

## INSTALLATION GUIDELINES FOR EXPOSED ROOFING SYSTEM

Flat or sloping roofing made of traditionally cast or pre-cast floors in concrete or with profiled metal. Decks, buildings, etc. in which the waterproofing system is mechanically fastened to the substrate to prevent the wind from lifting or moving it. The system will be weather resistant (rain, snow, hail, UV rays, etc.) and may be moderately accessible to pedestrian traffic for maintenance operations. Two different mechanical fixing systems are possible: fixing by washers and screws or linear fixing with a bar.

### 1. STORAGE

MasterSeal TPO liners are delivered on site in rolls, on flat, ventilated pallets. They should be stored in a dry place or, if this is impossible, they should be protected against dampness, rain and snow using waterproof sheets.

### 2. VAPOUR BARRIER

The purpose of this layer is to prevent any moisture working its way up from underlying structures and finding its way into the insulating layer, thus avoiding condensation within the roof covering. It is essential to incorporate a vapour retarder or barrier below the insulation when it is known that particular combinations of temperature and humidity may occur.

A layer of polyethylene film, 0.30 to 0.40 mm thick, dry-laid with 10 cm edge overlap and secured using double-sided adhesive tape.

### 3. INSULATION LAYER

The insulating layer must consist of rigid, high-density material. It is normally composed of expanded or extruded polystyrene, polyurethane, rock wool, etc. The insulation boards should provide the necessary density and rigidity to support the roof design and loadings.

### 4. SEPARATING LAYER

The function of this layer is to physically separate two adjacent membranes and protect the membrane from substrate irregularities and prevent membrane damage. The separating layer is normally made of geotextile manufactured from virgin polypropylene and shall be **MasterSeal 957** with a specific weight of 370 gm/m<sup>2</sup>.

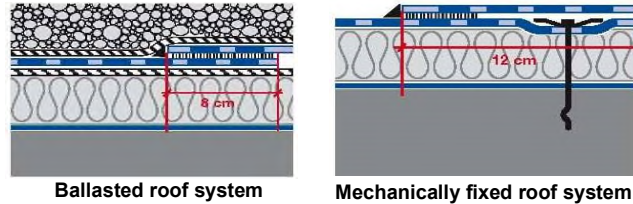
### 5. WATERPROOFING LAYER

The purpose of the waterproof membrane is to ensure complete and durable waterproofing of the roof area. In the context of this waterproofing system we shall consider **MasterSeal 750TPE** 1.5mm thick TPO synthetic membrane. **MasterSeal 750TPE** for mechanically fastened exposed roofing.

## 6. WATERPROOFING SHEET OVERLAP

This is the arrangement of the individual sheets of membrane material laid on the surface to be covered in such a way as to allow each sheet to be welded together.

- 6.1) Membranes for ballasted roof system, **MasterSeal 750TPE** membrane, minimum standard overlap 8 cm.
- 6.2) Membranes for mechanically fixed exposed roof system: the overlap is determined according to the fixing system selected but, in any case, the minimum standard overlap is 12cm.



## 7. FIXINGS (mechanically fixed roofs)

The purpose of the fixing devices is to prevent wind uplift from affecting the waterproofing system. The following fixing devices can be used:

- 7.1) Self-tapping screws for corrugated sheet metal.
- 7.2) Pre-drilled bars in galvanized steel.
- 7.3) Pressure plates for screws or plugs.

The type and number of fixings required will be determined by calculation of the size and zones of influence of wind loading upon each individual roof, in accordance with applicable regulations.

Mechanical fixing can be carried out by two different systems:

- 7.4) **Side lap fixing system:** Using this system the reinforced waterproofing membrane is fixed through the deck / substrate by appropriate fixings and distribution plates. The membrane is fixed along its outside edge at centres determined by the wind load restrictions.

Where additional fixings are required to the perimeter and corner zones a further row of fixings can be installed along the centre of the membrane and then overlaid with a welded cover strip of membrane. The same fixing method may be applied to a pre-drilled bar system in place of fixings and pressure plates.

- 7.5) **Bar fixing:** This system is used if the type of supporting element requires the positioning of the fastening line at a pre-established centre distance, owing to defects visible underneath the roofing. The fastening lines are placed parallel to the lengthwise axis of the line. Instead of distribution plates, a pre-drilled bar in galvanized sheet iron is used for all the fastening lines, not only for those at the foot of the vertical elements.



## 8. PERIMETER FIXING

**MasterSeal TPO** roofing systems must be fixed at all up-stands, perimeters and protrusions with pre-drilled galvanized steel bar. The fixing can be made horizontally or vertically depending upon the substrate and design constraints. **MasterSeal NP 472** is used as sealant at the termination.

## 9. CLEANING THE WELDING LINES

The surface of TPO liners can easily become electrostatically charged. This considerably increases build-up of dust and impurities on welding seams; it is therefore necessary to clean them with a cloth soaked in TPO CLEANER before welding. This cleaning operation can be omitted only when roll laying and welding are carried out simultaneously

## 10. WELDING THE SHEETS

Two types of welding system can be used:

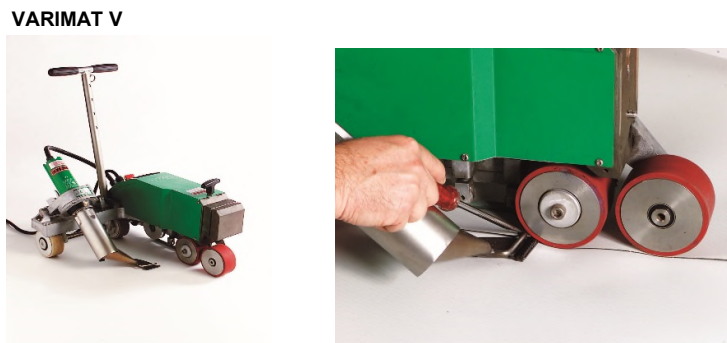
- Manual hot air guns – TRIAC PID
- Automatic welding machine – VARIMAT V

These welding systems are not mutually exclusive but can be used together according to the specific requirements and characteristics of each waterproofing job. Regardless of the welding system chosen, the sheet overlaps must be clean and dry.

- a) Hot air manual welding - The layers must be overlapped by 12 cm and fixed by welding spots every 40 cm (spot welding). The following phase is pre-welding. Usually the welding temperature is about 320°C (+/-20°C) according to the environmental conditions on the building site. The same procedures must be followed when performing the final weld.



- b) Automatic welding can be performed by hot wedge welders (e.g. Saldamax Mille, Varimat V) or hot air welders.



## 11. USE OF ACCESSORIES

To ensure perfect compatibility, use prefabricated corners, fittings and unions from the TPO range which are made of the same compound as the waterproof liner or one can prepare them on-site using the **MasterSeal 750TPE** membrane. Use a manual hot air gun to weld these to the TPO waterproof liner.

Tools:



## 12. OVERLAPPING THE SHEETS

It is strongly recommended that the number of membrane layers be limited to a maximum of three. If more than two, you need to chamfer the leading edge. If the sheet heads create 4-edge crossings, in addition to this chamfering you need to apply a round safety patch on the welding point. Avoid multiple welding with more than three sheets. For this purpose:

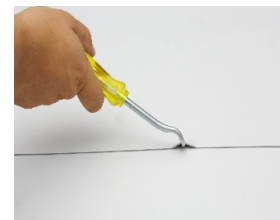
- a) Lay a transverse sheet or strip (minimum width 20 cm) across the bottom of two or more perfectly aligned and parallel sheets to provide a connection to the subsequent set.
- b) Offset each set of sheets transversally.

## 13. HECKING LAID SURFACES (SIGNALLING EFFECT)

The contrasting colors of the upper and lower surfaces of most TPO membranes allow the integrity of laid membranes to be checked. If, during installation, the waterproof membrane has been in any way damaged or abraded, this will be readily apparent as the darker inner layer of the membrane will be exposed. This can then be easily remedied by welding a piece of the same material over the damaged area.

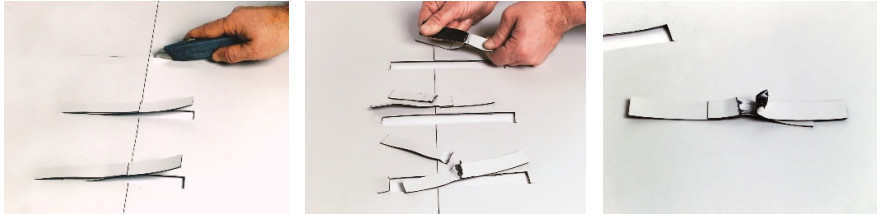
CHECKING OF THE MANUAL AND AUTOMATIC WELDING Integrity of welding can be checked by mechanical, pneumatic or destructive testing.

- a) **Mechanical test** (weld made by manual hot air gun or automatic equipment): This is carried out by passing the rounded tip of a seam probe along the welding line, exerting an adequate pressure to identify any defect in the welded seam. This operation is absolutely necessary to check the integrity of the welding and should be performed when the material is cold. Defective areas should be cleaned with seam cleaner and re-welded or over laid with **MasterSeal TPO** strip.



- b) **Destructive testing** (hot air welded seams): A destructive tensile test is carried out by peel testing a sample of the weld. To do this, take out a 1 cm wide section of the previously welded seam. Under test, the weld should not separate, nor should the covering tear.

Note: The test, although manually performed on site, is based on the provisions set forth by the UEAtc Directive.



### **EXPOSED ROOF** (mechanically fixed) Preliminary note:

In the case of a substrate made of corrugated sheet metal, waterproof sheets should be placed in such a way as to cross the longitudinal rib of the metal element perpendicularly.

With a concrete substrate, the waterproof sheets can be laid both perpendicularly and transversally to the direction of the support tiles. Wind force has different effects on the roof surface, which is why three areas of influence are distinguished: inside, perimeter and angle. The distance between the single fixings, their density and the number required in the three areas of a roof are established during the design phase for each case.

The basic criteria for the fixing design are: nature of support, shape of the roof, building height, wind speed of the area, topography of the area. The section of liner that is placed along the roof perimeter is most exposed to wind so you always need to include a complementary fixing line with a pre-drilled bar in galvanized sheet iron at the foot of the perimeter brickwork. The corner is the most heavily affected by the wind and obviously requires the largest number of fixing points. For more information and detailed calculations, please contact our Master Builders Solutions Technical representative.

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