Thin Surfacings

by

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Thin Asphalt Surfacings: General

Functional Characteristics of Thin Layer Surfacings:

- **Surface Properties** most important.
  - **Traffic Safety** (skid resistance/friction, drainage, splash & spray, optical properties)
  - **Protection of Lower Layers** ($H_2O$ & temperature, mech. wear, snow plough, chemicals,...)
  - **Environmental-Functions** (noise reduction,...)

- **No Bearing Capacity** but **Load Transfer & Crack-Bridging Function**
  - **Horiz. Shear**
    - (driving, breaking; slopes, curves, ...) → interlayer bond & aggregate bond
  - **Horiz. Tension & Compression**
    - (thermal dilatation, local tension from tire-rubber contact,...) → aggregate bond

**Material Requirements**

- **Binder:** as soft as possible (rutting!); good bonding ($H_2O$); aging & temp. resistant → PmB
- **Aggregates:** resistant to crushing, polishing & frost; good micro-roughness
Thin Surfacings: State of the Art & Practice
(remark: no surface treatments & no pre-fab)

**Status Europe:**
- Mostly hot mix thin asphalt layer surfacings
- In place fabrication
- Tack/Bond Coat: Cationic & polymer modified emulsions
- Tendency to fine aggregate sizes (noise)

**European Standards EN:**
- **EN 13108-1 AC**
  Asphalt Concrete
- **EN 13108-1 AC MR**
  Asphalt Concrete „Macro Rough“
- **EN 13108-2 BBTM** (ACVTL)
  Asphalt Concrete for Very Thin Layers
- **EN 13108-3 SA**
  A,B,C,S Soft Asphalt
- **EN 13108-4 HRA**
  Hot Rolled Asphalt
- **EN 13108-5 SMA**
  Stone Mastic Asphalt
- **EN 13108-6 MA**
  Mastic Asphalt
- **EN 13108-7 PA**
  Porous Asphalt
### Hot Mix Surfacerings, e.g. CH-Type H

<table>
<thead>
<tr>
<th>Type</th>
<th>Thickn [mm]</th>
<th>Filler &lt;63μm [M%]</th>
<th>Sand &lt;2mm [M%]</th>
<th>BinderType (standard)</th>
<th>Binder Dosage [M%]</th>
<th>Voids in Pav [V%]</th>
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<tr>
<td>AC 8</td>
<td>25...35</td>
<td>6..12</td>
<td>38..61</td>
<td>50/70; PmB50/70-53C</td>
<td>≥5.8</td>
<td>2.5...6</td>
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<td>AC 11</td>
<td>35...50</td>
<td>5..12</td>
<td>31..53</td>
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<td>≥5.4</td>
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<td>6..11</td>
<td>21..31</td>
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<td>5..9</td>
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<td>PmB50/70-53C; PmB70/100-48C; PmB50/70-65E; PmB70/100-60E</td>
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<td>7..12</td>
<td>20..30</td>
<td>50/70; 70/100; PmB30/50-65E; PmB50/70-65E; PmB70/100-60E</td>
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<td>2…5</td>
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<td>20..30</td>
<td></td>
<td>≥6.2</td>
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<td>25…35</td>
<td>3…5</td>
<td>10..17</td>
<td>PmB50/70-65E; PmB70/100-60E</td>
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<td>8…15</td>
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<td>19..31</td>
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Possible Contribution of Thin Surfacings to more Sustainable Solutions

- **Save Material Ressources**
  - Use of durable & 100% recyclable material components
  - Protection of lower layers (water, temp. isolation)

- **Save Energy**
  - Low temperature pavement layer
  - Bright surfaces (lighting)*: colorless binder, white chipping (e.g. rousil); fluorescent/reflective components
  - Self-deicing* & self cleaning

- **Reduce Environmental Pollution**
  - Noise (texture, rubber..)
  - Water cleaning (filtering) & retention/drainage & splash/spray*
  - Low abrasion* & dust prevention
  - Active (solar) energy harvesting
  - Urban heat island
  - Air cleaning (photocatalytic NO\(_X\) TiO\(_2\))

* Safety relevant
Current Gaps of Knowledge

- **Modeling, characterization & measurement of long term lab & in situ…**
  - **Surface properties/performance**
    - Friction texture including noise etc. (what measurement simulates reality best?)
    - Abrasion & ravelling (Wehner Schultze?)
  - **Material properties/performance**
    - Interlayer bond (moisture, temp, interface texture; blistering, crack-bridging..)
    - Aggregate bond (moisture, temp, surface prop., binder adhesivity; stripping, surface cracking)
    - Binder or mastic cohesivity (aging, damage & desintegration, deformability)
    - Tack/bond & sealing coats (are they necessary?)

- **Further General Gaps**
  - Inhomogeneity, scaling & size effects
  - Effect of combined traffic & weather histories (incl. accelerated simulation ?)

- **Special Innovation paths**
  - Recycling/Re-use (how much, re-usable material, substitute materials?)
  - Low-temp solutions (emulsion, foam bitumen, waxes, …)?

- **Outside of the Box**
  - All-weather construction robustness (rain, cold);
  - 0-Maintenance (self-healing, self-repair…)
  - Reinforcement (fibers, grids,..)
  - Multifunctionality (extra value? → smart pavements, self-deicing,..)
Main Research Questions

- **Basic understanding/framework:**
  - How to model, characterize, measure and compare long term lab & in situ surface and material properties/performance?

- **Material developments:**
  - How to increase durability of thin hot mix asphalt surfacings in terms of surface and material properties, including interlayer bond?
  - How can high performance thin surfacings be designed with minimum amount of energy consumption and maximum content of recycling/re-use materials (not as linear landfill but for improving properties)?
  - How to obtain all-weather construction robustness with simple & fast construction techniques (minimize congestion, minimize transportation distances)?
  - Is it possible to develop thin smart, adaptable surfacings with zero-maintenance and self-healing/repair properties?
  - How improve multifunctionality, additional value of pavement surfaces?

   - Noise (texture, rubber..) – water cleaning (filtering) & retention/drainage & splash/spray – active (solar) energy harvesting – reduce urban heat island – bright surfaces (colorless binder, white chipping, fluorescent/reflective components) – air cleaning (photocatalytic NOx TiO2) – isolation/protection
Work Groups activities

APE WG 1 RAP Recycling – (C. de La Roche) - resigned - open ?
APE WG 3 Life cycle analysis – J. Harvey
APE WG 4 New technologies and special environment aspects on asphalt pavements – Gordon Airey

New Work groups: goals, activities and working plan

WG on Cold Recycling, proposed chairman: K. Jenkins
WG on By-products recycling in asphalt pavements, proposed chairman: G. Huber
WG on Secondary materials recycling in asphalt pavements, proposed chairman: open ?
Thank You

sustainable solutions are cool!