



# PUSHING THE OPERATIONAL LIMITS OF SURFACE SEALS AND ITS EFFECT ON CURRENT MATERIALS SPECIFICATIONS

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## BACKGROUND

- TRH 3 April 2007 is excellent guideline for SELECTION, DESIGN and CONSTRUCTION of Surfacing Seals
- COLTO and SADC standards provide for Surfacing Seals under normal conditions.
- TRH 3 issues warnings relating to sealing under HIGH TRAFFIC VOLUMES.
- HIGH VOLUME roads relates to HEAVY TRUCK TRAFFIC rather than many light vehicle's.
- Equivalent Light Vehicle (ELV) 1 HEAVY = 40+ ELV

## BACKGROUND

- Low risk option is to assume an upper threshold of 40,000 ELV for SURFACING SEALS.
- There are major performance benefits in using SURFACING SEALS on HIGH (HEAVY) VOLUME ROADS
- Paper based on experience gained in applying SURFACING SEALS to HIGH VOLUME ROADS in the 50,000 – 80,000 ELV range. Approximately 2 million m<sup>2</sup> under traffic

### INTRODUCTION

- Surfacing Seals in High Volume applications relates to
  - ◇ RESEALING not New Construction
- In this application SURFACING SEALS compete head to head with UTFC and other asphalt mixes
- Trigger for use of SURFACING SEAL is PERFORMANCE and not only ECONOMICS
  - ◇ Interlayers
  - ◇ Water proofing
  - ◇ “High” deflection Skid Resistance

### INTRODUCTION

- EXAMPLES

Type & Reason	Lane configuration	AADT / direction/day	Heavy / Direction /day	Equivalent light vehicles (elv) (1 heavy = 40 elv)	
				Slow Lane	Fast Lane
Single Seal as Seal	Divided dual	5,620	1,350	54,140	4,030
Single Seal for Skid Resistance	Un-divided 4 lane	5,840	2,090	77,270	9,880
Double Seal for Seal & SAMI	Un-divided	5,740	1,780	66,800	8,380

- NOTE
  - ◇ High SLOW LANE ELV
  - ◇ Average to Low FAST LANE ELV

### DESIGN ASPECTS

- Traffic
- Selection of Surfacing Seal Type
- Road Geometry
- Materials
  - ◇ Binder
  - ◇ Aggregate
- Pre-Treatment Requirements

### DESIGN ASPECTS - TRAFFIC

### ALD 8 mm SINGLE

### DESIGN ASPECTS – TYPE OF SEAL

- PROPERTIES OF A GOOD SEAL – HIGH VOLUME ROADS
  - ◇ As much binder as possible
  - ◇ Good Voids
  - ◇ Sufficient Texture Depth
  - ◇ Even Ride
  - ◇ Quiet Ride

	BINDER	VOIDS	TEXTURE DEPTH	EVEN RIDE	QUIET RIDE	EASY TO CONSTRUCT
DOUBLE SEAL	MORE	MORE IN MATRIX	LESS	YES	MORE	LESS
SINGLE SEAL	LESS	LESS - OPEN	HIGH	YES - *	LESS	YES



### DESIGN ASPECTS – ROAD GEOMETRY

- Heavier trafficked roads generally **HIGHER GEOMETRIC STANDARDS**
- **LANE WIDTH**

$400\text{mm} + 1200\text{mm} + 800\text{mm} = 3700\text{mm}$

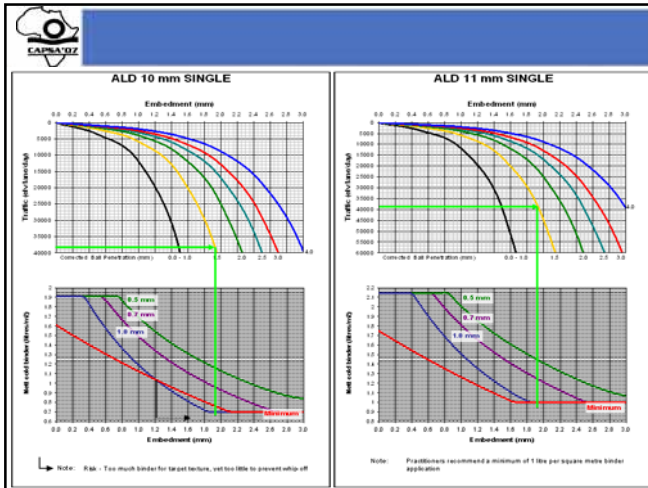
- **60% of LANE WIDTH** subject to ELV of 20-30% of **DESIGN TRAFFIC**

### DESIGN ASPECTS - BINDER

- **USE TG1**
- **Performance characteristics required**
  - ❖ **INITIAL ADHESION**
  - ❖ **BINDER LAYER THICKNESS**
  - ❖ **HIGH TEMPERATURE RESISTANCE TO FLOW**
  - ❖ **LOW TEMPERATURE ADHESION / DUCTILITY**
- **MODIFIED BINDERS** are recommended
- **Steer clear of Diluents / Fluxes / Cut-backs**

### DESIGN ASPECTS - AGGREGATES

- **Designer has good control over aggregate;**
- **TRH 3 Chapter 8 & COLTO 4300 specifications required modification for high volume application;**
- **Tight control required on:**
  - ❖ **ACV / 10% FACT**
  - ❖ **PSV**
  - ❖ **Grading – do not produce oversize.**
  - ❖ **FI & ALD**
- **Use TRH3 design graphs to determine min ALD required**




- ### DESIGN ASPECTS – PRE-TREATMENT
- Guidelines in TRH 3 are appropriate
  - Consider at this stage to apply additional binder outside of wheel path;
  - Consider special treatment in wheel paths.

- ### CONSTRUCTION ASPECTS
- Accommodation of Traffic
  - Opening road to Traffic
  - Climatic Conditions
  - Contractors Equipment
  - Joints between Sprays

- ### CONSTRUCTION ASPECTS – ACCOMODATION OF TRAFFIC
- ACCOMMODATION OF TRAFFIC
    - ❖ Ability to deal with traffic influences selection of Seal Type
    - ❖ Can the sealed lane be kept closed for 24 hours?
  - OPENING TO TRAFFIC
    - ❖ Complete Seal open to Traffic for 2 hrs at +25°C before temp drops.
    - ❖ In hot weather do not open fresh seal if road temp > SP - 15°C




- ### CONSTRUCTION ASPECTS – CLIMATIC CONDITIONS
- Apply COLTO limitations rigorously.
  - General rule – 1 May - 30 September – SEAL EMBARGO
  - Abandon work if overnight temps consistently drop below 8°C.
  - Avoid sealing into Autumn. Any add-on adjustment will show next summer.
  - Recommended best time
    - ❖ Early summer to March. (Seal through shut-down?)

 **CONSTRUCTION ASPECTS – CONTRACTORS EQUIPMENT**

- ❑ Equipment in good working order
- ❑ Sufficient TRUCKS – cover binder in 5 minutes
- ❑ Sufficient ROLLERS to complement daily production
- ❑ Consider STEEL WHEEL ROLLER
- ❑ SELF PROPELLED BROOMS



 **CONSTRUCTION ASPECTS – JOINTS AND LOW TRAFFIC AREAS**

- ❑ Longitudinal joint does not have to be on lane line;
- ❑ Consider thicker joint on Centreline;
- ❑ Keep away from outside (yellow) edge line;
- ❑ Do not place two joints on same longitudinal line.
- ❑ Fogspray outside wheelpaths





**CONCLUSIONS**

- ❑ Selection based on **PERFORMANCE** not Economics;
- ❑ Consider, **IS IT PHYSICALLY POSSIBLE** to construct?
- ❑ Best quality **MATERIALS** required;
- ❑ **ATTENTION TO DETAIL** during construction required to ensure performance;
- ❑ Apply TRH 3 with **PROJECT SPECIFICATION** amendments;

**PROJECT SPECIFICATIONS REQUIRED**

- ❑ Restrictions with respect to Climatic / Weather Conditions
- ❑ Aggregate requirements
- ❑ Accommodation of Traffic
- ❑ Opening to Traffic
- ❑ Isolated application of additional binder
- ❑ Joint positions
- ❑ Equipment
  - ❖ Rollers
  - ❖ Rotary Brooms

**THANK YOU**