Sustainability Benefits of Pavement Preservation

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Pavement Preservation and Sustainability

Preservation:

• Extends service life without rehab or reconstruction
• Reduces demand for new materials and energy
• May improve smoothness, fuel efficiency and safety
• May decrease noise
Sustainable Materials

- Reclaimed Asphalt Pavement
- Recycled Asphalt Shingles
- Slag Aggregates
- Reclaimed Rubber
- Bio-Binders and Binder Replacements/Extenders
- Ash Materials
RAP and RAS

- Widely reused but excess exists
- Binder plus aggregate
- ±5 to 30% binder
  - Oxidized, highly in RAS
- Angular sand in RAS
- RAP agg depends on source
Recycled Aggregates and Fillers

- Slag
- Rubber
- Glass
- Coal Ashes – Fly and Bottom Ash
Long History with Slag Aggregates

• Carbonate local aggregates in Indiana
  – Gravels can be 60% carbonates
  – Prone to polishing
• Air-Cooled Blast Furnace Slag use pre-dates 1946
• Steel Furnace Slag use pre-dates 1988
• Preferred aggregate for high volume surfaces
Alternative Binders

• Bio-Binders – plant, animal, algae based
• Waste cooking oils
• REOB/VTAE
• ???
Sustainable Preservation Treatments
Distresses Addressed

Asphalt Surfaces
• Cracking
• Raveling
• Bleeding/Flushing
• Oxidation
• Minor Roughness
• Friction Issues

Concrete Surfaces
• Some cracking
• Minor Roughness
• Friction Issues
Chip Seals

- Restore friction, seal surfaces, minor surface distresses
- Regular chip sealing extends life by 6 years (MnDOT)
- Single, double or triple
- Asphalt emulsion or hot-applied binder
- RAP and other reclaimed aggregates, alternative binders, ground tire rubber
Chip Seals

• Rubberized asphalt is used
  – Reportedly better chip retention
• LA County uses RAP in all chip seals
  – Also slurry seals and microsurfacing
• Indiana DOT has studied slags in chip seals.
Chip Seal Case Study

- Tippecanoe County, Indiana
- Interstate mill and fill project generated excess RAP
- High quality surface material including slag
- RAP chips pre-coated with binder
- Higher friction than typical chip seal aggregates and lower emulsion rates needed for chip retention
- Economical
- County very pleased and will use RAP whenever they can on both asphalt surfaces and gravel roads
Other Varieties of Chip Seals

• Scrub seals
  – Binder scrubbed into surface with mechanical broom
  – Caltrans has used RAP in these applications

• Sand seals
  – Chip seals with smaller aggregate
  – Excess RAP fines from fractionating
Fog Seals

- Thin applications of asphalts/emulsions
- Seal surface, prevent intrusion of water or oxygen, lock surface aggregates in place
- Could use alternative binders
- PennDOT and MnDOT, among others, have studied bio-based sealants
Slurry Seals

• Mix aggregates with emulsion and spread with squeegee or spreader box

• Waterproof surface and seal low severity cracks; may improve friction in some cases

• Recycled aggregates and/or alternative binders (including rubber)
Microsurfacing

- Similar to slurry seals but spread with specialized equipment; sets faster
- Fill ruts and surface irregularities
- Polymer-modified emulsion, aggregate, filler, other additives
- Recycled aggregates (LA County) and fillers like fly and bottom ash
- Cape seal = chip seal + microsurfacing
Thin and Ultra-Thin Overlays

- Small NMAS asphalt mix placed with paver
- Correct friction and minor irregularities; seal surface
- Recycled aggregates; alternative binders for thin overlays
- May be warm mix = reduced energy consumption, fumes
100% Recycle Plant
In-Place Recycling

• Hot or cold
• Up to 100% recycled aggregate
  – May include alternative binders
• Benefits – reduced hauling
• Potential drawback – energy with HIR
Concerns with RAP in Surfaces

• Unknown aggregate qualities, especially friction?
• Increased cracking potential in asphalt mix?
• NCSC has shown 25% low friction RAP can be used when blended with higher friction aggs (e.g., slag)
• Cracking limited with proper virgin binder selection and perhaps use of WMA additives
WMA + RAP and/or RAS

• Reduced aging with lower production temps
• May counteract oxidized RAP binder
• RAP contents of 50% with WMA
  – Improved rut resistance
  – Better resistance to moisture damage
  – Little to no effect on cracking
Compatibility

Pavement Preservation and Sustainability can go hand in hand.

• Extend service life
• Conserve resources
• Protect the environment
THANK YOU!

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