



ERA/AFCAP Workshop
Issues and Concerns Related to the Revised ERA
Specifications and Design Manuals

**SURFACE SEALS:
Issues and Concerns**

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Outline of Presentation

- International best practice document ?
- Aggregate strength parameters
- Double seals
 - Timing of second aggregate application
- Required surface temperatures
- Age Hardening

International Best Practice Manual

- **ARRB initiative**
 - Sprayed seal alliance
 - Purpose to share experience
 - Standardise where possible
- **Workshops**
 - 2008, 2010, 2012 + Oct 2014
 - CAPSA 2011 + 2015
- **Feasibility of 1 international best practice manual**
 - Ideal but not practical/ feasible
 - Different materials, climatic conditions, test methods, experiences, preferences
- **Recommendation**
 - Localise effort to sub-Saharan Africa

Aggregate strength parameters

- **TRH3 10% Fact too stringent for LVR ?**
 - YES
- **SABITA Manual 10 study**
 - P Paige-Green
 - 10% Fact 120 – 140 kN (Zimbabwe, Kenya)
 - 150 kN Australia
 - 120 kN in US for lightly trafficked roads
 - Botswana :Woodbridge, Slater recommended 130 – 180 kN for different traffic volumes
- **SANRAL Maximising sealwork project recommendations**

Current Recommendations

Table 1 : Guidelines for basic stone seal aggregate properties

Property	Traffic (AADT)			
	< 200 vpd	200 – 500 vpd	500 - 1000	More than 1000
Relevant Grade	3		2	1
Dry 10 % FACT [kJ] (min)	150	180	200	210
Wet 10 % FACT [kJ] (min)	75	90	150	157
Aggregate Crushing Value (ACV) [%] (max)*	30	25	23	21

Not ratio wet/dry

Note:

* ACV not allowed as alternative to 10% FACT on pedogenic materials. As an example, if calcrete is dried in the oven, as prescribed, a significant drop in ACV could be expected

Impact of lower crushing strength

- **Roller type and mass**
- **Softer/more dusty aggregate**
 - Emulsions & Cut-back binders
 - Precoating with hot binders

Double seals

➤ How long before application of 2nd layer ?

- Existing COLTO specification

The second application of binder shall preferably take place within 48 hours of the application of the tack coat when bitumen is used for the tack coat and not less than ten days of the application of the tack coat when cut-back bitumen is used in tack coat (ie new work).

- ORN and other manuals (3-4 weeks)

➤ Dependent on

- Seal type
- Binder type
- Design traffic (Aggregate matrix)

Double seals

➤ Hot binders without cutters

- Second layer could be done immediately
- NB Effect of different precoating types



Double seals

➤ Emulsions

- Essential to wait for proper curing
- NB for polymer modified emulsion (false breaking)
- Seal type (Entrap volatiles)



Double seals

➤ Cut-back binders

- General rule – not in tack coat
- Else – wait for volatiles to evaporate (How long ?)

➤ Recent trials

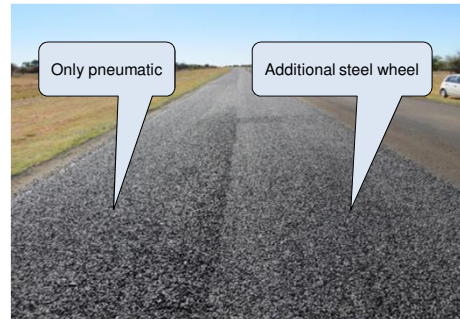
- 0 – 4% paraffin in open structure double seals
- No problems experienced



Trafficking of first layer

➤ Orientation of first layer

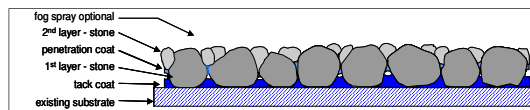
- Less binder required for second layer
- Could also be done with additional steel wheel rolling



Trafficking of first layer

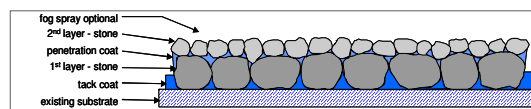
➤ Low volume roads

- OK – enough binder to hold the first aggregate layer
- Voids filled with binder
- Binder distribution 60/40



➤ High volume roads

- Minimum binder to hold 1st layer for construction
- Not enough to handle traffic
- Binder distribution 50/50



Required Road Surface Temperature

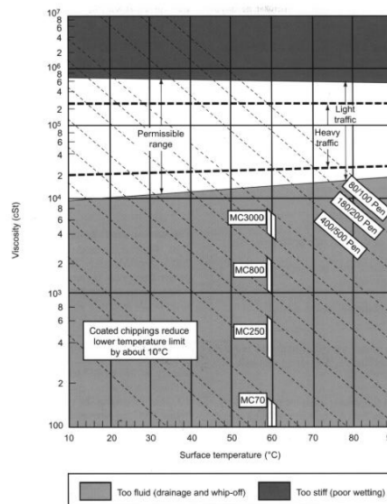
➤ South African specifications

- Emulsions & MC 3000 = 10°C
- 70/100 Pen or Hot modified = 25°C



Kobus Louw - Colas

Required Road Surface Temperature



Required Road Surface Temperature

➤ Experience with cutters in Hot modified binders

- 1°C lower for each 1% LFS (Paraffin)



70/100 pen bitumen (unfluxed)



70/100 pen bitumen + 3% paraffin



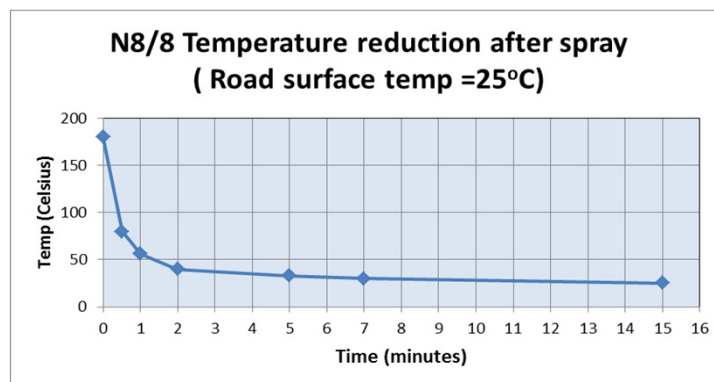
70/100 pen bitumen + 5% paraffin

Kobus Louw - Colas

Required Road Surface Temperature

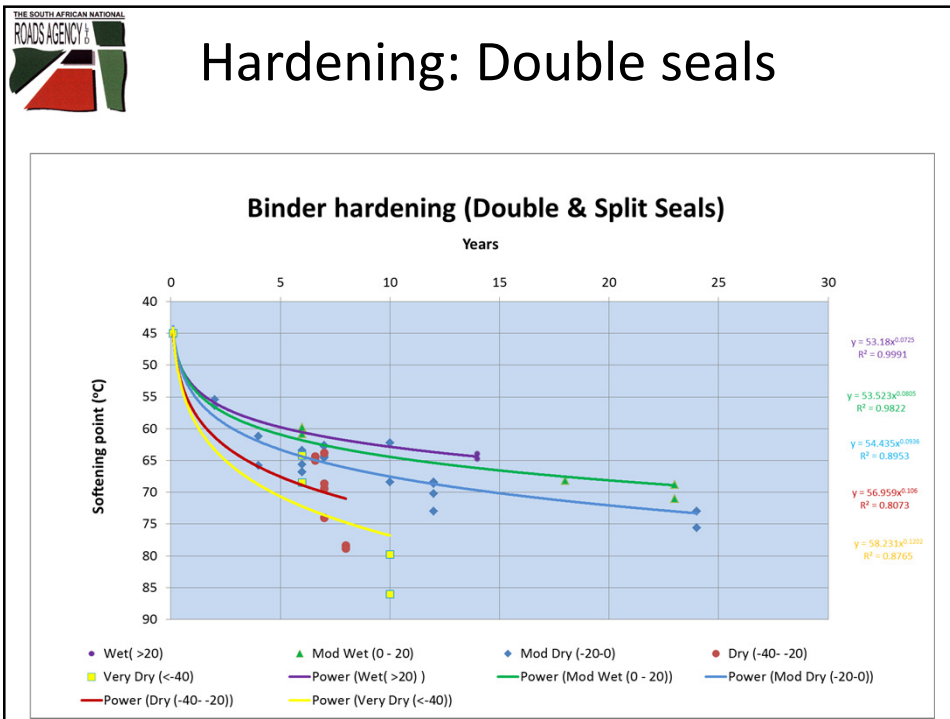
➤ Temperature reduction after spray

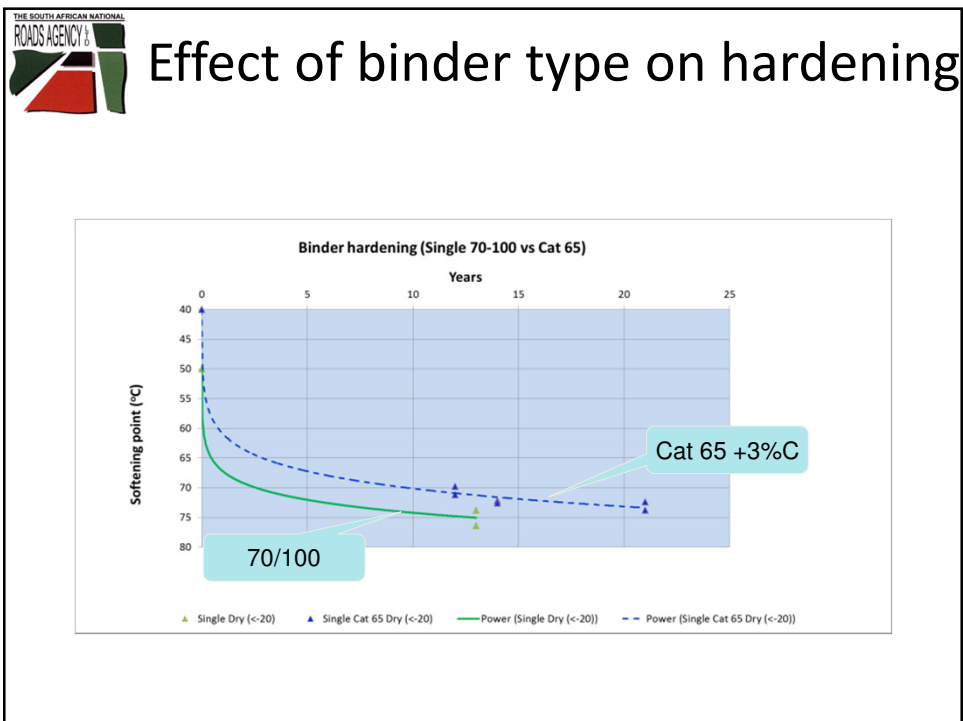
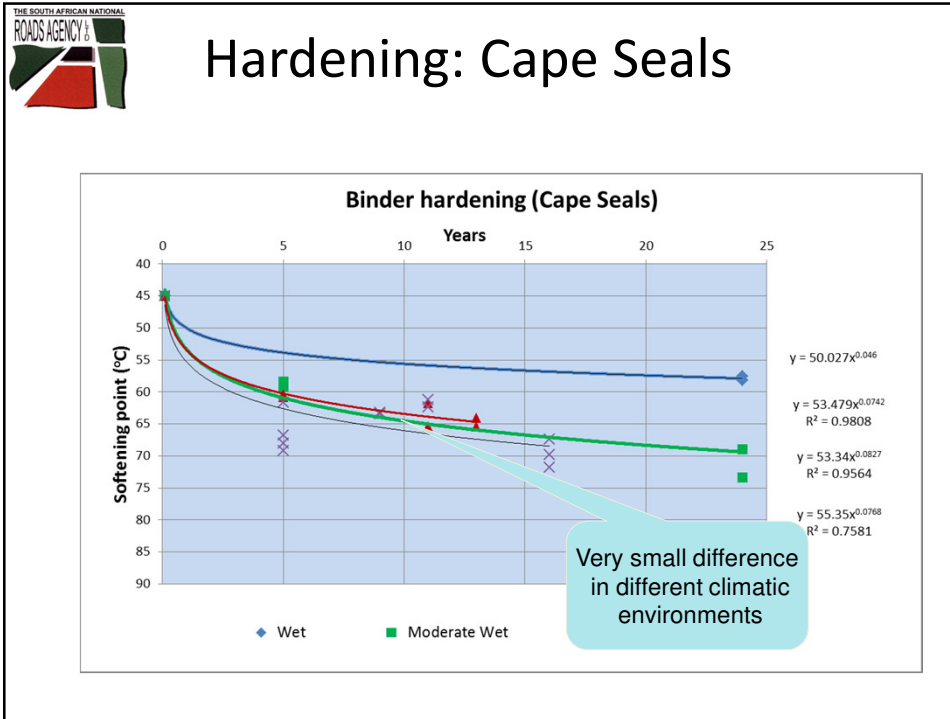
- Reason for short following distances (Chip spreader/ Rollers)

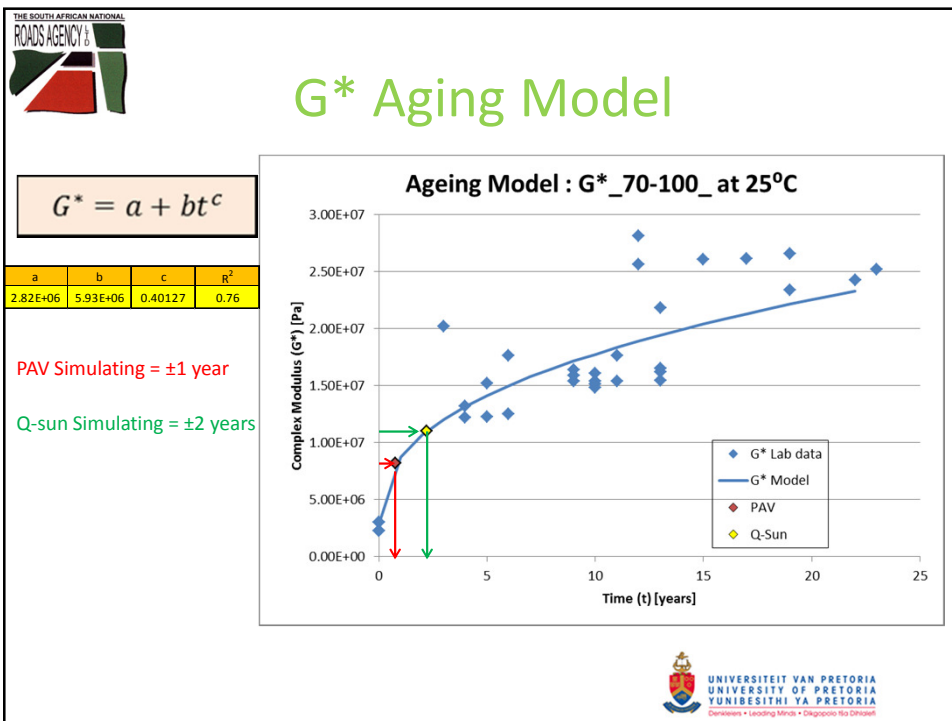
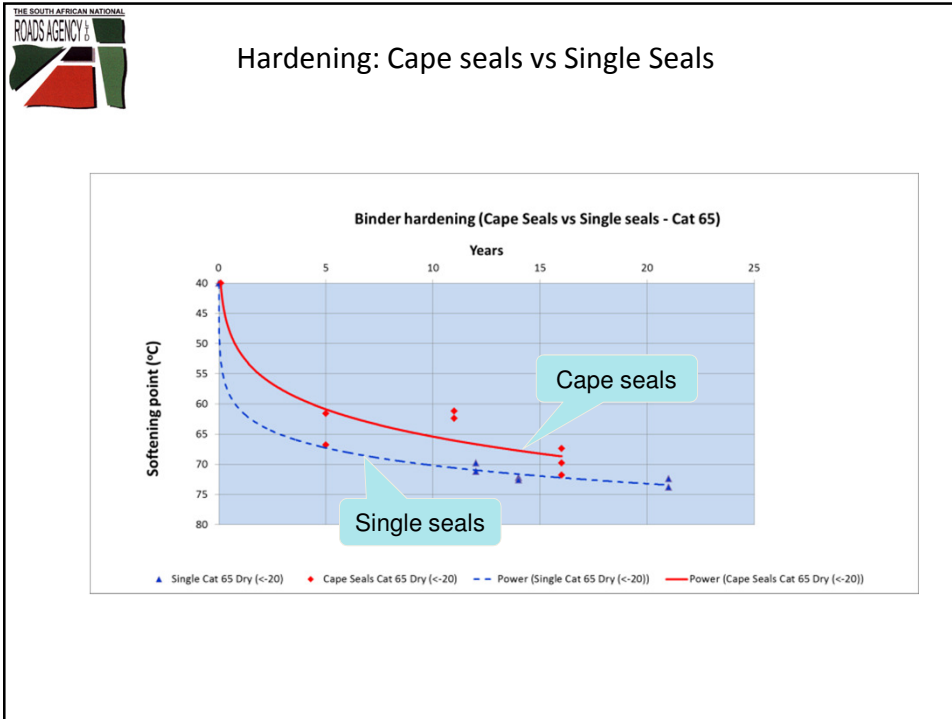


Age hardening

- **Studies on seals**
 - ARRB - J Oliver
 - SANRAL - Van Zyl & Mukandila
- **SANRAL**
 - 70 Samples
 - F(Seal type/ binder thickness, type, durability/ Climate)







END