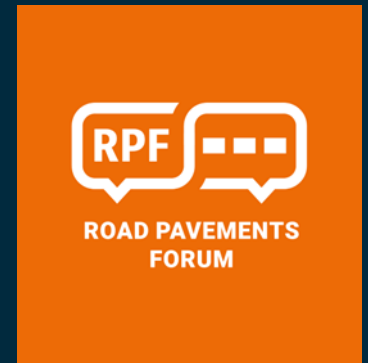


# 47<sup>th</sup> Road Pavements Forum

29<sup>th</sup> November 2024



**Road to PG Specification – SANS 4001-BT10**

**Steph Bredenhann, Phil Hendricks**

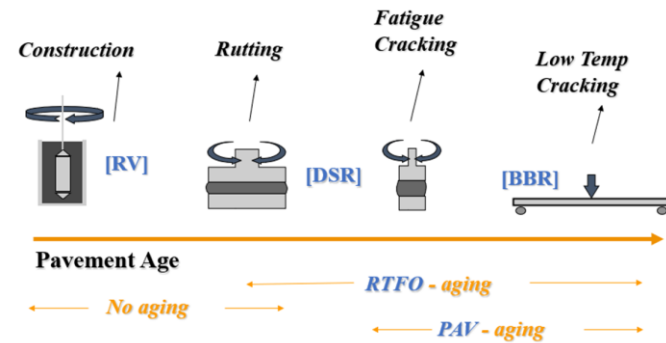
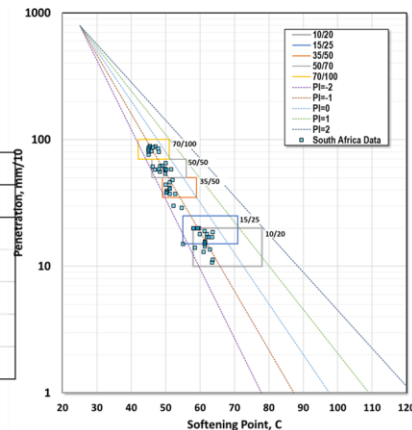


# CAPSA 2015, Franschhoek 2015



- Post CAPSA 2015
  - Franschhoek meeting to formulate a draft specification

SANS 4001:BT1			
Pen		SP	
10	20	58	78
15	25	55	71
35	50	49	59
50	70	46	56
70	100	42	51



Performance based tests with appropriate aging regimes

# Technical specification - SATS 3208

Test Property	Traffic class				Test Method
	S	H	V	E	
Max pavement design temperature (°C)	T <sub>max</sub>				
Minimum grading temperature (°C)	T <sub>min</sub>				
<b>Tests on Original Binder</b>					
G' and δ at ((T <sub>max</sub> + T <sub>min</sub> )/2+4)°C	Compulsory report only				ASTM D7175
G' and δ @ 10rad/s (kPa) @ T = T <sub>max</sub> Report G' and δ separately	Compulsory report				ASTM D7175
Viscosity at 165°C (Pa.s) ≥ 30 sec <sup>-1</sup>	≤ 0.9				ASTM D4402
Storage Stability at 180°C (% diff in G' at T <sub>max</sub> )	≤ 15				ASTM D7175
Flash Point (°C)	≥ 230				ASTM D92b
<b>Tests on Binder After RTFO Ageing (ASTM D2872 / TG1 MB3)</b>					
G' and δ at ((T <sub>max</sub> + T <sub>min</sub> )/2+4)°C	Compulsory report only				ASTM D7175
Mass Change (% m/m)	≤ 1.0				ASTM D2872 / TG1 MB3
J <sub>w</sub> at T <sub>max</sub> (kPa <sup>2</sup> )	≤ 4.5	≤ 2.0	≤ 1.0	≤ 0.5	ASTM D7405
Ageing ratio [G' <sub>RTFO</sub> / G' <sub>Original</sub> ]	≤ 3.0				ASTM D7175
<b>After RTFO &amp; PAV Ageing (ASTM D6521)</b>					
G' and δ at ((T <sub>max</sub> + T <sub>min</sub> )/2+4)°C	Compulsory report only				ASTM D7175
Maximum creep stiffness tested at temperature [S (60s) ≤ 300 MPa]	T <sub>max</sub> + 10°C				ASTM D6648
Minimum m-value tested at temperature [m (60s) ≥ 0.300]	T <sub>max</sub> + 10°C				
ΔT <sub>E</sub> (°C) = T <sub>E,S</sub> - T <sub>E,m</sub>	≥ -5				ASTM D7643
Ageing ratio [G' <sub>PAV</sub> / G' <sub>Original</sub> ]	≤ 6.0				ASTM D7175

- SATS 3208 technical specification coincided with CAPSA 2019.
- SATS 3208 - path towards complete acceptance of the PG specification and a path to a full SANS 4001 specification.
- SATS 3208 to be used in parallel with the SANS 4001 – road authorities were to specify accordingly.



# SABS SC008

- February 2023 SABS SABS/TC 0081/SC 04 "Roads and pavement materials testing" formed a Working Group to look at the conversion of SATS 3208 to SANS 4001- BT10.
  - Identify gaps in the standard
  - Deal with issues arising from the industry.

Phil Hendricks (Sabita) - Convenor

Gabriel Ngcobo (SABS) - Secretary support

Herman Marais (AECI Much) - National Member

Johan O'Connell (CSIR) - National Member

Georges Mturi - National Member

Pieter Myburgh - National Member

Kim Jenkins (University of Stellenbosch) - National Member

Steph Bredenhann (Naidu Consulting) - National Member

Herman Wolff (Western Cape Provincial Gov Department of Infrastructure) - National Member

Jacques Van Heerden National Member (Tekfalt Binders) – National Member

# Report from WG

- After numerous engagements with industry members, bodies and experts the WG report presented to SABS/TC 0081/SC 08 (CONSTRUCTION MATERIALS, PRODUCTS AND TEST METHODS - BITUMEN AND BITUMINOUS PRODUCTS - in October 2023 including a proposed SANS 4001 = BT10 specification.
- Comprehensive feedback from the SC08 members and positive involvement of the wider industry.
  - 8 categories of comments affecting the drafting of the standard

# Critical Factors for Consideration

- *Viscosity specification*
- *Economic feasibility?*
- *Availability of ALL work that informed SANS 4001-BT10*
- *Validity of work that informed SANS 4001-BT10*
- *Short Term Ageing: RTFO ageing*
- $\Delta T_c = T_{c,s} - T_{c,m}$
- *Temperature maps ( $T_{MAX}$  and  $T_{MIN}$ ) and Intermediate Temperature ( $T_{INT}$ ) Definition*
- *Useful Temperature Interval ( $UTI = T_{MAX}$  and  $T_{MIN}$ )*

# Meeting of Expert Group - 8,9 Oct 2024



Sabita in July requested Dr Geoff Rowe to conduct a peer review of the proposed binder specifications and to lead the proposed discussions.

# Critical Factors - Viscosity

## • *Viscosity specification:*

- Not aligned to Sabita manual TG1 - The Use of Modified Bituminous Binders in Road Construction.
  - ❖ 0,6 Pa.s in the Sabita T-G1 manual
  - ❖ TG1 is product specific, PG is binder blind
- The SANS 4001:BT10 requirement will be 0,9 Pa.s at  $> 30^{-1}$  sec @ 165°C based on research by CSIR to have Newtonian flow (constant viscosity independent of shear rate).
- 165°C chosen as a compromise, only “pumpability” is considered.



# Critical Factors - Economic feasibility

- Road construction is expensive and quality control in both design and construction is essential.

# Critical Factors – Storage stability

- Storage stability will remain in SANS 4001:BT10
- It is an important indicator
- It is not meant for rejection!
  - TG1 gives good guidelines on how to manage storage stability through good practice on manufacturing point, transport, etc

**Resolution:** The requirement for storage stability will be remain in the transition from SATS to the SANS specification item (less than or equal to 15%) with a note similar to that in the SABITA document TG1, with an emphasis on performance.

**Action:** The TG1 note regarding storage stability will be reviewed and amended, as necessary for inclusion into the proposed SANS specification.

# Critical Factors for Consideration – Short Term Ageing

- TG1:MB-3 (brass bottles) will not be included in SANS 4001:BT10
- Manual 39 will be adequately amended and properly referred to in SANS 4001-BT10 prior to the role out.

# Critical Factors - $\Delta T_c$

- $\Delta T_c$  – considered “problematic” for modified binders.
- Will not be included in SANS 4001:BT10
- Will be replaced with fatigue requirement:
  - $G^* \cdot \sin \delta < 5000 \text{ kPa}$
  - Relax to  $G^* \cdot \sin \delta < 6000 \text{ kPa}$  if  $\delta > 42^\circ$
- $\Delta T_c$  still good to use as a measure of ductility (individual choice)

Note: current available data will be evaluated to confirm.

# Critical Factors - Temperature

- Useful Temperature Interval (UTI) will remain as  $UTI = 80^{\circ}\text{C}$ .
- $T_{\text{MAX}}$  and  $T_{\text{MIN}}$  definition to remain as is in SATS 3208 ( $T_{\text{MIN}} = T_{\text{MAX}} - UTI$ ).
- Intermediate Temperature Definition, e.g.  $T_{\text{INT}} = 25^{\circ}\text{C}$  will be evaluated
  - Thus, not depended on  $T_{\text{MAX}}$  and  $T_{\text{MIN}}$

# Way Ahead

- Working Group will respond to the consolidated feedback received from the SABSTC08 and recommend reworked SANS 4001-BT10 - update from this Expert Group meeting and resolutions will be essential part of process.
- Sabita will consolidate the implementation items raised and forward those to the Chair of the Road Pavement Forum (RPF) – Steph Bredenhann - PG Implementation Working Group.
- Sabita will play a coordinating role for future engagements of the Expert Group which will meet at approximately six-monthly intervals. Points of discussion and leadership will be provided by Sabita representing industry, SABS SC08 and SANRAL.

**SANS 4001 – BT10 closer to fruition!!**