New Sabita Manual 42 SMA

SMA

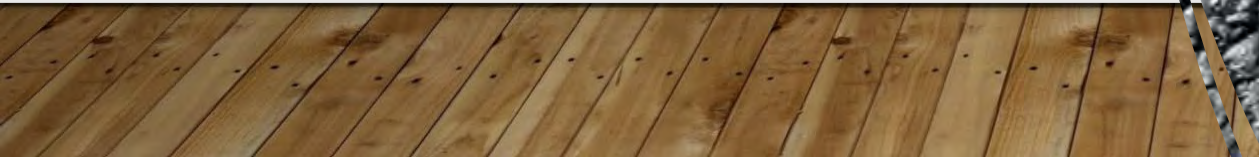SPLITTMASTIXASPHALT – GERMAN

STONE MASTIC ASPHALT – ENGLISH
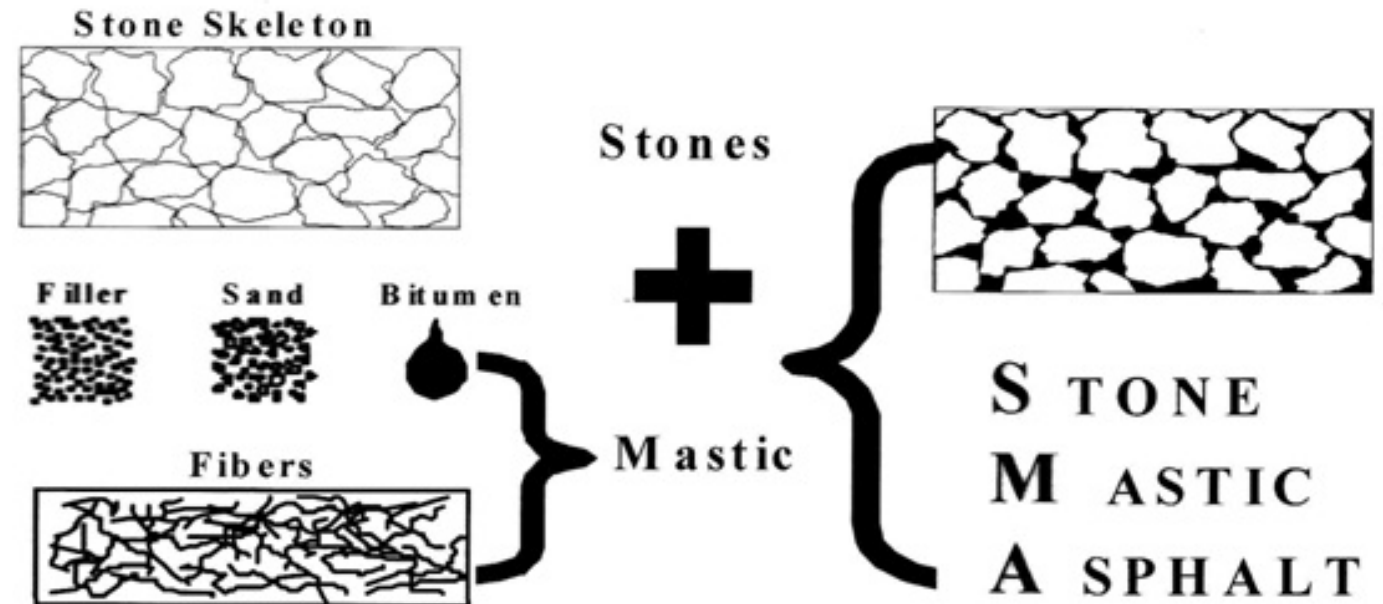
STONE MATRIX ASPHALT - US

SMA FEATURES

- Surface friction

- Surface drainage

- Noise attenuation

- Extremely durable

- Deals elegantly with both durability and permanent deformation
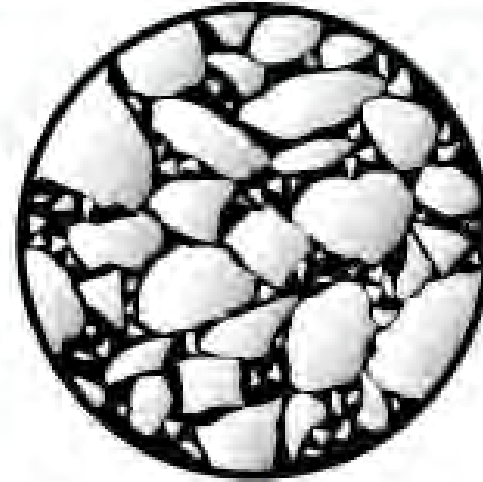
COMPONENTS

- Coarse Stone skeleton

- Mastic:

  - Fine aggregate

  - Filler

  - Bitumen

  - Stabilising agents (fibres)

COMPARISON

SMA a **_binary system_** of stone & a mastic consisting of fine aggregate, filler, binder and stabilising agent (e.g. fibres_

Stone Matrix Asphalt SMA

Conventional Hot Mix Asphalt HMA

DEVELOPMENT OF SA PRACTICE

- Manual 35 refocused on conventional dense asphalt, e.g. sand skeleton mixes

- Section on structure (volumetrics) on SMA removed

- Sabita TDFP examined the need to develop a stand-alone best practice document on SMA

- Having consulted with road authorities and stakeholders in the road and asphalt industries the need was affirmed

- Develop a new manual under the guidance of a specialist group to be appointed under the auspices of the Sabita TDFP

- Regular interaction with other bodies e.g. RPF, COTO

TDFP 31 OCTOBER 2024

- Appoint a specialist task group to formulate a project

- Deliverables

  - Comprehensive design method

  - Guidelines on construction
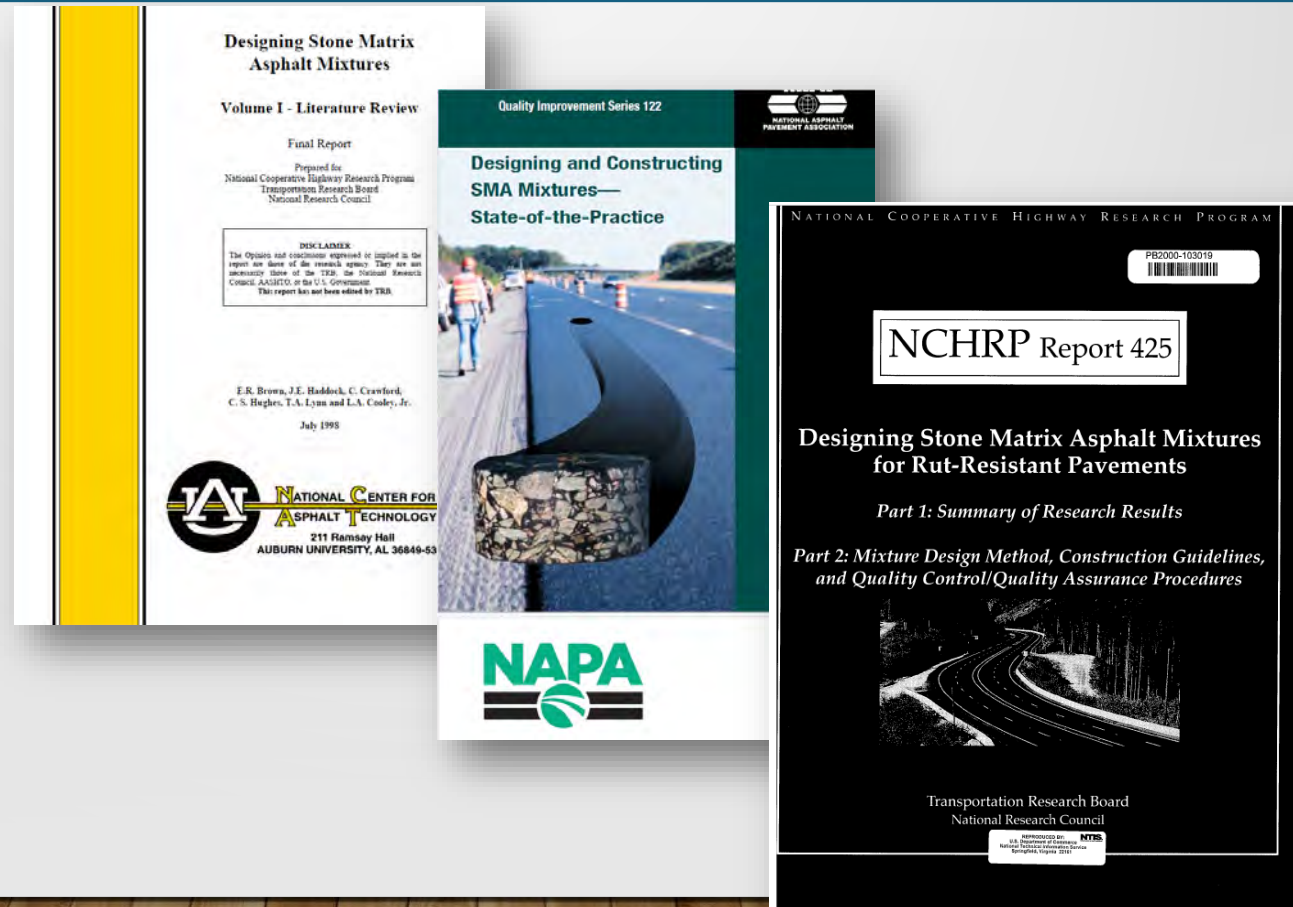
  - Guidelines on QC QA

STARTING BLOCKS

- SAT webinar in October 2023

- Sabita Study tour September 2024 (SMA)
  - Europe focus on design gradings (high level QC on agg. grading compliance)
  - USA focus on volumetrics (explicitly achieving stone skeleton)
  - Guidelines on construction
  - Guidelines on QC QA

EVOLUTION OF STANDARD IN USA

Since 1998 …

NATIONAL USA STANDARD

… to 2008

Standard Practice for

Designing Stone Matrix Asphalt (SMA)

AASHTO Designation: R 46-22[1]

Technically Revised: 2022   Editorially Revised: 2022

Technical Subcommittee: 2d, Proportioning
of Asphalt–Aggregate Mixtures

AASHTO

American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, DC 20004

Standard Specification for

Stone Matrix Asphalt (SMA)

AASHTO Designation: M 325-08 (2021)[1]

Adopted: 2008   Reviewed but Not Updated: 2021

Technical Subcommittee: 2d, Proportioning
of Asphalt–Aggregate Mixtures

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WHAT IS SMA?

- As per AASHTO 46:

- 3.1. *Definitions*:

- 3.1.1. *stone matrix asphalt (SMA)* - an asphalt mixture consisting of **two parts**, a coarse aggregate skeleton and a rich binder mortar (mastic).
The mixture must have an **aggregate skeleton with coarse aggregate-on-coarse aggregate contact** (generally referred to as stone-on-stone contact).

- Stone to stone contact is **explicitly a design objective**

- The coarse aggregate is generally considered to be that fraction of the aggregate retained on the 4.75-mm (No. 4) sieve but may be designated as other sizes.

PROGRESS

- Convened an expert work group

- Met March 13th, 2025

- *Affirmed adoption of AASHTO standards as a basis*

- Identifying additional requirements

- Identifying and assigning tasks

- Complete by mid 2026(?)

Table 1—Coarse Aggregate Quality Requirements

Test		Method	Minimum	Maximum
Los Angeles (L.A.) abrasion, % loss		T 96	—	30[a]
Flat and elongated, %[b]	3 to 1	ASTM D4791	—	20
	5 to 1	ASTM D4791	—	5
Absorption, percent		T 85	—	2.0
Soundness (5 cycles), %[c]		T 104		
Sodium sulfate or			—	15
Magnesium sulfate			—	20
Crushed content, %		ASTM D5821		
One face			100	—
Two face			90	—

[a] Aggregates with higher L.A. abrasion values have been used successfully to produce SMA mixes. However, when the L.A. abrasion exceeds 30, excessive breakdown may occur in the laboratory compaction process or during in-place compaction.

[b] Flat and elongated criteria apply to the design aggregate blend.

[c] Sodium sulfate or magnesium sulfate may be used. It is not a requirement to perform both methods.

WORK GROUP COMPOSITION

- **Road authorities;**
  - SANRAL – Gerhard Fourie
  - WCG – Melanie Hofmeyr
  - Gauteng PG – Adreo Brits
- **Asphalt manufacturers / contractors**
  - Robson Francis (National Asphalt)
  - Joanne Muller (Much)
  - Greg Reynolds (Tau Pele)
  - Phil Hendricks (Sabita)
- **Consulting engineers**
  - Steph Bredenhann (Naidu Consulting)
  - Willem du Toit (WSP)
  - Wim Hofsink (WHCES)
  - Emile Horak
  - Andre Greyling (BVi)
  - Benoit Verhaeghe
- **Academia**
  - Julius Komba (UP)

WAY FORWARD

- Gradings
  - Design OUTPUT for quality control (QC)
  - Design INPUT for trial gradings only
- Trial design mixes conforming to grading envelopes must comply with the key requirement that **VCA_{MIX} is less than VCA_{DRC}** and meet VMA requirements
- The application of the Bailey design (CUW: 110% - 125% of RUW) could be considered as a supplementary or alternative approach.
- When the specific gravity of the component aggregates differs by more than 0.20, gradings are based on volume.
- It is essential to verify the relationship between Gyratory and Marshall compaction, e.g. 50 blow Marshall with 100 SGC cycles. Locking-point will also be investigated.
- Adjustments to sieve sizes and the relevant applicable standards need to be considered.

ON RELATIONSHIP BETWEEN VCA$_{MIX}$ AND VCA$_{DRC}$
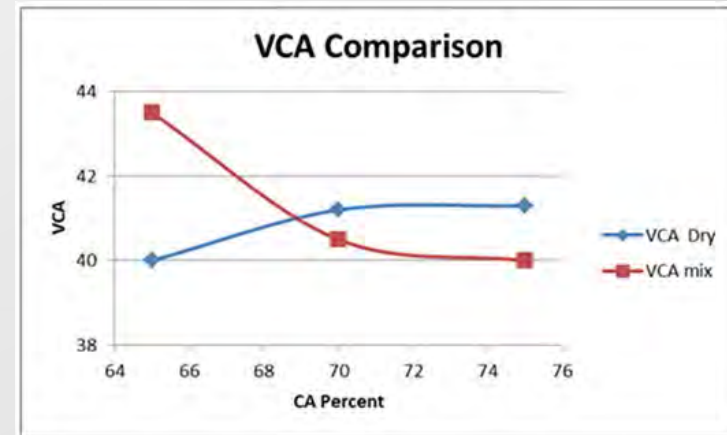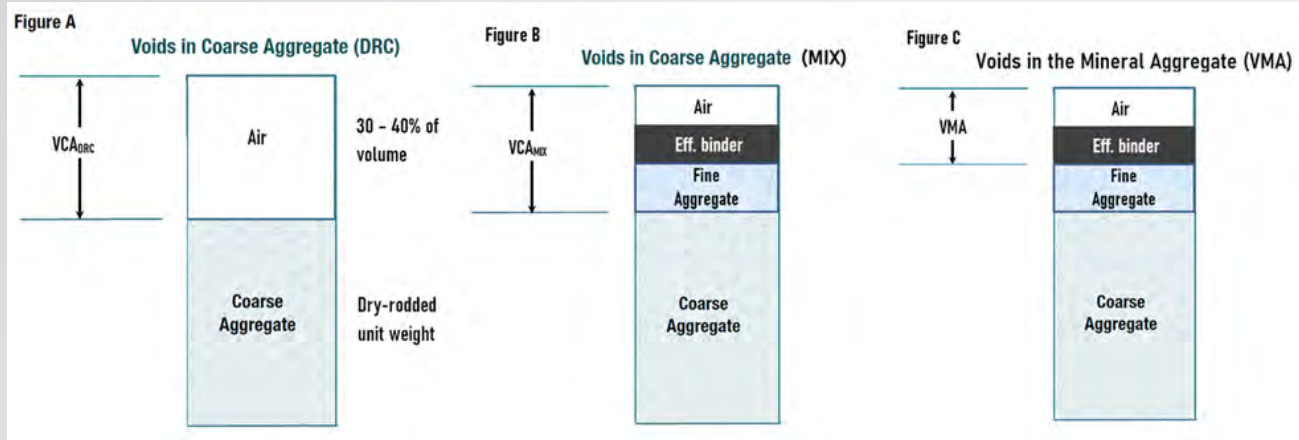
FORWARD / CONT.

- **Mastic Design**
  Mastic classified into two categories:
  - fine aggregate (> 0.075 mm)
  - filler (< 0.075 mm).

- Research suggests that an optimal voids content is typically achieved with a fine aggregate to filler ratio of 4:1
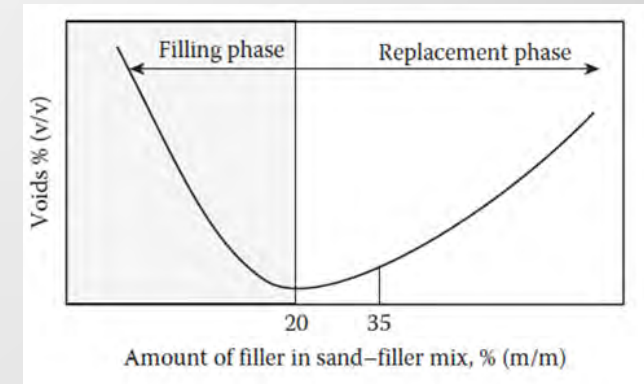
- **Preparation of Compacted Lab Specimens**

- **Verification of Standards and Methods Related to:**
  - Bitumen
  - Aggregates
  - Filler
  - Stabilising agents
  - Drainage

- **Ensuring that the quarry industry consistently meets quality standards**

- **The necessity for texturing (gritting) of freshly laid SMA**

Filling phase   Replacement phase

Voids % (v/v)

20   35

Amount of filler in sand–filler mix, % (m/m)

FIRST STEPS

- **Task group**: Develop a protocol for the preparation of compacted laboratory specimens with due regard to aggregate resistance to abrasion and absorptive properties

- **Meeting of Sabita with ASPASA** to assure that the stringent requirements regarding asphalt quality and CONSITENCY can be met
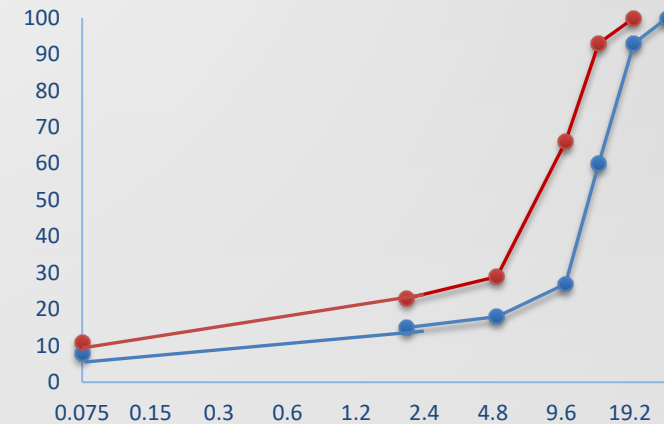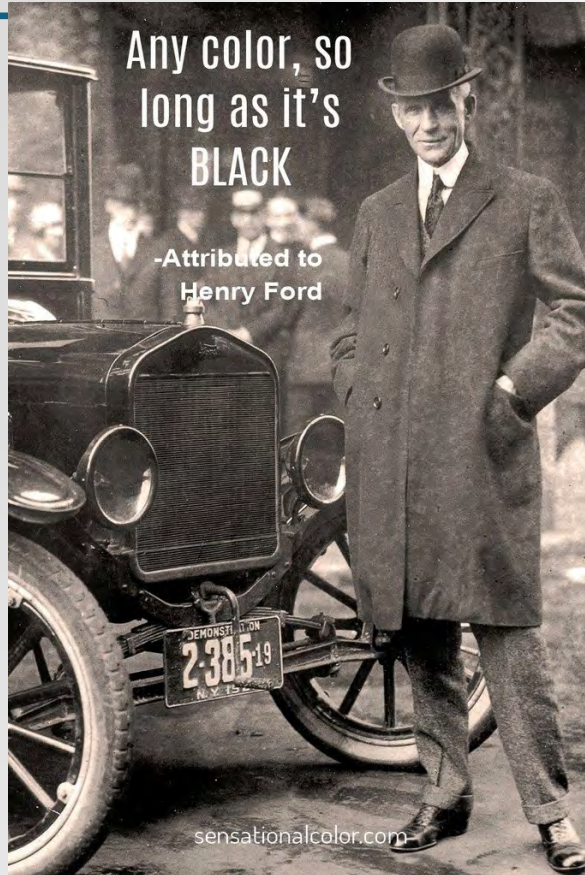
PARTING THOUGHTS

- SMA gradings are design OUTPUTS not INPUTS

- *Primary requirement: $VCA_{MIX} < VCA_{DRC}$*

Max Aggregate Size 20 mm

MODEL T FORD

Any color, so long as it's BLACK
-Attributed to Henry Ford
sensationalcolor.com

SMA – "Any" grading so long as
$$VCA_{MIX} < VCA_{DRC}$$