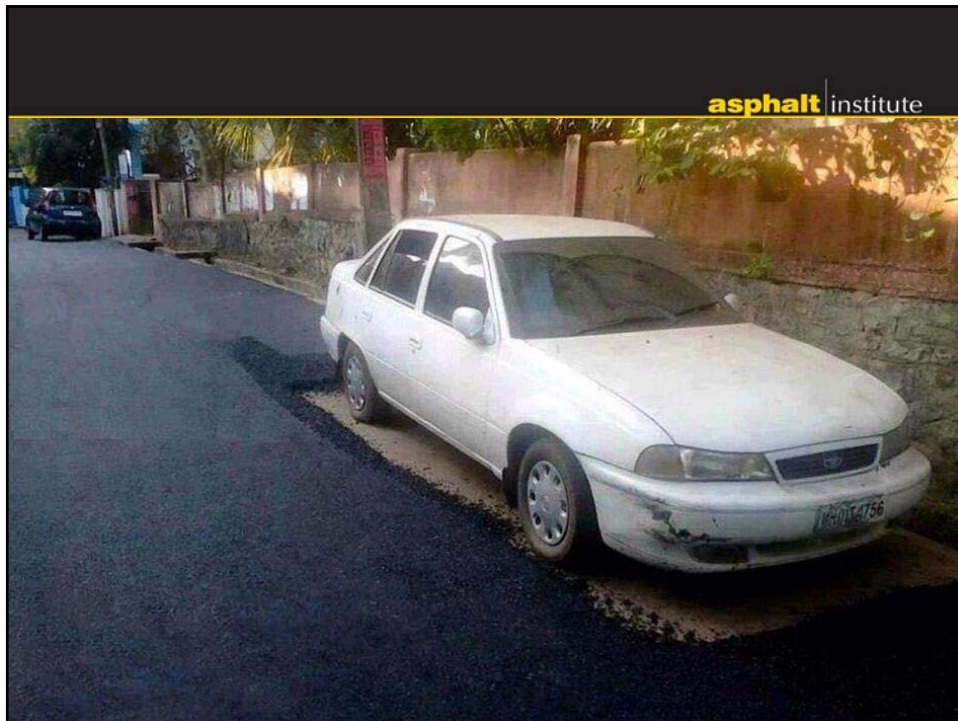


FAA's Mixture Specifications

- Revised P-401 (and P-403)**
- New P-601 (Fuel Resistant Mix)**

For SEAUPG, Nov 2014
By Mark Buncher





Airfield Pavement Challenges

asphalt institute

Airfields provide unique pavement challenges that are different from highways. Some examples:

- Heavier Loadings
- FOD Unacceptable!!!
- Higher Tire Pressures



Aircraft loads can exceed 1M pounds



Cracking on Airfield Pavement Surfaces Leads to Foreign Object Debris (FOD)



**Airfield pavements built to higher standard relative
to highways due to FOD. Huge \$ and safety issue.**

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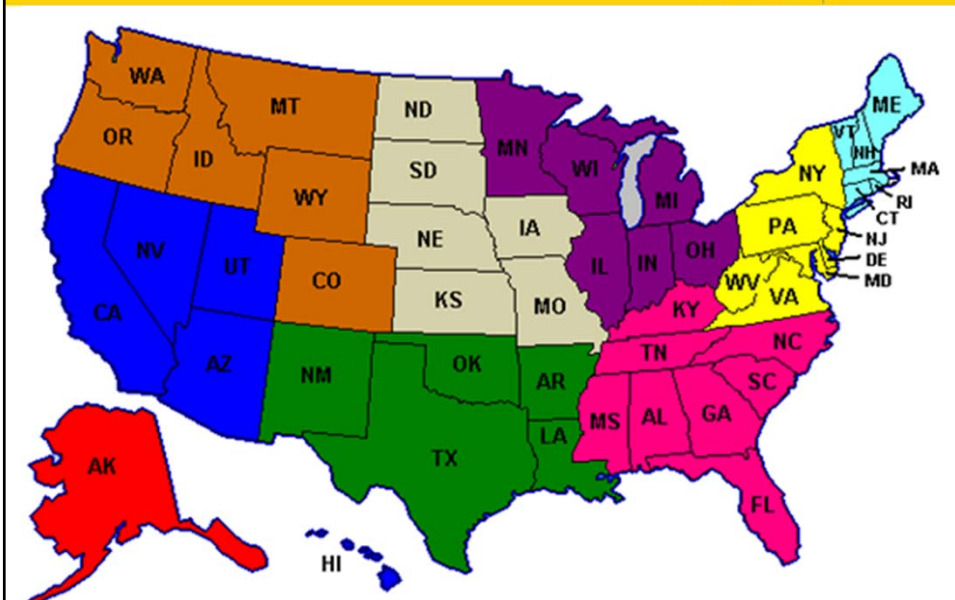


Tire pressures can exceed 300 psi
Commercial aircraft typically 250psi or higher
Often slow moving, channelized traffic pattern



Current FAA Regions

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AI / FAA Airport Pavement Technical Workshops

- **Twice per year**
 - Rotate among FAA Regions
- **Provide state of the art technical information on airport asphalt pavements**
- **Incorporates FAA's New AC 150/5370-10G**
 - Standards for Specifying Construction of Airports
 - Includes all specs (P-401, P-601, etc)



All lessons customized for airport pavements and FAA standards



Agenda for APTW

asphalt institute

- **Day One**
 - FAA Overview, Issues and Guidance
 - Design and Evaluation
 - Material Selection
- **Day Two**
 - Mix Design Considerations
 - Construction
- **Day Three**
 - Management and Preservation
 - Rehabilitation
 - Innovative Technologies



“Item P-401 Hot Mix Asphalt (HMA) Pavements”

- Section 1: Description
 - Note: used for surface courses on airfields with aircraft >12,500 lbs. For underlying layers, and for <12,500 lb aircraft, Item P-403 may be used. (P-403 similar to P-401 except no PWL.) State highway specs may be used for shoulders and other pavements not subjected to aircraft.
- Section 2: Materials
 - Aggregates, Asphalt Cement Binder, others
 - Submission of certified material test reports

P-401

- Section 3: Composition
 - 401-3.2 Job Mix Formula (JMF)
 - Marshall or Gyratory Method (engineer chooses)
 - 401-3.3 RAP
 - Note: None in surface mixes. Max 30% allowed on intermediate lifts and shoulders. Follow AI's MS-2.
 - No coal tar in RAP
 - No RAS
 - If 20-30% RAP, one binder grade softer. No grade dump!
 - 401-3.5 Test Section
 - Testing requirements
 - Min 300' x 20-30', include a longitudinal joint

P-401

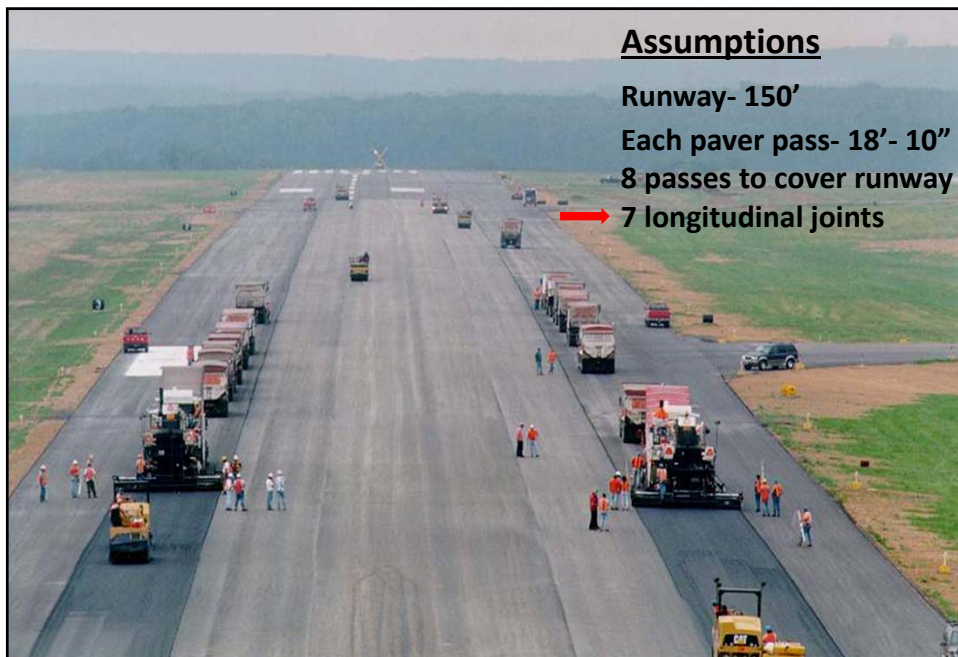
- Section 4: Construction Methods
 - 401-4.1 Weather Limitations
 - 401-4.2 HMA Plant Requirements
 - 401-4.3 to 401-4.5 Haul Trucks, MTVs, Pavers, Rollers
 - 401-4.10 Preparing underlying surface (tack or prime coat)
 - 401-4.11 Laydown Plan Required
 - 401-4.12 Compaction
 - 401-4.13 Joints
 - Cutback longitudinal joints 3-6”
 - 401-4.14 Grooving (P-621)

P-401

- Section 5: Material Acceptance (by engineer-owner)
 - 401-5.1 Acceptance Sampling and Testing
 - Plant produced material
 - Field placed material
 - 401-5.2 Acceptance Criteria
 - PWL
- Section 6: Contractor Quality Control (in addition to, and separate from acceptance testing)
 - 401-6.2 Contractor Testing Laboratory
 - 401-6.3 Quality Control Testing
 - 401-6.4 Sampling
 - 401-6.5 Control charts
 - Action and suspension limits
 - Reports

P-401

- Section 7: Methods of Measurement
 - 401-7.1 HMA is measured in number of Tons used in acceptable work
- Section 8: Basis of Payment
 - Percent Within Limits (PWL)
 - Adjusted payment schedule based on:
 - Smoothness
 - Mat and joint density (relative to lab density – not Rice)
 - Lab air voids
- Testing Requirement Methods
 - Mostly ASTM




Assumptions

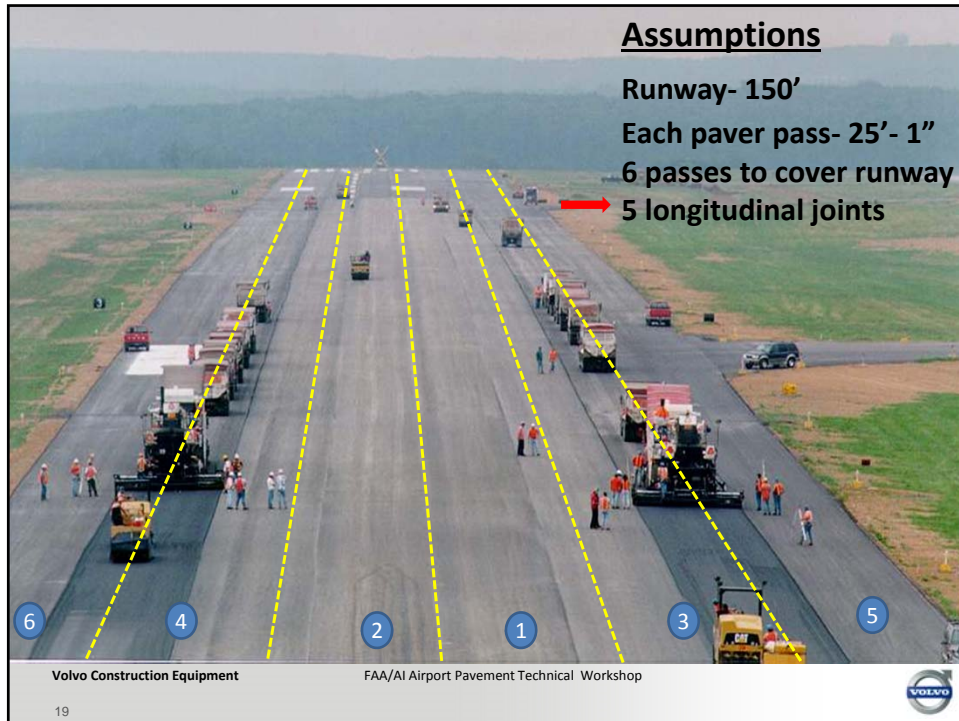
- Runway- 150'
- Each paver pass- 18'- 10"
- 8 passes to cover runway
- 7 longitudinal joints

Volvo Construction Equipment

FAA/AI Airport Pavement Technical Workshop

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Assumptions
Runway- 150'
Each paver pass- 25'- 1"
6 passes to cover runway
→ 5 longitudinal joints

6 4 2 1 3 5

Volvo Construction Equipment FAA/AI Airport Pavement Technical Workshop

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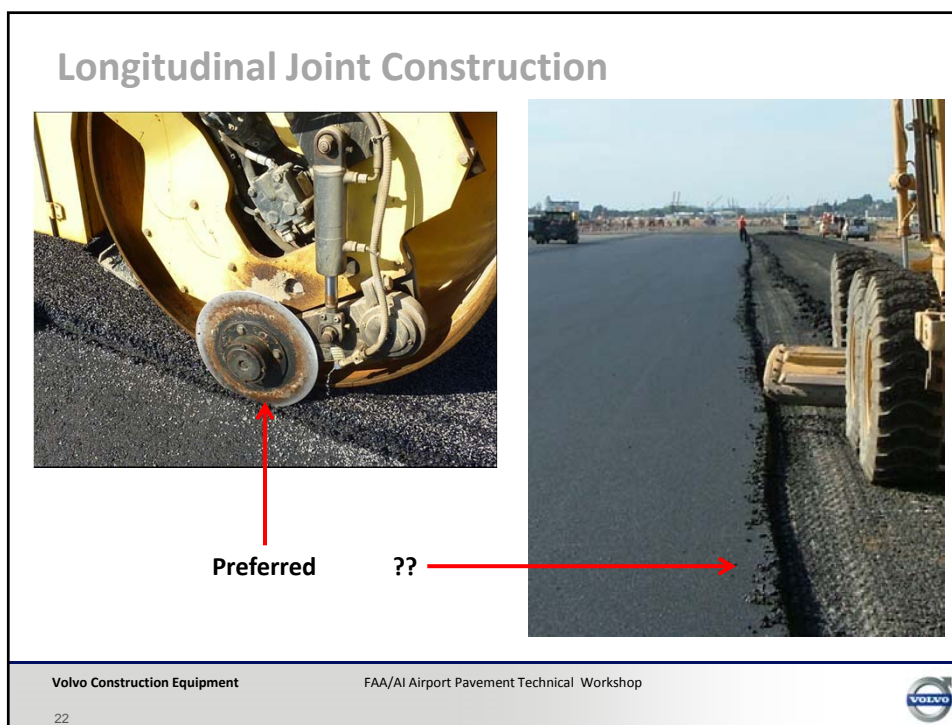


Assumptions
Runway- 150'
Each paver pass- 37'- 6"
4 passes to pave runway
→ 3 longitudinal joints

4 2 1 3

Volvo Construction Equipment FAA/AI Airport Pavement Technical Workshop

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401-2.3 Revised Binder Paragraph

➤ Performance Grade (PG) per ASTM D6373

- (removed option for Vis or Pen Grades)

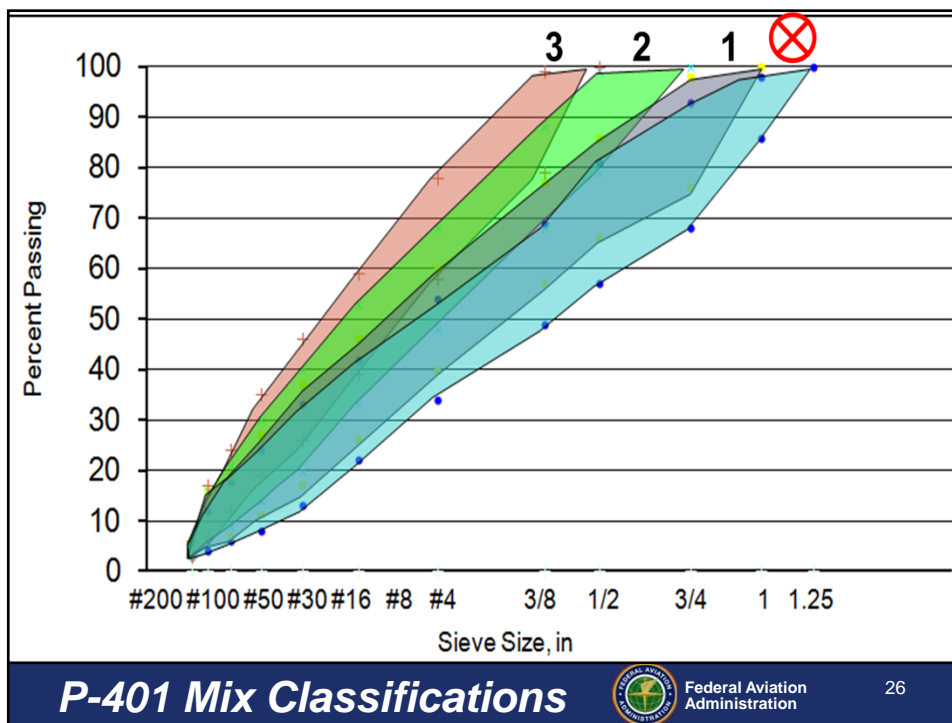
➤ Guidance for Selecting the PG (In Note)

- “Initial” (Base) grade consistent with local State DOT practices for climate only
- Then grade bump according to aircraft wt.:
 - Less than 12,500#: no grade bump
 - Between 12,500# and 100,000#: 1 bump
 - Over 100,000#: 2 grade bumps
 - Also consider tire pressures, stacking, any history of rutting

401-2.3 Revised Binder Paragraph

➤ Additional Guidance (in Note)

- Grade bump only for P-401, not P-403
- Grade bump top 5 inches of HMA
- Refer to:
 - AI's MS-26 The Asphalt Binder Handbook
 - AI's State Binder Spec Database on their website
 - The LTPPBind program
- Modified grades (UTI ≥ 92) require a minimum elastic recovery (ASTM 6084) of 70, or some other PG-Plus test required by the State
 - Refer to AI's Binder Spec Database



P-401 Mixture Classifications

- Three mixes in P-401
 - Gradation 1: 100% passing 1". Essentially a 19mm
 - Typically non-surface lifts.
 - Gradation 2: 100% passing ¾". Essentially a 12.5mm
 - Typical surface lift. Also used for underlying lifts.
 - Gradation 3: 100% passing ½". Essentially a 9.5mm
 - Used for leveling course, airfield shoulders, roads
- Lift Thickness: New P-401 says "4 x MAS".
 - FAA backing off. Now saying 2.5" for gradation 2.
- CA Crushed Faces
 - Aircraft ≥60,000 Lbs. – 75% 2FF & 85% 1FF
 - Aircraft <60,000 Lbs. – 50% 2FF & 65% 1FF

Either "Marshall Method" Mix Criteria, P-401

Test Property	Gross Wt ≥ 60 kips or Tire Pressures ≥ 100 psi	Gross Wt < 60 kips or Tire Pressures < 100 psi
No. of Blows	75	50
Stability, lbs (min)	2150	1350
Flow, 0.01 in	10 - 16	10 - 18
Target Air Voids, %	3.5	3.5

PAVE



Or “Gyratory Method” Mix Criteria, P-401

Test Property	Gross Wt \geq 60 kips or Tire Pressures \geq 100 psi	Gross Wt < 60 kips or Tire Pressures < 100 psi
No. of Gyration	75	50
Target Air Voids, %	3.5	3.5

PAVE/

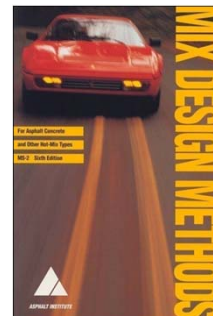


Minimum VMA, P-401

Mix Type	Minimum VMA
Gradation 3	16 %
Gradation 2	15 %
Gradation 1	14 %

VMA requirements are 1% higher than AASHTO M323 and AI's MS-2.

- Required at mix design and also checked during test strip.
- Not checked during production.



Moisture Sensitivity, P-401

- ASTM D 4867
- **TSR $\geq 75\%$**
 - If less, try adding LAS, hydrated lime or changing aggregate/binder combination

P-601 (Fuel-Resistant) Asphalt Pavement Specification:

- **Background:** Airports have fuel and oil spills on aprons/ TWs.
- **Also concerns with use of coal tar sealers**
- **P-601 Highly modified binder (PG 82-22)**
- **Gradation 3 (9.5mm NMA5).** 50 blow or 50 gyrations.
- **Low design air voids (2.5%)**
- **Improved stability and durability. Longer lasting pavement**
- **Minimal weight loss during fuel immersion tests**

Standard mix with PG64-22



P-601



In fuel immersion test, the standard mix loss was approximately 10% by



**SEC-AAAE General Aviation Airport Project of the Year:
Airfield Project**

Fuel Resistant Apron Rehabilitation Project

Bob Sikes Airport (CEW)—Crestview, FL

- **Feature article in Asphalt Institute magazine Feb 2012**
- **Now FAA's P-601. Also UFGS 32 12 12 FR.**
- **Also placed in Malaysia, Egypt, Yemen, Caribbean, La Guardia, Boston Logan, Charlotte Douglas, FDOT , Bob Sikes Airport FL, Herlong Airport FL.**



Logan Airport - 2014



10 year old FR Pavement

AI's New Mix Design Manual



MS-2, Asphalt Mix Design Methods, 7th Edition

- 55th year as industry's standard
- Defines AI's position
- Merges current SP-2 and MS-2
- 200 pages, 13 chapters
- Release: Dec 2014

