Module 5

Selection and application of bituminous binders

Selection & application of bituminous binders

- Road construction / maintenance techniques well documented in Sabita manuals and technical guideline documents
- Cover the use of the ranges of products in conventional structural and functional layers

Bituminous layers

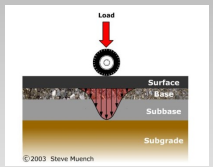
- Surface treatments
  - Chip seals
  - Slurry seals/ microsurfacing
- Asphalt layers
- Bitumen stabilised layers

Surface treatments

- Chip seals: chippings bound to one another & base/existing layer by the sprayed binder
- Slurry / microsurfacing: adhesion and cohesion due to binder in the mix
- Form an all-weather surface:
  - dust free
  - surface texture and skid resistance
  - resists the scuffing action of traffic
  - seals off under lying layers from the ingress of surface water

Asphalt

- Binder mixed with heated aggregates in the manufacturing plant
- Performs the same functions as chip seals BUT if of sufficient thickness, adds to the load-bearing capacity of the pavement
- On uneven surfaces improves riding quality.



Bitumen stabilised layers

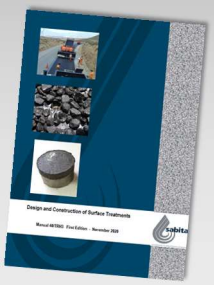
- Manufactured with either emulsion or foamed bitumen
- Improve the load-bearing capacity of pavement
- Resist the ingress of water
  - prevent damage to these layers due to the softening effects of excessive moisture
  - limits damage due to freezing and thawing.

Selection of bituminous binder

- Determined by several factors
  - Configuration / type of material to be bound
  - prevailing environmental conditions of climate and traffic (in-service and construction)
  - Topography / terrain
  - construction methods
  - costs/budgets
- ***Facilitated by a PG binder grading system***

Selection criteria

- ***Spray seals and slurries:***
  - Manual 40: *Design and Construction Of Surface Treatments*
  - TG1: *The use of modified binders in road construction*

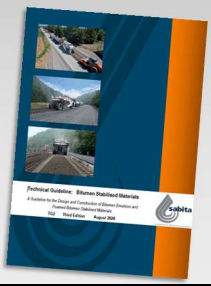


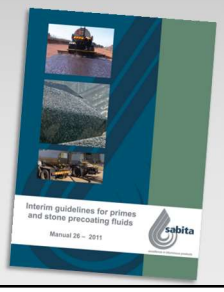
Selection criteria/cont.…

- ***Asphalt***
  - Manual 24: *User guide for the design of asphalt mixes*
  - Manual 35: *Design and use of Asphalt in Road Pavements*
  - Manual 33: *Design procedure for high modulus asphalt (EME)*
  - Manual 22: *Hot-mix paving in adverse weather*
  - Manual 27: *Guideline for thin layer hot mix asphalt wearing courses of residential streets*
  - Manual 17: *Porous asphalt mixes – design and use*
  - Manual 19: Guidelines for the design, manufacture and construction of bitumen-rubber asphalt wearing courses
  - Manual 26: *Guidelines for primes, bond coats and stone precoating fluids*

Selection criteria/cont.…

- ***Bitumen stabilised materials***
  - TG 2: Bitumen stabilised materials
- ***Primes, bond coats and stone precoating fluids***
  - Manual 26: *Guidelines for primes, bond coats and stone precoating fluids*





Classification

- Terminology used to classify bituminous binders :
  - Penetration grading of conventional bitumen as per mandatory SANS 4001-BT1
  - Nomenclature for modified binders as set out in TG1: *The Use of Modified Bituminous Binders in Road Construction* is still in use
- As the implementation of SATS 3208 takes effect, use of these categories would diminish - PG classification of binders will be implemented for general use.

"Comparative" grades

PG Classification	Penetration grade	Modified class
58S -22	70/100	
58H -22	50/70	
58V -22	35/50	S/A-E, S/A-R, A-H, A-P
58E -22		S/A-E, S/A-R, A-H, A-P
64S -16	50/70	S/A-E, S/A-R, A-P
64H -16	35/50	
64V -16		
64E -16		
70S -10		
70H -10		
70V -10		
70E -10		
76E -22[1]	10/20	

[1] This binder grade used in EME should comply with the following additional requirements:

- $G^*/\sin\delta$ at T_{max} and @ 10 rad/sec and ≥ 4
- % Recovery as per the MSCR method , 10%

Cautionary Notes on comparative grades

- Only an indication of the correspondence of the pen grades, TG1 classification and PG class
- Content based on somewhat limited data
- Indicates the restricted PG range of unmodified binders
- Correspondence NOT exact, nor invariant
  - relationship would typically depend on:
    - the source of the binder
    - the modification agents used
    - compatibility of the modifier agent and the specific base bitumen used
- Serves as a guide for further investigation and testing to establish a relevant, exact relationship and compliance

Summary of Module 5

- Selection criteria of binder for regular applications well documented
- Consider ALL relevant factors to optimise decision in the interests of:
  - cost effectiveness
  - sustainable practice
- Prepare and become familiar with the ***PG specification framework***