The Agenda

Why tack coats and bond coats?

Structural Design Aspects

Recommendations

The Quebec way to test the bond

Conclusions

Why Tack Coats and Bond Coats?

In the UK, they use the term bond coats

Bond between two layers of HMA

Essential for long term performance of the HMA structure

Should be machine applied

Better application
Why Tack Coats and Bond Coats?

- Asphalt Emulsion is the best binder to be used
- Hot asphalt cement (Georgia)
  - Safety issues
- Cut-backs
  - Asphalt cement + kerosene
  - Kerosene evaporates
  - VOC issues?

Structural Design Aspects

- In 2002 IBEF did a study worldwide
- Here is the mechanistic design approach using the LCPC design system ALIZE
- The idea was to compare the same structure; one with bonded layers, the other one with unbonded layers

### CHARACTERISTICS

<table>
<thead>
<tr>
<th>Flexible structure</th>
<th>CALCULATION 1</th>
<th>CALCULATION 2</th>
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<tbody>
<tr>
<td>Traffic range: 1.3 to 2.6 million axles</td>
<td>Service life 20 years</td>
<td>Service life 7 to 8 years</td>
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<td>5% risk</td>
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French approach based on ALIZE LCPC SETRA software for road pavement design
Structural Design Aspects

- Some owners in Europe in the 80’s due to the oil crisis decided not to use tack coats any more.
- This was the beginning of cold in place recycling five years later.
- This was the best system to restore the bonding due to the high fatigue effects of the unbonded layers.

Recommendations

- Machine applied
  - Better homogeneity for the dosage per square yard
  - Better application on the pavement
  - Homogeneous film

Recommendations

- Machine applied
  - Type of emulsion used
    - CSS 1h
    - CRS 2
    - CRS 2p (late modified)
      » High traffic
      » Modified PG
    - HFMS
**Recommendations**

- **Machine applied**
  - Check the rate per residual asphalt cement
  - Percentage of asphalt cement varies
  - Thicker for thin overlay (less than 1" overlay thick)
  - Like the glue of the rug
  - 200g/m² or 0.05 gal/sq yd of residual asphalt cement

- **Cracked pavement**
  - Higher rate to penetrate the cracks
  - On top of porous asphalt
    - Like a chip seal type
    - Sometimes slurry to ensure the waterproofing effect
  - Thin overlay
    - NOVACHIP machine or some VOGEL pavers
    - Tack coat included in the process

- **New techniques and innovations**
  - Track less tack coat
  - Blackridge
  - Colnet...
  - Spray bar integrated
  - NOVACHIP
  - VOGEL PAVER
Tests to evaluate the bonding

During the IBEF survey, we found tests to look at the bonding:

- Tensile test
- Torque test
- Shear test

Goal is to insure the bonding effect

Swiss Standard SN 671 961

- 150 mm core
- Thin surfacing pushed off substrate in shear mode
- Minimum shear force requirement:
  - 15 kN between thin surfacing and binder course
  - 12 kN between binder course and road base

Austrian Method

- Metal plates bonded to each end of core taken from site
- Core pulled apart in tensile mode
- Specifications:
  - < 1.5 n/mm² for polymer modified bond coat
  - < 1.0 n/mm² for non-polymer modified bond coat
- For each 0.1 N mm² below specifications
  - Severe penalty imposed
Great Britain Project

- Site or laboratory test method
  - using 100 mm diameter core
- Metal plate bonded to thin surfacing
- Bond measured in torque mode
- No specification set - record value only

MT Quebec Project

- Test done in situ
- Mobile equipment using tensile force (stripping resistance)
- Method being developed to define specifications to evaluate the relevance and impact of bond coats

Conclusions

- Tack coat / Bond coat
  - Important for the performances of HMA structure
  - Residual asphalt cement instead of emulsion dosage
- Machine applied
- Innovations are there