Pavement Design
Guide to Pavement Technology Parts 2 and 4C
March 2018 Webinar – Questions and Answers

This document addresses questions regarding Pavement Design – Guide to Pavement Technology Parts 2 and 4C raised during a webinar broadcast in March 2018. The recording of the webinar can be accessed on the Austroads website.

Are we correct that the new method is effectively ignoring strain contribution from adjacent axles for multi-axle groups when assessing the bound layer? Previously, this was implicitly allowed for by the equivalent axle-group loads between ESA and tandem and tri-axle groups. been told that a proposed safe system treatment can be given a rating. Can you explain what this rating means?

The new method does not strictly 'ignore' the strain contribution from adjacent axles, but it does not use the superposition concept either. The older pre-2017 SAR approach did not consider superposition either. Austroads research report The Influence of Multiple Axle Group Loads on Flexible Design (AP-R486-15) provides considerably more background and detail.

Why does the guide not include the use of geogrid reinforced subbase in the pavement design method?

At this stage the Austroads member agencies did not believe that they were able to provide additional guidance for considering geogrids in pavement design. However, research work is currently being undertaken as part of the National Asset Centre of Excellence (NACoE) program by the Australian Road Research Board (ARRB) for the Queensland Department of Transport and Main Roads. It is hoped that this work may lead to improved means of incorporating geogrids into pavement structural design.

Why were the example design charts removed? They were extremely useful teaching aids. The end result is that the examples in the 2012 version will probably be used.

The example design charts were removed at its was decided by Austroads members that the resources required for regeneration of the heavy-duty pavement example charts were better utilised in other developments. Stakeholder feedback indicated that, for the design of heavy duty pavements, the example charts were not being utilised by Austroads members. It should be noted that example design charts are retained in Chapter 12 for the design of lightly trafficked roads.

Slide 22 - Is it recommended to slake quicklime prior to stabilising clay subgrades which can be adequately pulverised?

Guide to Pavement Technology Part 2: Pavement Structural Design considers the structural design of road pavements. Considerations of different binder types for stabilisation are beyond the scope of the part. Guide to Pavement Technology Part 4D: Stabilised Materials (currently being revised) should be consulted when considering binder types to be used for stabilisation.

Slide 37 - Does the size of the asphalt beam affect the flexural modulus value measured in the lab test?

Yes, it does. The Austroads Test Method - Characterisation of Flexural Stiffness and Fatigue Performance of Bituminous Mixes (AGPT-T274-16) for measuring the flexural modulus of specimens defines the dimensions of the asphalt beam that are appropriate. Part 2 of the Guide to Pavement Technology considers direct measurement of flexural modulus to be conducted in accordance with the test method.

Slide 30 - The problem in using lab characteristics of an unknown material is knowing the construction variability and the impact that variability has on the design value. The designer may adopt numbers that require the material to be constructed to a precision which is not achievable. How do we reconcile this misfit?

Presumptive laboratory-to-field shift factors should reasonably take these considerations into account. For example, Austroads research report Cemented Materials Characterisation: Final Report (AP-R462-14) demonstrates how these variabilities were considered in determining appropriate means of considering cemented materials performance.

Cemented materials - In the lab, material is fully cured (no cracks) when the flexural modulus and strain-to-failure are measured; however, on-site, material is being driven over by heavy machineries at early stage to lay upper layers. this is commonly acknowledged to create microcracks, which affect flexural modulus and finally fatigue resistance. How is this considered by the fatigue formula in slide 30?

The determinations of both design modulus an in-service fatigue performance considers the difference in properties that occur between laboratory prepared specimens and constructed pavement materials. Austroads research report Cemented Materials Characterisation: Final Report (AP-R462-14) studies and analyses this issue in detail.

Slide 37 - Are we looking at a fatigue jig capable of accommodating a beam with a larger cross-section. The current unit only accommodates beam with width and depth of 63mm which for a 20 mm mix is only 3 times the maximum stone size so measured cycles may be misleading of field performance.

A fatigue beam jig able to test larger specimens has been proposed by ARRB to Austroads for examining the performance of stabilised materials (e.g. foam stabilised materials). To date Austroads has not funded development of this work. Research into the consideration of larger plant-mixed asphalt specimens has not yet been prioritised by Austroads members.

Why has SF been considered in 2017 Fatigue Performance? Then it's value is taken as presumptive? (slide 39 in comparison with slide 38)

Prior to 2017 the reliability factor (RF) used in the asphalt fatigue performance relationship was the incorporation of two distinctly separate issues. Firstly, it included an inherent lab/model-to-field shift factor to translate mean laboratory/model performance to mean field performance. Secondly it additionally provided the means to translate average (i.e. close to 50 percentile) performance to different levels of desired project reliability. The new approach separates these distinctly different concepts.

A presumptive value of the lab-to-field shift factor of 6 is provided for the designer that is not able to provide a more specific value.

Will there be further recommendations for traffic load distribution tables for rural verse urban lightly trafficked roads, and also for moderately trafficked non-highway local roads?

Part 2 includes presumptive traffic distributions for lightly to moderately trafficked pavements. For heavily trafficked pavements, it is not believed that a distinction between traffic loading distribution can be simply based upon the pavements classification as urban or rural.

Is the new Austroads Design Method similar to TMR TN167 approach?

TMR TN167 represents an implementation of the new Austroads design method. The partnership of TMR and ARRB in the NACoE research program enabled the accelerated implementation of the revised Austroads design approach within Queensland.

Is a decrease in viscosity being observed in bitumen stabilised pavement beams under high traffic loadings in the beam testing?

To date Austroads has not funded a detailed examination of the laboratory fatigue performance of bitumen stabilised pavement beams. As a result, the strain hardening aspects of bitumen stabilised beams have not yet been studied.

Slide 43 - The use of 24 hours to determine capacity is expecting traffic to move to less heavily trafficked parts of the day before we accept saturation. Perhaps we should look at hourly traffic movements and limit hourly traffic to no more than the lane capacity. We could have saturation traffic between 6.00 am to 10.00pm but actual traffic between 10.00pm and 6.00am. Traffic above saturation is more likely to divert onto other roads rather than to move to different times of the day. Please comment.

The aim of the guidance regarding traffic capacity provided in the new edition of Part 2 is to remind the designer to conduct a sanity check with regard to the design traffic level. The designer is welcome to consider subtleties beyond this sanity check. The crude sanity check was introduced to be a considerable improvement on past guidance.

Slide 46 - What is the assurance on the accuracy of calculating critical strains under individual axles vs. that of an Axle Group? The inter-axle effects of a large axle group (e.g. quad axles) will be a problem.

This issue was explored in considerable detail and reported in Austroads research report The Influence of Multiple Axle Group Loads on Flexible Pavement Design (AP-R486-15).

Slide 51 - How do apply the response-to-load calculation for a tandem axle group for buses where the front axle in the group has dual tyres and the rear axle in the group has single tyres?

The updated Part 2 does not consider this specific issue. Indeed, nor does the previous 2012 Part 2.

Slide 52 - How are we to characterise the types of vehicles to be travelling through a specific site? Is this to be estimated from WIM data?

Yes. Traffic Load Distributions for WIM sites across Australia and New Zealand are provided on the Austroads website. Additionally, state road agencies are providing presumptive distributions within their jurisdictional supplements to Part 2 of the Guide.

What are the limiting factors in R&D to increasing the allowable lime stabilised subgrade (select material) design modulus currently at E=150MPa?

The limit on design modulus of lime stabilised subgrades of 150 MPa was placed so that the modulus of stabilised subgrades would not exceed the maximum design modulus of selected subgrade materials.

Asphalt fatigue - it looks like only bottom-up fatigue is considered. Truck tires are changing, and most recent research shows that cracking starts right below the surface as a shear failure and it is then spread to the bottom layers (top-down cracking). How is this taken into account for by the new Guide?

As an interim measure the new Part 2 of the Guide considers that there is a maximum design traffic level beyond which any additional design asphalt thickness is considered to be unnecessary. In these conditions, the management of top-down cracking becomes a simple matter of milling and removing the cracked upper asphalt material. For thicknesses up to this traffic threshold, however, the new Part 2 of the Guide, considers that flexural fatigue initiating cracks at the bottom of asphalt layers is the dominant distress affecting pavement thickness design.

What work is underway to include geogrid reinforced pavements in the pavement design method in the future?

Work is currently being conducted as part of the Queensland TMR and ARRB NACoE research program.

Has there been any research/progress on using crumb rubber (tyre) for pavement?

Yes. Research is undergoing. ARRB is undertaking research on behalf of Queensland TMR, VicRoads, Main Roads Western Australia, Tyre Stewardship Australia as well as numerous state EPAs and state departments responsible for sustainability and environment.

Slide 54 - Should there be a horizontal section of the blue line to the right of 2 x10^8? The information shown in the table for slide 40 has the 2 x 10^8 limit.

Yes, if the combination of the combined effects of the new axle strain method are combined with the consideration of the design traffic limit for asphalt fatigue. The intention of slide 54 was to demonstrate the effect of the new axle strain design methods in isolation to other concepts introduced into the new Part 2.

Are there any projects planned to refine our knowledge of the asphalt endurance limit?

There is a clearly identified need. ARRB has studied various approaches (see Austroads technical report Asphalt Fatigue Endurance Limit AP-T131-09) and has recommended several options for future research work within Austroads technical report Asphalt Fatigue Damage Healing and Endurance Limits: Guide Implementation Options (AP-T319-16). To date neither Austroads nor individual road agencies have committed resources to the developing any of the proposed development actions.

What would be the standard method to test the strength of the rubberised concrete?

Austroads has not, to date, funded development of such a standard method.

Austroads | Level 9, 287 Elizabeth Street, Sydney NSW 2000 | www.austroads.com.au | austroads@austroads.com.au | +61 2 8265 3300