Development of a PG Specification for Bituminous Binders

Road Pavements Forum

5 – 6 November 2013

Further research required

Compliance criteria for the following damage resistance characteristics (DRC):

- Viscous deformation (at elevated temp.)
- Resistance to fatigue (intermediate temp.)
- Thermal fracture (at low temp.)

These cover the ***binder's contribution*** to distress

Current research projects

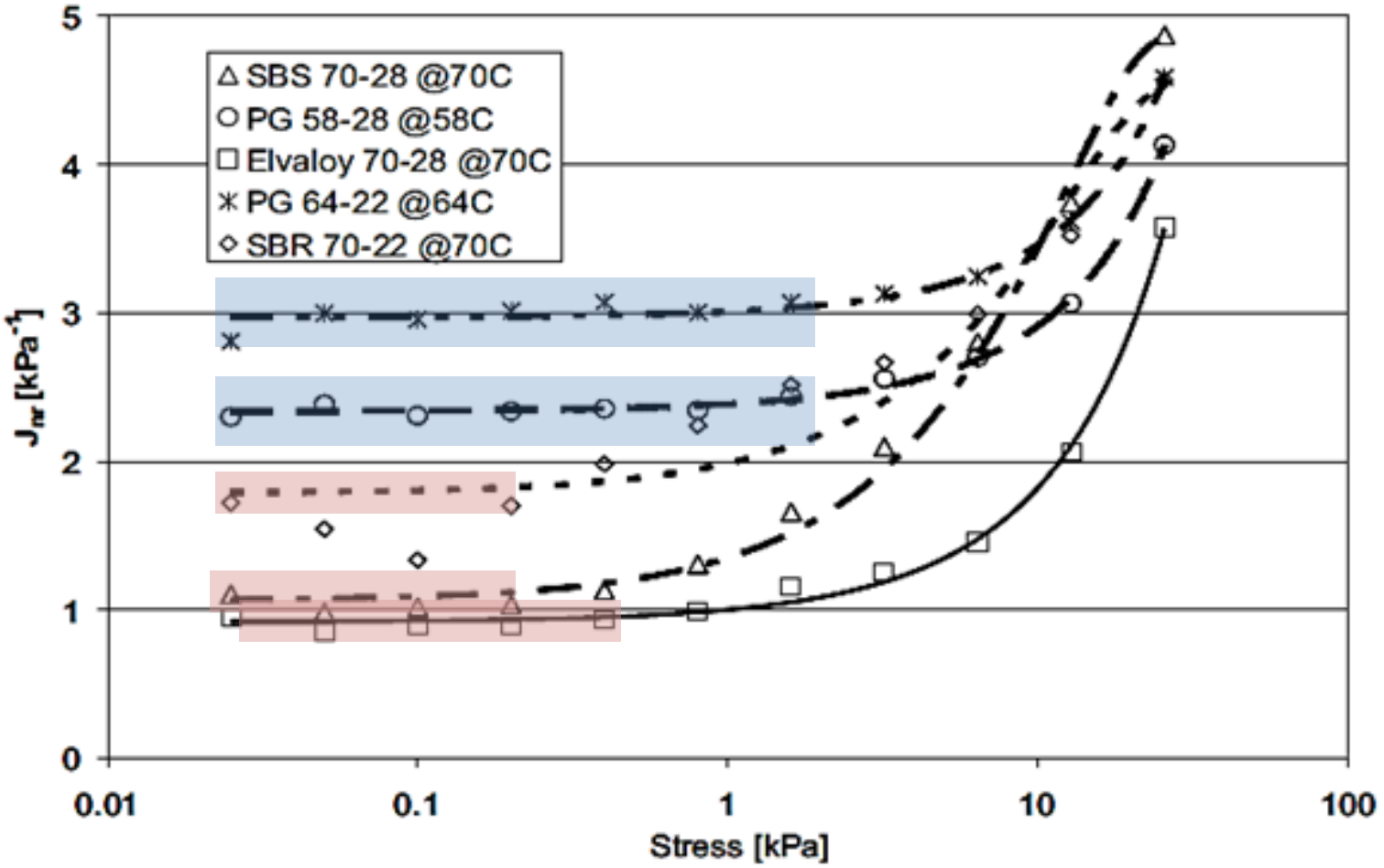
In August this year, Sabita approved 3 projects to be carried out by the CSIR BE:

- Appropriate stress levels for the MSCR test to characterise resistance of the binder to ***viscous deformation***
- Examination of the BYET as an monotonic alternative to cyclic tests to measure the binder's resistance to ***fatigue***
- A DSR based procedure to determine stiffness and stress relaxation properties of the binder to counter ***thermal cracking***.

Stress levels in MSCR test

- In November 2012 Bahia questioned whether 3,2 KPa (adopted in USA) was appropriate for SA pavements
- Stress dependency of PMB more complex than neat binder
- Ranking at an inappropriate stress level – poor prediction of performance

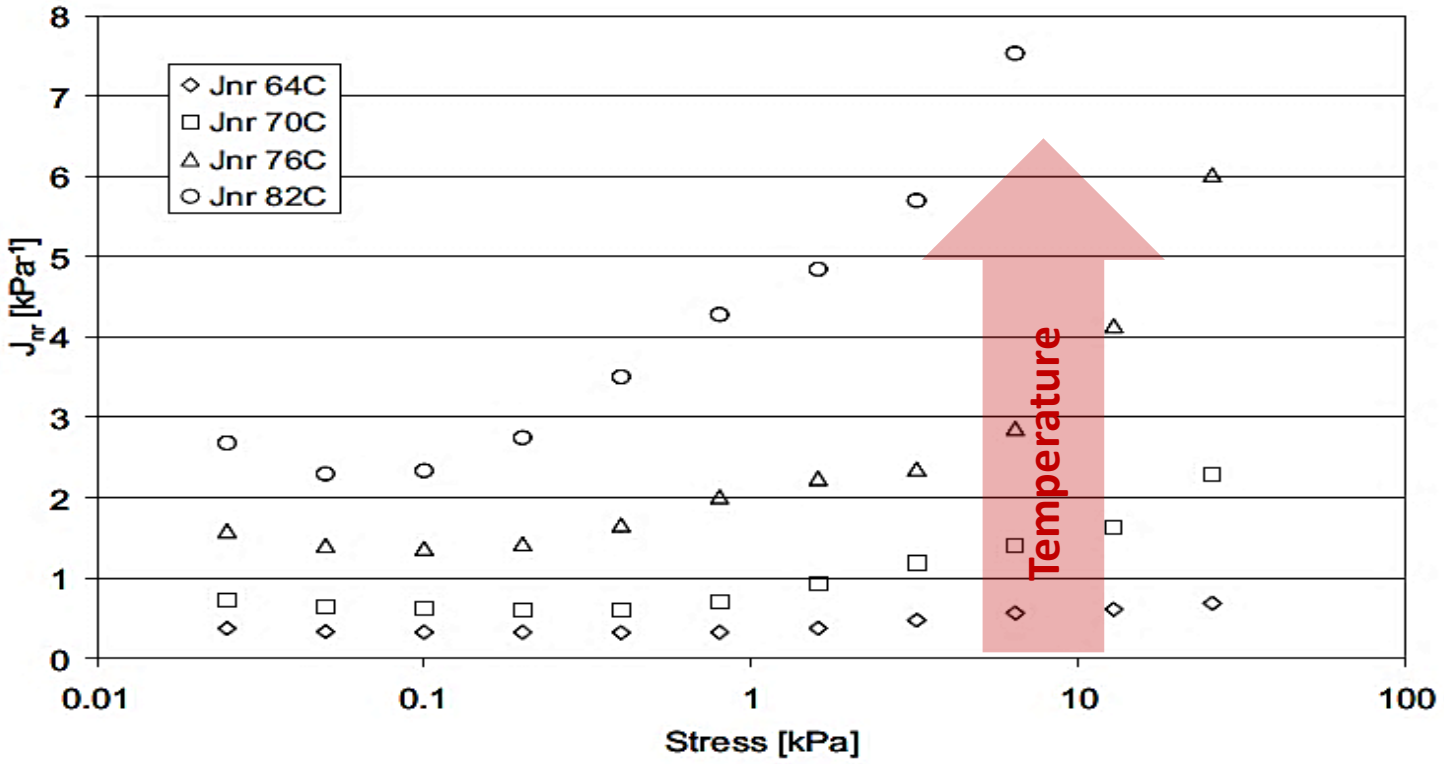
Relationship of J_{NR} and Stress



J_{NR} and rutting

- Comprehensive study by Reinke:
  - Stress dependency of 20 binders
  - Hamburg wheel test
  - Suggests 15 KPa rather than 3,2 KPa
  - Revision of compliance limits
- Question: how well does high full-layer temperature in the HWT represent field conditions
- More work required

Stress dependency and temperature



Stress dependency of SA binders at both 58°C & 64°C needs to be considered

Fatigue

- Mixes with similar grading and film thickness
  - 6 different binders – neat and modified
  - four point beam fatigue tests
- The 6 binders will then be subjected to the following tests & correlated to FPBT.
  - Monotonic: Binder Yield Energy Test (BYET);
  - Cyclic: Linear Amplitude Sweep (LAS); and
  - Number of cycles to a 20% reduction in dissipated energy – NP_{20} .

RILEM binder fatigue test

- Developed for a specific DSR model
- Measures the number of cycles to a retained G* - 20% of the initial value
- Concerns:
  - the low strain levels (0,004 – 0,025)
  - duration of the test, being 1,5 days per test at one of three recommended strain levels

Low temperature fracture

- September - Sabita project Georges Mturi visited UW-M
- DSR based procedure was investigated
- DSR equipment can cope with binder temps > $5^{o}C$
- Estimate *S* and *m* from DSR testing without resorting to BBR (standard rheological methods)
- Alternatively - HB proposed a creep test to determine *S* and *m* direct
- Project will study 20 binders (12 modified)
  - BBR
  - DSR testing at 5 or 10 ^{0}C

Work in progress

- Lab work for appropriate stress level
- BYE correlations
- Examinations of procedures for low temperature fracture
- Completion early 2014