



STUDY TOUR 2012

5th EURASPHALT & EUROBITUME CONGRESS

ISTANBUL

Binder Specifications and developments

High performance asphalt and
binders Part 2



2012 Study Tour Key Topics

1. Long life pavements

- Experience, design systems, use, durability & performance

2. High performance asphalt & binders

- High modulus asphalt (EME, HiMA), modifiers

3. Sustainability

- RAP/WMA, bitumen substitutes, carbon calculators & energy analysis
climate change impacts, societal concerns

4. Health & Safety

- Construction of road works, health considerations for bitumen
and asphalt products

5. Procurement Systems

- Proprietary products (Avis Technique, HAPAS, etc.), “green” procurement,
REACH, responsible sourcing, PPP and contract models



What did we want to learn?

What is the current status of binder specifications in Europe?

What strategic direction is being adopted for binder specifications?

What test protocols are under consideration for binder testing?

What are the learnings and actions for Australia?

Brief History



Circa 1995 member states of the European Union agreed that harmonisation of specifications was required to facilitate cross border trade.

The first task was to set up a CEN committee charged with producing a pan-European bitumen specification.

This group, TC336 worked on collating the existing country specifications and amalgamating them into Europe-wide specifications

Task Groups

TG1 High service temps
TG2 Low service temps
TG3 Ageing- conditioning

Data Collection

new tests
data on binders

CEN TC336
Bituminous
binders

Paving
grade
bitumen

EN 12591

Special
paving grade
bitumen

Hard paving
grade
EN 13924 -1
Multigrade
EN 13924 -2

Polymer
modified
bituminous
binders

EN 14023

Cationic
bituminous
mulsions

EN 13808

Cut-back &
fluxed
bituminous
binders

EN 15322

Oxidized
bitumens
*(industrial
applications)*

EN 13304

Hard grade
industrial
bitumens
*(industrial
applications)*

EN 13305

First generation – paving grade bitumen

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12591

November 1999

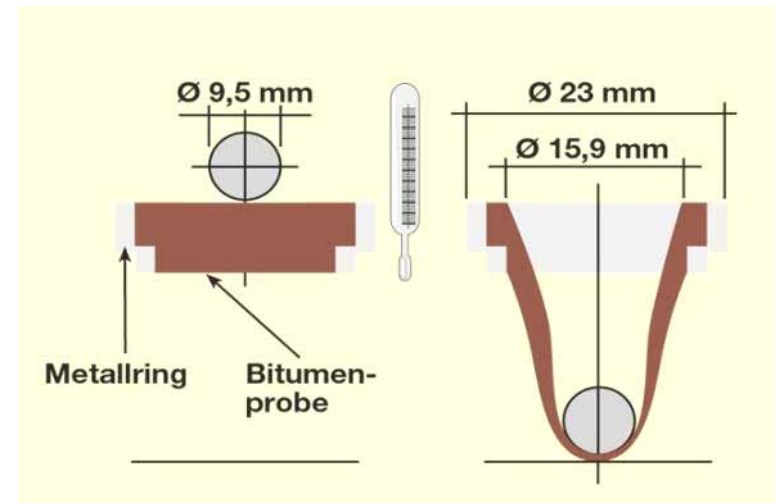
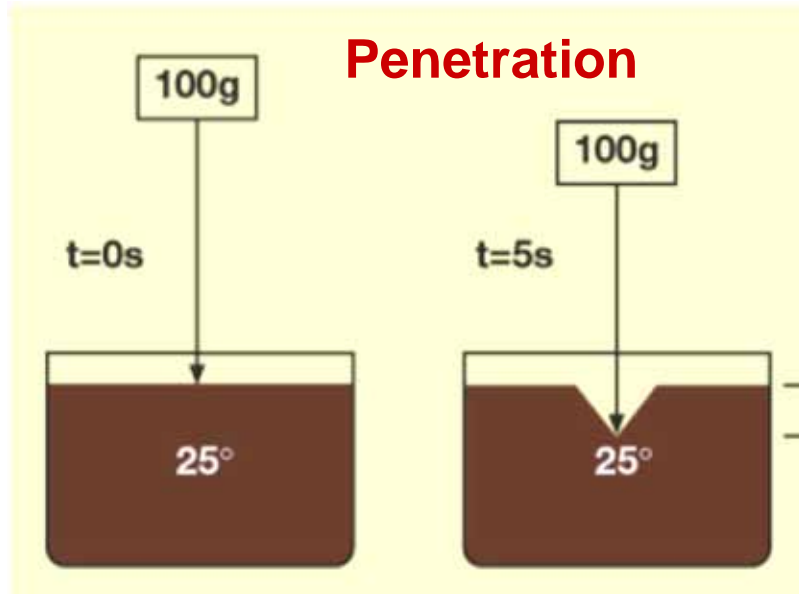
ICS 91.100.50; 93.080.20

English version

Bitumen and bituminous binders - Specifications for paving grade bitumens

EN 12591 (1999)

based on conventional
test methods



First generation - PMB specification

EN 14023 (2005)

Penetration

Softening point

Cohesion (optional methods permitted)

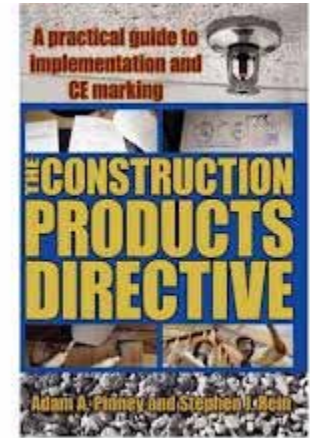
RTFOT

Flash point



Optional tests: Fraass, Elastic recovery, storage stability,

Progress towards Performance Related Specifications (PRS)



The European Construction Products Directive (CPD) requires that harmonised standards should be expressed as far possible in terms which are “performance based”

- Step 1 Identify binder properties linked to asphalt pavement performance
- Step 2 Select and standardise appropriate test methods to measure these properties
- Step 3 Collect data and ensure ~~field validation~~
- Step 4 Review the grading system according to the new specifications

ü

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Progress towards Performance Related Specifications (PRS)

Interestingly, binder adhesion is not yet a candidate property for inclusion in a PRS.

CEN's current position following an extensive amount of work is that an easy to use test to characterise bitumen adhesion doesn't exist nor is it likely that one will emerge in the near future.



Bitumen industry position report (2012)

Position Paper: Performance Related Specifications for Bituminous Binders



 eurobitume

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Future binder specifications



Eurobitume supports further studies and validation of new test methods in a move towards a limited or stepwise introduction of PRS.

It is considered that there is a need to differentiate between binders used in standard asphalt materials and those used in more intense traffic and special applications such as porous asphalt or EME.

Existing specifications do not adequately describe characteristics of PMBs

Future Binder Specifications

Simple and Complex Binders will have separate specifications

Simple binders (standard pen grades) can be satisfactorily specified by EN 12591

Complex binders are PMBs, hard grades and multigrades (Hard grades could be considered 'simple' but as they are used in special applications like EME they require a more precise description of the performance properties.)

A grading system for complex binders needs to be based on a correlation of binder properties and asphalt properties

Future Binder Specifications - Complex Binders

Task Group 1 (TG1) is working on finding a PMB property related to asphalt mechanical resistance and stability (rutting)

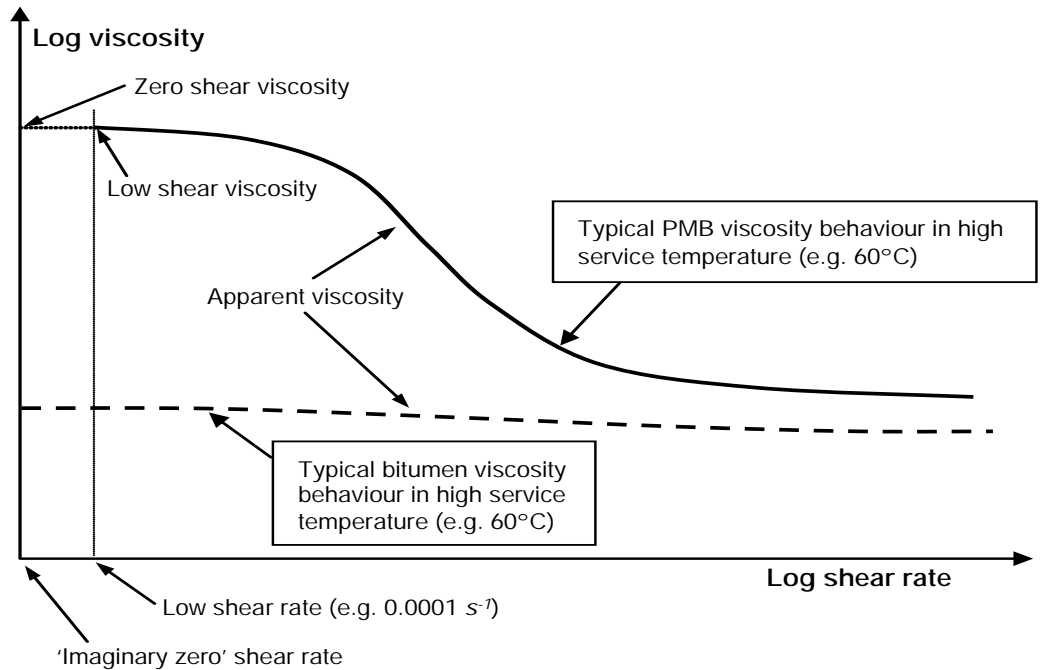
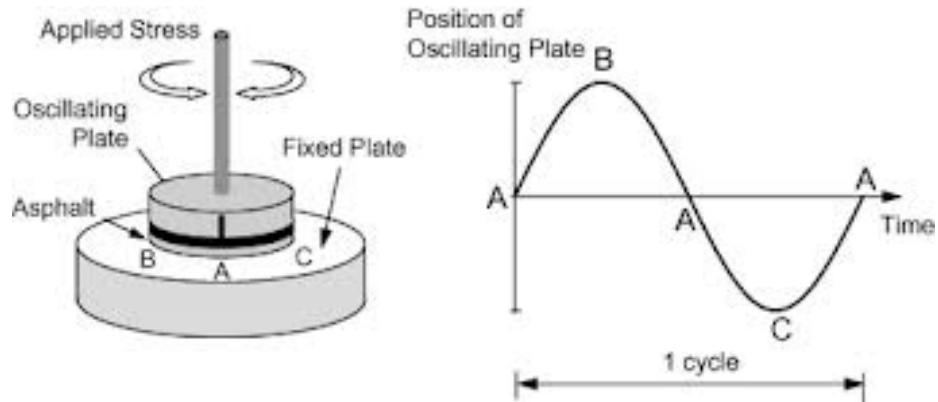
Zero Shear Viscosity (**ZSV**) using DSR

Easier to obtain Low Shear Viscosity (**LSV**)

SHRP used (DSR) parameter: **$G^*/\sin d$** - but poor correlation with field experience

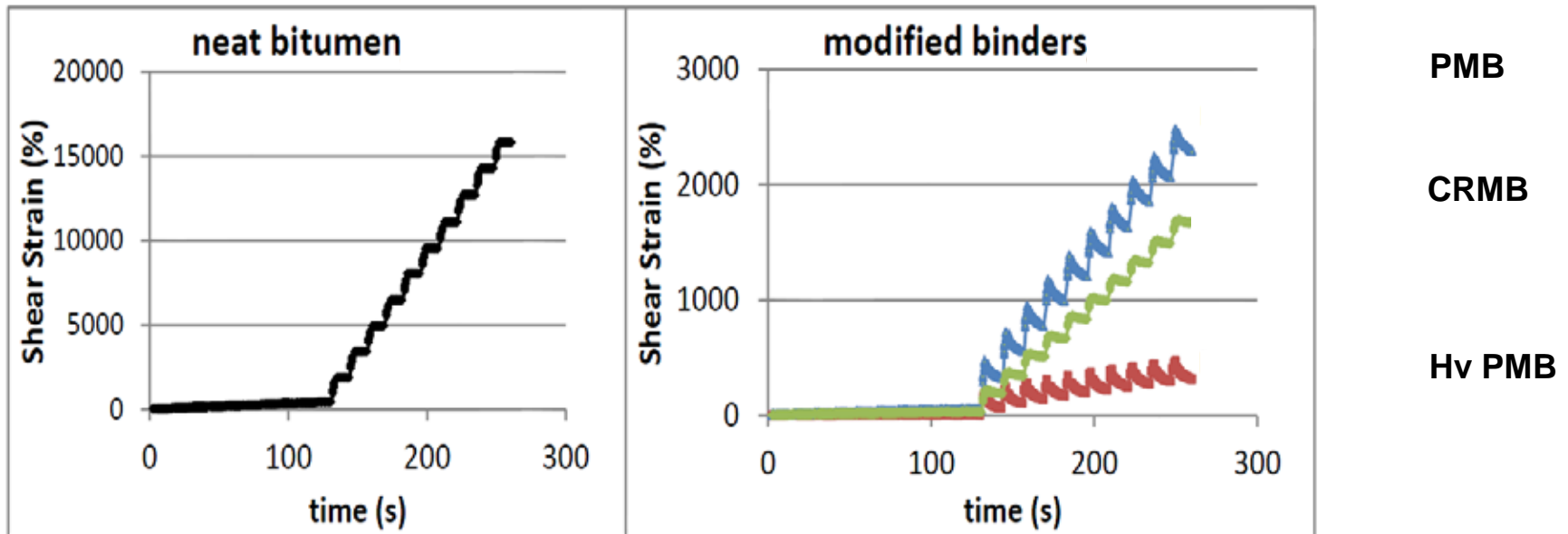
the Multiple Stress Creep Recovery (**MSCR**) test is under review: measures the non recoverable creep compliance (**J_{nr}**)

Dynamic Shear Rheometry



MSCR test

- load applied for 1 s, recover for 9 s
- further 10 creep/recovery cycles
- repeated for 4 stress levels (30, 100, 300, 1,000 Pa)
- J_{nr} (non-recoverable creep compliance) is the amount of residual strain left in the specimen after repeated creep and recovery



E&E Conference : Durability and Performance: Binders



23 papers

Rheological testing

Rheological characterisation

Ageing of bitumen

Permanent deformation

Fatigue and fracture

All work demonstrated the importance of stringent operating conditions for modified binders before they can be considered suitable for use as DSR binder performance indicators

A key conclusion from the papers dealing with permanent deformation was the successful use of the MSCRT and the correlation of J_{nr} with asphalt deformation for both conventional binders and PMBs

Summary

European has been working on EU Standards since 1995
(not dissimilar to Australia)

Binders are to be categorised according to rheological complexity for specification purposes:

- conventional binders : pen and softening point
- PMBs : sophisticated rheological tests

(Australia has a similar approach c.f. AS2008 with AGPT/T190)



Summary

TG1 “High Temperature Properties” working on a European Standard for MSCRT. Final draft in Q2 2013

TG2 “Low Temperature Properties” further validation against road performance for candidate tests Fraass, BBR and Fracture Toughness

TG3 “Binder Ageing and Conditioning” recommends RTFOT for short term ageing and PAV for long term ageing

TG5 “Specification Framework” PRS will be introduced into next version of EN 14023

Summary

Overall a similar approach to Australia

Proposed utilisation of internationally supported test equipment (DSR)

MSCRT proposed for high temperature characterisation

Low temperature characterisation unclear

It is important for Australia to continue to observe

European developments and exchange information and experiences

Thank you for your attention

Merci pour votre attention

Vielen danke für ihre zeit

Gracias por su atencion

Bedankt voor jullie aandacht

İlginiz için teşekkür ederim