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MYCUBE ASSET MANAGEMENT SYSTEMS (PTY) LTD

Chapter 8:

PRETREATMENT AND REPAIR OF EXISTING LAYERS

Standard Specifications for Road and Bridge Works for South African Road Authorities

Draft Standard (DS)

CHAPTER 8: PRETREATMENT AND REPAIR OF EXISTING LAYERS

October 2020

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1

Introduction

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- **Contents of Chapter 8 & 10 based on**
  - Existing COTO specifications
  - SANRAL proforma document
  - SABITA Manual 10
  - SABITA Manual 28
  - SABITA Manual 40
  - SANRAL Winter sealing study
  - SANRAL Seal performance study
  - SANRAL SAPEM manual
  - SANRAL QA system for seal work (in progress)
  - New TRH1/SABITA Manual 26
  - New SANS Specifications for spray-flair calibration
  - Sub-committee and opinions from experienced practitioners

2

Format

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CHAPTER 8: PRETREATMENT AND REPAIR OF EXISTING LAYERS

A8.1 PRIME COAT

CONTENTS

PART A: SPECIFICATIONS
A8.1.1 SCOPE
A8.1.2 DEFINITIONS
A8.1.3 GENERAL
A8.1.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS
A8.1.5 MATERIALS
A8.1.6 CONSTRUCTION EQUIPMENT
A8.1.7 EXECUTION OF THE WORKS
A8.1.8 WORKMANSHIP

PART B: LABOUR ENHANCED
PART C: MEASUREMENT AND PAYMENT
PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

3

Important aspects

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- **No reference to proprietary products**
- **Minimize "Opinion of the Engineer"**
- **Rather reference to "best practice guidelines"**
  - This means these documents must be up to date !!!
- **NB: Responsibility of seal design- Probability high that it will become the Contractor**

4

Chapter 8

- **PRETREATMENT AND REPAIR OF EXISTING LAYERS**
  - ❑ Prime coats
  - ❑ Fog sprays, cover sprays and rejuvenation sprays
  - ❑ Texture treatments
  - ❑ Rut and/or depression correction
  - ❑ Standard crack sealing
  - ❑ Geotextile crack sealing
  - ❑ Planing
  - ❑ Patching and edgebreak repair
  - ❑ Repair of surface defects

5

Prime coat

- **Weather limitations**
  - ❑ During foggy or wet conditions;
  - ❑ When rain is imminent;
  - ❑ When wind is blowing sufficiently hard to cause uneven spraying;
  - ❑ When the surface of the layer is visibly wet, i.e. more than damp;
  - ❑ When the temperature of the surface immediately prior to commencing with the application of the prime is below, or in the opinion of the Engineer, likely to fall below 10°C;
  - ❑ After sunset;
  - ❑ When at any position within the layer the moisture content of a granular base layer is more than 50 % of the optimum moisture content determined according to SANS 3001 No GR30. **In the event of rain after priming, the base shall be allowed to dry out to meet the above moisture content requirements prior to surfacing**. Limiting moisture contents for treated layers before priming shall be specified in the Contract Documentation.

6

Effect of upper layer softness

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- **Effect of**
  - ❑ Moisture in the upper base
  - ❑ Soft layer underneath the seal

7

Prime coats

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Bituminous binder for priming	Specification
MC-10 cut-back bitumen	SANS 4001 – BT2
MC-30 cut-back bitumen	SANS 4001 – BT2
Inverted bitumen emulsion	SANS 4001 – BT5
Other appropriate product containing solvents	Certified by independentcertification agency
Other appropriate product containing no solvents	Certified by independentcertification agency

- **Nominal rate = 0.8 l/m²**
- **Prime selection**
  - ❑ Contractor supply min 3 products (20 liters)
  - ❑ Apply by brush on base
  - ❑ Engineer evaluate (TRH1/Manual 26)
    - Penetration
    - Drying time
    - Permeability
    - Carbonation

8

Aggregate for blinding

- Where so instructed, blinding material shall consist of crusher sand or natural sand, with 100 % passing the 7,1 mm sieve and not more than 10 % passing the 2,0 mm sieve.

9

Preparation

- Broom
- Dampen – Check effect on prime type selection (no standing water)

10

Storage & Application

- Temp in accordance with relevant SANS 4001
- Mechanical distributor (see Chapter 10)
- Typical errors

11

Prime application

12

Workmanship

- **Hand sprays allowed (inaccessible to distributor)**
- **Surplus prime (crusher dust & remove)**
- **Opening to traffic**
  - Blinding only be permitted to facilitate traffic accommodation or access arrangements.
- **Workmanship (tolerances)**

Table A8.1.8-1: Payment Reduction Factors for Conditionally Accepted Prime Coat

Deviation specified spray rate at spraying temperature. (%)	Payment reduction factor of tendered rate.
±8,0	1.00
±9,0	0.97
±10,0	0.95
±11,0	0.90
±12,0	0.85
±13,0	0.80

13

Prime Coat : labour enhanced

- **Most items refer to PART A**
- **Small equipment allowed (separate payment iten)**

14

Prime Coat: Measurement & payment

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- **No separate payment for:**
  - setting out the works.
  - protection or repair as required
  - confined or restricted areas
  - loading of any materials.
  - hauling of any materials where the material is moved over a distance of less than, and up to 1,0 km.
  - transporting materials from commercial sources irrespective of the haul distance.
  - removal or any surplus material
  - precautionary measures required in terms of the Occupational Health and Safety Act (Act 85 of 1993) and the latest amendments thereof as well as the latest Construction Regulations
  - Removal of surplus prime.

15

A 8.2 Cover, Fog, Rejuvenation

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- **Definitions**
  - Fog – During life of seal (add and rejuvenate)
  - Rejuvenation – During life (rejuvenation-invert cutback emulsion)
  - Cover – final binder during construction
- **Convention (Diluted emulsions)**
  - 65 % cationic emulsion (60/40)
  - i.e. 60% emulsion and 40% water
- **Weather limitations (As per Chapter 10)**

16

Nominal rates

- Diluted **cationic emulsion cover** spray at **1,0 l/m2**
- Diluted **anionic or cationic emulsion cover** spray, in the case of Cape seals, at 0,8 l/m2
- Diluted **anionic emulsion fog spray as enrichment treatment at 0,8 l/m2**
- Rejuvenation spray with **cut-back inverted emulsion** or other Agrément certified products at **0,5 l/m2**

17

Fog sprays

- **Fog spray as enrichment treatment**
  - A diluted 60 % anionic stable-grade emulsion (50/50) shall be used in accordance with the Contract Documentation.

Cationic emulsion spray grade

Diluted SC-E1

18

Rejuvenation sprays

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- **Rejuvenation spray**
  - ❑ Agrément SA certified products or inverted bitumen emulsion complying with SANS 4001 – BT5, with the exception that the Viscosity at 60 °C on residue from distillation shall be between 10 and 20 Pa.s.
  - ❑ 0.5 l/m^2

19

Execution of the works

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- **Preparation and execution**
  - ❑ Cleaning of surface

  - ❑ Water tanker with a pressure distributor shall be available on standby for pre-wetting or post-wetting
- **Opening to traffic**
  - ❑ Only when cured and not tacky

20

Texture slurry

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Table A8.3.3-1: Nominal rates for application of texture treatments

Component	Nominal rate
Texture slurry application on existing macro texture of 1,0 mm to 2,0 mm	0,003 m³/m²
Texture slurry application on existing macro texture of 2,0 mm to 4,0 mm	0,0045 m³/m²
Microsurfacing application on existing macro texture up to 6,0 mm	0,007 m³/m²
Emulsion content for the texture slurry	200 l/m³
Emulsion content for the microsurfacing	180 l/m³
Active filler content of the texture slurry	16.5 kg/m³

Fine-Fine 0.003
Fine-Medium 0.0045

21

Design by Contractor

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- **Wet track abrasion test**
- **Colas test**

22

Materials

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- **Binders**
  - Conventional slurry binder shall be a 60 % stable-grade anionic bitumen emulsion complying with SANS 4001 – BT3
  - Microsurfacing binder shall comply to the specifications of Clause A10.1.5.5 of Chapter 10.
- **Aggregate**
- **Filler for slurry**
  - Ordinary portland cement and portland blast-furnace cement (PBFC) shall be SANS 50197 certified. Road lime shall be SANS 824 certified (Lime for Soil Stabilization).

23

Texture slurry grading

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Sieve size (mm)	Percentage passing sieve, by mass				
	Fine slurry			Coarse slurry	
	Fine Grade	Medium grade	Coarse grade	Type 1	Type 2
14					100
10				100	85 – 100
7		100	100	85 – 100	70 – 90
5	100	82 - 100	70 – 90	70 – 90	60 – 80
2	90 - 100	56 – 95	45 – 70	45 – 70	40 – 60
1	65 - 95	37 – 75	28 – 50	25 – 45	25 – 45
0.600	42 - 72	22 – 50	19 – 34	15 – 30	15 – 30
0.300	23 - 48	15 – 37	12 – 25	10 – 20	10 – 20
0.150	10 - 27	7 – 20	7 – 18	6 – 15	6 – 15
0.075	1 – 15	4 – 15	2 – 8	4 – 10	4 – 10

24

Microsurfacing

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Sieve Size (mm)	Type II Percent Passing	Type III Percent Passing	Stockpile Tolerance
	Overlay or Rut fill (up to 12 mm)	Rut fill (more than 12 mm)	
10	100	100	
7	100	85 - 100	5%
5	90 - 100	70 - 90	5%
2	65 - 90	45 - 70	5%
1	45 - 70	28 - 50	5%
0.6	30 - 50	19 - 34	5%
0.3	18 - 30	12 - 25	4%
0.15	10 - 21	7 - 18	3%
0.075	5 - 15	5 - 15	2%

25

Equipment

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- **Batch mixer**
  - Volume batching will only be permitted with the written approval of the Engineer.

    Note risk of bulking

- **Continuous slurry machine**

26

Execution of the works

- **Texture slurry – hand applied (Payment item ?)**
- **Microsurfacing – Continuous slurry machine**

- **Opening to traffic – only when completely cured**
- **Curing period before sealing**
  - Texture treatment using fine slurries **6 weeks**
  - Coarse slurry, rapid setting slurry or microsurfacing applied as screed or rut filling **12 weeks**
  - Crack sealing **2 weeks**
  - Asphalt patches for pavement repair **6 weeks**
  - Bitumen treated granular materials **4 weeks**
- **or until such time that the representative ball penetration value (SANS 3001-BT10) at expected operating temperature (refer SABITA Manual 40) road surface temperature, reduces to less than 2,0 mm.**

27

Curing period

28

Measurement and payment

C8.3.1		**Texture treatment**	
	C8.3.1.1	Application of slurry for texture improvement, applied by hand (Indicate aggregate grade, type of emulsion, filler type)	cubic metre (m^3)
	C8.3.1.2	Application of slurry for texture improvement, applied by spreader box (Indicate aggregate grade, type of emulsion, filler type)	cubic metre (m^3)
	C8.3.1.3	Application of microsurfacing for texture improvement, applied by spreader box (Indicate aggregate grade, type of emulsion, filler type)	cubic metre (m^3)

- **cubic metre of saturated fine aggregate used**
  - A20.1.5.13 Testing the saturated volume of fine aggregate for slurry

29

Rut / Depression correction

- **Rut correction - refers to filling of ruts in the wheel tracks**
- **Screeding - refers to level correction using coarse slurry, microsurfacing or asphalt where the road surface is uneven and where depressions, humps or small grooves occur as a result of deformation of the pavement layers not due to structural failure of the pavement.**

30

Rut / Depression correction

- **Materials**

Component	Binder	Aggregate
Asphalt materials **Refer to Chapter 9**	As specified	**As specified**
Coarse slurry	10.3.4	**10.3.17.1 for Type 1 or Type 2**
Microsurfacing	**10.3.5**	**10.3.18 for Type 2 or Type 3**

31

Execution of the works

- **Asphalt - See A8.4.7.1 for error**
- **Microsurfacing**
- **Coarse slurry**

32

Workmanship: Rut filling

- **Where microsurfacing is used:**
  - ❑ The applied thickness of the microsurfacing, before compaction, should be 20-25 % more than the depression/rut to be filled.

33

Microsurfacing

- ❑ The formulation of the product shall be such that complete curing will take place within a maximum of 4 hours, regardless of the climatic conditions during construction, to allow opening to traffic.
- ❑ Representative ball penetration value (SANS 3001-BT10) at expected road surface temperature, on the product shall reduce to less than 2mm within a period of 4 weeks.

34

Measurement and payment

Item		Description	Unit
C8.4.1		**Rut and/or Depression correction (screeding)**	
	C8.4.1.1	Bond coat using 50 % diluted stable grade bitumen emulsion	litre (ℓ)
	C8.4.1.2	Correction material	
	(a)	Continuously-graded asphalt (State Nominal maximum aggregate size and binder type)	ton (t)
	(b)	Semi-gap graded asphalt (State Nominal maximum aggregate size and binder type)	ton (t)
	(c)	Cold applied asphalt (Agrèment SA certified for specific class as specified)	ton (t)
	(d)	Coarse slurry (state aggregate grade and emulsion type)	cubic metre (m^3)
	(e)	Microsurfacing (state aggregate grade and binder type)	cubic metre (m^3)

35

Standard crack sealing

- **Refers to the sealing of singular line cracks, such as longitudinal cracks, transvers cracks and large block cracks, using cold or hot modified binders.**
- **General**
  - The types of cracks to be treated shall be specified in the Contract Documentation
- **Weather limitations**
  - Road surface Temperature > 10°C.
  - Not within 3 days after rain has fallen on the site.
- **Traffic limitations**
  - No crack sealing shall be allowed before 09:00 and after 15:00.

36

Materials

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- **Primer**
  - ❑ Invert bitumen emulsion
- **Modified binder crack sealant**
  - ❑ TG1 still applies
  - ❑ DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS
    - If the Contractor proposes a proprietary product, it shall be certified by an independent certification agency.
- **Aggregate for blinding**

37

Equipment

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- **A8.5.6.1 Equipment for crack-sealing**
  - ❑ Compressor
  - ❑ Prime injector
  - ❑ Sealant applicator
  - ❑ Roller (for volcanic cracks)

Item	Description	Unit
C8.5.1	**Standard crack sealing**	
C8.5.1.1	Cleaning cracks	
(a)	Cleaning crack with cold compressed air	metre (m)
(b)	Cleaning crack with hot compressed air	metre (m)
C8.5.1.2	Applying herbicides for sealing cracks	litre (ℓ)
C8.5.1.3	Priming (indicate primer)	litre (ℓ)
C8.5.1.4	Sealing the cracks	
(a)	Sealing using (State crack sealant)	litre (ℓ)
C8.5.1.5	Heating of surface before rolling	metre (m)
C8.5.1.6	Rolling the cracks	metre (m)

38

GEOSYNTHETIC CRACK SEALING

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- **Refers to the application of emulsion and a geosynthetic fabric over a cracked area, with or without a sand blinding layer.**
- **Geosynthetic fabric**
  - non-woven geosynthetic fabric, double needle punched ref **Table A10.1.5-10**

Table A10.1.5-10: Specifications for geosynthetic membranes

Property	Unit	Requirement	Test Method
Nominal mass	g/m2	130	SANS 9864/ISO 9864
Thickness	mm	1,2	SANS 9863/ISO 9863
Tensile strength (min)	kN/m	7	SANS 1525/ISO 10319
Elongation at break	%	40 - 60	SANS 1525/ISO 10319
Penetration load (CBR)	kN	1.5	SANS 12236/ISO 12236
Puncture resistance (DART)	mm	30	SANS 13433/ISO 13433
Tear strength (Min)	N	215	ASTM D4533
Grab strength (Min)	N	400	ASTM D4632
Melting point	oC	>165	ASTM D276
Bitumen retention	l/m2	>1,0	ASTM D6140

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39

Geofabric specifications

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- **Requirements to be included (C**

Property	Units	Requirements	Test Me
Nominal Mass	g/m²	130	SANS 98
Thickness	mm	1.2	SANS 98
Tensile Strength (min)	kN/m	7	SANS 15
Elongation at break	%	40-60	SANS 15
Penetration Load (CBR)	kN	1.5	SANS 12
Puncture Resistance (DART)	mm	30	SANS 13
Tear Strength Min	N	215	ASTM D
Grab Strength Min	N	400	ASTM D4632
Melting Point	°C	>165	ASTM D276
Bitumen Retention*	L/m²	>1.0	ASTM D6140

40

Binders

Bituminous binder for geotextile crack sealing	Specification
Cationic bitumen emulsion (solvents omitted)	SANS 4001 – BT4
SC-E1(t) - (solvents omitted)	TG1
Other appropriate product	Certified by independent certification agency

41

Execution

- **Execution of the works described**
- **Binder application**
  - 0.8 l/m^2
  - 1.2 l/m^2
- **Aggregate application**
  - sand or Grit as specified in Clause A10.1.5.12

42

Measurement and payment

Item		Description	Unit
C8.6.1		**Geosynthetic crack sealing**	
	C8.6.1.1	Sealing cracks with 200 mm wide geosynthetic (specify type of emulsion)	metre (m)
	C8.6.1.2	Sealing cracks with geosynthetic over areas (specify type of emulsion)	square metre (m^2)

- **Notes:**
  - No provision for binder variation and could be required dependent on coarseness of existing surfacing
  - No provision for without sand. If required, then have to change **A8.6.7.1 Preparation and execution**

43

Planing

- **Planing in the context of this Chapter refers to level correction where the road surface is uneven and where depressions, humps or small grooves occur as a result of deformation of the pavement layers not due to structural failure of the pavement or the removal or surface irregularities through precision milling to a specified depth, to obtain a clean and regular running surface.**

44

Equipment & execution

- **Planing machine**
  - ❑ Level control
  - ❑ The final texture shall be as smooth and even as possible without any longitudinal grooves in excess of 1,0 mm.
- **Planing deeper than 25 mm shall be classified as milling and payment shall be made under items C4.3.6 or C4.3.7 of Chapter 4.**

45

Workmanship

- **Surface shall not deviate by more than 5,0 mm from the bottom edge of the 3,0 m straight-edge placed in any direction.**
- **Depressions over which the planning machine has moved without touching the surface and which fall outside the specified smoothness requirements, shall be filled in as specified or, if so instructed by the Engineer, a screed shall be placed as specified in Section A8.4**

46

Measurement and payment

Item		Description	Unit
C8.7.1		**Planing**	
	C8.7.1.1	Planing of road surface (Indicate thickness in mm)	square metre (m^2)
	C8.7.1.2	Fog spraying on planned surfaces	litre (ℓ)
	C8.7.1.3	Hand spraying	litre (ℓ)
	C8.7.1.4	Spraying with mechanical equipment	litre (ℓ)
	C8.7.1.5	Rolling the planed surface	roller passes (m^2-pass)

47

PATCHING AND EDGE BREAK REPAIR

- **Definitions**
  - ❑ Structural patching - involves excavating existing failed areas and reconstructing the pavement layers, with specified pavement material.
  - ❑ Surfacing patching - involves the repair of only the failed surfacing layer (seal or asphalt) exposing but not affecting the underlying layer.
  - ❑ Edgebreak repair - involves repairing the edges of the paved area Work could include excavation of pavement layers and backfilling with suitable material and if specified, sealing the joint with a geosynthetic strip. Any excavation and backfilling extending into the wheel path shall be measured under patching.

48

Patching and Edgebreak repair

- **Materials**

Backfill material	Specification
Granular material of G4 quality	Chapter 4
Crushed stone of G1, G2 or G3	Chapter 4
Cement treated material of C4	Chapter 4
BSM1 or BSM2	Chapter 4
Hot-mix asphalt (continuous or semi-gap graded as stated in the Pricing Schedule)	Chapter 9
Cold-mix asphalt: certified by Agrèment SA as a minimum of Class 2 type	Chapter 9
Coarse slurry	Contract Documentation

49

Herbicides – Non-selective

- **Selective herbicides destroy certain plants as they work on processes that happen in those plants only, while non-selective herbicides will destroy any plant as they work on processes that happen in all present plants.**

50

Slurry edgebreak repair

51

Equipment, execution, M&P

- **Refer to document**

52

Repair of surface defects

- Repair of surface defects - deals specifically with repair of early bleeding areas and/or aggregate loss during the Defect Notification Period as defined in the conditions of contract.
- Repair of surfacing failures (typically delamination) is dealt with under patching in Section A8.8.

53

Repair of surface defects

- Bleeding
- Aggregate loss

54

Bleeding

- **Rolling-in of aggregate**
  - ❑ Trial sections shall be constructed to determine the most effective process using:
  - ❑ 10 mm and 7 mm aggregate
  - ❑ Pre-coated and unprecoated aggregate
  - ❑ Heated aggregate
  - ❑ Heating of the road surface
  - ❑ Steel wheel and pneumatic-tyred rolling

55

Bleeding

- **Water cutting**
  - ❑ Trials shall be conducted with the approved apparatus using different pressure settings and jets to obtain the target macro texture for the particular type of seal according to D10.1.6.

56

Aggregate loss

- **Slight loss**
  - Diluted cationic emulsion or SC-E1 (60/40) @ 0.8l/m^2
- **Aggregate loss (isolated areas)**
  - Remove and replace
  - Replace with one size smaller + cover spray
- **Loss of both layers of double seal**
  - Remove and replace
  - Add layer of aggregate (One size smaller) SC-E1 @ 0.8l/m^2
  - Cat 65 cover spray (60/40) @ 0.8l/m^2

57

Aggregate loss (large areas)

- **Remove and replace**
- **Replace and add additional layer of small aggregate**
  - precoated 5,0 mm aggregate precoated Grit seal is then constructed over the entire road surface, using a diluted cationic spray grade emulsion (60/40) at 0,8 l/m^2 and aggregate spread rate of 240 m2/m3
- **Replace and add slurry texture treatment (careful – not on bare areas)**

58

Aggregate loss

- **Small areas**
  - ❑Fill in with one size smaller
- **Large areas**
  - ❑Stone and Grit /5mm
  - ❑Stone and slurry

59

Precoated grit

60

Precoated grit

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- **Aggregate loss**

61

Measurement and payment

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- **Note for aggregate loss (within defects liability period – contractor's responsibility)**
- **Bleeding – can be for pretreatment or just repair (see payment items in document**

62

End

63