Thin Surfacings

by

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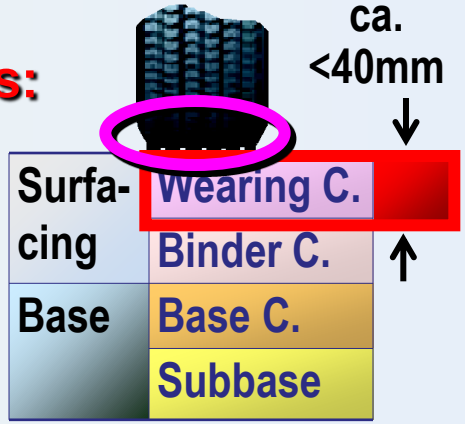
Thin Asphalt Surfacings: General



Functional Characteristics of Thin Layer Surfacings:

- **Surface Properties** most important.
  - Traffic Safety
    (skid resistance/friction, drainage, splash & spray, optical prop…)
  - 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

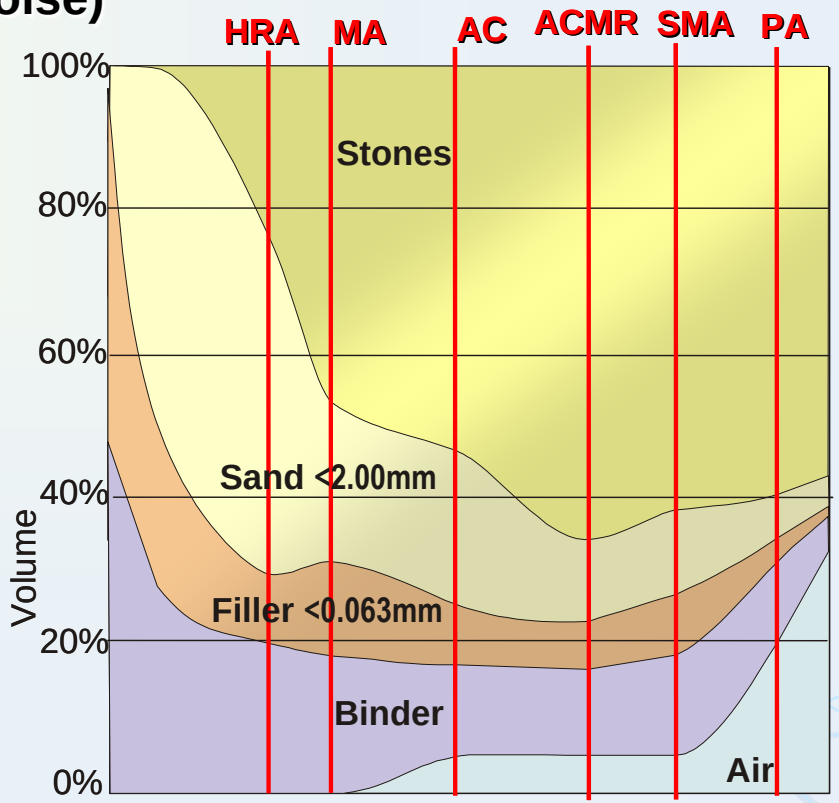
(remark: no surface treatments & no pre-fab)

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*



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Hot Mix Surfacings, e.g. CH-Type H

Type	Thickn [mm]	Filler <63μm [M%]	Sand <2mm [M%]	BinderType (standard)	Binder Dosage [M%]	Voids in Pav [V%]	EN
AC 8	25...35	6..12	38..61	50/70; PmB50/70-53C	≥5.8	2.5…6	13108-1
AC 11	35...50	5..12	31..53		≥5.4	2.5…6	
AC MR 8	20…30	6..11	21..31	PmB50/70-53C; PmB50/70-65E; PmB70/100-60E	≥5.7	3…8	
AC MR 11	25…40	5..9	16..26		≥5.6		
BBTM 8	15...25	7..9	25..35	PmB50/70-53C; PmB70/100-48C	≥6.0		13108-2
BBTM 11	20...30	10..12		PmB50/70-65E; PmB70/100-60E;	≥5.6		
SMA 8	25...35	7..12	20..30	50/70; 70/100; PmB30/50-65E;	≥6.4	2...5	13108-5
SMA11	30...45			PmB50/70-65E; PmB70/100-60E	≥6.2		
PA 8	25...35	3...5	10..17	PmB50/70-65E; PmB70/100-60E;	≥5.0	21...27	13108-7
PA 11	35...50		8…15		≥4.5		
MA 11	30…45	19..31	40..55	35/50;PmB30/50-65E	≥6.8	-	13108-6
MA 16	40…55	20..28	35..50		≥6.5		

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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 transportion 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 NO_X TiO_2) – isolation/protection

TC APE

Chair: M. N. Partl; Secr: G. Tebaldi

http://www.ape-isap-tc.unipr.it/

join us!

TRB: Sunday, January 10, 2010 ; 1.30 ÷ 4.30 pm
Shoreham Hotel - Forum Room

- **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 ?**


sustainable solutions are cool!
Thank You