SMA – Stone Mastic Asphalt

A Wearing Course for High Traffic/High Load Applications

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Layered Pavement Design

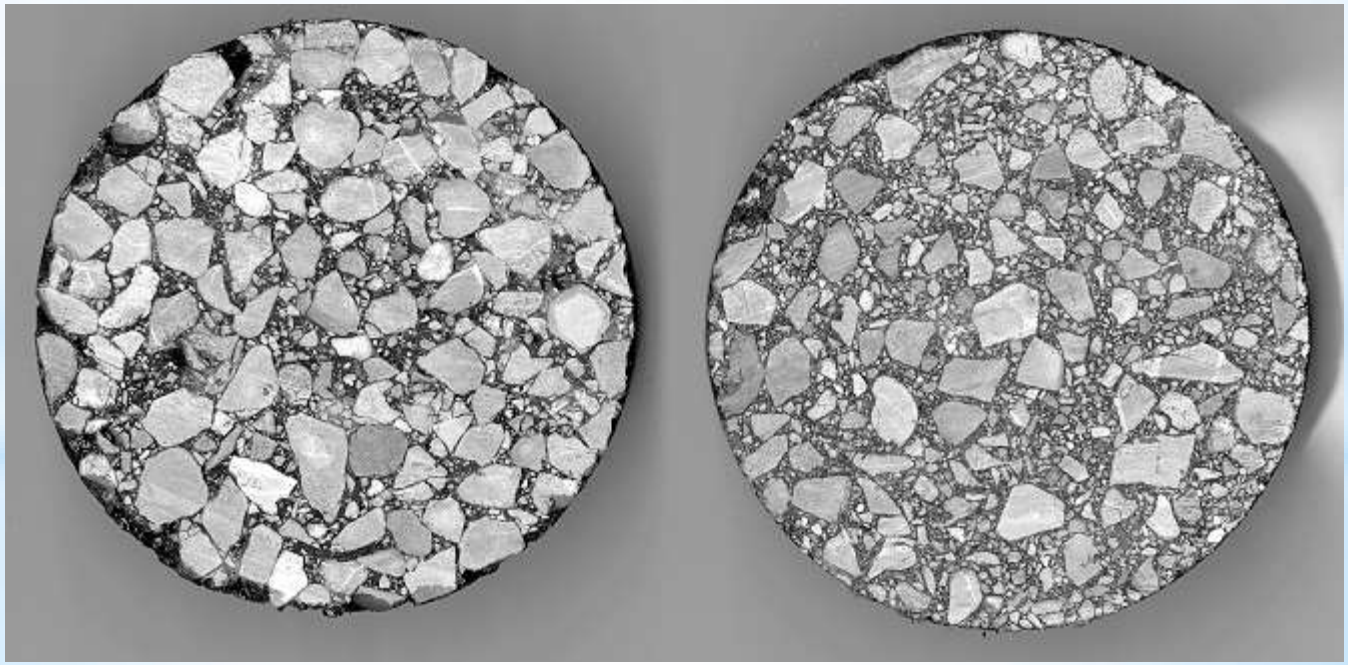
Start with foundation but also start with the "end in mind"..the wearing course

SMA

Stone Matrix Asphalt is a coarse graded rut resistant engineered hot mix asphalt surface layer.

It is composed of a strong aggregate skeleton, and a binder mastic composed of a high asphalt cement content, a cellulose or mineral fiber and high percentage of mineral filler.

Comparison
SMA – Dense Graded HBP



USA History

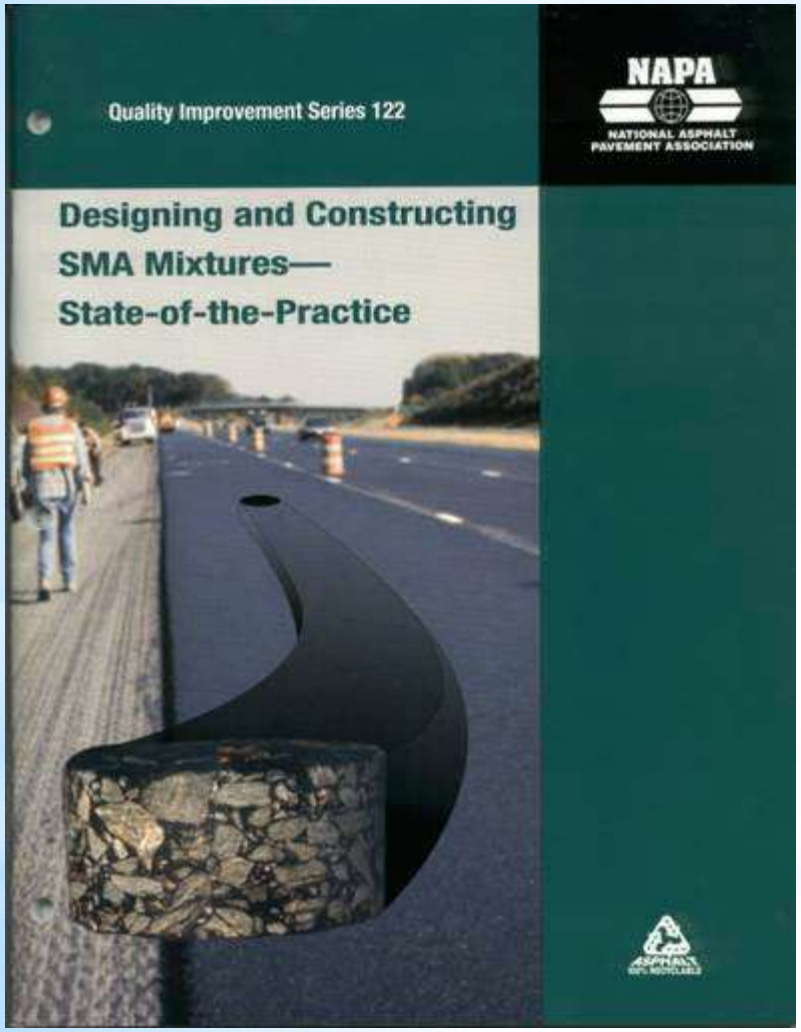
* Result of 1990 European Asphalt Study Tour
* Used in Europe for more than 20 years
* 1991 TWG
* 1994 first guidelines printed
* 1991 first SMA placed in US ~ 4 states
* 1997 over 28 states had tried
* 1999 NCAT developed mix design

SMA in the USA

SMA: 1991-1996

(100 projects/28 States/2 million tons)

* Marshall- 50 blow design
* 80% used 19 mm gradation
* 2/3 of projects 6% or more asphalt cement
* 65% used fiber
* Thickness 1.5 to 2 inches, typical surface layer
* Majority had 95% or better in-place MTD



. Summary of History
. TWG Guidelines
. Current Practices
. NCHRP 9-8 Results

Performance

NCAT Study (85 Projects)

- Rutting: 90% Projects < 4mm
- 25% of Projects = No Measurable Rutting
- More resistant to cracking
- No evidence of ravelling

Performance

- Georgia
  - 30%-40% Less rutting
  - 3 - 5 times greater fatigue cracking resistance
- Germany
  - 20 - 30 year service life
- Noise
  - 2 - 7 dB(A) quieter than dense graded HMA

Typical Aggregate Requirements

LA Abrasion	30 Max.
Flat & Elongated	20% max. (3:1)
	5% max. (5:1)
Soundness (Na_2So_4)	15 % max.
Crushed Face	100% min.
FAA	45 min.
PL/LL	NV/NP

Typical Aggregate Requirements

Nominal Maximum Aggregate Size SMA Mixes

4.75 mm (1/4”)
9.5 mm (3/8”)
12.5 mm (1/2”)
19 mm (3/4”)-*Non Surface/Wearing Course*
25 mm (1”)-*Non Surface/Wearing Course*

Typical Aggregate Requirements

Typical Mixture Requirements

Design Compaction	Marshall 50 blow
	SGC 75 Ndes
Asphalt Content	6% Min.
Air Voids	4.0%
VMA	17.0 min.
TSR	70 min.
Draindown	0.3% Max.

Production

- Calibrate mineral filler, fiber and antistrip & maintain interlock
- Establish and maintain mixing time
  - It may be longer
- Use multiple drops when loading trucks
- Minimize storage time
  - Temperature and draindown

Summary

- SMA is a premium high performance surface
  - Rut resistant
  - Crack resistant
- Requires high quality materials
  - Hard cubical aggregates
  - Polymer modified asphalts
  - Fibers and quality mineral filler
- Provides a high friction/low wear surface (eliminating chip seals or surface treatments)
- Can be placed at a lift thickness of 1-1/2” to 1-3/4” (12.5 mm NMAS)
- Yield = 1,300 ton/mile for 1-1/2” thickness @ 26’

SMA: Stone Mastic Asphalt

A Look at the Evolution of Class S Mix in South Dakota

First "Designed" SMA in SD:
Class S "Modified"
Interstate 29 Beresford-Canton
2004

Class S Modified Tonnages in SD

Year	Tonnage
2012	33,450
2011	208,700
2010	121,700
2009	243,700
2008	46,500
2007	0
2006	98,000
2005	50,000
2004	60,000
TOTAL	*862,050*