Design method

• Dutch design method has been adapted to the harmonised European Standards for asphalt
• these allow the fundamental approach (specification of stiffness, fatigue resistance, resistance to permanent deformation, water resistance) for asphalt concrete; the Netherlands has chosen this option
• the design parameters obtained from the type testing according to the European standards (stiffness, fatigue resistance) are translated to characteristic (85% reliable) values
• these are used in combination with partial factors of safety according to NEN-EN 1990 Eurocode 0 to incorporate design reliability

Design method

• Stiffness and fatigue testing

Design method

• asphalt stiffness

Design method

• asphalt strains and stiffness -> fatigue life N_f

Design method

• Triaxial testing
Design method
• Water resistance

Design method
• Use of functional properties

<table>
<thead>
<tr>
<th>Property layer</th>
<th>Class (traffic related)</th>
<th>Traffic</th>
<th>Fatigue resistance</th>
<th>Stiffness max.</th>
<th>Comp. resistance</th>
<th>Fatigue resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base layer</td>
<td>OL-A</td>
<td>T&lt;2000</td>
<td>f_{max} = 11000</td>
<td>f_{min} = 1,4</td>
<td>f_{min} = 6</td>
<td>f_{min} = 100</td>
</tr>
<tr>
<td></td>
<td>OL-B</td>
<td>T&lt;5500</td>
<td>f_{max} = 0,8</td>
<td>f_{min} = 80</td>
<td>f_{min} = 6</td>
<td>f_{min} = 80</td>
</tr>
<tr>
<td></td>
<td>OL-C</td>
<td>T&lt;7000</td>
<td>f_{max} = 0,4</td>
<td>f_{min} = 90</td>
<td>f_{min} = 6</td>
<td>f_{min} = 90</td>
</tr>
</tbody>
</table>

T = fixed value, dependent on traffic and application
O = no fixed value, actual value is used in the design

Design method
• Use of functional properties

<table>
<thead>
<tr>
<th>Functional properties</th>
<th>E&amp;C contracts</th>
<th>D&amp;C contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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Design method
• horizontal asphalt strains in bottom of different asphalt layers
  -> fatigue failure of asphalt layers

• asphalt strains (highly dependent on asphalt stiffness) are compared to fatigue resistance of asphalt

Design method
• tensile stresses in semi-bound road bases (slag bound bases or self-cementing bases)
  -> disintegration of road base

• tensile stresses usually tested against standard max. tensile stress value of 130 kPa
Design method
- Tensile stresses in bottom of cement bound road bases at extreme loading
  - Instantaneous failure of road base
- Tensile stress under high wheel loading is compared to characteristic tensile strength of road base material

Design method
- Repeated tensile stresses in bottom of bound road bases
  - Fatigue failure of road base
- Tensile stresses are compared to characteristic fatigue strength of road base material
  - However, this fatigue life is extremely hard to determine for conventional cement bound materials

Design method
- Compressive stress at top of cement bound road base
  - Crushing of road base
- Compressive stresses are compared to characteristic compressive strength of base material

Design method
- Compressive strains at top of subgrade
  - Permanent deformation of subgrade
- Compressive strains are compared to characteristic deformation resistance of subgrade

Design method
- Subgrade strain -> subgrade deformation resistance
  - This resistance is defined as the number of strain repetitions until deformation reaches intervention level
  - Is derived from classical SPDM relation, which proved (in Lin-track ALT testing) applicable for standard Dutch subgrade sand
  - Not to be used for any material