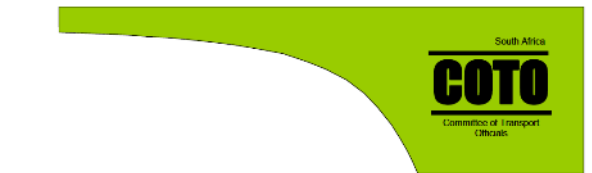


Chapter 10:

SURFACE TREATMENTS



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

**Draft Standard (DS)
CHAPTER 10: SURFACE
TREATMENTS
October 2020**

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Introduction

- **Sources for Chapter 10**

- ☐ Existing COTO specifications
- ☐ SANRAL proforma document
- ☐ SABITA Manual 10
- ☐ SABITA Manual 28
- ☐ 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
- ☐ Various forensic investigations
- ☐ Sub-committee and opinions from experienced practitioners

Format

PART A: SPECIFICATIONS

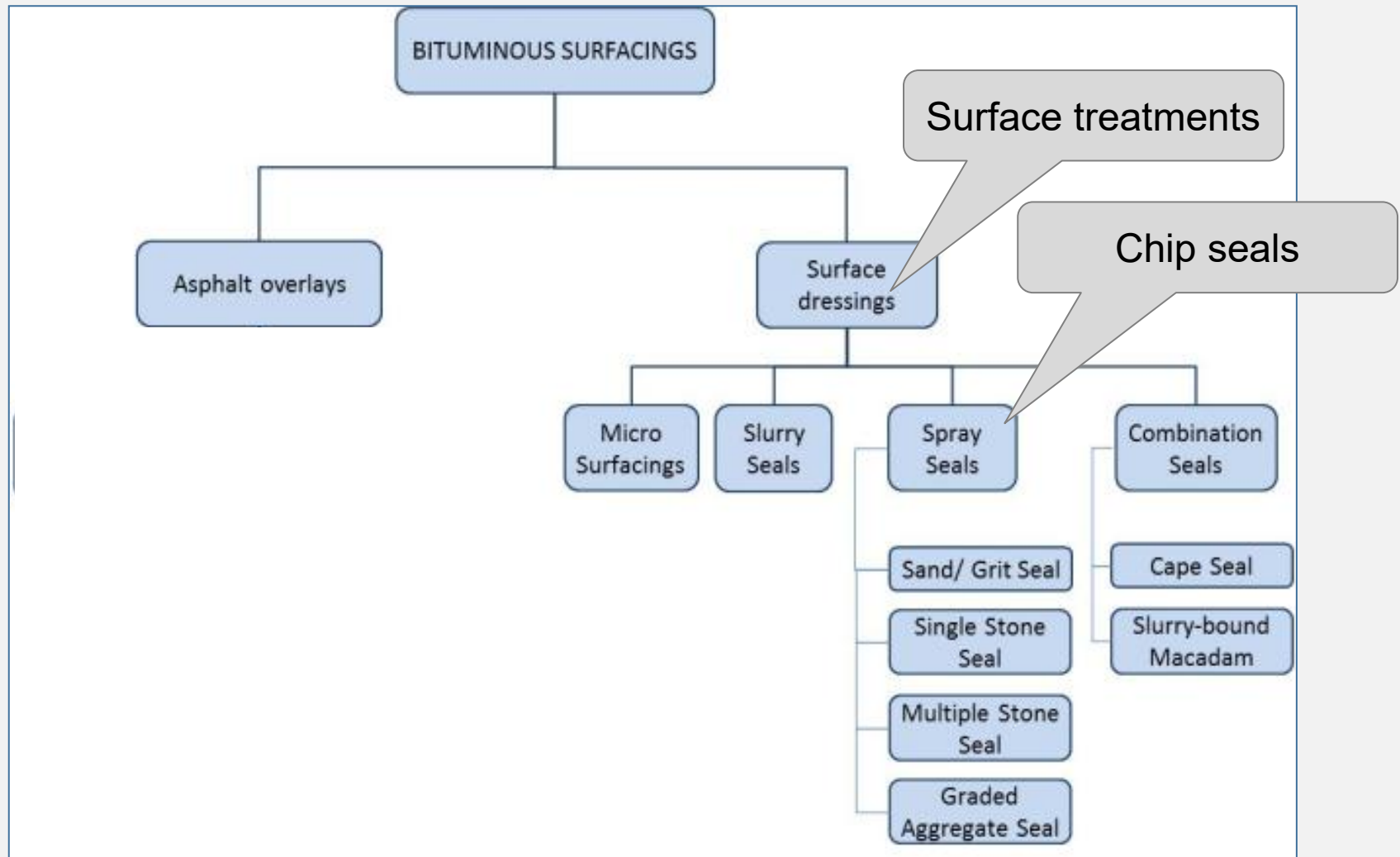
- A10.1.1 SCOPE**
- A10.1.2 DEFINITIONS**
- A10.1.3 GENERAL**
- A10.1.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**
- A10.1.5 MATERIALS**
- A10.1.6 CONSTRUCTION EQUIPMENT**
- A10.1.7 EXECUTION OF THE WORKS**
- A10.1.8 WORKMANSHIP**

PART B: LABOUR ENHANCED

PART C: MEASUREMENT AND PAYMENT

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

Seal types



Definitions

- **The term cover spray –**
 - refers to the application of a diluted emulsion as a final binder application on single or double seals or before application of the slurry, in case of Cape seals.
- **The term fog spray or rejuvenation spray –**
 - is used for the application of anionic emulsion, diluted anionic emulsion or invert emulsion rejuvenator for purposes of adding additional binder to the seal or rejuvenating the seal at a later stage of the seal life.

Chapter 10: General

- ❑ A10.1.3 General requirements
 - Requirements pertaining to all seal types
 - Weather limitations
 - Areas inaccessible to mechanical equipment
 - Protection of kerbs, channels, etc
 - Moisture content
 - Pretreatment
 - Demarcation of working area
 - Dust control
 - Spray Joints
 - Traffic limitations
 - Opening to traffic

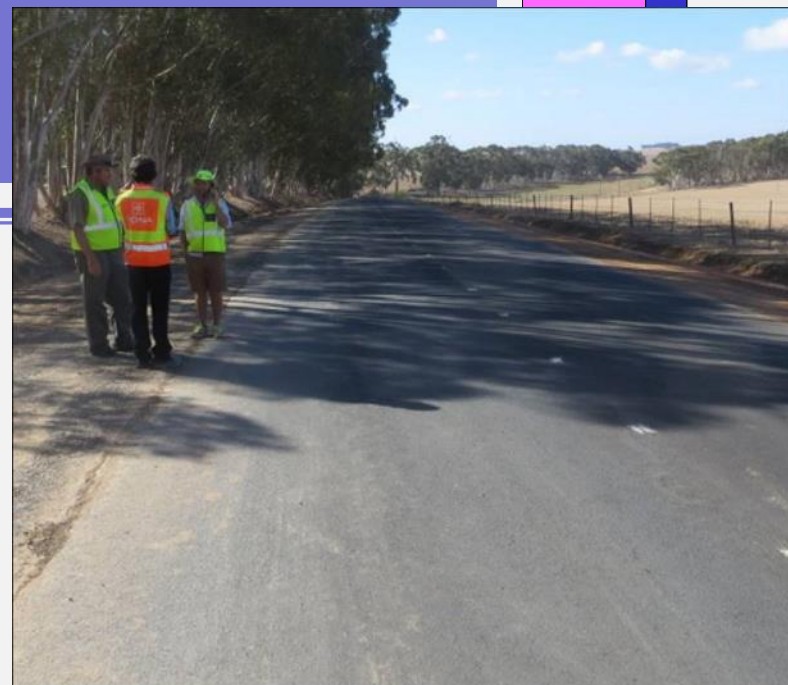
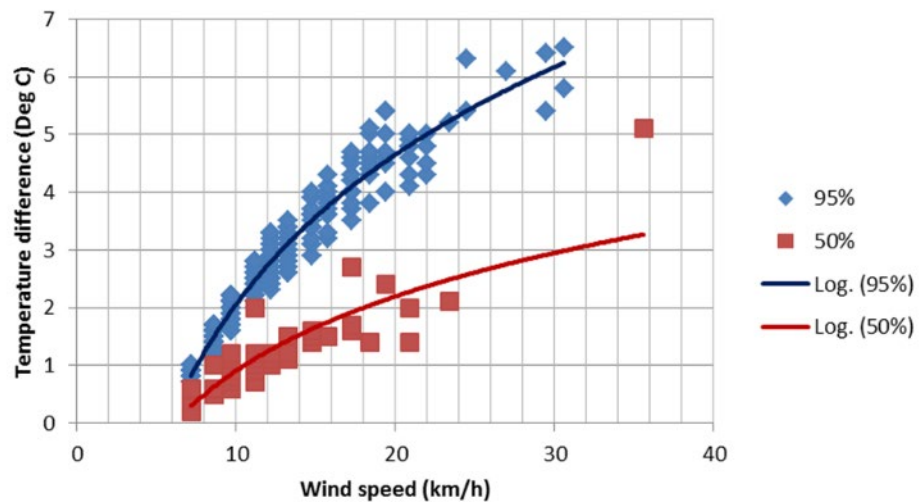
Chapter 10: General

- ❑ A10.1.3 General requirements continued
 - Trial sections
 - Maintenance
 - Nominal rates of application for tender purposes
 - Single seals
 - Precoating fluid

Weather limitations

- **Seal work shall not be permitted during the months of May, June, July and August unless allowance has been made in the Contract Documentation.**
- **Winter grade binders shall only be allowed if provision is made in the Contract Documentation.**

Temperature (Outdoor - Windchill) at different wind speed & humidity

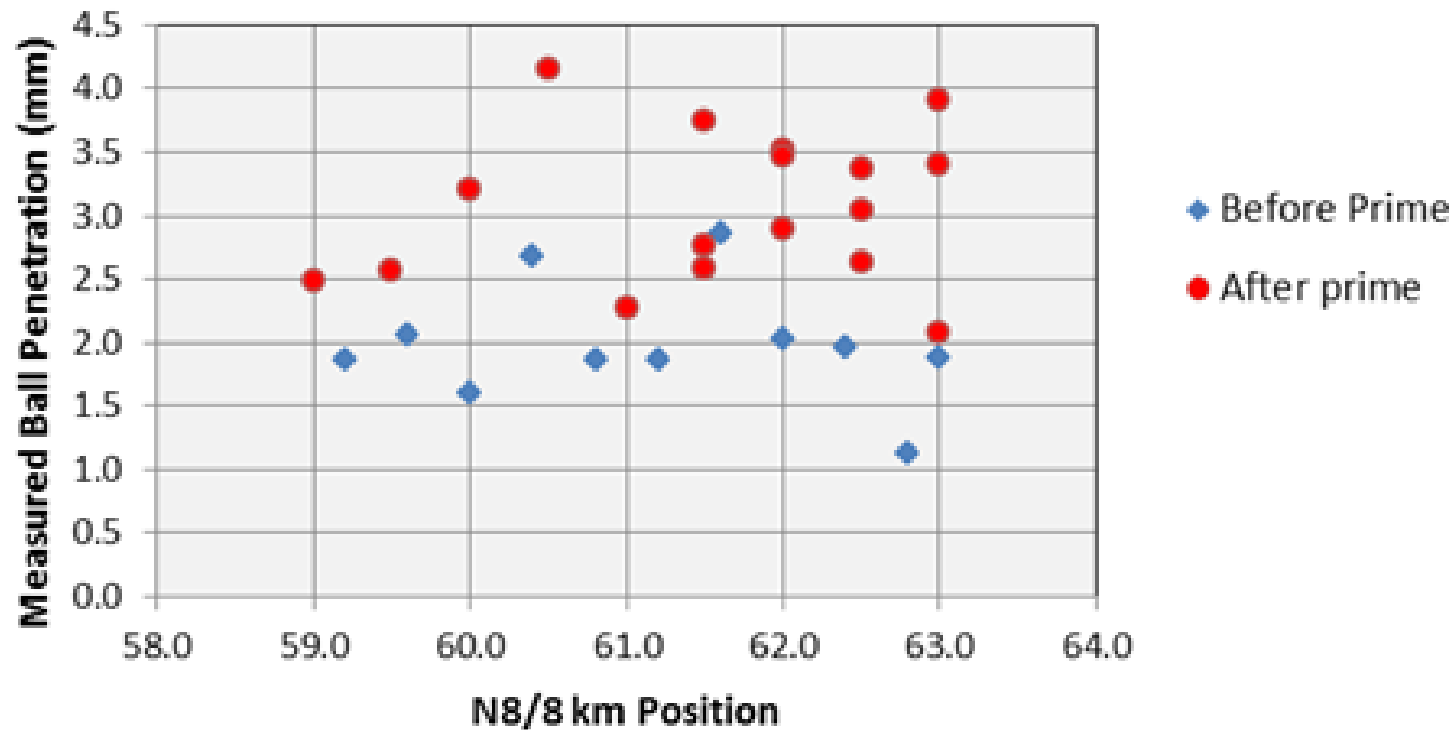


Moisture content in base

- **Seal work shall not be permitted on new granular base layers of type:**
 - ❑ G1, G2 or G3 if the moisture content in the upper 50 mm exceeds 50 % of the optimum moisture content as determined in accordance with SANS 3001 No GR30.
 - ❑ G4 or G5, if the moisture content in the upper 50 mm exceeds 60 % of the optimum moisture content as determined in accordance with SANS 3001 No GR30.
- **These limitations shall apply even if the layer has been previously primed.**

Moisture content

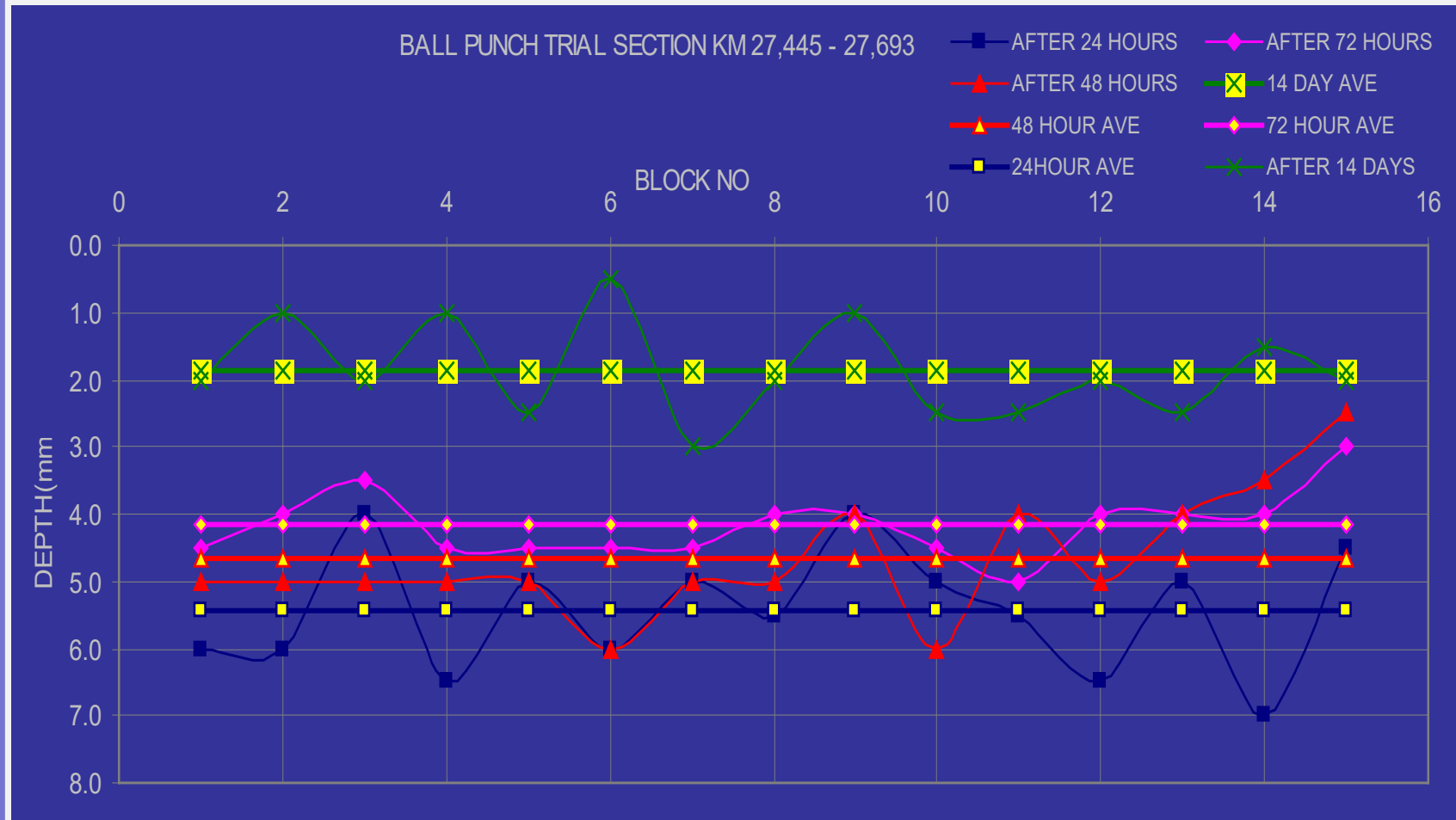
Increase in Ball Penetration after Prime



Pretreatment curing

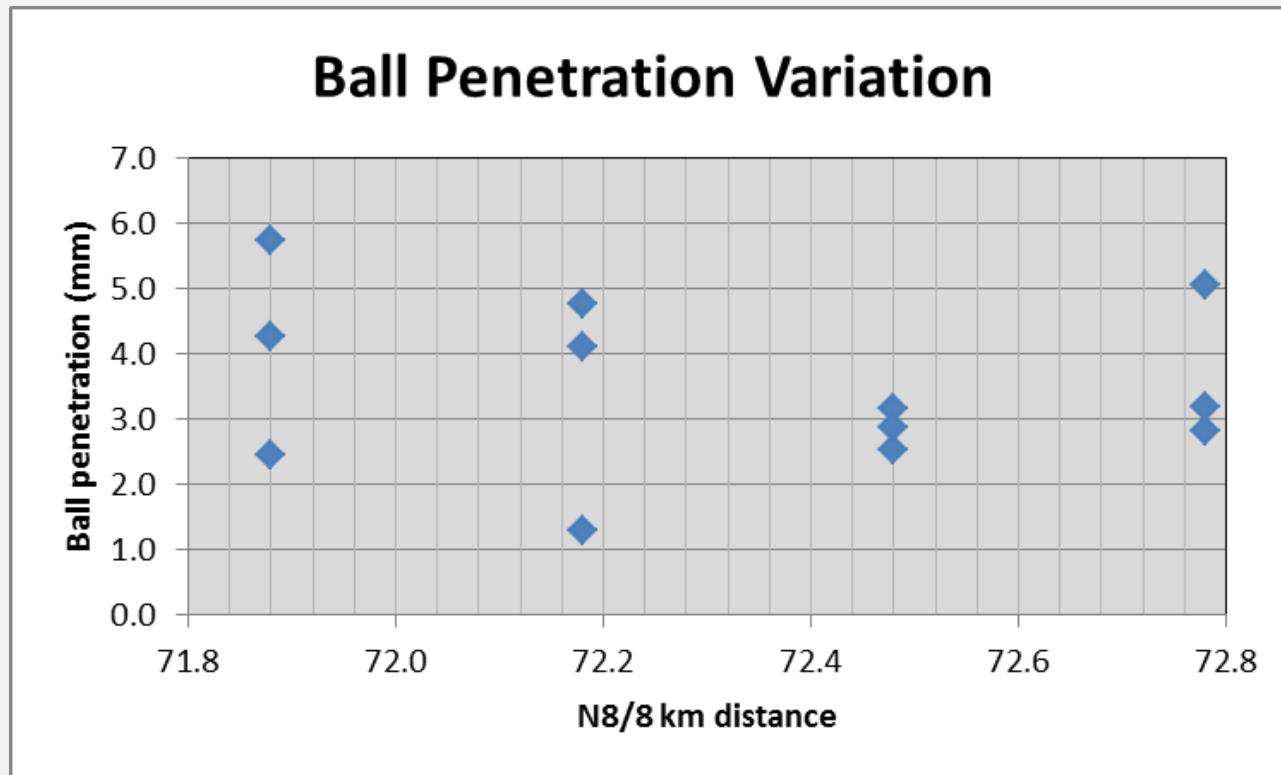
- Texture treatment using fine slurries 6 weeks
- Coarse slurry or microsurfacing applied as screed or rut 12 weeks
- Crack sealing 2 weeks
- Patches for pavement repair..... 6 weeks
- The Engineer may reduce the specified curing period for slurry and asphalt application, based on a representative corrected ball penetration (SANS 3001-BT10), at 25°C road surface temperature of less than 2 mm.

Ball pen checks on rut fill



Ball penetration

- Refer Sabita Manual 40 regarding interpretation and recommended limits its variation for different seal types



Spray joints

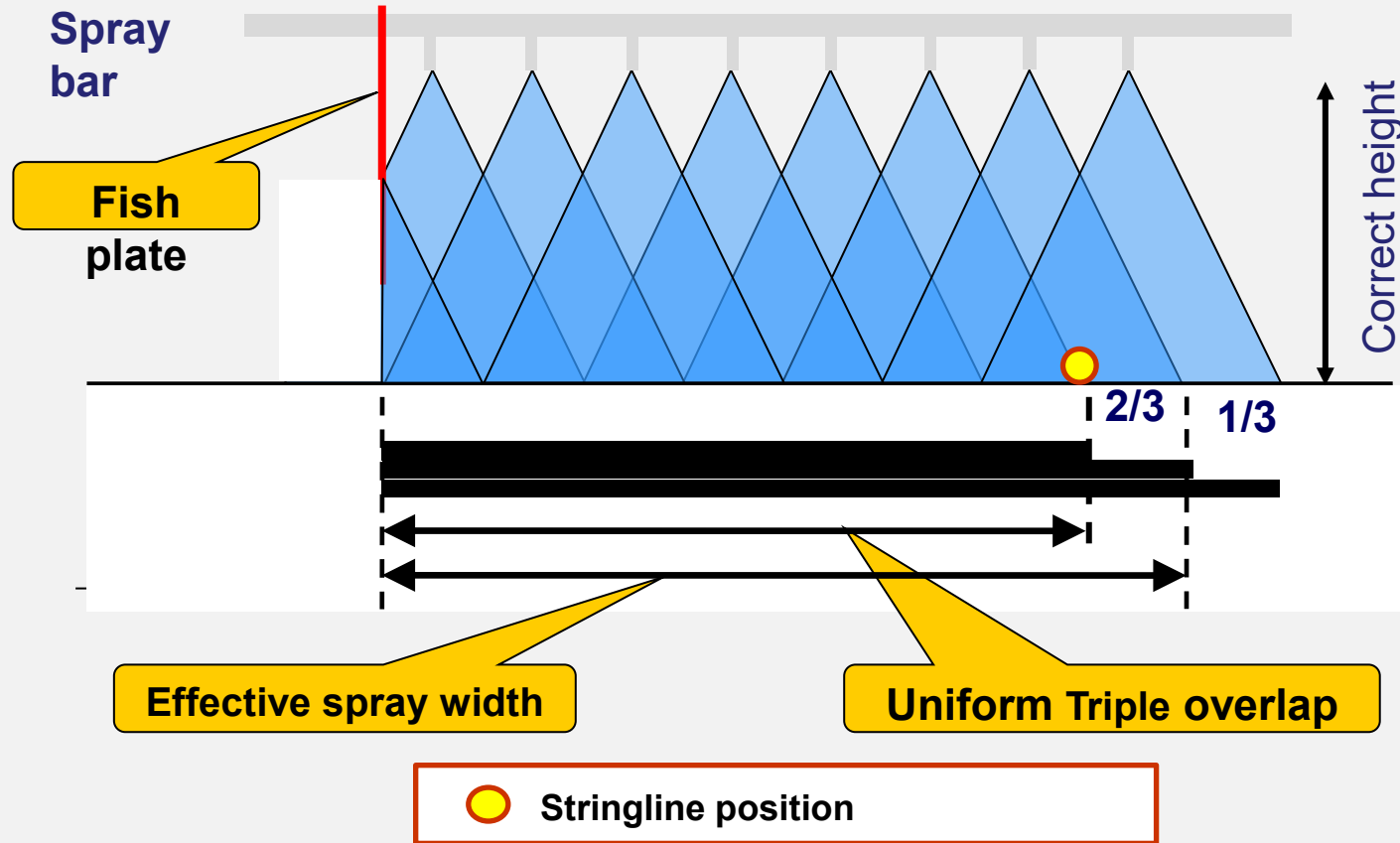
- **Longitudinal**

- ☐ Unless specified differently in the Contract Documentation, the spraying of adjacent strips shall overlap by 200 mm i.e. 100 mm of 2/3 application and 100 mm of 1/3 application
- ☐ The string line on the joint shall demarcate the area sprayed at full application and 2/3 application
- ☐ No turning of the end nozzles or use of fish plates shall be allowed at longitudinal joints
- ☐ Aggregate shall only be applied on the area with full triple overlap binder application
- ☐ No longitudinal joints are allowed in the wheel tracks
- ☐ All aggregate applied on the 2/3 and 1/3 binder application shall be broomed back or chipped off in

String line essential



Binder application



Aggregate application

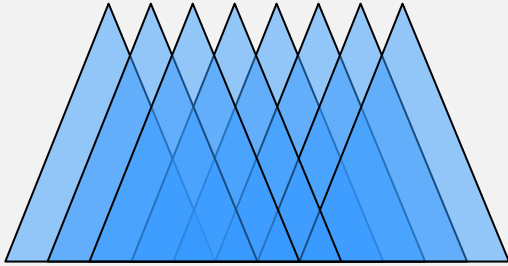
Triple overlap

Aggregate broomed back to
full application/stringline



Note: No joints in wheel track

Joint overspray

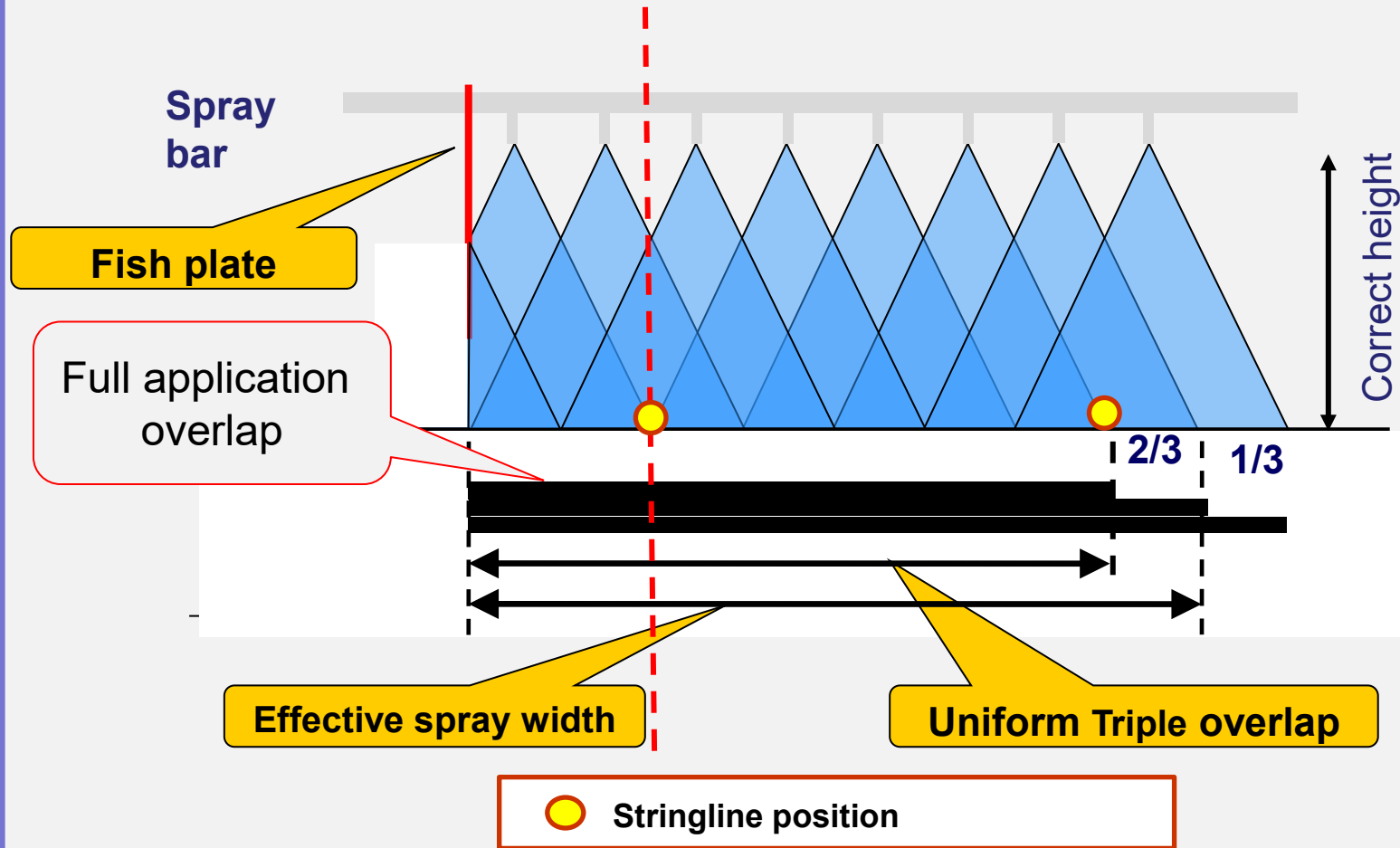


Uniform Triple overlap

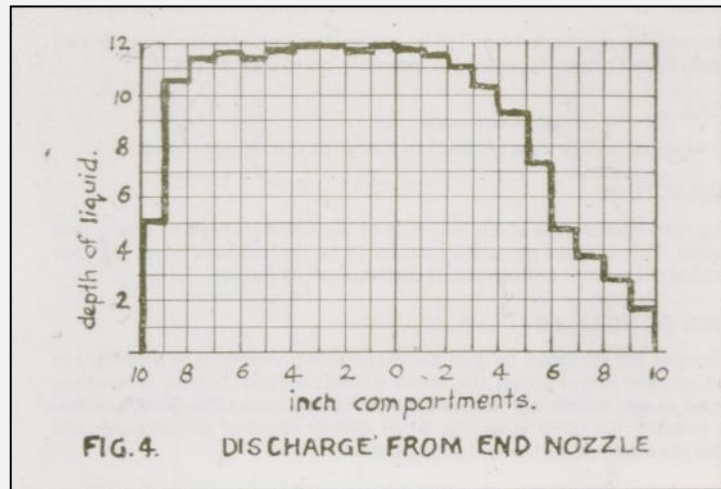
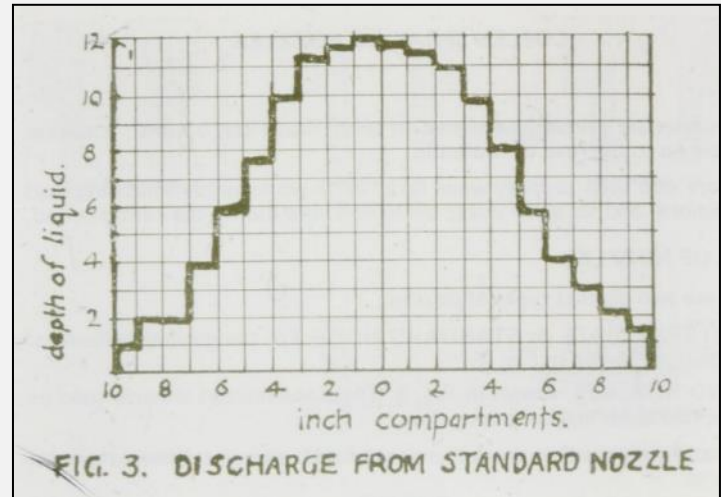
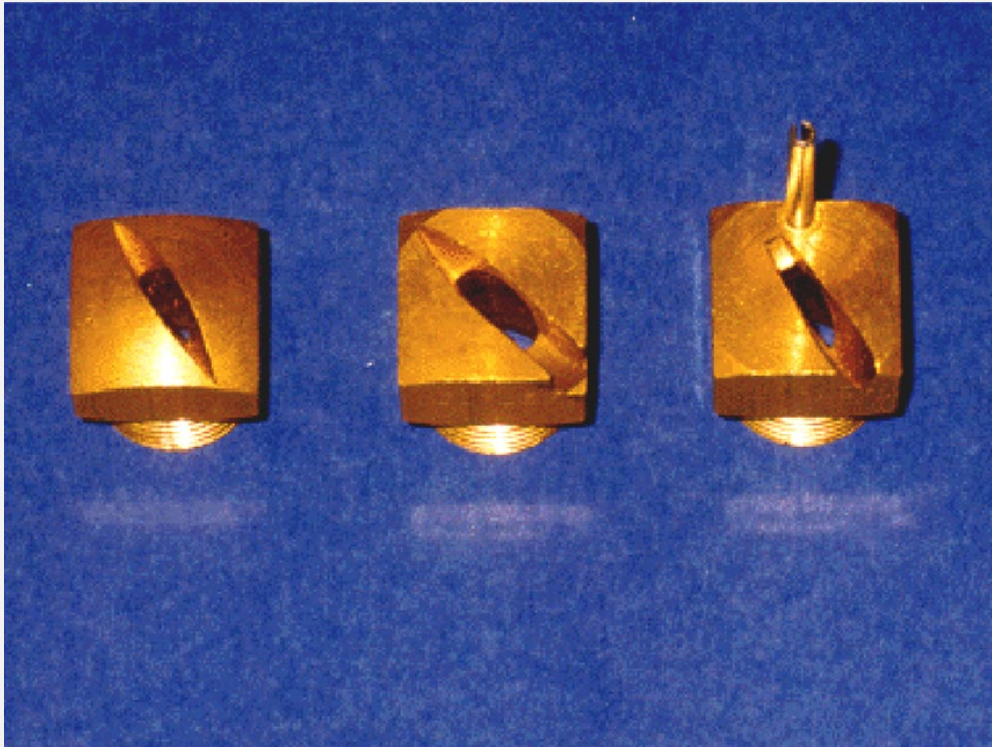
Joint overspray 4/3



Open joints: consider



Nozzles



Traffic limitations

- **Traffic shall not be allowed:**
 - ☐ On a single seal or double seal prior to application of the cover spray, if designed with a cover spray
 - ☐ On the first layer of aggregate of a double seal, second layer of a triple seal (split application double seal) or Cape seal (single seal with slurry)
 - ☐ On non-completed longitudinal joints
- **Stop/go positions shall not be allowed at steep grades.**
- **Speed restriction of maximum 60 km/h shall be enforced for at least 24 hours after opening to traffic**

Opening to traffic

- **Not opened – (tackiness, cured)**
- **Not open while rain/ still wet**
- **When non-fluxed binders are applied and cold temperatures are expected, the road shall only be opened to traffic when the surface temperature increases above 20°C.**
- **Where road widths allow, traffic shall be directed through placement of delineators to compact the full width of the applied seal.**
- **Etc**

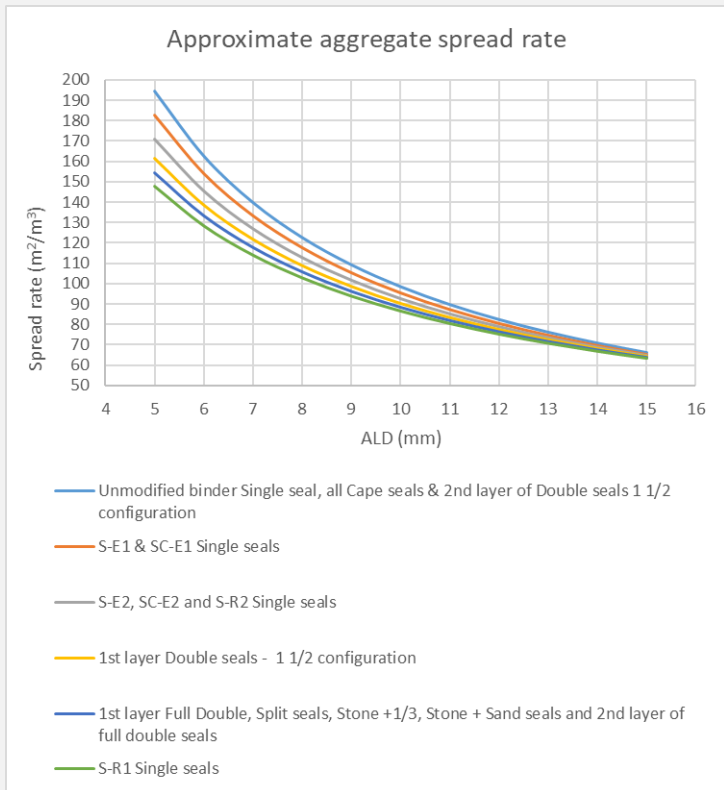


02 2 4

Trial sections

- **At the commencement of the surfacing operation, a 200 m lane section shall be considered as a trial.**
- **To demonstrate that the equipment and processes he proposes to use will enable him to construct the seal in accordance with the specified requirements.**

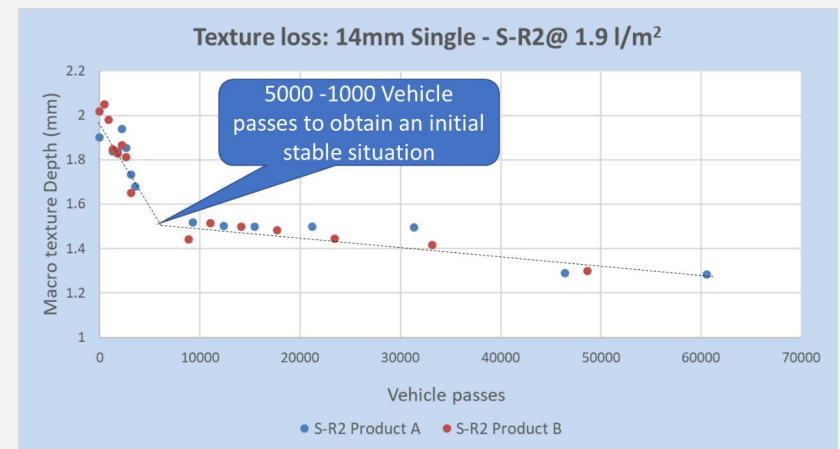
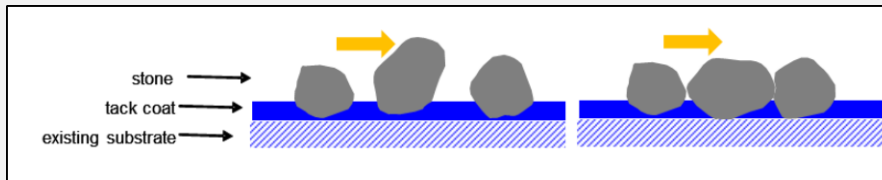
Aggregate spread rates





Traffic compaction

- Importance of controlled traffic compaction

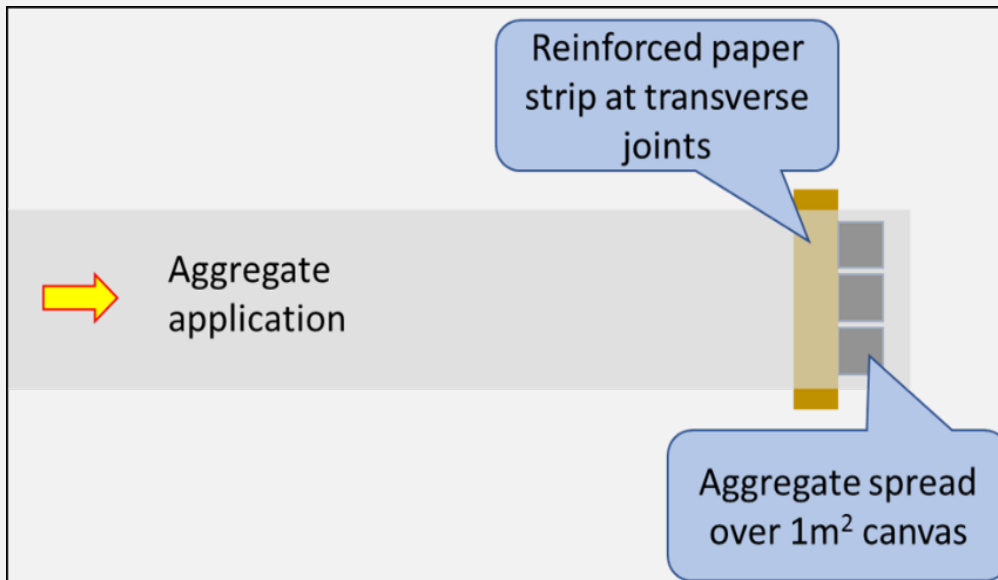


Aggregate spread

- **Same seal and binder application**
- **Different aggregate spread rates**



Spread rate check



Trial sections

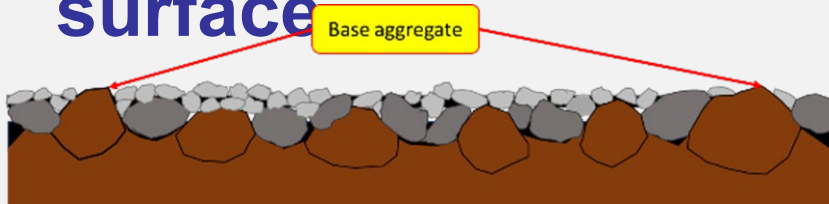
- Trial sections for sand seals and Grit seals, using emulsion, shall specifically be designed to evaluate the appropriate timing of aggregate application to prevent wave forming as well as the sequence and timing of rollers to prevent pick up.

Wave
forming



Base coarseness/variation

- **Effect of coarse base surface**



- **New guidelines for maximum existing texture allowed before texture treatment**



Maximum texture before sealing

Seal Code	Final surfacing type	Max Texture allowed
S1(10)	Single seal with 10 mm aggregate	0.8
S1(10)	Single seal with 10 mm aggregate (with cover spray)	1.0
S1(14)	Single seal with 14 mm aggregate	0.8
S1(14)	Single seal with 14 mm aggregate (with cover spray)	1.5
S1(14)	Single seal with 14 mm aggregate (with Bitumen rubber)	1.2
S2(10/S)	Double seal with 10 mm aggregate and sand	1.0
S2(14/S)	Double seal with 14 mm aggregate and sand	1.5
S4(10)	Cape Seal with 10 mm aggregate and one layer of slurry	1.5
S4(14)	Cape Seal with 14 mm aggregate and one layer of slurry	2.0
S4(20)	Cape Seal with 20 mm aggregate and two layers of slurry	2.5
S2(14/7)	Double seal with 14 mm aggregate and a layer of 7 mm aggregate	1.5
S2(14/5)	Double seal with 14 mm aggregate and a layer of 5 mm aggregate	1.5
S2(20/10)	Double seal with 19 mm aggregate and a layer of 9,5 mm aggregate	2.0
S2(20/7)	Double seal with 19 mm aggregate and a layer of 6,7 mm aggregate	2.0
S2(20/7/7)	Double seal with 19 mm aggregate and two layers of 6,7 mm aggregate	1.5

Method statement !!!!!!!

- **Contractor shall proceed with that approved operation and document the approved method statement, which shall include aggregate spread rates, the timing, type, sequence and number of roller passes, as well as the approved strategy for opening to traffic.**

Nominal rates of application

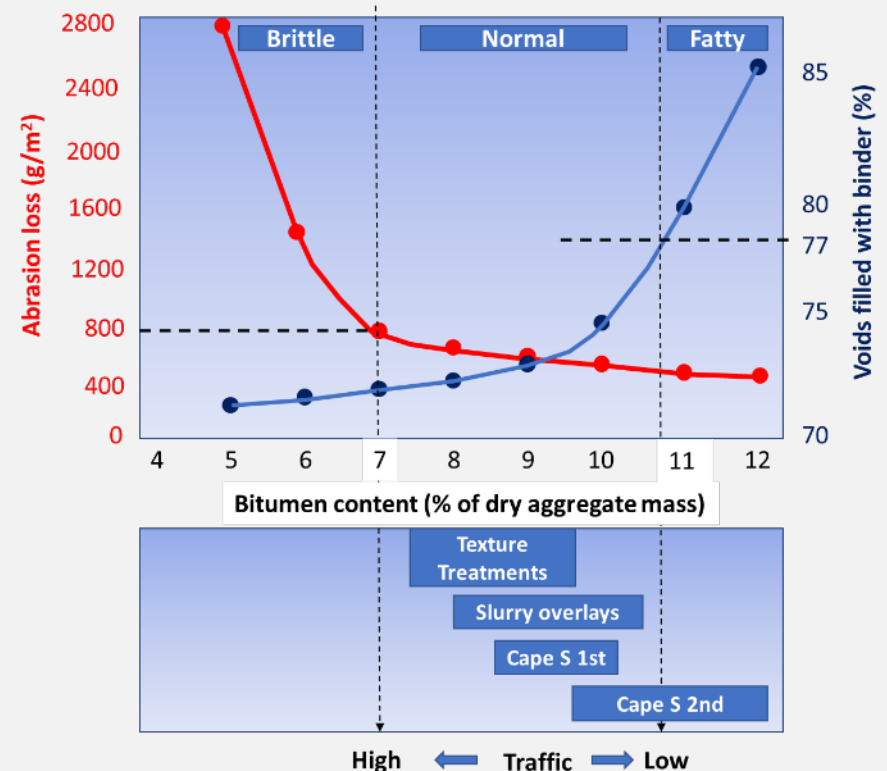
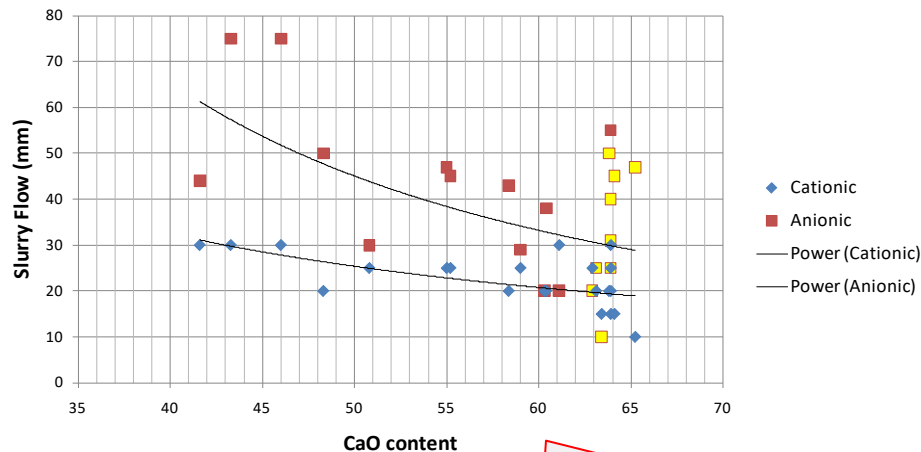
- **ONLY FOR TENDER PURPOSES !!!!**
- **Refer Tables in document (Remember variation allowance)**
- **Final application rates can only be determined after**
 - ☐ Testing of aggregate properties
 - ☐ Surface conditions determined
 - ☐ Trial section completion
 - ☐ Method statement approved

Nominal rates of application

- **Note Cape seals (slurry binder)**

- ❑ First layer 230 l/m³
- ❑ Second layer 260 l/m³
- ❑ Only 1% cement

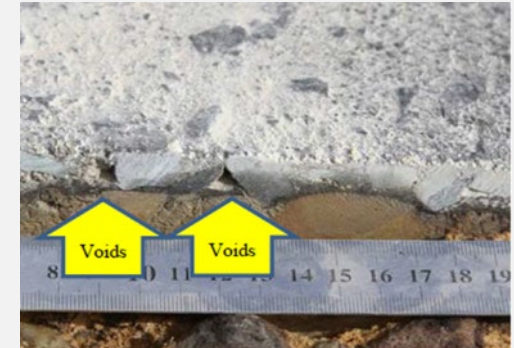
Slurry Flow versus CaO content



Note: Different sources of cement could have different effects on slurry

Cape seals

- **Aggregate spread**



- **Slurry problems**



Chapter 10

- **A10.1.4 Design by Contractor/Performance based systems**

Design by Contractor/Performance based systems

- **Performance period**

- ☐ two years after issuing of the Taking-over certificate, or any other period as specified in the Contract Documentation

- **A10.1.4.3 Contractor's obligation before tendering**

- ☐ **Employer**

- Visual defect assessment according to TMH9 (Part A and B) per 100 m lane section
- Rutting according to TMH13 in each wheel track (Average per 10 m)
- Macro texture in wheel tracks according to TMH13 (Average per 10 m)
- Macro texture in-between wheel tracks according to TMH13 (Average per 10 m)
- Position, size and condition of existing patches

Design by Contractor/Performance based systems

- **A10.1.4.3 Contractor's obligation before tendering**
 - ❑ **Contractor**
 - Traffic loading and volumes
 - Climatic conditions
 - Up- and downgrades along the road
 - Traffic accommodation requirements
 - ❑ **Achievable specifications**
 - When, in the opinion of the Contractor, the properties of the proposed materials do not adhere to the specifications set in this chapter and/or the prescribed performance over the specified period cannot be met, a set of achievable specifications shall be submitted as part of the tender or, if an alternative is proposed, to the Engineer for evaluation.

Chapter 10: Materials

- **A10.1.5 Materials**

- ☐ Conventional Bituminous Binders for seal work
- ☐ Polymer Modified Bituminous Binders for seal work
- ☐ Bituminous binders for cover sprays
- ☐ Bituminous binders for slurry seals
- ☐ Bituminous binders for microsurfacing overlays
- ☐ Water for diluting emulsions
- ☐ Precoating fluid
- ☐ Cutting back of bitumen in the distributor or dedicated plant on site
- ☐ Heating and storing of bituminous binders

Chapter 10: Materials

- **A10.1.5 Materials .. continued**
 - ☐ Single sized aggregate
 - ☐ Aggregate for blinding single seals
 - ☐ Aggregate for Sand and Grit seals
 - ☐ Aggregate for Graded Aggregate seals
 - ☐ Precoating of Hydrophilic aggregates
 - ☐ Aggregate management
 - ☐ Geotextile membranes for seal work
 - ☐ Dry material for slurry seals
 - ☐ Aggregate for Microsurfacing

NB Binders

- **PG Specifications not implemented as yet**
- **Bituminous binders for cover sprays**
 - ☐ Chip seals – Cationic
 - ☐ Cape seals Cationic or anionic
- **Bituminous binders for microsurfacing overlays**
 - ☐ quickset cationic bitumen emulsion, modified with an elastomer and conforming to AC-E2 specifications as given in the latest publication of TG1. The emulsion must be specially formulated to allow for a time of between 90 and 240 seconds when mixed with the selected aggregate, to ensure sufficient setting time of the mix during placing.

- **A10.1.5.8 Cutting back of bitumen in a dedicated plant**
 - ☐ shall only be allowed when specified in the Contract Documentation.
 - ☐ be done with MC30 in accordance with SABITA: Guide for the control of HSE hazards.
 - ☐ MC30 shall comply with the requirements of SANS 4001 – BT2.
 - ☐ The temperature of the bitumen, when the MC30 is introduced shall not be higher than 140°C.

- **A10.1.5.9 Heating and storing of bituminous binders**
 - ❑ f) Homogeneous hot-applied modified binders (winter grade)
 - When S-E1 is cut back with MC30, the supplier shall provide temperature-viscosity relationships for the different percentages of MC30 addition and recommendations regarding spray temperatures
 - ❑ g) Bituminous binders for Cape seals
 - A10.1.5.1. No volatile solvents are allowed in the tack coat binder.

Aggregate specifications

- Grade class**

Traffic (AADT)	Less than 300	300 - 3000	More than 3000
Relevant Aggregate Grade	3	2	1

- Hardness**

Relevant Aggregate Grade	3	2	1
Dry 10 % FACT [kN] (min)	130	180	210
Wet 10 % FACT [kN] (min)	100	135	160

- PSV**

Relevant Aggregate Grade	3	2	1
Aggregate position in seal			
Exposed aggregate	48	49	50
Underlying aggregate	45	47	48

Grading - Final

Sieve size (mm)	Grade	Percentage by mass passing					
		Nominal size (mm)					
		28	20	14	10	7	5
37.5	1 & 2	100					
28		85 - 100	100				
20		0 – 35*	85 - 100	100			
14		0 – 5**	0 – 35*	85 - 100	100		
10			0 – 5**	0 – 35*	85 - 100	100	
7				0 – 5**	0 – 35*	85 - 100	100
5					0 – 5**	0 – 35*	85 - 100
3.35							0 – 35*
2.0						0 – 5**	0 – 5**
	3	Grading shall comply with the requirements for grades 1 and 2 with the following exceptions: * 0 – 50, ** 0 – 10,					
Fines content passing 0,425 mm sieve	1	0.5	0.5	0.5	0.5	0.5	1.0
	2	1.5	1.5	1.5	1.5	1.5	2.5
	3	2.0	2.0	2.0	2.0	3.0	3.5
Dust content: Material passing at 0,075 mm sieve (max)	1	0.2	0.2	0.2	0.2	0.5	0.5
	2	0.5	0.5	0.5	0.5	1.0	1.0
	3	1.5	1.5	1.5	1.5	1.5	1.5

Slurry grading

TABLE B4302/11

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	86 – 100
7		100	100	87 – 100	71 – 91
5	100	84 – 100	72 – 91	72 – 91	62 – 82
2	84 – 99	51 - 90	40 – 64	40 - 63	36 – 56
1	60 - 90	33 – 68	25 - 46	22 – 41	22 - 41
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	4 - 12	4 - 12	2 - 8	4 - 10	4 - 10

Slurry Consistency test



These are not
Specifications –
only guidelines

Application	Target Flow
Slurry bound macadam	60 mm
Texture treatment or Cape Seals	30 - 40 mm
Slurry overlay	20 - 30 mm
Micro surfacing	10 - 20 mm

Purpose of cement in slurry



- **Also note the variation in cement sources
CaO**

Chapter 10: Equipment

• **A10.1.6 CONSTRUCTION EQUIPMENT**

- ☐ Binder distributor
- ☐ Chip spreaders
- ☐ Rollers
- ☐ Water sprinkler
- ☐ Rotary broom
- ☐ Drag broom
- ☐ Miscellaneous equipment
- ☐ Batch mixer for slurry
- ☐ Mass-measuring device
- ☐ Loader for aggregate
- ☐ Continuous slurry machine
- ☐ Spreader box for slurry

Binder distributor

- Not have any fuel, oil or binder **leaks**;
- Have a straight and **clean spray bar**, all the spray heads of which shall be of the **same type** which open simultaneously and shall not leak when closed;
- Have its spray heads all spraying at **the same angle** to the spraybar and the height adjusted to the correct level so as to obtain the required overlapping. The uneven application of binder shall be unacceptable.
- Have its **sieve undamaged and clean**;
- Be under the direct control of an **operator** approved by the Engineer on the grounds of a CV with experience and list of contracts completed with references, in writing or a certificate of competence signed by a representative of a road authority;
- Be fitted with a suitable **cut-off spray-head (end nozzles) or fishplates** to prevent over spraying onto gravel shoulders or staining of concrete elements on the edge of the surfacing of the road.

Binder distributor: Certification

- Be capable of spraying the binder at the specified applications rates. The pump of the distributor shall be capable of delivering the binder at the spray bar nozzles at the correct pressure to obtain the specified application rates, **irrespective of the viscosity properties of the prescribed binder and the number of nozzles open.**
- Fitted with a suitable valve or other **access gate for taking of samples** of the binder for testing purposes.
- The binder distributor, pumps and nozzles, used for non-homogeneous modified binder shall be **adapted to spray the rubber modified binder** satisfactorily. The Contractor shall provide proof by way of a test on the site that the binder distributor has sufficient reserve power to maintain the required constant speed up the **steepest incline** to which spray has to be applied and to obtain a uniform distribution of the binder.

Current SANS 3001

SANS 3001 forms part of a set of tests for annual certification of a binder distributor as fit for purpose, and includes the following:

- a) validation of a dipstick (see SANS 3001-BT21);
- b) power and road speed (see SANS 3001-BT22);
- c) pump system performance (see SANS 3001-BT23); and
- d) spray bar transverse distribution (see SANS 3001-BT24).

Interval, who, where?

- **SANS 3001-BT20:2010** Edition 1
- At an intervals of not more than **12 months** the vehicle shall be tested as described in SANS 3001-BT21, SANS 3001-BT22, SANS 3001-BT23 and SANS 3001-BT24.
- The testing shall be **carried out by employees** of the vehicle owner and all results shall be observed and recorded by a **representative of an accredited independent testing organization**.
- The employees shall be responsible for conducting the tests in a safe manner. The tests may be carried out at the **owner's depot or at an approved testing facility**.

Certificate

The **certificate shall be issued by the independent testing organization** after each successful procedure, indicating that the vehicle is fit for purpose and shall contain the following details:

- a) the name of owner;
- b) the name of independent testing organization;
- c) the make and model of vehicle;
- d) the vehicle registration and VIN numbers; and
- e) the date of testing.

The reports from the individual tests shall be attached to the certificate

- **Power**

- ☐ Must be able to reach 300m/min (18 km/h) in 2 sec

- **Speed**

- ☐ Increments of 60m/min to 300m/min
- ☐ Road speed indicator must be within 5%

- Spray Bar height**

$$H_{SB} = \text{ROUND} \left\{ \left(\frac{1,5N_{SP}}{\cos N_A \times \tan 0,5F_A} \right) \right\}$$

where

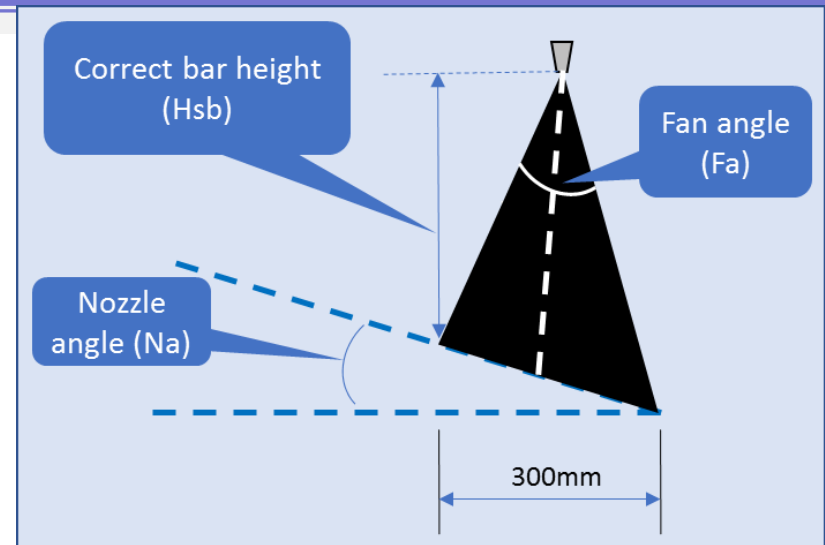
H_{SB} is the spray bar height from nozzle tip to road surface, expressed in millimetres (mm);

N_{SP} is the nozzle spacing, expressed in millimetres (mm);

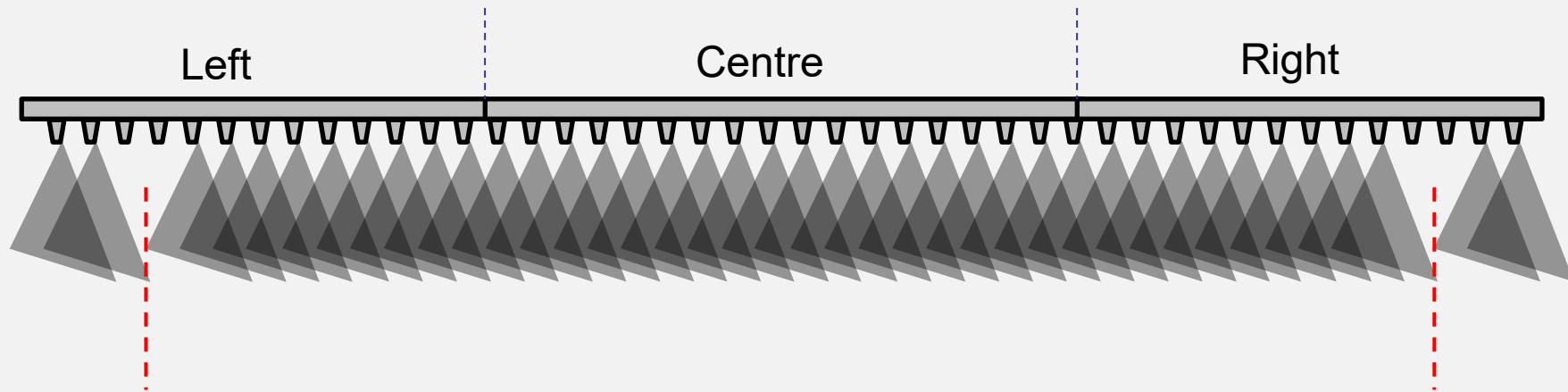
N_A is the nozzle angle to the spray bar axis, expressed in degrees;

F_A is the fan angle of the nozzle, expressed in degrees.

NOTE For most distributors (nozzle spacing 100 mm, nozzle angle 30°, and fan angle 80°), H_{SB} is taken as 210 mm.



- **Spray flair check**



- **Pump output consistency**
 - ☐ Set to 150 l/min/m (4.2m spray bar width)
 - ☐ Discharge per 30sec for 3 min
 - ☐ Allowable difference (Max-Min) = 0.7 l/min/m

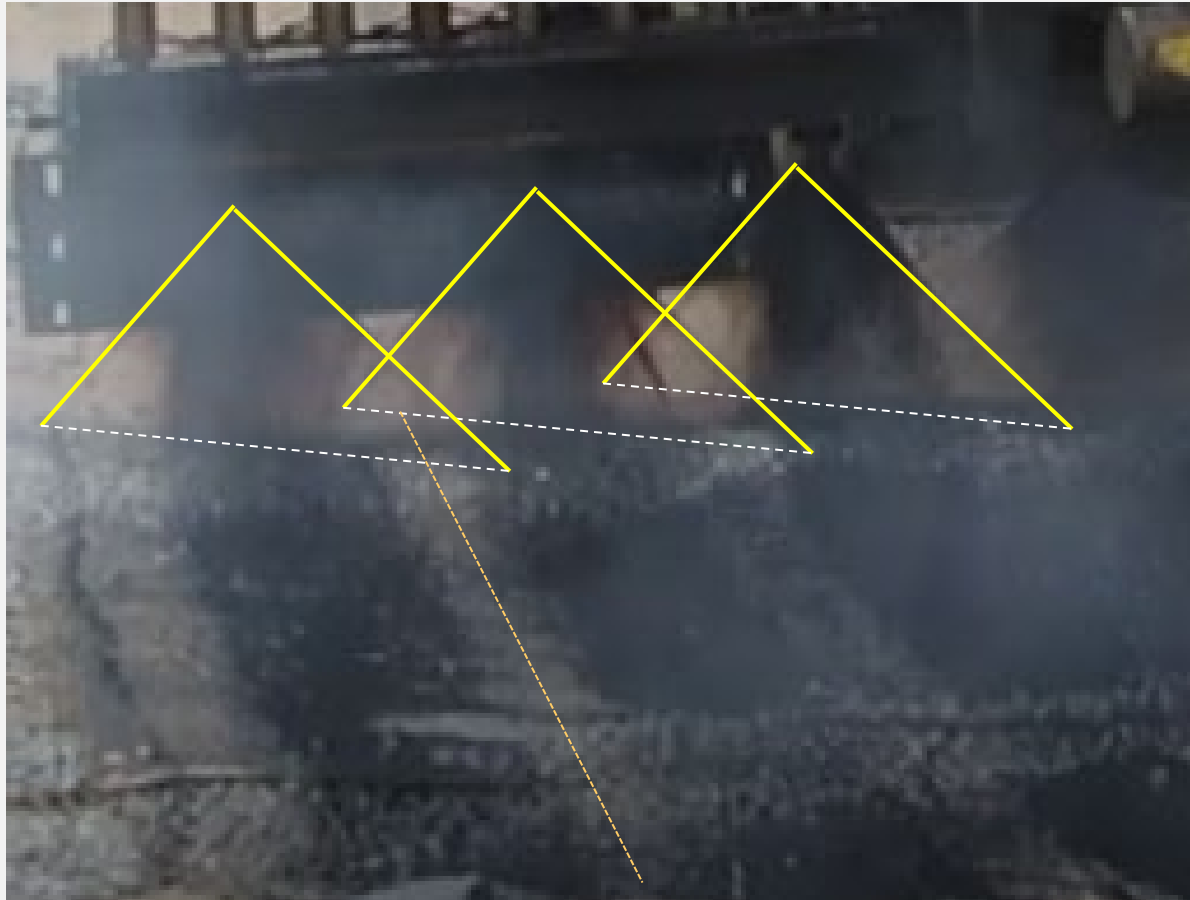
Transverse distribution (Bucket Test)

- ☐ Uniform discharge per 3 nozzle sets (Each nozzle vs average)
 - 5 % for emulsions, cutback, or penetration binders;
 - 7 % for polymer binders; and
 - 10 % for bitumen rubber
- ☐ Mean of left-hand and right hand bar sections vs mean of centre (5%)
- ☐ Mean of left-hand vs mean of right hand bar sections (5%)

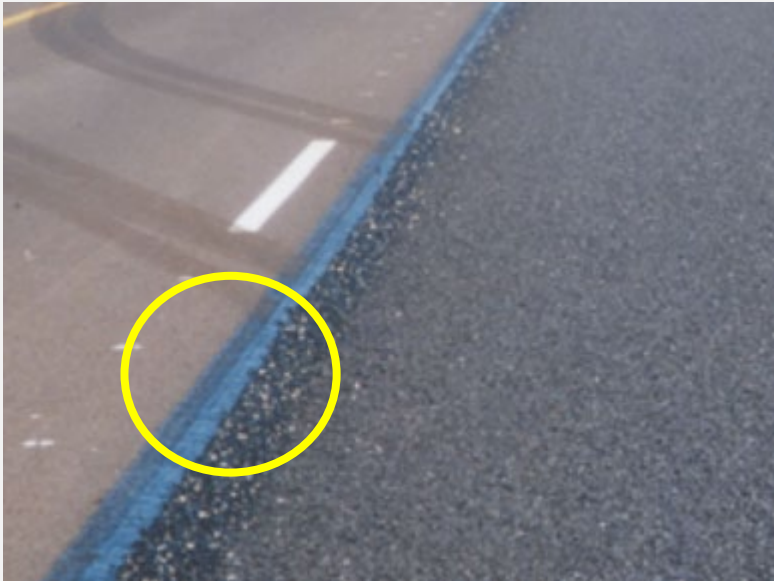


Why do we still get tramlining ?

Effect of too high pressure

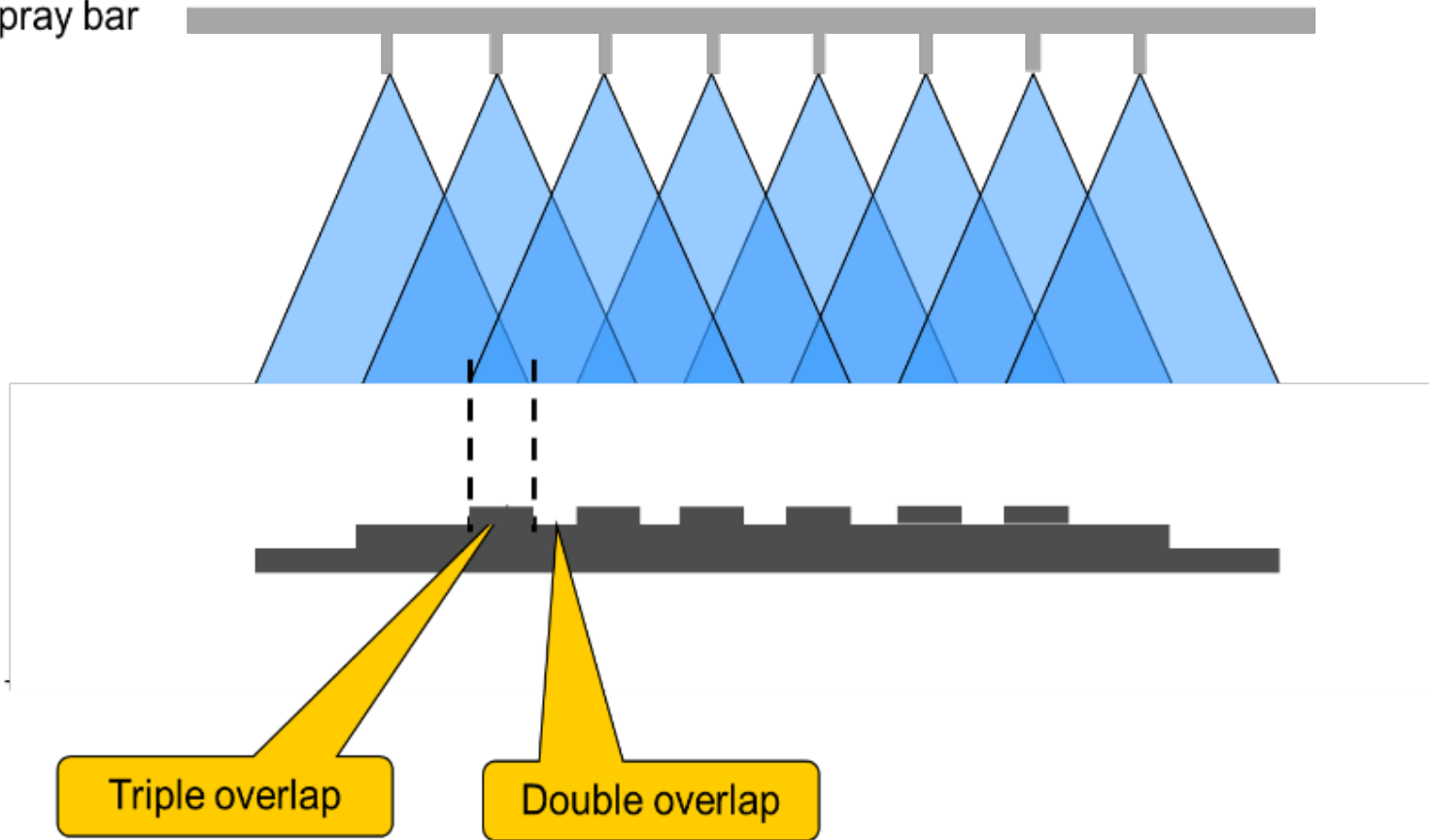


Poor fan also visible on edge



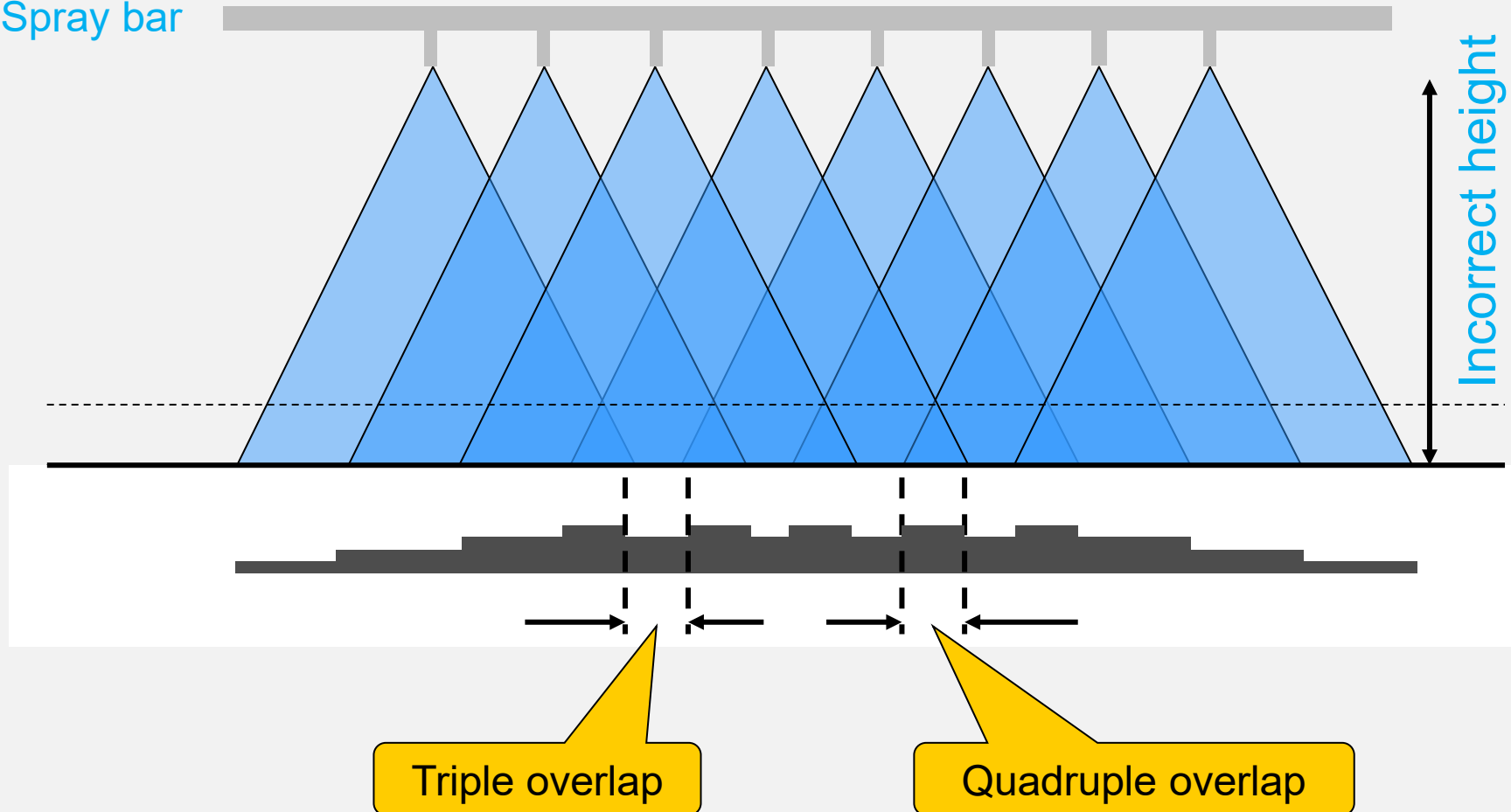
Spray bar too low

Spray bar

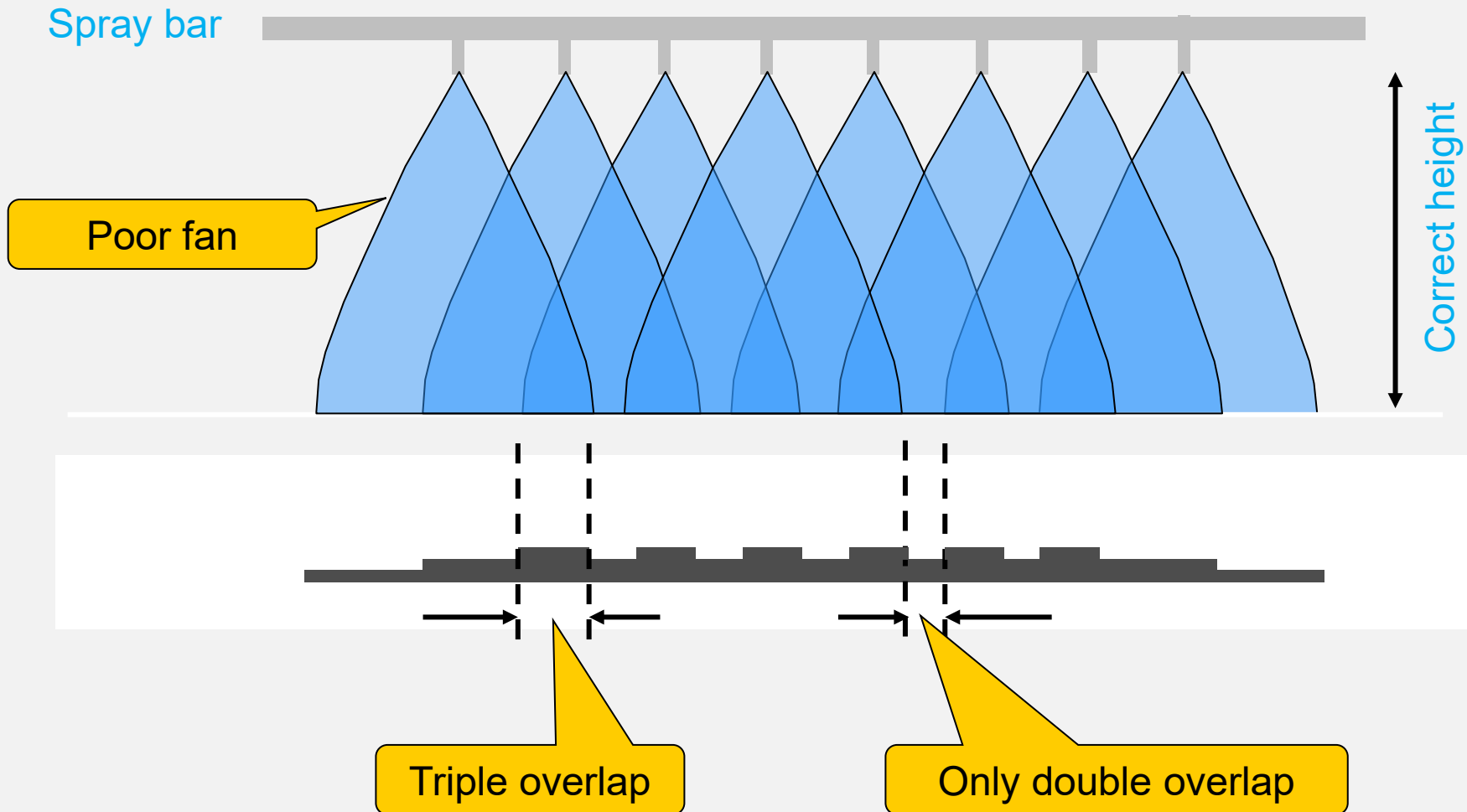


Effect of too high spray bar

Spray bar



Effect of too low pressure



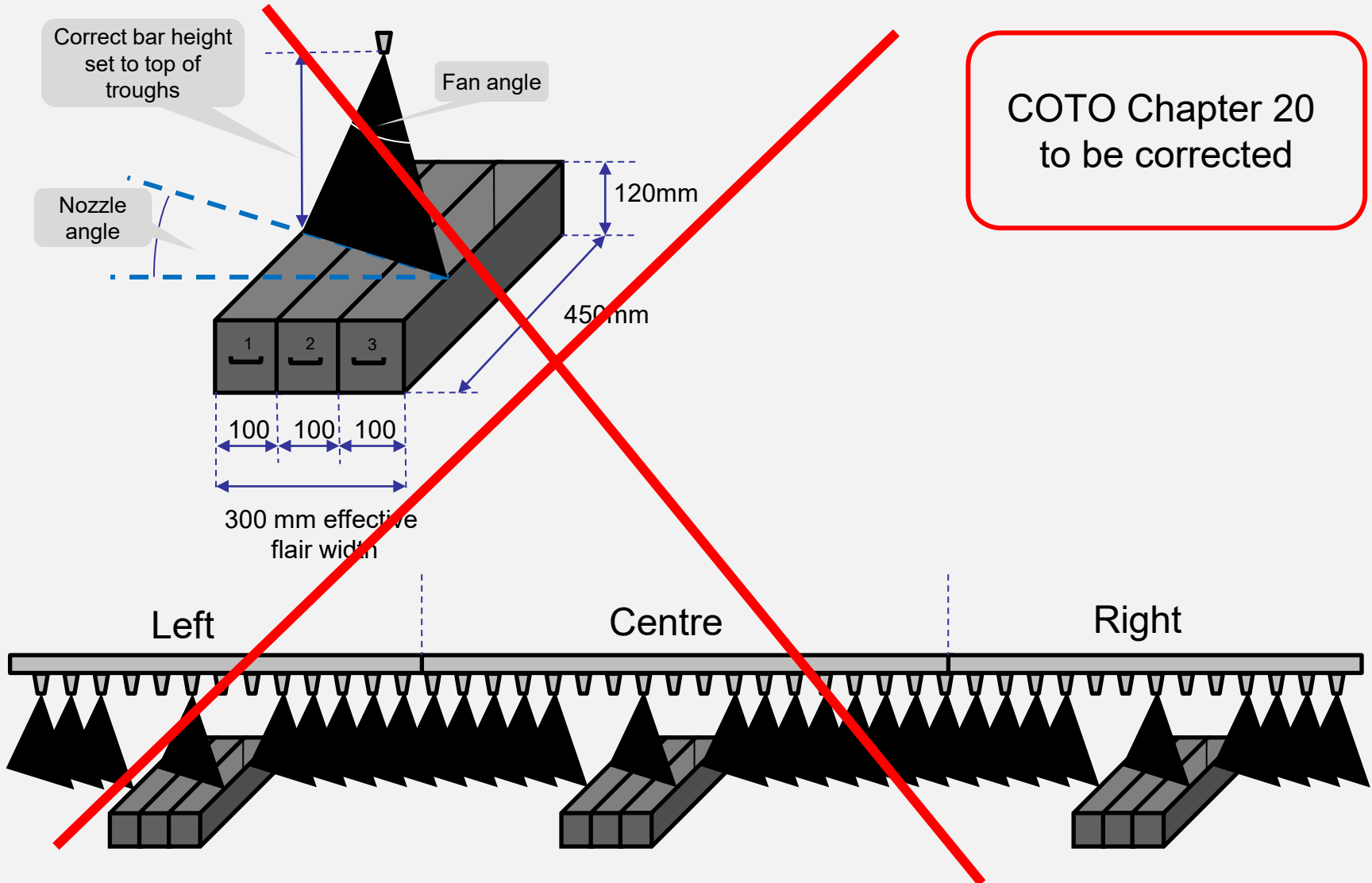
How can we test and certify uniform fan transverse distribution ?

- **Several alternatives considered**
- **Variables**
 - ☐ Viscosity (Binder and temperature)
 - ☐ Nozzle design
 - ☐ Pump speed and pressure
- **Also full calibration plant** →



- **Need simple process that could also be used on site**

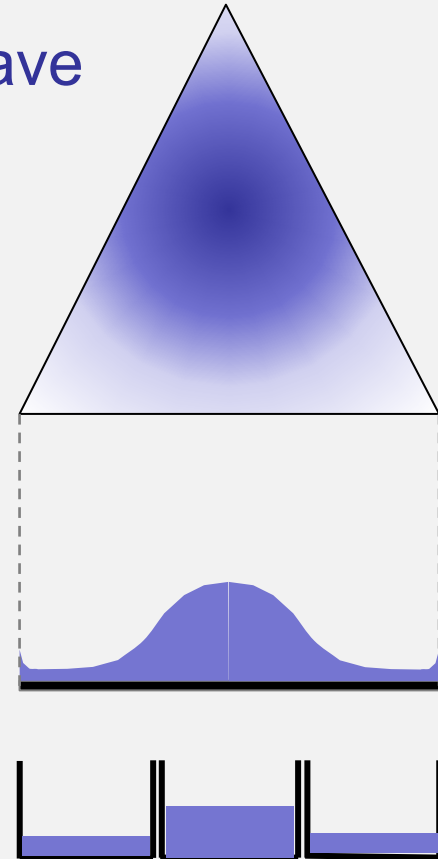
Initial: Spray fan distribution test



Results: SANS 3001- BT25

- **Spray fan distribution test**
 - ▣ Testing by Tosas, Colas, Spraypave

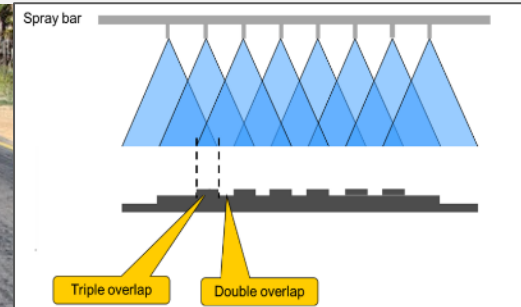
Principle: Test variation
across fan width



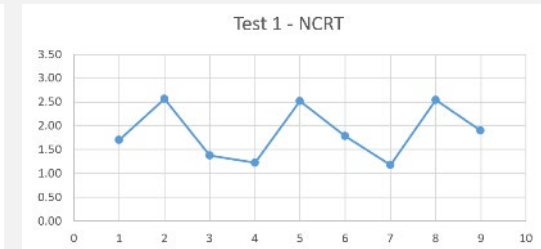
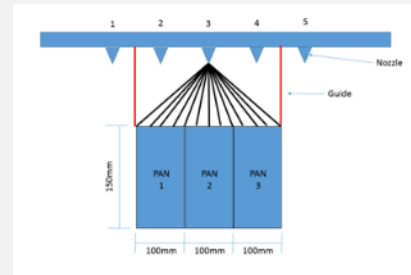
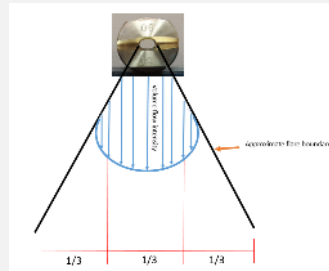
New distributor checks

- **Equipment certification**

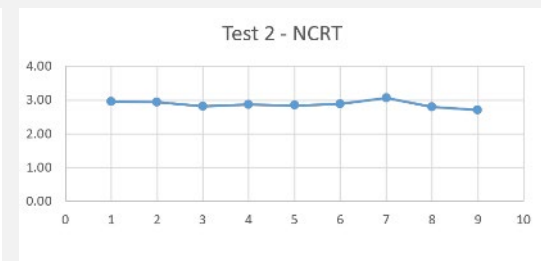
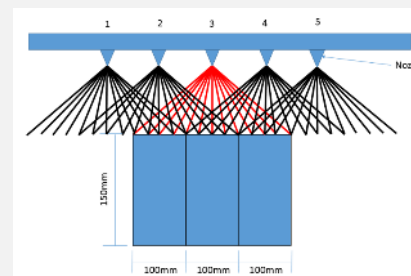
- ☐ Spray flair distribution (SANS 3001-BT25)



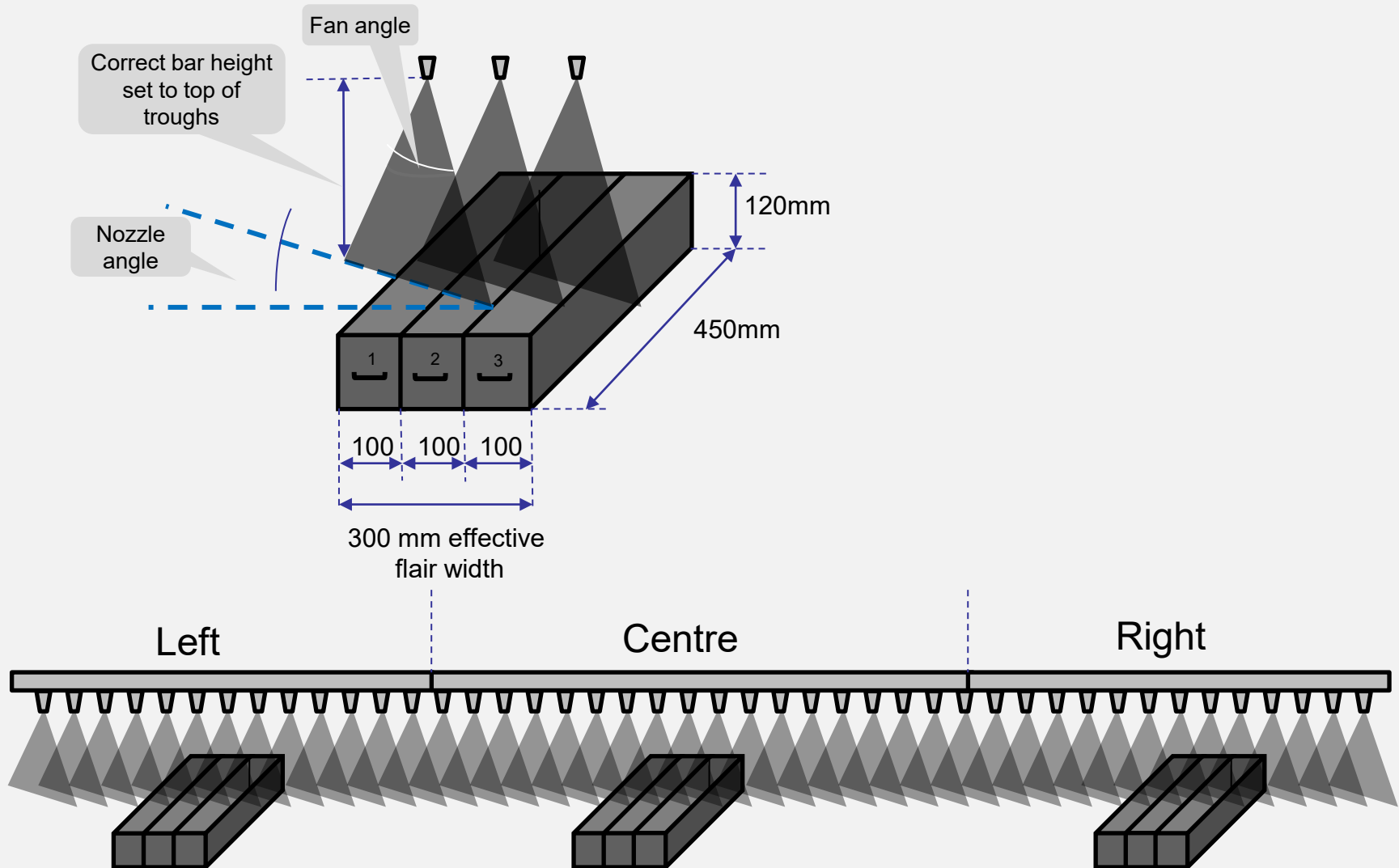
- ☐ Testing completed



- ☐ On-site equipment being finalised



Spray flair specifications



Application

- **BT25 compliments BT21-BT24**

- ☐ The transverse distribution of spray flairs shall be field verified according to SANS 3001-BT24 and Clause A20.1.5.9 of Chapter 20. The maximum permissible tolerance permitted for each trough form the average of the nine troughs is 10 %.

- **Responsibility of supplier/distributor owner**

- ☐ Determine appropriate pressure and spray bar height to obtain a uniform distribution over the fan width for 3 binders e.g.:
 - 65% Cationic Emulsion at 60°C
 - 70/100 Pen bitumen at 170°C
 - S-E1 at 180°C
- ☐ Testing during certification process

- **Certification**

- ☐ Accredited independent testing organization
- ☐ Recording and issuing of certificate

- **Site checks** Check fan transverse distribution only with one binder

Chip Spreaders

- Proper and **uniform transverse distribution** of chips across the width of application.
- The chip distribution shall be tested by means of canvas patches, each **1,0 m by 1,0 m** and placed **side by side over the full width of application.**
- The mass of chips spread onto each individual canvas patch shall not deviate by more than **10 % from the spread rate determined as part of the trial section and recorded in the approved method statement.**

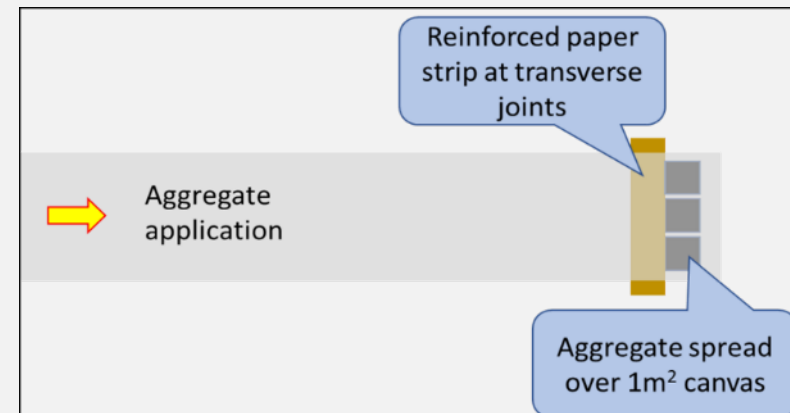
Chip Spreaders

- **At least 2 Chip spreaders**
 - ☐ 1 must be self propelled
- **Non-self-propelled chip spreader may only be used in the event:**
 - ☐ of a **breakdown** of the self-propelled chip spreader during a pull, and shall be limited to the completion of that pull. No further application of binder shall be permitted until such time as the self-propelled chip spreader is repaired or replaced.
 - ☐ of spreading Class 3 aggregate, Graded aggregate, Sand- or Grit seals and **Slurry-bound Macadam seals**.



Determine aggregate spread rate

- Hand pack
- Calibrate chip spreader



Rollers

- **Pneumatic tyred** rollers (minimum two)
 - ☐ not be less than 2 ton per wheel.
 - ☐ Individual tyre pressures shall not differ by more than 35 kPa from one another.
 - ☐ In case of sealing more than 12 000 m² per day, using hot binder, at **least three** pneumatic-tyred rollers are required
- **Rubber-soled steel wheel** rollers (as and when specified in the Contract Documentation) between 6 and 8 tons
- **Light steel** wheeled rollers of 2 – 4 tons (minimum two)
- **Heavy steel** wheel rollers of 5 – 12 tons (as and when specified in the Contract Documentation)
- No steel-wheeled rollers shall be used on the final aggregate layer without the consent of the Engineer, unless a cover spray will be applied after brooming the surface

Other

- **Water sprinkler**
- **Rotary broom**
 - ☐ self-propelled or a towed type
 - ☐ minimum bristle length allowed shall be 70 % of the initial length.
- **Drag broom**
 - ☐ Triangular or “Z-shaped” drag broom

Rollers

... Heavy steel – (8 – 12 ton)



Slide 79

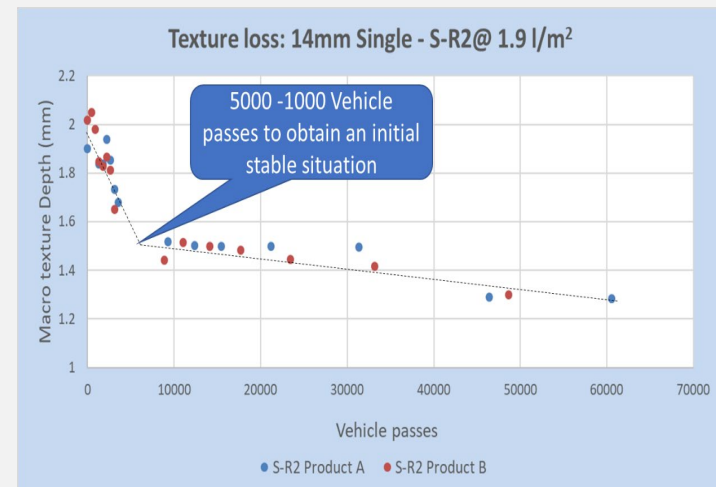
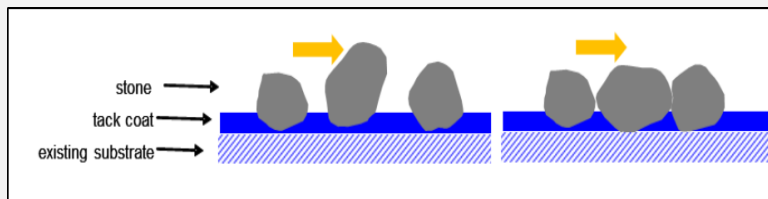
Light Steel wheel



Slide 80

Rubber-padded steel wheel

- Why ?



Rollers

... Pneumatics – (20 – 27 ton)



Slide 82

PTRs Min 2

- **Full cover within 5 min**
- **Slow 5-8km/h**



Slide 83

Aggregate matrix – traffic compaction



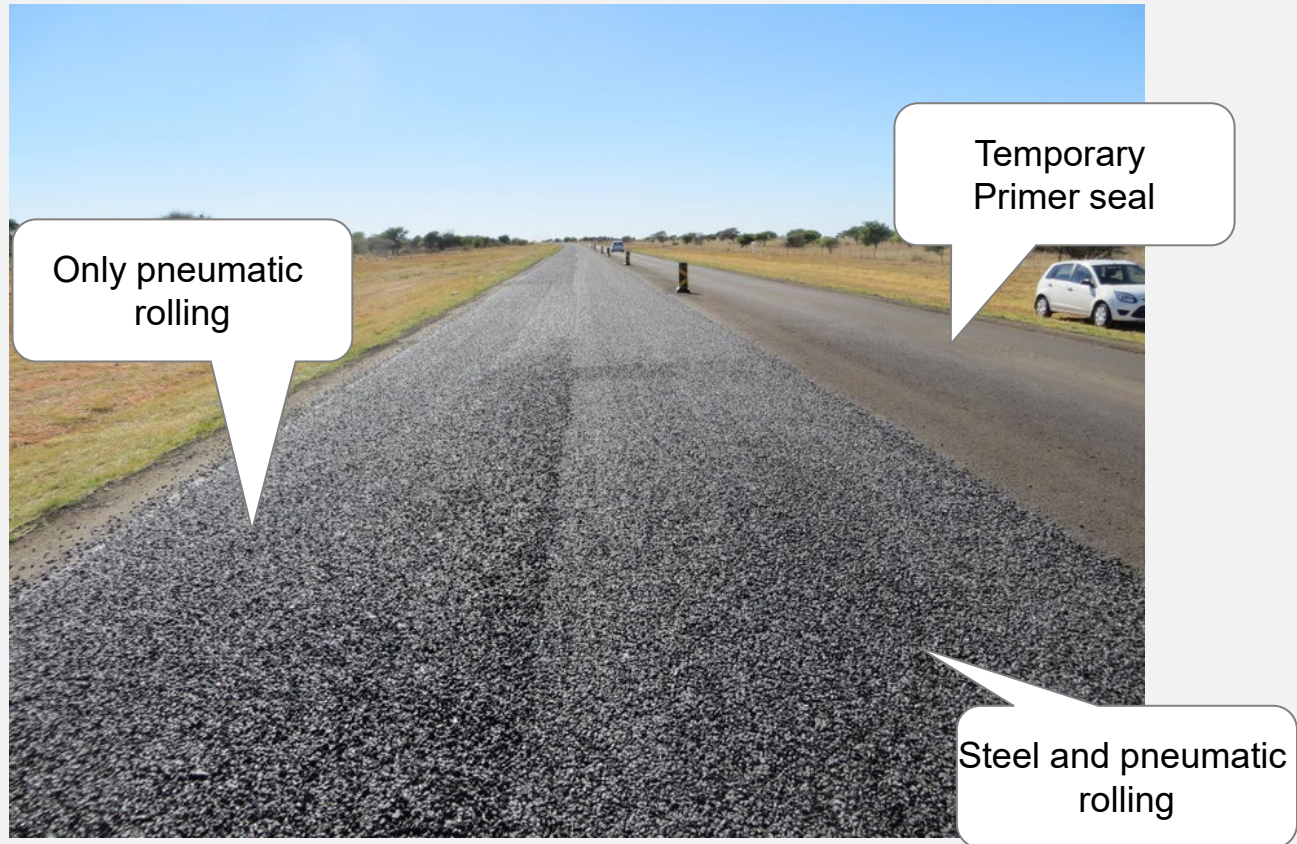
After rolling



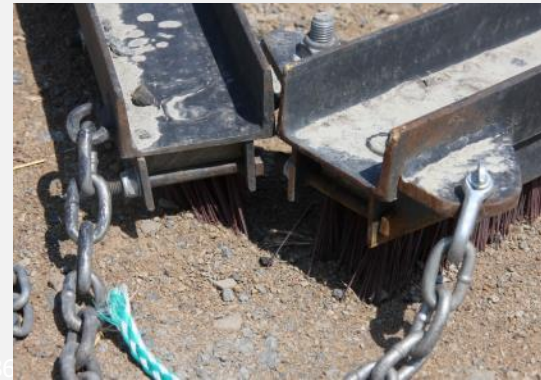
After traffic compaction



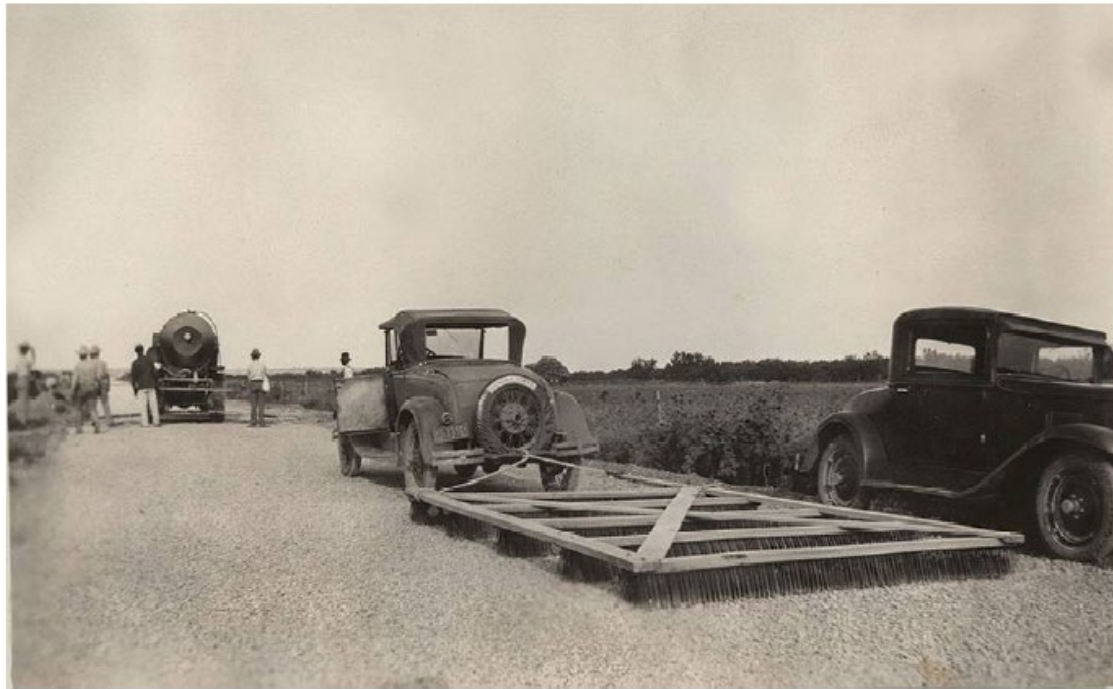
Effect of rolling on texture



Drag Broom



Slide 86



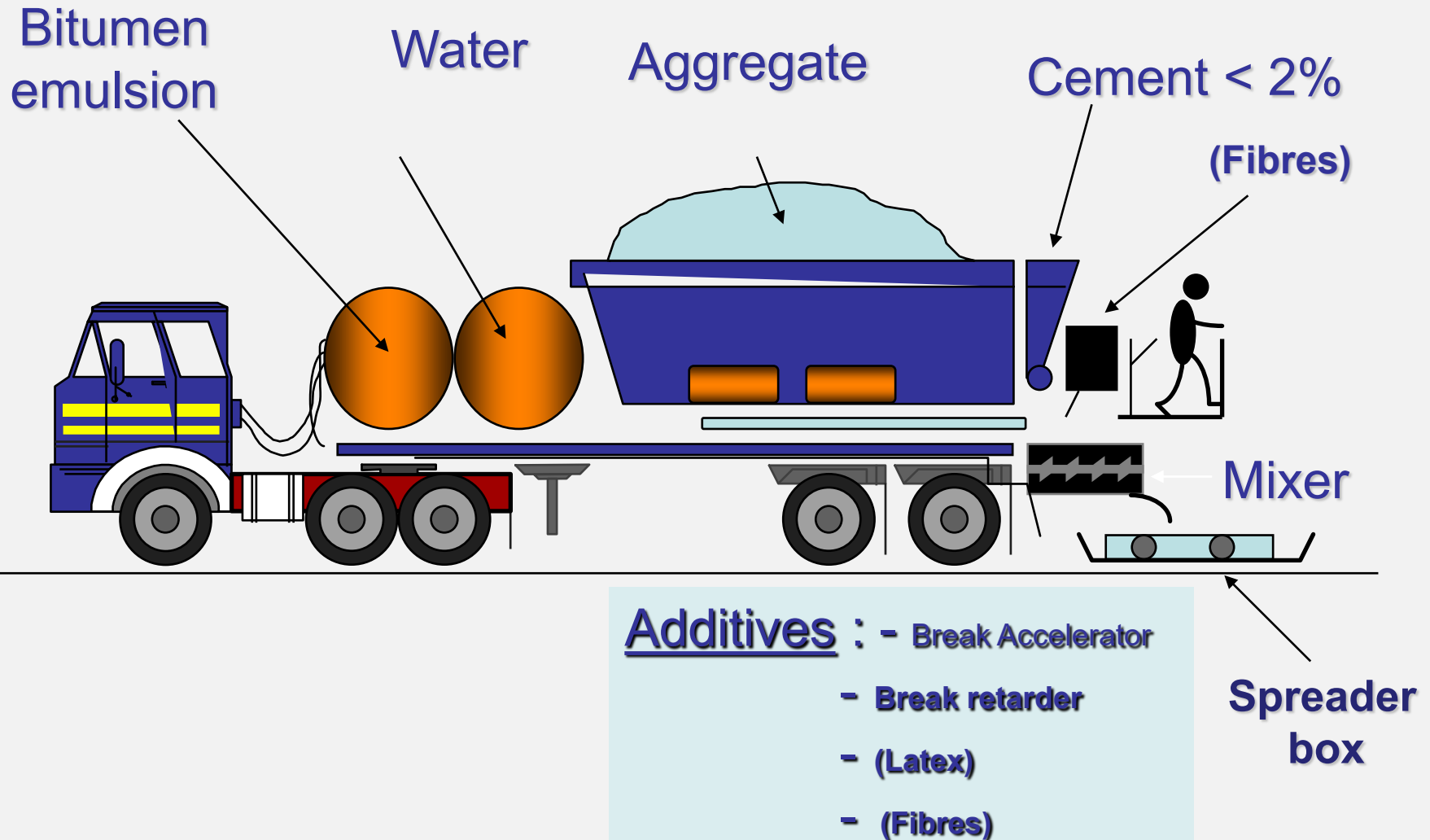
Sweeper

Rotary broom



Slide 88

The Slurry Machine



Slurry batch mixer



RUTFILLING



Slurry seal

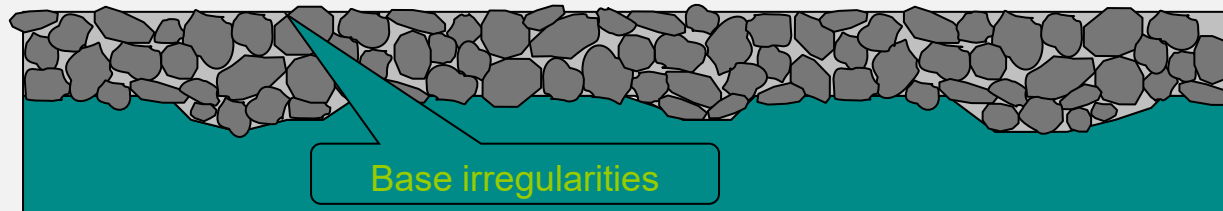


Chapter 10: Execution

- **A10.1.7 EXECUTION OF THE WORKS**
 - ☐ Single Seals
 - ☐ Multiple stone seals
 - ☐ Sand and Grit seals
 - ☐ Graded Aggregate Seals (OTTA Seals)
 - ☐ Slurry Seals
 - ☐ Microsurfacing
 - ☐ Cape seals (Stone and slurry combination seals)
- **Important aspects highlighted in Chapter 10**

SLURRY-BOUND MACADAM SURFACING

- **A10.1.7.8 Slurry-bound Macadam Seal**
 - ❑ a) Application of aggregate



Additional benefits

- Hides base irregularities
- Extremely strong (handles HV turning actions well)
- Erosion resistant
- Expected life 12 – 15 years



Place

Roll static



Spread

Level



Protect



SLURRY-BOUND MACADAM SURFACING



Apply
slurry

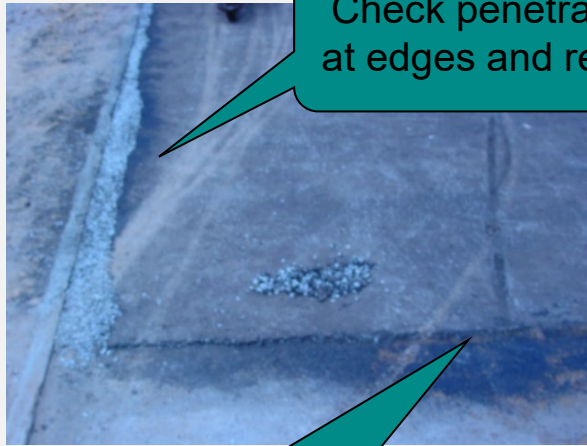
Protect

Vibratory
roll



Smooth
slush marks

SLURRY-BOUND MACADAM SURFACING



Check penetration
at edges and repair

Cut back to full
penetration



Apply final slurry



Drag burlap

Payment adjustment (Single)

Table A10.1.8-1 Payment reduction factors for conditionally accepted binder application rates

Diluted emulsion. Deviation from specified spray rate Net emulsion. (%)	Hot applied binder and undiluted emulsion Deviation from specified rate. At spray temperature. (%)	% Payment of tendered rate for seal
±5.0	±5.0	100.00
±6.0	±6.0	97.56
±7.0	±7.0	94.32
±8.0	±8.0	90.28
±9.0	±9.0	85.44
±10.0	±10.0	79.80

Payment adjustment (Double)

Table A10.1.8-2 Calculation of weighted payment adjustment

Binder layer		Binder	Specified hot application rate	Applied rate	% out	Adjustment factor %	Acceptance	Weighted adjustment	Variation (R/l) tendered	Cost of binder (R/l)	%Cost of layer
First application (tack coat)		Hot: S-R1	2.00	2.20	10.00	79.80	Conditional	46.49	6.00	12	58.25
Second application (penetration coat)		Hot: S-E1	1.30	1.20	7.69	91.61	Conditional	28.91	5.00	6.5	31.55
Cover spray		Diluted Cat 65	1.00	1.10							
% Emulsion in dilution	70	Cold: Cat 65	0.7	0.77	10.00	79.80	Conditional	8.13	3.00	2.1	10.19
							% Payment	83.53		20.60	
							Tendered price/m ²	62.00			
							Payment /m ²	51.79			

PART B: LABOUR ENHANCED

- **Scope**

- ☐ NB Only emulsions allowed (No hot binders)

- **Equipment**

- ☐ Spec provided for motorised hot bitumen emulsion hand sprayer
- ☐ Chip spreading
 - Spotting and hand spreading allowed
 - Manually operated chip spreader (Specs same)

- **Rolling**

- ☐ (\pm 1 ton) tandem pedestrian rollers



PART C; measurement & Payment

- **Provision for Winter sealing**

Item	Description	Unit
C10.1.4	Winter effects	
C10.1.4.1	Re-establishment of sealing team after embargo period	lump sum (LS)
C10.1.4.2	Extra-over relevant tendered rate for sealing in winter	square metre (m ²)

- **Labour enhanced**

- ☐ Provision for construction by hand on almost all items

PART D

- **GUARANTEES AND COMPLIANCE CERTIFICATES**

- ☐ SCOPE
- ☐ GENERAL
- ☐ PERFORMANCE GUARANTEE REQUIREMENTS
- ☐ FUNCTIONAL PERFORMANCE ASSESSMENTS²
- ☐ VISUALLY ASSESSED PROPERTIES
 - Definition
 - Assessment specification
 - Data processing and reports
 - Acceptance criteria
- ☐ D10.1.6 INSTRUMENTALLY ASSESSED PROPERTIES
 - D10.1.6.1 Surface macro-texture

PART D

- **GUARANTEES AND COMPLIANCE CERTIFICATES**
 - ❑ EVALUATION FOR ACCEPTANCE
 - Assessment on completion of the works
 - Assessment one year after completion in performance period
 - Assessment two (2) years after completion in performance period
 - Assessment at any time during the Performance Period
 - ❑ ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE
 - ❑ NOTIFICATION OF REMEDIAL WORK
 - ❑ REMEDIAL WORK

Macro texture

Macro-texture measurements must be taken in accordance with the specification presented in **Table D10.1.6-1**.

Table D10.1.6-1 Specification for measurement of surface macrotexture

Item	Specification
Frequency of measurement	Between 7 and 14 days after opening to traffic, and then after year 1 and 2 of the performance period, coinciding with the Employer's regular road-assessment programme.
Position of measurement	Both wheel paths and in-between wheel paths of all trafficked lanes.
Testing intervals	Record data over 10m intervals.

e) Data Processing and Reports

Surface macro-texture data must be processed so as to produce results in the format specified in **Table D10.1.6-2**.

Table D10.1.6-2 Specification for output of surface macro-texture

Item	Specification
Unit	Mean Profile Depth (ISO 13473-1) calculated for each 10 metres.
Segment lengths	1 km
Statistical summary	Produce cumulative distribution graph for each segment

Macro texture

f) Acceptance criteria

Using the cumulative distribution graph for each segment, the measured surface macro-texture must meet the acceptance criteria presented in **Table D10.1.6-3**.

Table D10.1.6-3 Acceptance criteria (Minimum) for initial surface macro-texture

Seal Type	10 mm	14 mm	14/7	20/10	20/7/7	20/7	20 Cape	14 Cape
5 th Percentile MPD	1.8	1.95	1.5	1.8	1.55	1.7	NA	NA

Notes:

The average MPD value per km lot becomes the reference MPD for performance measurement

The volumetric texture depth as determined by SANS 3001-BT11 = 1.35 times the Mean Profile Depth

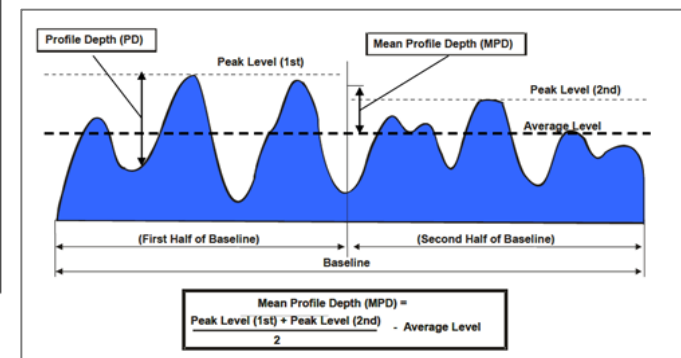
Table D10.1.6-4 Acceptance criteria for surface macro-texture performance – double seals

Time	Percentage retention of initial Mean profile depth (%) ²	Maximum (%) of 1 km segment with surface macro-texture retention worse than limit value
Year 1 ¹	85.0	20 %
	80.0	5 %
	75.0	0 %
Year 2 ¹	80.0	20 %
	75.0	5 %
	70.0	0 %

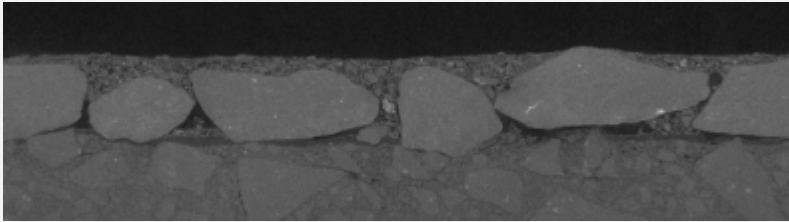
Notes:

1. Time in years after the issuing of the Performance Certificate.
2. Mean Profile Depth value over 10 metres.

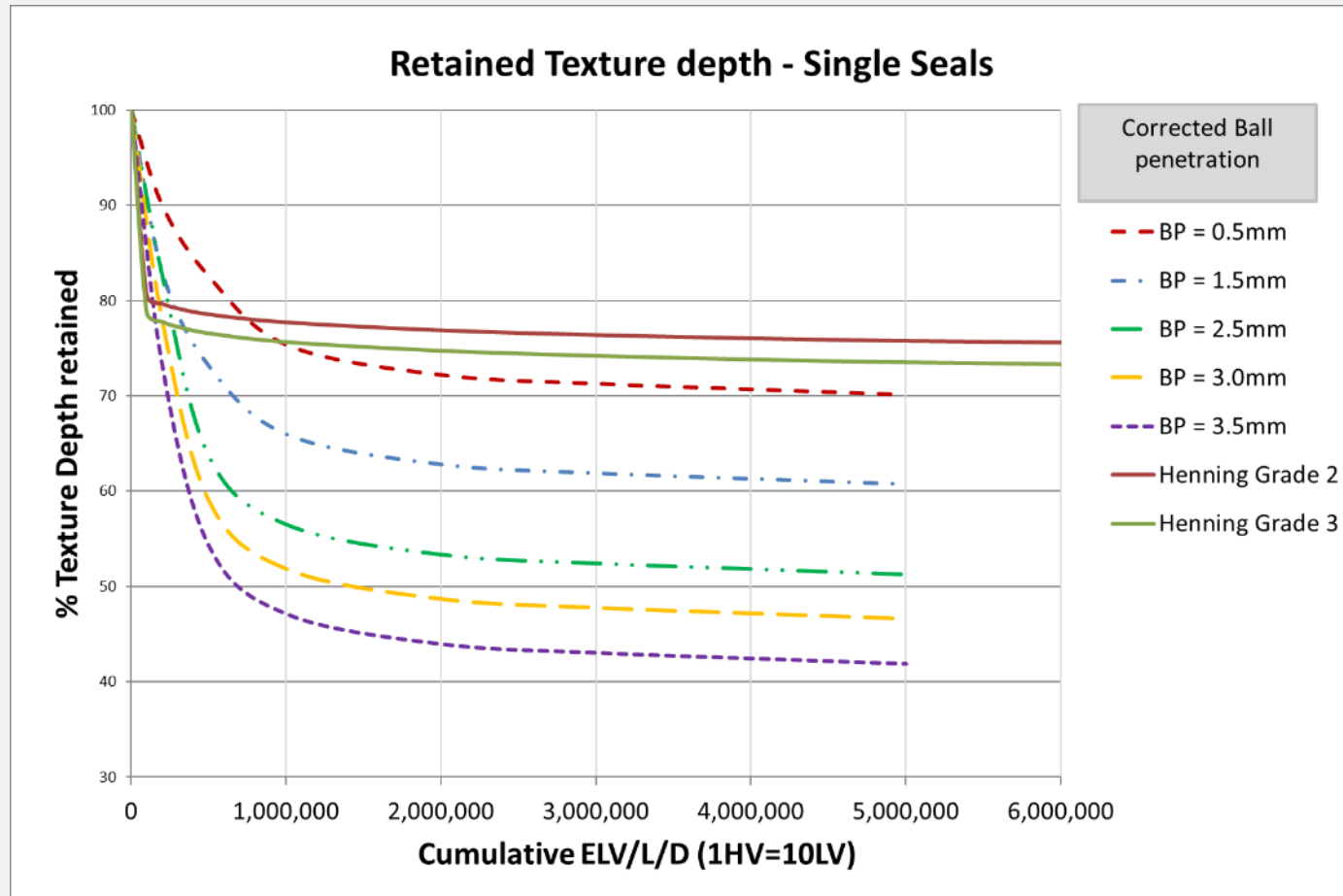
Not specified



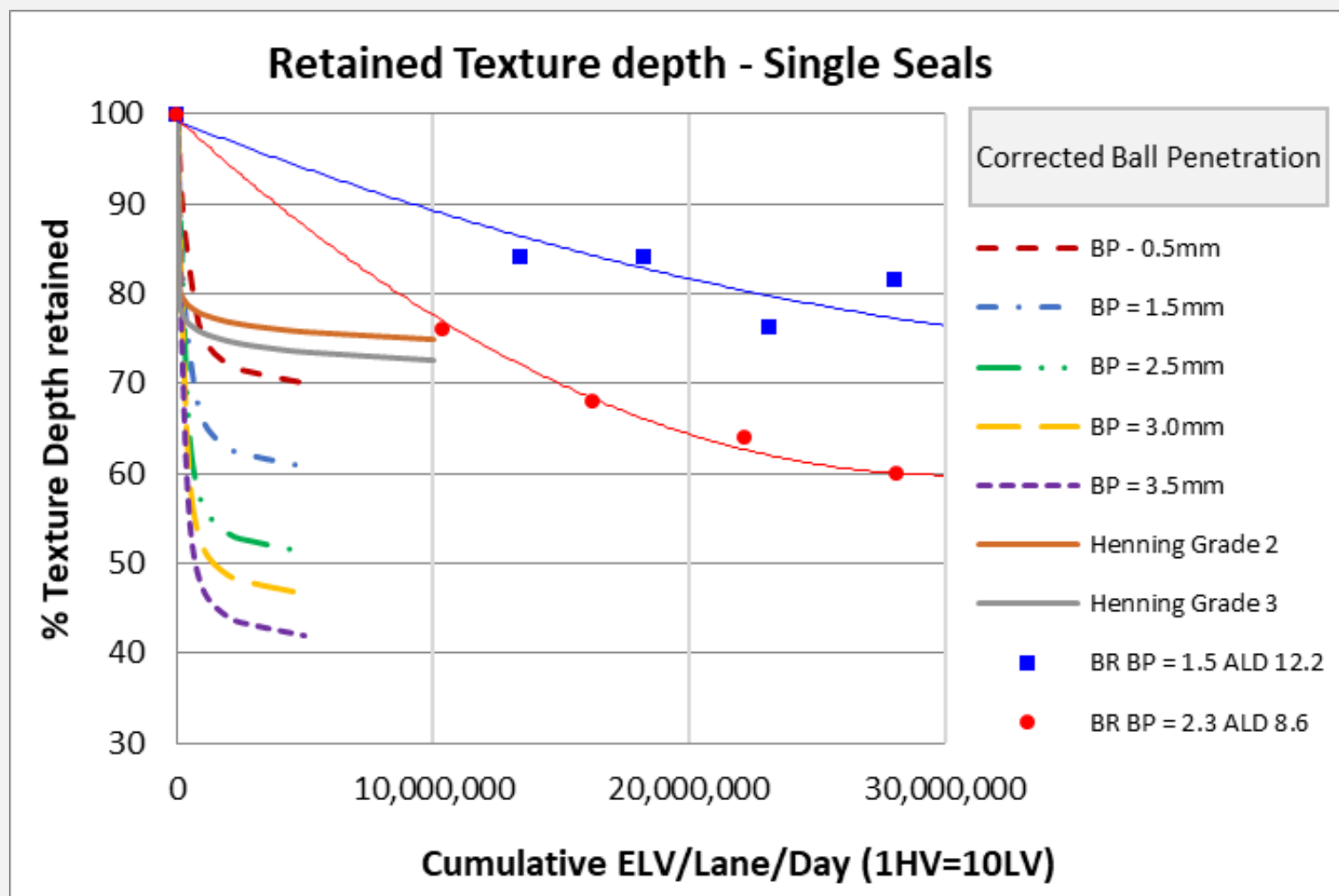
Cape seals



Source of specifications



Source of specifications



Discussion