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Topic: Typical causes and solutions to Bleeding Seal Coats

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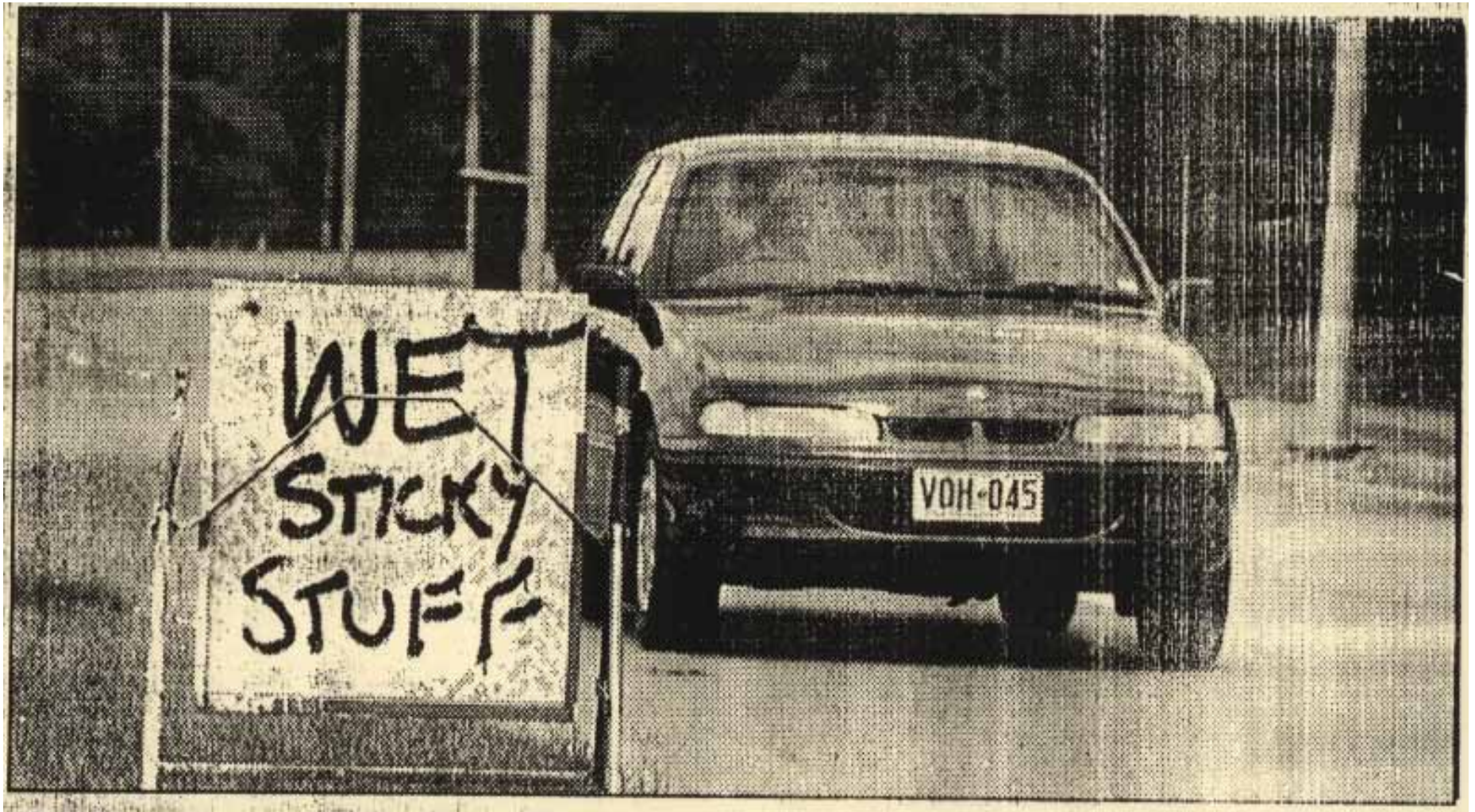
AUSTRALIAN ASPHALT PAVEMENT ASSOCIATION

Most likely it refers to that black stuff: BITUMEN



We know what you mean: There's no telling just what the offending substance was on the Ridgehaven road. And there were not too many brave enough to ask nearby council workers. **Photo: Ian Roddie**

3 simple questions

- ***Is this acceptable***
- ***WHY does it happen***
- ***How can we minimise the potential of it happening***

Reseal gone wrong – patching showing through

Bad publicity in local newspaper about “slippery” state of the seal: blamed for accident on cold & damp morning

Typical causes

Bleeding = early loss of texture

Up to 10% of the national network may be affected (about 30 000km)

- **Poor standard of pavement preparation**
- **Inappropriate treatment selected**
- **Poorly executed design**
- **Poor standard of seal construction**
- **Timing of the treatment (weather)**
- **Unexpected increase in traffic**

q **Or is it all hot air ?**

That is – due to HOT prevailing weather conditions

Causes why seals bleed

New work

- Pavement material/construction/preparation
- Pavement soft surfaces
- Initial seal treatment selection and design

Lack of texture due to aggregate embedment into soft surface on new pavement

Causes why seals bleed

Reseals

- Poor maintenance practices
- Choice of patching materials and application
- Particularly "when" – timing before reseal
- Reseal treatment selection and design

Why do seals bleed

ØThe “black stuff” is often blamed

Generally C170 bitumen – but, is it really the cause?

recent trials have again proven the binder is usually not the main reason a seal bleeds

Alternatives – C 240, C320, multigrade

lowers the risk compared to C170, but by how much, may have supply issues etc

PMB

expensive, more difficult to use but minimises risk. Low - medium modification PMB minimises risk at reasonable cost

Primersealing practice

Some issues to consider:

- Size of aggregate – 7mm v 10mm
- Primerbinder – cutback v emulsions
- THINK about the NEXT treatment
- Take care with the design
- Life expected

Type of primerbinder	Grade	Life expectancy (months)
Cutback bitumen	AMC4 AMC5	6 – 18 12 – 36
Bitumen emulsion	CRS, HBCE	12 - 36

Primersealing practice

Final Sealing over cutback

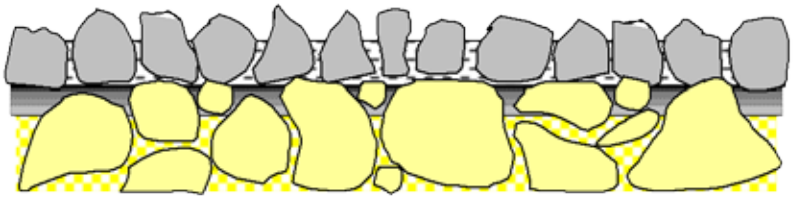
Often too soon

- Let p/binder cure and harden
- Recommend minimum of **12 months** with C170 based cutback bitumen primerbinders

Final sealing over bituminous emulsion

- Shorter time than cutback to cure and harden
- Recommend minimum **3 months**
- Less risk with 5 or 7mm aggregates

Single/single Seal (S/S) treatment



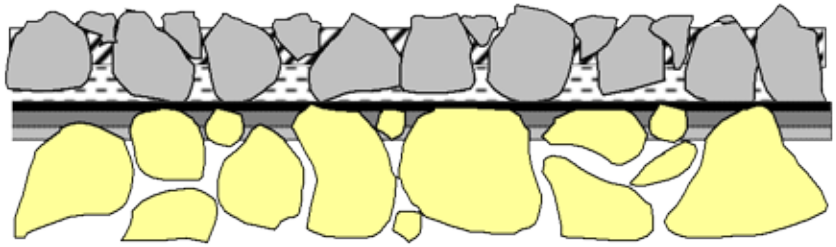
Single/single: Most common economical type of seal
New work and reseal treatments

Binder: C170, PMB, multigrade

Aggregate: 7/10/14mm

Design: National design method
"Austroads update of seal design" – 2006

Double/double Seal (D/D) treatment



Double/double: More robust seal than a single/single for areas of high traffic loading & shear stress.
2 layers of binder, and 2 layers of aggregate

Binder: C170, PMB, multigrade

Aggregate: 1st layer is larger aggregate
2nd layer is ideally half size of 1st layer

Combinations: 20/10, 20/7, 14/7, 10/5 mm

Design: National design method – updated 2011

Selection of seal treatments

D/D seal compared to S/S seal

- D/D more robust and reduces risk of stripping/bleeding in high stress areas
- D/D a bit more expensive initially but offset by reduced risk and longer life
- Preferred construction for D/D is both seals applied with minimal trafficking between them
- D/D design using Austroads gave higher design rates – this has been reviewed and design amended (publish late 2011 as part of AP-T68))

Selection of seal treatments

Inappropriate or high risk treatment selected

- S/S v D/D seals on heavily trafficked road
- High stress areas
- Soft granular pavement surfaces
- Assess risk of potential problems
  - Failures such as stripping or bleeding
  - Ø CAN WE LIVE WITH IT IF IT FAILS? (safety)
  - Ø Consider possible corrective treatments available

New Selection Guide has been developed to assist

Publish late 2011 as part of update of AP-T68/06

Austroads seal design (AP-T68/06)

Used correctly it provides reliable seal design

Main issues that should be carefully considered:

- Embedment of aggregate
- Effect of heavy vehicles

Ø Measuring potential embedment on prepared new granular pavement

- After compaction and dry back, prior to priming/primersealing
- On primed surface prior to sealing

Ø Recommended

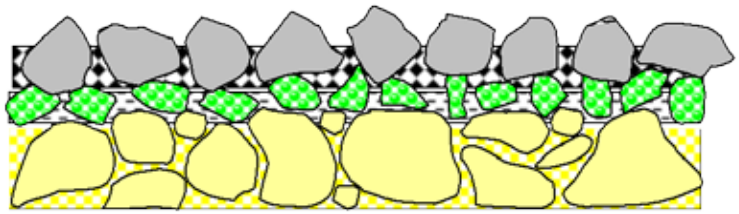
- Ideally = 3mm or less
- Maximum = 4mm

Ø If greater than 4mm need to check compaction, dry-back

OR

Ø Consider alternative treatment, defer the seal if possible

Inverted seal



Use: Correct existing non-uniform texture prior to resealing
Minimize potential aggregate embedment on initial seals when sealing soft bases (e.g. limestone)
Resealing fatty seals

Binder: C170, PMB, multigrade

Aggregate: Small - generally 5 or 7mm
Large - 10/14/16mm

NOTE: this is NOT an upside down D/D

Potential aggregate embedment

Modified Ball Penetrometer

Standard Austroads seal design test Method

Austroads penetrometer design based on South Africa (RSA) original concept

We are comparing use and results with RSA

Local manufacture (Qld) – about $1000

Recommended to all road authorities and contractors to purchase and use in seal design on new works

Austroads seal design

EFFECT of HEAY VEHICLES ON SEAL PERFORMANCE

- Ø Heavy Vehicles (HV) and Large Heavy Vehicles (LHV) have differing effect on packing of aggregate and embedment
- Ø LHV considered to have 3 times effect of HV
- Ø CONCEPT OF Equivalent Heavy Vehicles (EHV)

$$\% EHV = (HV) + (3 \times LHV)\%$$

- Ø Requires accurate traffic volumes and break up of HV and LHV

- Ø Design binder rates may be up to 30% less binder than if designed without the traffic adjustment

HV (6 axles)

LHV (9 axles)
B-Double

Austroads seal design –PMB Factor

PMB in seal design requires using specific PMB Factor

- Ø for type of seal & grade of PMB
- Ø PMB Factor ranges from 1.0 for high stress (HSS) to 1.3 (SAM) for crack reflection
- Ø Designers often use SAM factor for all PMB seals

PMB final seal - HV & LHV not adequately considered and incorrect PMB factor

Austroads seal design – variable texture

- By taking into account the existing variable surface texture we can avoid early stripping in coarse areas/bleeding in wheel path
- Can use a Correction Seal or variable transverse application

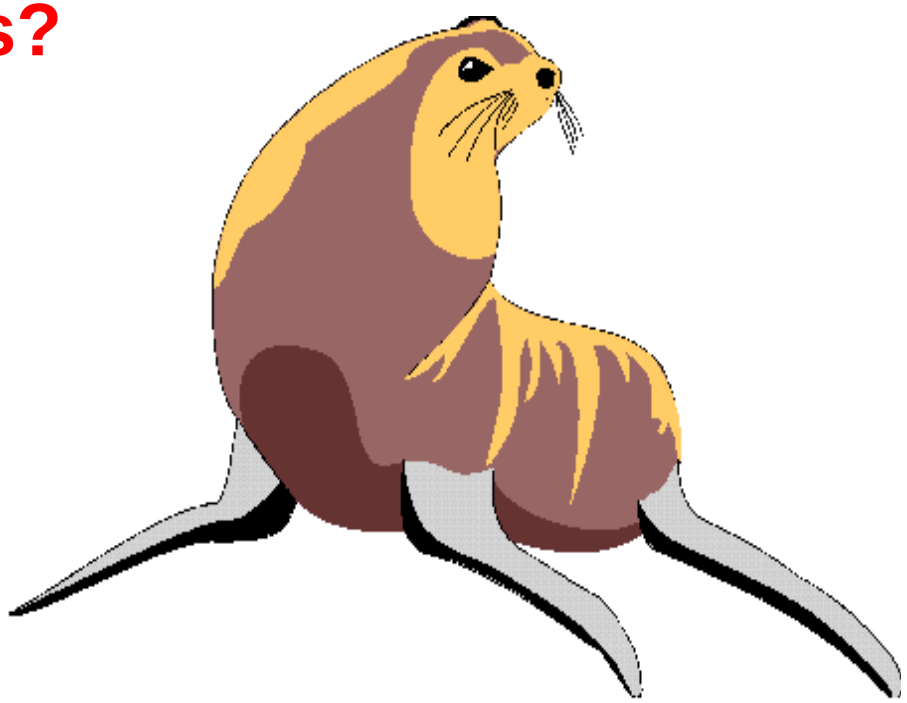
Construction practices

- **Timing of the works can be higher risk due to:**
  - **Weather: work done late in season and then subject to sudden increase in temperatures in early summer**
  - **Traffic: higher/heavier traffic is higher risk**

    short term increase, carting crops etc
  - **Cutter required: takes 12 months for most of cutter to evaporate from a binder in a seal**
  - **Maintenance: patching etc just prior to sealing**

Treatment of flushed/bleeding seals

Why treat flushed seals?



Skid resistance

Maintenance cost

Vehicle damage

Damage to the sprayed seal

Treatment of bleeding seals

- **EARLY TREATMENT – low cost/more effective**
  - Worst condition after several continuous hot days (and nights)
  - Apply water and cool down
  - Apply grit, 5/7mm aggregate (pre-coated) to keep tyres from binder
  - Apply “hot” aggregate from asphalt plant
- **LONGER TERM TREATMENT**
  - Applying solvent and fine aggregate
  - High pressure water/shot blasting

Stripped seal

Bleeding after pin down seal

Applied kerosene on warm day

Covered with 7mm pre-coated aggregate
Rolled with small truck

Next morning - 1.3mm texture
Applied full width, lasted 2½ years

High pressure water blasting

- Removes excess binder
- Preferably in cool weather
- Disposal of waste may be difficult, specified sites
- Do NOT reseal too quick