

Agenda

Airport Pavements

- FAA Specifications
- Pavement Types
- Airport vs. Highway

PREVENT

- Structure
- Mix Design
- Construction Notes
- QC Testing
- RAP

IDENTIFY

- Common Deficiency Types
- How to Address Them

REPAIR / MAINTAIN

- Approved Treatments
- Pavement Maintenance Program

FAA SPECIFICATIONS



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Standard Specifications for
Construction of Airports

Date: 12/21/2018
Initiated By: AAS-100

AC No: 150/5370-10H
Change:

FAA Flexible Pavements (AC 150/5370-10H)

- **Surface Course**

- P-401 (asphalt mixture)
- P-403 (Similar to P-401 but no PWL)
 - Loads <30,000 lbs. or shoulders, roads, blasts pads or small maintenance projects
 - State Hwy specs may be used in lieu of 10H
- P-404 (fuel resistant asphalt mixture)

- **Stabilized Base Course** (typically required for aircraft > 1000,000 lbs.)

- P-403
- P-304, P-306, P-307 (various cement treated aggregate bases)

- **Base Course**

- P-207 (full-depth reclamation) - **NEW**
- P-208 (crushed aggregate)
- P-209 (aggregate base)

- **Subbase**

- P-154 (coarse sand)

FAA P-401 Specs

AC 150/5370-10G
(July 2014)

AC 150/5370-10H
(December 2018)

7/21/2014

AC 150/5370-10G

Part 5 – Flexible Surface Courses

Item P-401 Hot Mix Asphalt (HMA) Pavements

This specification contains options for both Marshall and Gyratory Mix Design Methods. The Engineer shall select the options for the selected mix design method.

12/21/2018

AC 150/5370-10H

Part 6 – Flexible Pavements

Item P-401 Asphalt Mix Pavement

This specification is intended to be used for the surface course for airfield flexible pavements subject to aircraft loadings of gross weights greater than 30,000 pounds (13,600 kg) and is to apply within the limits of the pavement designed for full load bearing capacity. Item P-401 may also be used as a stabilized base course. For airfield pavement projects at non primary airports, serving aircraft less than 60,000 pounds (27216 kg), state highway specifications may be used in states where the state has requested and received FAA approval to use state highway specifications.

FAA Flexible Pavements (AC 150/5370-10H)

Airfield provide unique pavement challenges different from highways

- Heavier Loadings
- Higher Tire Pressures
- Performance Super Critical
 - High Condition Level
 - FOD Unacceptable
 - Low engine intake acts like a vacuum for any loose debris on pavement
 - Repairing RW/TW = Major Disruption to Operations
 - Cannot just close a lane

PREVENT

Best way to address pavement distresses or defects is to prevent them from happening in the first place.

Prevent

SURFACE

HMA prevents water into base, smooth surface (free of loose particles), resists stress and provides skid-resistance

BASE

Principal structural component

SUBBASE

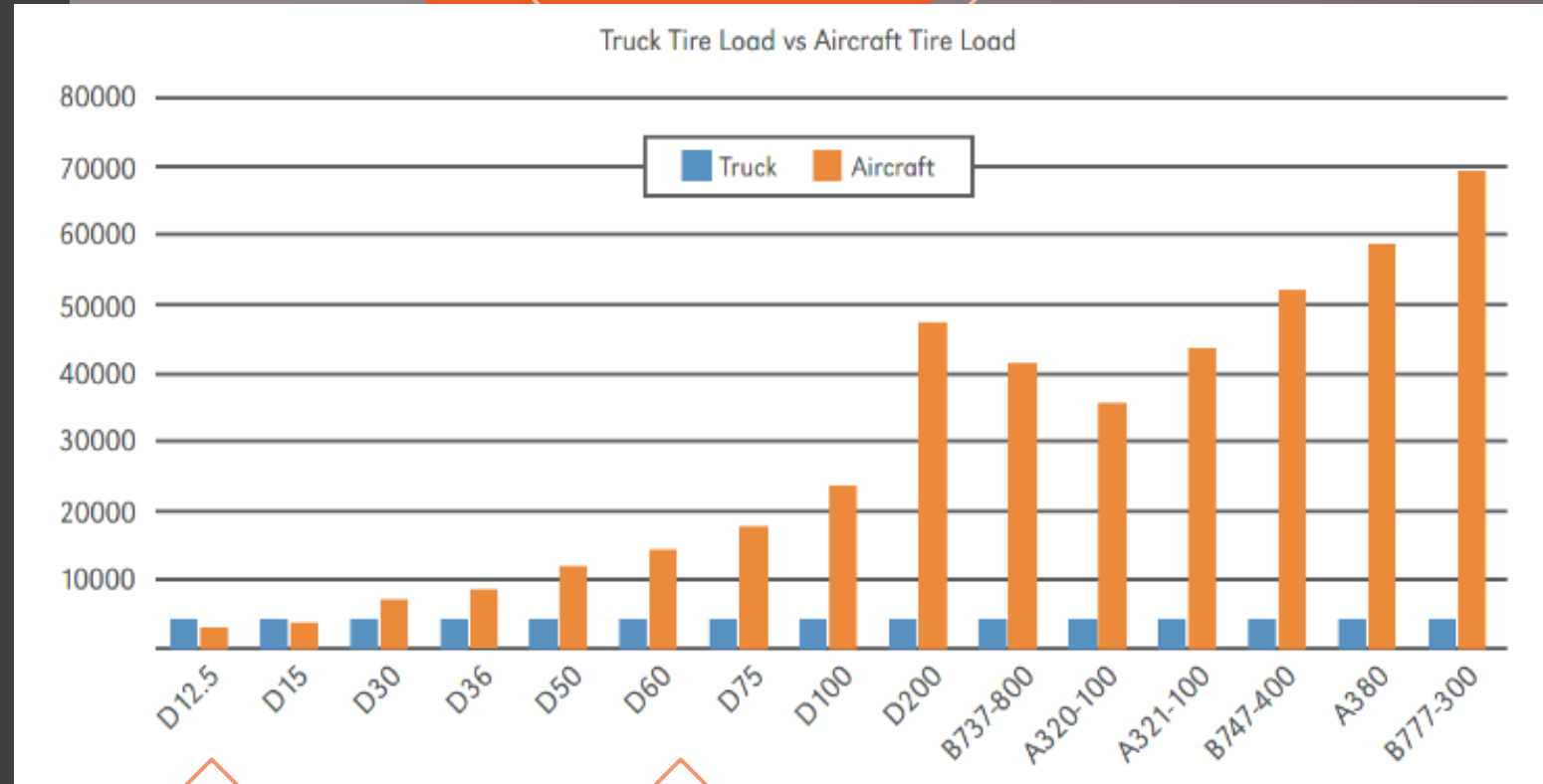
Backup to base

SUBGRADE

Soil layer

More Opportunity for Highway Asphalt Mixtures

- Previously, P-401 required for pavement subject to aircraft loading > 12,500lbs
- New cutoff, P-401 required for loading >30,000lbs for surface courses
- Allows more room to use less stringent state highway specifications

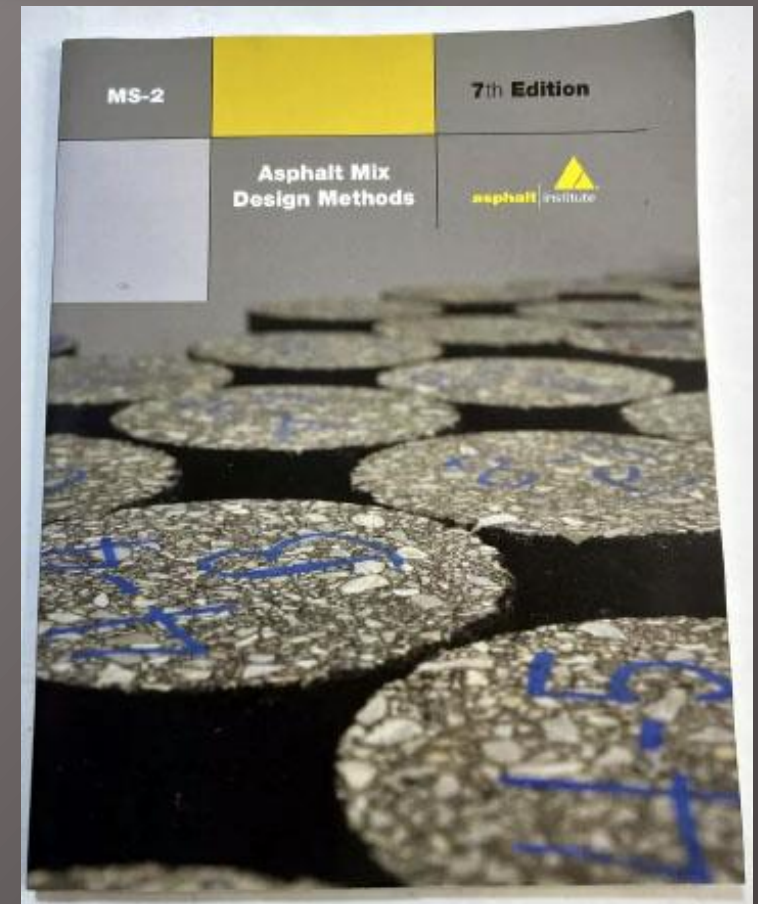


Sate Specs
allowed under
10-G

Sate Specs now
allowed under
10-H

FAA Asphalt Mixture Design - Key Factors

- Material Selection
- Superpave Design per Asphalt Institute MS-2
 - Increased VMA
- Performance
 - Tensile Strength Ratio
 - Asphalt Pavement Analyzer



Materials: Aggregates

Coarse Aggregate Material Requirements

| Material Test | Requirement | Standard |
|---|--|------------|
| Resistance to Degradation | Loss: 40% maximum | ASTM C131 |
| Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate | Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate | ASTM C88 |
| Clay lumps and friable particles | 0.3% maximum | ASTM C142 |
| Percentage of Fractured Particles | For pavements designed for aircraft gross weights of 60,000 pounds (27200 kg) or more: Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face ¹ | ASTM D5821 |
| | For pavements designed for aircraft gross weights less than 60,000 pounds (27200 kg): Minimum 50% by weight of particles with at least two fractured faces and 65% with at least one fractured face ¹ | |
| Flat, Elongated, or Flat and Elongated Particles | 8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 ² | ASTM D4791 |
| Bulk density of slag ³ | Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter) | ASTM C29. |

Fine Aggregate Material Requirements

| Material Test | Requirement | Standard |
|---|--|--------------|
| Liquid limit | 25 maximum | ASTM D4318 |
| Plasticity Index | 4 maximum | ASTM D4318 |
| Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate | Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate | ASTM C88 |
| Clay lumps and friable particles | 0.3% maximum | ASTM C142 |
| Sand equivalent | [45 minimum] | ASTM D2419 |
| [Natural Sand | [0% to 15%] maximum by weight of total aggregate | ASTM D1073] |

Mineral Filler Requirements

| Material Test | Requirement | Standard |
|------------------|-------------|------------|
| Plasticity Index | 4 maximum | ASTM D4318 |

Errata - effectively immediately: Clay Lumps should be 1.0% maximum (6/29/2020)

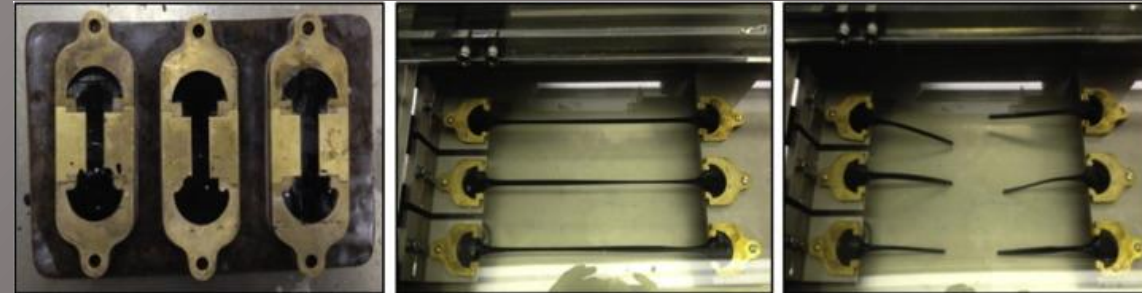
Special Aggregate Cases

Some aggregates may contain ferrous sulfides and iron oxides which can cause stains on exposed surfaces. In areas where staining has been a problem or is suspected, the Engineer should verify that producers and aggregate suppliers have taken steps to minimize the inclusion of any ferrous sulfides or iron oxides in aggregate to be used in the project.

On large projects and/or projects that span multiple construction seasons, additional aggregate tests may be necessary to validate consistency of aggregate produced and delivered for the project.

Materials: Asphalt Binder Selection

- ASTM D6373: Standard Specification for Performance-Graded Asphalt Binder
 - Even if your state is an AASHTO state
- PG Plus Test Required (*Modified Binders*)
 - State PG Plus test for given grade
 - If none: ASTM D6084 Elastic Recovery



401-2.3 Asphalt binder. Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) [____].

[

Asphalt Binder PG Plus Test Requirements

| Material Test | Requirement | Standard |
|------------------|---------------|-------------------------|
| Elastic Recovery | [75%] minimum | ASTM D6084 ¹ |

¹ Follow procedure B on RTFO aged binder.]

Materials: Asphalt Binder Selection

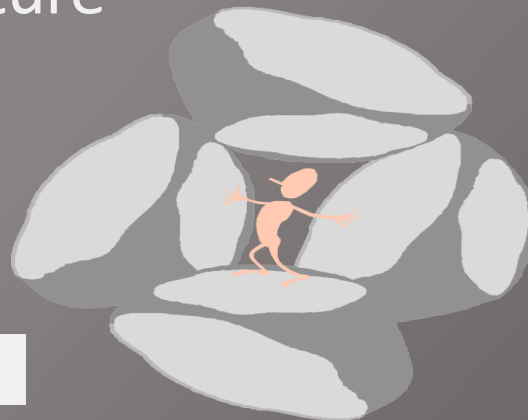
| Aircraft Gross Weight | Required Grade Bump | |
|-------------------------------|---|--|
| | High Temperature Adjustment to Asphalt binder Grade | |
| | All Pavement Types | Pavement area with slow or stationary aircraft |
| $\leq 12,500$ lbs (5670 kg) | -- | 1 Grade |
| $< 100,000$ lbs (45360 kg) | 1 Grade | 2 Grade |
| $\geq 100,000$ lbs (45360 kg) | 2 Grade | 3 Grade |

Superpave Design: Increased VMA

$$\text{VMA} = \text{Air Voids} + \text{Asphalt}$$

Air Voids

- Rut resistance
- Allow room in mixture for asphalt expansion as temperature increases



Why is VMA Important?

Asphalt

- Too Little Asphalt
 - Durability Problems
 - Asphalt Film Thickness - Too Thin
- Too Much Asphalt
 - Stability Problems
 - Rutting and Shoving

Mixture Performance



Asphalt Pavement Analyzer (APA) - AASHTO T 340

- 250 psi hose pressure
- 250 lbf wheel load
- 64°C air temperature



Tensile Strength Ratio

- AASHTO T 283
- 1 freeze-thaw cycle





CONSTRUCTION

- Quality materials
- Plant calibrated
- Correct drainage **before** paving
 - only way to correct after paving is mill it up
- Be aware of mix design changes

CONTRACTOR QUALITY CONTROL PROGRAM

P-401.6.1
P-401.5.3



Asphalt Content

Minimum of two asphalt content tests (ASTM D6307 or ASTM D2172 if CF >1.0)



Gradation

Minimum of twice per lot (ASTM D5444, ASTM C136 and ASTM C117)



Mixture Moisture Content

Determined once per lot (ASTM D1461 or AASHTO T 329)



Temperatures

Checked at minimum four times per lot, at necessary locations to determine the temperatures of the dryer, the bitumen storage tank, the mixture at the plant and the mixture at the job site.

CONTRACTOR QUALITY CONTROL PROGRAM

P-401.6.1
P-401.5.3



Density

Mat Density: One core from each subplot

Joint Density: one core over longitudinal joint for each subplot



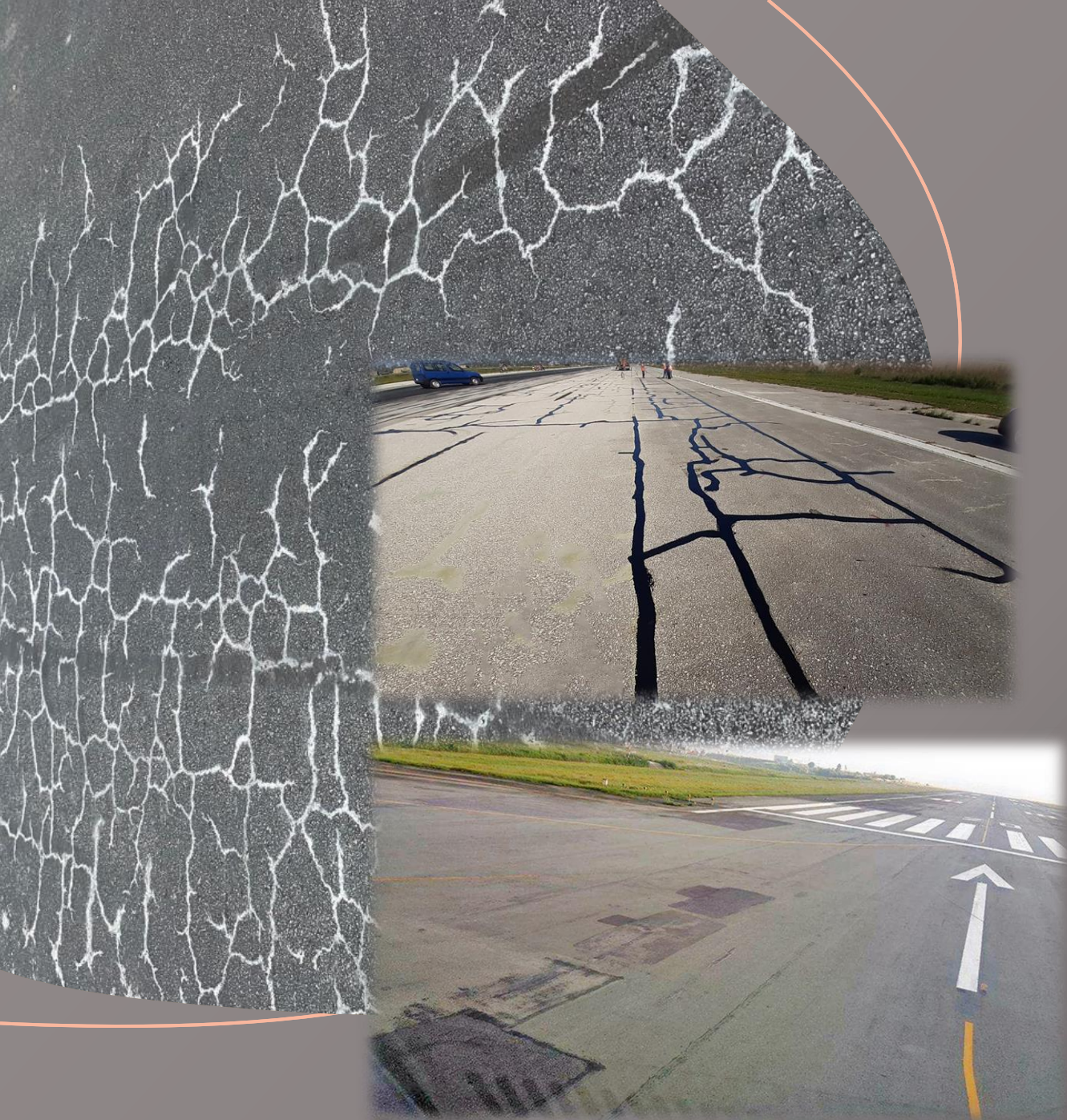


Reclaimed Asphalt Pavement (RAP) P-401-3.4

- Max size of 1-inch (25mm)
- Percent asphalt content determined by ASTM D2172
- Shall only be used for shoulder surface course mixes and for any intermediate courses.
- >20% to 30% RAP select one binder grade softer
- Do not use RAP containing Coal Tar
- Binder grade adjustment

IDENTIFY

What are the common deficiencies and how to do we address them?



Cracking

- Longitudinal, transverse and edge
- Block
- Reflection
- Alligator (fatigue)

Repair

- Crack filling
- Patching
- Mill and Repave

Disintegration

- Raveling
- Asphalt Stripping
- Jet Blast Erosion
- Delamination
- Fuel Erosion

Repair

- Cold mix patching
- Hot Mix Patching
- Mill and Replace
- Fuel Resistant Mixtures





Distortion

- Rutting
- Shoving
- Swelling
- Depressions

Repair

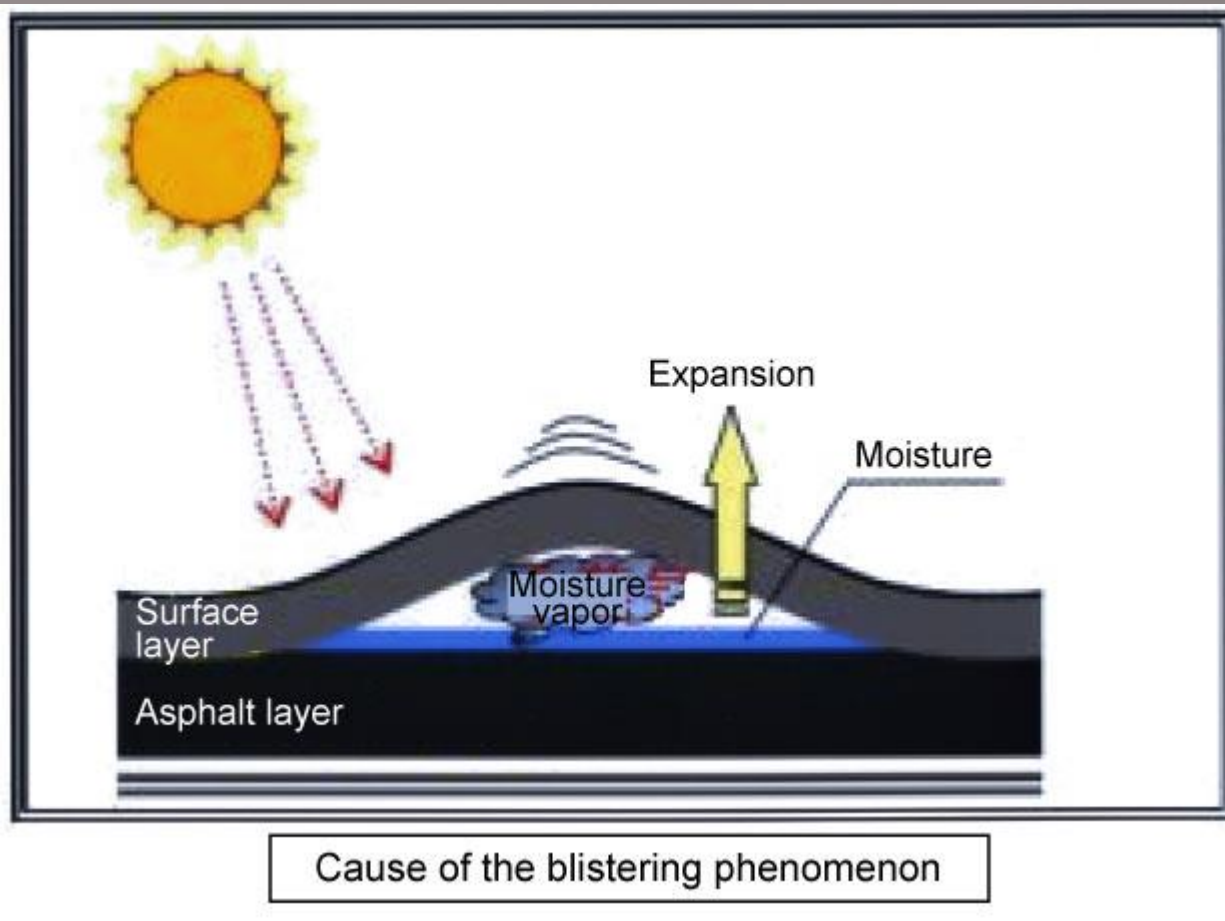
- Surface Treatment
- Remove and replace

Miscellaneous

- Polished Aggregates
- Contaminates - Rust Spots
- Bleeding
- Blistering



What is Blistering?



MAINTAIN

A long-lasting pavement requires maintenance and monitoring

FAA Asphalt Specifications (AC 150/5370-10H)

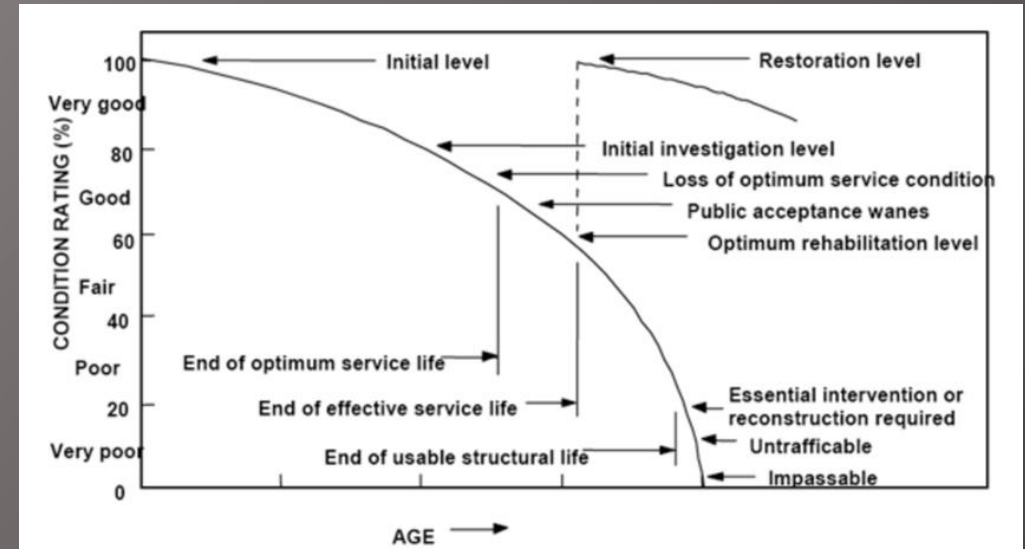
Surface Treatments

- P-608, P-609 (Seal Coats)
- P-609 (Chip Seal)
- P-623, P-636 (Slurry Seals)
- P-629, P-630, P-631 (Coal Tar)
- P-632 (Asphalt Rejuvenation)



Pavement Maintenance Program

- Visual Inspection and Non-Destructive Testing
 - Evaluate Pavement Load-Carrying Capacity
- Schedule Maintenance and Rehab while Maximizing Benefits, Minimizing Costs
 - Forecast future performance / condition
 - Track pavement deterioration and determine cause
 - Objective, systematic, repeatable
- PCI (Pavement Conditions Index)
 - Snapshot of road health on scale of 0 - 100



Common Pavement Distresses

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[Link to Video](#)



LET'S TALK ABOUT WHAT DISTRESSES YOU SEE

Asphalt Testing Solutions & Engineering

Tanya Nash, P.E., Director of Engineering

Steve McReynolds, Director of Operations

