EMIRATESGBC TECHNICAL WORKSHOP

REFLECTIVE TPO MEMBRANE ROOFING

Facilitator  Company  Date
Vince Robinson  MAPEI  27th August 2019
Thermoplastic PolyOlephine – TPO
What are they....

‘TPOs – are relatively "new generation" roof membranes that combine the attributes of two of today’s popular flexible single-ply membranes EPDM and PVC’
Reinforced TPO membranes can be produced by:

1) Calendering with lamination
   (Compresses, Sheet Forming, Layering)

1) Extrusion with lamination  The production of multi-layer reinforced membranes in one-step process which means laminated reinforcing elements to enhance mechanical resistance of the finished product.

2) Extrusion-coating techniques.

Most TPO membranes are reinforced with polyester, fiberglass or a combination of both. Unreinforced TPO membranes are also available.
Coextrusion TPO reinforced single ply roofing membranes
SYNTHETIC MEMBRANES

• Synthetic waterproofing in Europe constitutes 20% of the market size (75% PVC and 20% TPO). This is a growing market sector.

• Synthetic waterproofing market in the USA represents two million m², TPO constitutes 45%, PVC 10%.

• Synthetic membrane use in the Middle-East represents 10% of the market, increasing year on year. This is a growing market sector with designers and specifiers slowly moving away from problematic older technology membranes.
Thermoplastic Poly Olephine - TPO

TPO membranes are installed in the same manner as other thermoplastic, hot-air welded membranes.

TPOs can be:

1) Mechanically-attached
2) Fully adhered
3) Stone or paver ballasted
4) Or installed as a vented roofing system. Commercial wind-vented systems pull the air from under the roof membrane through equalizer valves, typically located along the roof’s perimeter. The process is similar to sucking the air out of a balloon.
LOGISTICS CENTER
MECHANICALLY FIXED SYSTEM

1. Structural slab
2. Vapour control layer
3. Thermal insulation
4. TPO roofing membrane
5. Hot air welding
6. Mechanical fixing system
ADHERED SYSTEMS

1. Structural slab
2. Fully bonded vapour control layer
3. Fully bonded thermal insulation
4. Adhesive
5. Fleece backed TPO roofing membrane
6. Hot air welding
BALLASTED SYSTEMS

1. Structural slab
2. Vapour control layer
3. Thermal insulation *
4. TPO roofing membrane
5. Protection layer
6. Ballast
7. Hot air welding

• Install a separation layer, if required
SHOULD WE SEE MORE USE OF WHITE TPO MEMBRANES AS PART OF THE BUILDING ENVELOPE......
WHY TPO....

- White membrane - Sustainable – Eco Friendly
- No Plasticisers
- Long life expectancy
- 100% Recyclable
- Light and easy installation
- Heat welded seams
- Chemical stability and compatibility
- Commercial & technical benefits
- Dimensionally stable
- Can withstand extreme heat & UV exposure
- SRI 102 - Energy savings
- No gas emissions during heat welding
A white, sun reflecting surface provides the building owner with substantial energy savings.

On a hot summer day the difference could be as high as 30 °C.
TPO MEMBRANES ARE A PROVEN ENERGY SAVING MATERIAL, SHOULD THEIR USE BE A MANDATORY GOVERNMENTAL REQUIREMENT
Temperatures measured in the period June / September 2015

Environmental temperature [°C]

Surface temperatures [°C]

64.5 °C
43.5 °C
42.0 °C
LEED, internationally recognized green building certification system is the International reference for design, building and management of environmental friendly, high-performance buildings.

White TPO Membrane roofing contributes to satisfy the requirement for obtaining LEED certification points.

More specifically:

**Sustainability of the site**
Credit 7.1. Heating isle effect: external surfaces

**Materials and resources**
Credit 2 Management of building waste
Smart White Means Energy Savings

Example of approximate cooling / energy savings:
• $45,000 (Dhs165k) over a 15 year span (versus a black roof) installed on a 50,000ft$^2$ (4645m$^2$) building in Beijing.
• Significant portion of installed cost “paid back” over time.

Third party links for energy saving calculation:

Dept of Energy's Oak Ridge National Labs site:
Cool Roof Rating Council site:
www.coolroofs.org
Energy Star site:
www.roofcalc.com
LONGEVITY OF TPO MEMBRANES COMPARED TO TRADITIONAL WATERPROOFING
ISO 14001 Plant certified to ISO 14001
30% 30% of energy used in our manufacturing plant is produced by the cogeneration process
100% 100% recycling of water in the production process
100% 100% recycling of production wastage
EPD EPD certification
LEED certification *
Reduction by 70% of packaging materials
ENVIRONMENTAL FRIENDLY Production system
CO₂ Reduced emission CO₂

* LEED (Leadership in Energy and Environmental Design) is an internationally recognized green building certification system. It is the International reference for design, building and management of environmental friendly, high-performance buildings.
SMART WHITE REFLECTANCE CONCEPT
## TPO – PVC

<table>
<thead>
<tr>
<th>Property</th>
<th>PVC</th>
<th>TPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected life</td>
<td>&gt;15 years</td>
<td>&gt; 30 years</td>
</tr>
<tr>
<td>High chem. compatibility</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Hot air welding</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Signal Layer</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Elongation</td>
<td>&gt;300%</td>
<td>&gt;500%</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>&gt;11 Mpa</td>
<td>&gt;15 Mpa</td>
</tr>
<tr>
<td>Puncture resistance</td>
<td>HIGH</td>
<td>HIGH</td>
</tr>
<tr>
<td>Density</td>
<td>1.3 Kg/m²</td>
<td>0.92 Kg/m²</td>
</tr>
<tr>
<td>Colour</td>
<td>Any</td>
<td>Any</td>
</tr>
</tbody>
</table>

* Depending on thickness and service conditions
COST OF TPO MEMBRANE WATERPROOFING COMPARED TO TRADITIONAL WATERPROOFING SYSTEMS
<table>
<thead>
<tr>
<th>Feature</th>
<th>EPDM</th>
<th>TPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected life</td>
<td>&gt; 30 years</td>
<td>&gt; 30 years</td>
</tr>
<tr>
<td>High chem. compatibility</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Hot air welding</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Signal Layer</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Elongation</td>
<td>&gt;500%</td>
<td>&gt;500%</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>&gt;11 Mpa</td>
<td>&gt;15 Mpa</td>
</tr>
<tr>
<td>Puncture resistance</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>Density</td>
<td>1.2 Kg/m²</td>
<td>0.92 Kg/m²</td>
</tr>
<tr>
<td>Colour</td>
<td>Black</td>
<td>White</td>
</tr>
</tbody>
</table>

EPDM LAPS ARE GLUED USING SOLVENTED ADHESIVES
TPO – ENVIRONMENTAL IMPACT

- Chloride free
- 100% recyclable
- Uses recycled content
- 35% lighter than PVC
  - TPO density: 0.92 Kg/m²
  - PVC density: 1.30 Kg/m²
- On a 100,000 m² roof with a 1.5 mm thick membrane:
  - PVC – 195 Tons (9 containers)
  - TPO – 138 Tons (6 containers)
- TPO doesn’t release any harmful gas or smoke during welding.
- SRI 102 – Energy saving
TPO benefits in hot climates

- Durability and increased life expectancy, even in fully exposed applications (Mech Fix or Fully bonded)
- Longevity is not dependent on extra thickness
- Lighter color results in heat reflection
  SRI 102
- Easier and faster application in extreme temperatures
- No shrinkage when laid loose
- No degradation under UV
- Recycled material used
- Heat welded seams
Hot air Manual Welding

1. Spot welding
2. Pre-welding
3. Welding
Hot air manual welding
HOT AIR MANUAL WELDING

Internal corner
WORKING DETAILS

VENT COVERING
WORKING DETAILS

DRAINPIPE OUTLET
AUTOMATIC WELDING
Application by qualified Contractors

Training

Approved contractor
SHARJAH CITY CENTER
METRO, BRATISLAVA (SLOVAKIA)
MALL OF THE EMIRATES
ENERGY EFFICIENT SOLAR PANEL ROOF
LOGISTICS CENTER
AUCHAN PALERMO
Thank You