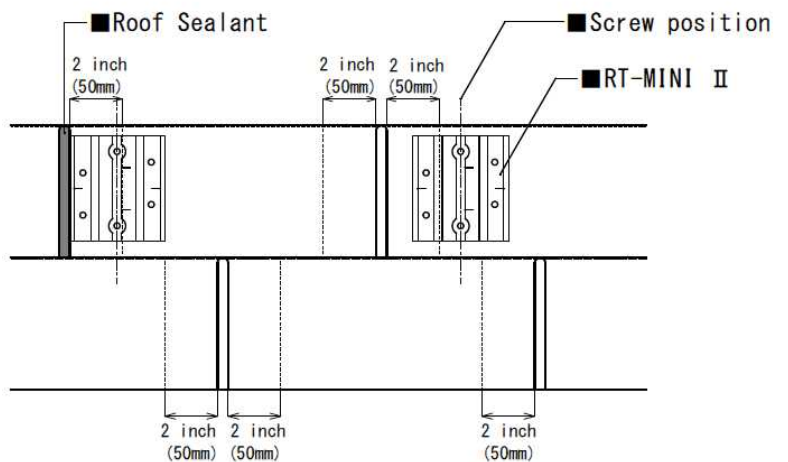
Rafter Install

- ③ If there is a shingle gap within 2 inches from the base, sealant shall be applied to the gap as it is shown.

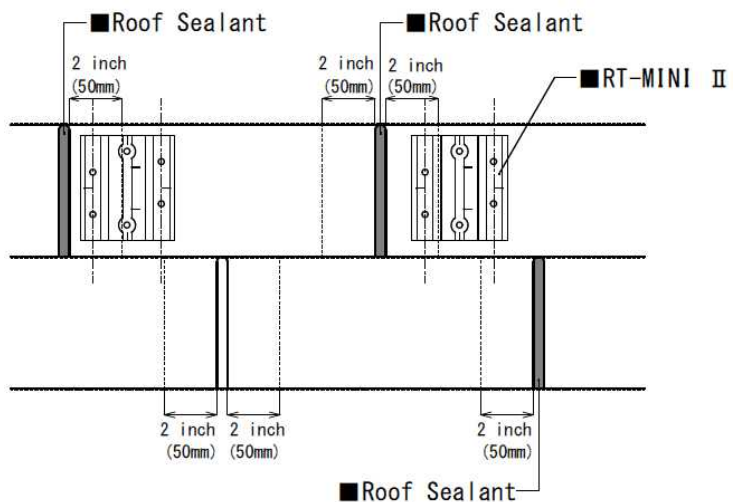
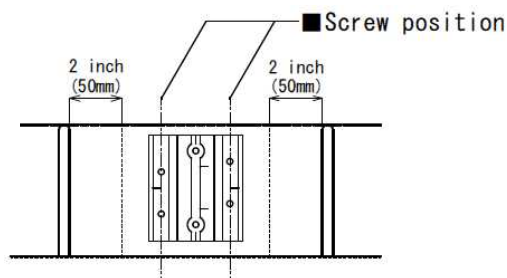


- Best to position the bracket 2 inches away from the slit.

- If the mounting screw is within less than 2 inches from the slit, fill the slit with roof sealant.



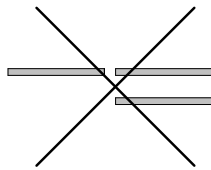
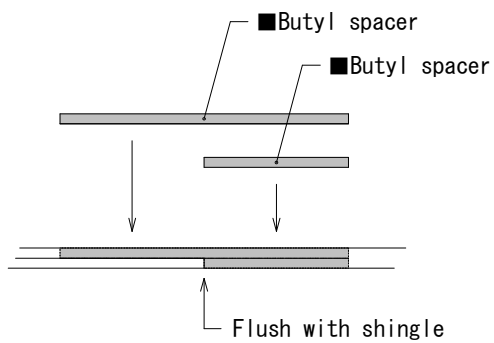
Deck Install



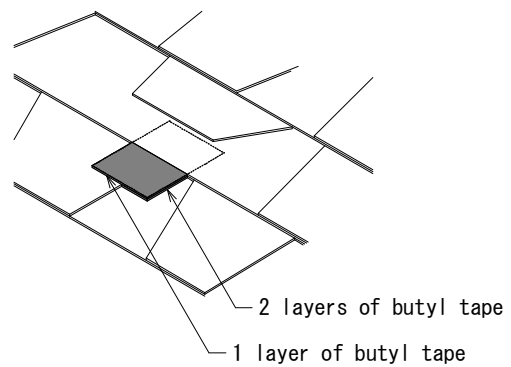
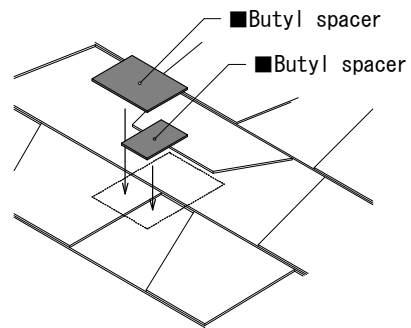
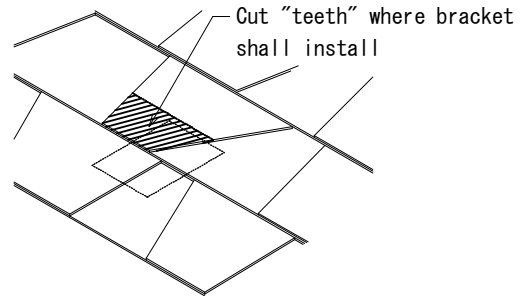
Leveling the Base Options

[Case 1]

- Use RT butyl tape to level the surface of the composite shingle roof.



Note: Do not splice the butyl tape.



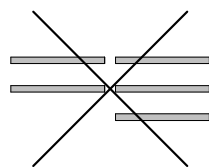
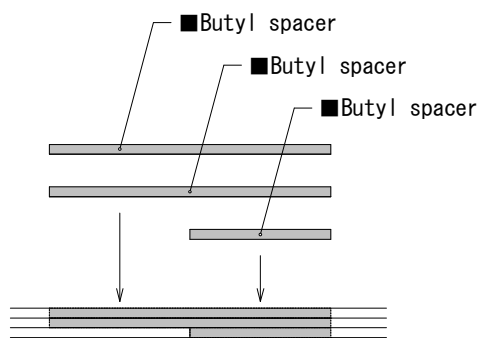
[Case 2]

- Building layers of RT butyl for the bracket to be mounted over the teeth region of composite shingle roofs.

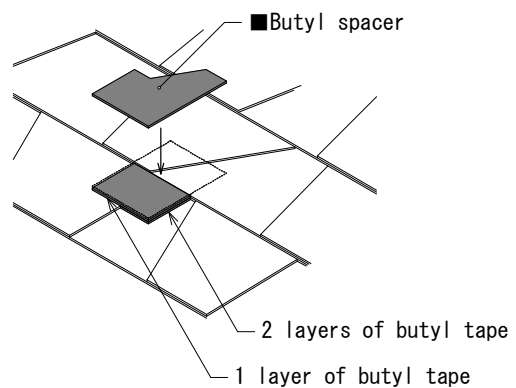
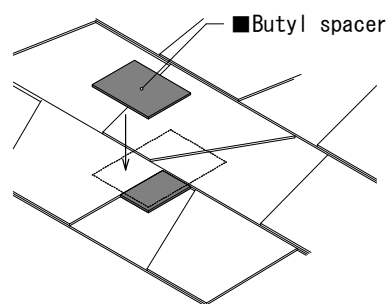
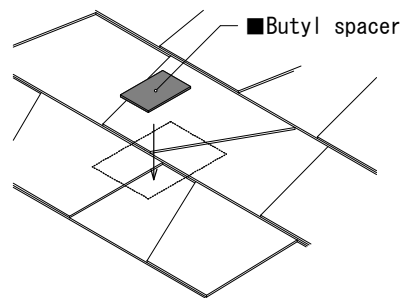
We recommend 4 layers maximum.

Layer 1 is already applied to the bottom of the bracket.

The following layers must be cut to shape to cover the surface of the bracket at each location, assuring a leveled surface.



Note: Do not splice the butyl tape.



[Case 3]

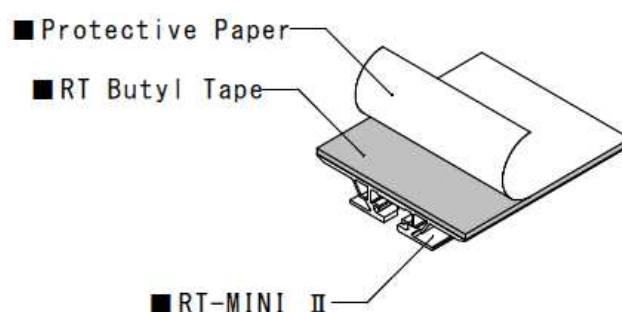
- **Roofing Leveling Option**

The application of one layer of asphalt roofing shim with the proper asphalt roofing cement is an alternative to leveling when a Roof Tech base is to be installed between 2 levels (layers of asphalt shingles).

- ④ Peel off the protective paper from the RT butyl tape.

! Attention

Do not leave any protective paper on the surface of the RT butyl tape, it can cause an improper seal and may allow water intrusion under the bracket.

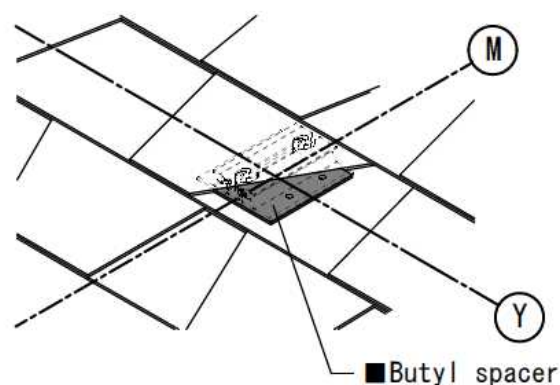


- When there are gaps in the position to install, fill them in with the additional RT butyl tape.

Note: Each bracket comes with RT butyl tape installed.

! Attention

Peel off the protection paper from both sides of any additional RT butyl tape.



⑤ Installing the bracket.

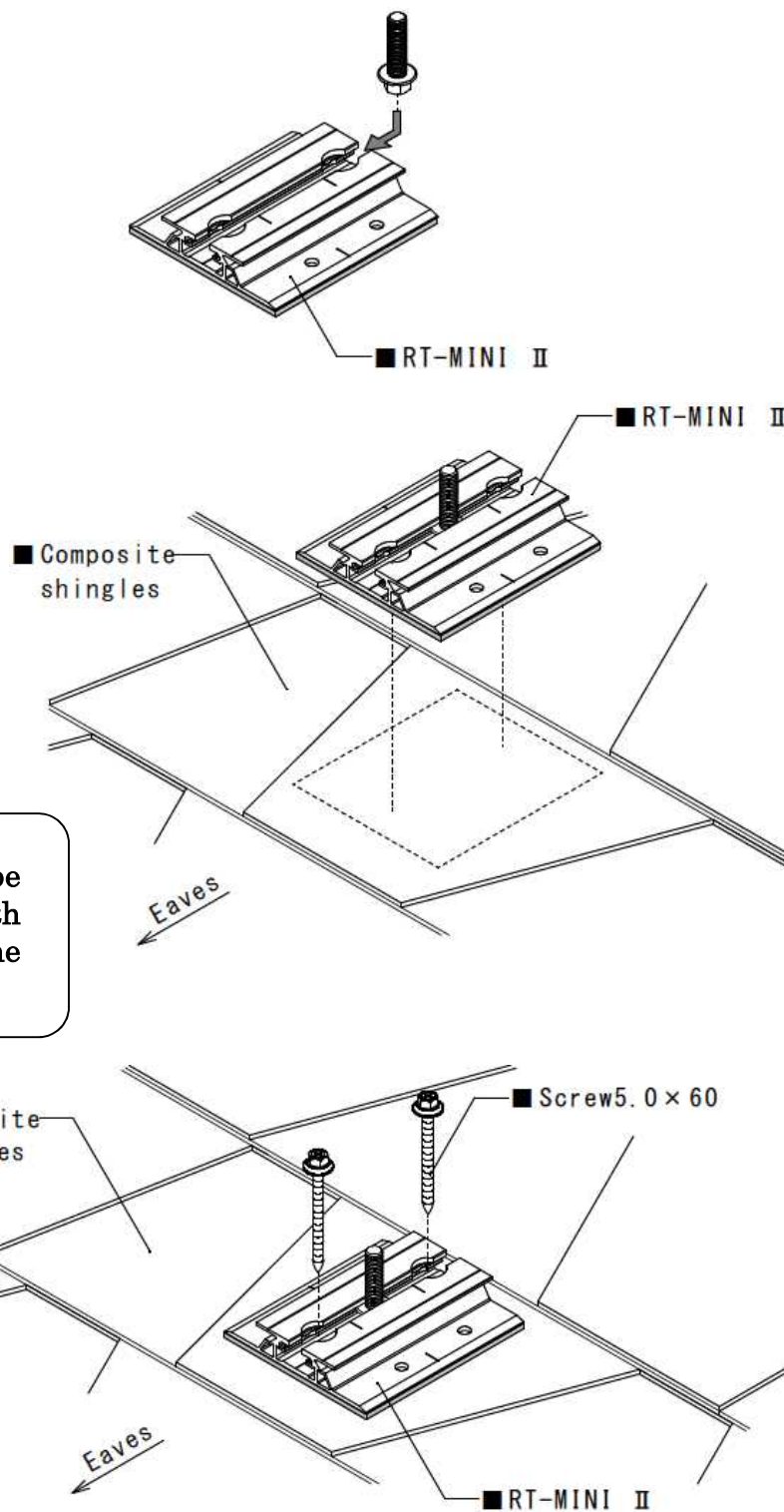
Place the brackets at the specified position and make sure the RT butyl makes good contact with the roofing surface.

Slide the 5/16" Flanged bolt into place before fastening the bracket on the roof.

Set the bracket with 2 ea. Screws, M5.0 × 60 mm stainless wood screw using 8mm hex socket.

After completing process, make sure the brackets are securely fixed.

[Fastening it to the Rafter]



! Attention

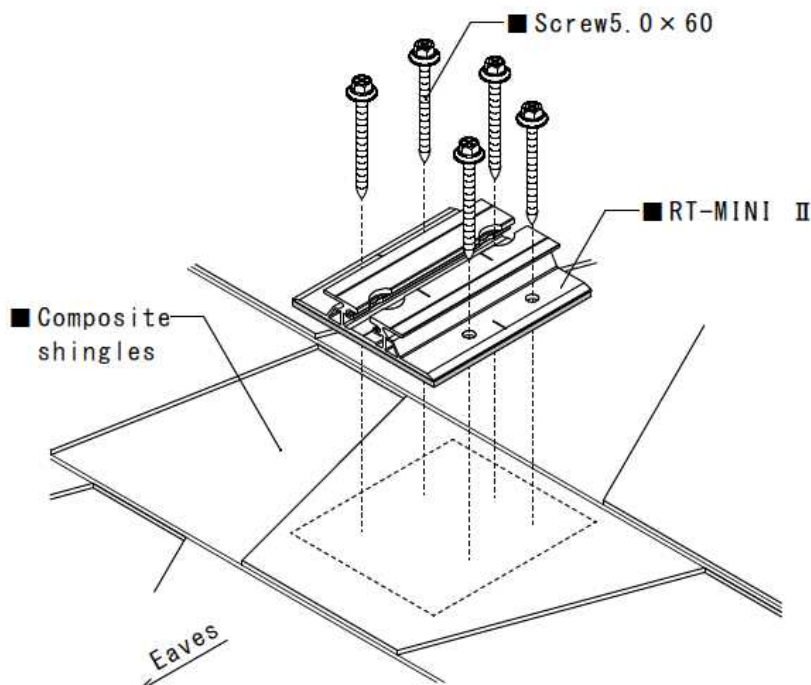
The 5/16" Flanged bolt must be set on the channel before both wood screws are fixed to the rafter.

[Fastening it to the Roof Deck]

! Attention

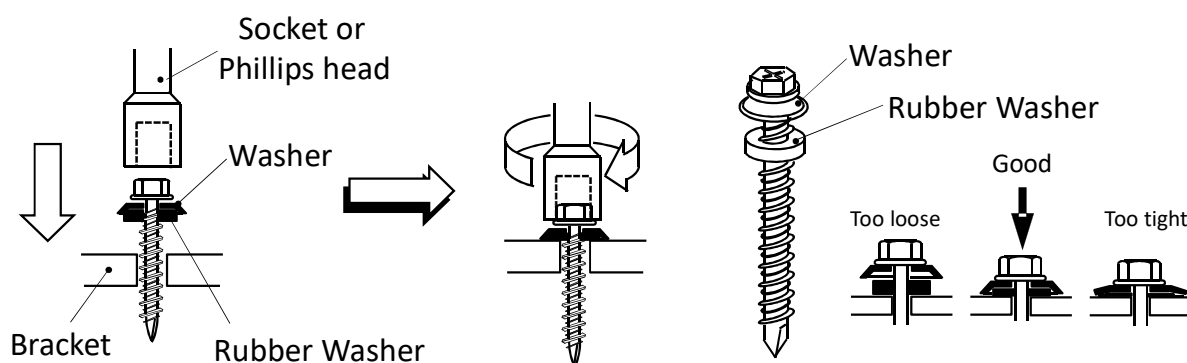
When the MINI II base is installed on the deck, 5 screws must be used. Four screws are fixed into the sides and 1 on the ridge side.

Note: Each MINI II is shipped with 2 mounting screws. The installer must purchase additional screws when mounting it to the roof deck.



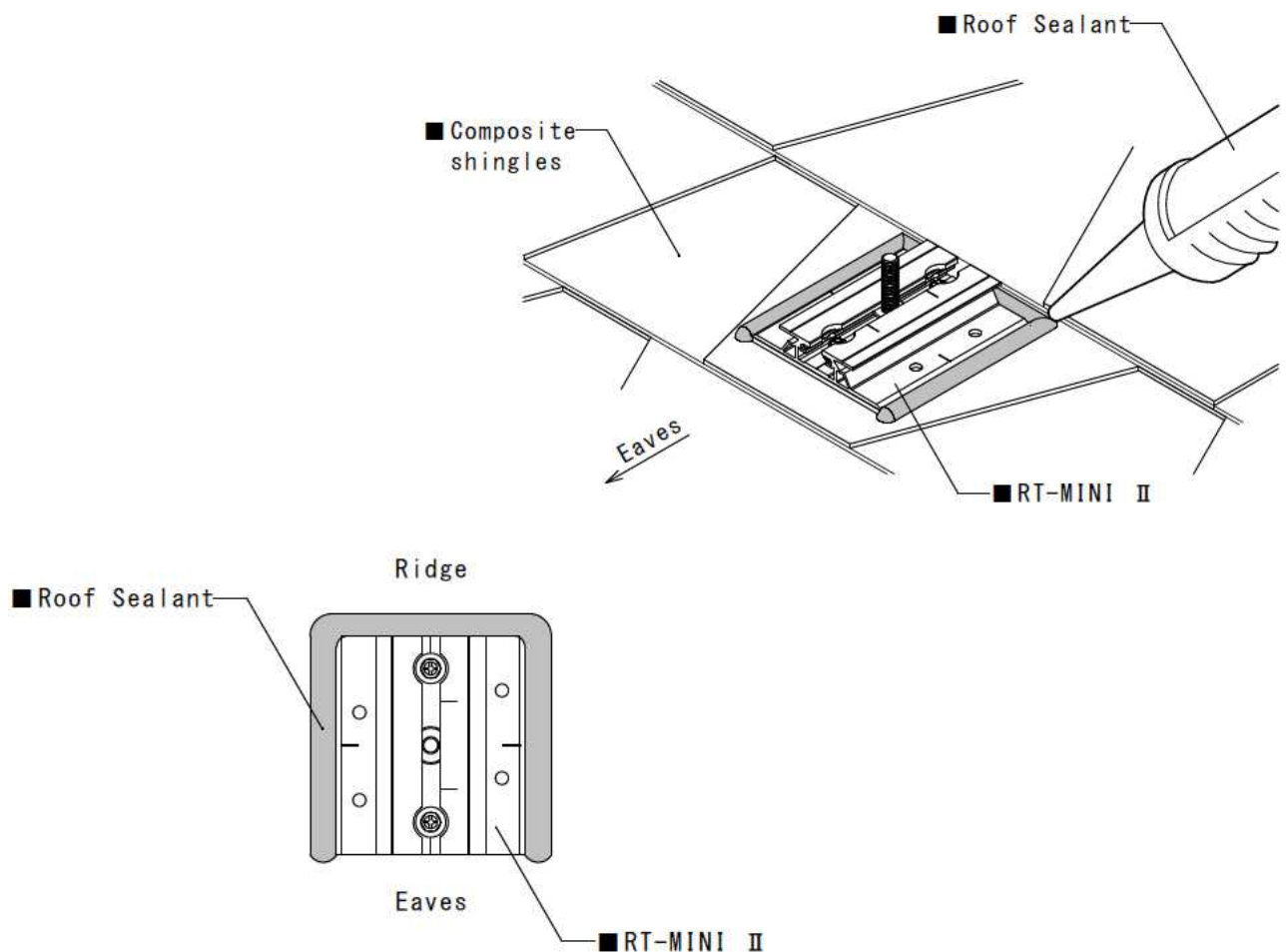
! Attention

Note: Proper torque values for the 5.0x60 mm screw will vary depending on the rafter and/or deck characteristics; hardness, age, and moisture of the wood. It should be tightened until the conical washer stops rotating..



When tightening the screws please tighten all screws equally and avoid using an impact driver as it can over torque the screws or even snap off the head.

- ⑥[OPTIONAL Sealant Layer] Apply roof sealant to the top and each side edge of the brackets. This adds additional UV protection.
Cover the exposed RT butyl tape with roof sealant.
No need to apply it to the bottom of the brackets.



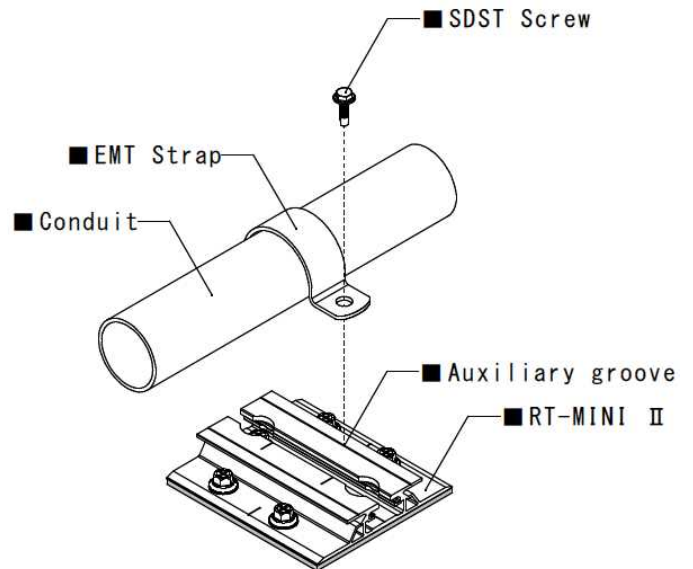
! Attention

You may verify that the screws underneath the deck panel are stained with butyl rubber. This indicates a good flashing performance.

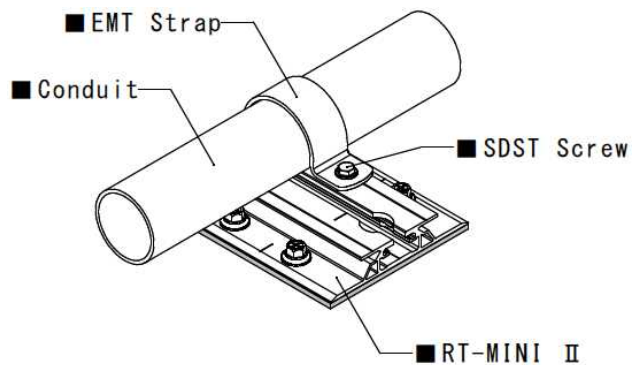
2. Conduit Strap Installation (Optional)

(1) A conduit Strap can be installed on top of MINI II

- ① Align the conduit Strap to the groove on top of MINI II

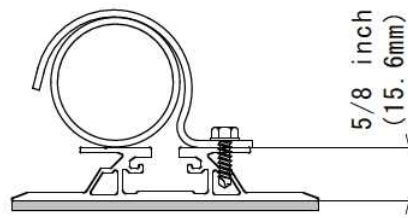


- ② Use the SDST screw to fix the conduit Strap. Length of SDST screw must not exceed 5/8".



Attention

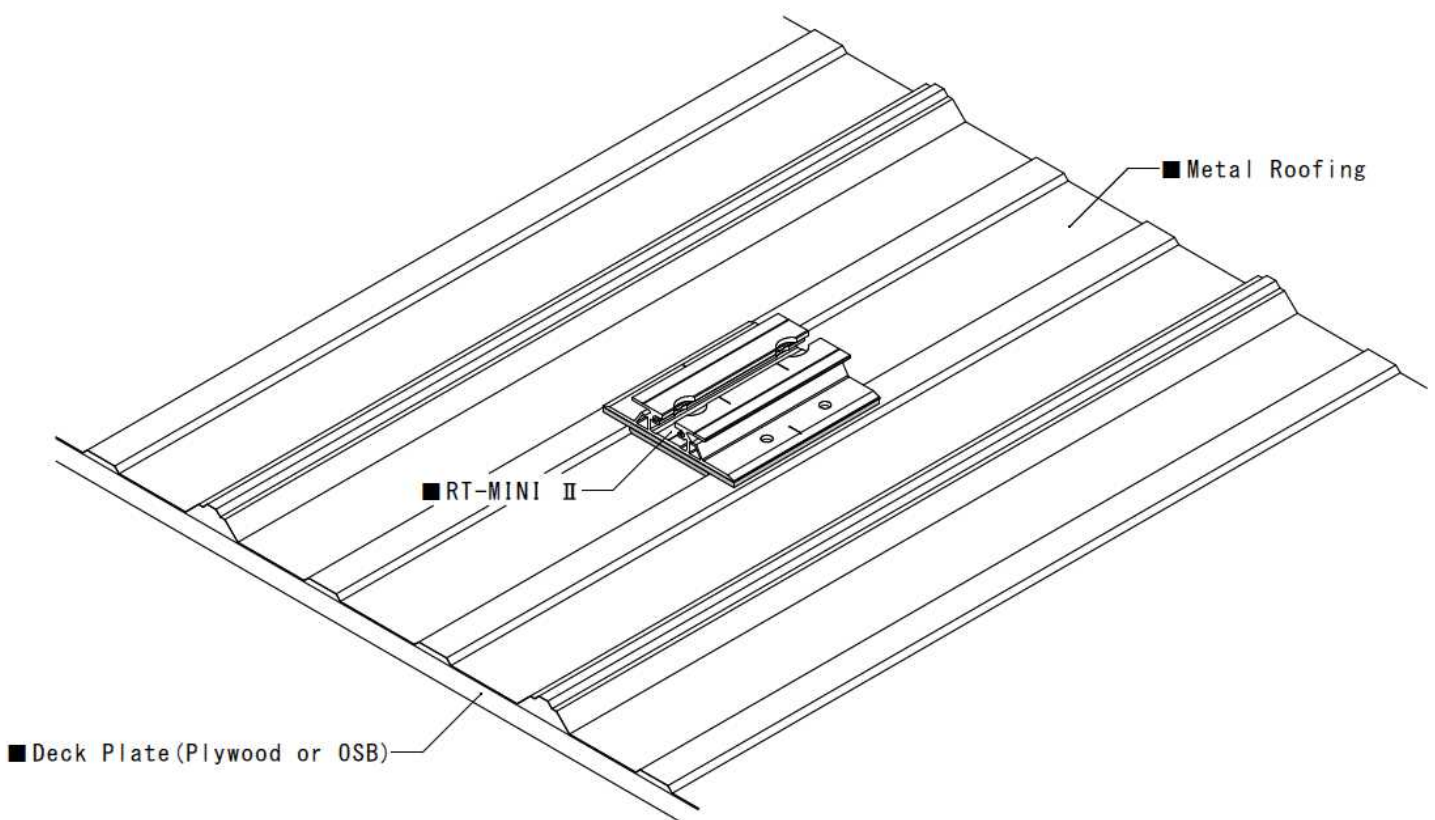
The SDST SCREW length must not exceed 5/8".



Installation on a Metal Roofing

1. Requirement

- The Roof Tech P.E. Letters are created for a minimum 7/16" OSB with 2x4" rafters 24 in o.c.



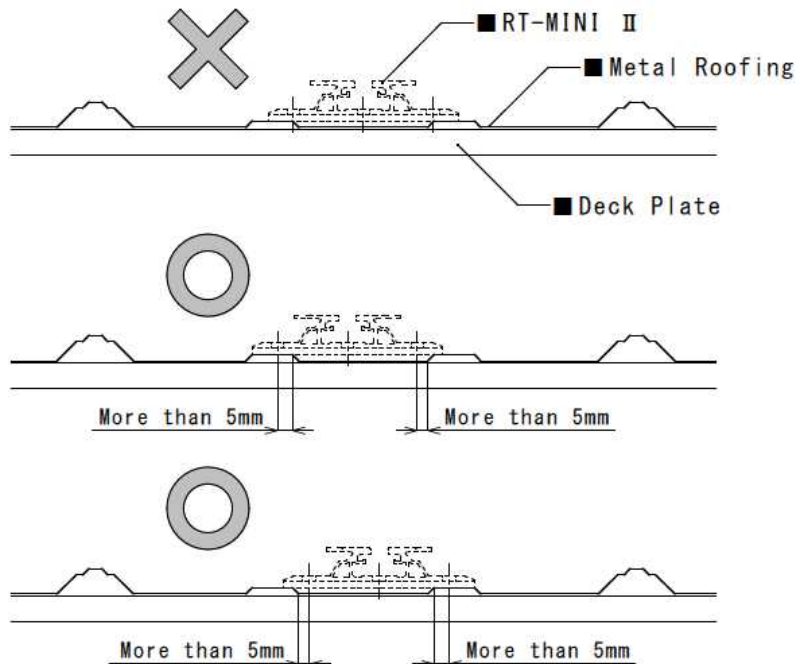
IMPORTANT:

Metal roofs have a high thermal expansion and contraction factor. Screwing through a standing seam metal roof is not recommended and will also void the roof warranty. Exposed fastener metal roofs have a lesser impact from thermal expansion, however attention to the panel length is important. Consult with the metal roof manufacturer for solar roof attachment guidelines.

2. Marking on the Roof

(1) Layout

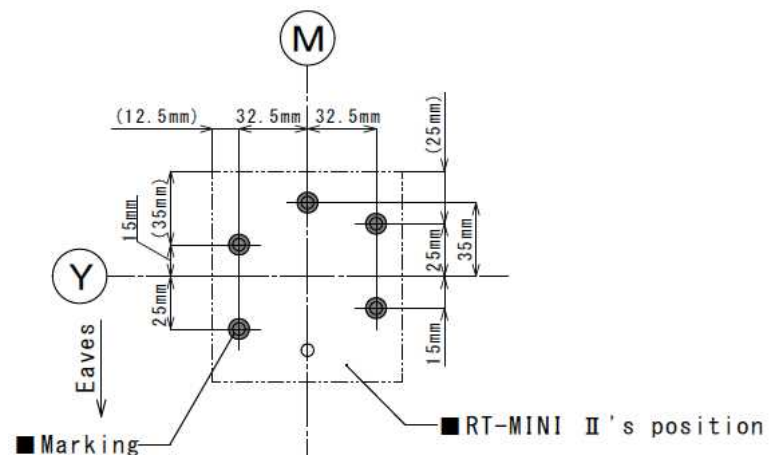
- ① The MINI II base must be mounted on the flat surface. Please make sure the location is not on slope surface of metal ribs. Screw must be fixed to the flat surface. Also, its center must clear 5mm from the edges (Please refer to the 3 pictures on the right.)



- ② In case of Deck Installation, mark at ± 15 mm, ± 25 mm from the intersection of the M Line and Y Line.

[Fastening to the Deck]

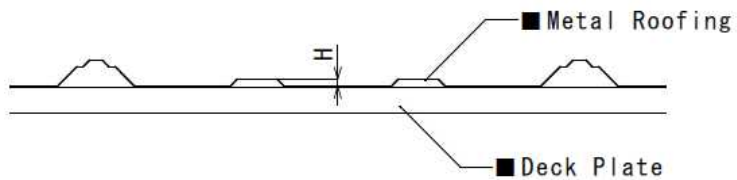
- ③ Then mark at ± 32.5 mm from the M Line
- ④ Mark at $+35$ mm from the Y Line on the M Line.



! Attention

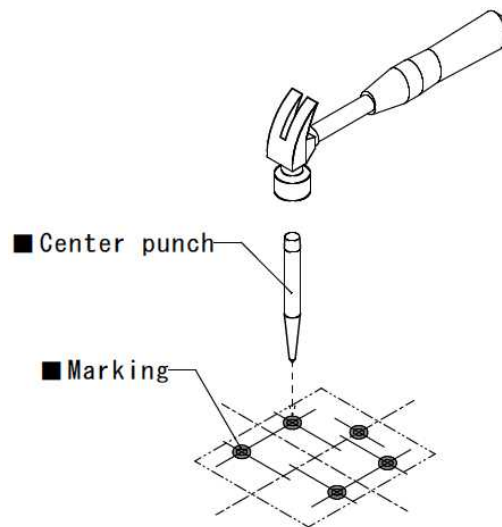
Note; Marking spot is not symmetric when MINI II base is installed on deck. You may want to have an extra MINI II to assist in marking to a metal roof. (Create a MINI II JIG by removing the RT Butyl from it.)

(2) Check the height of metal rib.



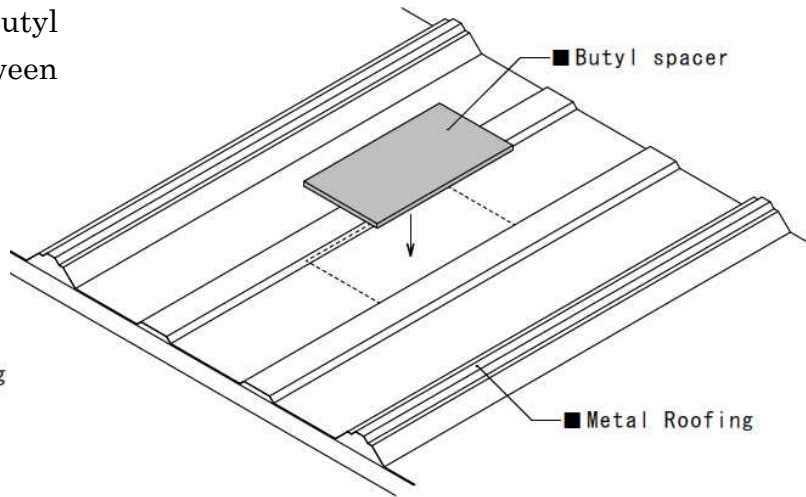
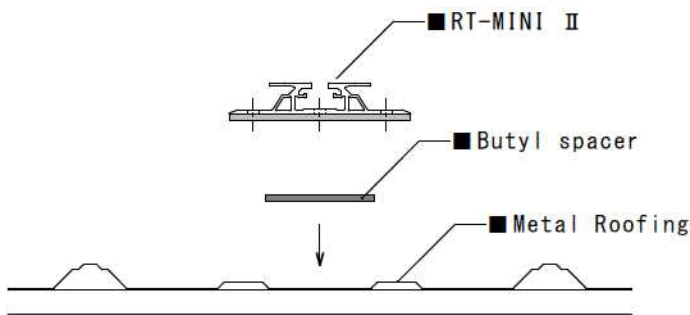
1) The maximum height “H” is 5mm.

- ① Use Center punch to make a pilot hole. You can mark on roof or use base’s screw hole directly from top of the base.



3. Bracket Installation

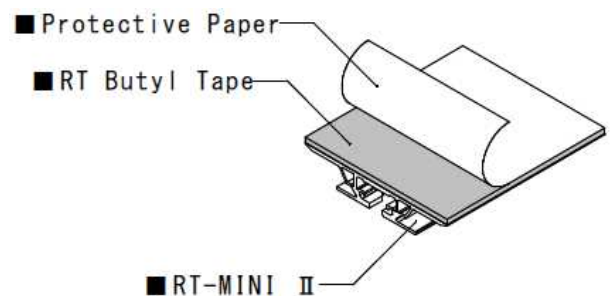
- ① Please add a butyl pad (RT - Butyl Spacer) on the surface between the ridges.



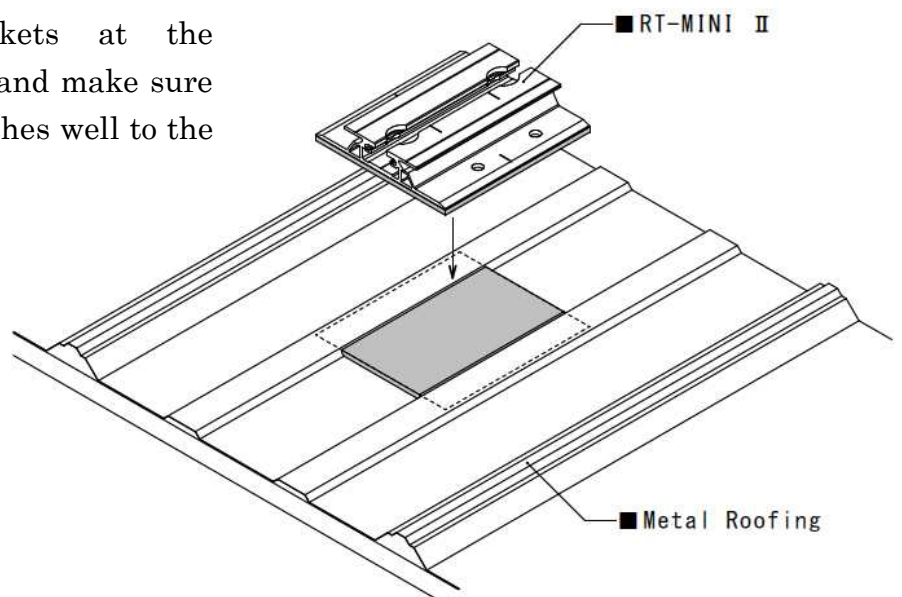
- ② Peel off the protective paper from the RT butyl tape.

! Attention

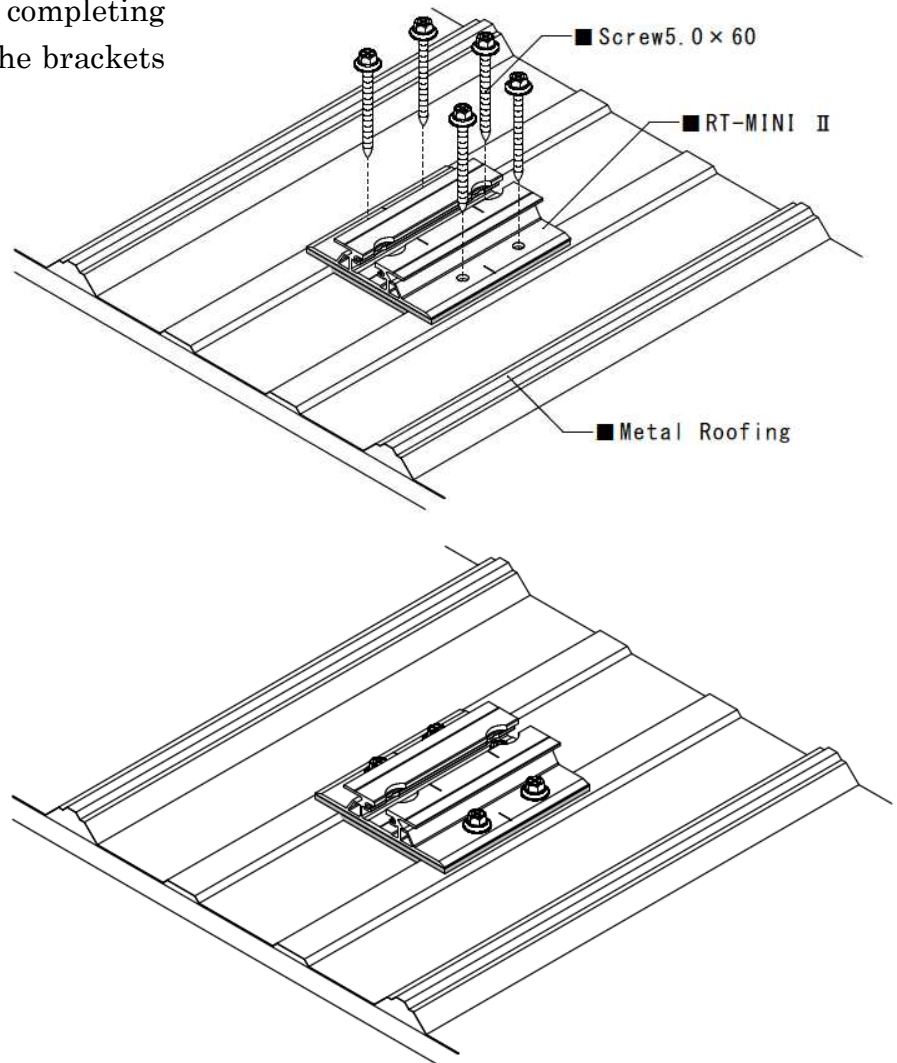
Do not leave any protective paper on the surface of the RT butyl tape, it can cause an improper seal and may allow water intrusion under the bracket.



- ③ Place the brackets at the specified location and make sure the RT butyl attaches well to the roofing surface.



- ④ Set the bracket with 5 ea. (for Roof DECK), of M5.0 × 60 mm stainless wood screw using 8 mm hex socket. After completing process, make sure the brackets are securely fixed.



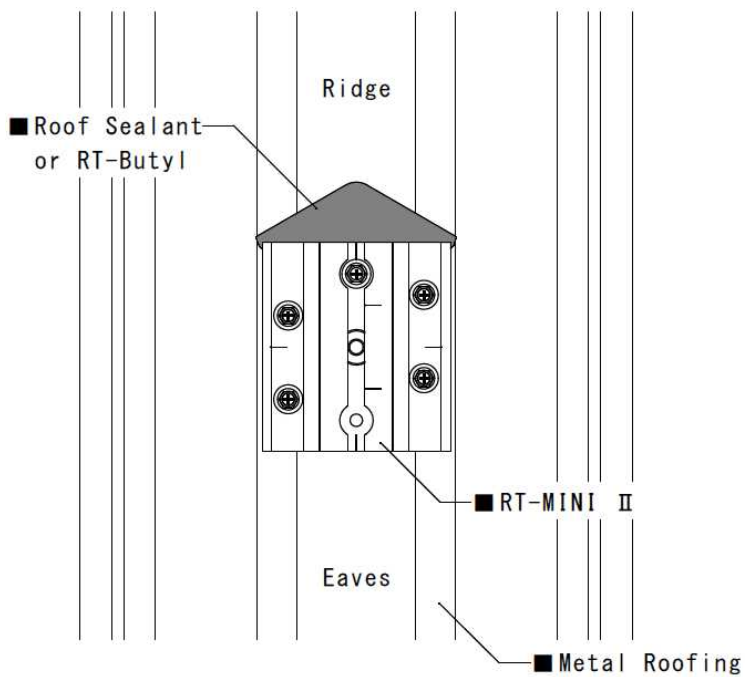
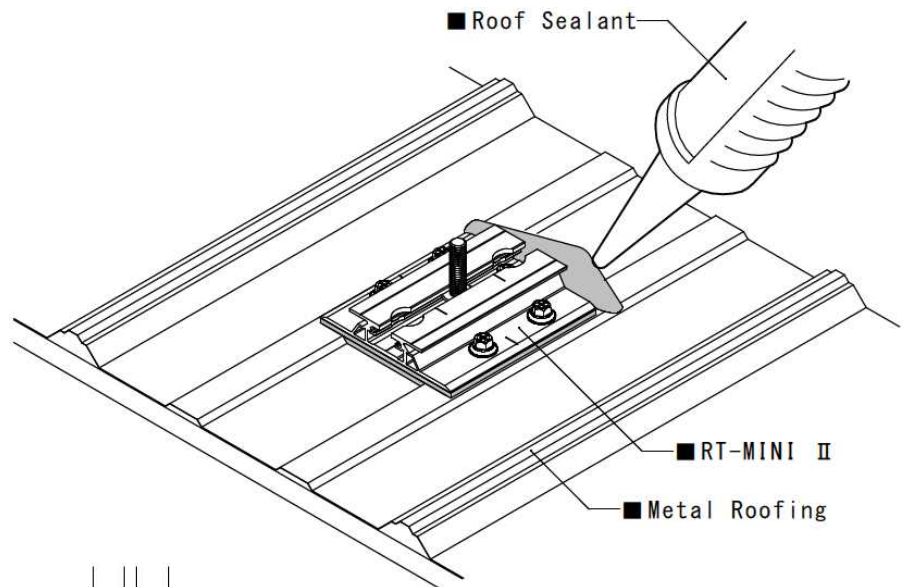
Attention

When the MINI II base is installed on the deck, 5 screws must be used. The screws are fixed into the side 4 holes and 1 ridge side hole.

Note: Each MINI II is shipped with 2 mounting screws. The installer must purchase additional screws when mounting it to the roof deck.

ADDENDUM
Installation Instruction for metal roofing

- ④ Apply roof sealant on the ridge side of the brackets to form a slope and triangle. Optional is the sealant to each side of the brackets. Do not apply sealant to the bottom of the brackets.



Installation on a Composite Slate

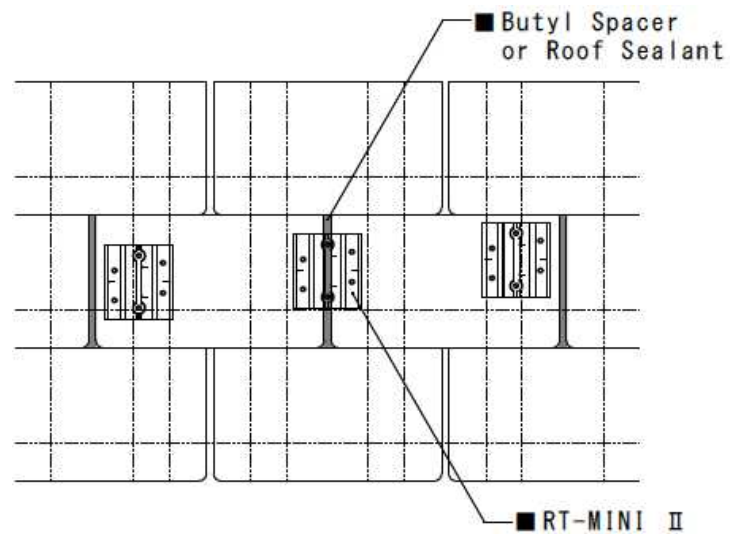
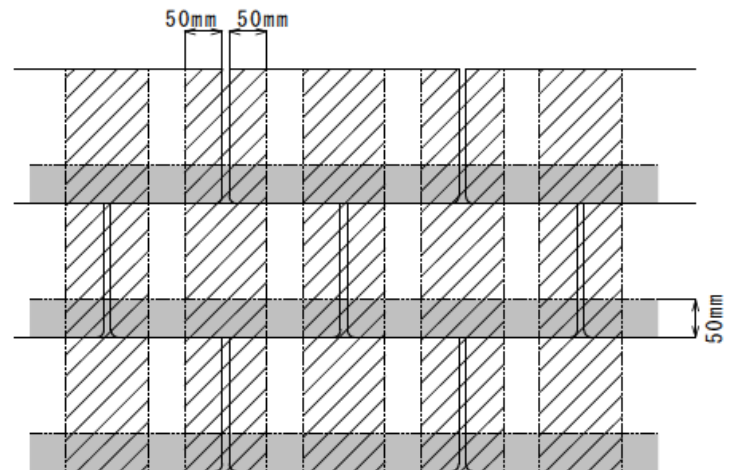
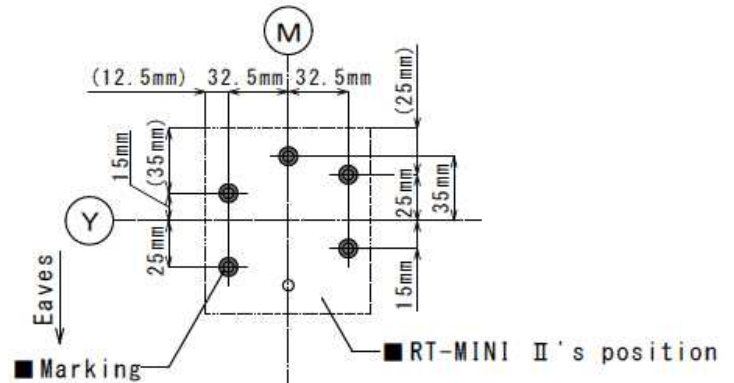
1. Requirement

- Composite Slate, compatible with RT Butyl

2. Marking on the Roof

(1) Layout

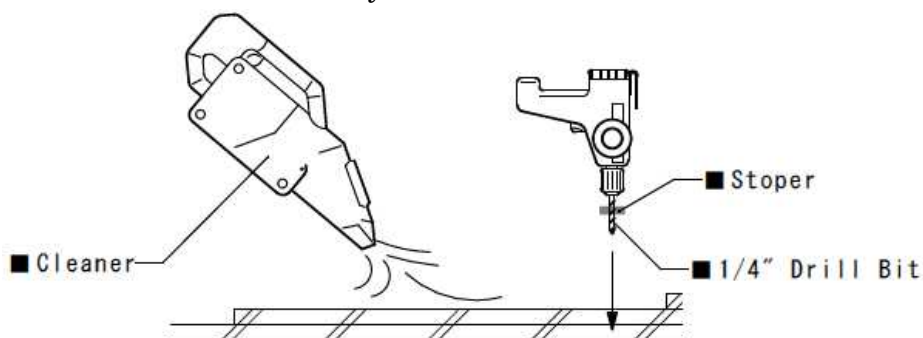
- ① The MINI II base must be mounted on the flat surface.
- ② Mark at ± 15 mm, ± 25 mm from the intersection of the M Line and Y Line.
- ③ Then mark at ± 32.5 mm from the M Line
- ④ Mark at $+35$ mm from the Y Line on the M Line.
- ⑤ If the Mini is located at the gap of the roof surface or within 50mm, the gap has to be filled with sealant or butyl tape as seen in the exhibit to the right.



3. Bracket Installation

- ① Drill a pilot hole to fill with sealant with a ϕ 1/4 inch (ϕ 6.5 mm) drill bit at the markings.

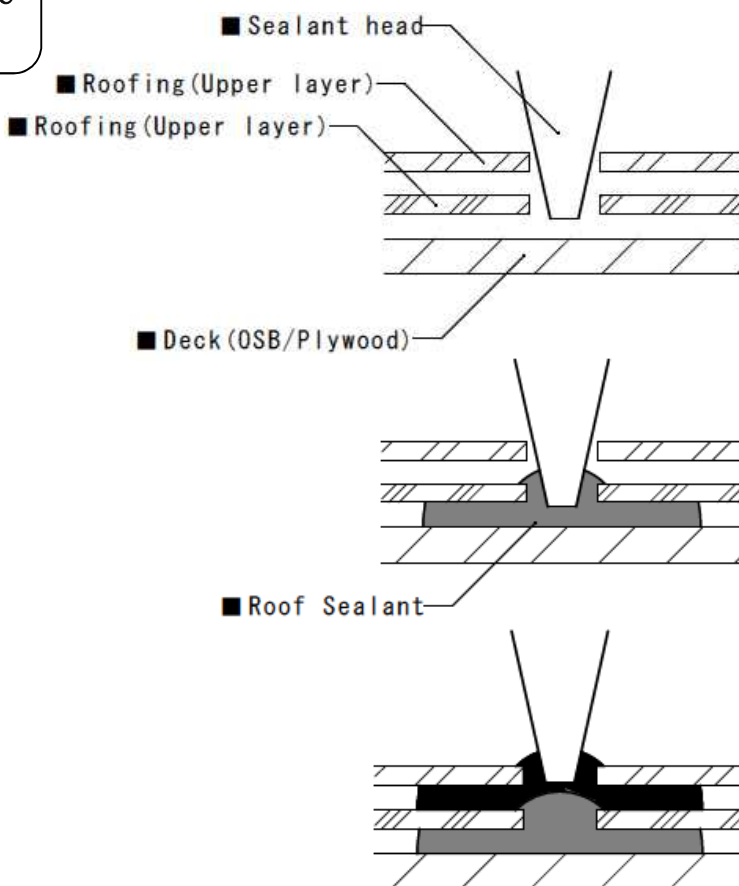
Note : It is easier to manage drill depth by using any stopper on the drill bit. Please make sure to use stopper to drill through the layer of roofing material only. Do not to drill all the way to the wood deck or underlayment.



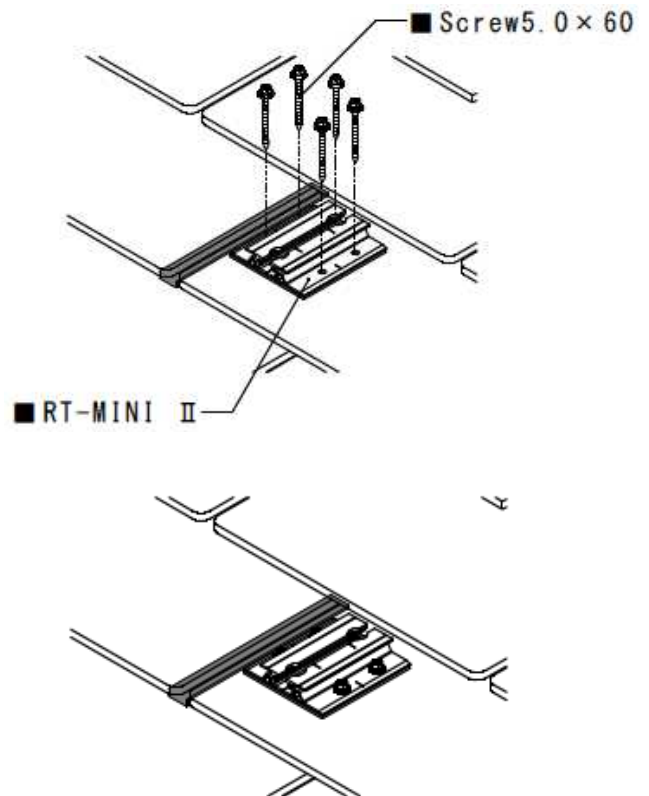
! Attention

You must avoid drilling into the wood underneath it.

- ② Fill the cavity with a sealant listed in our Installation Manual. The sealant must be flush with the slate surface.



- ③ Set the bracket with 5 ea.
(for Roof DECK), of M5.0 ×
60 mm stainless wood screw
using 8 mm hex socket.



Attention

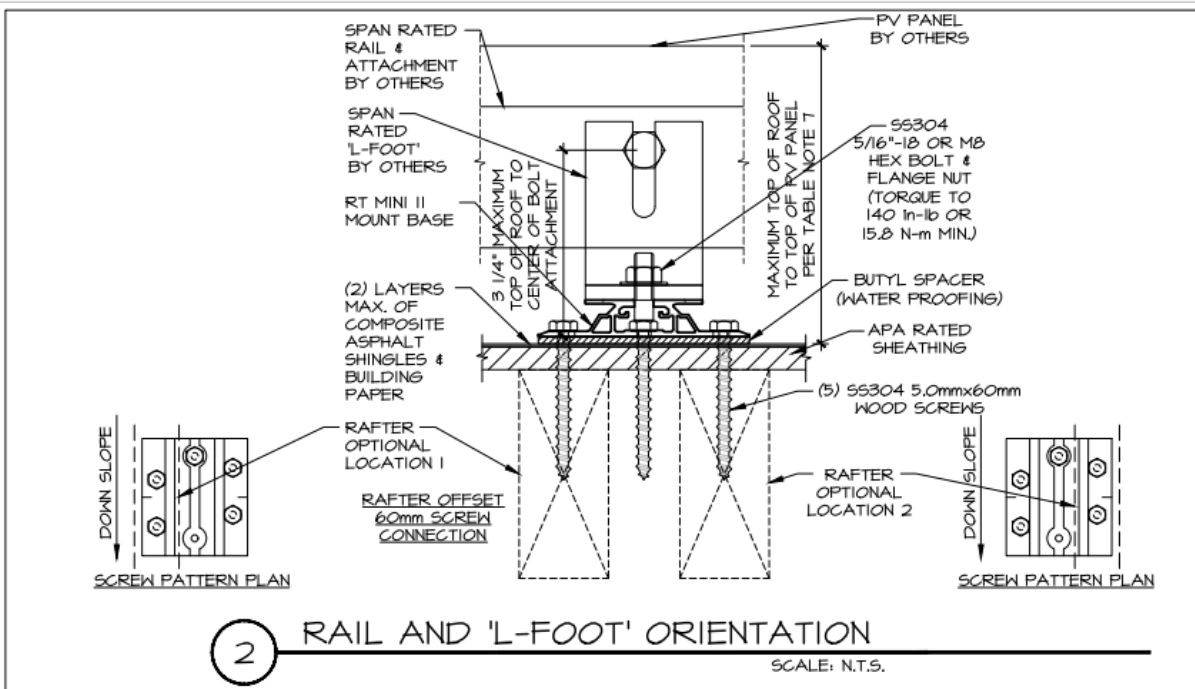
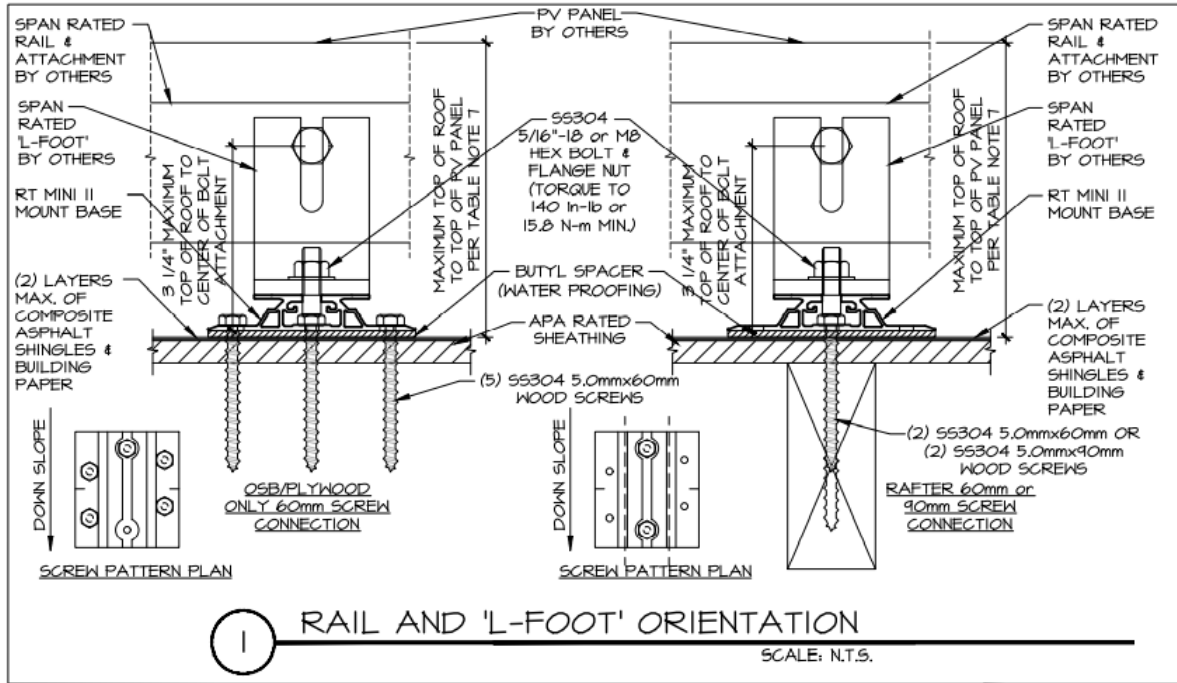
When the MINI II base is installed on the deck, 5 screws must be used. The screws are fixed into the side 4 holes and 1 ridge side hole.

Note; Each MINI II is shipped with 2 mounting screws. The installer must purchase additional screws when mounting it to the roof deck.

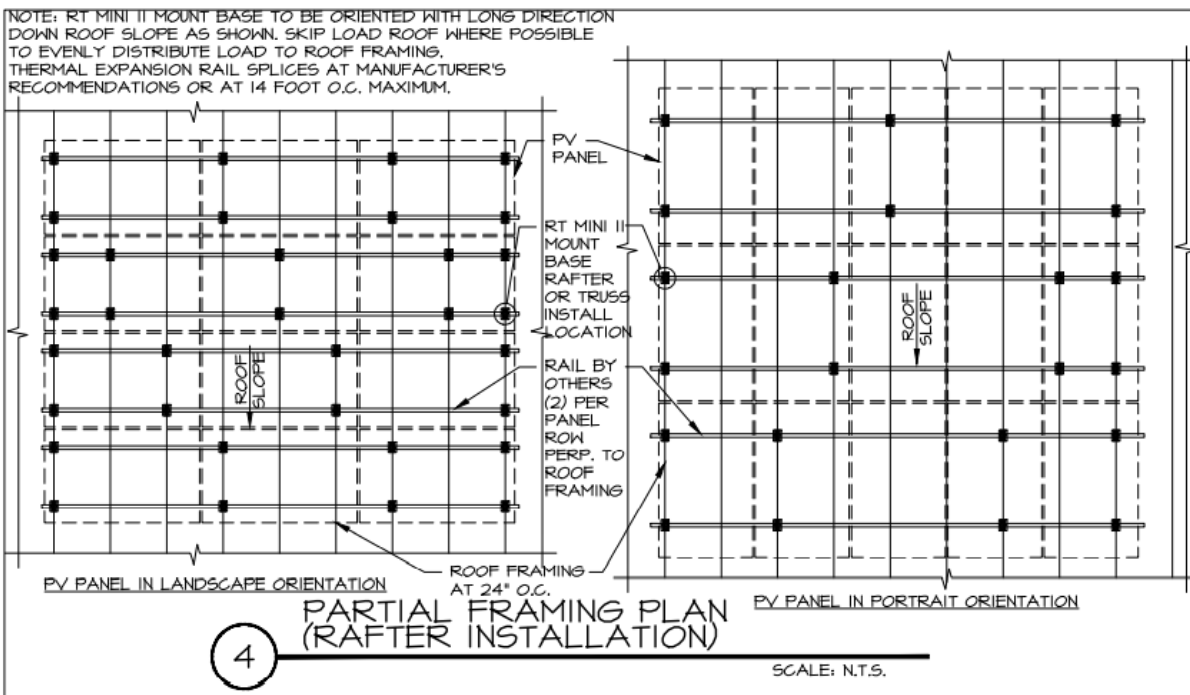
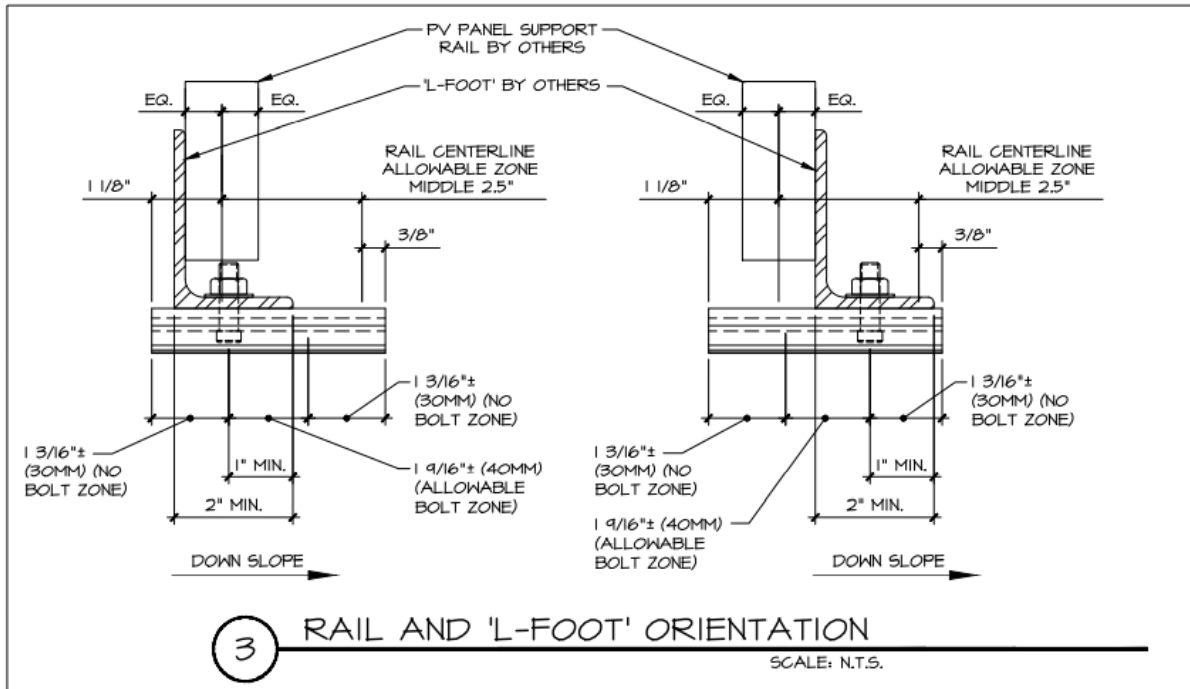
ADDENDUM

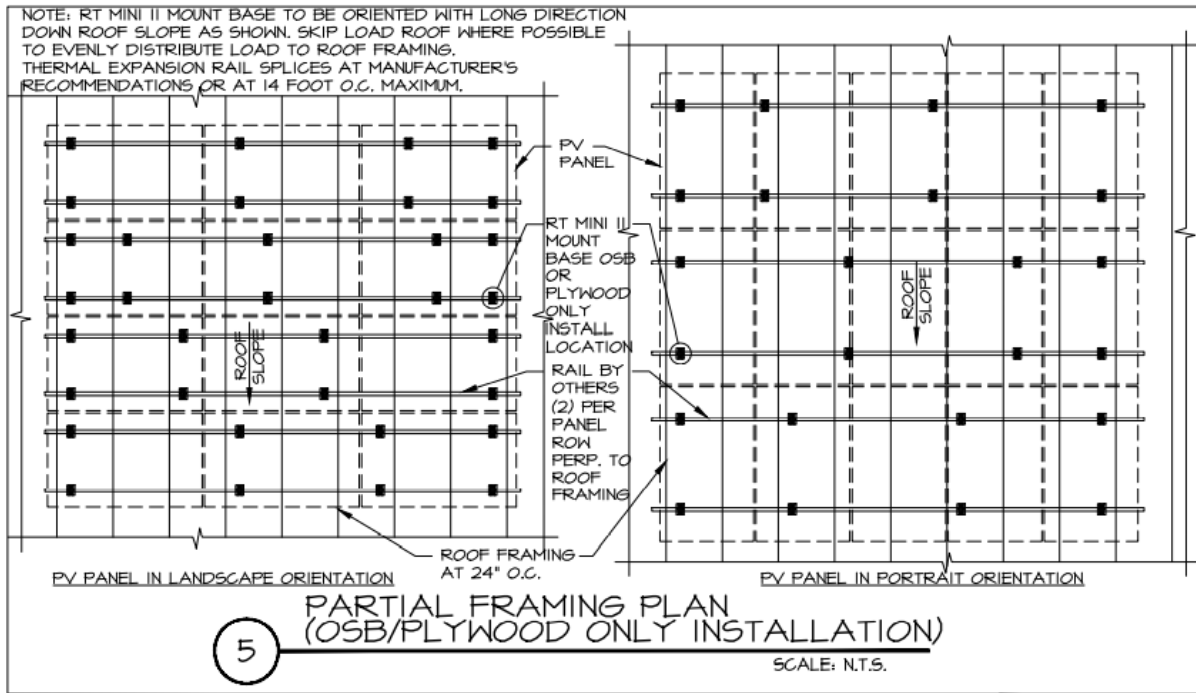
MINI used with L-Foot and Rail

It is important that the designer and installer are acquainted with the PE stamped letters posted on <http://www.roof-tech.us/support>.



ADDENDUM
MINI used with L-Foot and Rail





Customer Support

For assistance call Roof Tech customer support.

(858) 935-6064

<http://roof-tech.us/>

