Questions

TOUR TO USA
25 October to 10 November 2014

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SEVEN KEY TOPICS

1. Best practice and safer construction works
2. Advances in pavement engineering and design
3. Treatments of rigid pavements including replacement with full depth asphalt or crack-and-seat with overlay
4. Thinlays for pavement preservation
5. Introducing innovation and sustainable pavement solutions
6. Government decision making for road infrastructure investment
7. Perpetual Pavements

1. Best practice and safer construction works

What the AAPA study tour would like to understand in regard to best practice construction activities in the USA is the following:-

- Equipment used and special features
- Site setup and traffic management
- Nature of the mixes used – workability, temperature
- Management of placement performance
- Man management, clothing, pre-start, training

1.1 Bitumen / asphalt binders

1.1.1 How much bitumen / asphalt binder is used annually in the USA?

1.1.2 PG system
a) what proportion of the usage is to the PG system?
b) are there any concerns / disadvantages to the system?
c) to what extent is the PG+ version (+elastic recovery) used?
d) how do DOT's monitor binder quality?
e) how does the airport sector monitor bitumen quality?

1.1.3 Product stewardship & pefromance
a) how are HSE aspects such as odour & fuming controlled?
b) do Venezuelan derived bitumen present different fuming behaviours?
c) are there regional performance difference for bitumen from different crudes?

1.2 Hot Mix Asphalt

1.2.1 How to achieve compaction of Rut Resistant HMA with PMB
Problem: require a wax based compaction agent (Sasobit) to get compaction to <7% airvoids for 14mm and PMB HMA. 20mm mixes OK.
Questions:

a) What can be done?
b) Can free water foam be used as a compaction agent?

1.2.2 Moisture in pavement
Problem: granitic aggregate problems with high stripping potential, client concerned for thick lift asphalt pavements.
a) is there information on the moisture levels in a pavement over its life?
b) what construction details used to limit water ingress?
- longitudinal & transverse joint details
- sealing of edges
- compaction testing at the pavement edges
c) is there a voids gradient used a heavy duty pavement structure?
- would the air voids be highest at the surface?
- how does this affect the "rich bottom" in the perpetual pavement design?

1.3 Warm Mix Asphalt

1.3.1 Why is WMA used so much in the USA?

1.3.2 Does the compaction bonus encourage it's use?
- size of bonus |when used | stick vs. carrot

1.3.3 Are there differences in use/drivers/application between minor & major contracts?

1.3.4 How is the normal "grocery trade" or casual customers affected?
a) do they have concerns that the differences in temperature / handling etc?
b) does the WMA set "suddenly" at the lower temperatures?
c) do they retain the ability to control workability?

1.3.5 Are there techniques for <100 ºC compaction?

1.3.6 PMB's in WMA
Problem: Foam half-life & expansion ration of PMB is about half of a normal asphalt grade binder. PMB does not appear to foam very well.
Questions:
a) how to improve the PMB foaming performance?
b) what is the impact of the reduced half life and expansion ration?

1.4 Contract conditions

1.4.1 Defect liability & warranty periods
a) how long are they?
b) how is performance against warranty assessed?
c) how is non compliance addressed?
d) is there documentation / examples of agreements available?

1.4.2 Specification requirements
a) temperature segregation in asphalt
– how is this tested / measured?
- are the benefits / incentives provided for uniformity i.e. reduced testing?
- is documentation available?

1.5 Pavement maintenance practices

1.5.1 What is done to improve HSE outcomes and safety for under traffic repairs
a) planning the works
b) modelling the traffic for improved traffic accommodation
c) traffic safety improvements through better equipment & personal controls

1.5.2 How is pavement maintenance under heavy city traffic undertaken?
a) asphalt concrete pavements
b) cement concrete pavements
c) asphalt concrete over cement concrete
d) are working platforms used where repairs carry temporary traffic (2 days)?

1.5.3 What techniques are used to provide diamond grinding of cement concrete to improve ride quality?

1.5.4 Crack sealing – new ideas, products and systems

2. Advances in pavement engineering and design

In the pavement engineering area AAPA has a long track record of funding first principles research into pavement engineering and design technologies. AAPA members participate around the table with State Road Authority colleagues at a national level through AUSTROADS committees that fund research and set standards and specifications for the industry.

- How are advances in pavement engineering developed in the USA
- Is there a National approach to new design tools and techniques
- What tools (ALF) are used to verify design models
- What is current best practice

2.1. Pavement Design

2.1.1. Structural design methods – which are the most commonly used for heavy duty pavements?

2.1.2. Typical pavement design structures for heavy duty pavements – what are they?

2.1.3. Pavement design reports – are typical design reports accessible / available?

2.1.4. Harder SBS binders – are alternate design inputs / methods used for these binder types?

2.1.5. Very heavy duty surfacing – are hard coarse sand and aggregates required?

2.2. Binders

2.2.1. PG system binders – being "blind" to the modifier used, does this allow for a wide range of modifiers to improve the grade?
- is this common practice?
- what types of modifiers are used?

2.2.2. International supply & new sources – have any changes been noticed?

2.2.3. Hard EME (High Modulus) penetration grade binders – are they used in the USA?

2.2.4. PMB types – are alternate modifiers being widely used?
a) crumb rubber
b) harder SBS
c) other special polymers

2.2.5. Surface enrichment
a) is this a common maintenance treatment?
b) is the performance improvement document / recorded / published?
c) is it used on all asphalt types?
- DG,
- OGA
- SMA?

2.2.6. Trackless tack coats – are they commonly used?

2.3. Crumb Rubber Binder

2.3.1. Crumb rubber – is it considered a modified bitumen of a hot mix modifier?

2.3.2. Health & Environmental impacts
a) how are the odour and air pollution aspects addressed in production and construction?
b) how have the health concerns of crumb rubber asphalt been addressed?

2.3.3. Making & blending
a) is there special equipment to reduce odours & emissions?
b) does the rubber used impact on the manufacture?
c) what types of rubber are most commonly used?
d) how do the terminal & field blended impact on CRA performance?
e) are there limits or operating rules around the delivery / manufacture?
f) are there improved handling techniques to reduce HSE impacts?

2.3.4. Alternate uses
a) is crumb rubber used in sprayed / chip seals?
b) what parameters are used to assess it comparable performance?

2.4. Crumb Rubber Asphalt

2.4.1. Cost effectiveness
a) what are the most cost effective applications for crumb rubber in asphalt?
b) what is the relative cost of crumb rubber asphalt to conventional asphalt?

2.4.2. Usage
a) how much is currently used in asphalt?

b) what was the major driver to its use?
c) is the usage variable by State?

2.4.3. Mix design using crumb rubber
a) how different are the requirements compared to normal HMA?
b) does the design consider:
- dry blend
- terminal blend
- field blend

2.4.4. Recycling – how is done?

2.4.5. What case studies and examples are available to support CRA use?
a) NAPA feedback on projects?
b) Case studies by APA and DOT's?

2.4.6. How does Crumb Rubber Asphalt compare to conventional binders and SBS PMB mixes"

2.5. RAP & WMA

2.5.1. High % RAP
a) are there extra test requirements?
b) what material properties are considered relevant in the design?
c) how does the inclusion of PMB in the RAP impact on the design?
d) is the % moisture in the RAP a consideration for high % designs?
e) are there guides / reference documents available?

2.5.2. WMA differing test results to HMA
a) is the difference in the Lottman test WMA/HMA considered important?
b) when would the difference be important?
c) are there other test methods to be considered?

2.6. Open Graded Asphalt

2.6.1. Performance
a) what is the normal functional life expectancy of OGA?
b) how is the old OGA replaced or rehabilitated?

2.6.2. Design
a) what layer thicknesses?
b) aggregate size used?
c) is a waterproofing layer / membrane used beneath OGA?

2.6.3. Binders
a) are special binder used?
b) PMB & Crumb Rubber binder – what percentage of use?
c) what percentage of binder is used?

2.7. Stone Mastic / Matrix Asphalt

2.7.1. Usage
a) is this commonly used?
b) what is its status as a wearing course?

2.8. Low Temperature Asphalt

2.8.1. What products are available for <100ºC asphalt?

a) are they commonly used?
b) are there available design values available for inclusion in pavement design?

2.9. Maintenance Techniques

2.9.1. Chip sealing – there appears to be a growing trend to the use of more surface seals on granular material.
a) why is this occurring?
b) are there advantages and consequences?

2.9.2. Foam stabilisation – this is a common rehabilitation technique in Australia
a) has it use been growing in the USA?
b) what states / regions are most active?
c) what typical designs & binder types & contents are used?
d) is cement or lime included in the design?
e) is there the potential for collaboration?

2.10. Test equipment

2.10.1. Ground Penetrating Radar (GPR)
a) is this being used?
b) experimental developments & research?
c) pavement management system integration?
d) is there documented info on systems & benefits?

2.10.2. Hamburg Wheel Tracker
a) how is it used ?
– included in specification?
- test under defined conditions?
- screening test?
b) is it used as a production compliance test?
c) it's the use of different limits for different binder grades linked to climate?
d) how repeatable are the test results?
e) can its results be compared to the Lottman test – are there advantages?

2.10.3. GPS and rolling patterns
a) is GPS & compaction measurement being used to control density?
- extent of usage
- lead contractors / preferred suppliers
- to what extent are the results mandated / accepted

2.11. Accelerated Pavement Testing

2.11.1. What is the role of APT in the development and introduction of new asphalt technology in the USA?

2.11.2. What type of APT device is most commonly used in the USA?

2.11.3. Would it be possible to establish a MOU between ARRB/TMR and USA APT providers to collaborate and share research and performance outcomes?

2.11.4. Which device is used
a) by location?
b) by type
c) why was the given device chosen?
d) with experience would there be reasons to chose an alternate device?

2.11.5. Operating APT systems
a) what are the operating costs?
b) how is that evaluated against the results obtained?
c) how are cost efficiencies achieved in testing & experimental design?

2.11.6. How are the testing outcomes put to use?
a) design systems
b) commercial introduction of the material / structure?

2.11.7. Demonstration & systems for introduction
a) are there standard ways to share the APT performance outcomes?
b) is there a USA type HAPAS or Avis Technique system?
c) how do DOT's accept the proven products as alternatives?

2.11.8. Asphalt fatigue & temperature
a) does FHWA have information on their research into temperature / fatigue?
b) has the finding been included in the MEPDG?
c) can the information be accessed?

3. Treatments of rigid pavements including replacement with full depth asphalt or crack-and-seat with overlays

Old concrete pavements in Australia's urban centres have reached the end of their useful life and now State Road Authorities are faced with the challenge of how to repair and/or replace these pavements under very heavy 24 hour traffic.

- What is best practice in the USA
- Experience with crack and seat and AC overlay
- Interlayer treatments
- Reflective cracking experience
- Availability of crack and seat devices to Australia

3.1. Rehabilitation of concrete pavements

3.1.1. Crack & seat versus Rubblisation
a) how is the choice made to use a given treatment?
b) is there a "best" option and what drives the decision?
c) are there examples of the proof of use for each technique?
d) can case studies be provided on the successful use?
e) which is best for urban areas around utility services? Other options?

3.2. Asphalt pavement design on crack & seat / rubbilised concrete

3.2.1. Pavement design of crack & seat and Rubblised concrete pavements
a) what design systems are available?
b) are there design inputs with performance related links

3.2.2. Concrete failure modes vs repair & rehabilitation
a) does the failure mode influence the best rehabilitation technique?
b) will poor concrete construction impact significantly on rehabilitation design?
c) how are the costs of maintenance an interventions compared to C&S or R

3.2.3. Asphalt options for concrete pavement maintenance

a) what asphalt solution are most commonly used for concrete repairs and rehab?
b) do highly modified seals play a role on plan jointed concrete?
c) is crumb rubber asphalt useful in concrete maintenance?

4. Thinlays for pavement preservation

Delivering better value for money solutions means that the industry must drive smarter and more cost effective outcomes utilizing the best available technology. In our urban environments the constraints of traffic volumes, kerb levels and services

- What is the latest in the development of thinlays for urban environments
- What design standards are used
- How are these products handled

4.1. Usage of Thinlay

4.1.1. Typical applications
a) what are the typical pavement preservations applications of Thinlay?
b) are the products proprietary or non-proprietary?
c) is there a generic performance based specification available?

4.2. Pavement preservation

4.2.1. What is the role of innovation in reducing costs?
a) with the reduced road funding available is there more innovation?
b) will ThinLay play a major role in extending the network performance?
c) has the use of staged construction been used to stretch design lives?

4.2.2. Surface enrichment
a) are emulsion treatments and thin slurry treatments used & to % of market?
b) is its role as a pavement life extender been acknowledged & proven cost effective?

5. Introducing innovation and sustainable pavement solutions

Innovation is the key to the future success in the development of cost effective infrastructure in the roads environment. The implementation of innovative solutions is often the blockage in delivery of better value for money solutions.

- How is innovation delivered in the USA
- What are the drivers for innovation
- What roles do industry and government play

5.1. Superpave

5.1.1. The aim included the reduction of asphalt rutting
a) has this been achieved?
b) have aspects such as premature cracking arisen from the stiffer mixes?
c)

5.2. Pavement design models

5.2.1. Asphalt fatigue & temperature
a) does FHWA have information on their research into temperature / fatigue?
b) has the finding been included in the MEPDG?
c) can the information be accessed?

5.3. Product innovation systems

5.3.1. Does the USA have a HAPAS, Avis Technique system to introduce innovations?

5.3.2. How are newly proven products
a) commercialised?
b) introduced as proven alternatives on standard contracts?
c) are there different systems across the States?
d) does FHWA have a role?

6. Government decision making for road infrastructure investment

The key to long term future funding of the road network resides with the ability of Treasury to understand the pavement deterioration model for road pavements. The funding models and decisions around new capital infrastructure is often tied to political outcomes.

- What progress is being made in the USA Nationally or at a State level to secure longer term funding
- What tools are being used to communicate the message
- Who is involved

7. Perpetual Pavements

AAPA has funded the development of a new approach to Perpetual Pavement Design, which will fundamentally transform the way in which heavy-duty freeway environments are designed for full depth asphalt pavements.

- What is current practice in the USA
- Where are the design standards heading
- What tools are being utilized to verify pavement designs
- What is the acceptance and uptake of new design tools by the State DOT's

7.1. Materials

7.1.1. Binders

a) what is the most typical PG binder used in Perpetual Pavements?

7.1.2. Supporting pavement structure

a) what is the minimum supporting pavement structure used for perpetual pavements?

b) what materials are used in the support structure?

- crushed rock
- cement treated layers
- selected fill layers
- subgrade treatments

7.2. Structural design

7.2.1. Indeterminate structural pavement design lives

a) How are these concepts included in current USA design systems?

b) do they vary by State?

c) what structural design methods are currently used to accommodate them?

7.2.2. Pavement structure

a) what is a typical perpetual pavement? Thickness & materials used?

b) are recent design reports available?

c) how are long life / perpetual pavement designs performing?

d) are there examples including age, traffic loads and design?

7.2.3. Feedback on AAPA design proposals

a) feedback is sought on the AAPA proposed structural design?

b) review and repose from the ICPP in Ohio?

c) peer input and comments during visit to the USA