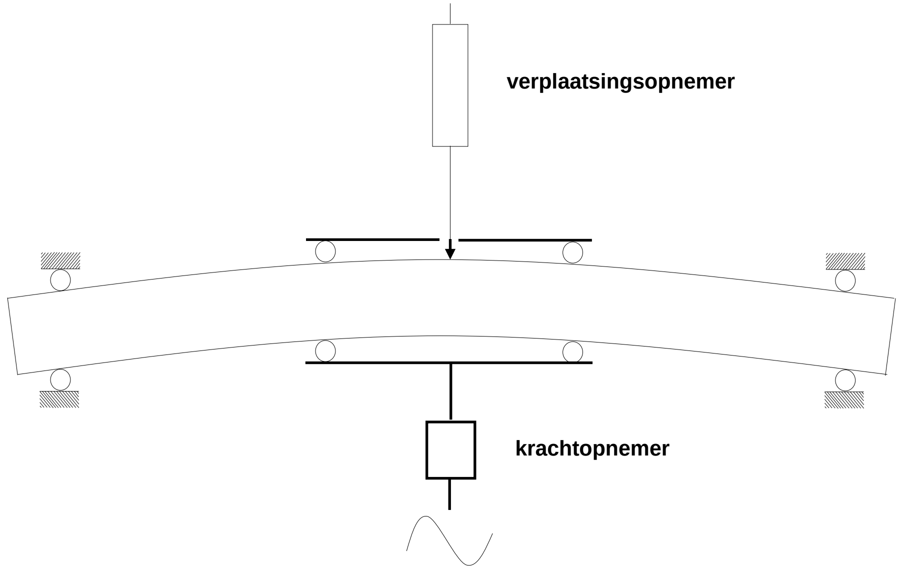
Design method

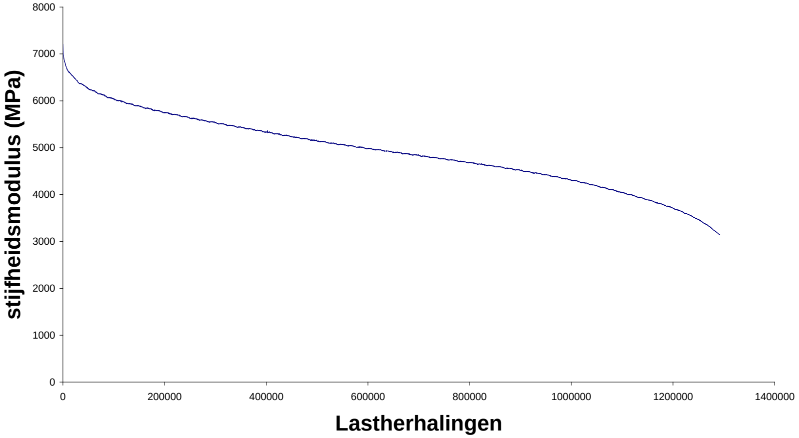
Design method

- 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

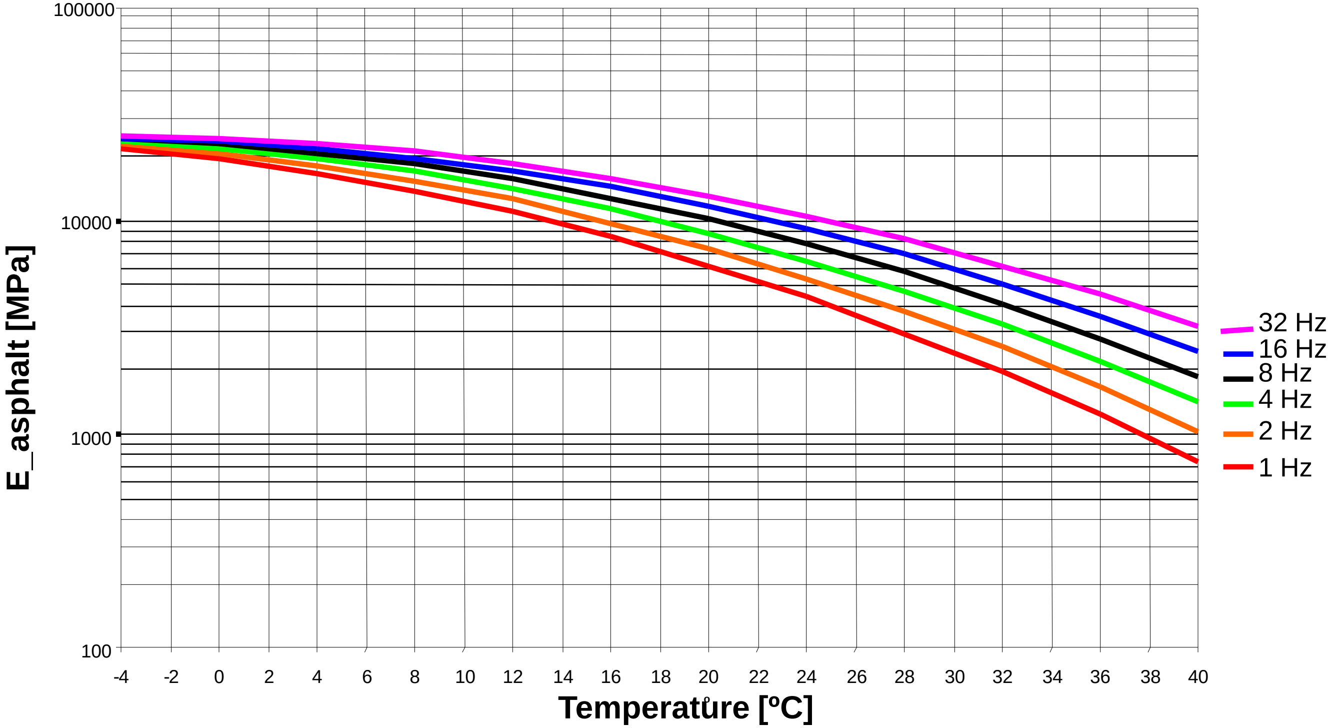
- Stiffness and fatigue testing





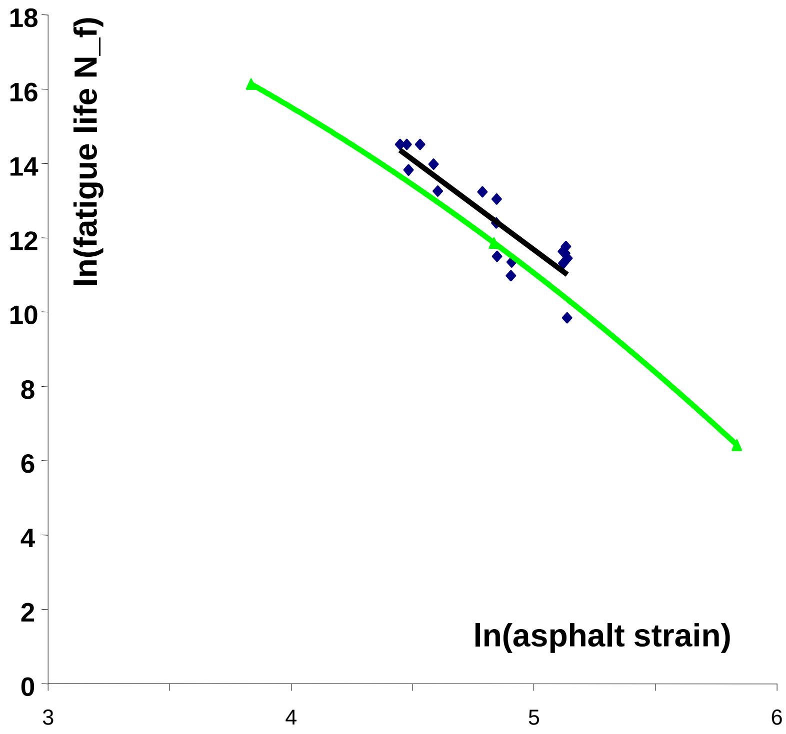
Design method

- asphalt stiffness



Design method

- asphalt strains and stiffness –> fatigue life N_f



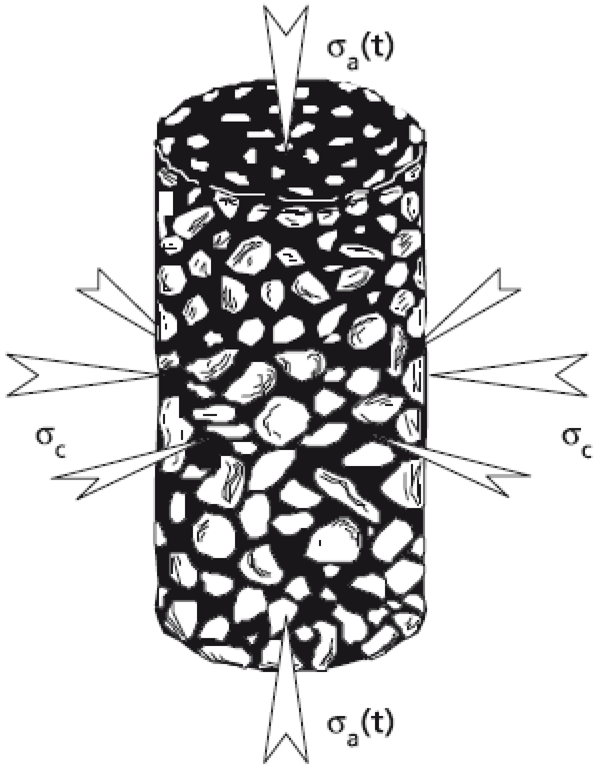
Design method

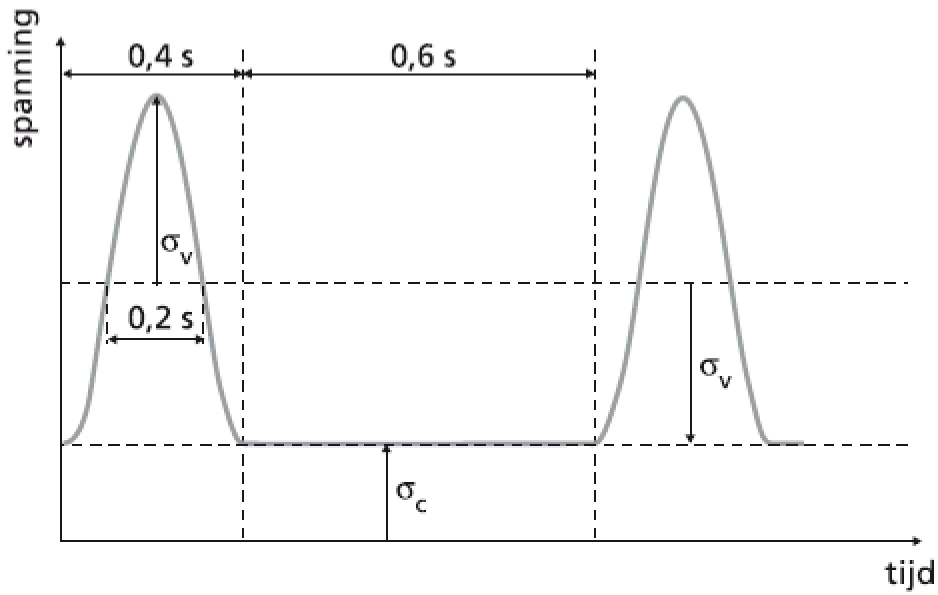
- Triaxial testing

Steundruk: σ_C

Haversine axiale spanning: $\sigma_a(t) = \sigma_V \cdot [1 + \sin(0{,}5 \cdot \pi \cdot \omega t)]$

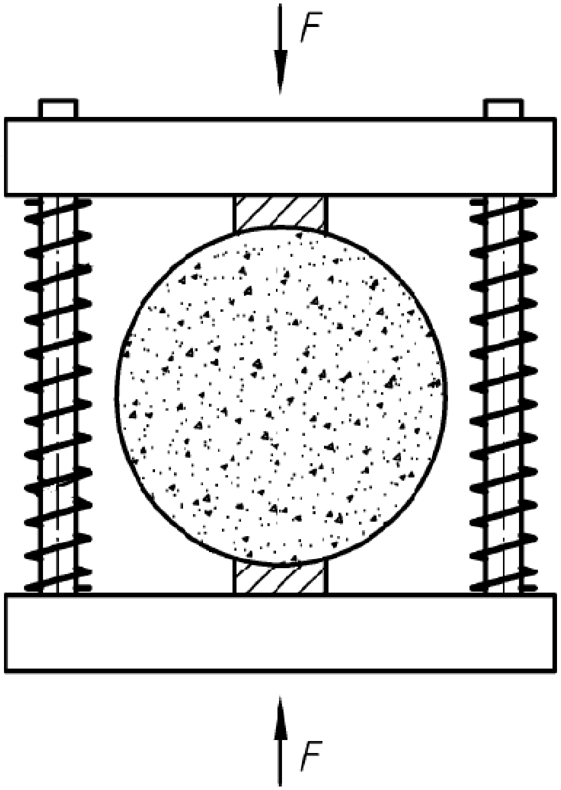
Totale axiale spanning: $\sigma_a(t) = \sigma_a(t) + \sigma_C$





Design method

- Water resistance



Design method

- Use of functional properties

	Functional properties							
	E&C - contracts				**D&C contracts**			
	ITSR	fcmax	Smin	ε6	ITSR	fcmax	Smin	ε6
PA and SMA	empirical				empirical			
AC wearing courses	T	T	T	T	T	T	O	O
AC binder courses	T	T	T	T	T	T	O	O
AC base courses	T	T	T	T	T	T	O	O

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

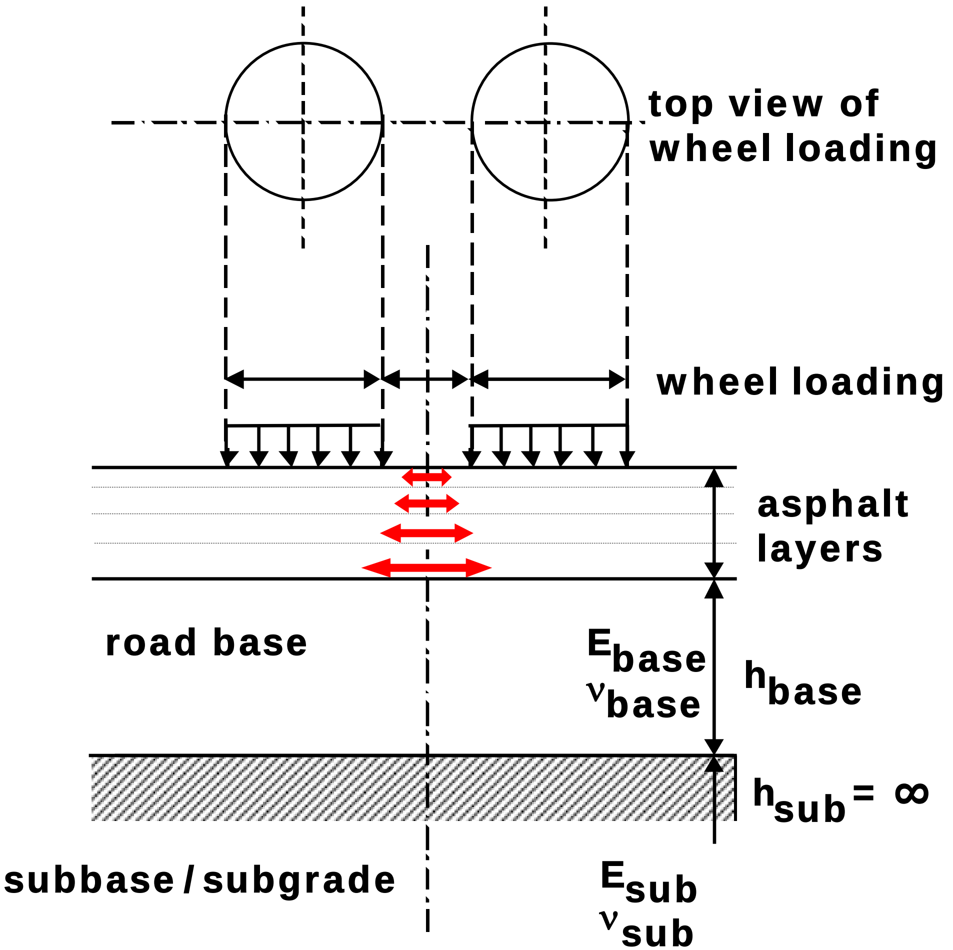
Property / layer	Class (traffic related)	HRmin	HRmax	water-resistance	stiffness min* .	Stiffness max.	Creep resisance	Fatigue resistance*
Base layer	OL-A	Vmin2,0	Vmax7	ITSR70	4500	Smax11000	fcmax1,4	ε6-100
	OL-B				5500	Smax14000	fcmax0,8	ε6-80
	OL-C				7000		fcmax0,4	ε6-90
	OL-IB				7000		fcmax0,2	ε6-90

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

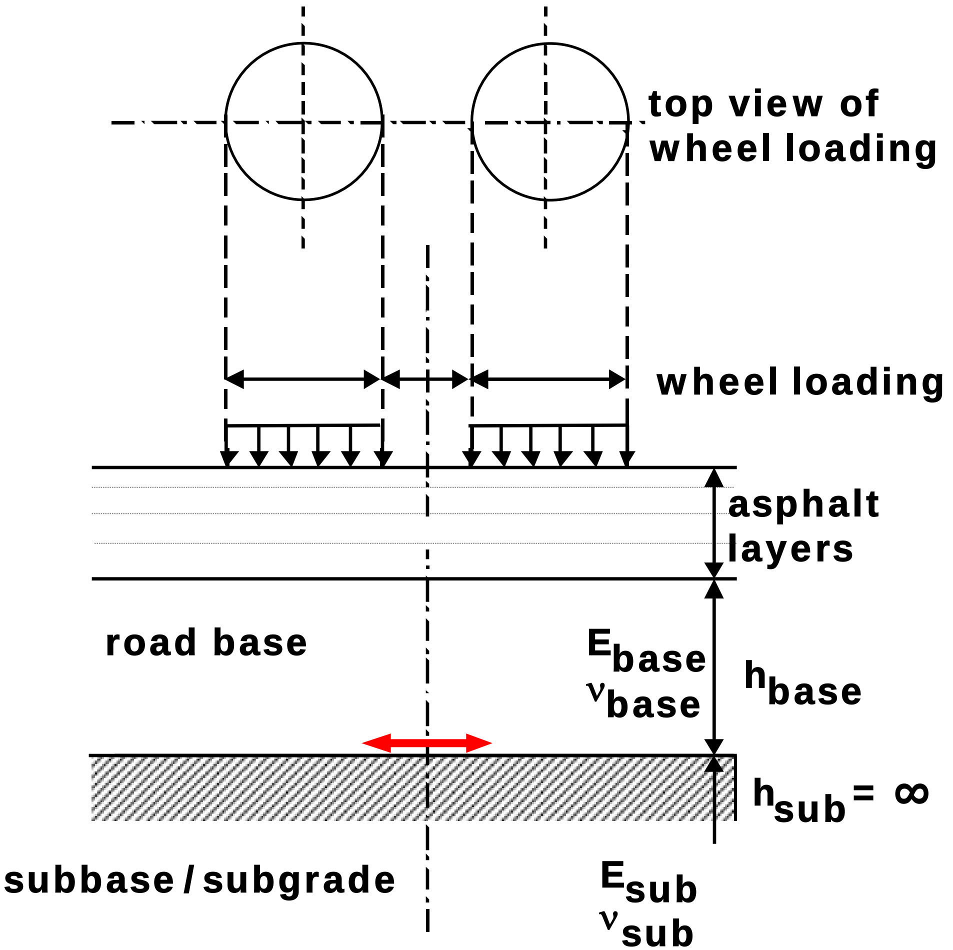


Design method

- 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

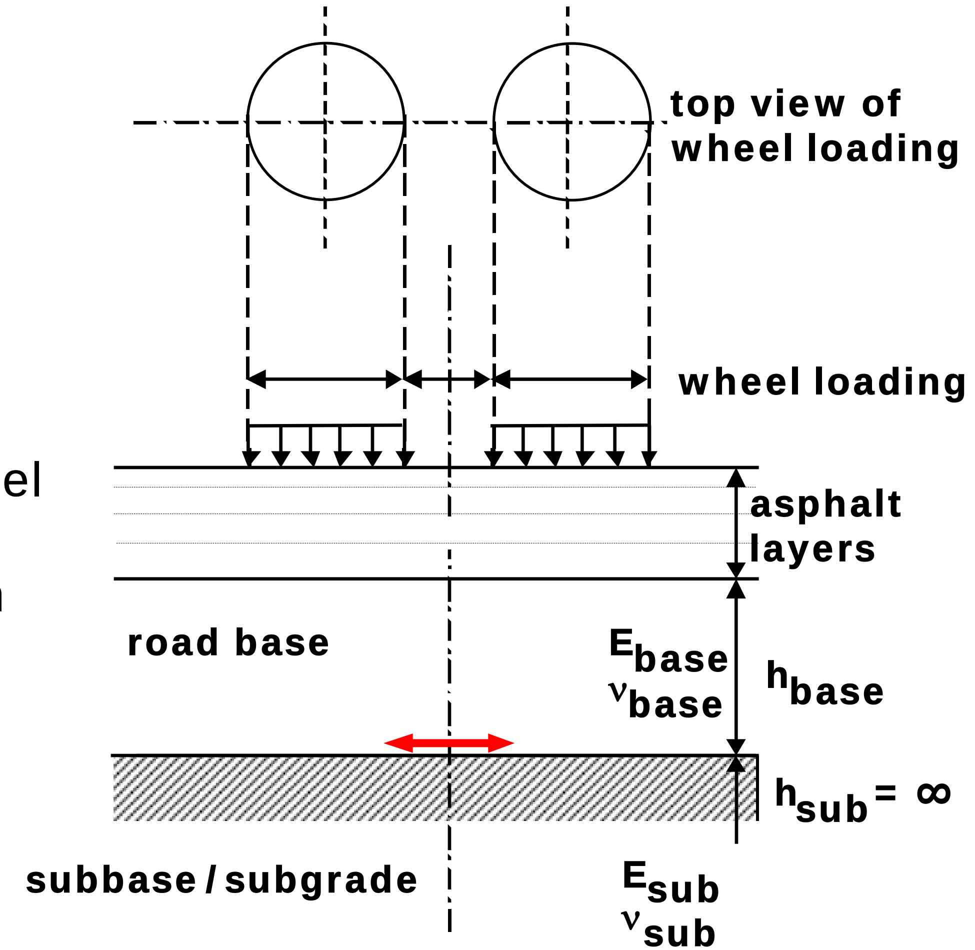


Design method

- tensile stresses in bottom of cement bound road bases at extreme loading

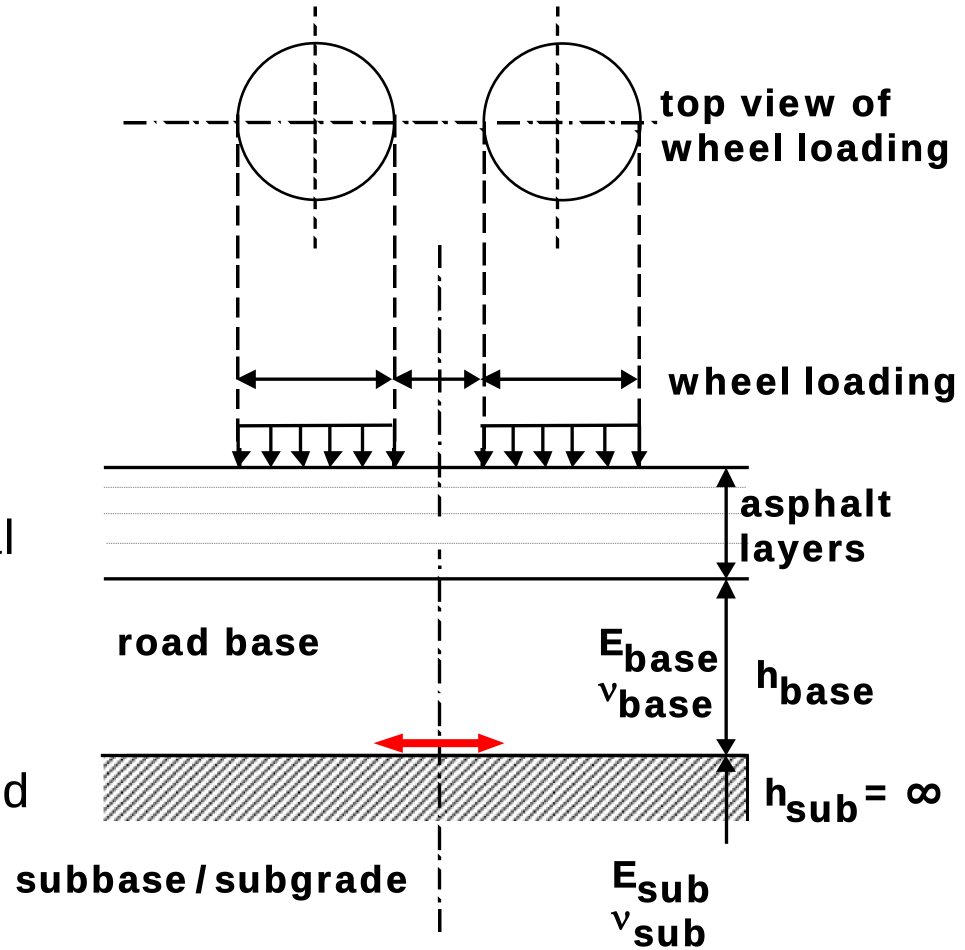
  -> instantaneous failure of road base

- tensile stress under high wheel loading is compared to characteristic tensile strength of road base material



Design method

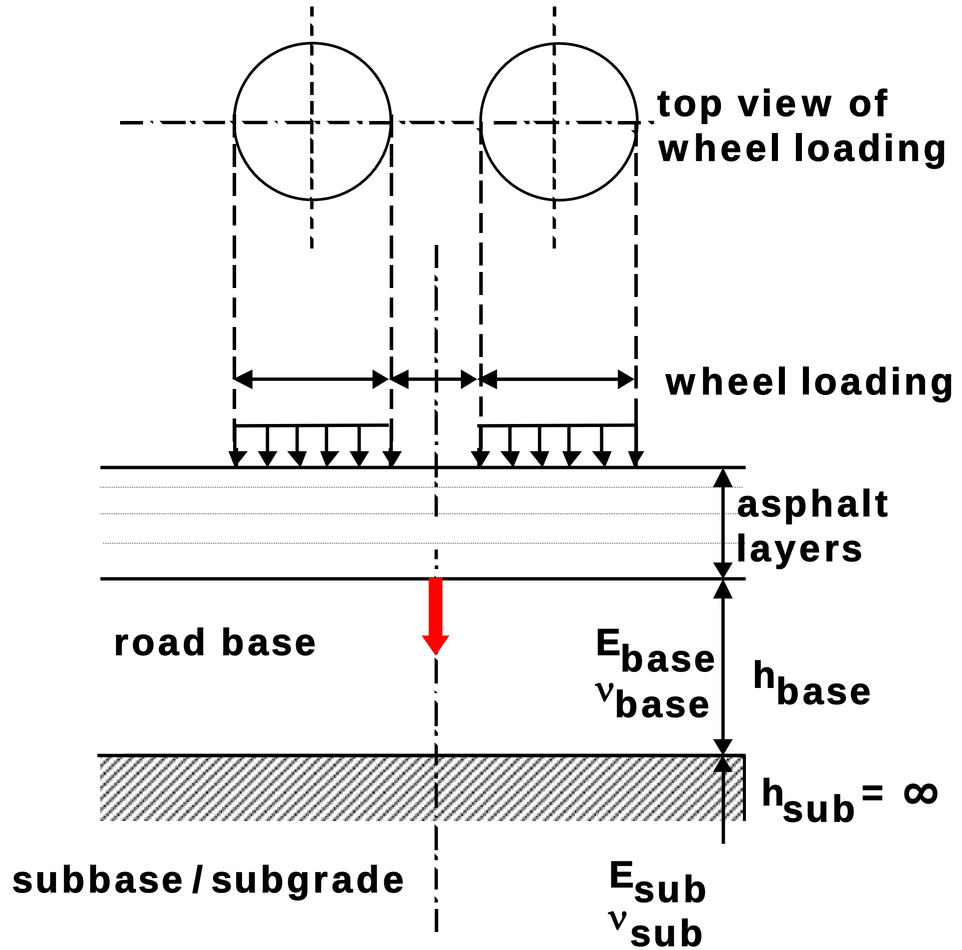
- repeated tensile stresses in bottom of bound road bases
  -> fatigue failure of road base
- tensile stresses are compared to characteristic fatigue strength of road base material
- however this fatigue life is extremely hard to determine for conventional cement bound materials



Design method

- compressive stress at top of cement bound road base
  -> crushing of road base

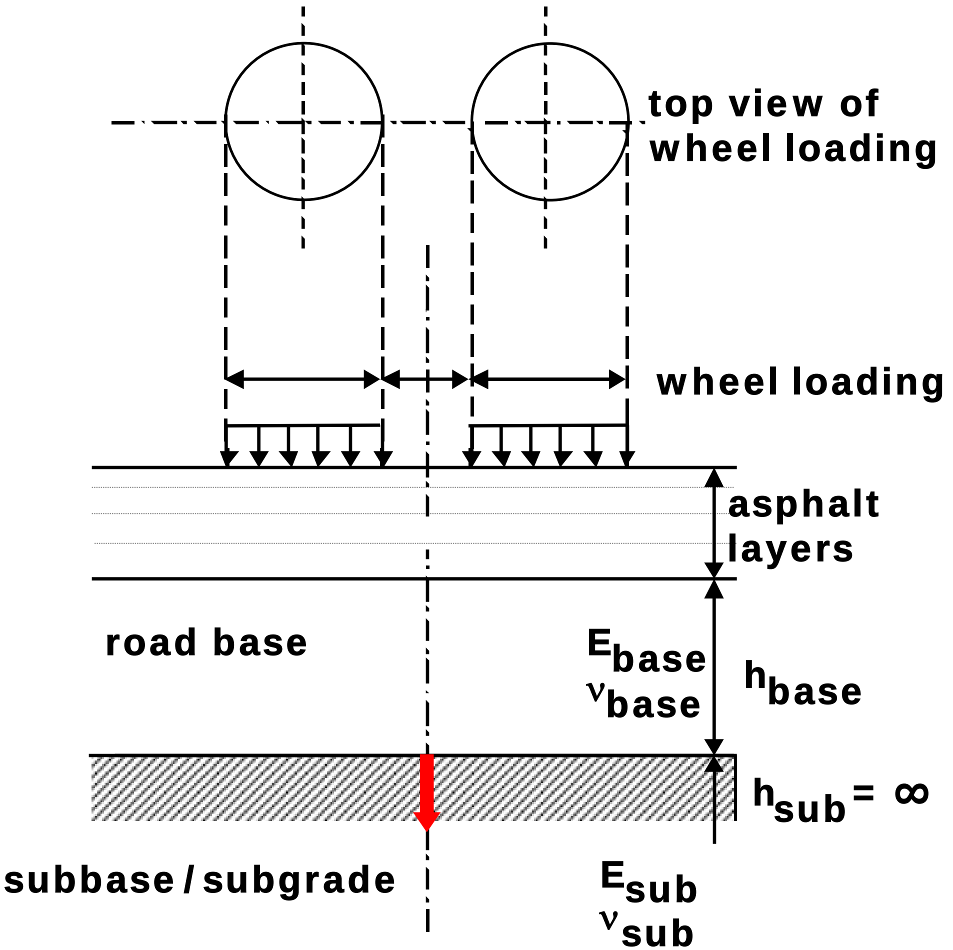
- compressive stresses are compared to characteristic compressive strength of base material



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!