



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

Douglas Judd



BACKGROUND

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









BACKGROUND

- q **Low risk option is to assume an upper threshold of 40,000 ELV for SURFACING SEALS.**
- q **There are major performance benefits in using SURFACING SEALS on HIGH (HEAVY) VOLUME ROADS**
- q **Paper based on experience gained in applying SURFACING SEALS to HIGH VOLUME ROADS in the 50,000 – 80,000 ELV range. Approximately 2 million m² under traffic**



INTRODUCTION

- q **Surfacing Seals in High Volume applications relates to**
 - √ **RESEALING not New Construction**

- q **In this application SURFACING SEALS compete head to head with UTFC and other asphalt mixes**

- q **Trigger for use of SURFACING SEAL is PERFORMANCE and not only ECONOMICS**
 - √ **Interlayers**
 - √ **Water proofing**
 - √ **“High” deflection Skid Resistance**



INTRODUCTION

q 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

q NOTE

- ✓ **High SLOW LANE ELV**
- ✓ **Average to Low FAST LANE ELV**



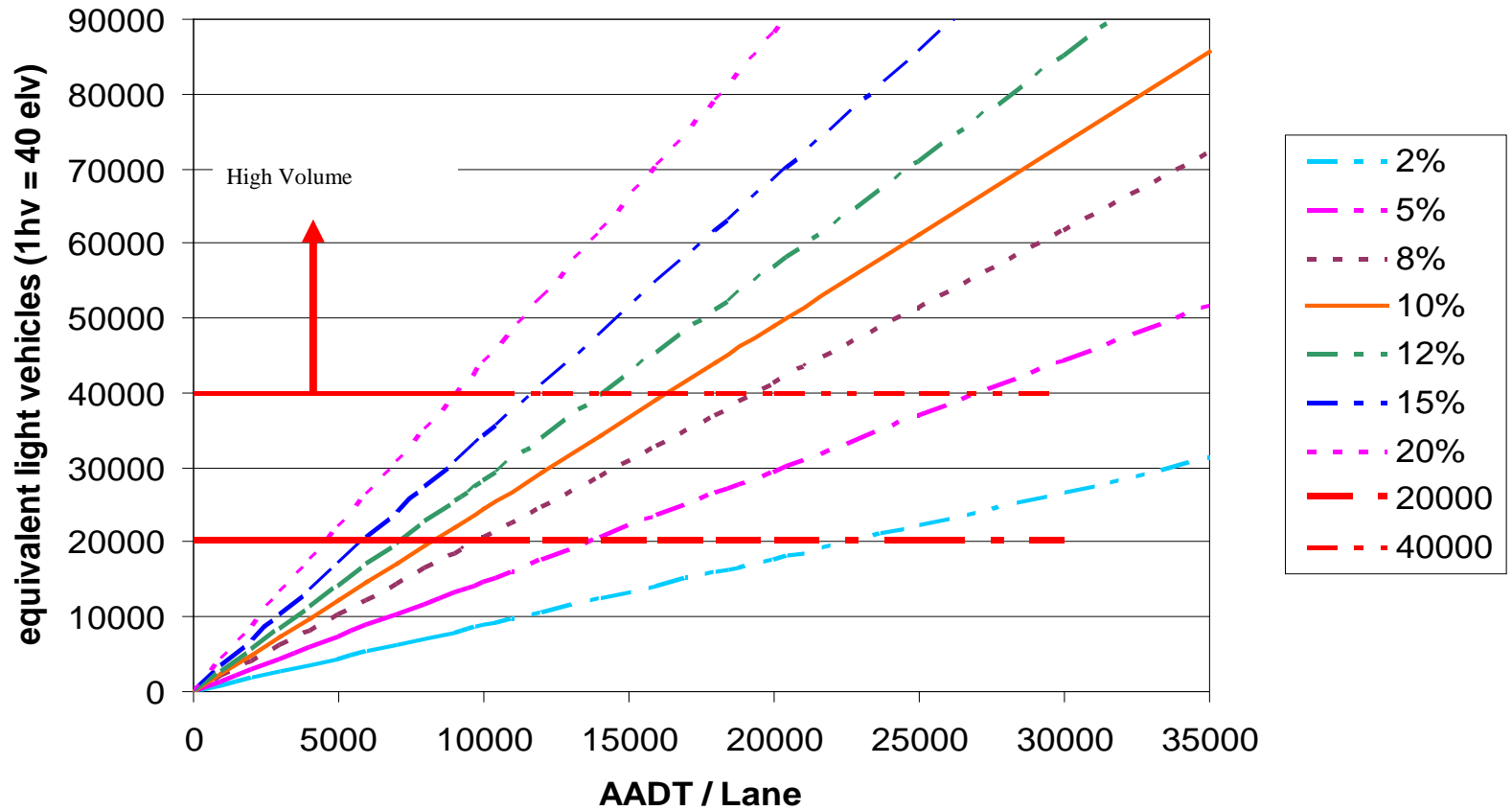
DESIGN ASPECTS

- q **Traffic**
- q **Selection of Surfacing Seal Type**
- q **Road Geometry**
- q **Materials**
 - √ **Binder**
 - √ **Aggregate**
- q **Pre-Treatment Requirements**

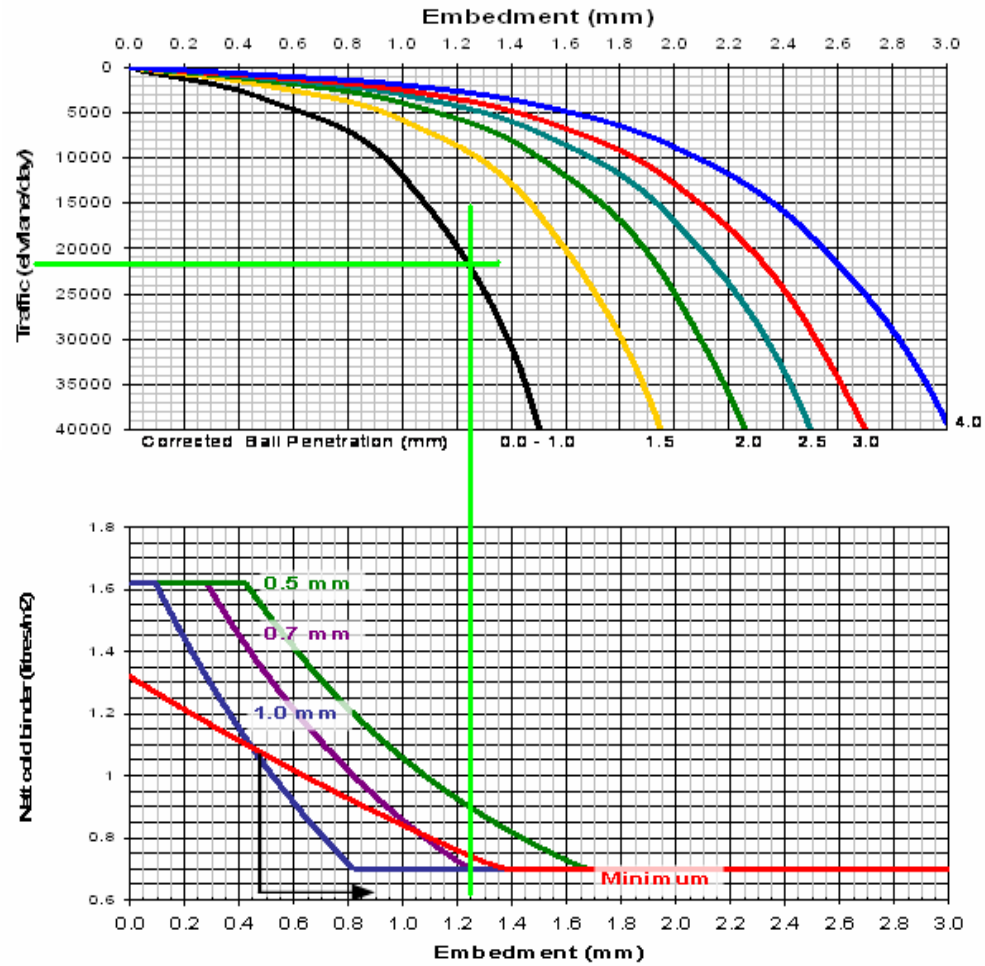


DESIGN ASPECTS - TRAFFIC

AADT/Lane VS elv for % Heavy



ALD 8 mm SINGLE





DESIGN ASPECTS – TYPE OF SEAL

q 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

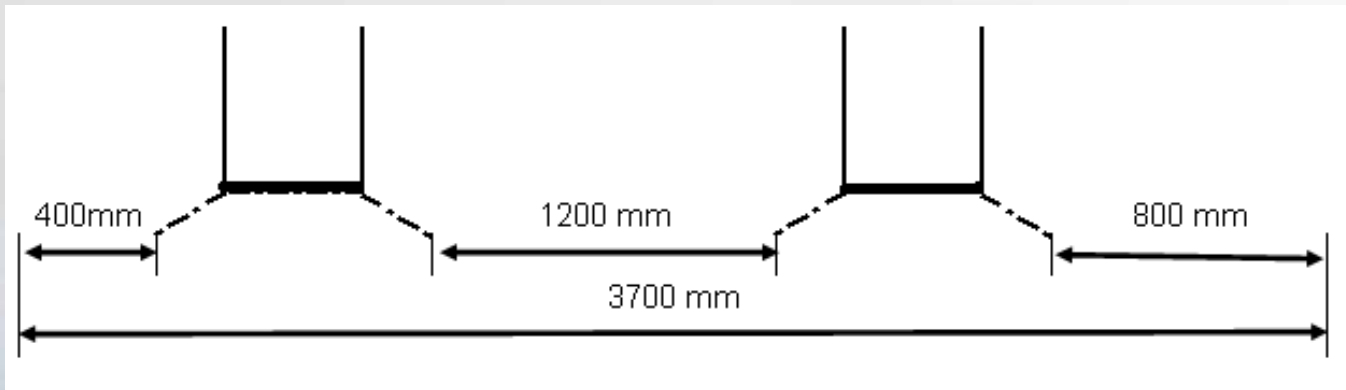






q **Heavier trafficked roads generally HIGHER GEOMETRIC STANDARDS**

q **LANE WIDTH**



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



DESIGN ASPECTS - BINDER

- q **USE TG1**

- q **Performance characteristics required**
 - v **INITIAL ADHESION**
 - v **BINDER LAYER THICKNESS**
 - v **HIGH TEMPERATURE RESISTANCE TO FLOW**
 - v **LOW TEMPERATURE ADHESION / DUCTILITY**

- q **MODIFIED BINDERS are recommended**

- q **Steer clear of Diluents / Fluxes / Cut-backs**



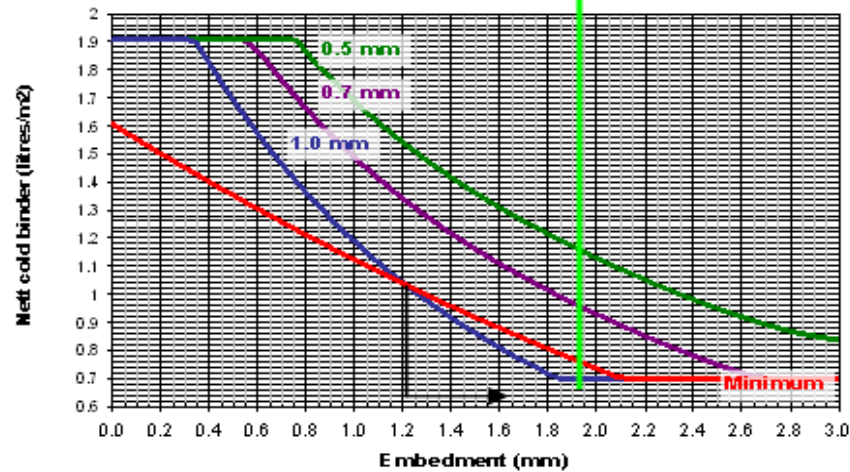
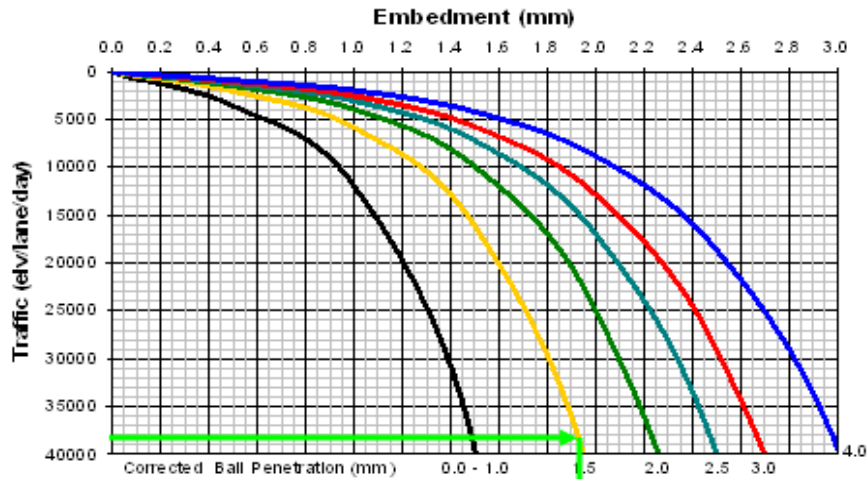
DESIGN ASPECTS - AGGREGATES

- q **Designer has good control over aggregate;**
- q **TRH 3 Chapter 8 & COLTO 4300 specifications required modification for high volume application;**

- q **Tight control required on:**
 - √ **ACV / 10% FACT**
 - √ **PSV**
 - √ **Grading – do not produce oversize.**
 - √ **FI & ALD**

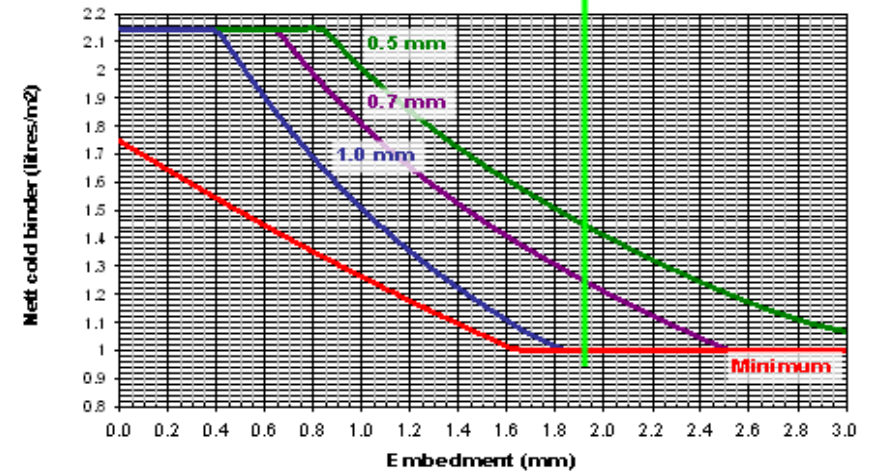
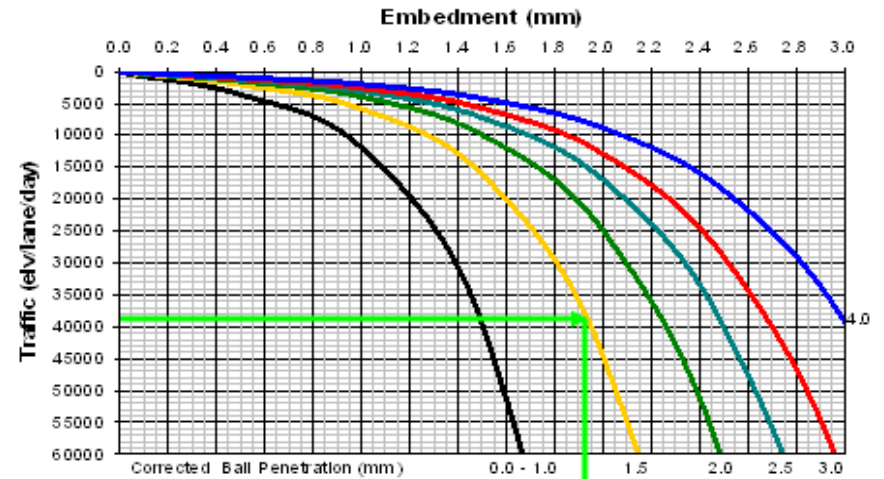
- q **Use TRH3 design graphs to determine min ALD required**

ALD 10 mm SINGLE



Note: Risk - Too much binder for target texture, yet too little to prevent whip-off

ALD 11 mm SINGLE



Note: Practitioners recommend a minimum of 1 litre per square metre binder application



DESIGN ASPECTS – PRE-TREATMENT

- q **Guidelines in TRH 3 are appropriate**
- q **Consider at this stage to apply additional binder outside of wheel path;**
- q **Consider special treatment in wheel paths.**



CONSTRUCTION ASPECTS

- q **Accommodation of Traffic**
- q **Opening road to Traffic**
- q **Climatic Conditions**
- q **Contractors Equipment**
- q **Joints between Sprays**



CONSTRUCTION ASPECTS – ACCOMMODATION OF TRAFFIC

q ACCOMMODATION OF TRAFFIC

- ✓ Ability to deal with traffic influences selection of Seal Type
- ✓ Can the sealed lane be kept closed for 24 hours?

q 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

- q **Apply COLTO limitations rigorously.**
- q **General rule – 1 May - 30 September – SEAL EMBARGO**
- q **Abandon work if overnight temps consistently drop below 8°C.**
- q **Avoid sealing into Autumn. Any add-on adjustment will show next summer.**

- q **Recommended best time**
 - v **Early summer to March. (Seal through shut-down?)**



CONSTRUCTION ASPECTS – CONTRACTORS EQUIPMENT

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









CONSTRUCTION ASPECTS – JOINTS AND LOW TRAFFIC AREAS

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







CONCLUSIONS

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



PROJECT SPECIFICATIONS REQUIRED

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



THANK YOU

