RPF Task Group on Bituminous Materials (BitMat Committee)

Road Pavement Forum

May 2018 Cape Town

Steph Bredenhann

Contents

- Objective and Role
- Active projects
- Working groups feedback
- Performance-grade Binder implementation

Objective and Role of Committee

- Objectives
  - Providing direction to the various working groups
  - Act as national standard committee for bituminous materials
- Role
  - Review documents drawn up by the working groups and offer input
  - Coordinate and manage the various working groups and determine if more work is required
  - Reports by the conveners of the numerous sub-groups working on current initiatives will be presented and discussed with regards to progress, feedback, challenges, program, etc

Active Projects

- TRH1 Revision: Prime coats and curing membranes (Gerrie van Zyl)
- TRH3 Revision: Seal design (Gerrie van Zyl)
- TRH8/Sabita Manual 35 – implementation
- TRH21 Asphalt recycling – implementation
- TG1 Update: Modified binders: add S-R2/A-R2 binders
- TG2 Update: Bituminous stabilisation (Kim Jenkins)
- TG3 Update: Asphalt reinforcement (Phillip Joubert)
- Performance-grade Binder Implementation (Steph Bredenhann)
- Sabita Manual 19: Bitumen-rubber asphalt mixes – implementation
- Sabita Manual 33: EME Working Group (Johan van Heerden)
- Cold mix asphalt (Dennis Rossmann)
- Trackless tack (Dennis Rossmann)
- SABS Affirmations

TRH1/Manual 26 – Progress - GvZ

Primes and Precoating

- Background
  - TRH1: 1986
  - SABITA Manual 26: 2006
- Decision to update (2017)
  - First Draft Released (October 2017)
  - Comments from TRH1 team incorporated (April 2018)
  - Distribution to obtain industry comments (May 2018)
- Finalisation
  - Comments by end of June 2018
  - Updated Manual 26 to be released (August 2018)
  - Final Draft for submission to RMC (August 2018)

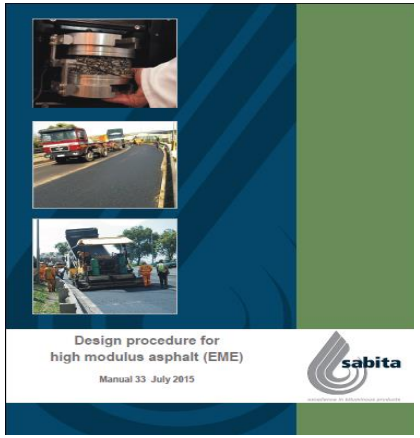
TG2 (2018) update on BSMs - KJJ

- *New Chapters*: Rehab Design Investigation
- *Updates and New Items*:
  - New Mix design Method includes triaxial
  - New ME Design function: based on LTPP in-service of 14 BSM structures & >23 sections
  - PN Number update: traffic and performance data from last 9 years. Include in SAPEM.
  - In plant mixing: more emphasis
- *Moratorium*: SANRAL to finalise

TG 3 – Geosynthetics (GS) in Road Pavements - PJ

- TG3 to be updated and scope expanded
- New scope to include GS all pavement layers
- Planning done in 2017:
  - New Structure has been defined
  - Work packages have been defined
  - Work packages have been assigned to 4 teams
- Detail work to recommence in June 2018

Manual 33: Design Procedure for High Modulus Asphalt (EME) – JvH

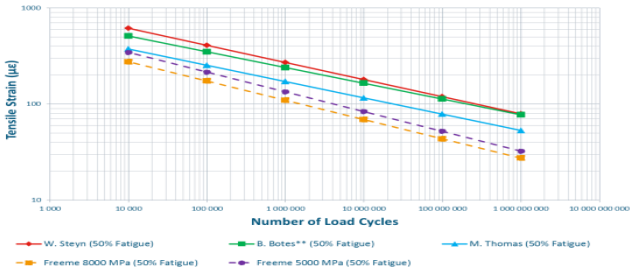


- **Objective/s of the Workgroup:**

  Update the Relevant National Standard;

  to include Structural and Material Design Best Practice Guidelines of Enrobé à Module Élevé (EME) Asphalt Base Layers in South Africa.

- **Project Structure, Methodology and Programme:**



  Planning Completed in 2017

  Work Packages have been Defined; and
  Task Leader and Resource Team have been Assigned.

  Detailed Work to Commence in July 2018

  Task 1: Develop a Database of Constructed EME in SA;
  Task 2: Establish Performance of Previously Constructed EME in SA;
  Task 3: Investigate, Identify and Update Bitumen Specification Anomalies;
  (Penetration Grade or PG specifications)
  Task 4: Identify EME Best Practice Materials Design Concerns and Update;
  Task 5: Identify EME Best Practice Pavement Design Concerns and update;
  Task 6: Identify Construction Concerns and Provide Standard Specification.

Revision of Sabita Manual 35 - PM

April 2018 revision (now available) entails:

- Minimum binder content - now based on a minimum binder film thickness - as covered in the recently distributed Sabita “bulletin”
  (Richness Modulus still relevant to EME as per Sabita Man 33)
- Removal of the table showing typical fatigue lives of asphalt types
  - based on very limited data
  - undesirable effect of some practitioners regarding them as compliance criteria
  - fatigue lives should be mix specific and used in conjunction with the mix stiffness to determine fatigue strength requirements of the pavement design.
- Some Bailey ratios were revised in the light of discussion with Bill Pine.
- Grading control points were amended to be aligned to Bailey requirements.
- PG 70 grade binder introduced in section on binder selection
- ***Incorporation of changes into TRH8 still needs to be resolved***

SA PG Binder Specifications (BitSpec Subcommittee)

Road Pavement Forum

November 2017 Pretoria

Steph Bredenhann

Implementation Plan

- Introduction to industry on 25th January 2016
- Workshops to inform indu March 2016
  - 15th in Johannesburg
  - 16th in Cape Town
  - 17th in Durban
  - 18th in Port Elizabeth
- Bitumen Rh gy Masterclass
  - 21-23 Jun n Pretoria
  - Intern experts
  - Followed up April 2017 in Cape Town
- Two-year parallel implementation
  - Include data analyses and research

Completed

Ongoing

Two-year parallel Implementation

- Data analysis
  - Majority of SA bitumens analysed
- Research
  - 5 Masters at Stellenbosch University – 4 finalising
  - 1 PhD at CSIR – completion early in 2018
- Fingerprinting
  - still to be done, but actions identified
- SANS Specification in progress **SATS 3208**
- Interim implementation is COTO and Client pro-formas
- Implementation in July 2018 still on track, getting tight

Specification in a nutshell

Test Property	Traffic class				Test Method
	S	H	V	E	
Max pavement design temperature (°C)	T_{max}				
Minimum grading temperature (°C)	T_{min}				
G* and δ at $[(T_{max} + T_{min})/2+4]$°C	Compulsory report only				ASTM D7175
G*/sinδ @10rad/s (kPa) @ T = T_{max} Report G* and δ separately	Compulsory report				ASTM D7175
Viscosity at 165°C (Pa.s) ≥ 30 sec^{-1}	≤ 0.9				ASTM D4402
Storage Stability at 180°C (% diff in G* at T_{max})	≤ 10				ASTM D7175
Flash Point (°C)	≥ 230				ASTM D92b
	After RTFO Ageing				ASTM D2872 / TG1 MB3
G* and δ at $[(T_{max} + T_{min})/2+4]$°C,	Compulsory report only				ASTM D7175
Mass Change (% m/m)	≤ 1.0				ASTM D2872 / TG1 MB3
J_{nr} at T_{max} (kPa^{-1})	≤ 4.5	≤ 2.0	≤ 1.0	≤ 0.5	ASTM D7405
Ageing ratio $[G^*_{RTFO} / G^*_{Original}]$	≤ 3.0				ASTM D7175
	After RTFO plus PAV Ageing				ASTM D6521
G* and δ at $[(T_{max} + T_{min})/2+4]$°C,	Compulsory report only				ASTM D7175
Maximum creep stiffness tested at temperature [S (60s) ≤ 300 MPa]	T_{min} + 10°C				ASTM D6648
Minimum m-value tested at temperature [m (60s) ≥ 0.300]	T_{min} + 10°C				
ΔT_c (°C) = $T_{c,S} - T_{c,m}$	≥ -5				ASTM D7643
Ageing ratio $[G^*_{PAV} / G^*_{Original}]$	≤ 6.0				ASTM D7175

PG Binder-grades:

- PG58-22
- PG64-16
- PG70-10

Traffic classes:

- S = standard
- H = High
- V = Very high
- E = Extreme

Design traffic (million E80)	Traffic Speed (km/h)			Asphalt mix design level
	< 20	20 - 80	>80	
< 0.3	S	S	S	IA
0.3 - 3	H	S	S	IB
> 3 - 10	V	H	S	II
> 10 - 30	E	V	H	
> 30	E	E	V	III

Comparative results BT1 to SATS 3208 (CSIR)

Binder for PG64	70/100 Binder 1	70/100 Binder 2	70/100 Binder 3	50/70 Binder 1	50/70 Binder 2	50/70 Binder 3	35/50 Binder 1	35/50 Binder 2	35/50 Binder 3
Penetration (10^{-1}mm)	89	85	81	65	62	62	48	46	38
Softening Point (˚C)	45.4	47.8	45.8	50.0	48.4	49.0	52.0	51.2	52.6
DSR |G*|/sinδ @ 64 ˚C	0.6	0.8	0.9	1.3	1.3	1.2	2.3	2.0	4.4
After Rolling Thin Oven Test									
Mass Change (m/m%)	+ 0.1	+ 0.1	+ 0.1	+ 0.1	+ 0.1	0.0	+ 0.1	+ 0.1	0.0
J_{nr} (at σ = 3.2 kPa) at 64 ˚C	9.8	6.2	6.9	4.1	5.0	4.9	2.0	2.1	2.2
Binder Class	AE1 Binder 1	AE1 Binder 2	AE2 Binder 1	AE2 Binder2	AE2 Binder 3	AP1 Binder 1	AP1 Binder 2	AH1 Binder 1	AH2 Binder 1
Softening Point (˚C)	57.7	58.8	67.6	66.2	73.0	65.8	65.6	54.6	90.0
Elastic Recovery (%)	78	82	90	86	89	80	76	UTT	90
DSR |G*|/sinδ	2.5	1.6	4.8	3.3	2.7	3.9	4.7	3.1	4.4
Mass Change (m/m%)	0.0	0.0	- 0.1	0.0	+ 0.2	0.0	0.0	+ 0.1	+ 0.1
J_{nr} (at σ = 3.2 kPa) at 64 ˚C	1.2	2.3	0.8	0.9	0.9	0.2	0.3	1.7	1.7

Thanks