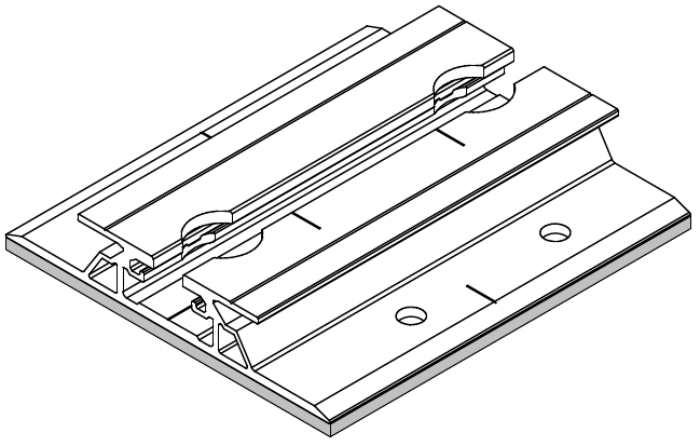
Jan./2024

INSTALLATION MANUAL

RT-MINI Ⅱ



Roof Tech
The Standard for Waterproof Flexible Flashing Since 1994.

10620 Treena St, Suite 230
San Diego, California 92131
TEL (858) 935-6064
www.roof-tech.us

INSTALLATION MANUAL

Contents

Introduction 1
Periodical Inspection 2
Tools Required for Assembly 3
Technical Note 3
Moisture Content 4
Installation Safety 4

PART A: Materials 5

PART B: Bracket Installation 6
1. Installation of Brackets 6
(1) Bolt options 6
(2) Brackets Layout 6
(3) RT-MINI Ⅱ Mounting Options 9
(4) Bracket Installation 11
2. Conduit Strap Installation (Optional) 20

Installation on a Metal Roofing
1. Requirement 22
2. Marking on the Roof 23
3. Bracket Installation 25

Installation on a Composite Slate
1. Requirement 28
2. Marking on the Roof 28
3. Bracket Installation 29

Installation on a Membrane
1. Requirement 31
2. Marking on the Roof 32
3. Bracket Installation 33

MINI Ⅱ used with L-Foot and Rail 35

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.
- Substituting the parts such as the RT Butyl or the RT 5x60mm or 5x90mm Stainless Wood Screws provided by Roof Tech will void the warranty and invalidate the PE Structural Letters.
- 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 ambient 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	(Lbf.in)
FBN25 5/16 Hex Flanged Bolt and Flanged Nut (Included)	15.8 N･m	(140)

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.

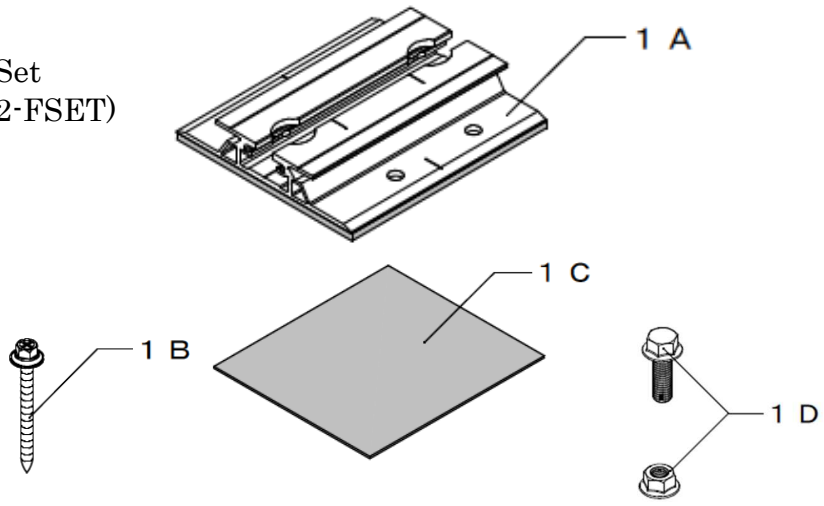
- Use properly anchored fall protection equipment.
- Use caution to prevent objects from falling or dropping off the roof area.
- Cordon off ground areas directly beneath the roof work area when possible.
- Always use personal protection equipment such as safety glasses, gloves, etc.
- Do not perform 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**

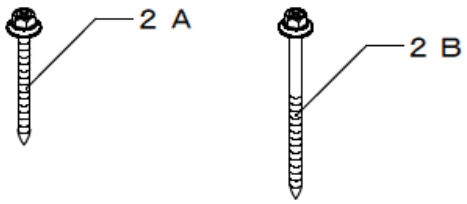
① RT-MINI Ⅱ Bracket Set
(P/N RT2-00-MINIBK2-FSET)

	Item
1A	RT-MINI Ⅱ
1B	Screw 5.0×60
1C	RT Butyl Flashing
1D	FBN25 Bolt and Nut



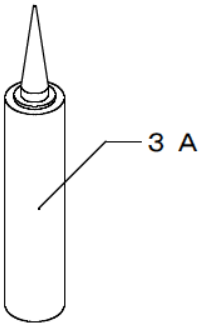
② Screw（Optional）

	Item
2A	Screw 5.0×60
2B	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.

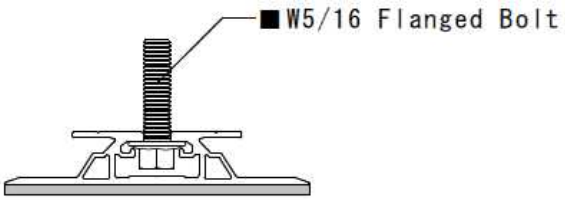
Note: Above sealants evaluated for asphalt roofs!

PART B: Bracket Installation

1. Installation of Brackets

(1) Bolt options

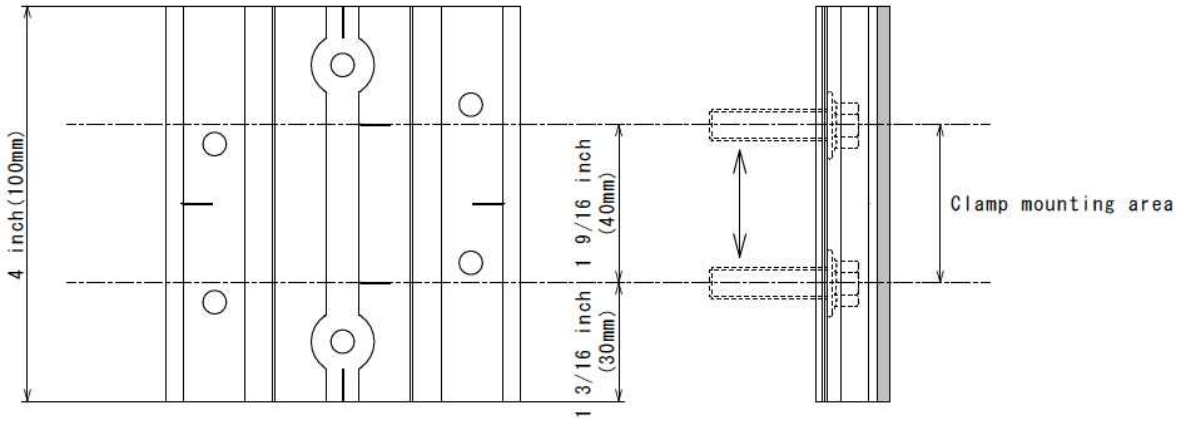
a) For the FBN25 5/16" Flanged Bolt Set **(L-Foot mounting option included)**



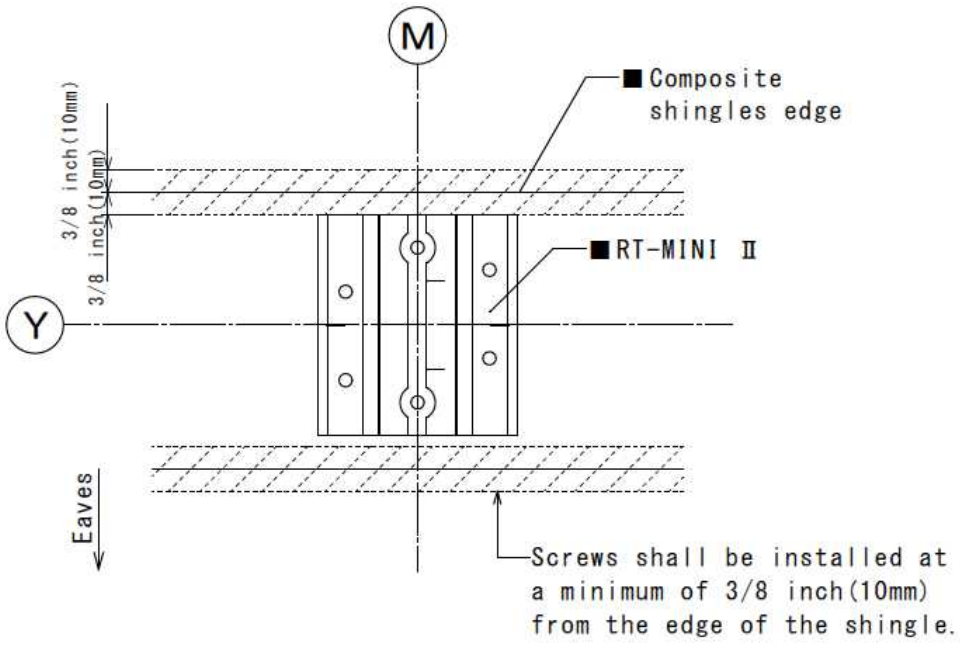
Note: Other than supplied bolts will not fit the RT-MINI Ⅱ base.

(2) Brackets Layout

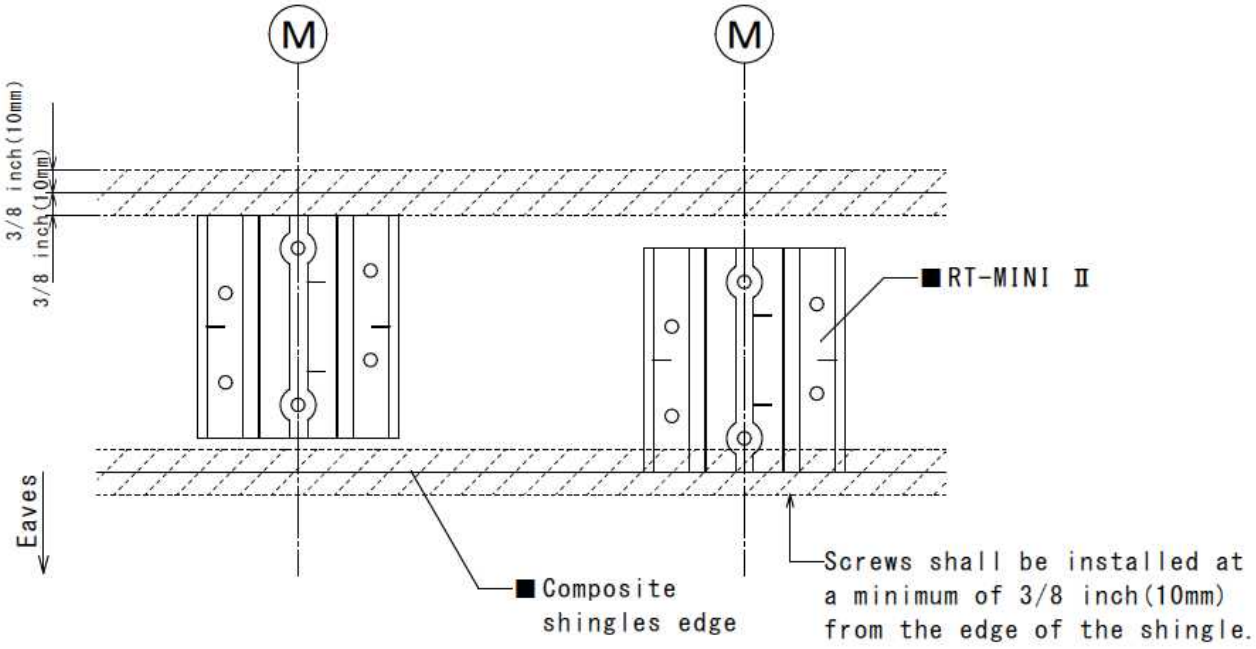
There is 1 9/16 inch (40mm) adjustability to secure the bolt.



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.

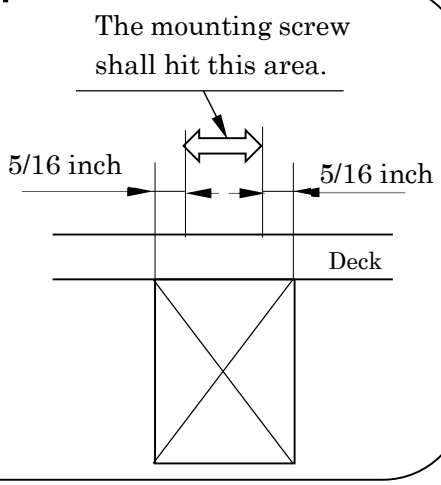
(ii) Line Y: Horizontal Bracket center line.

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

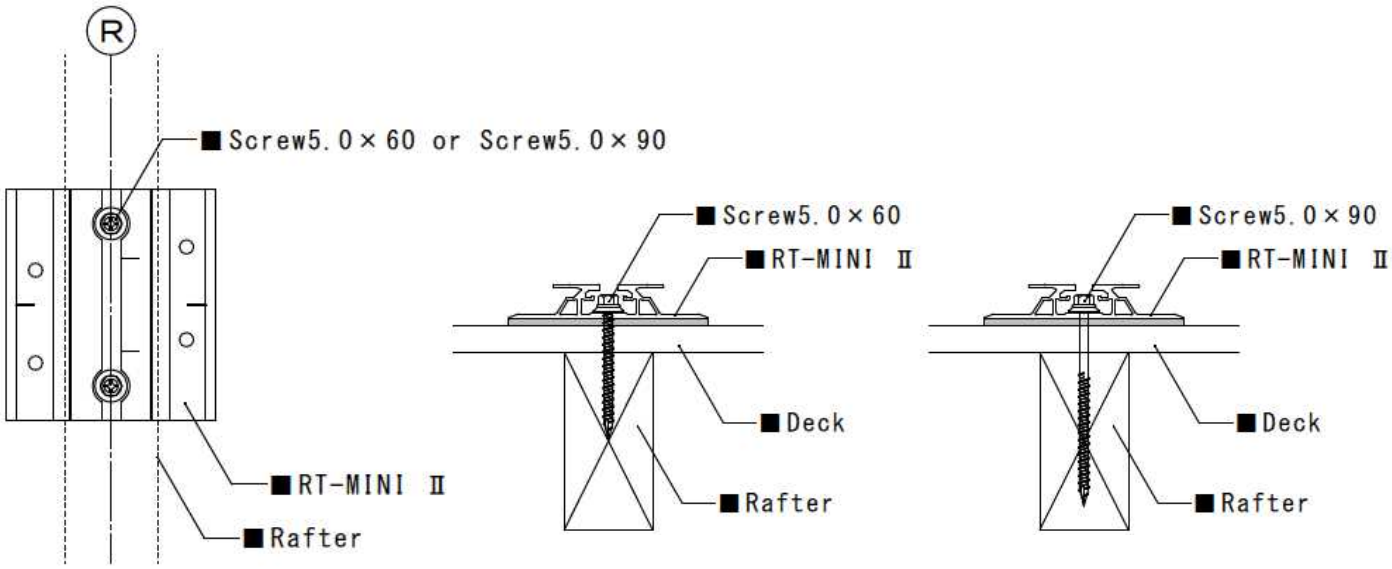
According to the NDS, the distance from the side edge of the rafter and the 5 mm diameter mounting screws for RT-MINI Ⅱ shall be at least 5/16 inch (7.9 mm) from the edge.

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.)

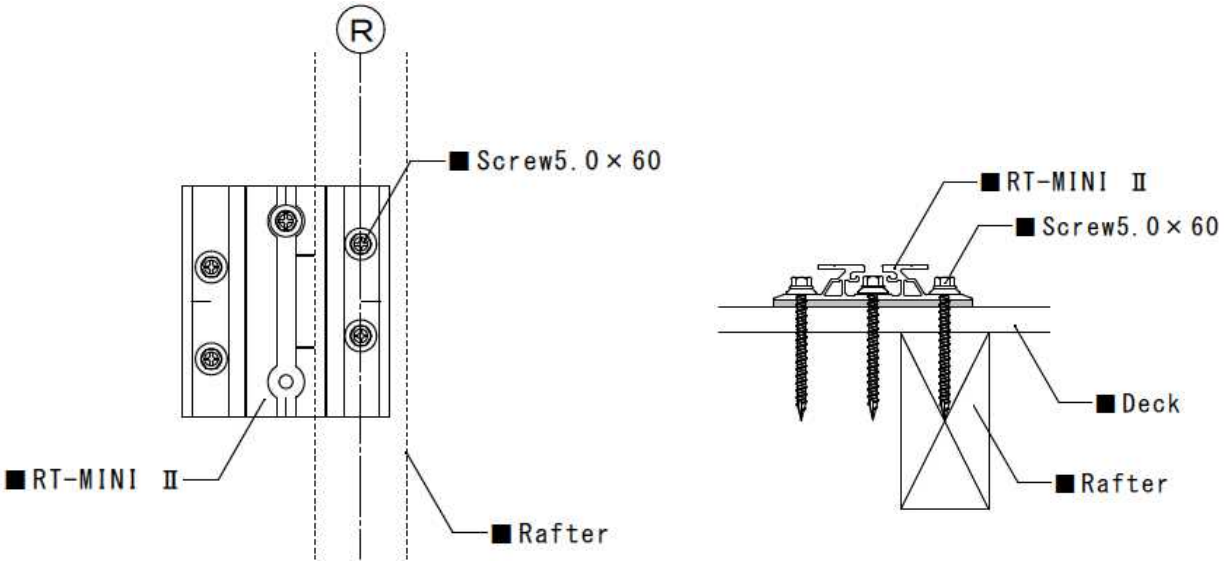


(3) RT-MINI Ⅱ Mounting Options

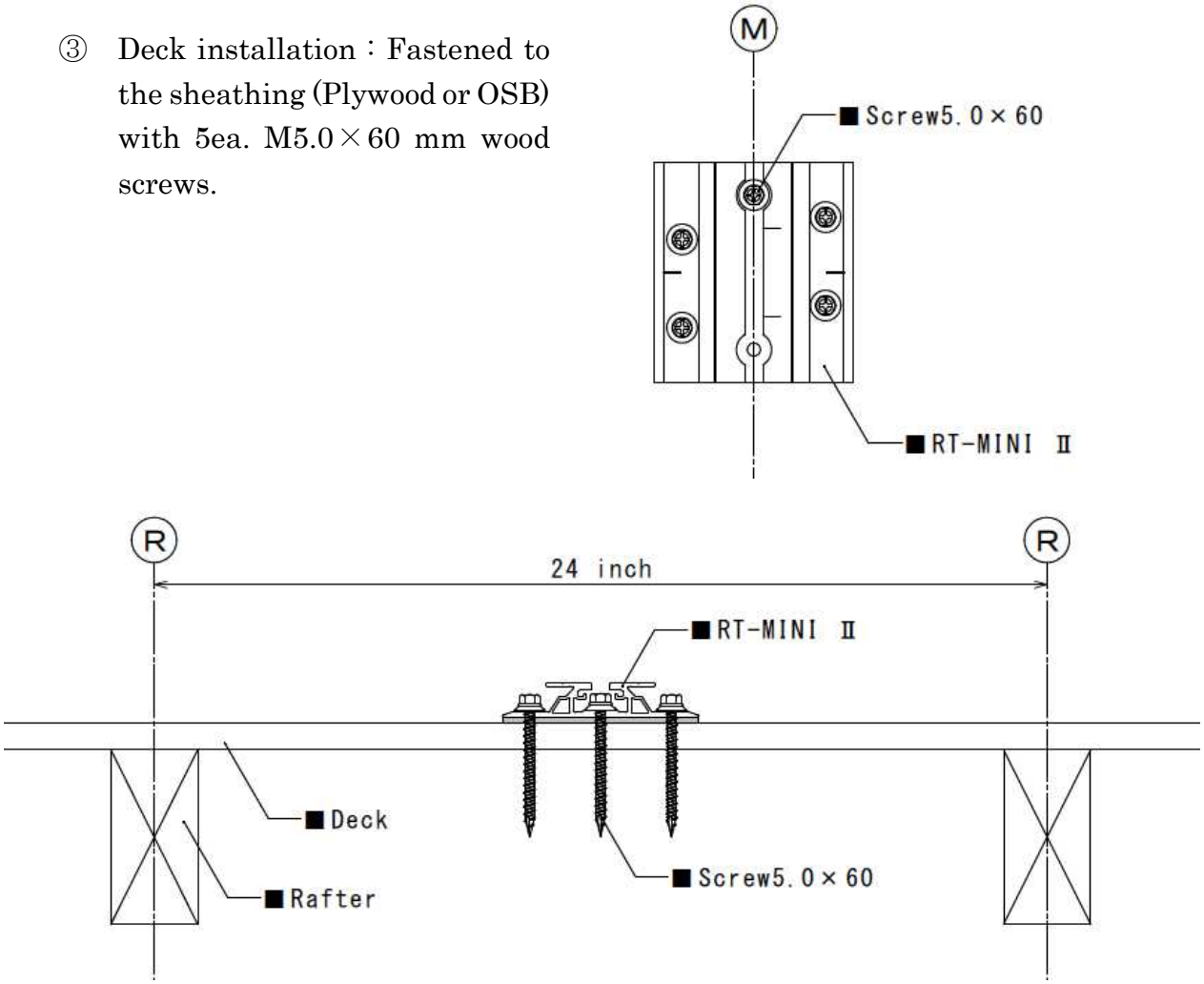
① Rafter installation (Center) : Fastened in the center to the Rafter with 2ea. M5.0×60 mm or M5.0×90 mm wood screws.



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.



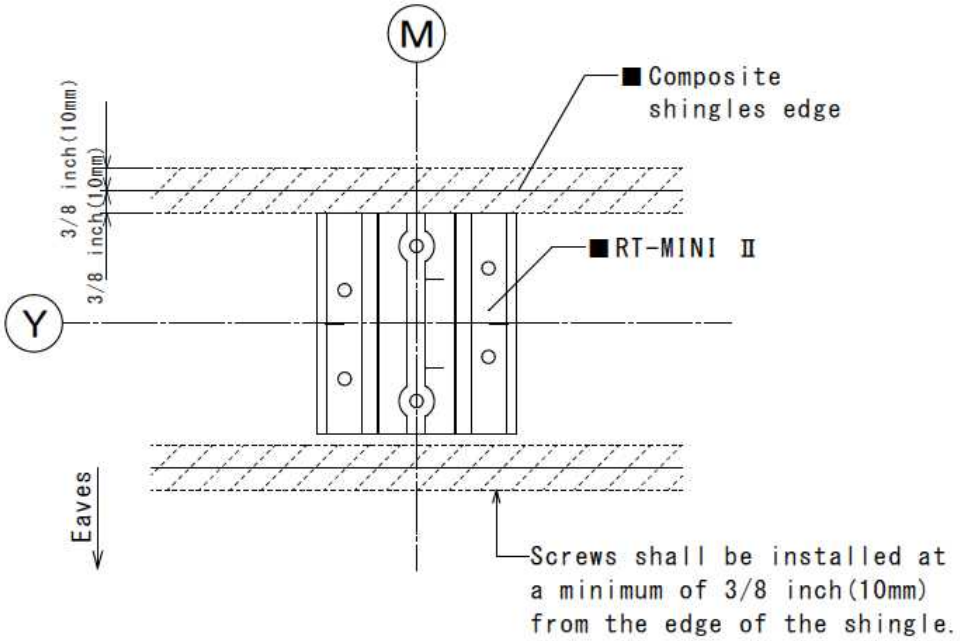
Note: Verify the PE stamped letters for maximum span values.

(4) Bracket Installation

Attention

To maintain the flashing performance, avoid installation when the ambient 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.



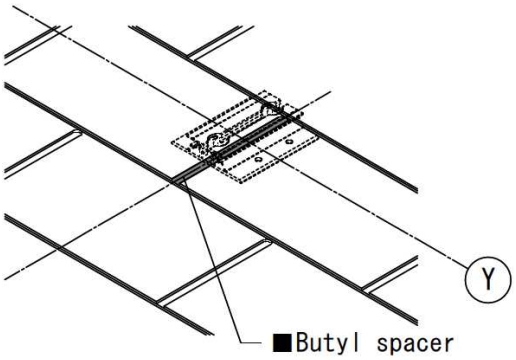
Attention

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;

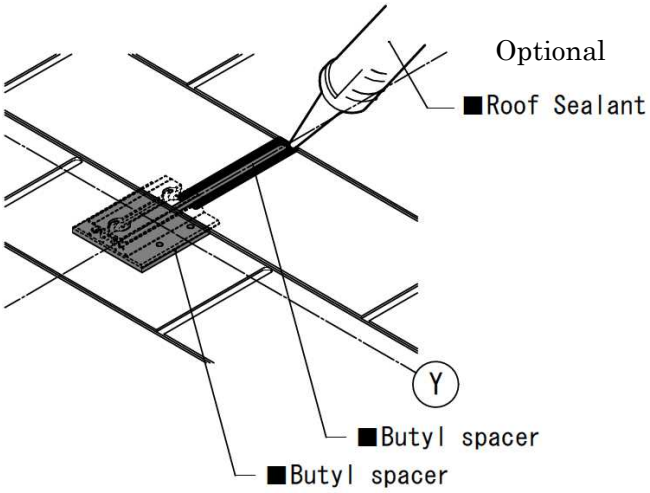
1) **Tip the driver at an angle.**
2) **Use a 3 mm steel drill to make a hole.**
3) **If possible, remove the nail from underneath.**

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.



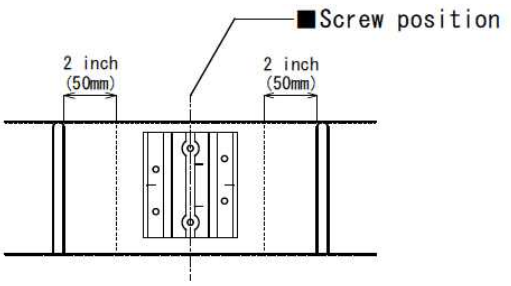
- When there is a slit at the installation spot, fill in with the additional RT butyl tape.
  The slit must be filled with RT butyl tape.

- When there is a slit above the bracket, fill it in with RT butyl tape to match its shape. (Optional) 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.



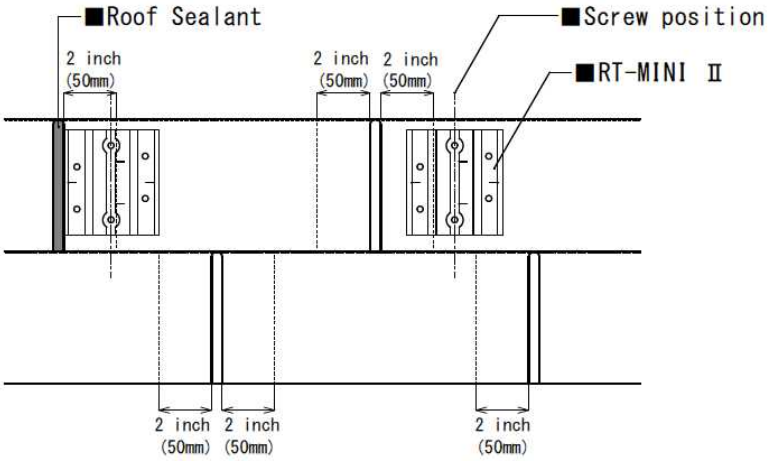
Rafter Install

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

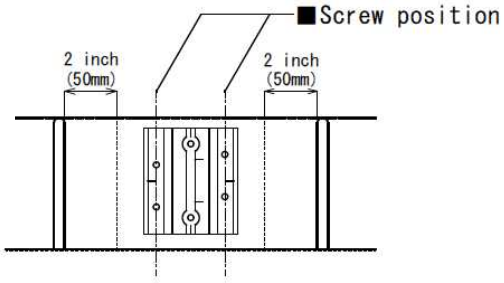


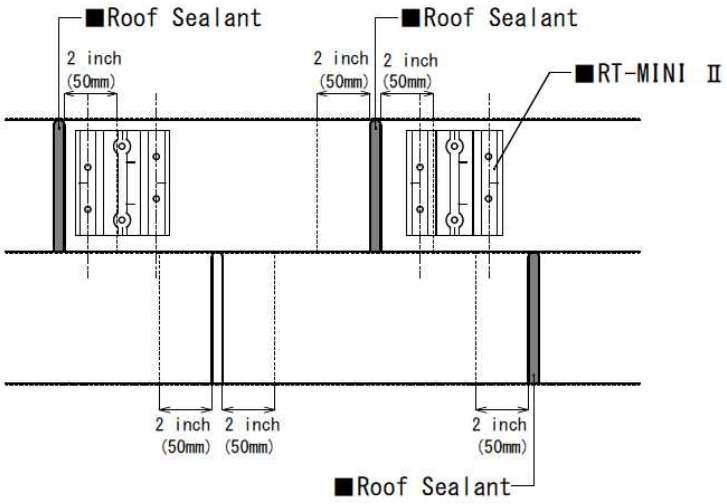
● Best to position the bracket 2 inches away from the slit.

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



Deck Install

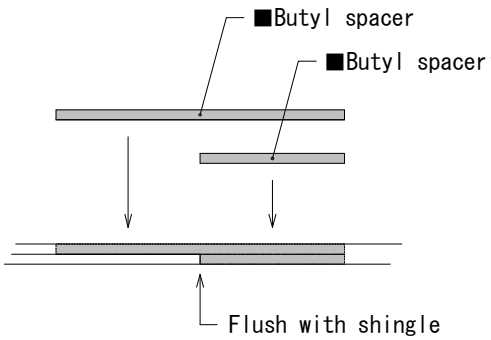


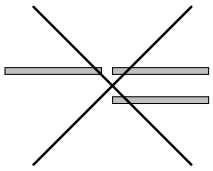


Leveling the Base Options

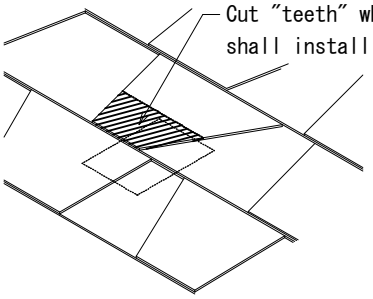
[Case 1]

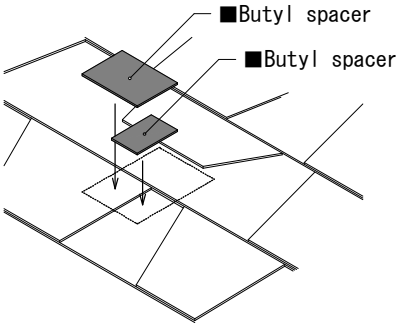
- Use RT butyl tape to level the surface of the composite shingle roof.

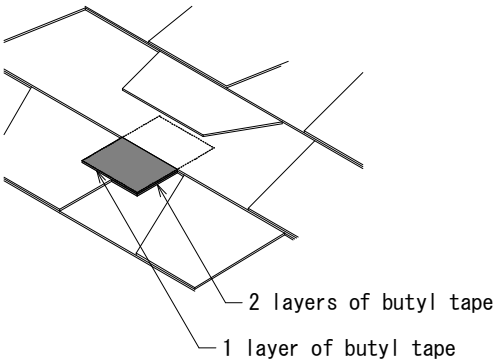




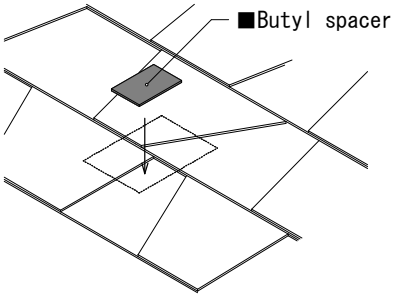
Note:Do not splice the butyl tape.





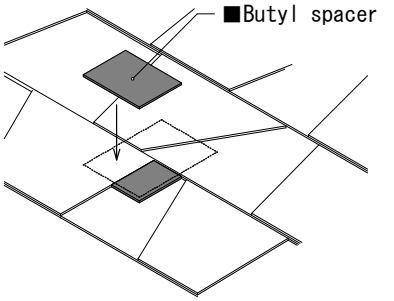


[Case 2]

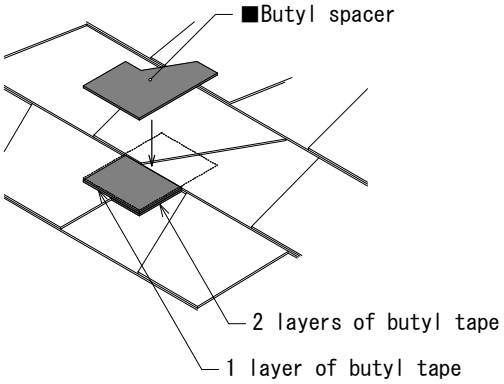


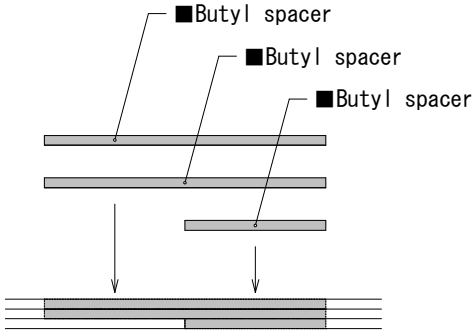
● Building layers of RT butyl for the bracket to be mounted over the teeth region of composite shingle roofs.

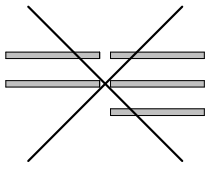
We recommend 4 layers maximum.
Layer 1 is already applied to the bottom of the bracket.



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





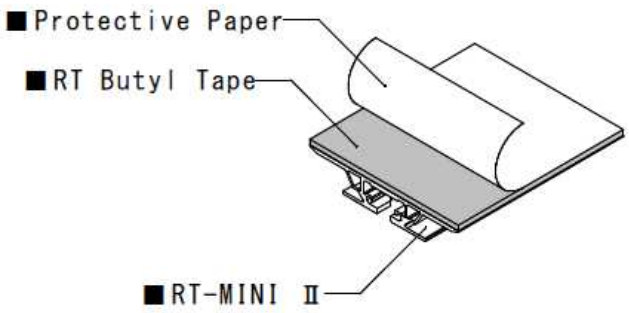


Note:Do not splice the butyl tape.

[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.

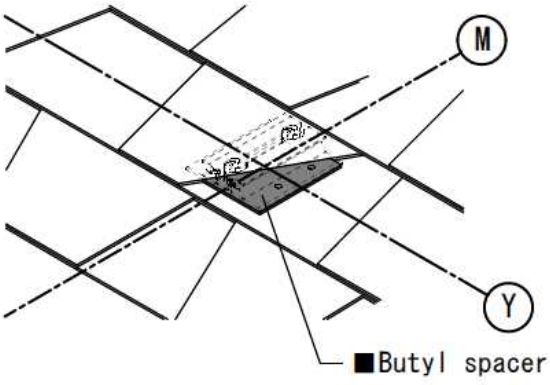


! Attention

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.

⑤Installing 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.

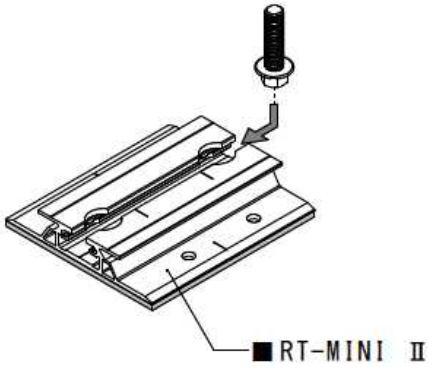
Set the bracket with 2 ea. Screws, M5.0 × 60 mm stainless wood screw using 8mm hex socket.

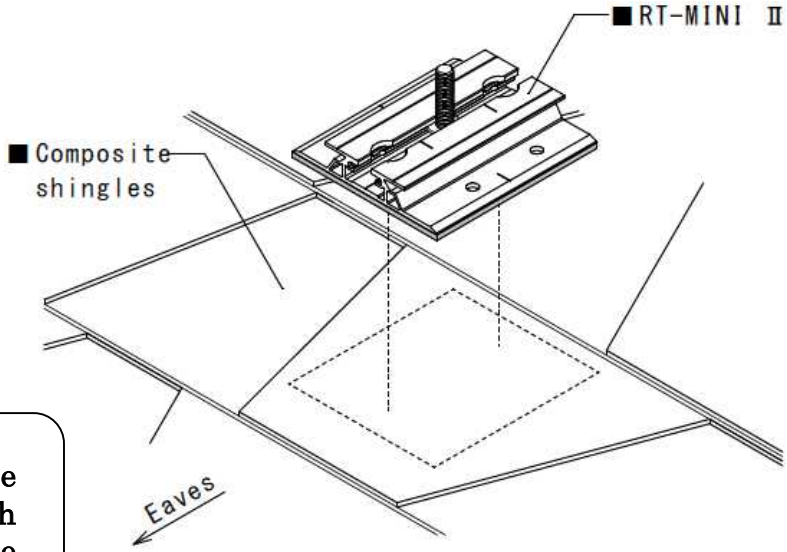
After completing process, make sure the brackets are securely fixed.

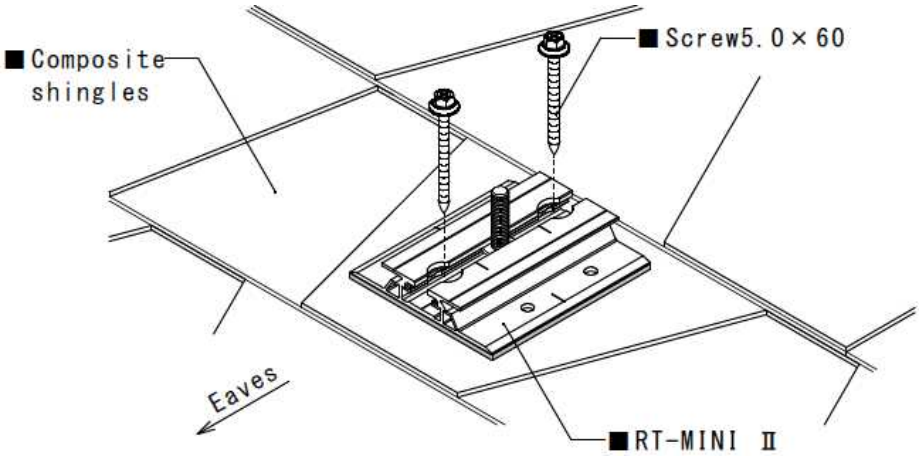
! Attention

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

[Fastening it to the Rafter]





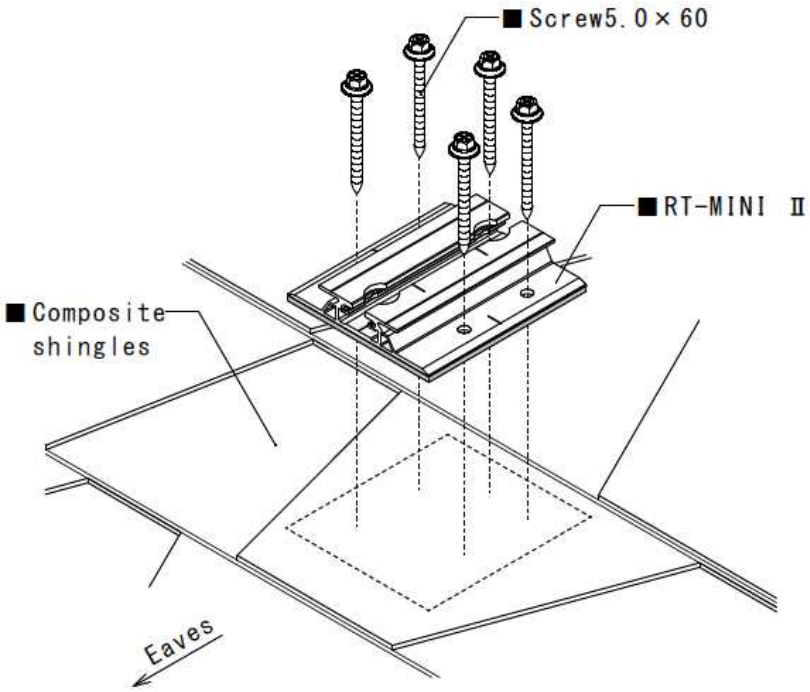


Attention

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.

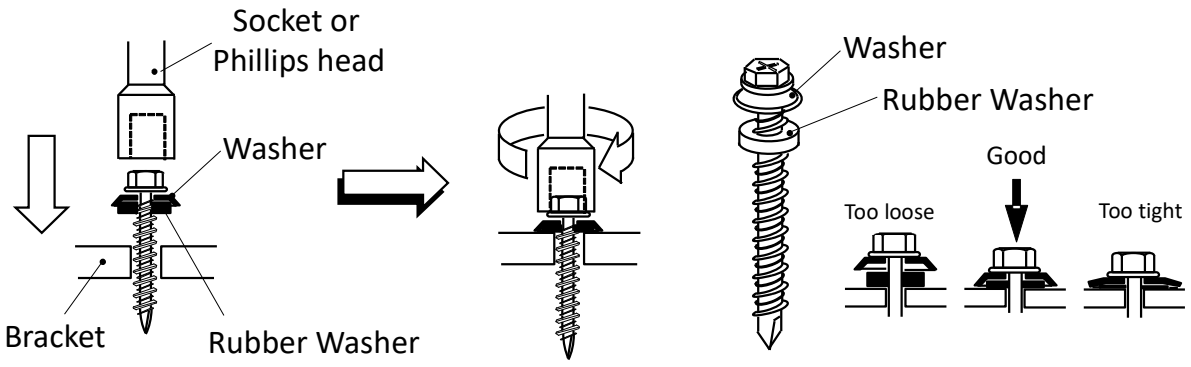
Note; Each MINI Ⅱ is shipped with 2 mounting screws. The installer must purchase additional screws when mounting it to the roof deck.

[Fastening it to the Roof Deck]



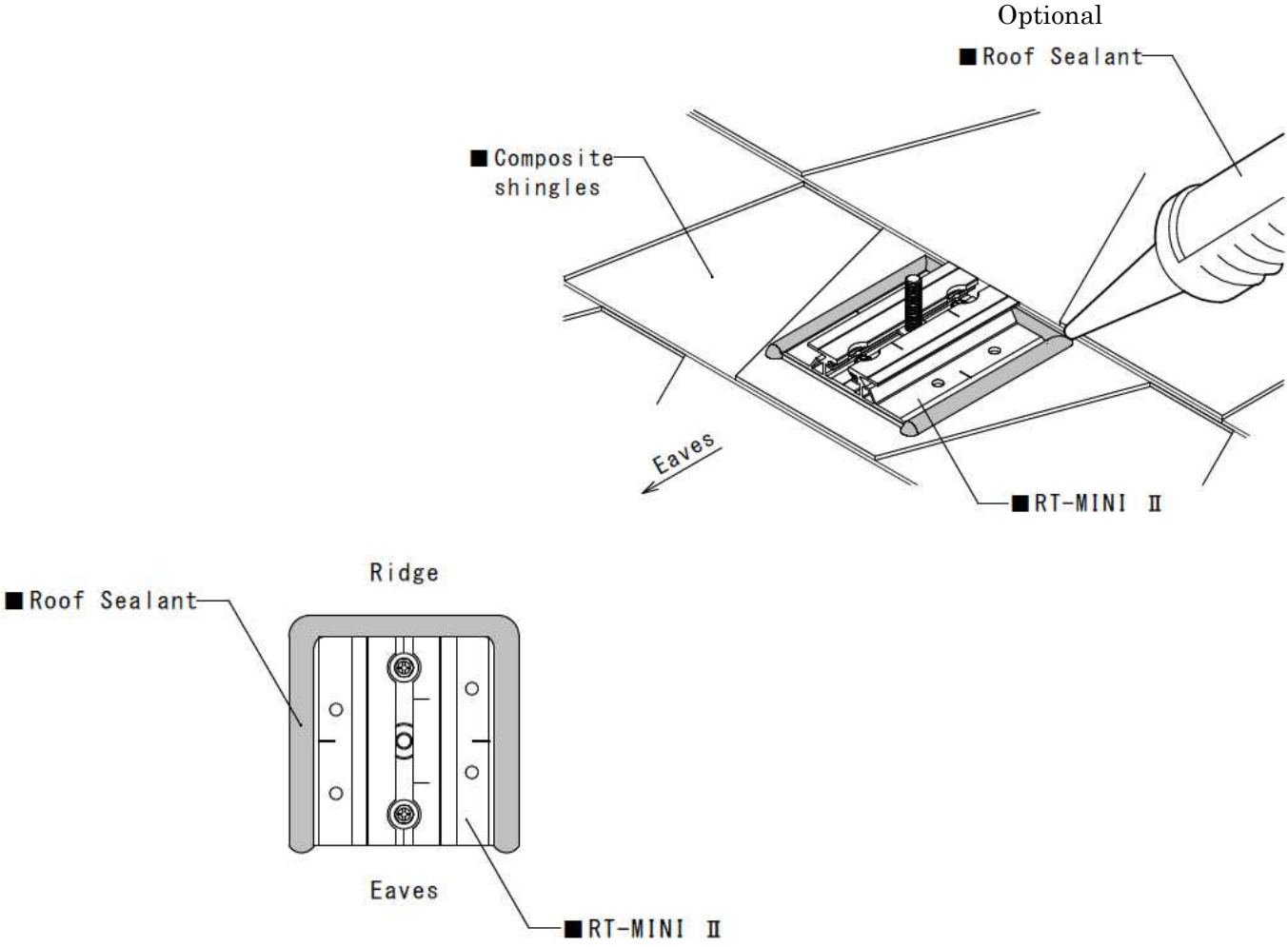
Attention

Note: Proper torque values for the 5.0×60 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.



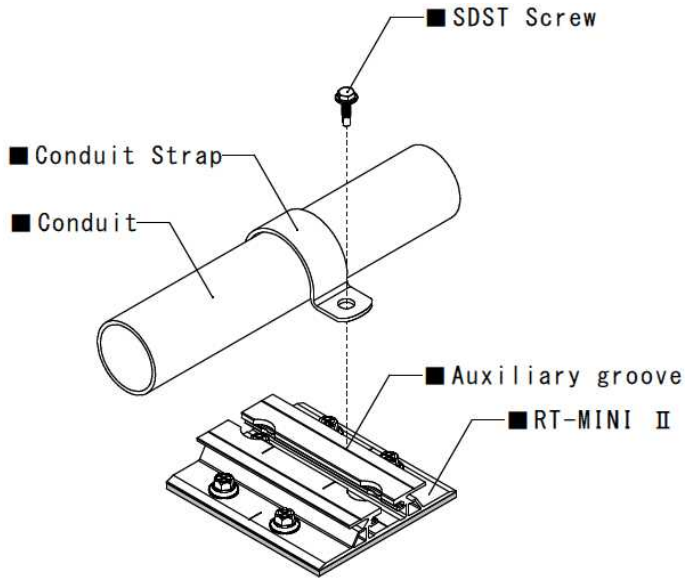
! Attention

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

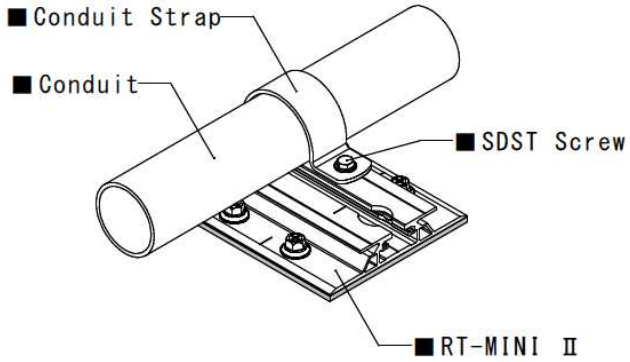
2. Conduit Strap Installation (Optional)

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

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

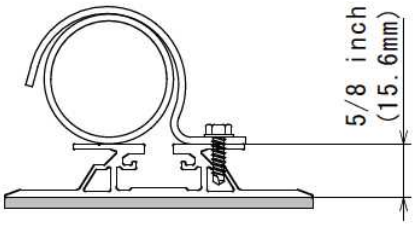


② Use the SDST screw to fix the conduit Strap. Check the conduit strap instructions for the diameter of the SDST screw. Length of SDST screw must not exceed 5/8".



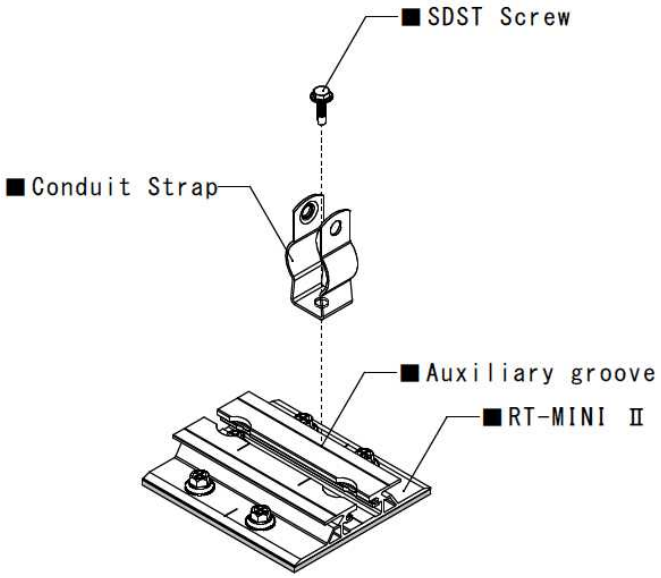
Attention

The SDST SCREW length must not exceed 5/8". Examples are 9/16" and 5/8"

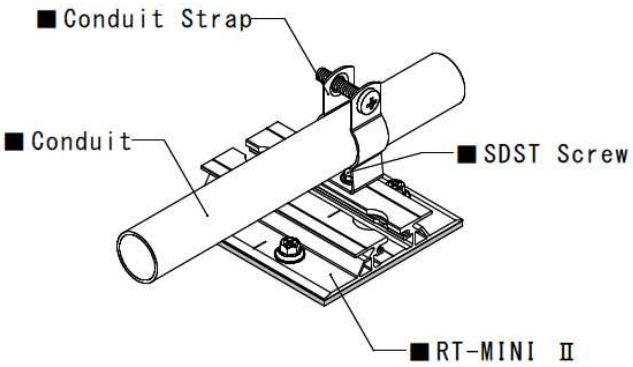


(2) A conduit Strap can be installed on top of MINI II [Case 2]

① Align the conduit Strap to the groove on top of MINI II To avoid derating the conductors, select conduit straps that will provide a minimum combined distance of 7/8" (23 mm) between bottom of conduit and roofing material.

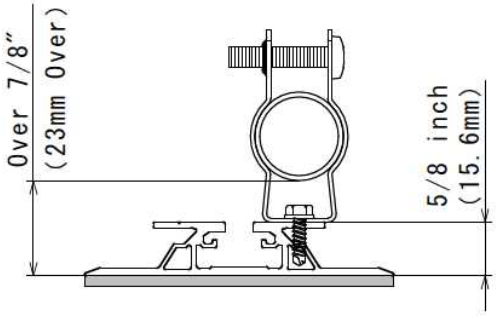


② Use the SDST screw to fix the conduit Strap. Check the conduit strap instructions for the diameter of the SDST screw. Length of SDST screw must not exceed 5/8".



! Attention

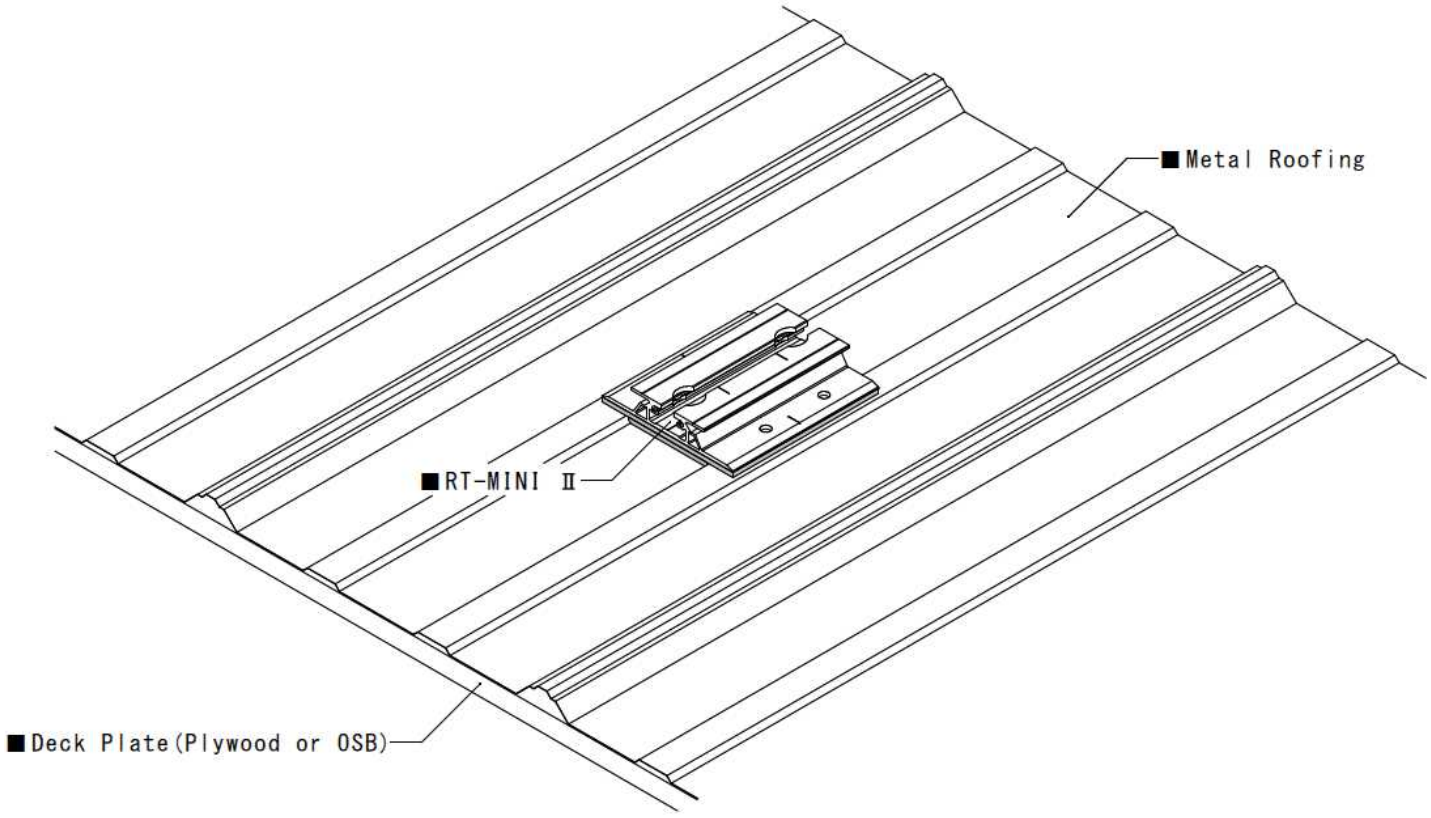
The SDST SCREW length must not exceed 5/8". Examples are 9/16" and 5/8" Select conduit straps that will provide a minimum distance of 7/8" between bottom of conduit and roofing material.



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.



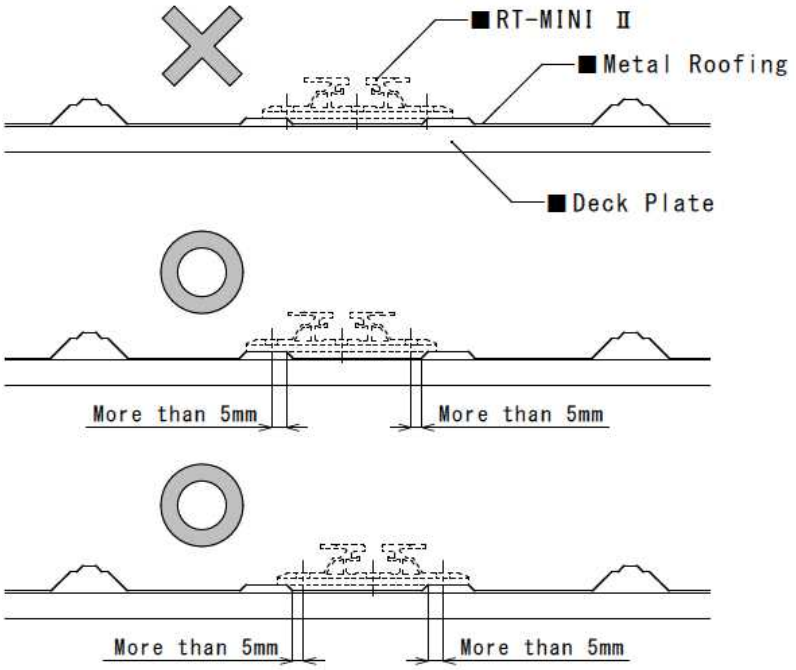
IMPORTANT:

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.)

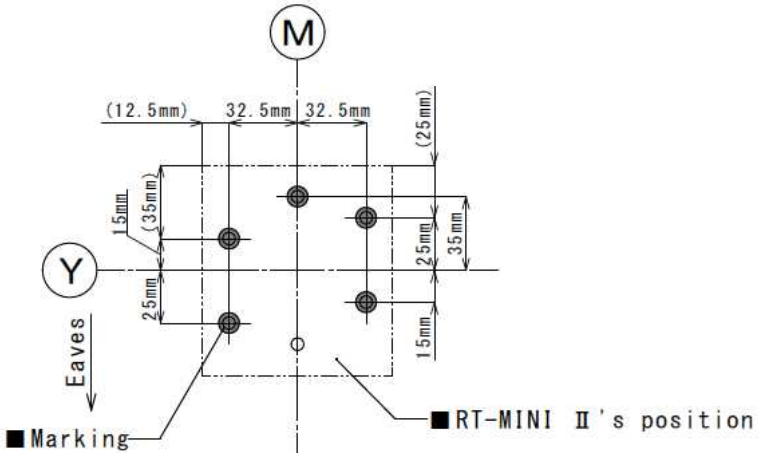


② In case of Deck Installation, mark at ±15 mm, ±25 mm from the intersection of the M Line and Y Line.

③ Then mark at ±32.5 mm from the M Line

④ Mark at +35 mm from the Y Line on the M Line.

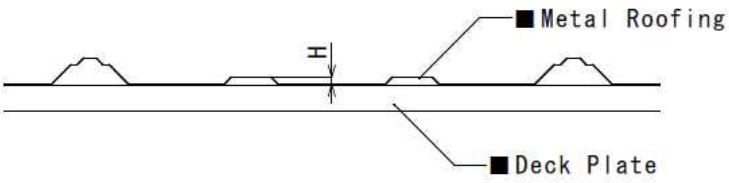
[Fastening to the Deck]



! Attention

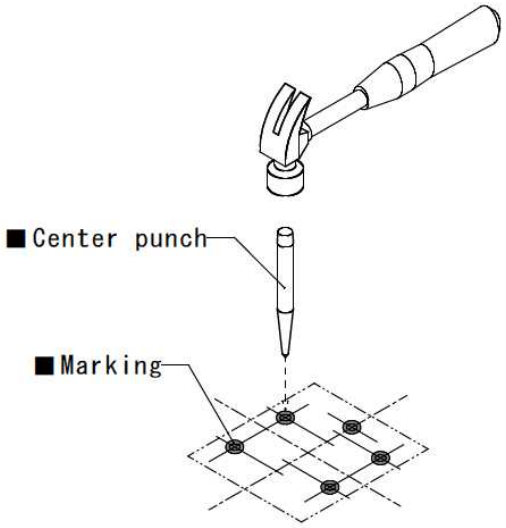
Note; Marking spot is not symmetric when MINI Ⅱ base is installed on deck. You may want to have an extra MINI Ⅱ to assist in marking to a metal roof. (Create a MINI Ⅱ JIG by removing the RT Butyl from it.)

(2) Check the height of metal rib.



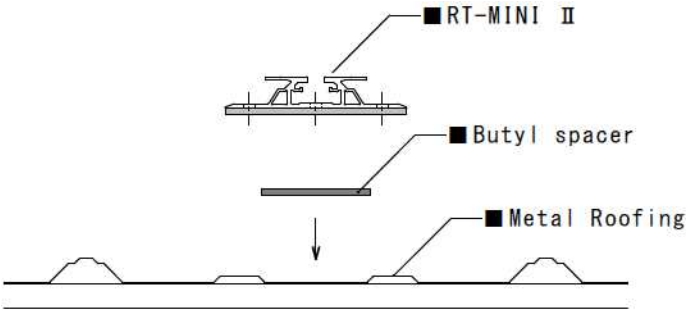
1) The maximum height "H" is 5mm.

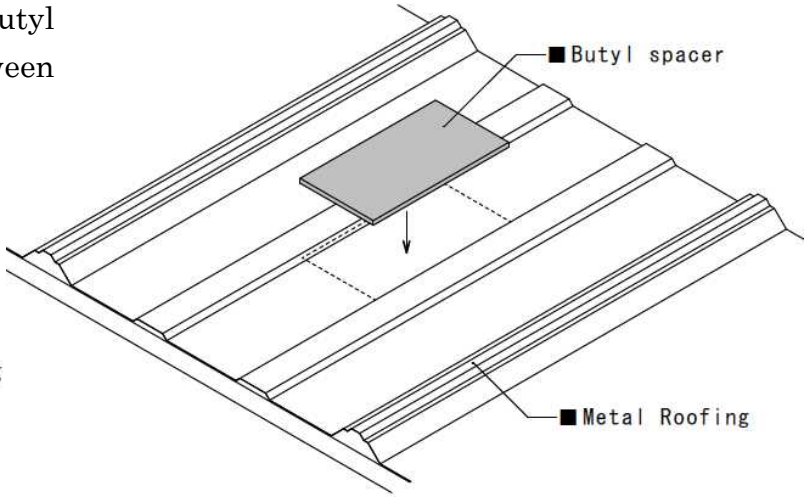
① Use Center punch to make a pilot hole. You can mark on roof or use base's screw hole directly from top of the base.



3. Bracket Installation

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

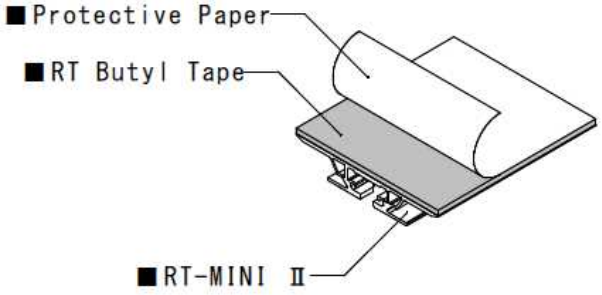




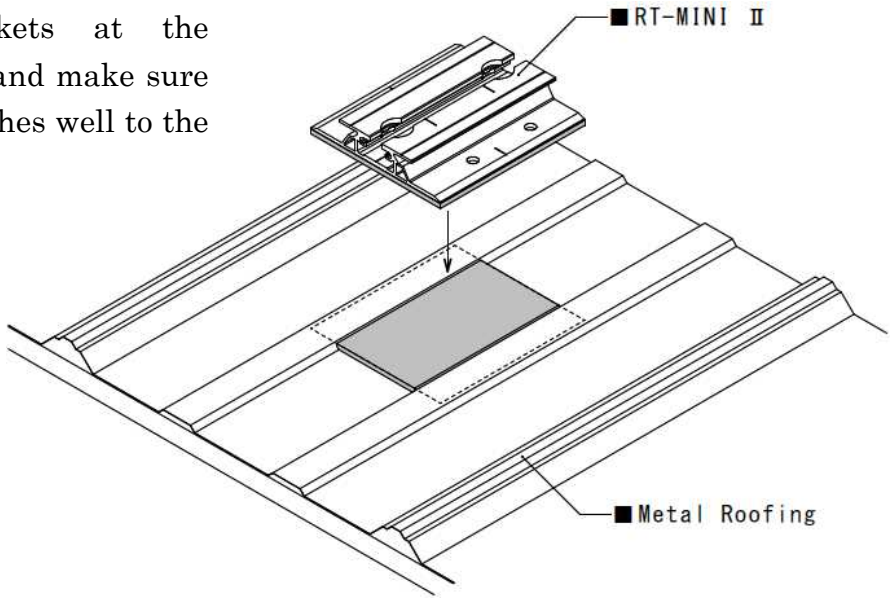
② Peel off the protective paper from the RT butyl tape.

! Attention

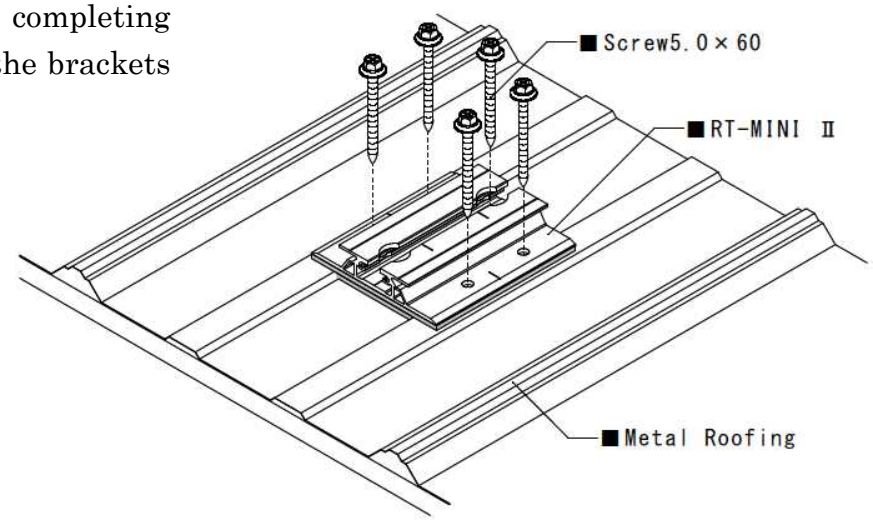
Do not leave any protective paper on the surface of the RT butyl tape, it can cause an improper seal and may allow water intrusion under the bracket.

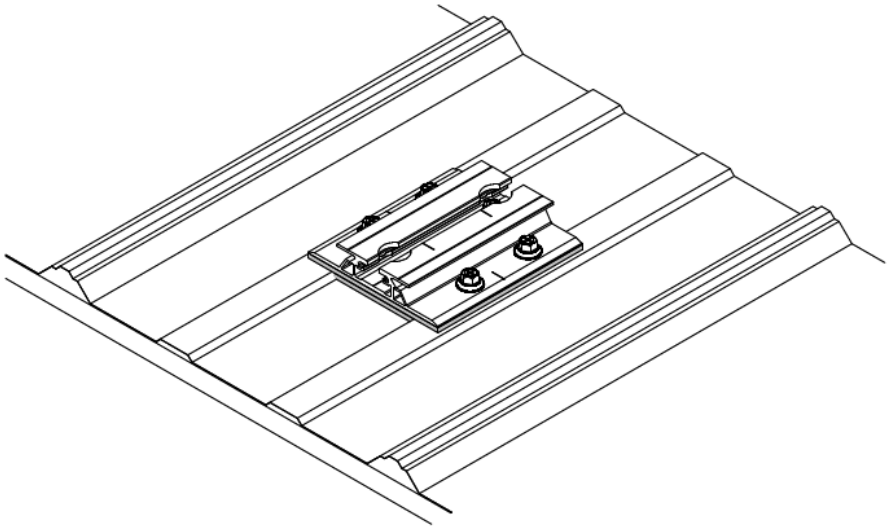


③ Place the brackets at the specified location and make sure the RT butyl attaches well to the roofing surface.



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.



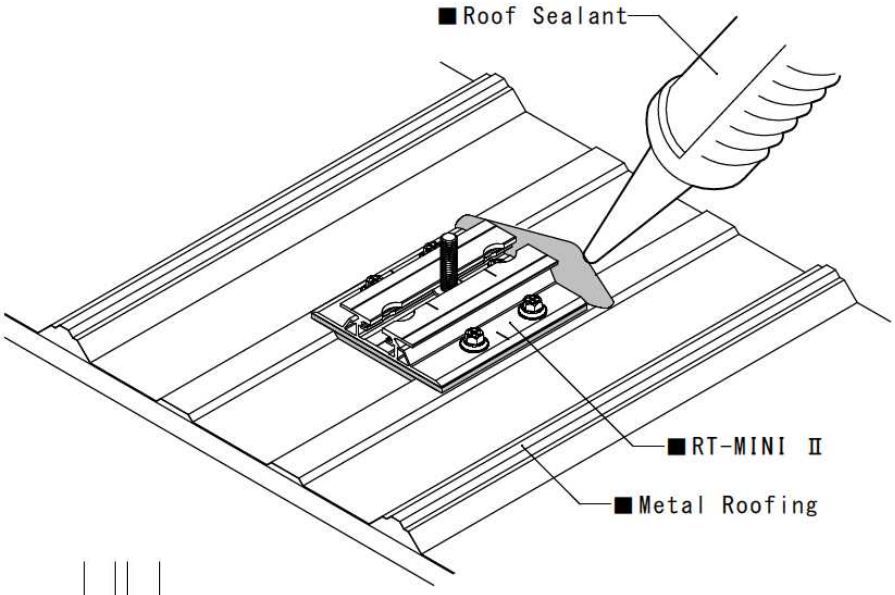


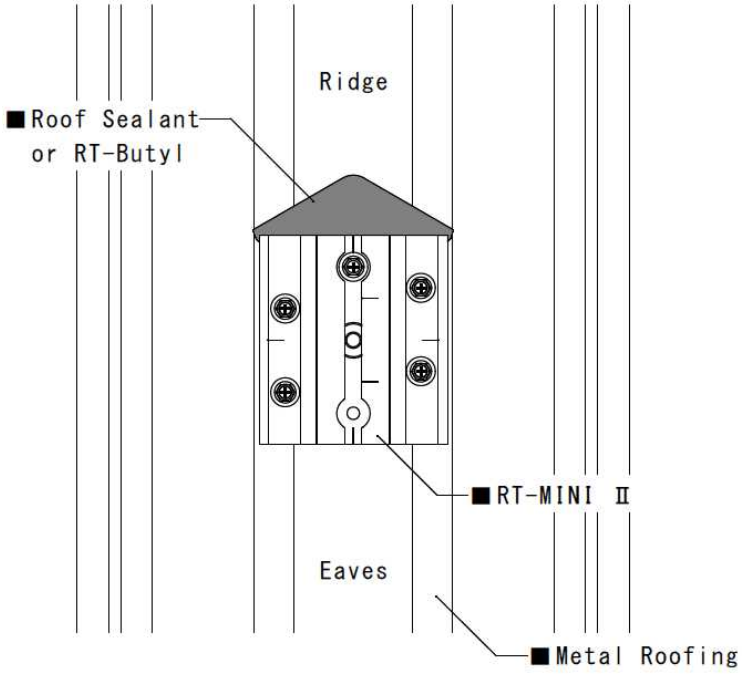
! Attention

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.

⑤ 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

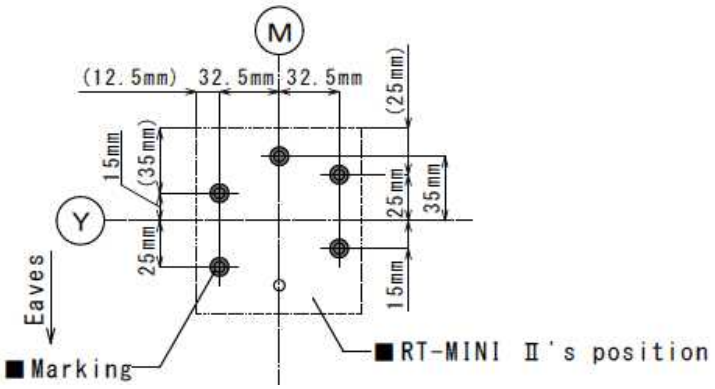
① The MINI Ⅱ base must be mounted on the flat surface.

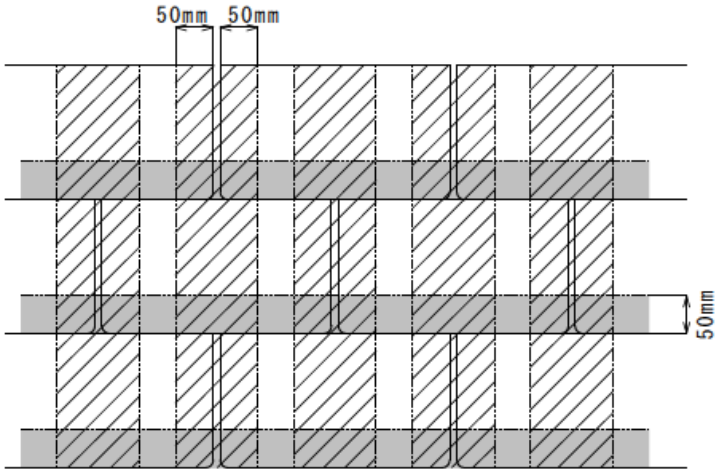
② Mark at ± 15 mm, ± 25 mm from the intersection of the M Line and Y Line.

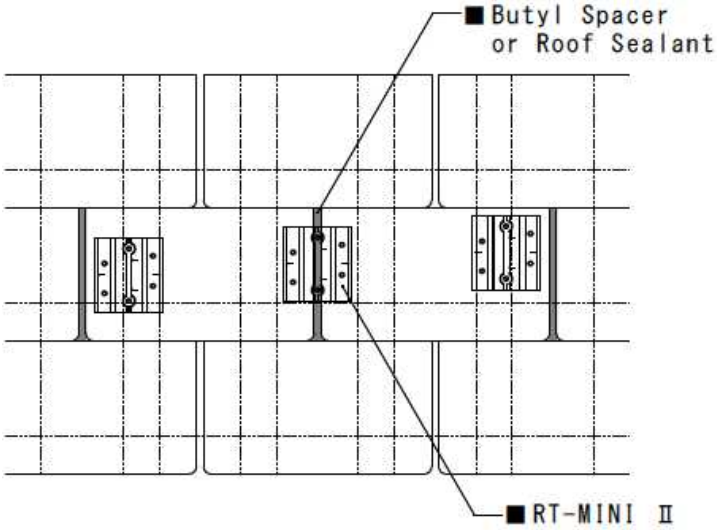
③ Then mark at ± 32.5 mm from the M Line

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.



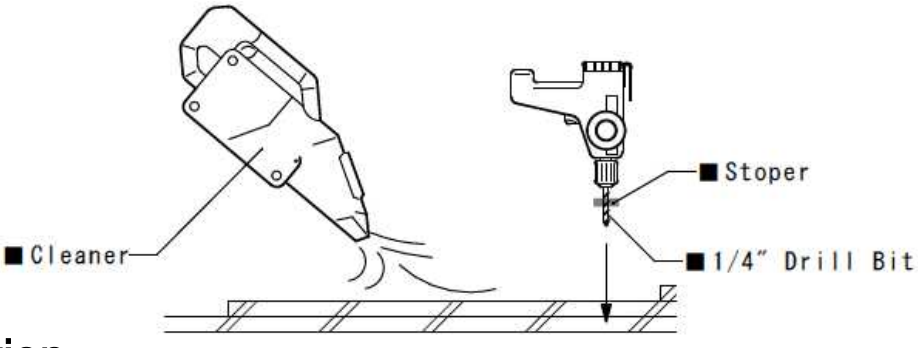




3. Bracket Installation

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

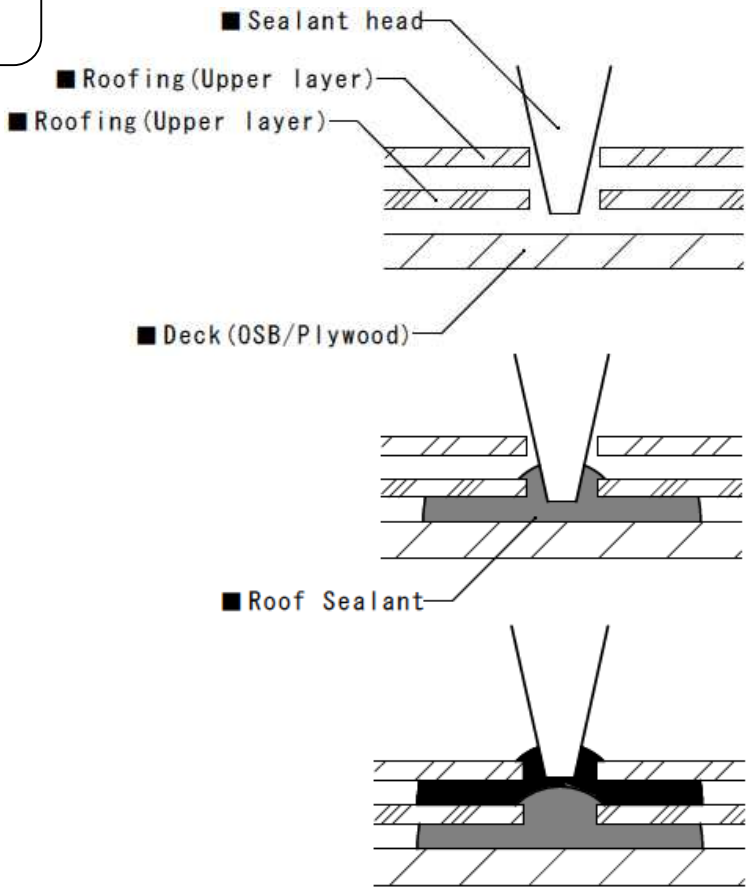
Note : It is easier to manage drill depth by using any stopper on the drill bit. Please make sure to use stopper to drill through the layer of roofing material only. Do not to drill all the way to the wood deck or underlayment.



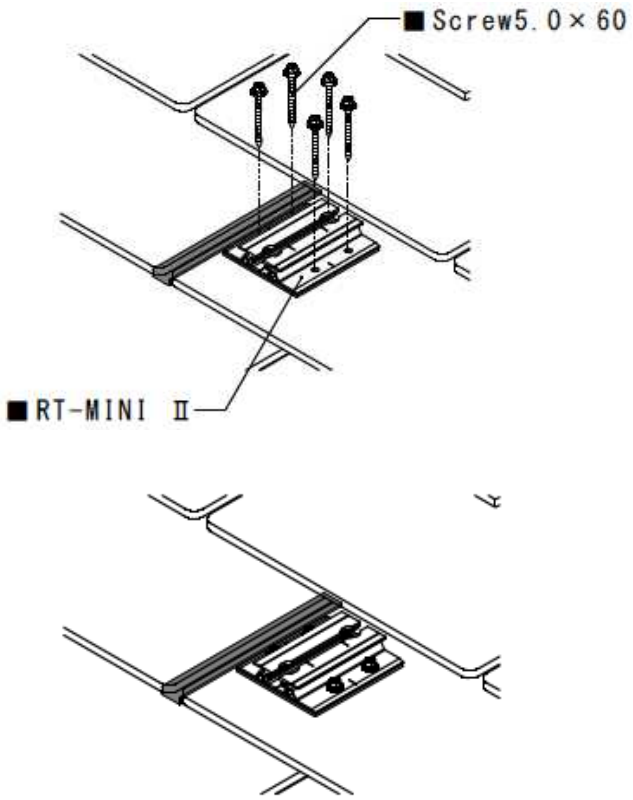
! Attention

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

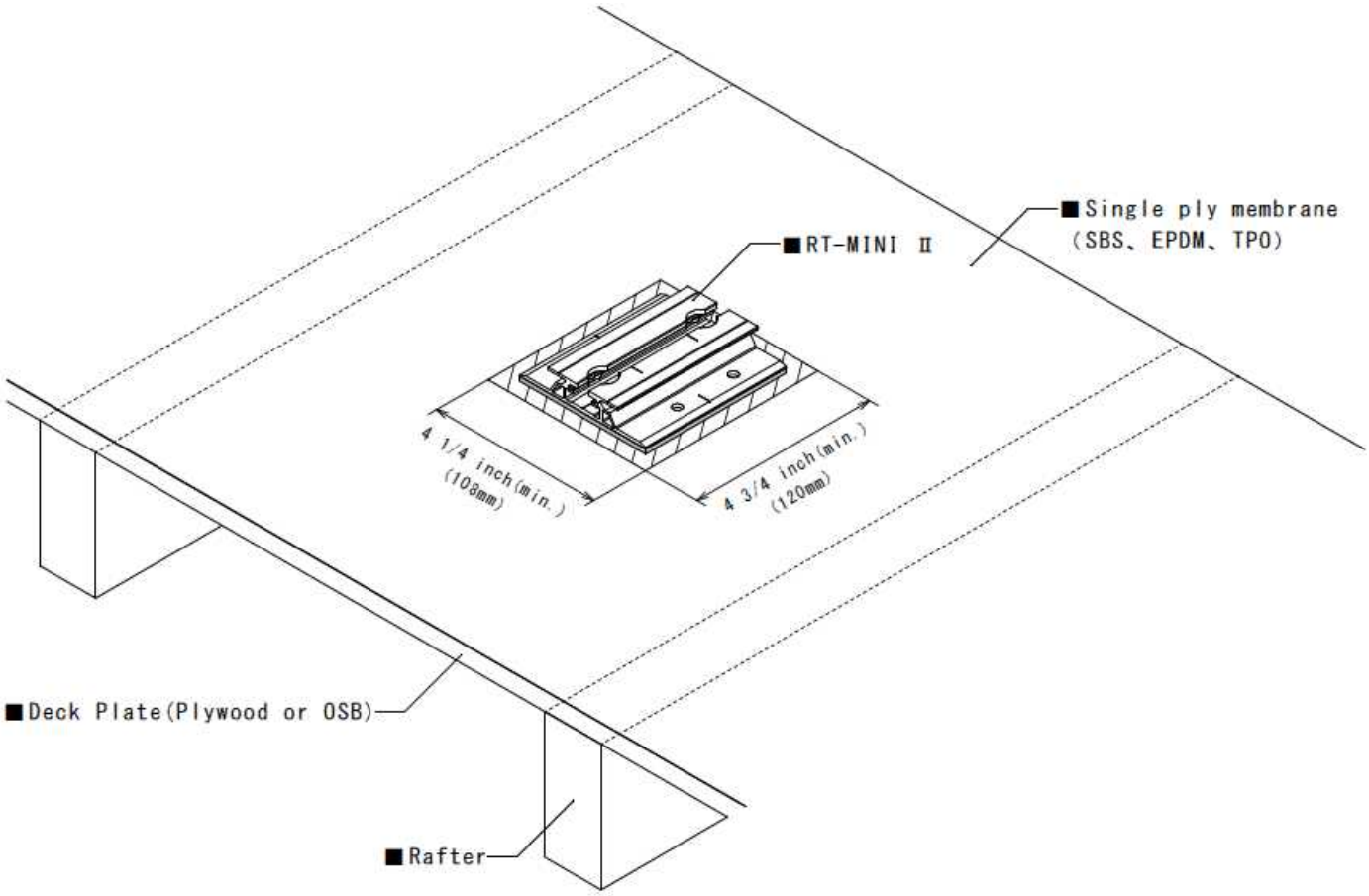
When the MINI Ⅱ base is installed on the deck, 5 screws must be used. The screws are fixed into the side 4 holes and 1 ridge side hole.

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

Installation on a Membrane

1. Requirement

- Applicable to SBS, TPO and EPDM.
- The Roof Tech P.E. Letters are created for a minimum 7/16" OSB with 2x4" rafters 24 in o.c.
- In installation, work carefully to avoid damaging the roof (membrane).
- Remove dirt, etc. from the roof surface before installation. Butyl tape is to be applied to a dry roof surface, so please make sure the roof surface is sufficiently dry.



2. Marking on the Roof

(1) Layout

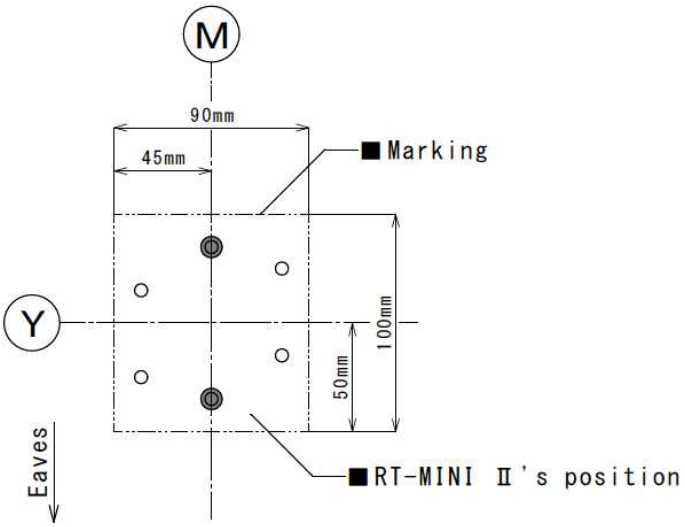
The same is true for both Rafter and Deck installations.

① Mark the outline at ± 45 mm from the M line. (See illustrations.)

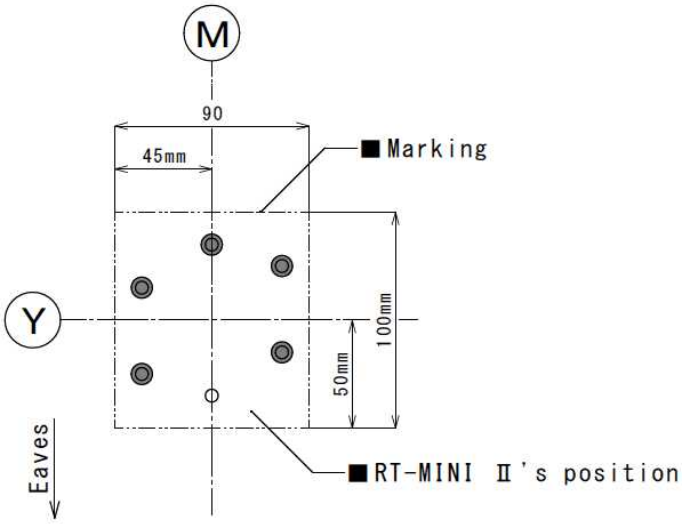
② Mark the outline at ± 50 mm from the Y line. (See illustrations.)

This mark is for applying butyl tape in a later process.

[Fastening to the Rafter]

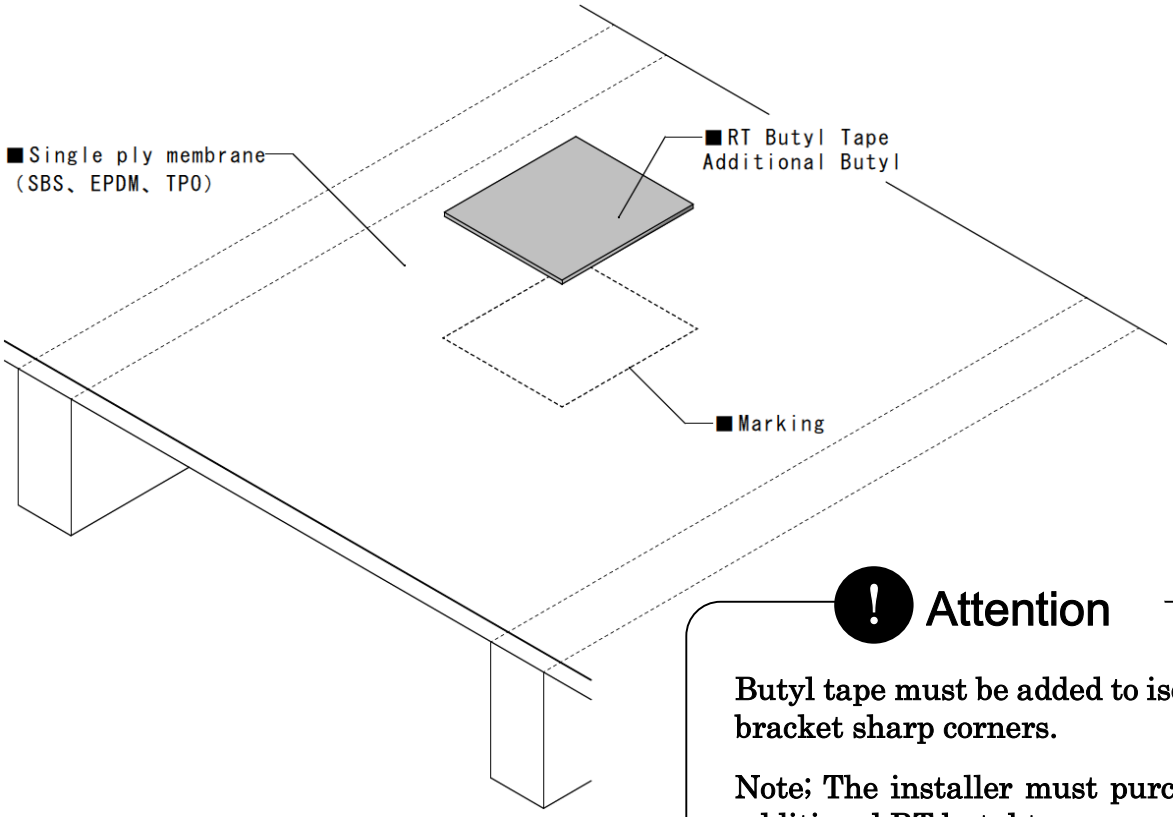


[Fastening to the Deck]



3. Bracket Installation

① Peel off the protective paper from the additional RT butyl tape and affix it to the marking position.

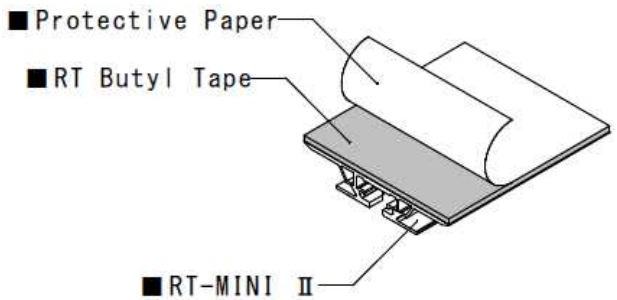


Attention

Butyl tape must be added to isolate bracket sharp corners.

Note; The installer must purchase additional RT butyl tape.

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

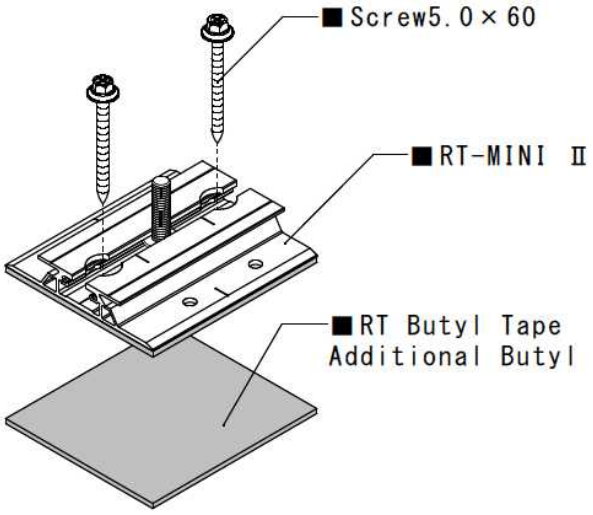


Attention

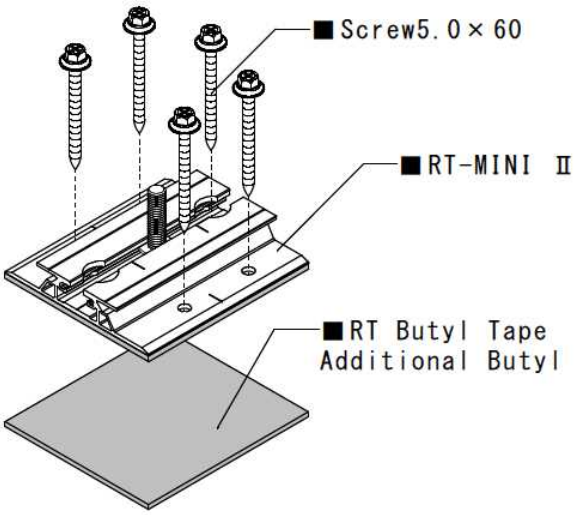
Do not leave any protective paper on the surface of the RT butyl tape, it can cause an improper seal and may allow water intrusion under the bracket.

③ Brackets should be secured in the marked positions on the added RT butyl tape. Place the brackets at the specified location and make sure the RT butyl attaches well to the roofing surface. Set the bracket with 2 ea. (for RAFTER), or 5 ea. (for Roof DECK), of M5.0 × 60 mm stainless wood screw using 8 mm hex socket. **Slide the 5/16" Flanged bolt into place before fastening the bracket on the roof [rafter install].** After completing process, make sure the brackets are securely fixed.

[Fastening to the rafter]



[Fastening to the roof deck]



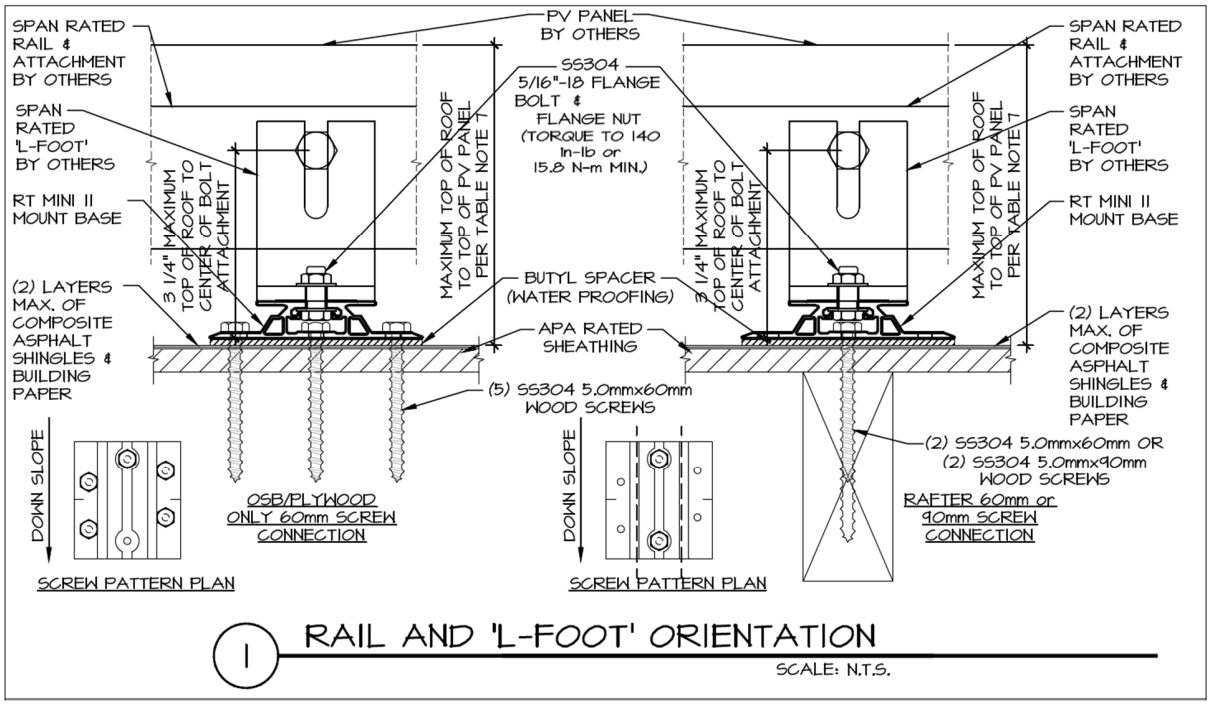
! Attention

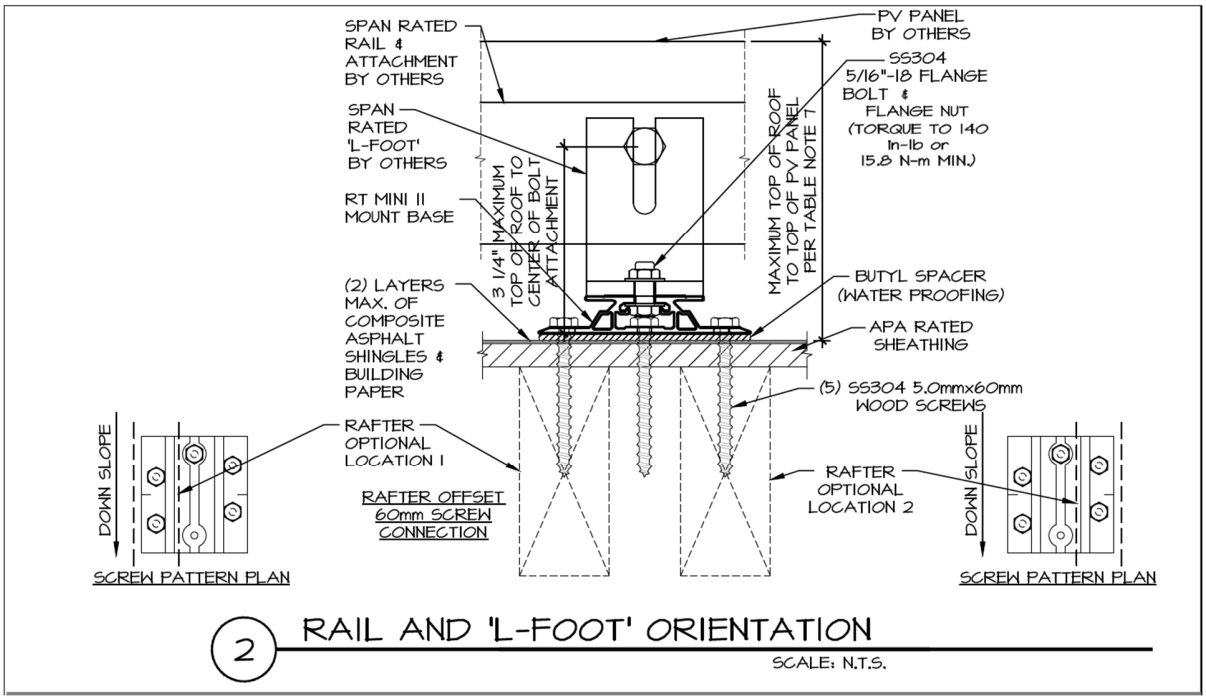
When the MINI Ⅱ base is installed on the deck, 5 screws must be used. The screws are fixed into the side 4 holes and 1 ridge side hole.

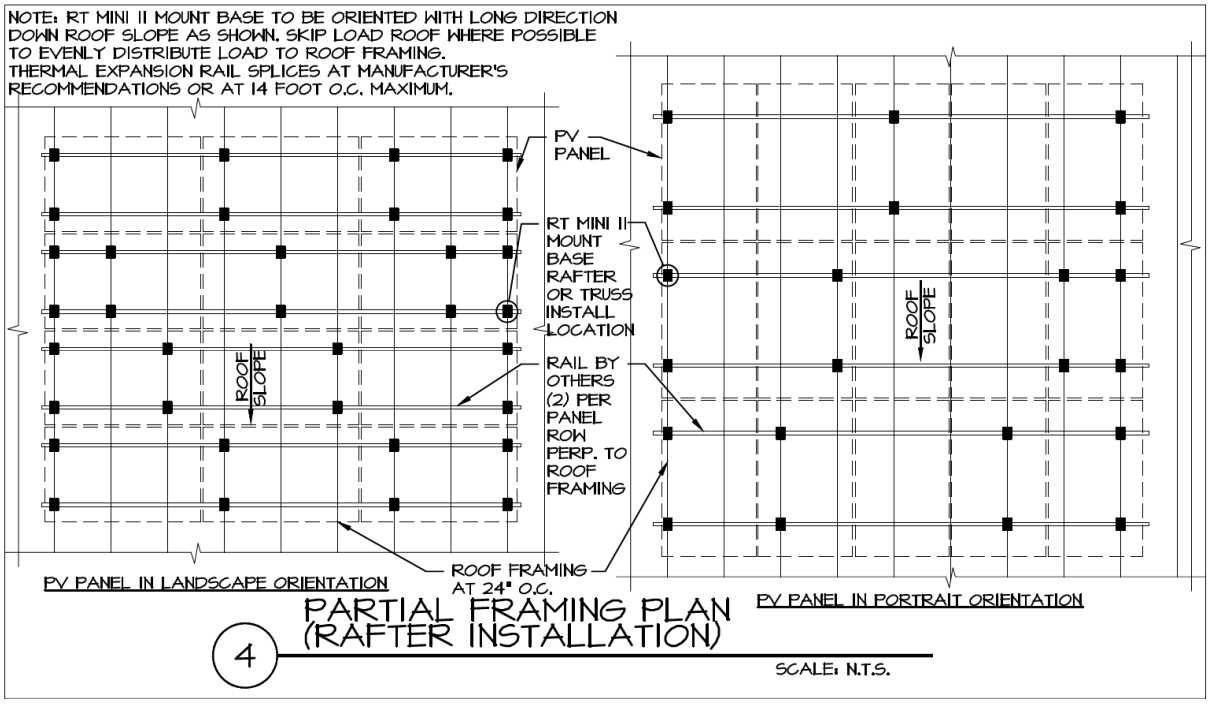
Note; Each MINI Ⅱ is shipped with 2 mounting screws. The installer must purchase additional screws when mounting it to the roof deck.

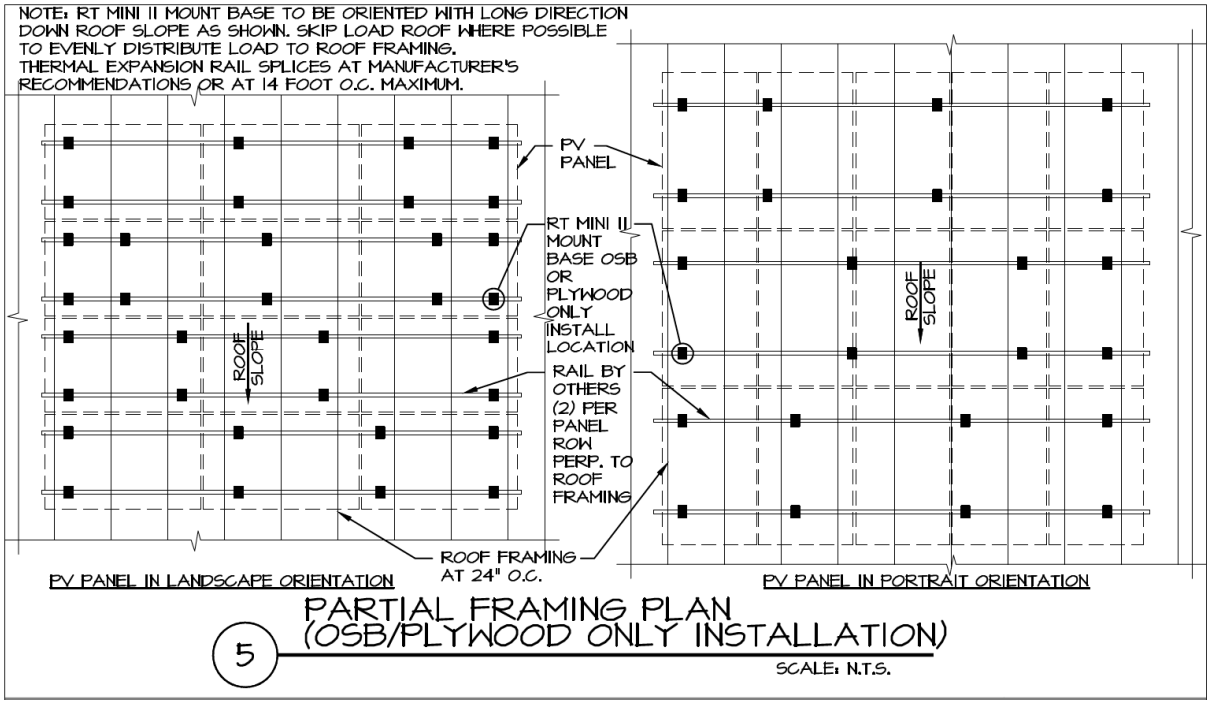
MINI II used with L-Foot and Rail

It is important that the designer and installer are acquainted with the PE stamped letters posted on https://roof-tech.us/pages/stamped-p-e-letters-ibc-and-irc-compliant.






NOTE: RT MINI II MOUNT BASE TO BE ORIENTED WITH LONG DIRECTION DOWN ROOF SLOPE AS SHOWN. SKIP LOAD ROOF WHERE POSSIBLE TO EVENLY DISTRIBUTE LOAD TO ROOF FRAMING. THERMAL EXPANSION RAIL SPLICES AT MANUFACTURER'S RECOMMENDATIONS OR AT 14 FOOT O.C. MAXIMUM.
PV PANEL
RT MINI II MOUNT BASE RAFTER OR TRUSS INSTALL LOCATION
RAIL BY OTHERS (2) PER PANEL ROW PERP. TO ROOF FRAMING
ROOF SLOPE
ROOF FRAMING AT 24" O.C.
PV PANEL IN LANDSCAPE ORIENTATION
PV PANEL IN PORTRAIT ORIENTATION
PARTIAL FRAMING PLAN (RAFTER INSTALLATION)
4
SCALE: N.T.S.


NOTE: RT MINI II MOUNT BASE TO BE ORIENTED WITH LONG DIRECTION DOWN ROOF SLOPE AS SHOWN. SKIP LOAD ROOF WHERE POSSIBLE TO EVENLY DISTRIBUTE LOAD TO ROOF FRAMING. THERMAL EXPANSION RAIL SPLICES AT MANUFACTURER'S RECOMMENDATIONS OR AT 14 FOOT O.C. MAXIMUM.
PV PANEL
RT MINI II MOUNT BASE OSB OR PLYWOOD ONLY INSTALL LOCATION
RAIL BY OTHERS (2) PER PANEL ROW PERP. TO ROOF FRAMING
ROOF SLOPE
ROOF FRAMING AT 24" O.C.
PV PANEL IN LANDSCAPE ORIENTATION
PV PANEL IN PORTRAIT ORIENTATION
PARTIAL FRAMING PLAN (OSB/PLYWOOD ONLY INSTALLATION)
5
SCALE: N.T.S.

Customer Support

For assistance call Roof Tech customer support.

(858) 935-6064

http://roof-tech.us/

Roof Tech