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

7. Special mixes

SARF Manual 24 – 25 Nov. 2020

Joanne Muller

sabita
excellence in bituminous products

1

Elements

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

You are here

sabita
excellence in bituminous products

2

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

3

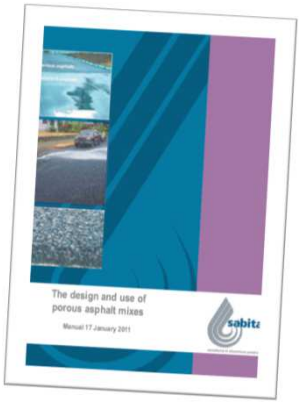
Cold mix asphalt

- 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 recently revised*** and updated.

4

Porous Asphalt

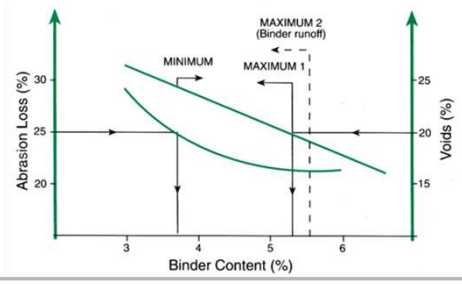
- ***Stone skeleton*** mixes
  - NMAS 10 -14mm mm
  - approximately 11% passing the 2 mm sieve)
  - 3,0 and 4,0 % of filler
  - ***void content ≈20%.***
- ***High binder film thickness*** is usually for improved durability.
- Contains either fibre ***additives*** or modified binder or both to:
  - to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



5

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)



6

Light traffic (residential areas)

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

7

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

8

Warm mix asphalt (WMA)

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

9

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)

10

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***

11

Technology categories

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

12

EME

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

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

sabita

13

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 ***stone skeleton*** offers high ***resistance to rutting***

sabita

14

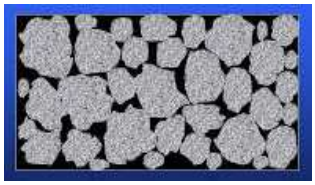
SMA

- 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.

15

Composition

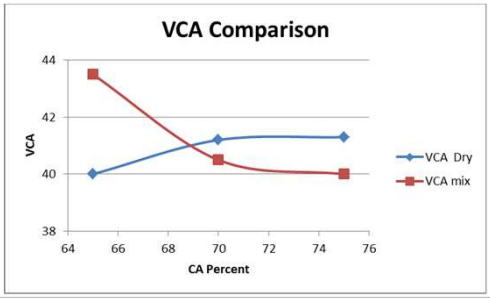
- ***Super stone skeleton*** mix
- Voids filled with a voidless binder rich mastic
- Binder may contain fibres or modifiers to prevent drainage during handling
- Key requirement: volumetrics should ***not permit dilation of the stone matrix*** by over-filling with mastic



16

Ensuring stone skeleton

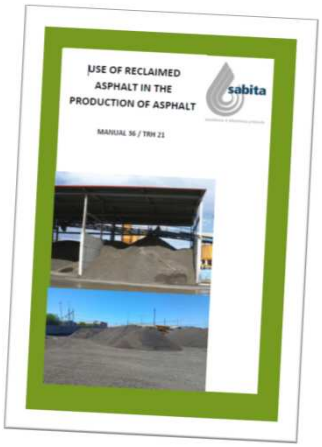
- VCA $_{MIX}$ i.e. the volume in between the coarse aggregate particles (filled with filler, fine aggregate, air, binder, (and fibre) < VCA of the dry aggregate



17

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

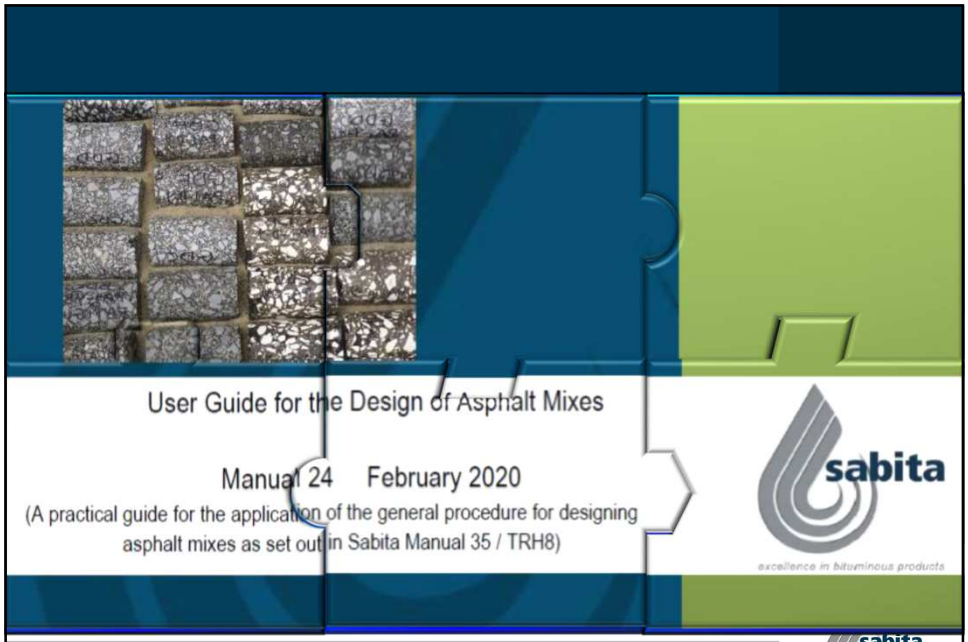


18

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

19



Questions?

20