Pavement Preservation Treatments & Strategies

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Outline

- Pavement Age
- Pavement Condition
  - Distresses
  - Measured Characteristics
- Preservation Treatments – The Toolbox
- A Decision Making Process
- Questions
SCOPE

- **Flexible Pavements** – Asphalt Concrete surface with various underlying base and subgrade structures.

- **Rigid Pavements** – Portland Cement Concrete. **Will not** be discussed as part of this presentation.

- **Highways, streets and roads** (not airport airside pavements)
PAVEMENT AGE

Early life – 0 to 7 years
Mid life – 8 to 14 years
Late Life – 15 or more years
PAVEMENT CONDITION
Visual Distresses

Structural
- Rutting
- Fatigue Cracking

Environmental & Construction
- Transverse Cracks
- Longitudinal Cracks
- Centre of Paver Cracks
- Segregation
- Ravel
- Wheel path
- Flushing/Bleeding
Pavement Distress Types
Environmental and Construction Cracking
Pavement Distress Types
Structural Deficiency
Field Reconnaissance
Establish Extent and Severity

- **EXTENT** is “how much” of this distress is present on the roadway?

- **SEVERITY** is “how bad” is the distress?
Extent Definition for Transverse Cracks

- **Few**: 0 to 20 cracks/km (>50 m spacing)
- **Frequent**: 21 to 50 cracks/km (20 to 50 m spacing)
- **Extensive**: more than 51 cracks/km (<20 m spacing)
Severity Definition for Transverse Cracks

• **Repaired:** Repaired with A1, A2 or A3 treatment where no opening is evident and bonds are intact.

• **Slight:** Single cracks ≤ 3 mm, cracks repaired with A1, A2 or A3 but sealant not bonded.

• **Moderate:** All single cracks > 3 mm and < 10 mm, branched cracking with branching interval of 3 or more branches per lineal metre. Secondary cracks present.

• **Extreme:** All cracks ≥ 10 mm wide, multiple cracking, spalling with considerable breakup and loss of material.
PAVEMENT CONDITION
Automated Data Collection

• Pavement Layer Types and Thicknesses
• Roughness (IRI, longitudinal profile)
• Rutting
• Structural Strength/Capacity
Automated Pavement Condition Data Collection
Rut and Roughness Assessment

Hwy 21:16 Southbound
Section: km 0.000 to km 35.605
Roadway Code: C1 Lane Type: DL
Reporting Interval: 50 m Lane Code: L1

Average Rut Depth for Reporting Interval

Maximum Average Rut Depth for Reporting Interval

Average IRI for Reporting Interval
Structural Analysis
Treatment Decision Tree

Guidelines for Assessing Pavement Preservation Treatments and Strategies
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FIGURE 1: GUIDELINES FOR SELECTING PRESERVATION TREATMENTS

I. IRI - RIDE LEVEL

SEGMENT SMOOTHER THAN TRIGGER VALUE

IRE Trigger Value

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OL (20 YR) ≤ 40 mm
- Preventative Maintenance
- Thin OL
- HIR
- Mill & Inlay
- Two Lift OL

OL (20 YR) > 40 mm

40 mm < OL (20 YR) ≤ 70 mm
- Preventative Maintenance
- Thin OL
- HIR
- Mill & Inlay
- OL (10 yr)
- OL (20 yr)

70 mm < OL (20 YR) ≤ 90 mm
- HIR
- Mill & Inlay
- OL (10 yr)
- OL (20 yr)

OL (20 YR) ≥ 90 mm
- OL (20 yr)

20 YR STRUCTURAL OVERLAY REQUIREMENT - OL (20 YR)

SEGMENT ROUGHER THAN TRIGGER VALUE

NOTES:
The 20 year structural overlay requirement is the thickness of overlay required following AASHTO Pavement Design Manual based on the 20 year Design ESALs.
The service life of all overlay, mill and inlay and HIR treatments should be determined using Figures 2, 3, 4 and 5.

ENVIRONMENTAL/CONSTRUCTION DISTRESSES

POTHOLES, DIPS, HEAVES & LOCAL DISTORTION
- Generally treated as local repairs using deep patch or mill/patch procedures

TRAFFIC/LOAD DISTRESSES

TRANSVERSE CRACKS (FIGURE 6)
LONGITUDINAL CENTRE OF PAVEMENT CRACKS (FIGURE 7)
SEGREGATION (FIGURE 8)
RAVEL (FIGURE 9)
RUTTING (FIGURE 10)
LONGITUDINAL WHEEL PATH PATRIDGE CRACKS (FIGURE 11)
WHEEL PATH FLATTENING/BLEEDING (FIGURE 12)
TREATMENT TYPES
“The Toolbox”

- Preventative Maintenance Treatments
- Surface Treatments
- Rehabilitation Treatments
- Reconstruction
PREVENTATIVE MAINTENANCE TREATMENTS

- Crack Fill (hot or cold pour)
- Blow and Go Crack Fill
- Rout and Seal Crack Treatment
- Spray Patch (Cracks and localized surface areas)
- Thermo-Patch (dipped cracks and ruts)
- Micro-Surfacing (dipped cracks and ruts)
- Diamond Grinding (ridged cracks)
Green Crack Fill Treatments
PREVENTATIVE MAINTENANCE TREATMENTS

- Shallow Mill and Spray Patch (ridged cracks)
- Shallow Mill and Fill (deteriorated cracks)
- Deep mill and Fill (deteriorated cracks)
- Squeegee Patch
- Mix Patch (cold or hot mix)
- Skin Patching
- Deep Patching
Preventative Maintenance Treatments
Deep Mill and Fill Transverse Cracks
SURFACE TREATMENTS

- Fog / Flush Coat
- Spot Seal (chip, graded or spray patch)
- Chip Seal Coat
- Graded Aggregate Seal Coat
- Slurry Seal Coat
- Micro-Surfacing
- Reprofile by Cold Milling
Micro-Surfacing Rut Fill
REHABILITATION TREATMENTS

- Hot In-Place Recycling (HIR)
- Cold Mill and Inlay (CM&I)
- Thin ACP Overlay (40 mm or less)
- Reprofile by Cold Mill and Overlay
- CM&I or HIR of travel lanes plus Overlay
- Deep CM&I with select ACP, RCC or PCC
- White Topping or Ultra-Thin White Topping
- Two Lift Overlay
REHABILITATION TREATMENTS

• Structural Overlay (≥ 80 mm ACP)

• Cold in Place Recycle (CIR) plus overlay or surface treatment

• Full Depth Reclamation (FDR) and stabilization plus overlay or surface treatment
Rehabilitation Treatments
RECONSTRUCTION

Remove and replace existing pavement structure in whole or part.

Pavement layers could be salvaged for future use.
WHAT TO DO?
Preservation STEP 1

Assemble Information on Existing Pavement

- **Collect Data** on existing pavement layer types & thicknesses
- **Field Reconnaissance** by experienced pavements personnel
- **Types** of visible distress
- **Extent and Severity** of Each Distress
- FWD data and **Structural Need**
- IRI data to determine **Roughness**
- Automated **Rut Data**
WHAT TO DO?
Preservation STEP 2

• Determine Treatment Options for each distress (by extent and severity)
  – Decision Trees / Matrices from AT-GAPPTS
  – Availability of equipment, materials & expertise?
  – Contractual Constraints
  – Time of year and weather?

• Multiple Distresses – Revisit Treatment Options to Confirm they will work.
WHAT TO DO?
Preservation STEP 3

- Assign Treatment Service Lives
- Determine Treatment Costs
  - Geographic location (city vs country)
  - Historical bid prices
- Run Life Cycle Cost Analysis
- Recommendation based on Lowest Net Present Worth Treatment
Acknowledgement


Available on Alberta Transportation Website under /Technical Resources/Pavements Publications and Roadway Data/
QUESTIONS ???????

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