Seal Coating in Alberta

• Description of various seal coats used within Alberta.

• Chip seal coat construction and associated problems.

• New techniques to alleviate these problems and/or to improve performance.
Types of Seal Coats

• Seal coats first used in Alberta in the 1940’s.
• Continues to be extensively used today.
• Types of seal coats.
  – Chip Seals
    • Cationic emulsion and 12.5 mm single sized aggregate
    • AADT > 800, 70% of seal coat program
    • Average costs $3.50/m² (2007-09)
  – Graded Aggregate Seal
    • High float emulsion and 12.5 graded aggregate
    • AADT < 800, 30% of seal coat program
    • Average costs $2.60/m² (2007-09)
Reasons for Seal Coating

• Protects pavement surface against further deterioration.
  – Seals minor cracking and open textured surfaces to air and moisture penetration.
  – Reducing asphalt aging and oxidation from sunlight, air and water.
  – Protects pavement surface from traffic wear.

• Year round improvement in skid resistance.

• Improved lane delineation.

• Does not contribute to structural strength.
Construction - Emulsion Application
Construction – Aggregate Spread
Construction - Rolling

- Traffic also provides compaction and chip embedment.
Construction – Sweeping Excess Chips
Final Product

• Aggregate design application rate (kg/m²)
  – Rate to achieve complete one-stone coverage
• Design binder application (litre/m²)
  – Rate to achieve 70% chip embedment.
Slight to Moderate Flushing of Seal Coat in wheel paths

Extreme Flushing of Seal Coat in wheel paths
Two-Stage Binder Application

- 1\textsuperscript{st} distributor pre-sprays light application (0.3 l/m\textsuperscript{2}) in non-wheel path locations.
Two-Stage Binder Application

- 2nd distributor sprays the entire lane at a rate that is appropriate for high traffic (approx. 1.9 l/m²)

- Relatively low cost enhancement (+$0.10/m²)
Travelling Public Is Not Impressed!

• Travel delays

• Noise at Tire/Pavement Interface

• Workmanship

• Vehicle and windshield damage claims due to “flying chips”
Measures to Alleviate Complaints

• Increased use of pilot vehicles to better control traffic.
• Pre-construction advertizing.
• Limits placed on the length of roadway under speed restriction.

• Increased use of polymer modified emulsions.
  – Binder is stickier and more elastic.
  – May be more resistant to excess chip embedment & wheel path flushing.
  – Faster curing and opening to traffic.
  – Better short and long-term chip retention
Measures to Alleviate Complaints

• Apply fog coat after sweeping is completed.
  – Does appear to help, however;
  • Additional construction procedure with it’s own risks, delays and cost.
Racked-In Seal Coat Trial Project

• Trial construction using a racked-in seal coat.

  – Two stage aggregate application.

  – 1\textsuperscript{st} chip application is under-applied (roughly 80% of design rate).

  – 2\textsuperscript{nd} application of smaller chips (5 – 8 mm) are meant to wedge or rack themselves between the larger chips.

  – Excess aggregate is the smaller chips – less offensive and damaging.
Racked-In Seal Coat

• Trial project completed in 2008 – Hwy 39 Leduc to Calmar
  – Local maintenance contractor provided technical expertise for material selection and seal coat design.
    • Polymer modified emulsion
  – Trial also included a proprietary specialty seal coat product:
    • Fibre-reinforced membrane system (FiberMat)
  – All around agreement that smaller chips were less offensive.
  – Slightly less tire noise than regular chip seal.
  – Both products are being monitored and are performing well.
Surface Appearance

Regular Chip Seal

Racked-In Seal
Racked-In Seal Coat - 2009

• Second project included in seal coat contract for North Central region.
  – Hwy 2A south of Leduc, 36 lane-km.

• Not as successful as 2008 project.
  – Much pick-up of binder and chips on tires of the haul trucks.
  – Chips were tracked for kilometres onto highway surface.

• Narrow window for proper application rate of 1st chips.
  – Too little leads to pick-up on tires.
  – Too much and now it’s a regular chip seal.
Tire Pick-Up Issues
Fibre-Reinforced Membrane System

Direction of Application

- Chopped fibres
- Chippings
- First layer of emulsion
- Second layer of emulsion
Fibre-Reinforced Membrane System
Fibre-Reinforced Membrane System

• Proprietary process with claims of mitigating reflective cracking better than regular seal coats.
• Also claims to be more robust and less susceptible to snow plow damage.
• Reflective cracking on Hwy 39 one year later
  – Roughly 60% of the transverse cracks have reflected through in both products (i.e. with fibre reinforcement and without).
  – None or very little of the wheel path distress cracking has reflective through in either product.
• Department may consider to use in the future on highways with more extensive wheel path cracking.