Best practice in spray seal application

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• Why priming - the difference between prime and primerseal
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• Summary
A **prime** is an application of a primer to a prepared granular base. It usually consists of:

- a bitumen and cutter oil or
- specially formulated bitumen emulsion primer and
- is placed without a cover aggregate

**Prime:**

- AMCOO, AMCO, AMC1 may be used
- generally requires a light prime (lesser bitumen to cutter ratio) to facilitate greater penetration of the binder into the base.

Source: Austroads Part 4K, Seals (2009)
A **primerseal** is an application of primerbinder sprayed onto a prepared crushed rock or gravel pavement surface and covered with a layer of aggregate. It allows:

- immediate trafficking and
- permits a delay in placing of the final surfacing.

**Primerseal:**

- AMC3, AMC4, AMC5 may be used.
- may be preferred on a road section to be constructed under traffic (i.e. a resurfacing or rehabilitation project) prior to overlaying
- warrants a heavier prime (i.e. greater bitumen to cutter ratio) – retaining stone

Source: Austroads Part 4K, Seals (2009)
Why priming?

prime and seal $\neq$ primerseal
Cutting agent is needed to temporarily reduce the viscosity of the binder. This allows penetration and bonding into the underlying base. This can be achieved by using:

- cutback bitumen – a blend of conventional bitumen (typically C170) and a cutting agent i.e. kerosene (blended to the desired ratios)
- bitumen emulsion – dispersion of bitumen binder and water to create an emulsified solution (applied at the desired blend ratios).
Benefits
• Relatively simple application and good penetration to the base
• traditional cutback bitumen has been widely accepted.

Backside:
• undesirable curing times
• requires a minimum of 5 days (for primer sealing a minimum of 3 months)
• curing time is depending on prevailing weather conditions
• if the overlying material is placed over the prime/primer seal prior to curing, the volatile material can deteriorate the overlying bituminous material (stripping, bleeding, etc.).
Primer products - cutback

Bleeding seal using 5 parts cutter - 2011
Primer products - cutback

Sealing too early
Hydrocarbon had been locked into seal - 2009

Road temperature 64 °C – 2014
Customer added 2% cutter

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A typical sealing application 40 years ago was:
• prime AMCO or AMCOO (depending of texture of the base surface)
• sand cover prime
• open it to traffic for around 1 month or longer depending on pavement design
• clean cover of repair any pavement failures
• seal two coat.

The cutter was Jet A fuel or power kerosene many years ago.
Currently:

- using low flash point kerosene (widely used) - some states still use power kerosene (Jet A1)
- low flash point kerosene has higher oil content - takes longer for the kerosene to escape in the atmosphere, i.e. longer curing time
- time pressure on jobsites may lead too early cover – leads to improper curing and subsequently stripping.
The future for prime is emulsion based:

- cures in less than 12 to 24 hours (depending on weather)
- reducing delays to paving operations and seal operations
- leads to savings in the final construction cost
- reduction in the level of hydrocarbon solvent emitted
- no compromise in pavement penetration and strength
- eliminated risk that the hydrocarbon being locked in between bitumen coats.

Emulsion based prime needs:

- to have low viscosity properties for surface penetration, coating of fine particles, sealing surface pores and bonding between pavement layers
- to be stored and handled properly
- to be periodically agitated if stored for longer term to avoids settlement.
The way forward

Emulsion prime - local street
EMULPRIME CPE:
• is a proprietary all purpose formulated bitumen emulsion
• designed to achieve penetration with most road pavement materials
• suitable for priming concrete pavements such as bridge decks
• contains a reduced level of hydrocarbon solvent
• designed to cure quickly, enabling construction vehicle access generally within 2-4 hours under fine weather conditions
• suitable for priming cool and damp pavements
• non-flammable
• reduces risk of pollution due to washout unforeseen rainfall
• reduces risk of flushing, caused by trapped solvent
• reduces hydrocarbon emissions
• typical application rate is 0.6 to 1.1 L/m² on unbound sub-grade, or stabilized pavements.
Summary

- Primer and primerseal typically consists hydrocarbon products
- Requires curing time otherwise carries risk
- Cost effective alternative is an emulsion based primer