

South African Asphalt Mix Design Manual

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the Roads Pavements Forum (RPF)

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- Project plan and progress,
- State of the art study,
- Vision for the asphalt manual,
- Way forward.

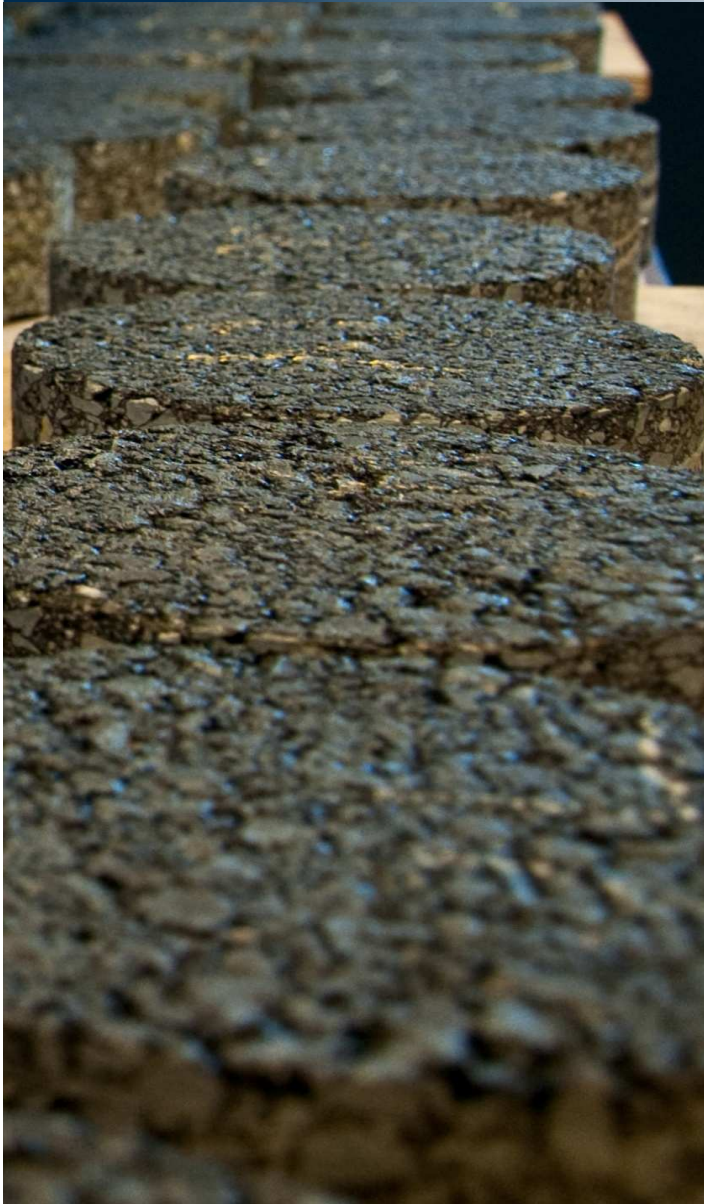


- Drafting of the manual funded by the Southern African Bitumen Association (SABITA),
- Co-funding from CSIR for supporting research,
- Project consists of four phases:
 - I. Establishment of project management structure,
 - II. State of the art study,
 - III. Experimental work and Manual development, and
 - IV. Dissemination



- Update the design methods in line with international and local advances in asphalt technology and increasing demands placed on asphalt pavements,
- Include new mix types (e.g. HiMA, WMA), and
- Mix design method should have link to structural design methods of SAPDM.





- Literature study:
 - Current practice in South Africa,
 - Local developments,
 - International developments.
- Interviews with stakeholders:
 - Producers (and other mix designers),
 - Consultants,
 - Clients,
 - Academics





- International trend towards performance related design methods (EU, USA, AUS),
- Performance related design would allow increased reliability and simplification of the mix design and binder selection process,
- Direct link between performance tests and pavement design (SAPDM),
- Typical performance parameters:
 - Workability,
 - Durability,
 - Permanent deformation resistance,
 - Fatigue performance,
 - Stiffness.



Vision for the asphalt manual: binder testing

7-14



- Performance grade binder specification, similar to US SUPERPAVE
- Select binder for project specific traffic and climate conditions,
- Dynamic Shear Rheometer (DSR) to become main piece of equipment in binder testing,
- DSR results required to predict stiffness and aging of binder as part of SAPDM,
- Modified and unmodified binders to be assessed using the same specification,
- Project to validate use of PG for SA binders has begun.



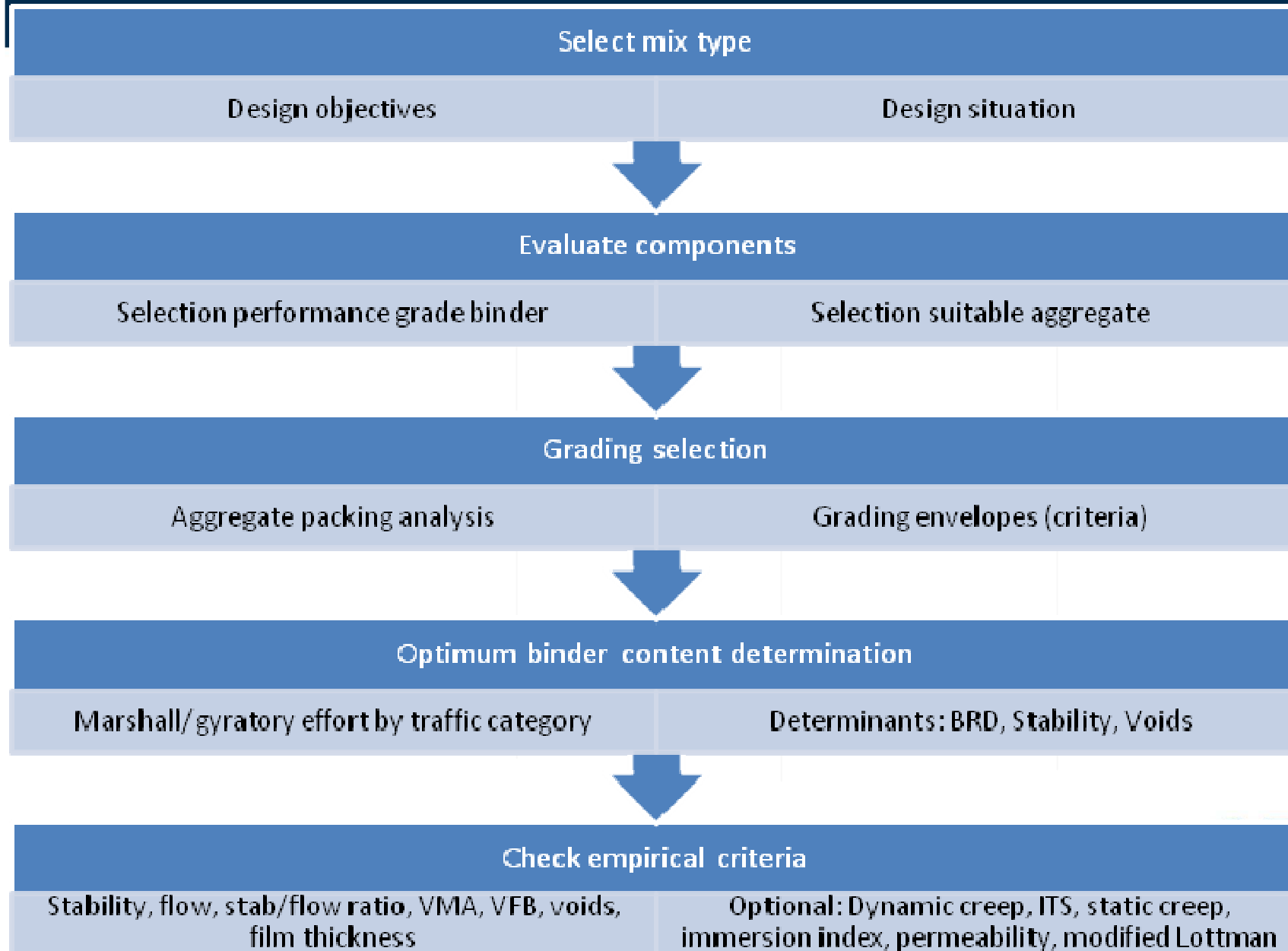
Vision for the asphalt manual: binder testing

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Binder Property	Current Specification Equipment Requirements	New Proposed Specification Equipment Requirements
Short-term Ageing	Rolling thin Film Oven	Rolling thin Film Oven
Long-term Ageing	N/A	Pressure Ageing Vessel
Penetration	Penetrometer	N/a
Softening Point	Ring and Ball Apparatus	N/a
Viscosity	Brookfield Viscometer	DSR
Spot Test	Spot Test Kit	N/a
Elastic Recovery	Ductility Bath	N/a
DSR $ G^* /\sin\delta$	N/a	DSR
J_{nr}	N/a	DSR
DSR $ G^* \sin\delta$	N/a	DSR
A, VTS viscosity parameters	N/a	DSR
Percent Recovery at σ $= 3.2$ kPa	N/a	DSR
Storage Stability	Ring and Ball Apparatus	DSR
Flash Point*	Flash Point Cup	Flash Point Cup
Rolling Stones Test*	N/a	Turning apparatus

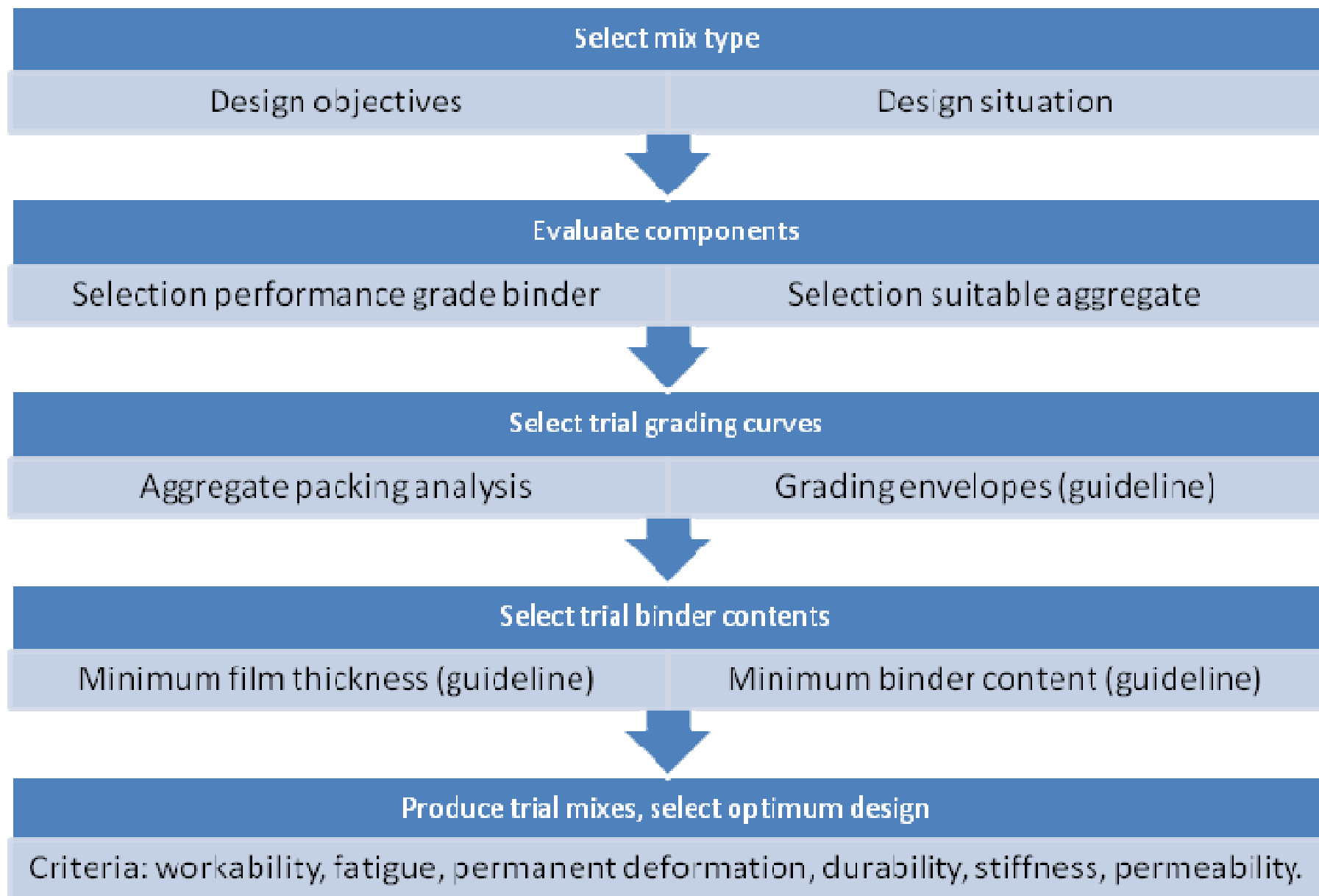
Vision: Revised conventional mix design process

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Vision: Performance related mix design

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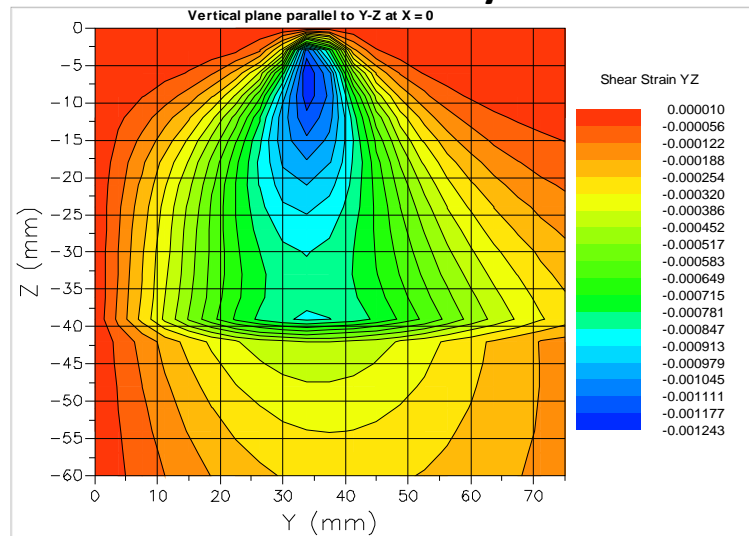


Parameter	IGDHMA	Method	Performance approach	Method
Workability	N/A	N/A	SUPERPAVE gyratory compactor	ASTM D 2013-98
Stiffness	Indirect tensile test	ASTM D4123 (withdrawn)	Dynamic modulus test	AASHTO TP 62
Permanent deformation	Dynamic creep	CSIR RMT-004	Permanent deformation test	To be finalized
	Static creep	TMH 1 – C6		
	MMLS	MMLS draft protocol 2008		
	Transportek wheel tracker	CSIR protocol		
	Modified Marshall			
	SUPERPAVE gyratory compactor	ASTM D 2013-98		
	Static creep	TMH 1		
	Axial loading slab test	CSIR protocol		
Fatigue	Indirect tensile strength	ASTM D4123	Four Point Bending test	AASHTO T 321
	Four Point Bending test	AASHTO T 321		
Moisture susceptibility	Modified Lottman	ASTM D4867	Modified Lottman	ASTM D4867

Vision for implementation

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Pavement analysis



Structural requirements

Property	value
E* [GPa]	> 5
Fatigue [$\mu\epsilon$ to 10^6]	> 300
Perm. def. [ϵ_p]	< 2%



Tender specification

Property	value
E* [GPa]	> 5
Fatigue [$\mu\epsilon$ to 10^6]	> 300
Perm. def. [ϵ_p]	< 2%
Workability [voids]	< 6%
Durability [TSR]	> 80%

Mix selection

Property	Mix 1	Mix 2	Mix 3
E* [GPa]	14	6	3
Fatigue [$\mu\epsilon$ to 10^6]	220	370	280
Perm. def. [ϵ_p]	0.8 %	1.5 %	4.2 %
Workability [voids]	5.0	4.5	5.2
Durability [TSR]	90	85	75



Way forward

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- Validation of performance grade binder selection in progress (due March 2012),
- Discussion document to be workshopped (early 2012),
- Experimental work performance related mix design and manual drafting to start.



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Thank you!

