Airport Pavements & Maintenance

Michael W. Buening, PE
Chief Airport Engineer, INDOT
June 6, 2018
Presentation Outline

- Airport Pavement
  - Typical Pavement Sections
  - Aggregates
  - HMA
  - Concrete
  - Soils
  - Construction Considerations
Pavement Section

- Pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade.
- A pavement is a structure composed of structural elements, whose function is to protect the natural subgrade and to carry the traffic safety and economically.
Pavement Section

The essential difference between Flexible pavement and Rigid pavement is the manner in which they distribute the load. Flexible pavement can adjust its position to the shape of the underlying layers. Rigid pavement tends to distribute the load over a relatively wide area (works as a slab).
**Typical Section**

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Flexible</th>
<th>Rigid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Course</td>
<td>P401</td>
<td>P501</td>
</tr>
<tr>
<td>Base Course</td>
<td>P403**</td>
<td>P403**</td>
</tr>
<tr>
<td></td>
<td>P209</td>
<td>P304**</td>
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<tr>
<td></td>
<td>P208</td>
<td>P306**</td>
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<tr>
<td></td>
<td>P209</td>
<td>P209</td>
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<tr>
<td></td>
<td>P208</td>
<td>P208</td>
</tr>
<tr>
<td>Subbase</td>
<td>P219**</td>
<td>P219**</td>
</tr>
<tr>
<td></td>
<td>P154</td>
<td>P154</td>
</tr>
<tr>
<td>Subgrade</td>
<td></td>
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</tr>
</tbody>
</table>

* P219 may be used as base depending on quality of materials and gradation.

** May be used as stabilized base.

Note: P-Specs in AC 150/5370-10 or equivalent State DOT materials.
HMA Construction Topics

- FAA Spec P-401 & P-403
- Segregation
- Material Temperature
- Cleanliness & Tack Coat
- Surface Milling
- Compaction, Roller Pattern, Speed
- Joint Construction
PCC Construction Topics

- FAA Spec P-501
- Multiple full depth cuts for removal
- Subgrade & forms prepared before placing
- Consolidation without Air Entraining loss
- Finishing without added water
- Curing surface and edges
- Timing for joint sawing
- No traffic until 550 psi flexural strength
Drainage Considerations

- Keep moisture out of pavement and subgrade
- Pavement sloped to avoid any ponding
- Joints and Cracks Sealed
- Turf build up at pavement edge removed
- Storm drains all intact and flowing properly
- Subsurface drains not blocked and flowing properly. Rodent screens all in place
Presentation Outline

- Pavement Maintenance
  - General Discussion
  - Pavement Distresses
  - Pavement Maintenance Treatments
  - FAA Pavement Preventative Maintenance Plan
  - FAA Specifications
  - Joint & Crack Sealing

- Questions or Comments
General Maintenance

- What is Pavement Maintenance?
- Pavement Performance

Typical Pavement Performance Curve
General Maintenance

- Pavement Performance Curve Treatments

- Preventive Maint.
- Reconstruction
- Resurfacing
- Defer Action
- Routine Maint.

Pavement Condition

Good

Poor

Time (Years)
General Maintenance

- Pavement Maintenance Benefits

- Functional Pavement Condition (e.g. Ride Quality)

Good

Poor

Time (Years)
Treatable Distresses HMA

- Rutting
Treatable Distresses HMA

- Raveling, Roughness
Treatable Distresses HMA

- Bleeding
- Flushing
Treatable Distresses HMA

- Block Cracking, Oxidation
Treatable Distresses HMA
- Thermal Cracking, Crack Deterioration
Treatable Distresses HMA

- Longitudinal Cracking
Treatable Distresses HMA

- Surface Friction
- Edge Cracking
- Potholes
Treatable Distresses PCC
- Joints, Spalling
Treatable Distresses PCC

- Scaling
Treatable Distresses PCC

- Corner Breaks
Treatable Distresses PCC

- Faulting
Treatable Distresses PCC

- Cracking & Crack Deterioration
Treatable Distresses PCC

- Pumping, Loss of Fines
Treatable Distresses PCC

- Surface Friction Loss
- Small Blow-ups
Non-Treatable Distresses, HMA

- Severe Potholes
- Extensive Fatigue Cracking
- Delamination / Stripping
- Unstable Rutting, Shoving
Non-Treatable Distresses, PCC

- Severe Cracking, Shattered Panels
- Larger Blow-ups
- Extensive Corner Breaks
- Extensive Faulting
Maintenance Treatments, HMA

- Crack Filling, Crack Sealing
- Patching
- Seal Coats
- Fog Seals
- Chip Seals
- Thin Overlays
- Fine Milling
Maintenance Treatments, PCC

- Joint Sealing & Crack Sealing
- Diamond Grinding & Grooving
- Partial Depth Repairs
- Full Depth Repairs
- Load Transfer Restoration
- Undersealing
- Slab Jacking
Maintenance Treatments, Other

- Underdrain Installation
- Storm & Underdrain Repair
- Grading
FAA Airport PMP

- Grant Assurance #11 requirement
- AC 150/5380-7B details PMP
- PMP Components
  - Pavement inventory
  - Pavement Structure
  - Maint & Rehab history w/ costs
  - Pavement Condition Information
  - Traffic Data
FAA Airport PMP

- PMP update every year or third years with detailed PCI Study
- ASTM D5340-12 Standard PCI Surveys
- Paver Distress Manuals in AC Appendix
- Record of all inspection and maintenance kept until pavement replaced.
- Less comprehensive routine inspections to be documented and kept (daily, weekly, monthly)
FAA Specs AC 150/5370 – 10G

- P101 Surface Preparation
- P605 joint seals for concrete
  - ASTM D5893 Silicone sealant
  - ASTM D6690 Hot Applied joint & Crack Sealant
  - Backer Rod 25% ± 5% larger than crack width
  - Joints **must** be clean & dry (sand or water blast)
  - Silicone 2:1 width to depth ratio
FAA Specs AC 150/5370 – 10G

- **P603 Tack Coat**
  - Cleaning and full coverage is key

- **P608 Emulsified Asphalt Seal Coats**
  - Chip seals required for RW or TW
  - Aggregate can be left out on Secondary or tertiary pavements
  - Low to moderate weathering can be “Fog Sealed”
  - Polymer Modified increases durability
# FAA Specs AC 150/5380 – 6C

**Table 6-1. Quick guide for maintenance and repair of common flexible pavement surface problems**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Repair</th>
<th>Probable Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weathering/Oxidation</td>
<td>- Apply surface treatment</td>
<td>- Environment</td>
</tr>
<tr>
<td></td>
<td>- Overlay</td>
<td>- Lack of timely surface treatments</td>
</tr>
<tr>
<td>Cracks</td>
<td>- Remove old sealer material if present</td>
<td>- Age</td>
</tr>
<tr>
<td></td>
<td>- Clean and prepare cracks</td>
<td>- Environmental conditions</td>
</tr>
<tr>
<td></td>
<td>- Seal/reseal cracks</td>
<td>- Bitumen too hard or overheated in mix</td>
</tr>
<tr>
<td></td>
<td>- Joint heating may be an option for longitudinal cracks when under the</td>
<td>- Sealant defects (e.g., incorrect application temperature, improper sealant</td>
</tr>
<tr>
<td></td>
<td>direction of an engineer. (Operate heaters to avoid excessive heat on</td>
<td>selection, improper crack preparation)</td>
</tr>
<tr>
<td></td>
<td>the pavement.)</td>
<td></td>
</tr>
<tr>
<td>Alligator or fatigue</td>
<td>- Remove and replace damaged pavement, including the base and/or</td>
<td>- Base and/or Subgrade failure</td>
</tr>
<tr>
<td>cracking</td>
<td>subbase course if required.</td>
<td>- Overload</td>
</tr>
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<td></td>
<td></td>
<td>- Under-designed surface course (too thin)</td>
</tr>
<tr>
<td>Patches</td>
<td>- Remove/replace.</td>
<td>- Inadequate/Improper repair detail/material</td>
</tr>
<tr>
<td></td>
<td>- Repair and Resurface</td>
<td>- Age</td>
</tr>
<tr>
<td>Surface irregularities</td>
<td>- Remove and replace damaged areas</td>
<td>- Traffic</td>
</tr>
<tr>
<td>(e.g., rutting,</td>
<td>- Surface grinding/milling</td>
<td>- Age</td>
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<tr>
<td>wash-boarding,</td>
<td></td>
<td></td>
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<tr>
<td>birdbaths)</td>
<td></td>
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</tr>
<tr>
<td>Loss of Skid Resistance</td>
<td>- Remove rubber/surface contamination</td>
<td>- Rubber deposits/surface contamination</td>
</tr>
<tr>
<td></td>
<td>- Apply surface treatment</td>
<td>- Polished aggregate</td>
</tr>
<tr>
<td>Bleeding</td>
<td>- Blot with sand and remove sand prior to resuming aircraft operations.</td>
<td>- Improper surface treatment</td>
</tr>
<tr>
<td></td>
<td>Excessive bleeding may require removal and replacement of pavement.</td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td>- Grade pavement shoulders, clear drainage path</td>
<td>- Overly rich mix/low air void content. Bleeding may be a precursor to other</td>
</tr>
<tr>
<td></td>
<td>- Clean out drainage structures, e.g., edge drains, outfalls, etc.</td>
<td>surface deformities forming, e.g., rutting, wash-boarding, etc.</td>
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<tr>
<td></td>
<td></td>
<td>- Poor maintenance of drainage facilities</td>
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<td></td>
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<td>- Poor maintenance of grade</td>
</tr>
</tbody>
</table>
**FAA Specs AC 150/5380 – 6C**

Table 6-2. Quick guide for maintenance and repair of common rigid pavement surface problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Repair</th>
<th>Probable Cause</th>
</tr>
</thead>
</table>
| Joint sealant damage | Remove old sealant, clean joints, reseal | - Age  
- Environmental conditions  
- Sealant defects (e.g., incorrect application temperature, improper sealant selection, improper joint preparation) |
| Cracks           | Clean and seal cracks  
- Repair/replace slab  
- Evaluate adequacy of pavement structure; may require strengthening | - Loss of slab support  
- Load repetition; curling stresses; and shrinkage stresses |
| Corner Breaks    | Seal and maintain until full depth patch | - Loss of slab support  
- Load repetition and curling stresses |
| Joint spalling   | Remove lose material; refill with approved product; reseal  
- Partial depth repair | - Latent defects, i.e., excessive finishing  
- Incompressible matter in joint spaces  
- Snow plow damage |
| Slab blowup      | Replace slab in blowup area; clean and reseal joints | - Incompressible material in joints preventing slab from expanding |
| Loss of Skid Resistance | Remove rubber/surface contamination.  
- Grinding. | - Rubber deposits/surface contamination  
- Age, i.e., surface wear |
| Drainage         | Grade pavement shoulders, clear drainage path  
- Clean out drainage structures, e.g., edge drains, outfalls, etc. | - Poor maintenance of drainage facilities  
- Poor maintenance of grade |
| Popouts          | Remove FOD | - Material |
| Patches          | Remove/replace | - Inadequate/Improper repair detail/material  
- Age |
Joint & Crack Filling or Sealing

- Top pavement maintenance treatment
- Joint & Crack Filling - less preparation, lower cost, lower life, asphalt emulsions, PG binders
- Joint & Crack Sealing – working cracks or joints, routing if needed, fiber reinforced, polymer modified, crumb rubber modified
Joint & Crack Filling

- Since non-working cracks do not change in width significantly with temperature, applications of crack filling treatments can proceed at any time of the year.
Joint & Crack Sealing

- Spring and fall have the best weather for asphalt pavement crack sealing.
- Temperature between 45 and 65 degrees
- Cracks are normally at the middle of their working ranges.
Joint & Crack Sealing

Winter & Summer NOT the Right Time for Joint and Crack Sealing

- Winter
  - Don’t Pour
  - Summer
  - Compression

- Summer
  - Don’t Pour
  - Winter
  - Tension

- Spring or Fall
  - Pour Joint
  - Summer
  - Compression (minimum)
  - Winter
  - Tension (minimum)
Joint & Crack Sealing

- Good example of a crack seal job. The seal material is not painted on the roadway and is contained to the crack area.
## Trouble Shooting

### Table 4: Trouble Shooting Crack Sealing and Filling Projects

<table>
<thead>
<tr>
<th>CAUSE</th>
<th>Tacky Picks Up</th>
<th>Re-Cracks Quickly</th>
<th>Bumpy Surface</th>
<th>Separation From Crack Sides</th>
<th>Emulsion Sealer Not Breaking</th>
<th>Emulsion Sealer Breaks Too Fast</th>
<th>Emulsion Sealer Washes Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crack Wet</td>
<td></td>
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<tr>
<td>Sealant Not Cured</td>
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<tr>
<td>Crack Dirty</td>
<td>●</td>
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<td>Insufficient Sanding</td>
<td>●</td>
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<td>Poor Finish, Wrong Tools</td>
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<tr>
<td>Sealant Too Cold</td>
<td>●</td>
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<tr>
<td>Sealant Too Hot</td>
<td>●</td>
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<td>Application Too High</td>
<td>●</td>
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<tr>
<td>Application Too Low</td>
<td></td>
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<tr>
<td>Sealant Degraded Due to Overheating</td>
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<tr>
<td>Rain During Application</td>
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<tr>
<td>Cold Weather</td>
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<tr>
<td>Hot Weather</td>
<td>●</td>
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</tr>
</tbody>
</table>
# Common Problems & Solutions

**Table 5: Common Problems and Related Solutions**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tracking</strong></td>
<td>- Reduce the amount of sealant or filler being applied.</td>
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<tr>
<td></td>
<td>- For hot applied materials, allow to cool or use sand or other blotter.</td>
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<tr>
<td></td>
<td>- Allow sufficient time for emulsions to cure or use a sufficient amount of sand for a blotter coat.</td>
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<tr>
<td></td>
<td>- Ensure the sealer/filler is appropriate for the climate in which it is being placed.</td>
</tr>
<tr>
<td><strong>Pick out of Sealer</strong></td>
<td>- Ensure cracks are clean and dry.</td>
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<td></td>
<td>- Increase temperature of application.</td>
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<td></td>
<td>- Use the correct sealant for the climate.</td>
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<td></td>
<td>- Allow longer cure time before trafficking.</td>
</tr>
<tr>
<td><strong>Bumps</strong></td>
<td>- Check squeegee and ensure it is leaving the correct flush finish.</td>
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<td></td>
<td>- Have squeegee follow more closely to the application.</td>
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<td></td>
<td>- Decrease the viscosity of the sealer.</td>
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<td></td>
<td>- Change the rubber on the squeegee.</td>
</tr>
</tbody>
</table>
Questions or Comments?
Michael Buening mbueling@indot.in.gov