

SMA - Stone Mastic Asphalt

**A Wearing Course for High Traffic/High
Load Applications**

**North Dakota Asphalt Conference
April 2, 2013
Bismarck, ND**

Layered Pavement Design

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

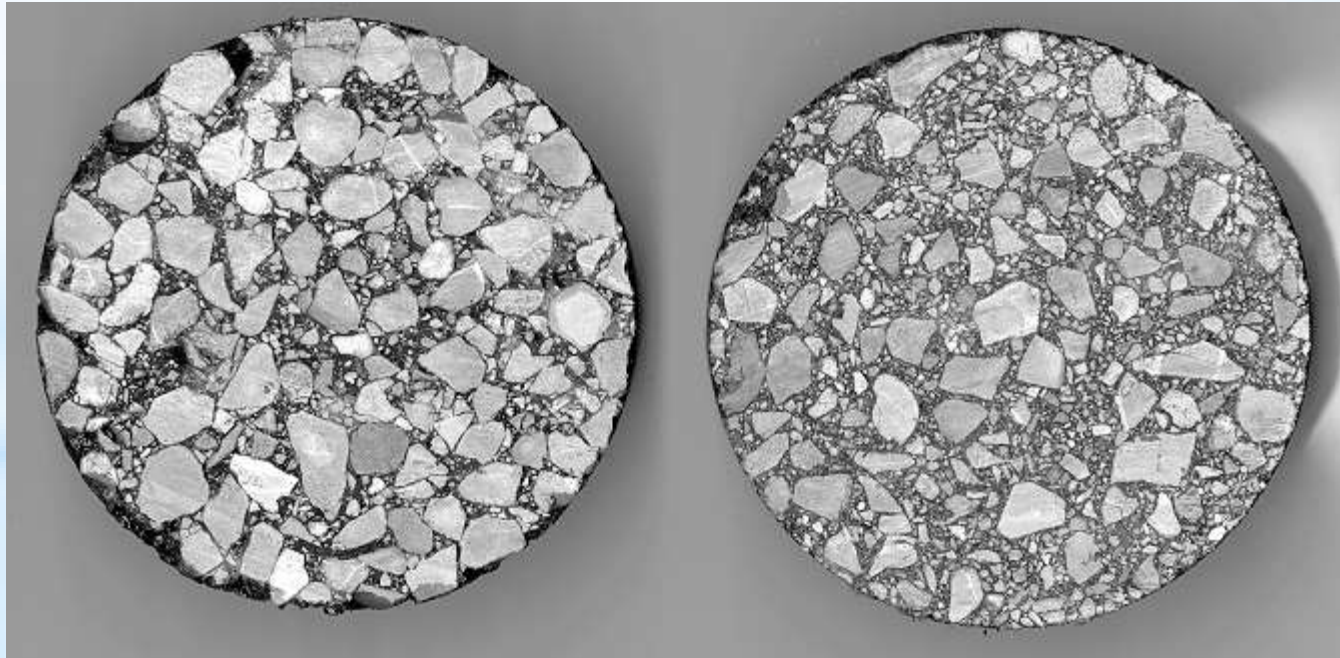


SMA

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

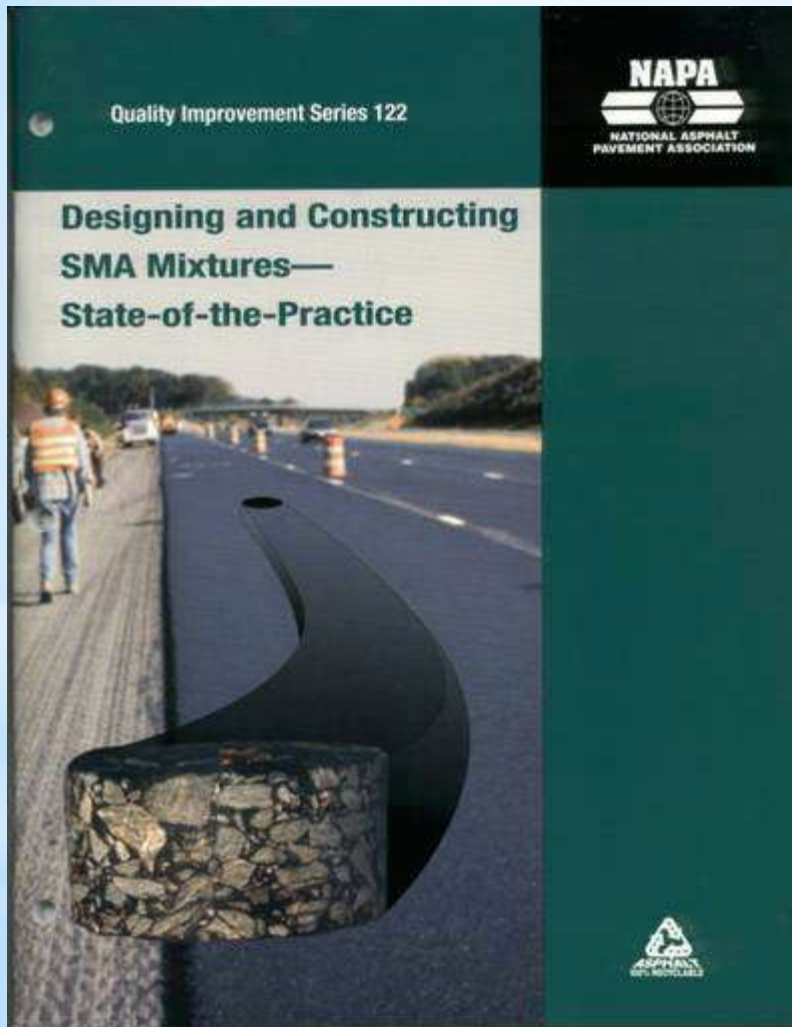
- * Result of 1990 European Asphalt Study Tour
- * Used in Europe for more than 20 years
- * 1991 TWG
- * 1994 first guidelines printed
- * 1991 first SMA placed in US ~ 4 states
- * 1997 over 28 states had tried
- * 1999 NCAT developed mix design

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")

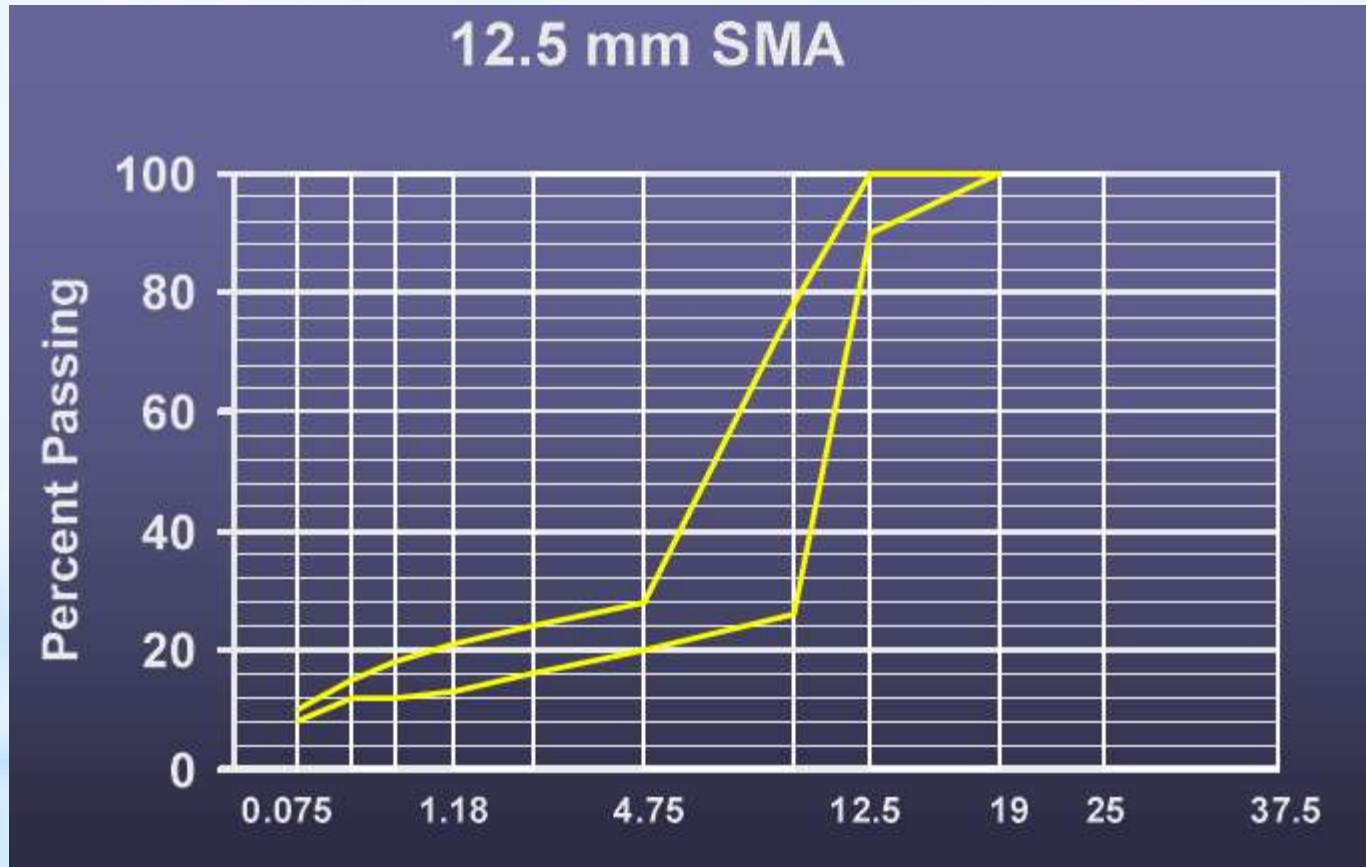
9.5 mm (3/8")

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