



ortb

Recent Research and Development in Pavement Technology

Dr Didier Bodin

Future of roads infrastructure



<https://highways.today/2019/06/27/eurovia-power-road/>

Acknowledgment



The **arrb** team



and more

Our Tools...

Pavement Condition Monitoring & Forensic Investigation



Accelerated loading: Full scale pavement testing

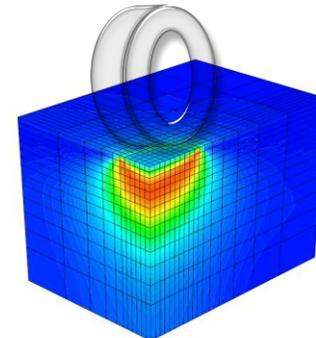


<https://www.youtube.com/watch?v=Uixbn69WZLU>

Laboratory Material Testing: Pavement Materials & Constituents



Numerical Analysis and Structural Design



TAU
> 3.47E+03
< 2.02E+05
2.00E+05
1.91E+05
1.81E+05
1.72E+05
1.62E+05
1.53E+05
1.43E+05
1.34E+05
1.25E+05
1.15E+05
1.06E+05
9.63E+04
8.68E+04
7.74E+04
6.80E+04
5.85E+04
4.91E+04
3.96E+04
3.02E+04
2.08E+04
1.13E+04

Recent implementation and research

- Thickness design of new and rehabilitated pavement
- Material testing and performance based characterisation
 - Unbound granular base and subbase
 - Stabilised base
- New results for bituminous binders
- Towards thickness design method for Foamed Bitumen stabilised base



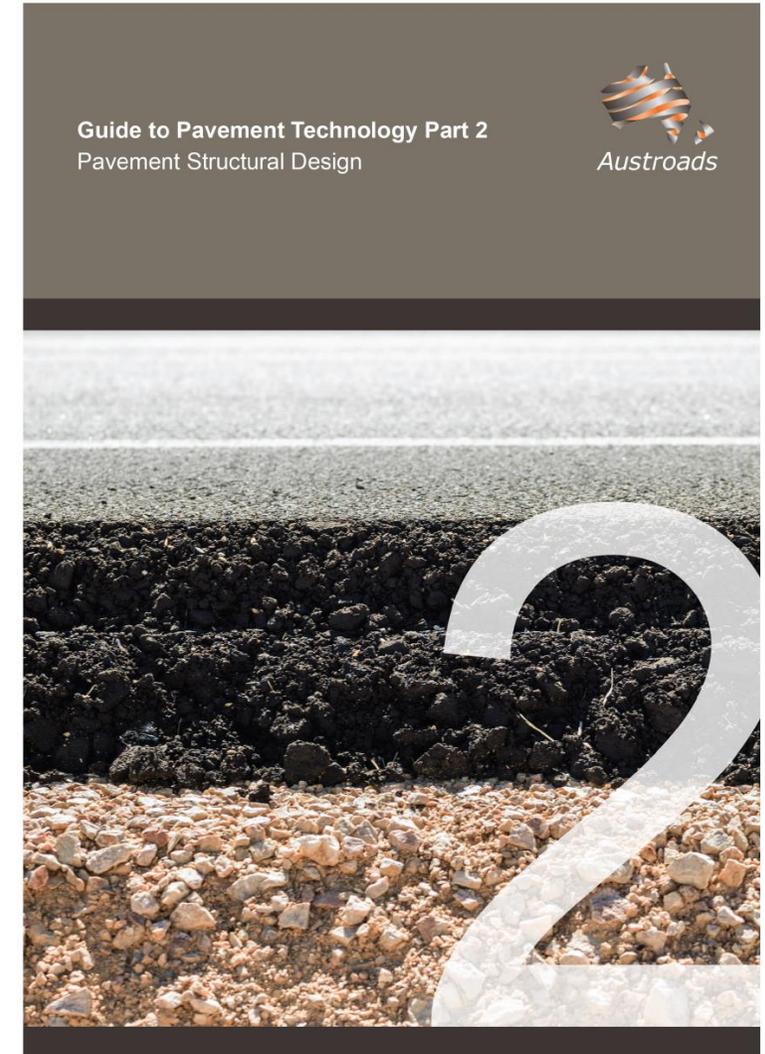
Improving Design Methods

Austrroads Guide to Pavement Technology Part 2

Pavement Structural Design

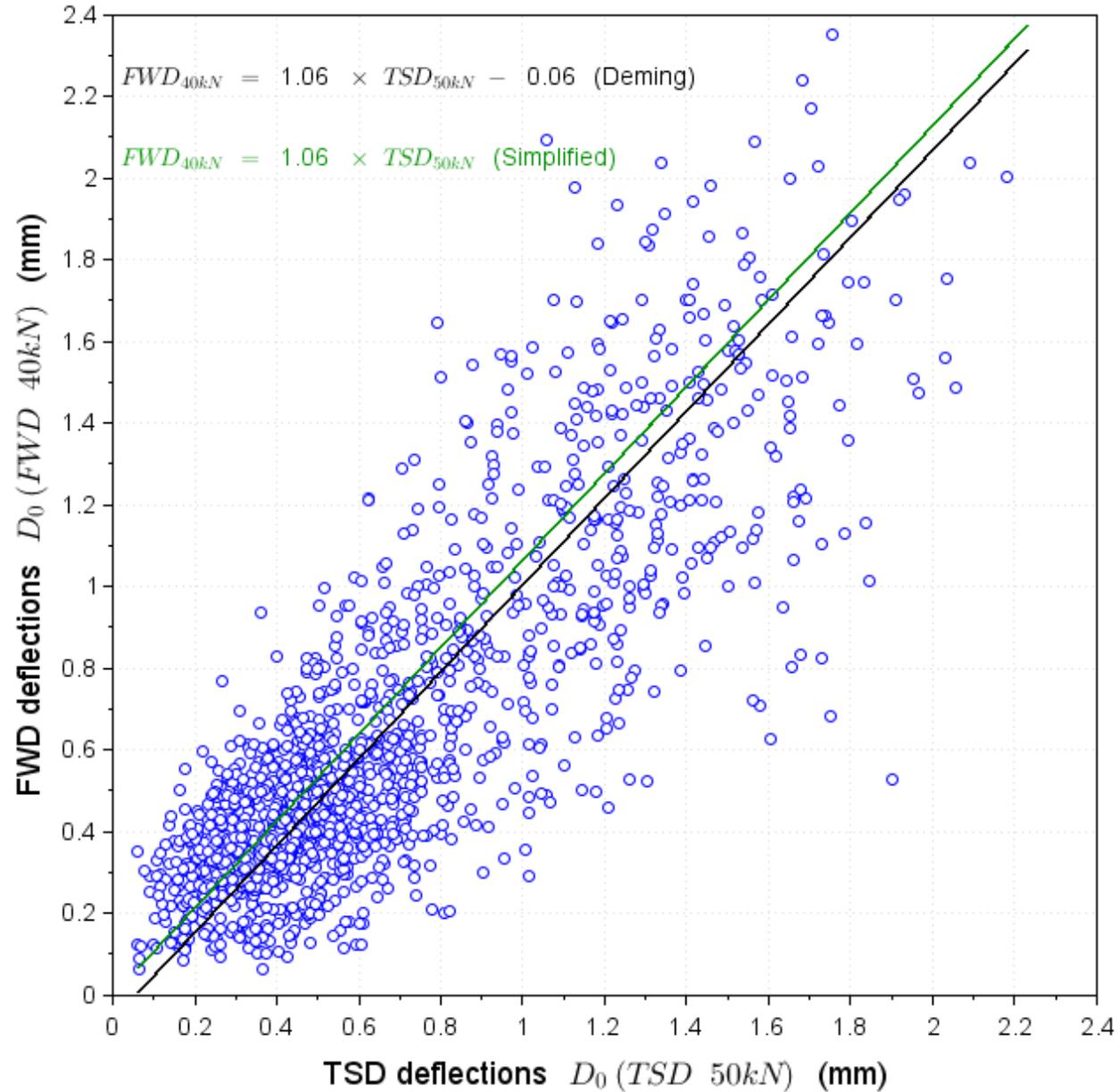
2017 update to the design of heavy-duty flexible pavements, including the new:

- axle-strain approach central to the mechanistic-empirical design method
- definitions of design traffic
- characterisation of cemented material and asphalt.
- The potential structural contribution of lime-stabilised subgrades for flexible pavements



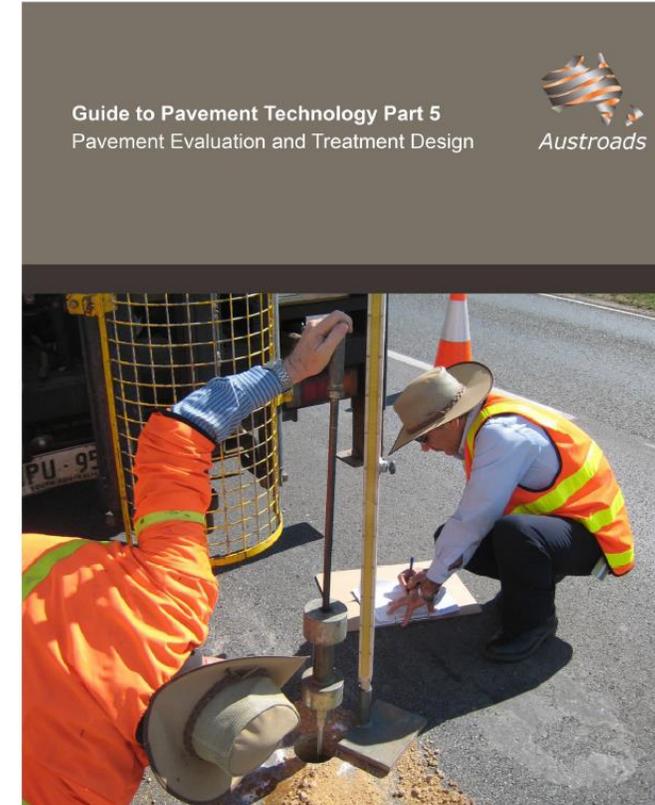
Leveraging Benefits of New Technology

iPave



Granular Overlay Empirical Design

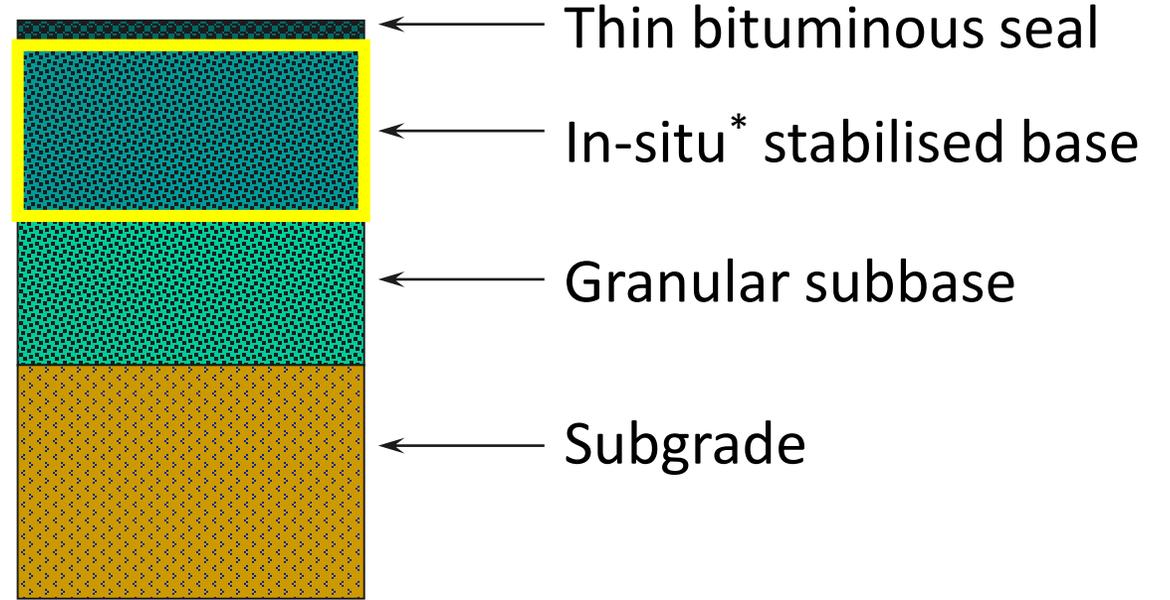
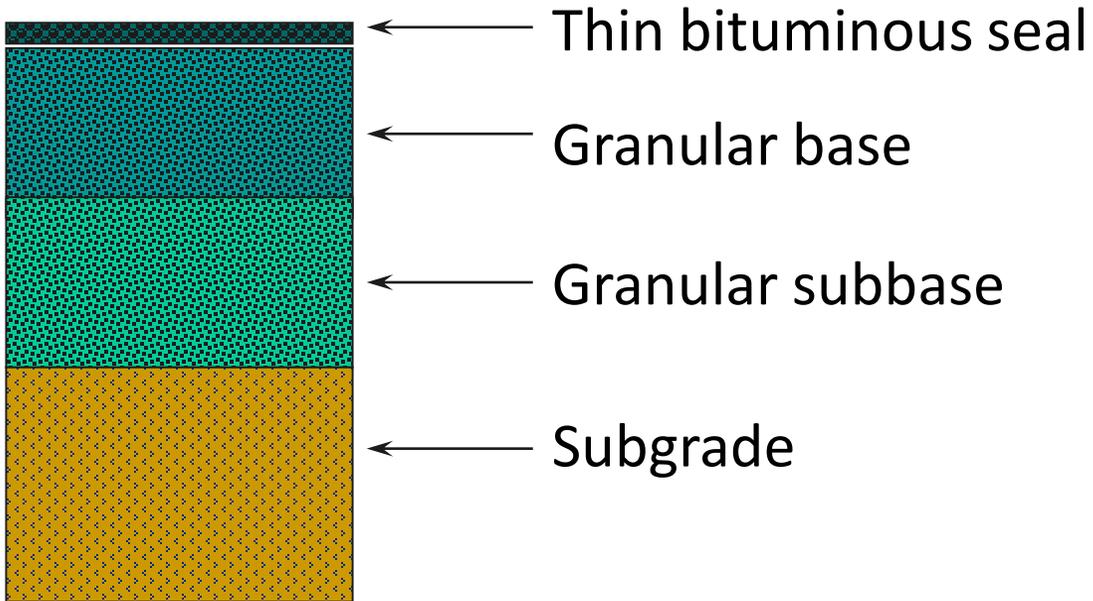
iPave



Deflection measurement device	Deflection standardisation factor
Deflectograph, 80 kN single axle with dual tyres	1.2
TSD, 50 kN dual tyres	1.2
Falling Weight Deflectometer, 40 kN load	1.1

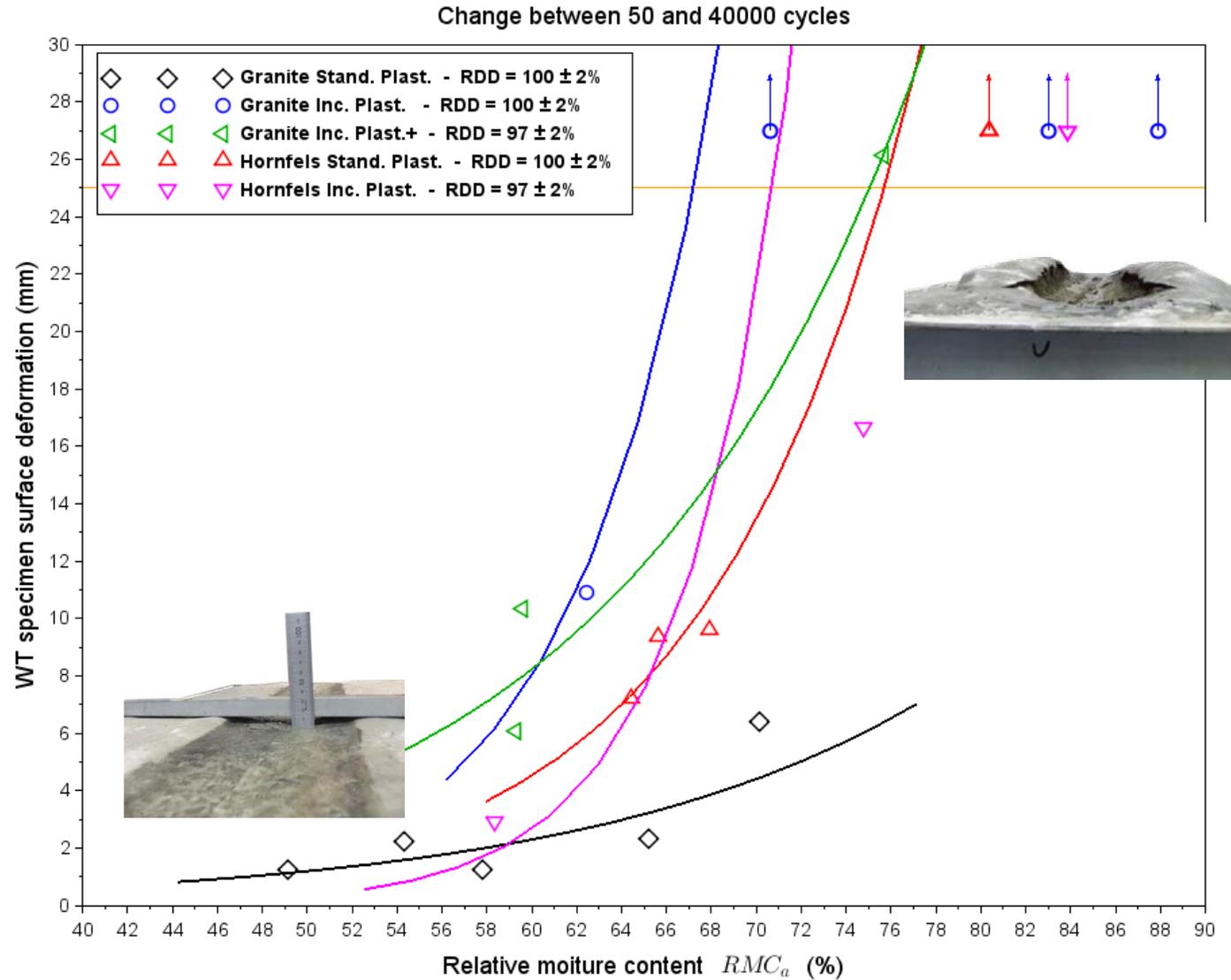
Fit-for-purpose and resilience

Unbound or stabilised granular base



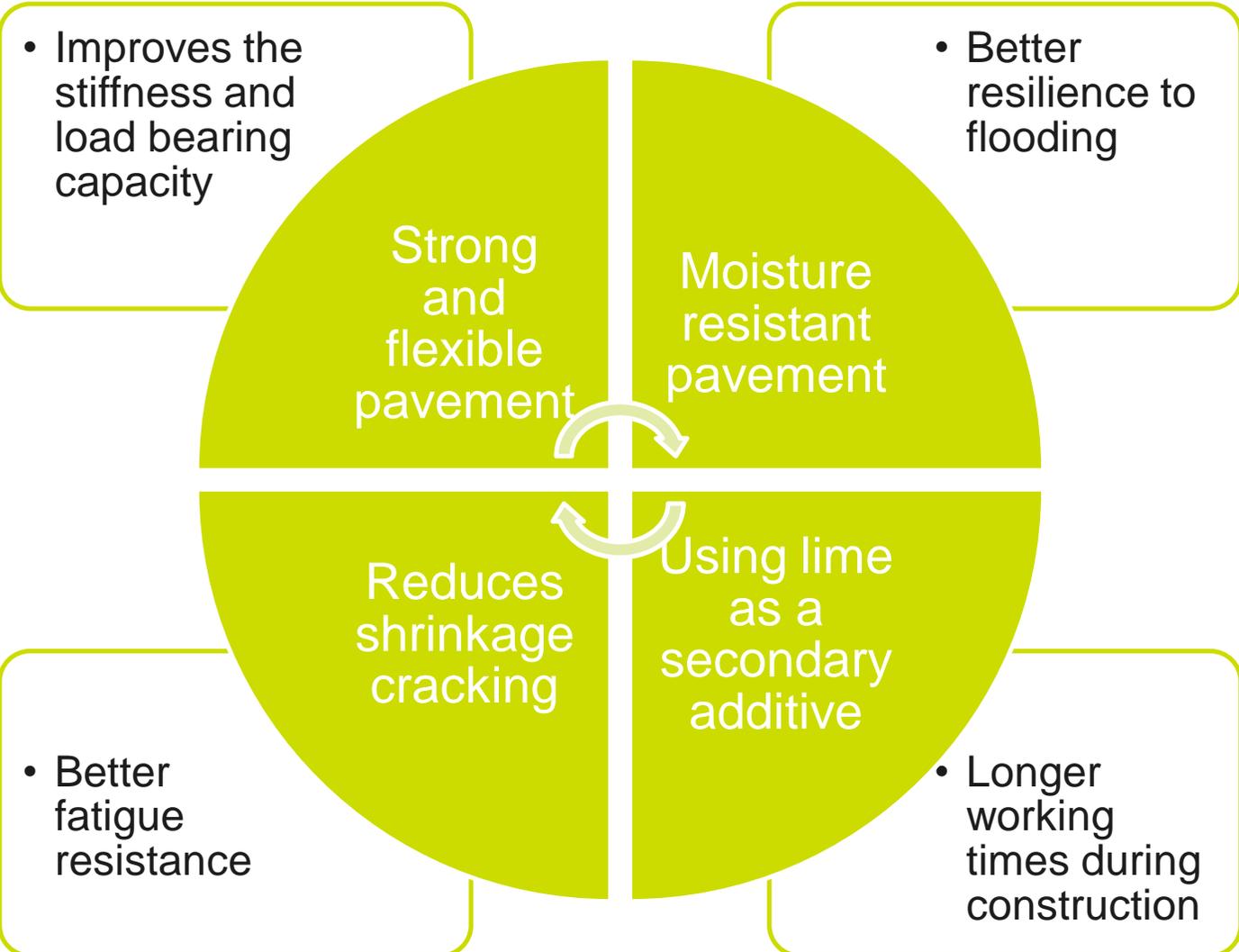
* or plant mixed

Moisture sensitivity of granular materials



In-situ Stabilisation

Foamed Bitumen Stabilisation



Source: QTMR

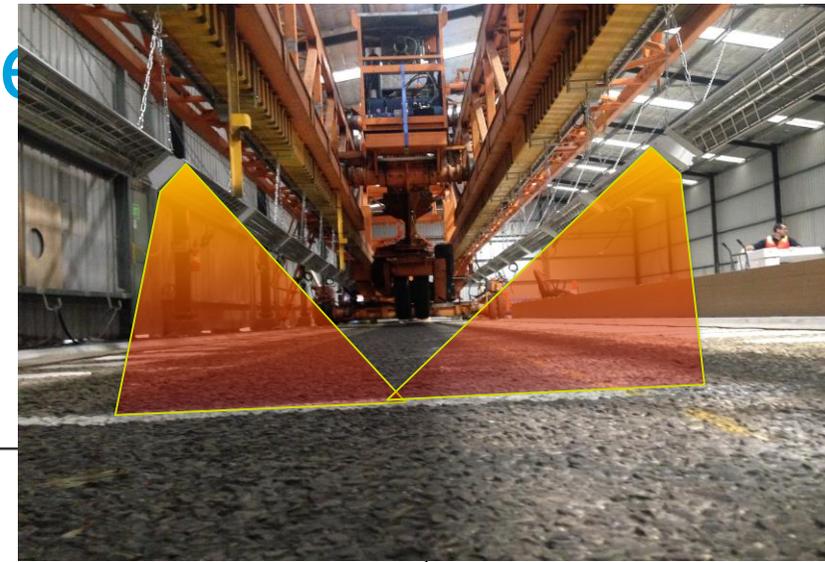
Can we recycle asphalt patches?



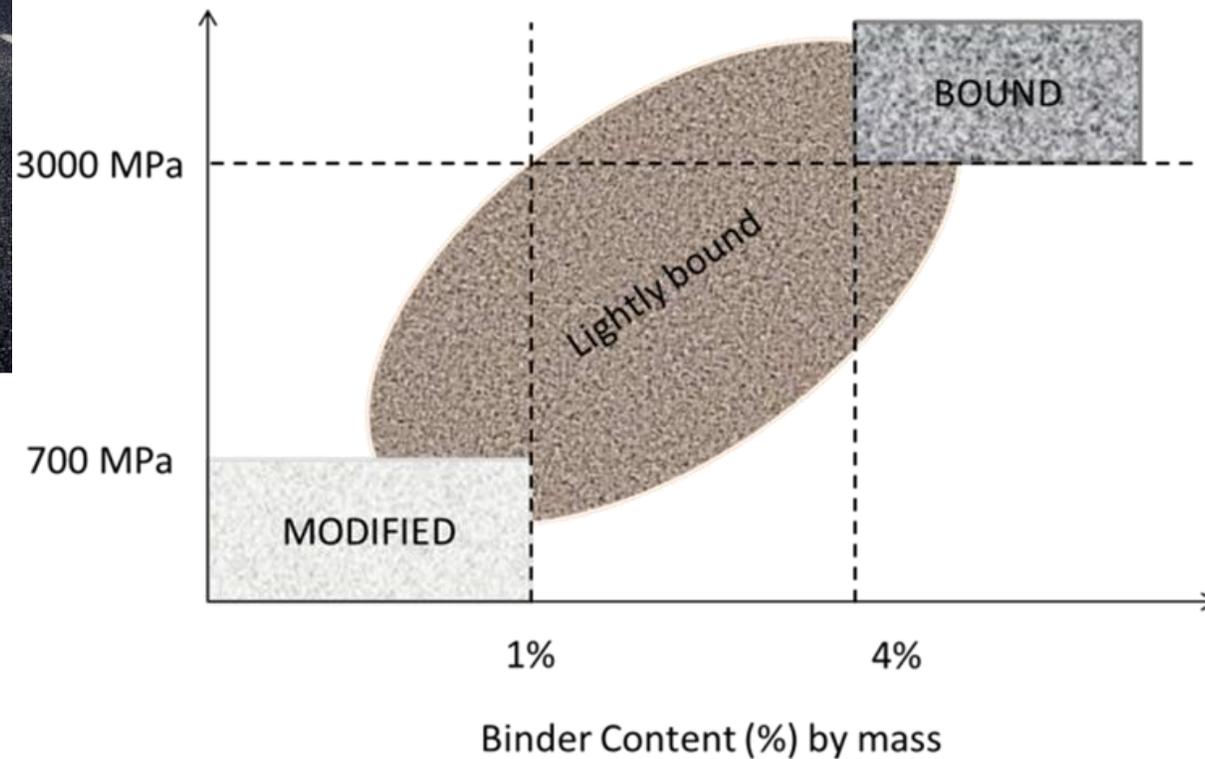
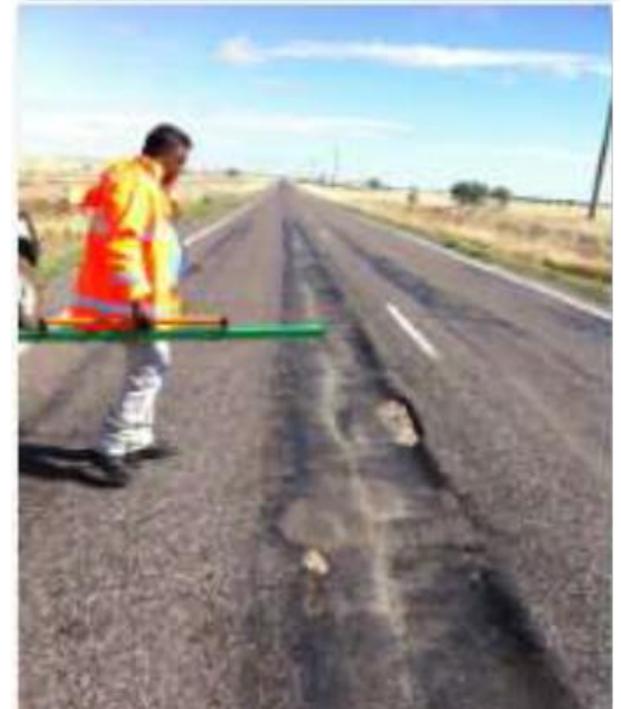
Deformation of FBS with high RAP content

ALF full-scale pavement testing (Austroads TT2046)

- 12 m x 3.75 m test sections
- Load up to 80kN (single, tandem and triaxial)
- Controlled loading & climatic condition



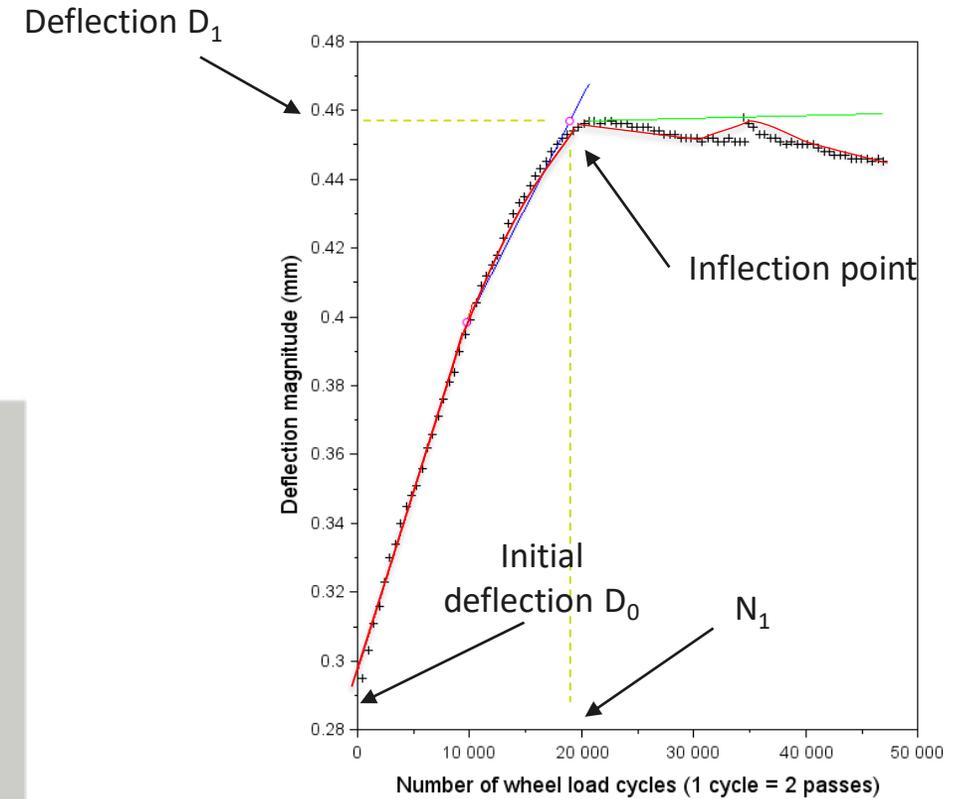
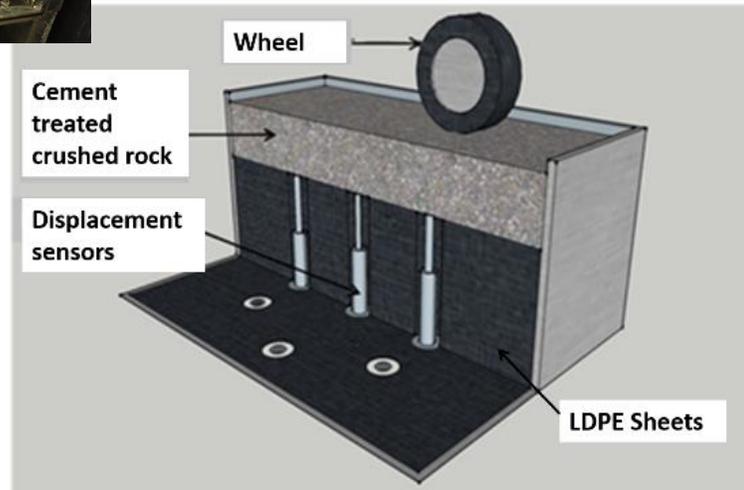
Lightly cemented granular materials



How does lightly bound materials work?

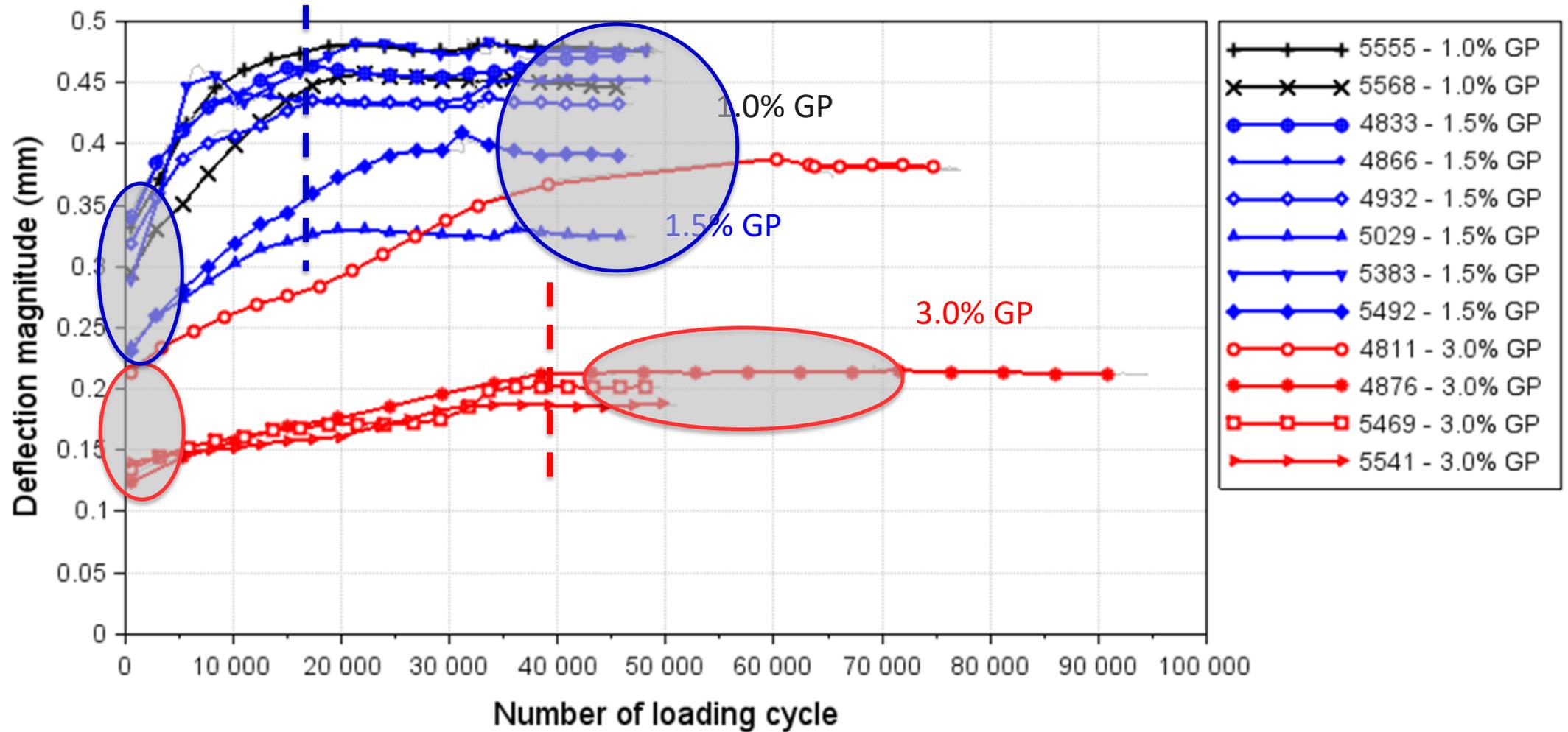
Laboratory pavement layer testing (meso-scale)

⇒ fatigue cracking evaluation



(Grenfell et al. 2016)

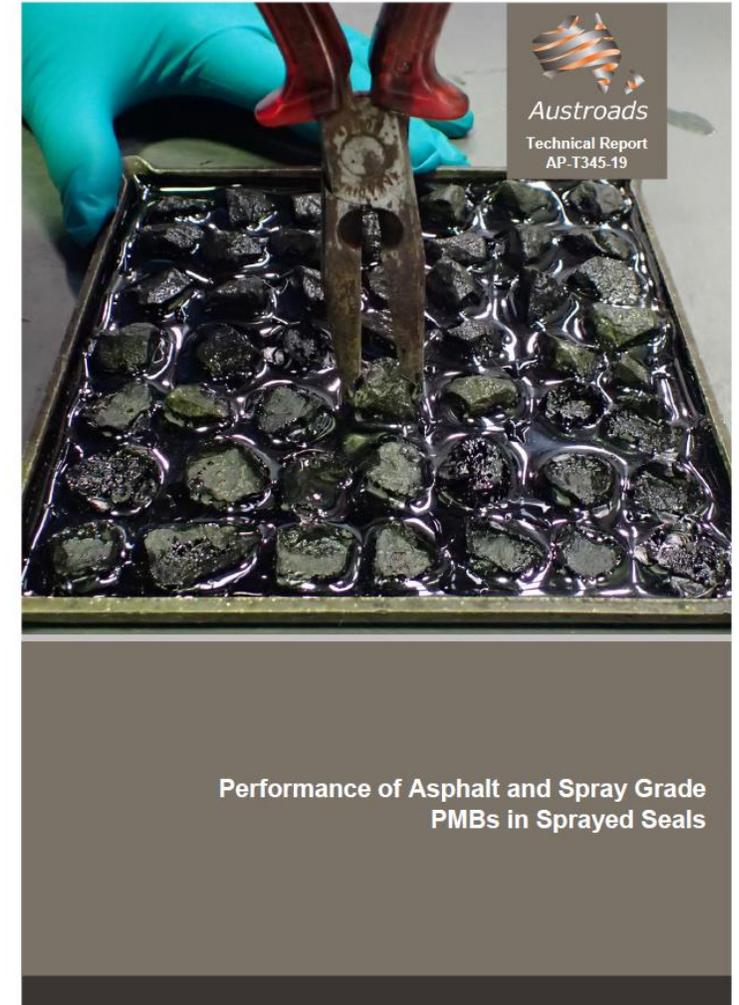
Effect of Cement Content



Bitumen and PMB: What's new?

Bituminous binders for sprayed

- 2019 update AGPT/T190: inclusion of a cracking parameter
- Relationship between cutter oil properties and sprayed seal performance ⇒ basis for updating AS3568 update (AP-T344-19)
- Research towards simplification of PMB and potential merge of some asphalt and sprayed sealing grades (AP-T345-19)

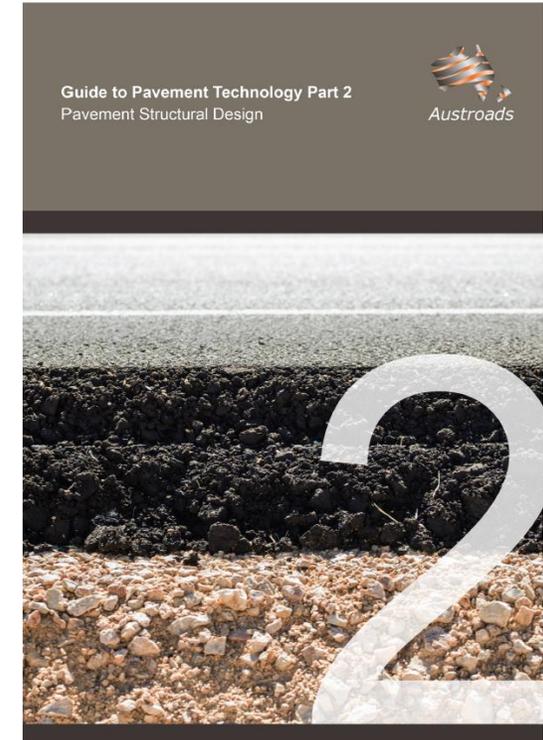


Developing thickness design method for foamed bitumen stabilised base



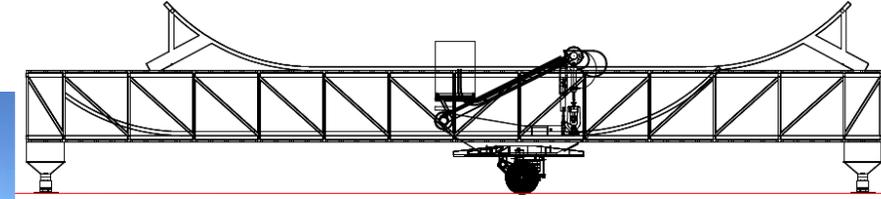
ARRB / Road Agencies engagement:

- Future needs/challenges
- Identify new or promising technology
- Develop and articulate the program of research
- Implementation of findings



Strategic research for Foamed Bitumen Stabilisation

Develop method for thickness design



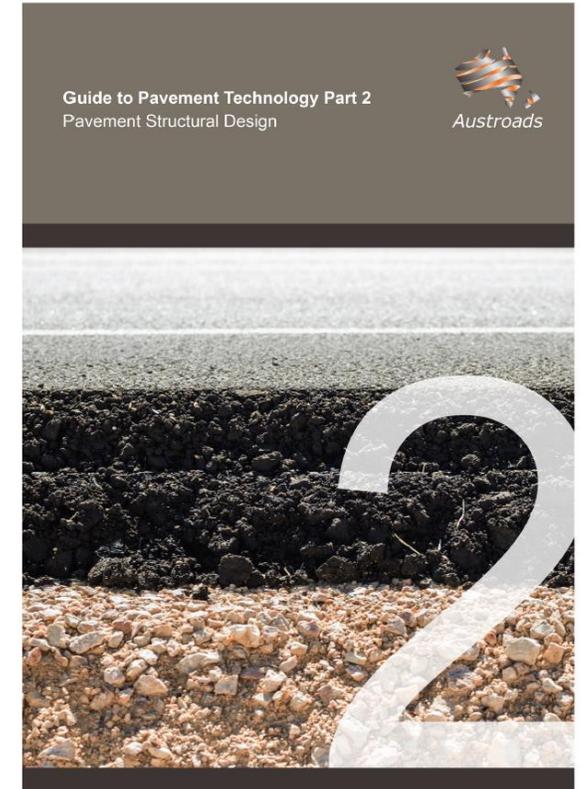
- Harmonise mix design practice
- Field trials (varying thickness, climate...)
- Distress mode
 - Fatigue cracking
 - Rutting shape loss (not dominant)
- Interim thickness design method

- Full-scale pavement testing (ALF)
- Field performance evaluation
- Controlled accelerated loading conditions
- Selected materials

Control: 100% Crushed Rock
Mix 1: 50% Crushed Rock - 50% RAP
Mix 2: 20% Crushed Rock - 80% CTSB

Long term research for Foamed Bitumen Stabilisation

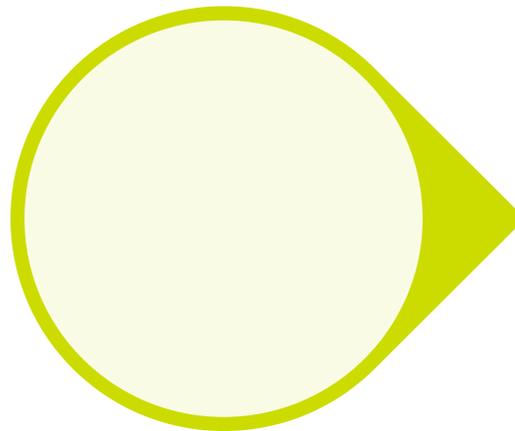
Develop method for thickness design



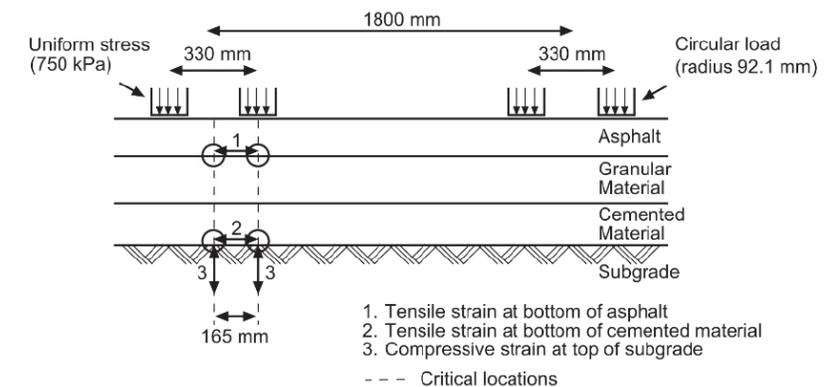
- Laboratory fatigue characterisation
- Effect of mix design
- Develop laboratory fatigue relationship
- Link between both field and APT

$$N_f = \left(\frac{k}{\epsilon}\right)^p$$

⇒ in-service relationship



Axle with dual tyres





QUESTIONS?



SMART PAVEMENTS NOW

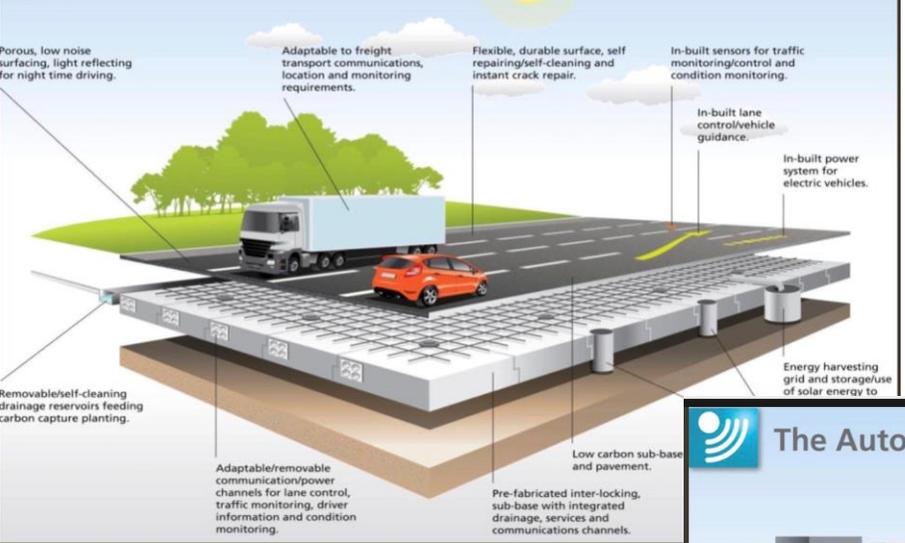
18-20 SEPTEMBER

**FIND OUT MORE AND
SEE THE PROGRAM AT**

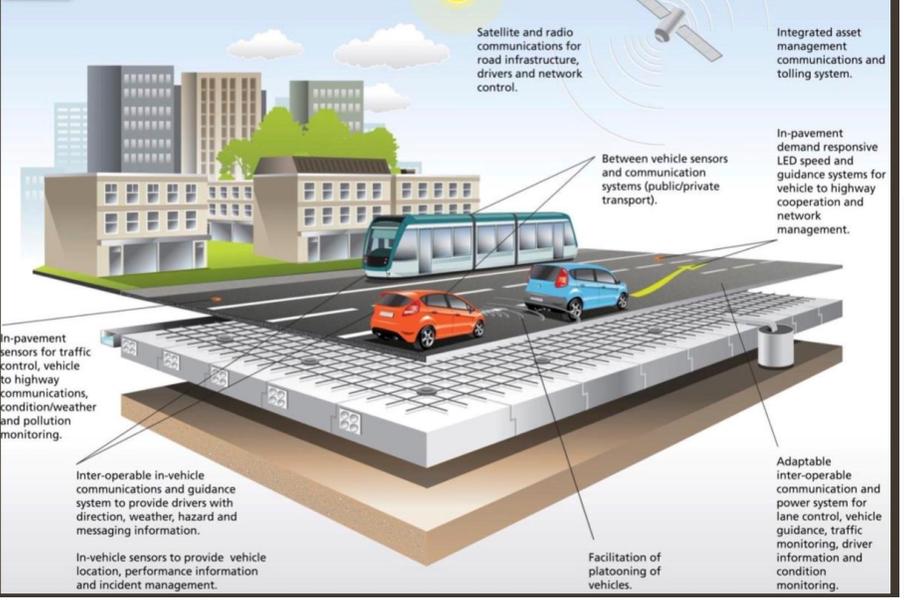
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The Adaptable Road



The Automated Road



The Resilient Road

