The Institute of Asphalt Technology
Irish Branch

SMA
Specification and Durability Characteristics

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Specifications

I.S. EN 13108-

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

ICS 93.080.20

English Version
Deutsche

Bituminous mixtures - Material specif

Mélanges bitumineux - Spécifications des matériaux - Partie 5: Béton bitumineux grenu à forte teneur en mastic

This corrigendum becomes effective on 30 Januar language versions of the EN.

Ce corrigendum prendra effet le 30 janvier 2008 p linguistiques officielles de la EN.

Die Berichtigung tritt am 30.Januar 2008 zur Einar EN in Kraft.

EUROPEAN COMMITTEE
COMITÉ EUROPÉEN
EUROPÄISCHES KOM

Management Centre: rue de

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NSAI Standards

Draft S.R. 28:201x - Re

Draft for public enquiry

Title: Recommendation for the use and implementati series bituminous mixtures – material specifica

Public enquiry commences: 21-10-2017
Public enquiry closes: 21-11-2017

Readers are warned that this draft is subject to ongoi and change.

Any comments or proposed changes submitted will be relevant technical panel.

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

TII Publications

GE PE DN CC DP AM RE

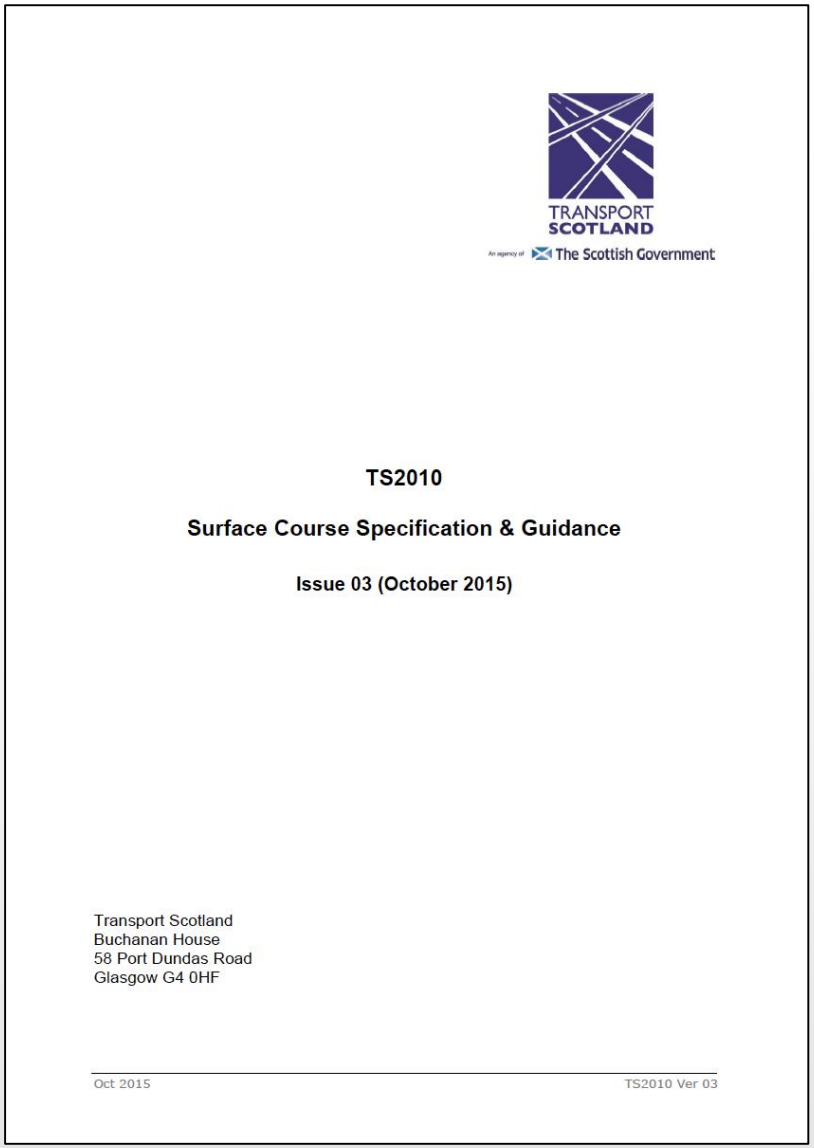
Specification for Road Works
Series 900 - Road Pavements -
Bituminous Materials

CC-SPW-00900
September 2017

CC Construction & Commissioning

Standards

Specifications


TRANSPORT SCOTLAND

An agency of The Scottish Government

TS2010

Surface Course Specification & Guidance

Issue 03 (October 2015)

Transport Scotland
Buchanan House
58 Port Dundas Road
Glasgow G4 0HF

Oct 2015 TS2010 Ver 03

Transport Scotland:

- Problems with the quality and in-service performance of Stone Mastic Asphalt
- Put measures in place to adjust the specification and improve quality control
- Became apparent that Germany produced SMA that was reliable, durable and fit for purpose
- Research became concentrated on the German specifications and practices…

SMA Specification comparisons

Constituent requirements	TII Since 2015	NRA 2010	SR 28 2017 draft (end use Public Roads)	TS 2010
Coarse Aggregate	PSV DN-PAV-03023 (HD36)	PSV 60	HD 36 (SR17)	HD36 / declared note 1
	AAV DN-PAV-03023 (HD36)	AAV 10	HD 36 (SR17)	AAV 12
	LA 25			LA 30
	FI 15		FI 20 (SR 17)	FI 20 (<15 Ideal)
	F_4			
				Micro Deval declared
Fine Aggregate	Crushed Rock PSV 55+	Crushed Rock, Sand or mixture		Crushed Rock
	F_{22}			
Filler	Limestone, Hydrated Lime or Cement		Crushed rock, Hydrated Lime, CEM	Limestone or Hydrated Lime
	not reclaimed	including reclaimed		All Limestone
Binder - PMB	PMB 65-105/60		PMB	PMB 75/130-75
Binder - Paving Grade	40/60 (up to 100 cvd)	not permitted	40/60	not permitted
Fibres	Compulsory for 40/60	Optional	Optional	Compulsory

Note 1: TS2010 has a performance requirement for skid resistance, using 'declared' provides opportunity for contractor to adopt and verify performance of aggregate with variant PSV

SMA Specification comparisons

Product requirements	TII since 2015	NRA 2010	SR 28 2017 draft (end use Public Roads)	TS 2010
Particle Size Distribution	10mm nominal size mixture			
14	100			100
10	90 to 100			93 to 100
6,3	30 to 55			35 to 52
2	20 to 35			20 to 32
0,063	6 to 12			8 to 12
Binder Content - Polymer	5,8	5,3	5,6	6,7
Binder Content - Paving Grade (on roads up to 100 cvd)	5,8	Not permitted	5,8	Not permitted
Fibres (optional on PMB mix)	0,3 to 1,5		0,3 minimum	0,3 minimum
Binder Drainage	$D_{0,3}$			
Air Void content - minimum	$V_{min\ 2,0}$	not applicable	$V_{min\ 2,0}$	$V_{min\ 3,0}$
Air Void content - maximum	$V_{max\ 5,0}$	not applicable	$V_{max\ 5,0}$	$V_{max\ 3,5}$
Water Sensitivity	$ITSR_{80}$			$ITSR_{NR}$
Resistance to permanent deformation	$WTS_{Air\ 1,0}$ $PRD_{Air\ tbr}$	$WTS_{Air\ tbd}$ $PRD_{Air\ tbd}$	$WTS_{Air\ 1,0}$ $PRD_{Air\ tbd}$	$WTS_{Air\ tbr}$ $PRD_{Air\ tbr}$
Evaluation	CE Mark Works proposals		CE Mark	TAIT – 3 stage: Laboratory study Mix trial Full site trial

SMA Specification comparisons

Works requirements	TII since 2015	NRA 2010	TS 2010
Air Void content - minimum	tbr	n/a	$V_{min\ 2,0}$
Air Void content - maximum	tbr	n/a	$V_{max,5,0}$
Water Sensitivity	tbr	n/a	n/a
Resistance to permanent deformation	tbr	n/a	n/a
Grit application	n/a	n/a	1 to 1,25 kg/m² (coated)
Surface macrotexture (>60km/hr)			
Average per 1000m minimum	1,1	1,5	n/a
Average per 1000m maximum	1,6	n/a	n/a
Average for a set of 10 minimum	0,9	1,2	n/a
Surface macrotexture (>60km/hr) After 3 years			
Average per 1000m minimum	n/a	1,3	n/a
Average for a set of 10 minimum	n/a	1,0	n/a
Skid resistance Site Category A, B & C (higher for other stressful sites			0,39 GN after 4 weeks 0,56 GN after 6 months
Bond Coat	PMB >0,35 kg/m²	PMB >0,40 kg/m²	Cohesion 1,0 J/cm² >0,35 kg/m²

Design Process - Testing

- **Binder Drainage**
  - Fibres essential for paving grade binder and some PMB mixtures need fibres to meet specification - increased binder retention
- **Water Sensitivity**
  - Generally ok with limestone filler, some aggregates need adhesion agents
- **Air Void analysis**
  - Targeting lower levels in the laboratory provides greater scope for achieving levels in the Works
- **Resistance to Permanent Deformation**
  - 60^{o}C small device to assess resistance to rutting
- **Complete Type Testing, Declaration of Performance and CE Mark**

Works Testing

- **Macrotexture Characteristics**
  - on laid mat
- **Water Sensitivity**
  - on loose sample taken from the paver augers
- **Air Void analysis**
  - on cores extracted from the mat
- **Resistance to Permanent Deformation**
  - on cores or cut slab taken from the mat

Industry data

- **Water Sensitivity**
  - Design data: 36 sets Range 81 to 110, Av 93 *(spec min 80)*
  - Site data: 4 sets Range 85 to 90, Av 87 *(spec tbr)*

- **Air Void analysis**
  - Design data: 90 sets Range 2.5 to 9.6, Av 5.1 *(spec 2.0 to 5.0)*
  - Site data: 32 sets Range 2.8 to 7.8, Av 4.6 *(spec tbr)*

- **Resistance to Permanent Deformation**
  - Design data: 65 sets WTS_{air} Range 0.02 to 0.93, Av 0.15 *(spec max 1.0)*
  - Site data: 31 sets WTS_{air} Range 0.01 to 0.68, Av 0.16 *(spec tbr)*

- **Macrotexture Characteristics**
  - Site data: 90 sets Range 1.2 to 1.8, Av 1.5 *(spec av 1000m 1.1 to 1.6)*

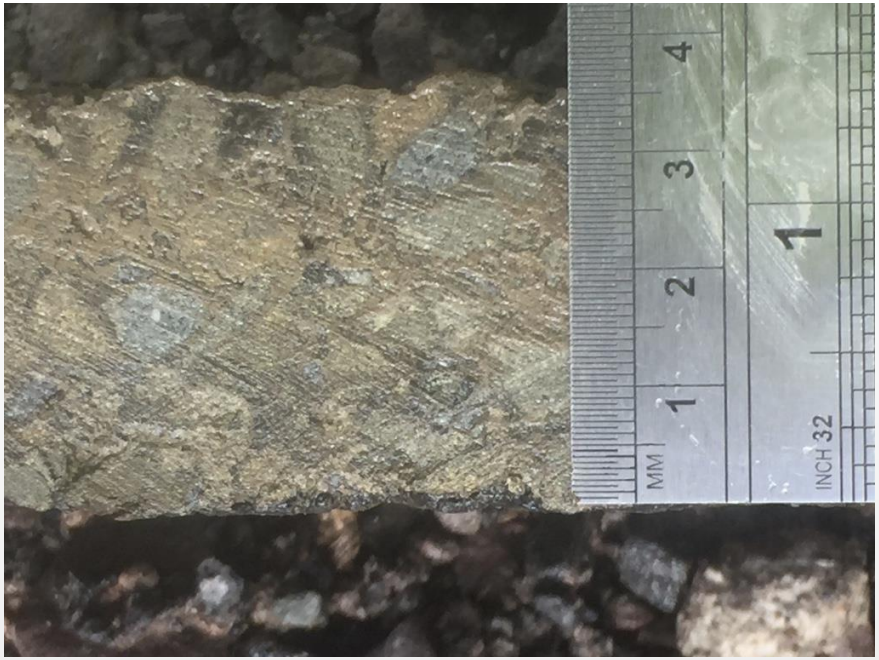
Note: industry data relates to SMA 10 PMB mixtures only

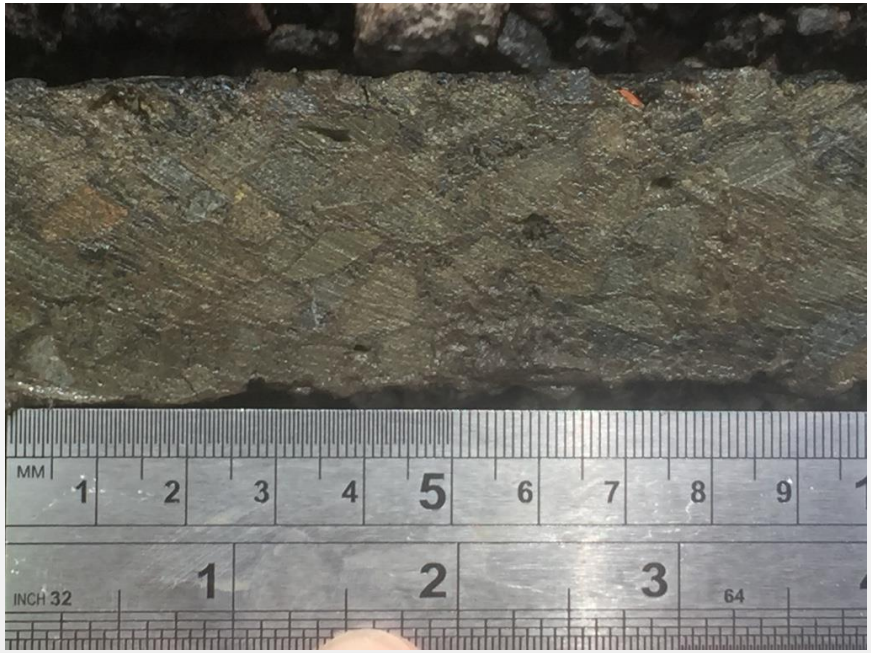
Typical finish

New Specification

Old Specification

Low void content





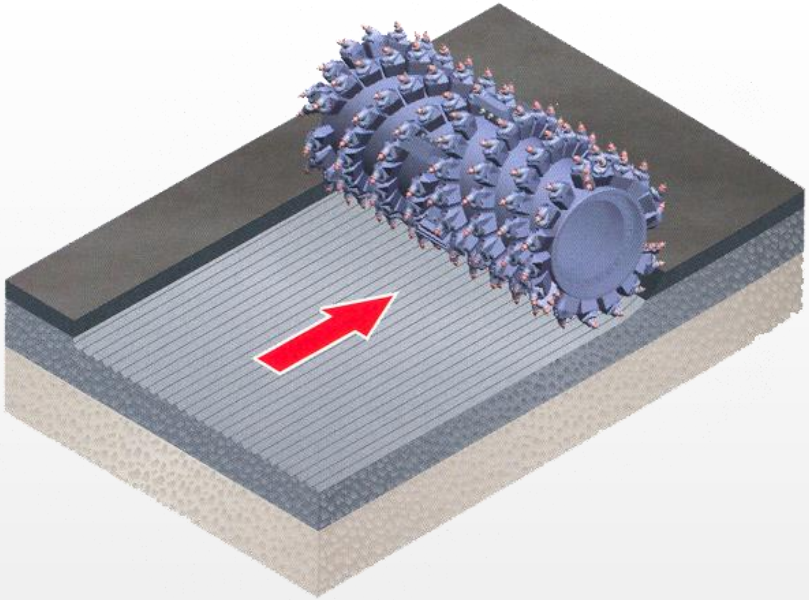
- Air voids less than 2% can result in deformation under heavy traffic
- Air voids greater than 6% can allow water and air to penetrate into the layer
- High air voids increase the potential for water damage, oxidation and aggregate loss or fretting under trafficking

Best Practice for Durability

Key Factors

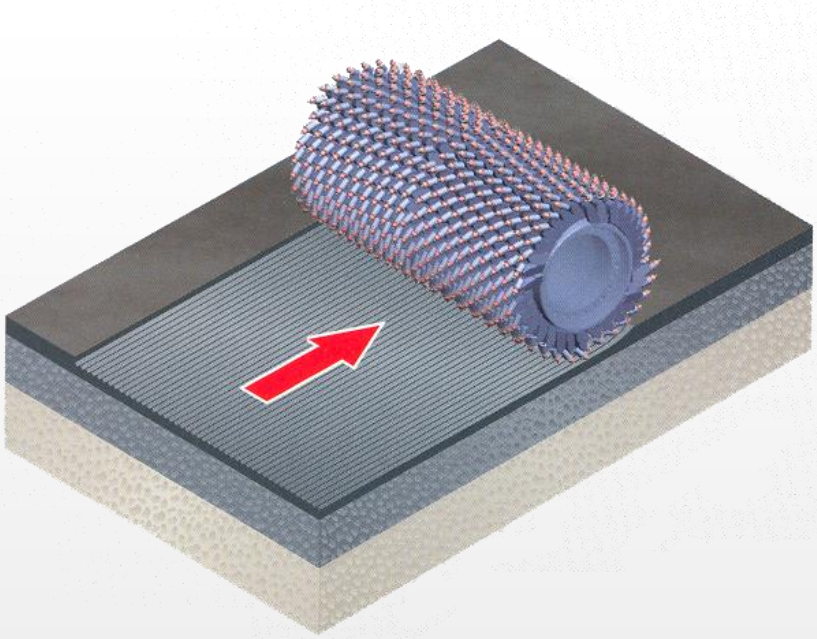
- Sealing underlying layer is essential
- Bonding layers is essential
- High binder content
- Low air void content

Milling Drums



Standard milling drum

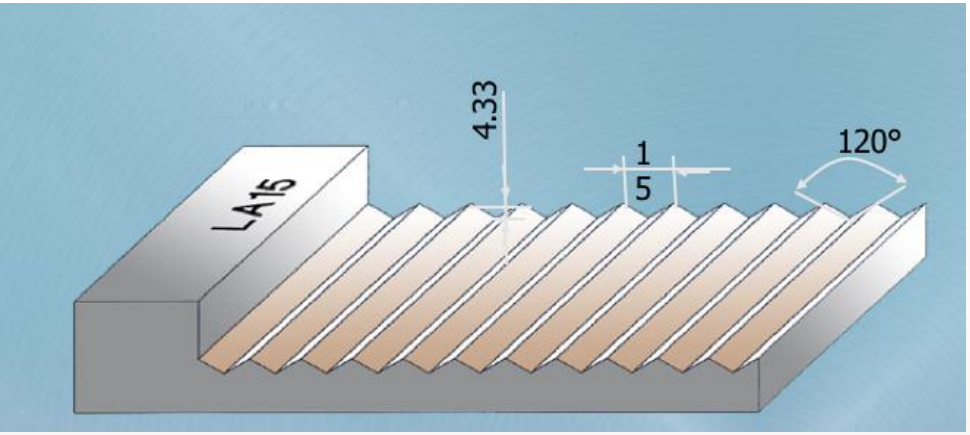
168 picks

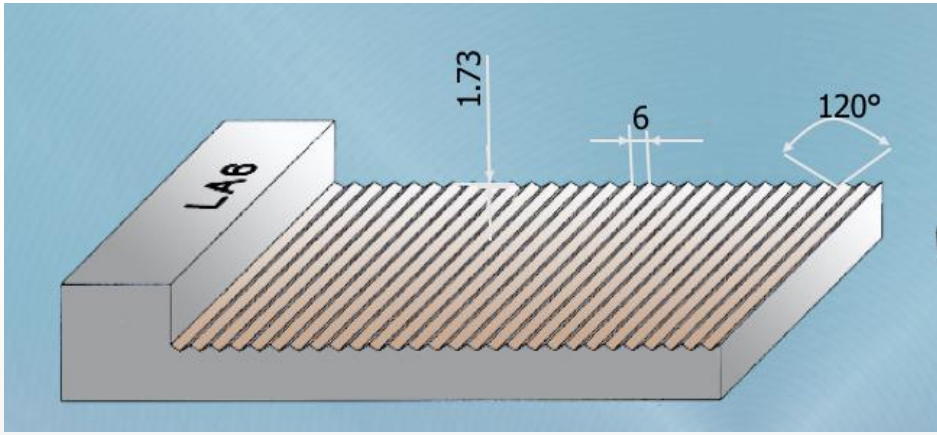


Fine milling drum

672 picks

Milling Drums





Bond to substrate

Longitudinal Joint detail

Transverse Joint detail

Ironwork

Laid 5 years

Laid 7 months

Ironwork

Offset paving

Full width paving

Echelon paving

Learn from the experience of others!

- Maximise binder content for improved durability
- Macrotexture should be acceptable but not excessive
- Good design and trials = successful long term projects
- Train the operatives! Manufacturing and laying

Thank you

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'providing independent specialist advice on all aspects of asphalt pavements'