

SMA....and other thin surfacings the "modern" option

The New Black!

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Origins of 'Modern' SMA /NTS/TSCS

- Became widely used during 1990's.
 - More than 15 years experience
- SMA in the UK is a variation on the original German "splittmastixasphalt" [fibres] and French Béton Bitumineux Très Mince [BBTM] [polymers]
- Lots of proprietary versions (often the same thing under different names!)
- Most common form was with 14mm aggregate .
 - Followed by 10mm & now increasingly 6mm
- Generally designed to have more texture depth than EU mixtures
- Durability is generally related to texture depth
 - Early presentations showed lives between 8 years and 25 years in Germany
- Longer lives achieved by
 - Designing the mixture to be open.
 - Polymer modified binder or thick binder film thickness using fibres
- Shorter Lives achieved by

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- minimum binder contents
- minimum compaction. Sometimes unavoidable as a result of weather at time

• Recent trials of more dense (& lower textured) "6-ish" mm mixtures look good.

- All proprietary materials satisfy EN 13108- 5
 - Which has a wide target grading envelope
 - Including EN 13108-20 and 21
 - Only Wheel Tracking for Performance
- Used in UK for binder course
- EN products are 'in the back of the lorry'



- BBA HAPAS approved surfacing materials
 - Are a sub-set of EN 13108-5
 - Have additional performance tests
 - Include installation







HAPAS Requirements

Applicability of test Test Performance Parameter Levels⁽¹⁾ HD36/99⁽²⁾ Polished Stone Value Data always required Laboratory PSV for aggregates used for tests: of the aggregate. installation / HD36/99⁽²⁾ AAV Aggregate Abrasion Value performance trial Wheel tracking⁽³⁾ Wheel tracking rate (mm/hr) Required when the (45°C and/or 60°C) nominal laid thickness + 0 - 3 Depth of rutting (mm) claimed regulating depth ≥20 mm Record⁽⁶⁾ Torque bond test⁽⁴⁾ Shear stress (kPa) Always required Installation depth (mm) Record Always required Sensitivity to water Retained stiffness after water Always required Record immersion (ITSM Ratio) Road tests: Visual observations Initial Always required -Required for Visual assessment by After 2 years trial period 0 - 6 performance trials only inspection panel Texture depth⁽⁵⁾ Initial texture depth (mm) Always required 0 - 3 Retained texture depth (mm) 0 - 3 Required for Determine rate of decline Record performance trials only

Table 2: Mandatory tests



What's in it?

Aggregate, binder, filler & fibres (most common)



0.25mm fraction (note presence of cellulose fibres)

0.063mm fraction (note presence of cellulose fibres)

10mm aggregate (note good shape)

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What does SMA surface course look like?







What does SMA binder course look like?





Asphalt Concrete binder course



SMA binder course

- Low voids
- High binder content
- Aggregate skeleton mix
 - Strength and deformation resistance by point to point contract between aggregate particles
- Durable
 - Waterproof
 - Water resistant
 - Rut resistant





SMA keeps the foundation dry as well



Using an SMA binder course



Climate Resistance

- SMA offers potential to help us meet Climate Change Adaptation needs.
 - Warmer climate = increased rate of ageing.
 - Warmer & wetter winters = increased deterioration
- Significant threats to binder film & binder/aggregate adhesion.
- Ageing of asphalt is key to its durability.
- SMA has less propensity to ageing as
 - Greater binder film thickness
 - Lower voids reduces access to ageing
 - With appropriate mix design and aggregate selection





Thicker binder film= better climate & age resistance







But is it up to the job?



Best Practice Guidelines for Surfacing

June 2006

"Enquiry responses have indicated generally that NTS is **performing equally well or better than traditional materials** in most circumstances on local authority highways."





Thick binder film = increased skid risk?

Had some bad (& often ill informed) press over initial skid risk & durability concerns, mainly with generic SMA

The binder film masks the microtexture of the aggregate initially.

In itself the binder can melt under extreme braking



Nice new shiny surface



Types of Texture

• **Positive Texture** some aggregate protrudes above the true running line of the tyre:

 E.g., chipped hot rolled asphalt, surface dressing

Water escapes from under tyre largely via tread but also through texture depth

Minimum TD required 1.5mm





Types of Texture

- Negative Texture aggregate generally lies in the true running line of the tyre:
- E.g. SMA, porous asphalt

Water escapes from under tyre via tread, texture depth and via subsurface interconnected voids

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Minimum TD required 1.3mm

Further reductions in TD are anticipated 15/10/2009

Claimed problems with SMA

Early life friction? - no problem!

Correct treatment prior to opening = traffic friendly surface

IL > 0.45 and traffic speed >30mph





Claimed problems with SMA

Difficult to Lay?

No!

But poor understanding of material & poor laying practice has given SMA a bad name!





Data in HAPAS Certification usually only relates to material for heavily trafficked highways

Other binders are possible and may be preferable 15/10/2009

Claimed problems with SMA Difficult to Lay?

No!

But poor work can easily lead to segregation & early failure!





Why poor work?

 Poor workmanship at joints



Cold material





Laid too thin



Poor compaction



Contractor responsibilities 15/10/2009

Why poor work?

Traffic management



• No binder course



Inadequate support



• Night time working



Client responsibilities





15/10/2009

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Claimed problems with SMA

Not suited to small areas?

Yes it is! Patching mix with increased resistance to softening, tar, water etc..

Select the correct grade

HAUC Spec only permits BBA HAPAS approved







Crack Resistance

		Aggregate		Toughness
Rank	Product	size (mm)	Supplier	$[N/mm^{1.5}]$
1	SuperFlex	14	Bardon	36
2	HRA SC SBS	30/14		35
3	Axophalt Compave	10	Lafarge	33
4	MasterPave	14	Tarmac	31
5	HRA SC 50pen	35/14	Ringway	29
5	MasterFlex	14	Tarmac	29
5	MasterFlex	10	Tarmac	29
5	MasterPave	20	Tarmac	29
5	ULM - H	10	Ringway	29
10	SMATex	14	Bardon	27
11	SMATex	10	Bardon	26
11	SMA	10	Ringway	26
13	SMA	14	Ringway	25
14	MasterPave	10	Tarmac	24
15	ULM - U	10	Ringway	23
15	ULM - U	14	Ringway	23





Italics denotes fibres rather than polymer modified binder



But is it up to the job?



"The wide variety of proprietary system surfaces which are available broadens the scope of sites that are potentially suitable for their application.

We now have 15 years experience in their use



Reduction in tyre noise



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Effect of resurfacing 6mm TSCS Loose Road Maidstone



5.9 dBA reduction [RSI] [CRTN]

Skid resistance of HRA, Surface Dressing and SMA



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Effect of aggregate size on SFC [TSCS]



LANE 1

A34 Winchester

Roe PG , A Dunford and GI Crabb 2008 HA /QPA/RBA collaborative research programme 'Surface requirements for Asphalt Roads' **PPR 324** TRL



- ✓ Durable
- ✓ Good Climate Resistance
 - ✓ Resistant to water and ageing
- ✓ Deformation Resistant
 - ✓ Even when hot
- ✓ Good Ride Quality
 - \checkmark especially with a binder course
- ✓ Easy to Lay
 - \checkmark within a lane; with a small gang
- ✓ Good Skid Resistance
 - ✓ maximises the 'effective PSV' of the aggregate
- ✓ Low Noise
 - ✓ thanks to negative texture and aggregate size used
- ✓ Reduced spray
 - ✓ Except for the heaviest storms
- ✓ Reduced rolling resistance
 - ✓ Improved fuel consumption



SMA Benefits

High Quality QA and

5 year guarantee *

[*if requested]

Horses for Courses



AC

HRA



and the winner is

SMA TSCS











WHAT VISCOSITY DO YOU WANT YOUR COFFEE ?"