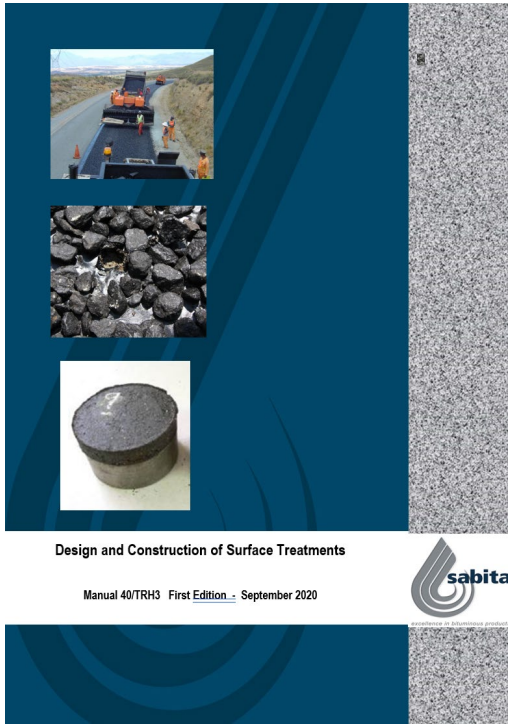
SABITA Manual 40: PART A

Selection, Design, Construction and Maintenance



Gerrie van Zyl

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What do we expect from seals

- **Safe, durable all-weather riding surface with acceptable noise level**
  - ❑ Protect the base from vertical moisture ingress
  - ❑ Provide Skid resistance
  - ❑ Protect the underlying layer from the abrasive and destructive forces of traffic and the environment
  - ❑ No damage to vehicles from aggregate loss
  - ❑ Noise levels appropriate to local environment

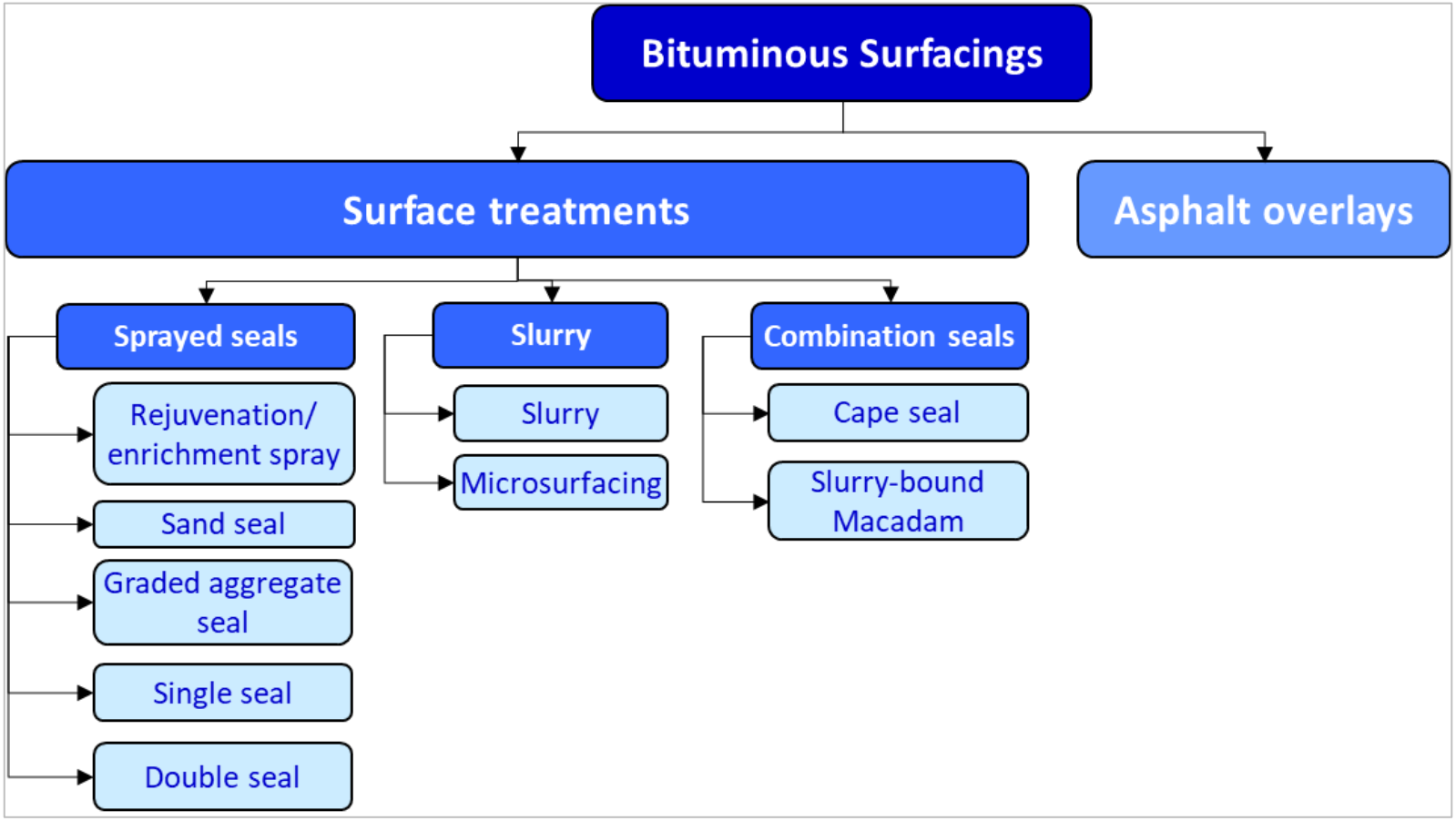
- **In all situations ?**

  NB – Important to understand the limitations of seals

PART A: General

- Introduction
- Definitions, functions and basic requirements
- Evolution of seal design in RSA
- South African environment
- Surface treatment types

Surface treatments



Skid resistance

• Side-way force coefficient

Site category and definition		Investigatory levels (SFC)							
		0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65
A	Motorway								
B	Dual carriageway non-event								
C	Single carriageway non-event								
Q	Approaches to and across minor and major junctions, approaches to roundabouts								
K	Approaches to pedestrian crossings and other high-risk situations								
R	Roundabout								
G1	Gradient 5 - 10% longer than 50m								
G2	Gradient > 10% longer than 50m								
S1	Bend radius < 500m - dual carriageway								
S2	Bend radius < 500m - single carriageway								

• Grip tester

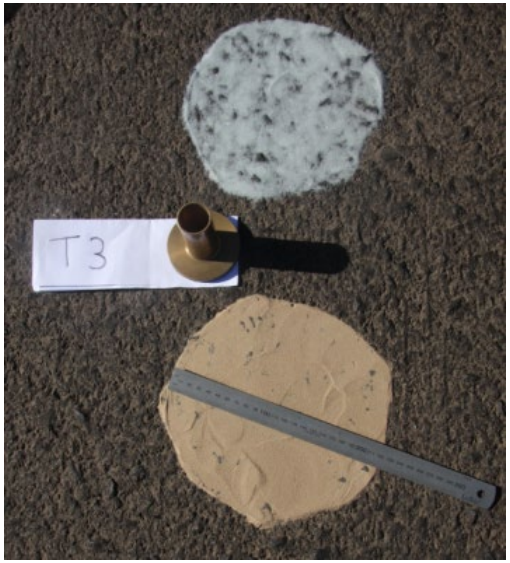
Correlation affected by speed and temperature

Typical skid values (SFC)

Surfacing type	Condition	Binder type	Range of results at 50km/h	Typical average
Coarse slurry	Sound	Modified	0.6 - 1.00	0.8
7 mm Single seal	Sound	Conventional	0.51 - 0.87	0.7
10 mm Single seal	Sound	Conventional	0.36 - 0.64	0.5
14 mm Single seal	Sound	Conventional	0.29 - 0.65	0.5
	Sound	Bitumen rubber	0.50 - 0.66	0.55
20 mm Cape seal	Sound	Conventional	0.56 - 0.80	0.65
	Severe bleeding	Conventional	0.07 - 0.39	0.2

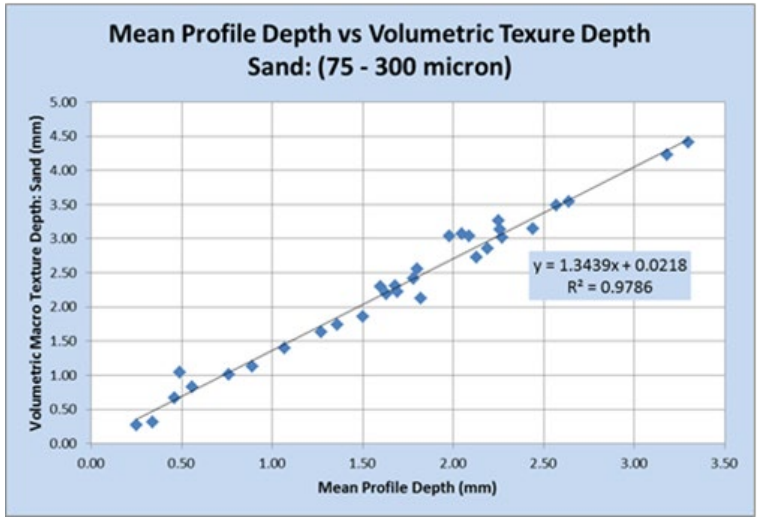
Macrotexture

- **Caused by protruding aggregate**
- **Effects**
  - Hysteresis
  - Water displacement
- **Volumetric texture depth**

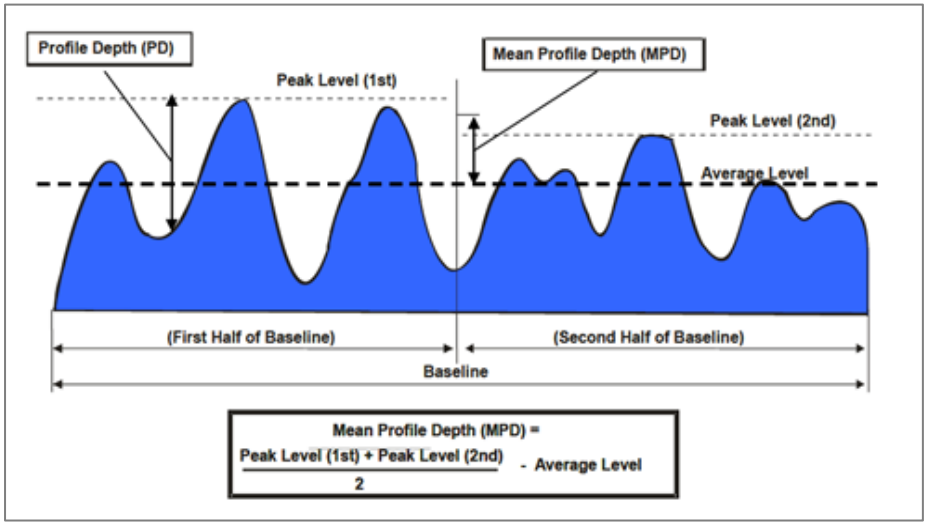


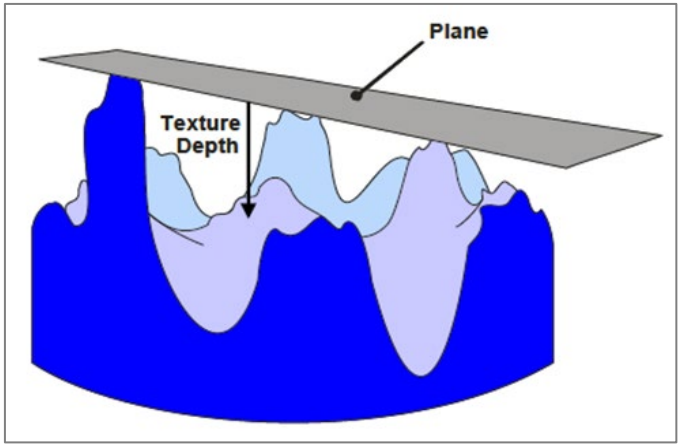
Macrotexture

- **Mean Profile Depth**
  - ETD = 0.2 x 0.8 MPD
  - ETD = 1.35 x MPD



- **Mean Texture Depth**





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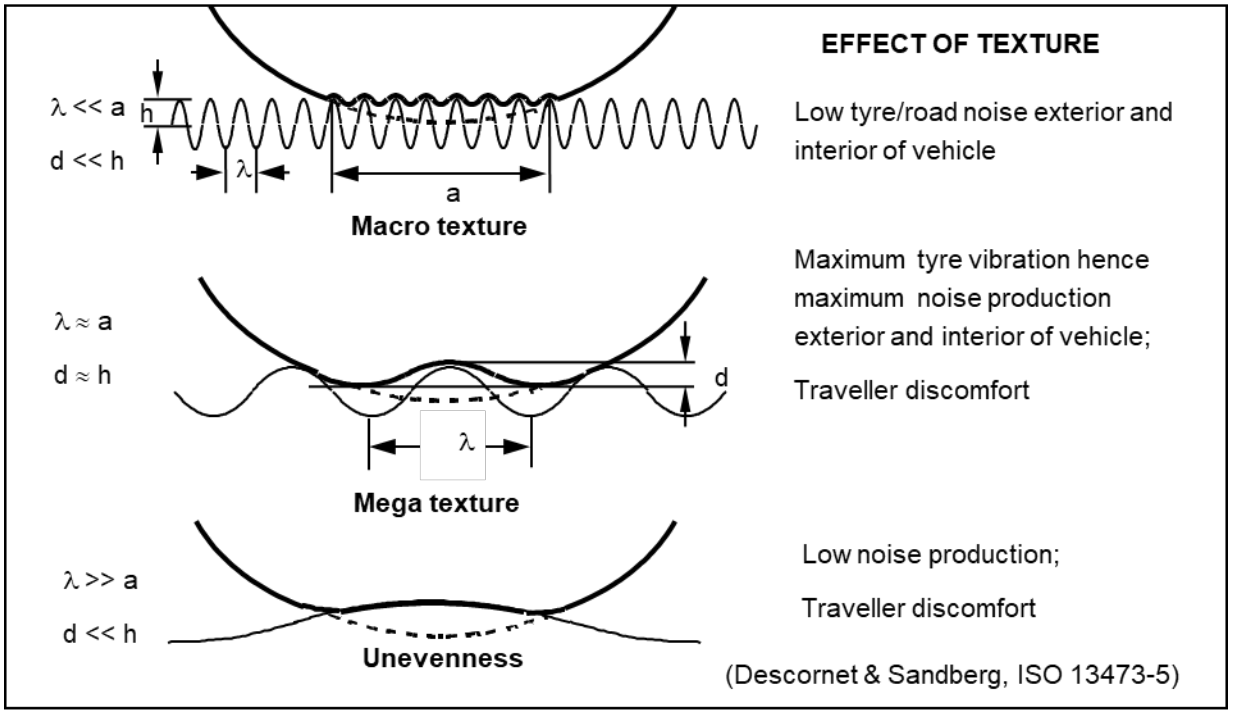
Typical in-service texture depth

	Surfacing Type					
	Grit	7 mm	10 mm	14 mm	20+7+7 mm	20+10 mm
Average VTD (mm)	0.9	1.2	1.9	2.5	1.8	2.2

Road-Tyre Noise

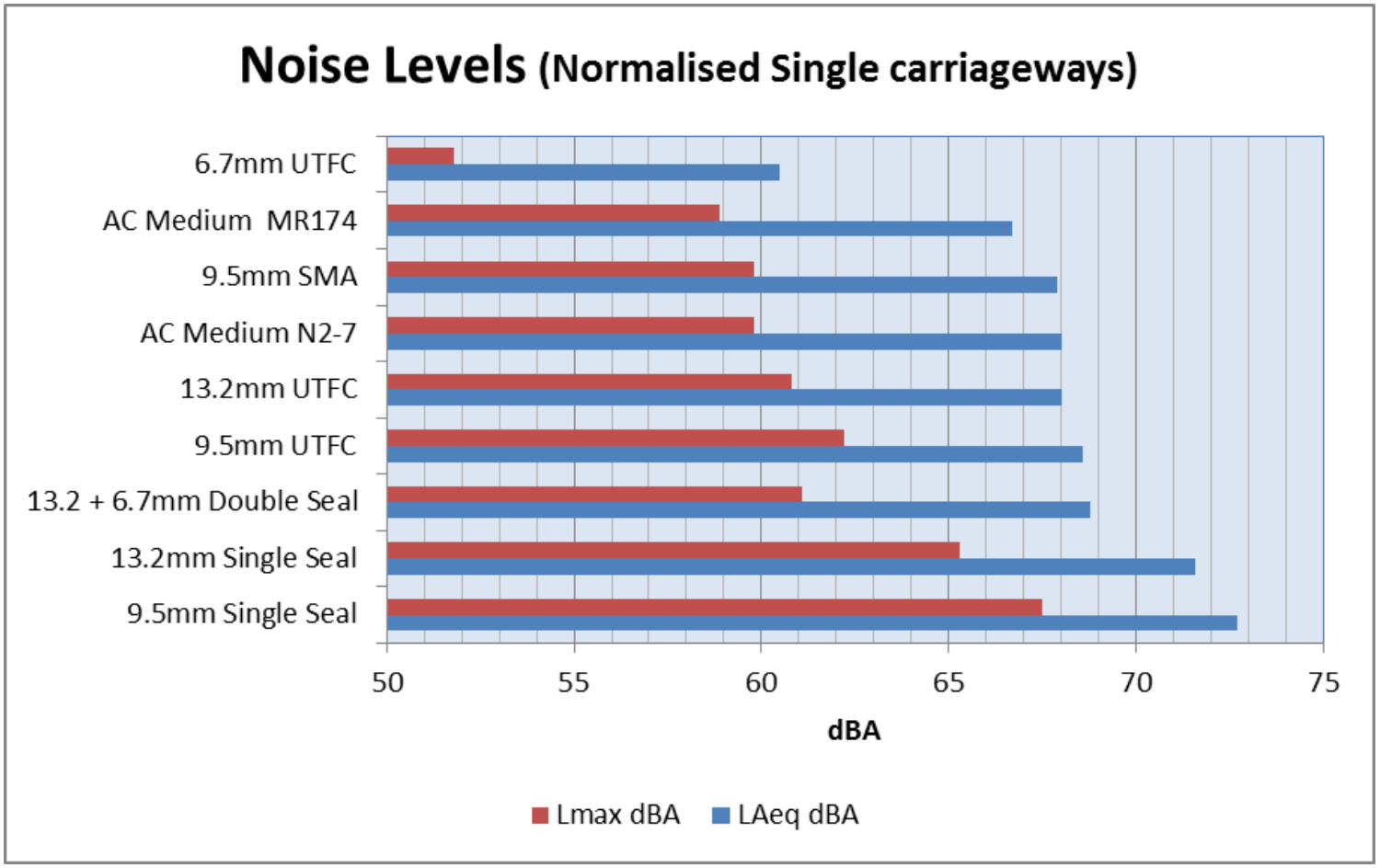


Single carriageways

Section	Surfacing Type	GN	SFC	ETD	L_{Aeq}
E1	9,5 mm SMA	0.52	0.45	0.656	67.90
E3	AC Medium	0.55	0.46	0.561	66.70
E5	13,2 mm UTFC	0.58	0.50	1.119	68.00
E7	6,7 mm UTFC	0.61	0.51	1.072	60.50
E8	9,5mm Single Seal	0.64	0.55	1.351	72.70
E9	13,2 mm Single Seal	0.44	0.38	1.788	71.60
E10	13,2 + 6,7 mm Double Seal	0.56	0.47	1.156	68.80
W2	9,5 mm UTFC (N2 Hakerville)				68.60
W3	AC Medium (N2/7 km 40.6))				68.00

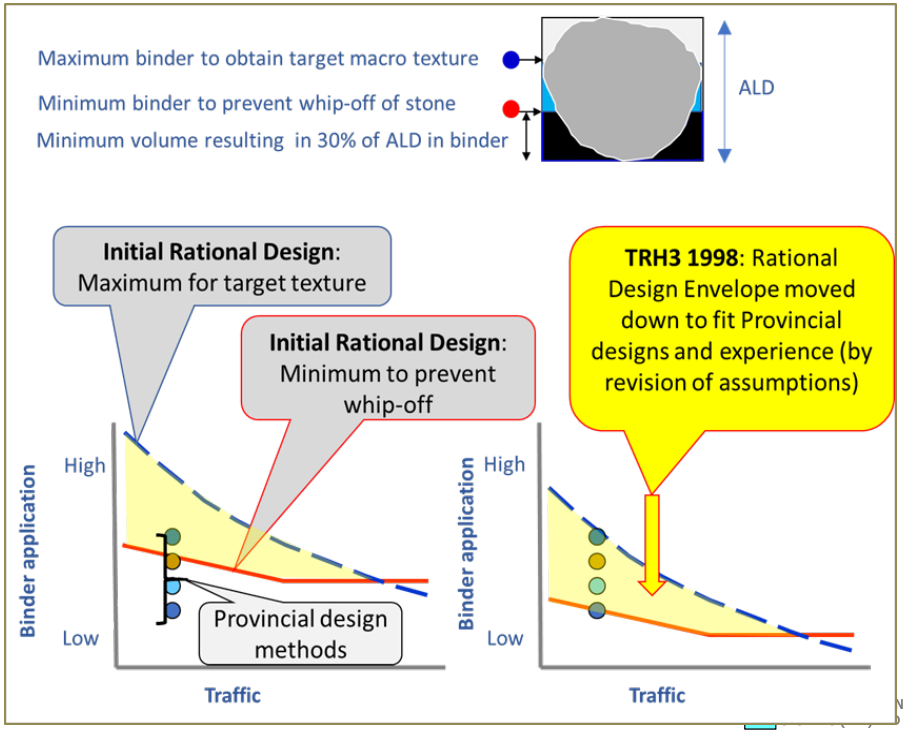
>0.4 >0.9

Normalised Single carriageways



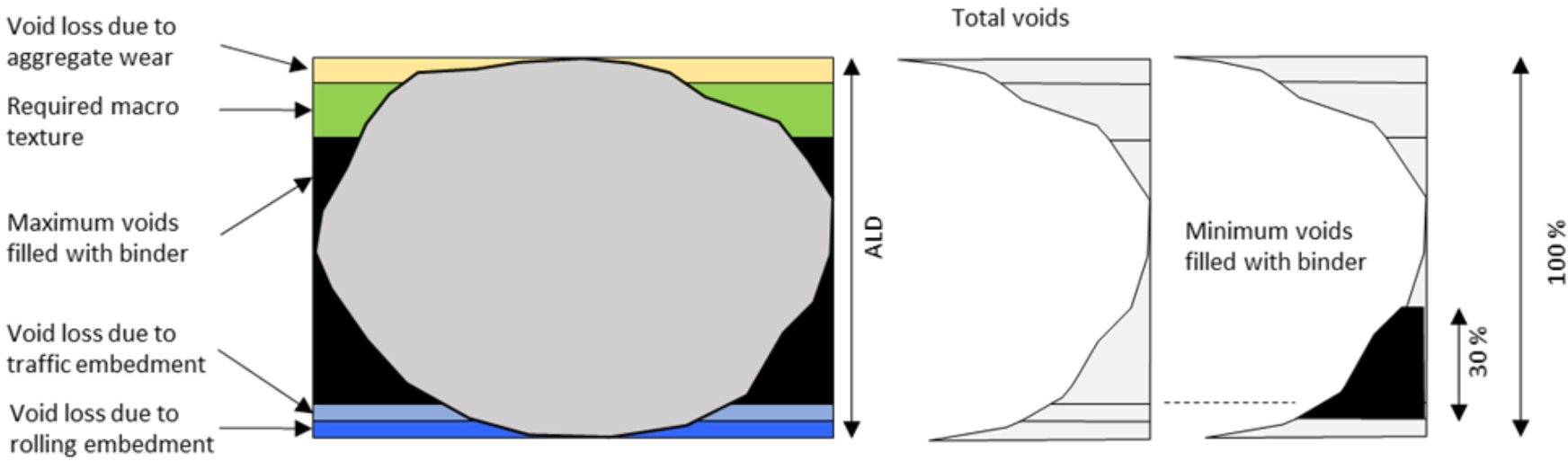
Evolution of seal design in RSA

- 1935 (Hanson)
- 1950 – 1970 (Provincial adjustments)
- 1986 – TRH3 (Rational design +)
- 1998 – TRH3
- 2007 – TRH3
- 2020 – Manual 40



Design Principles

- **Volumetric**
  - Assuming binder filled from bottom



  - Refined Rational Design Method
  - Simplified Method

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Seal Types in RSA

Seal Code	Description
S3 (S <10)	Graded aggregate seals - Single application (<10mm)
S3 (S 10+)	Graded aggregate seals - Single application (10mm or more)
S3 (D <10)	Graded aggregate seals - Double application (<10mm per layer)
S3 (D 10+)	Graded aggregate seals - Double application (10+mm per layer or first layer covered with sand seal)
S7 (<10mm)	Thin microsurfacing or Slurry seal
S7 (>10mm)	Thick Microsurfacing or Coarse slurry seal
S1 (7)	Single seal with 7 mm aggregate
S1(10)	Single seal with 10 mm aggregate
S1(14)	Single seal with 14 mm aggregate
S1(20)	Single seal with 20 mm aggregate
S2(10/S)	Double seal with 10 mm aggregate and sand
S2(14/S)	Double seal with 14 mm aggregate and sand
S4(10)	Cape Seal with 10 mm aggregate and one layer of slurry
S4(14)	Cape Seal with 14 mm aggregate and one layer of slurry
S4(20)	Cape Seal with 20 mm aggregate and two layers of slurry
S2(14/7)	Double seal with 14 mm aggregate and a layer of 7 mm aggregate
S2(14/5)	Double seal with 14 mm aggregate and a layer of 5 mm aggregate
S2(20/10)	Double seal with 20 mm aggregate and a layer of 10 mm aggregate
S2(20/7)	Double seal with 20 mm aggregate and a layer of 7 mm aggregate
S2(20/7/7)	Double seal with 20 mm aggregate and two layers of 7 mm aggregate
S8(14)	Slurry-bound Macadam seal with 14 mm aggregate
S8(20)	Slurry-bound Macadam seal with 20 mm aggregate
AC	Asphalt layer with suitable grading and thickness

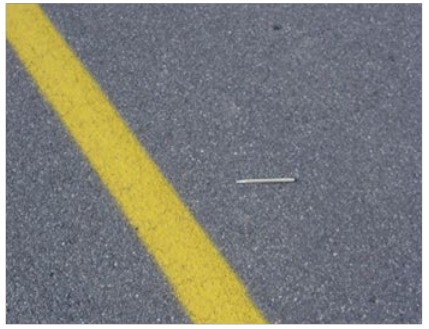
Surface treatment types

Grit seal/ sand seal

Double Grit seal/ sand seal

After construction

After a period in service



Final surface

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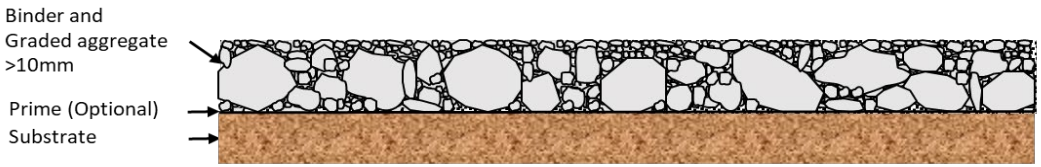
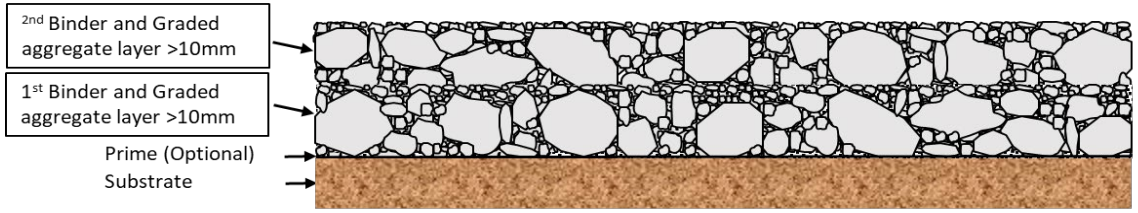
Surface treatment types

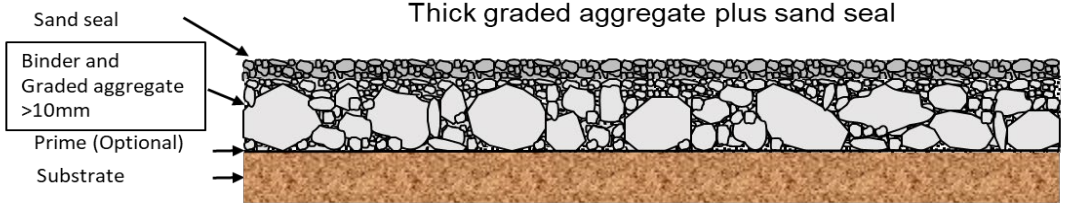
Thick single graded aggregate seal



Double thick graded aggregate seal



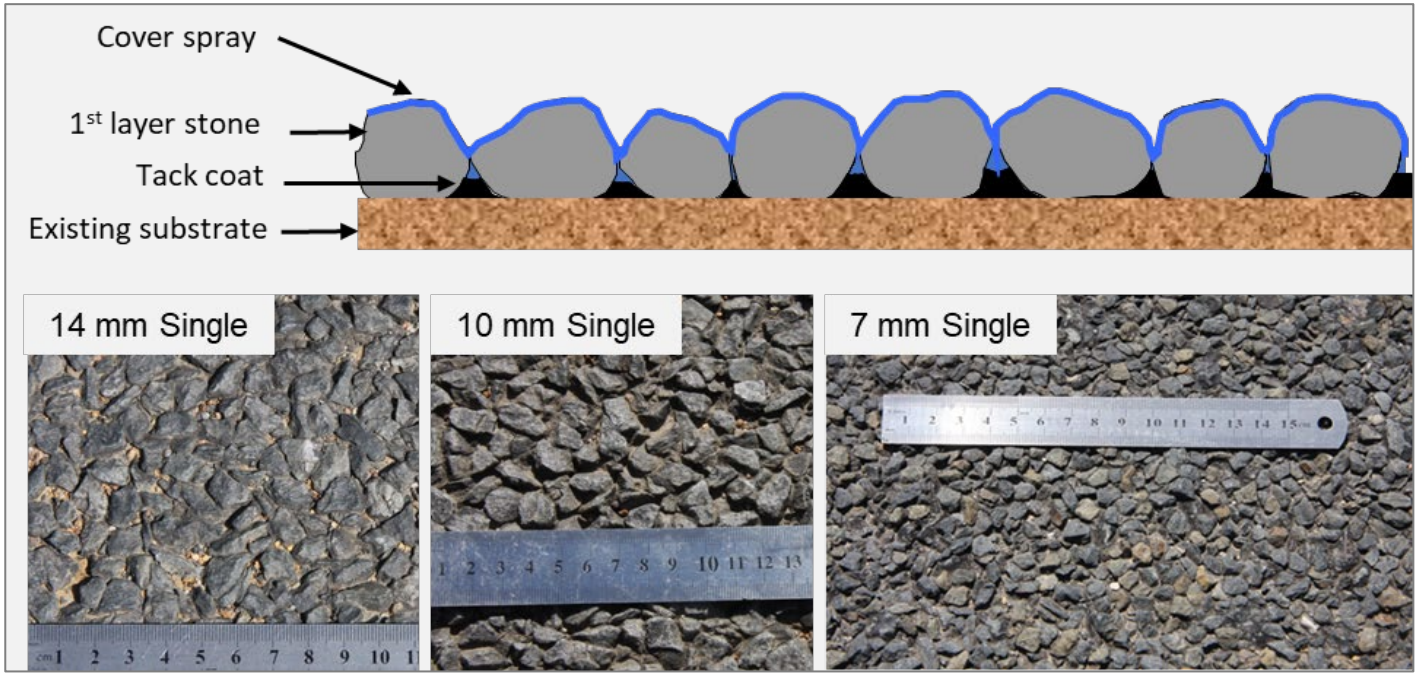
Thick graded aggregate plus sand seal



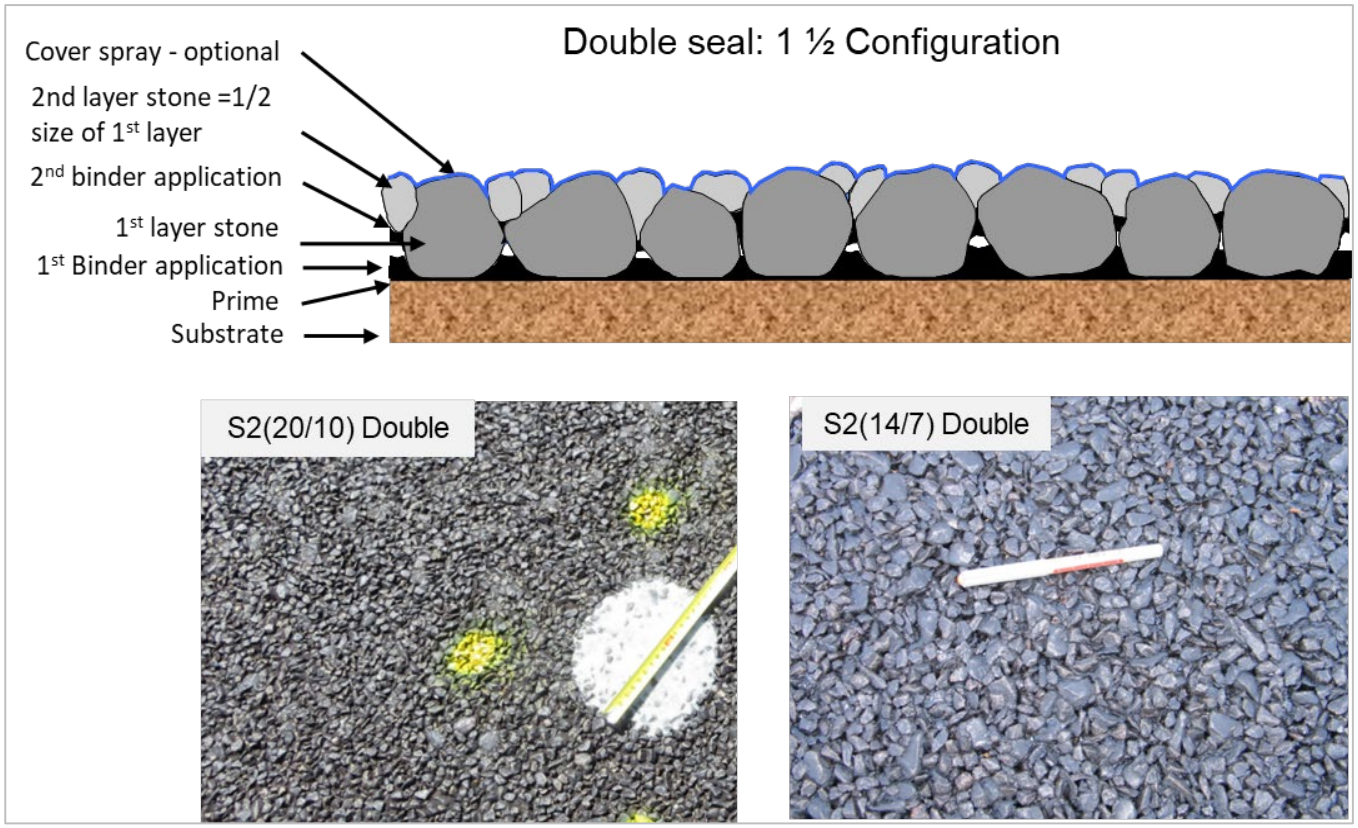
Single graded aggregate 20mm

20mm Graded aggregate plus sand seal

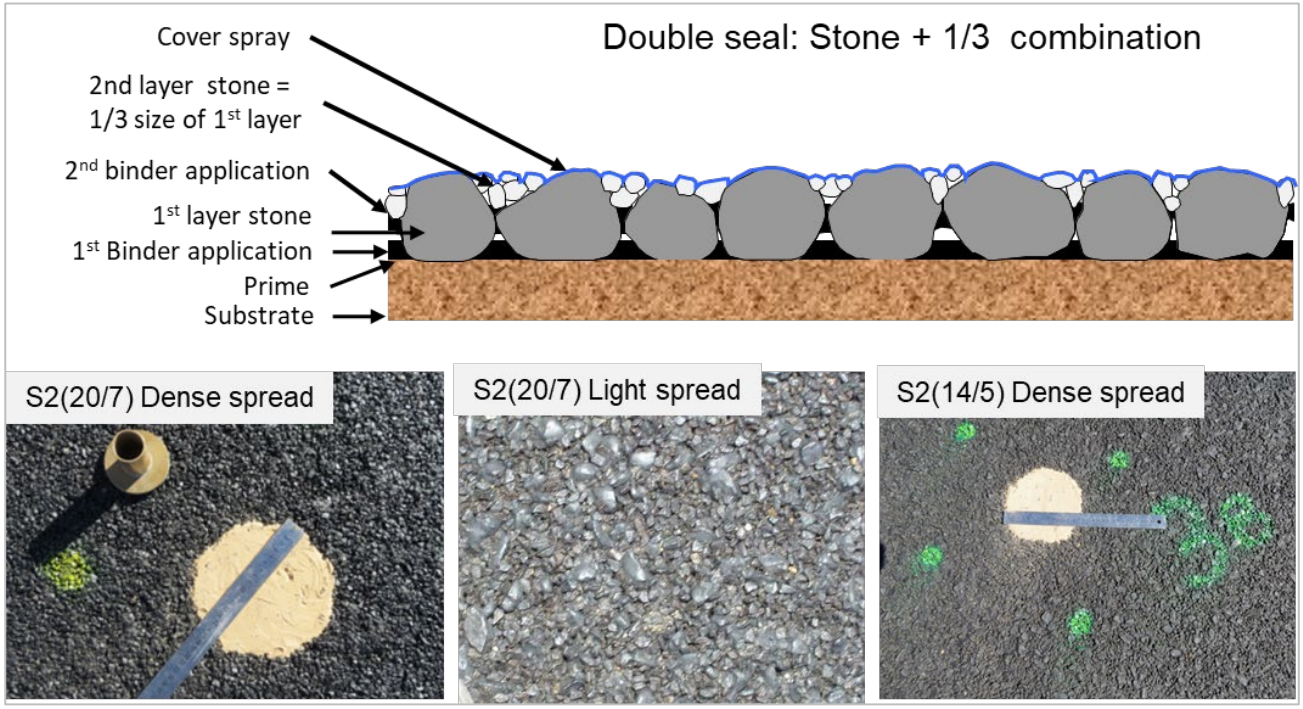
Surface treatment types



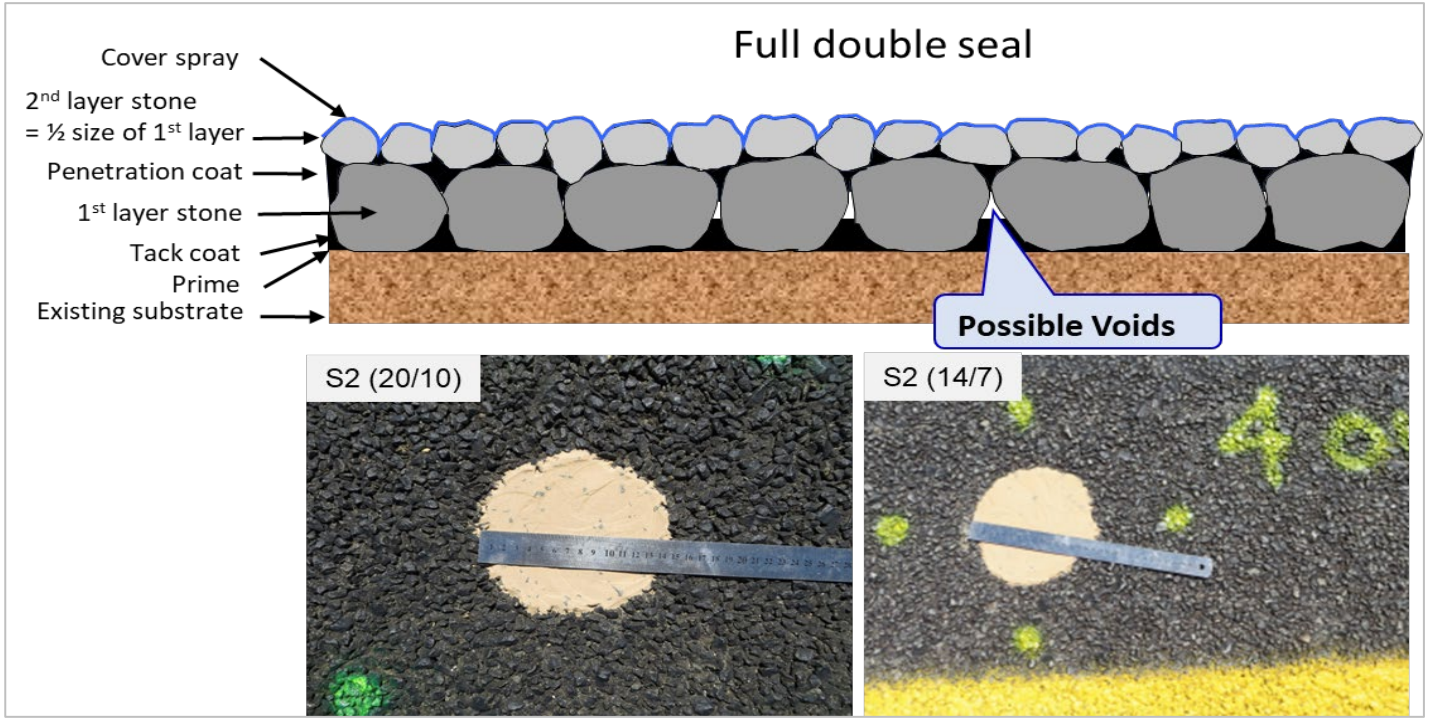
Surface treatment types



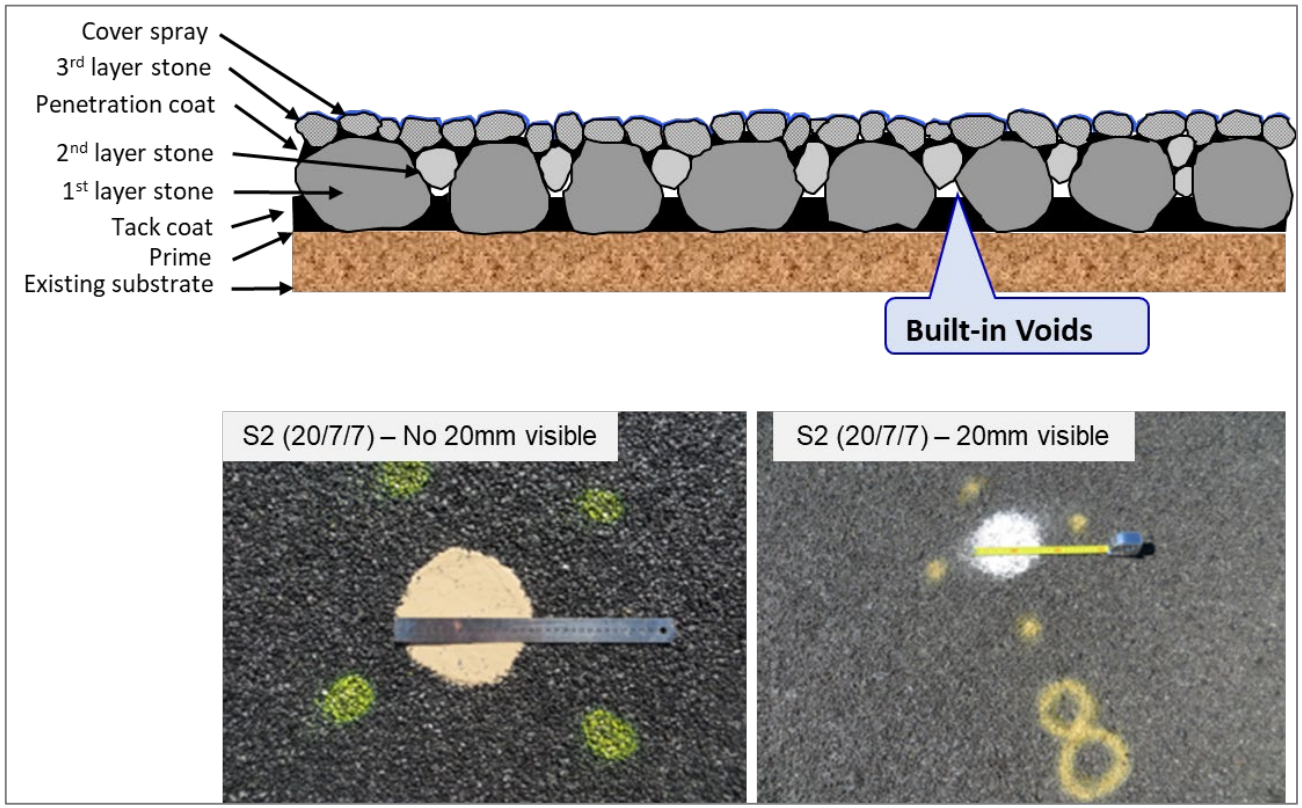
Surface treatment types



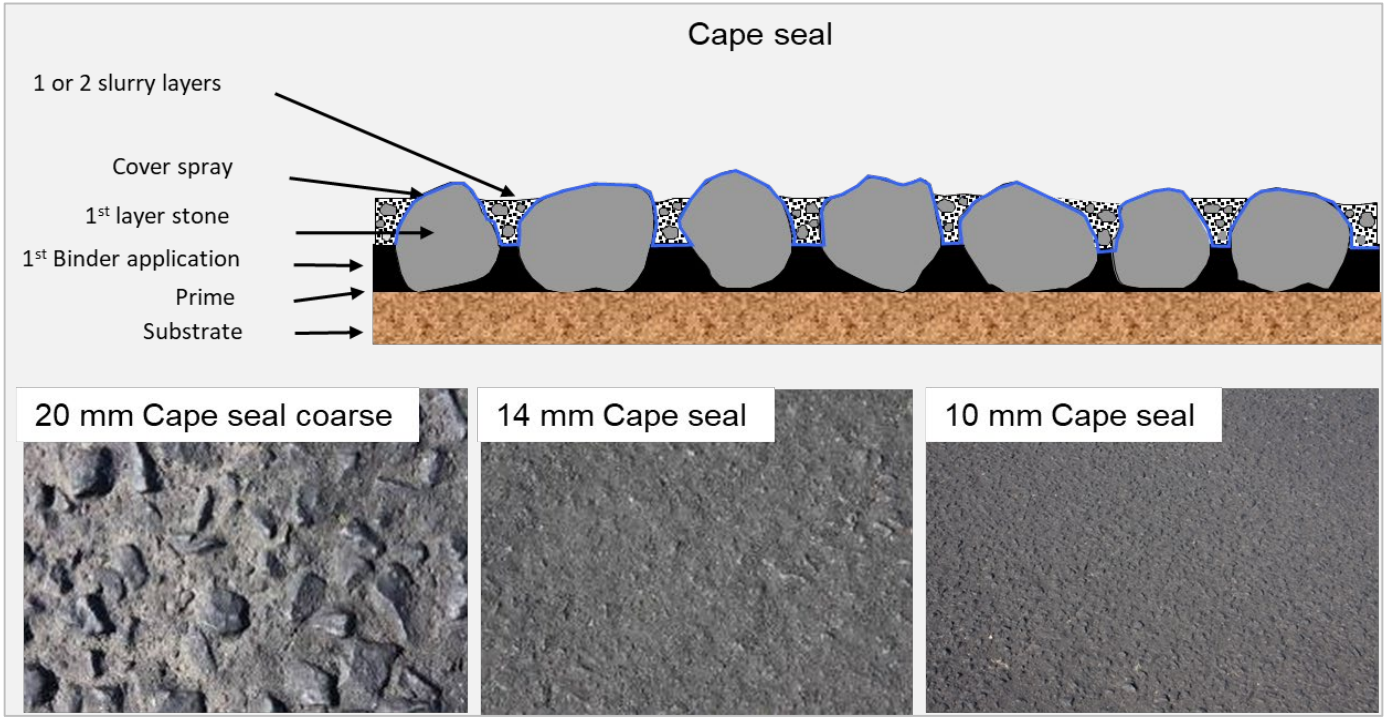
Surface treatment types



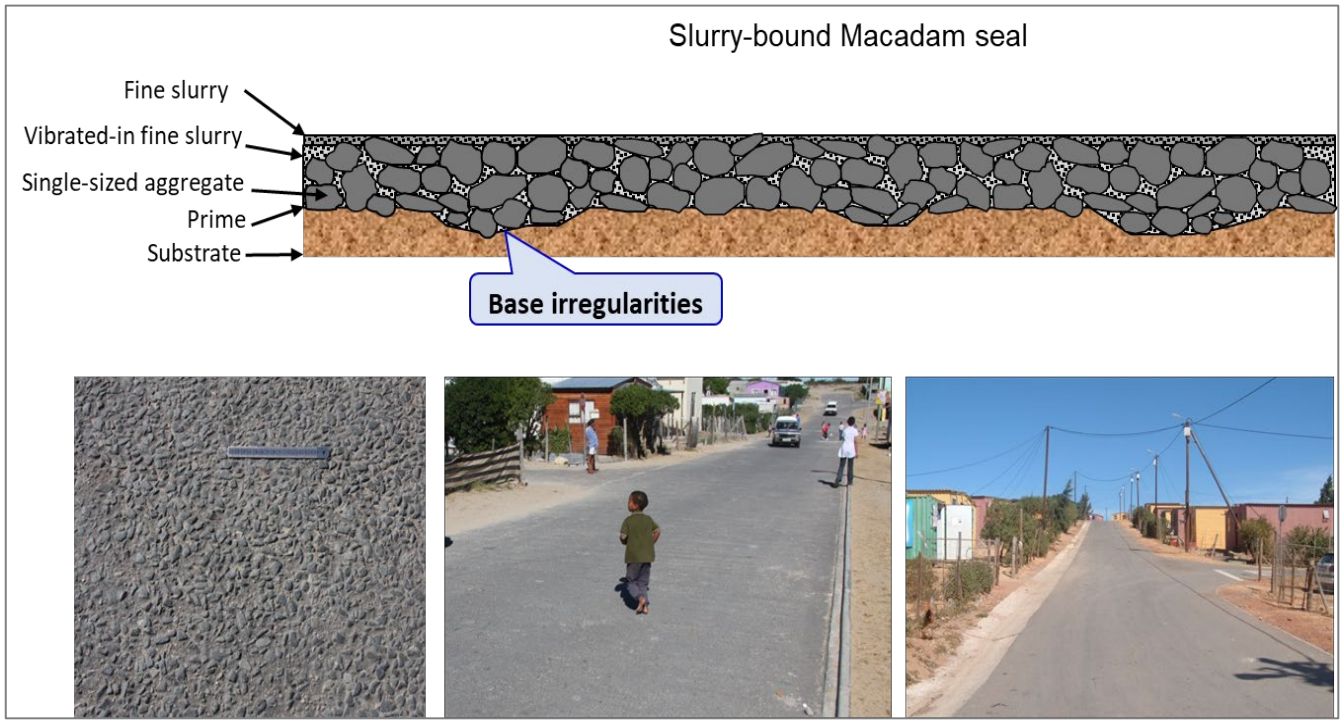
Surface treatment types



Surface treatment types

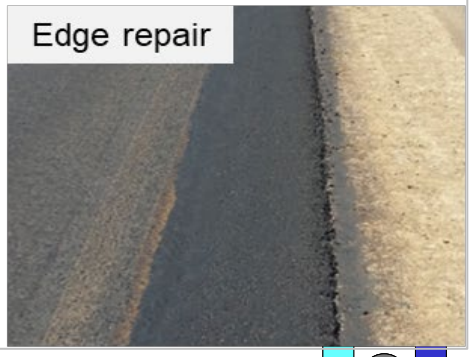


Surface treatment types

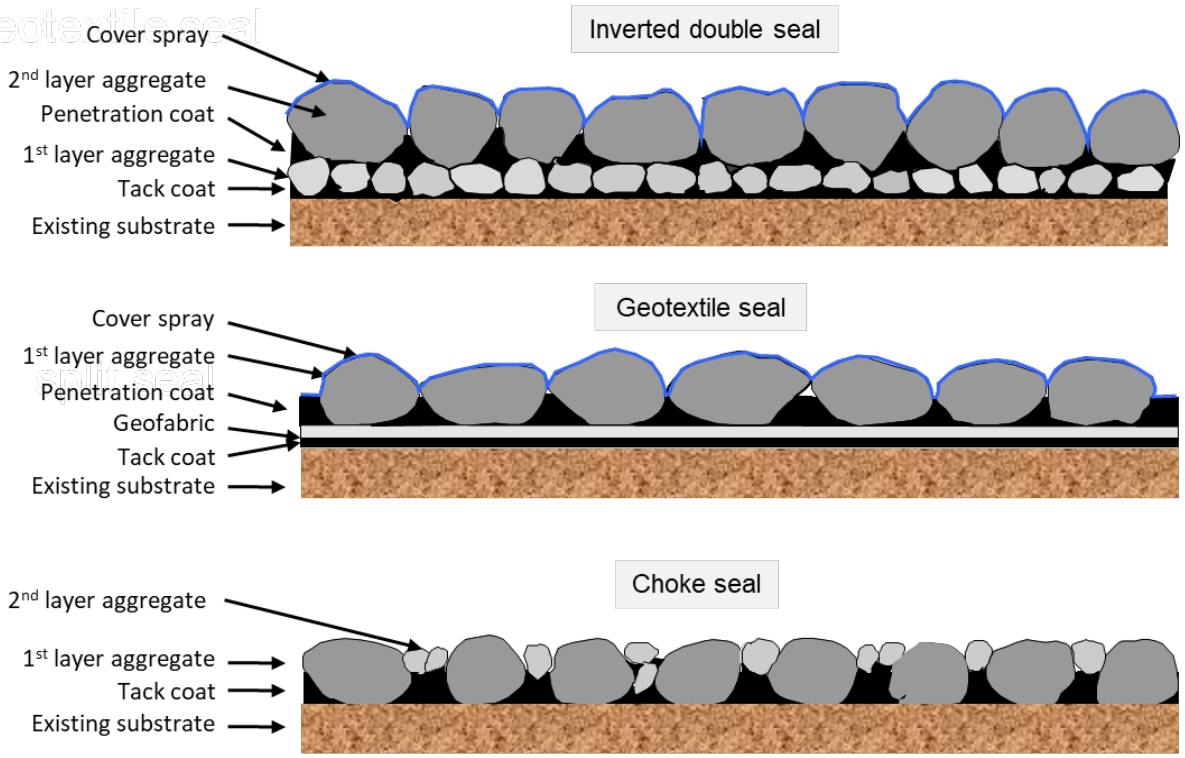


Surface treatment types

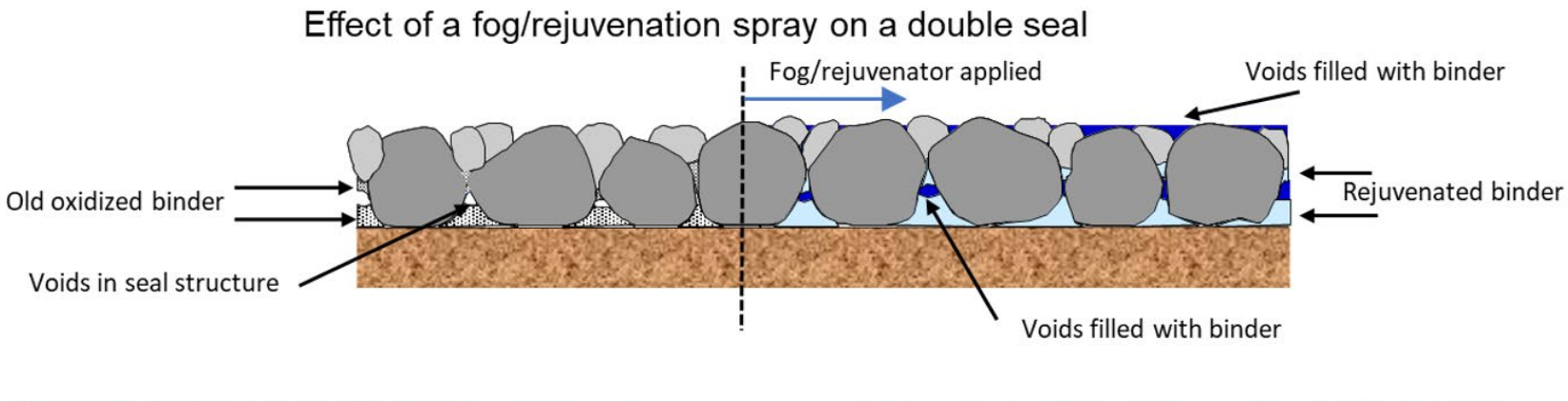
Slurry or microsurfacing seal



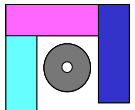
Other seal types



Rejuvenator/ Enrichment



END



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