

# TPO MEMBRANE SYSTEMS

## Installation & Application Guide for PEB roofs



**GreenShield**

Heatshielding & Waterproofing Your Roof

Covers GreenShield™ TPO  
membrane products:

GS TPO 1.2 RF FR  
GS TPO 1.5 RF FR

[www.greenshield.co.in](http://www.greenshield.co.in)

Introduction

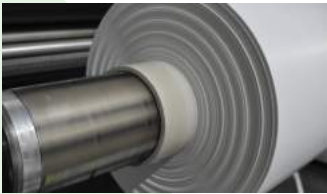
This application guide provides standard procedures for the application of GS TPO membranes of corrugated metal roof deck using mechanically fastened system upon the roof. Such systems typically are typically applied over factory building, airports, trains stations, cold storages, large shopping centers and warehouses that require protection from weathering and heat.

The step-by-step directions and illustrations provide solutions to your installation questions and assist you for top quality application of GreenShield™ TPO Membrane system



GreenShield™ TPO Membrane Products, covered under this installation system:

- 1: GS TPO 1.2 & 1.5 RF FR:** 1.2 / 1.5 mm thick, scrim reinforced TPO membrane, suitable for loosely laid / mechanically fastened / ballasted exposed systems.
- 2: GS TPO 1.2 & 1.5 SP:** 1.2 / 1.5 mm thick, un-reinforced TPO roofing membrane, suitable for exposed systems.



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EQUIPMENT LIST

Below is a list of equipment that may be required for specific type of installation.

Handy Equipment & Tools

1. Gloves	10 .Scissors
2. Drill Bits (Carbide, Steel)	11. Silicone Rubber Roller
3. Measuring Tape	12. Utility Knives
4. Seam Probe	13. First Aid Kit / Box
5. Eye Protection	14. Rags
6. Brooms	15. Personal Protection Equipment (PPE)
7. Chalk Line	16. Lawn or Linoleum Roller
8. Wire Brush	17. Writing / Marking Instruments
9. Caulk Gun	18. Brushes & Trowels

Powered Equipment

1. Screw Guns	5. 10,000 – 20,000-watt generator
2. Robot Welder	6. Extension Cord
3. Electric Drill	7. Handheld Hot Air Welder Machine
4. Hammer Drill	8. Automatic Roller Hot Air Welder Machine

Other Equipment

1. Rivet Gun	10. Screwdriver Set
2. Hammer	11. Aluminum Tape
3. Pull Out Tester	12. Adhesive Application Gun
4. T-Square	13. Metal Crimpers
5. Reciprocal & Circular Saw	14. Vice – Grip Pliers
6. Hand Saw	15. Stirring Sticks
7. Paddle Mixer	16. Ladder
8. Tongs	17. Shovels
9. Rubber Mallet	18. Mixing Vessels

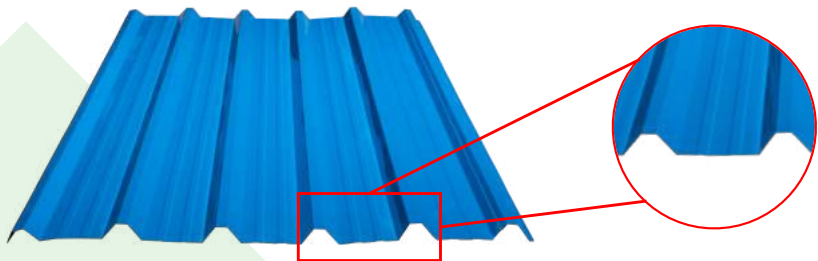
# 2

## ROOF SUBSTRATE PREPARATION

### Structural Requirement

A roof or deck is expected to be structurally sound to support and restraint the roofing system. It should also pose enough strength to withstand all anticipated loads, foot or construction traffic, rain and wind loads. It should also be able carry the weight of application workers and the equipment without showing signs of deflection at any point.

Here in this application guide, GreenShield is referring roof as a supporting substrate to the GreenShield system; irrespective of the fact that roof may be built for furnishing or sound control purpose. To perform this application process, the roof or deck must be rigid.



### Surface Requirement

Here the roof surface is a corrugated roof panel, primarily 0.5 / 0.7 mm thick metal sheet, that is primarily fastened onto the purlins and sub structure below. Typically, these roofs sheets like this:

For application over PEB roofs, the surface must be free of large cracks, undulations, torn roof edges and should be as smooth as possible. There should be no large holes or sharp changes in elevation of the surface. All sharp undulations from metal fasteners or ripped roof edges must be cleared and repaired, prior to installation. If so, discuss the feasibility with GreenShield experts. Before system application is commenced, the roof or deck should be inspected thoroughly by the roofing applicator, the building contractor and the property owner's representative to identify if it fulfils the given conditions. Roof-mounted equipment should rest on structural framing of the building, not on the GreenShield roofing system. Any water seepage or leak resulting from rooftop mounted equipment are not covered under the GreenShield warranty.

Before application all roof mounted equipment must be removed prior to installation and must be re-installed on frame structure and not directly on the membrane.

Surface preparation includes, but not limited to, smoothening and filling all holes, irregularities and depressions before the system is applied. Post that, complete the moisture scan and make sure any wet surface or materials are clean and dry. Carefully sweep all roof surface to eliminate all dirt and debris. Grind and cut out large chunks or blisters on roofs. Repair cracks and holes in roof especially those larger than ¼" wide.

### Slope Requirement

Providing a proper slope for water to drain off is a mandatory requirement of the site, before GS TPO systems can be installed. For PEB roof decks, the slope must conform to proper gradient for water drain-off and roof must be free from any kind of water accumulation or ponding during testing.

### GS TPO Relaxation Requirement

After the surface is fully prepared in accordance with the GreenShield™ guidelines, unpack and unroll GreenShield™ TPO Membrane and position without stretching. Let the membrane relax for up to 30 minutes and inspect for any damages.



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**APPLICATION ON  
PEB ROOF**

# 3

## APPLICATION ON PEB ROOF

**MECHANICALLY FASTENED SYSTEM** – where the TPO membrane is mechanically anchored in the roof deck using fasteners and washers, which are then overlapped with TPO membrane and heat welded. The overlap completely encapsulates the fastener, which is not exposed to any external weathering – ensuring no water, heat seeps into the insulated panel. The roof edges of the building are covered with TPO edge trims, mechanically anchored and heat welded with TPO on top – thus completely encapsulating the system, preventing any wind from blowing beneath the TPO or roof.

A layer of vapour barrier film, insulation board / cover board are laid up over the corrugated roof, before installing the membrane. Review image below to understand the system.

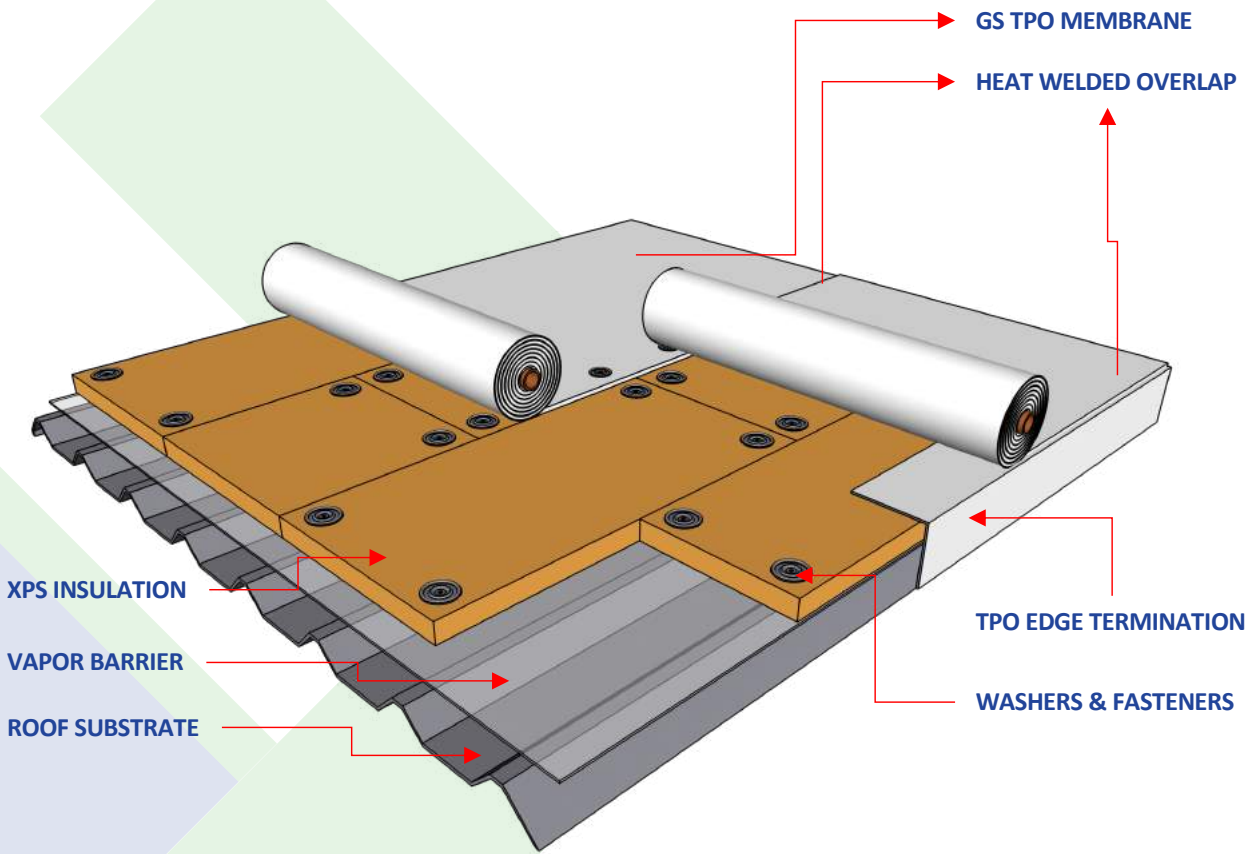


FIGURE 1: TPO ROOFING SYSTEM



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## APPLICATION ON PEB ROOF

The system build-up, consisting of vapor barrier, insulation boards, cover board and TPO membrane is extremely easy and fast for installation. A 10,000 sq.ft PEB roof can be covered in a week to 10 days.

After surface is fully prepared, lay vapor barrier film on top of GI sheet / PEB roof. Tack heat weld the edges to keep the film in place. Small overlaps of adjacent sheets onto each other and tack weld the same.

Once vapor barrier is laid, lay the insulation boards on top of this film. Insulation boards must be installed in a cross pattern, as shown below, and aligned such that the mechanical fastening of these boards happens on the ridge of the roof sheet and not the valley. Ensure only that many insulation boards are installed that can be covered with the TPO roofing system on the same day. Do not leave the insulation boards, exposed as this may result in moisture entrapment, condensation. Refer **FIGURE** below on method to lay insulation boards.

Insulation board installation is critical to ensure proper system anchoring to the roof deck, ensuring wind-uplift resistance, proper insulation, avoiding future chances of leakages. Once laid, Insulation boards of 4 X 2 ft or 6 X 4 ft are fastened to the metal deck using approved fastener system in the method show below in **FIGURE 2A & 2B**.

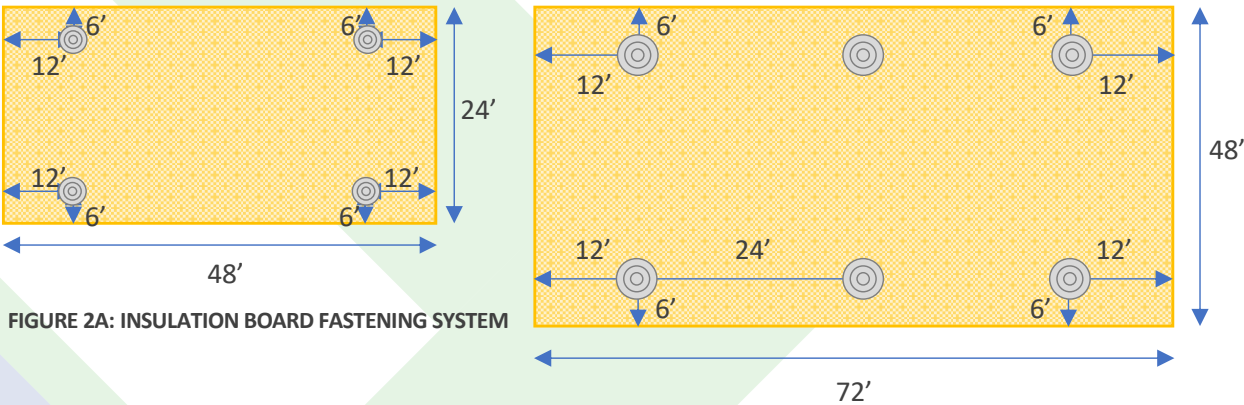


FIGURE 2A: INSULATION BOARD FASTENING SYSTEM

Insulation board fastening, must always be done on the ridge of the roof deck and never in the valley to avoid any future water seepage. Tightly screw down the washers using a suitable screw gun with adjustable clutch.

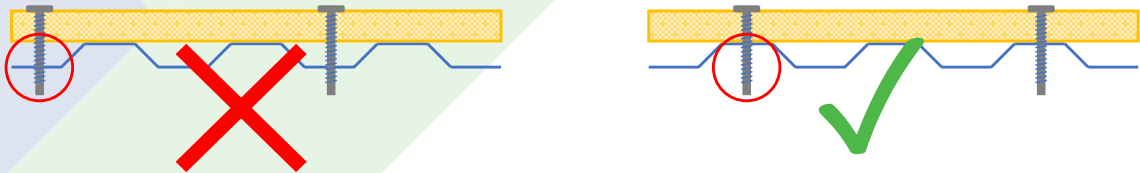


FIGURE 2B: INSULATION BOARD FASTENING SYSTEM



# 3

## APPLICATION ON PEB ROOF

Once the Insulation boards are installed, unroll GreenShield™ TPO membrane and position it over these boards. Begin fastening one side of the membrane onto the boards, with the fasteners penetrating the roof deck below. Ensure the fasteners penetrate the roof ridge and not the roof valley. The TPO edge must extend minimum 15 mm beyond the fastener plate.

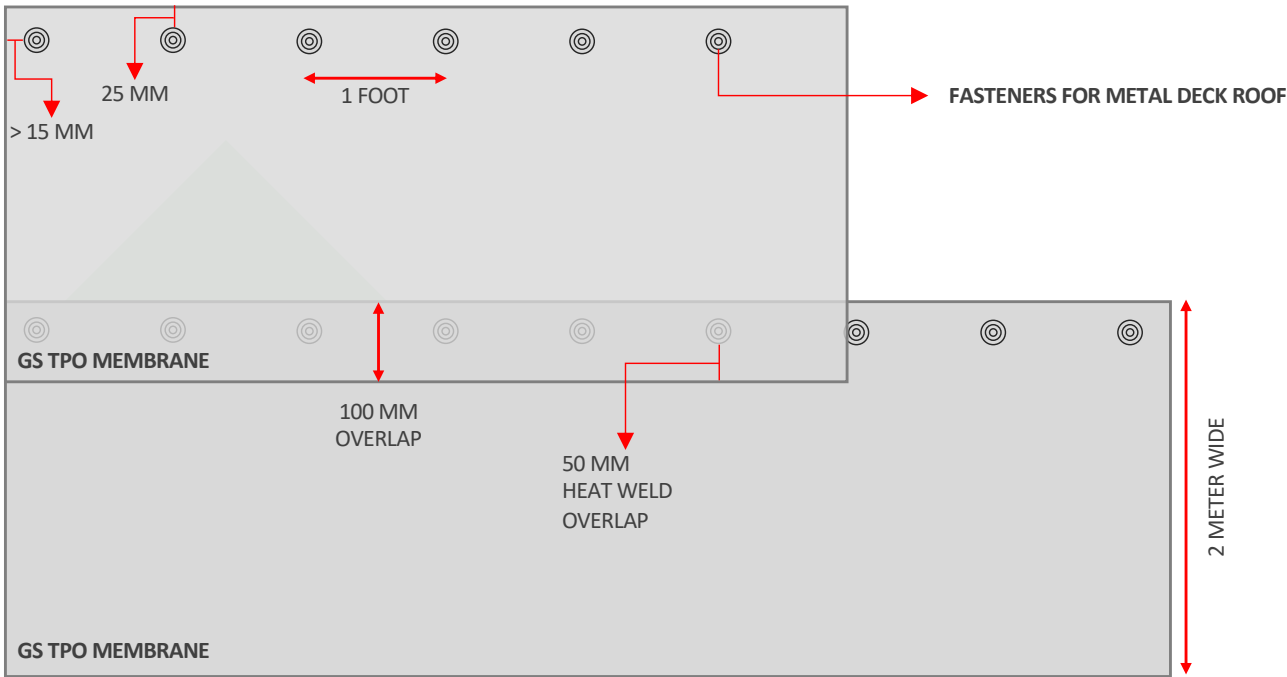


FIGURE 3A: MECHANICALLY FASTENING MEMBRANE OVER INSULATION BOARD

The TPO membrane is staggered over the insulation board to avoid edge matching as well as overlap of fasteners. GS TPO membranes are available in 1.2, 1.5 & 2.0 meter widths to provide flexibility to installers and reduce installation wastage

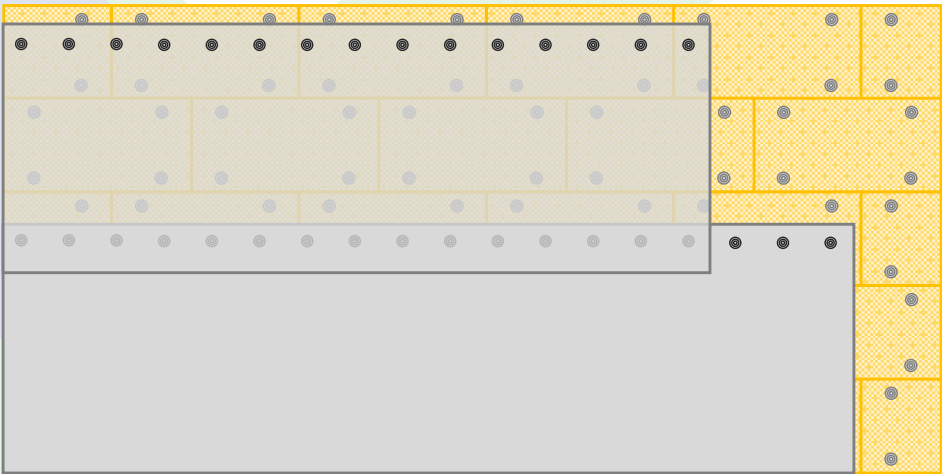


FIGURE 3B: MECHANICALLY FASTENING MEMBRANE OVER INSULATION BOARD





# 3

## APPLICATION ON PEB ROOF

Once the entire roof is covered with the TPO membrane, edge detailing must be completed as described in **FIGURES 4, 4A & 4B** below.

Edge detailing is required to secure the complete roofing secure around the building edges, upstands, vertical walls, other protrusions like day lights, roof equipment, solar panels stands, wind turbines and so on.

Termination over vertical wall: The membrane will be secured with a GS Termination Bar, used in conjunction with water repellent sealant, between the membrane and the substrate, under compression behind the termination bar. The termination bar must be installed directly into the wall surface and mechanically fixed at maximum 250 mm centers using appropriate fasteners. A bead of PU / Epoxy General Purpose Sealant is applied along the top edge of the termination bar, securing it from water

FIGURE 4: VERTICAL WALL TERMINATION

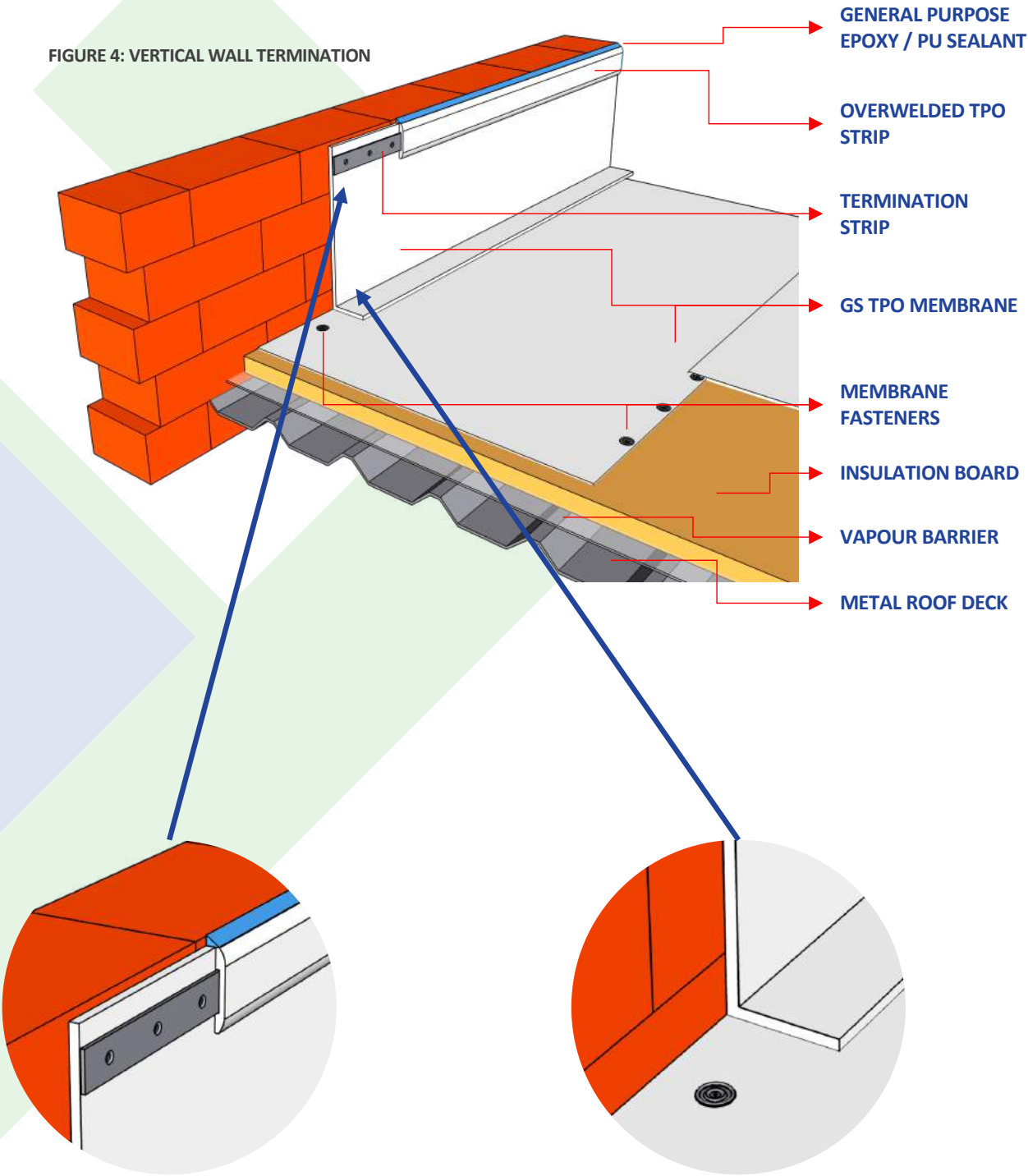


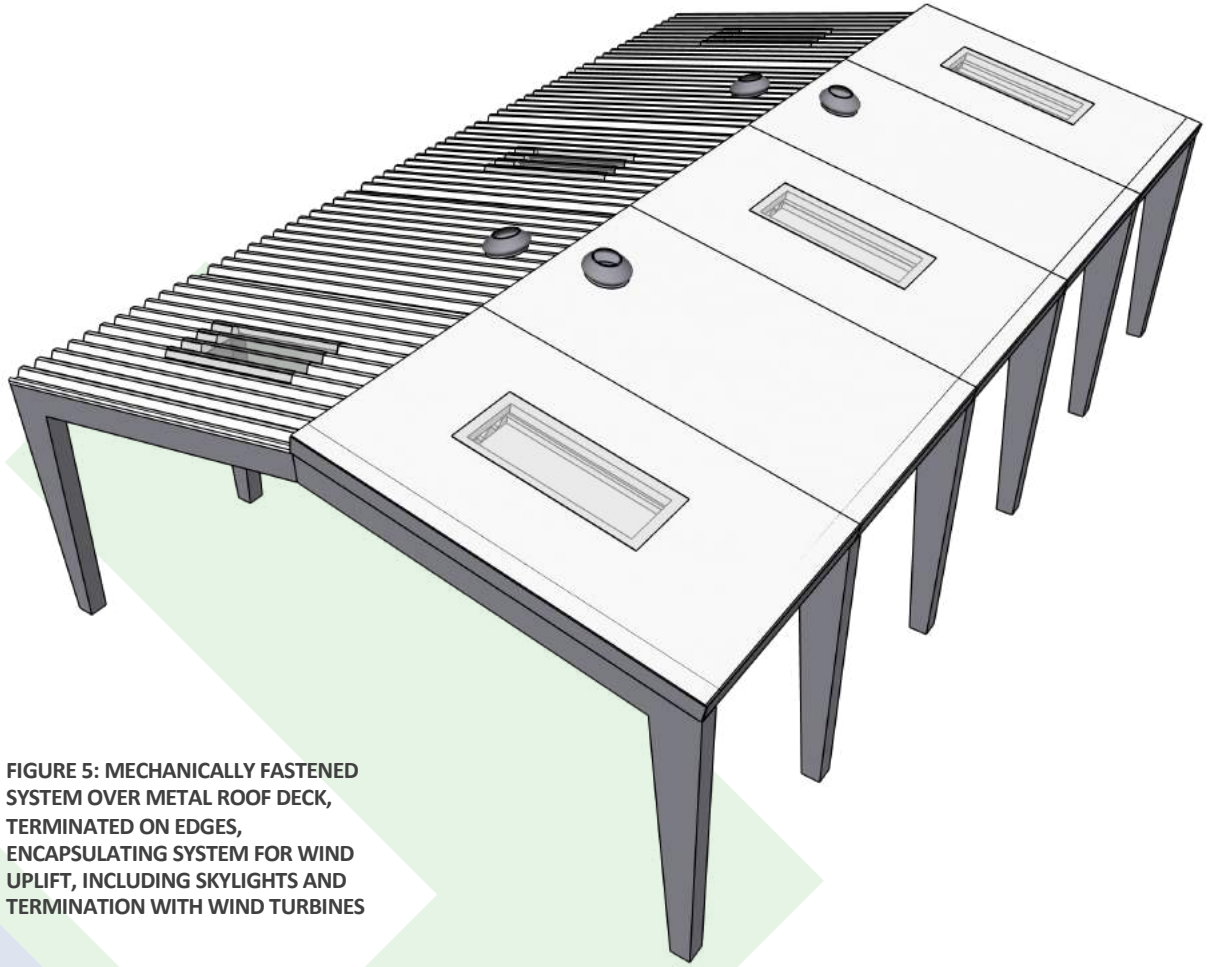
FIGURE 4A: EDGE TERMINATION TOP SIDE, MECHANICALLY ANCHORED TO VERTICAL UPSTAND / PARAPET WALL, COVERED WITH HEAT WELDED TPO MEMBRANE STRIP – ENCAPSULATING THE TERMINATION BAR

FIGURE 4B: EDGE TERMINATION BOTTOM SIDE, HEAT WELDED TO THE HORIZONTAL TPO MEMBRANE ON THE FLOOR

## 3

## APPLICATION ON PEB ROOF

The completed system would look as described in **FIGURE 5** below:



**FIGURE 5: MECHANICALLY FASTENED SYSTEM OVER METAL ROOF DECK, TERMINATED ON EDGES, ENCAPSULATING SYSTEM FOR WIND UPLIFT, INCLUDING SKYLIGHTS AND TERMINATION WITH WIND TURBINES**

#### Washers and Fasteners:

These are critical accessories for securing membrane to the roof deck, ensuring high wind uplift resistance.

Fasteners are self drilling / self tapping screws, suitable for 0.5 to 1.25 mm thick profiled roof sheets. Fasteners are 300 mm in length with a  $\varnothing$  of 4.8 mm with a PH-2 or TX-20 head for optimum torque transfer.

Plastic Sleeve is used for fixing the thermal insulation. The telescopic design prevents damage to the insulation board as well as reducing effect of thermal bridging using fasteners internal air pocket.

Washers are used for fixing membrane. These are round shaped Galvanized metal  $\varnothing$  70 mm, 0.5 mm thick, suitable for the fastener system, securing the membrane in place



# 4

## CORNER, EDGE, FLASHING INSTALLATION

### Corner and Joint Terminations

The GS TPO Membrane is flexible and easy to mould into shapes and corners. To ensure proper coverage of critical corners and joints, using an experienced applicator engineer is important.

Using hand-held hot air gun, heat up the membrane to make it malleable and then push into corners. On cooling the membrane will take shape. Further corners need to be cut, spliced and over welded to provide proper coverage and rain-coating of the substrate below. **FIGURE 6** below provides details of how membrane is installed around corners

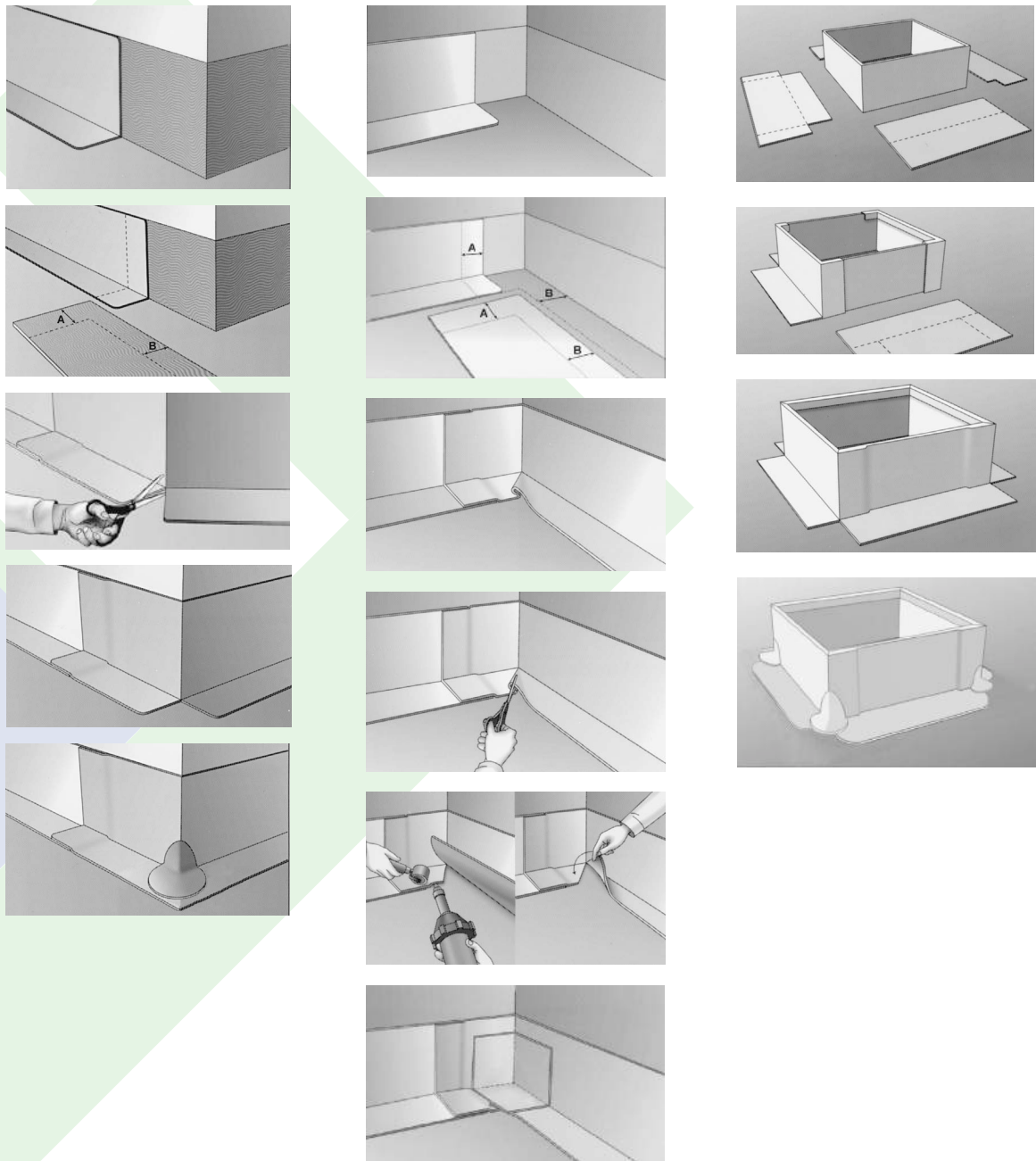


FIGURE 6: CORNER AND JOINT TERMINATIONS DURING TPO MEMBRANE INSTALLATION



Installing Skylights & Wind Turbine on roof

Most of the PEB roofs use skylights, that re part of the roof system and shaped into the roof corrugated profile. With a further thickness of insulation board and TPO system, these skylights would sit lower than the revised height of the roof. To cover this, GreenShield Transparent Skylight sheets are manufactured and applied over these existing skylights. These GS skylights, easily weld onto the TPO membrane, securing the skylights in place, protecting from water percolation / leakage.

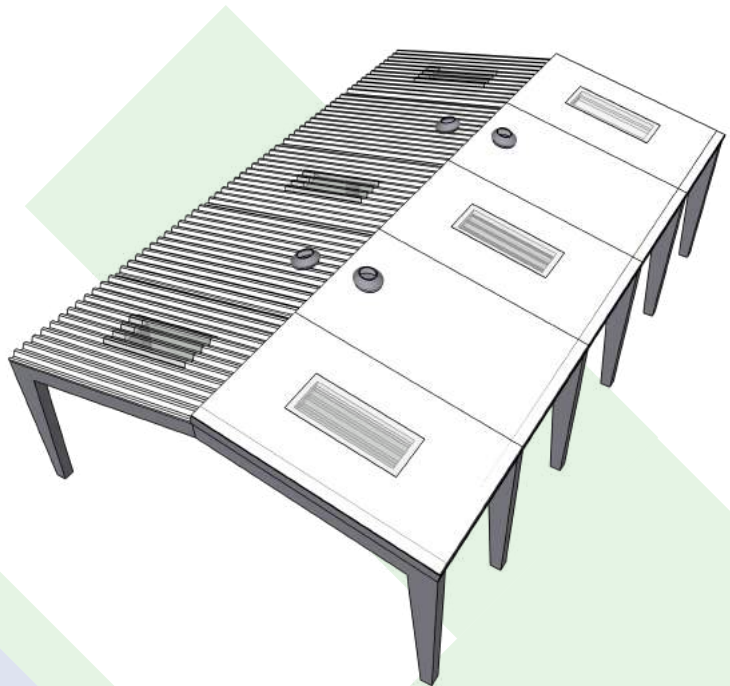


FIGURE 7: TPO COVERED ROOF VS CORRUGATED METAL ROOF

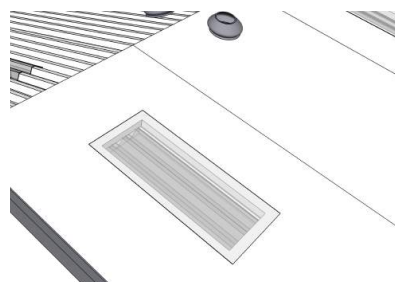


FIGURE 7A: THE MEMBRANE IS PROPERLY TERMINATED FOR WIND TURBINE & SKYLIGHTS

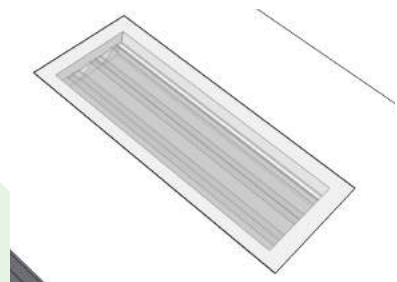


FIGURE 7B: GS SKYLIGHT SHEETS ARE HEAT WELDED TO TPO FOR PROPER SEALING, ENSURING NO WATER LEAKAGES, YET PROVIDING LIGHT THROUGH THE ROOF

Skylight sheets are manufactured using special high UV resistance, high clarity olefins, under special care to ensure complete translucency and diffusion of light through the roof.

Wind Turbines terminations are customized to actual dimensions of the sight. Special formed terminations are used to encapsulate the round edge of wind turbines with the TPO membrane, heat welding and securely sealing the turbine with the roof, ensuring no water seeps through.