A practical guide for the application of procedures for designing asphalt mixes as per Sabita Manual 35/TRH8

7. Special mixes

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Elements

- Constituents and Proportioning
- Lab Design Procedures Overview
- Special Mixes
- Bonus round….

You are here

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Special mixes

- Cold mixes
- Porous asphalt
- Mixes of light traffic (residential areas)
- Warm mix asphalt
- EME
- Stone mastic asphalt (SMA)
- Mixes with reclaimed asphalt (RA)

In this course: touch on key issues only

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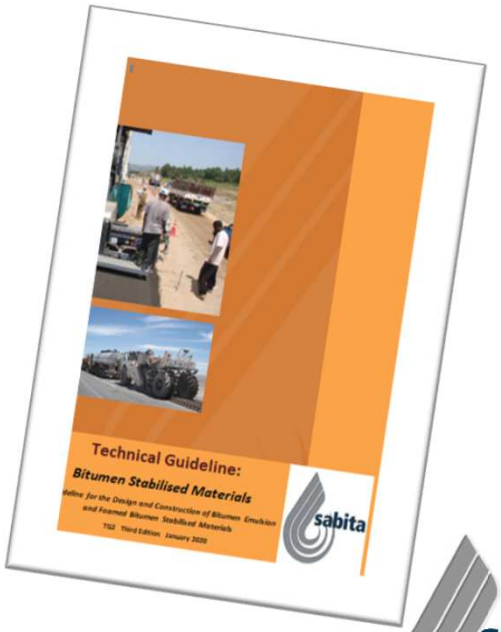
Cold mix asphalt

- Two categories of product fall within this ambit:
  - cold asphalt ***proprietary products*** (maintenance)
  - ***bitumen stabilised*** materials bitumen ***emulsion*** or ***foamed*** bitumen processes.
- Cold asphalt - Agrèment South Africa ***accredited products recommended***.
- The reference document for bitumen stabilised materials – ***TG2***.
- ***SABITA currently working on CMA Certification process…***

AGRÉMENT SOUTH AFRICA
innovative construction product assessments



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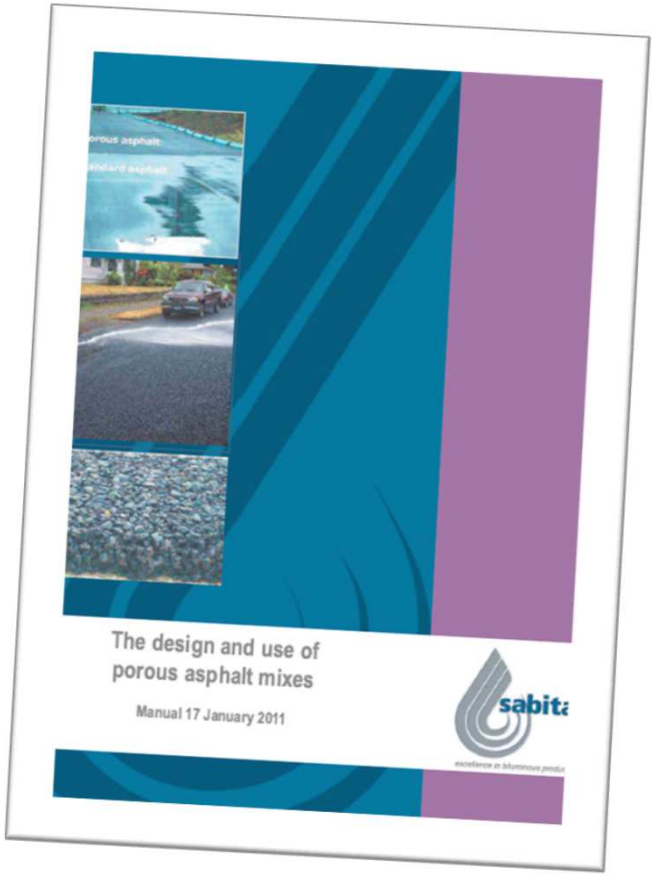
Porous Asphalt

- ***Stone skeleton*** mixes
  - NMAS 10 -14mm mm
  - approximately 11% passing the 2 mm sieve)
  - 3,0 and 4,0 % of filler
  - ***void content ≈20%.***
- ***High binder film thickness*** is usually for improved durability.
- Contains either fibre ***additives*** or modified binder or both to:
  - to raise the effective viscosity
  - ***avoid drain-down*** of the binder during transport and paving,



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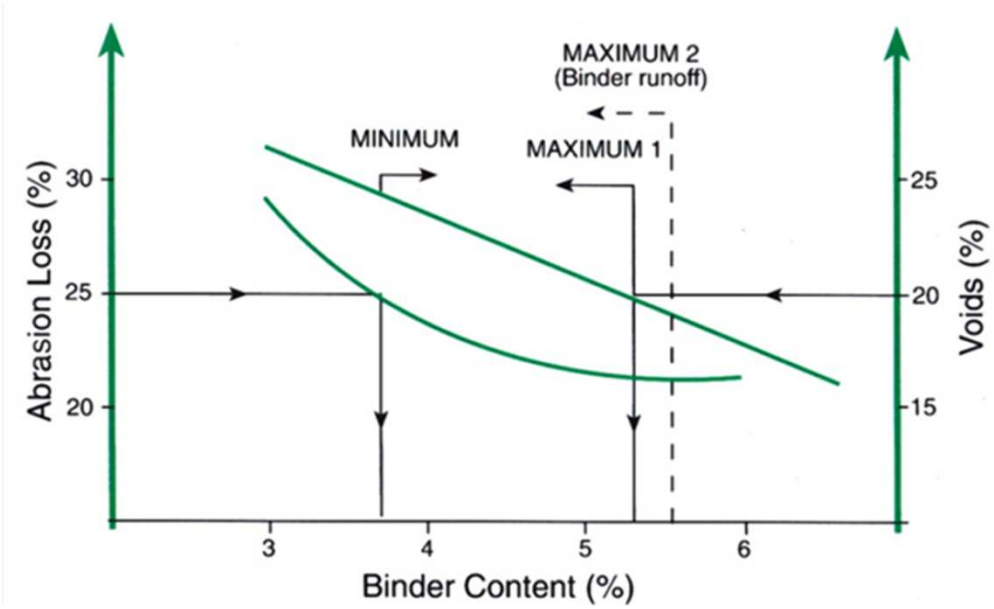
Optimum binder content

- Average of:
  - lesser of
    - ***max*** to maintain min voids (20%)
    - ***max*** to prevent run-off
  - ***min*** binder contents (durability and abrasion resistance according to the Cantabro test)



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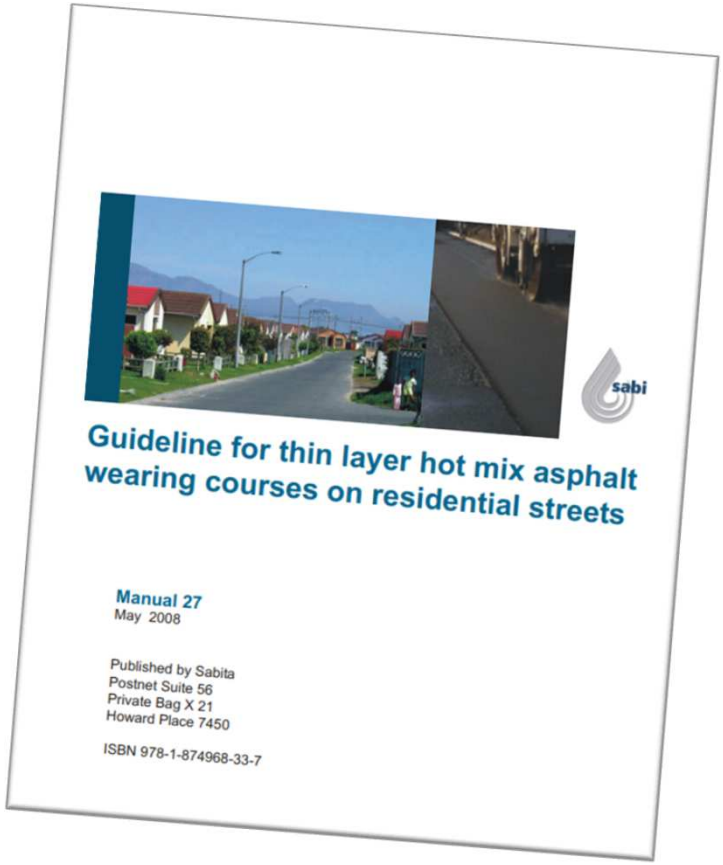
Light traffic (residential areas)

Sabita Manual 27:
Guidelines for thin layer hot mix asphalt wearing courses on residential streets


Guideline for thin layer hot mix asphalt wearing courses on residential streets

Manual 27
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Special considerations

- Usually asphalt manufacturers have ***standard mixes*** & should be approached to for supply
- Thin layers - susceptible to ***rapid cooling***
  - Difficult to achieve adequate ***compaction***
  - ***Extra care should be taken in both the design and construction procedures to ensure that adequate densification will be achieved***
  - base course finish may not be of the highest quality, hence layer thickness control may prove to be a challenge
- ***Sand skeleton*** mixes preferred
- ***Soft binder grades*** to prolong compaction window

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Warm mix asphalt (WMA)

- Sabita Manual 32:
  Best practice guideline for warm mix asphalt

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WMA Features

- ***Manufacturing*** and paving of asphalt mixes at significantly ***lower temperatures*** than conventional asphalt
  - Conventional asphalt: 140°C - 160°C
  - ***WMA*** typically produced at ***100°C - 140°C***
- Quality of WMA = that of conventional asphalt
- Health, environmental and engineering ***benefits associated*** with the use of ***WMA***. (These are listed in Manual 32)

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WMA technologies

- Technologies used for ***coating*** and ***workability***
- Ready to use binders or additives during mixing
- Categories of technology
  - ***Water technologies***
  - ***Chemical additives***
  - ***Rheological modifiers***

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Technology categories

- ***Water technologies***
  - Binder foam system
  - Water bearing chemicals (Zeolites)
  - Moist fine aggregate addition systems (LEA)
- ***Chemical additives***
  - Little effect on rheology of the binder
  - Reduction of surface tension – lubricating
  - High solid emulsions
- ***Rheological modifiers***
  - Viscosity modifiers

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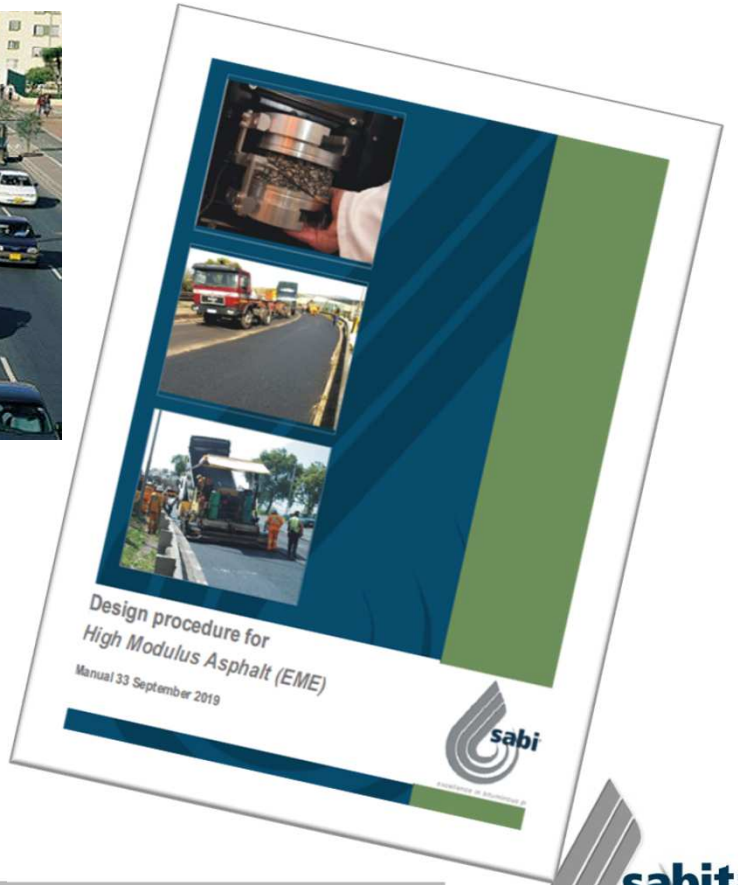
EME

***E**nrobé* à ***M**odule **É**levé* – High Modulus Asphalt

Very heavy – extreme traffic situations – up to ***100 million E80s***



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EME properties

- ***Very high stiffness***
  - reduced tensile strains
  - superior load transfer to substrates
  - significantly reducing the stresses in underlying layers
- ***High binder content*** enhanced ***fatigue*** life
- ***High stiffness binder*** (10/20 pen), in conjunction with a ***sound aggregate structure*** offers high ***resistance to rutting***

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SMA

- Covered in ***Appendix B*** of Manual 35
- ***Premium asphalt wearing course***
  - Durable - suited to high traffic volumes
  - Superior skid resistance;
  - Excellent ride quality;
  - Low noise levels;
  - Low tendency of back spray under wet conditions.

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Composition

- ***Super stone skeleton*** mix
- Voids filled with a voidless binder rich mastic
- Binder may contain fibres or modifiers to prevent drainage during handling
- Key requirement: volumetrics should ***not permit dilation of the stone matrix*** by over-filling with mastic

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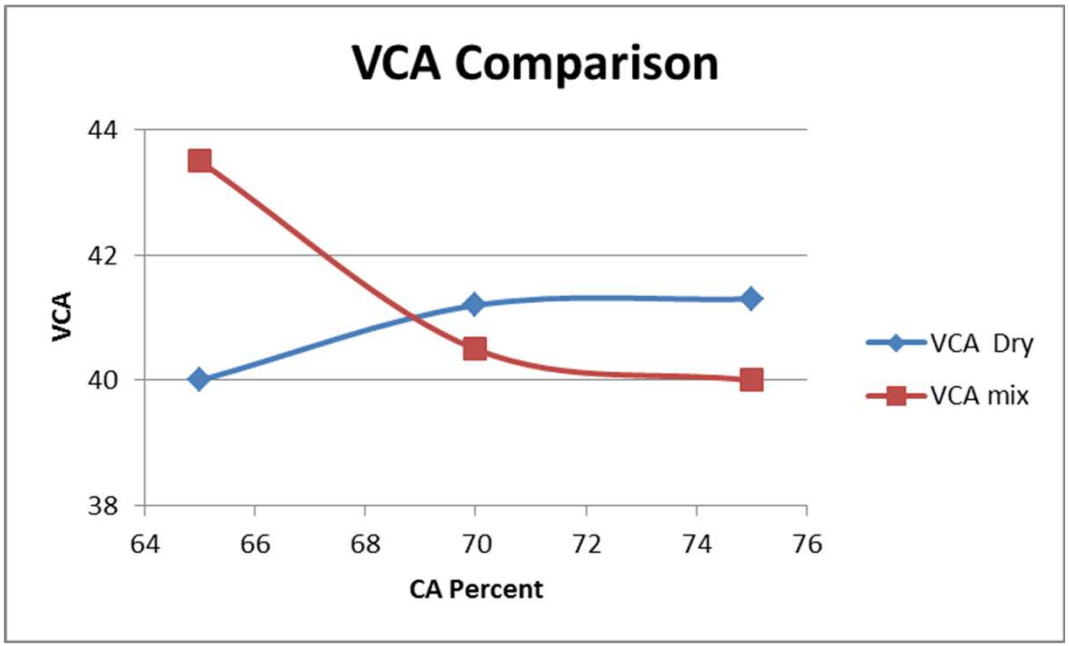
Ensuring stone skeleton

- VCA $_{MIX}$ i.e. the volume in between the coarse aggregate particles (filled with filler, fine aggregate, air, binder, (and fibre) < VCA of the dry aggregate



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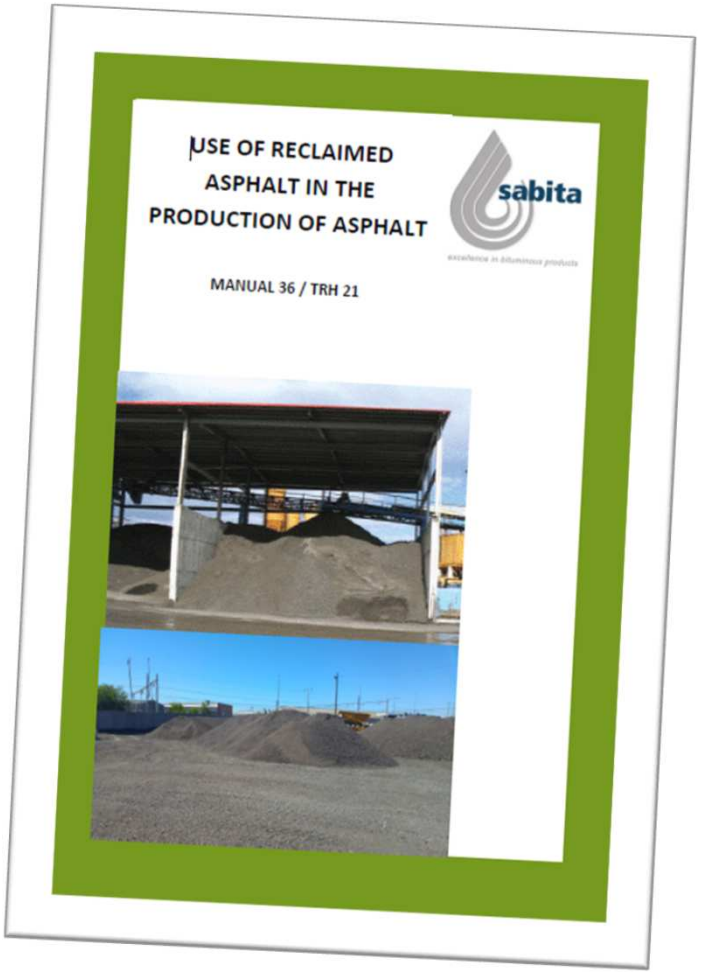
Mixes with RA

- Mixes with ***> 10% of RA*** now ***common practice*** in SA
- Now part of the ***skills profile*** of asphalt designers
- Proportions of new aggregate, new binder and RA to ***meet specifications***
- RA content determined by ***mix design*** characteristics, ***NOT*** by:
  - an asphalt ***plant's capability***
  - ***client perceptions*** of the maximise the use of milled material available



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Good practice

- Fractionating of RA recommended to ***improve uniformity***
- ***Binder designed*** to meet requirements of final mix; may require:
  - use of soft binder
  - use of rejuvenators

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User Guide for the Design of Asphalt Mixes

Manual 24 June 2022

(A practical guide for the application of the general procedure for designing asphalt mixes as set out in Sabita Manual 35 / TRH8)

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Questions?

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