Update: Pavement Related Advisory Circulars Changes in the ACs

ACIL's Policies & Practices (P2)
2017 Meeting & Conference

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Presentation Objectives

- **Summarize work in Airports Safety & Standards, Airport Engineering Division (AAS-100)**

- **Overview and Highlight Principle Changes in:**

  Advisory Circular 150/5320-6F
  Airport Pavement Design and Evaluation

- **Discussion, Comments, Common Questions on:**

  Advisory Circular 150/5335-5C
  Standardized Method of Reporting Airport Pavement Strength - PCN

  Advisory Circular 150/5370-10G
  Standards for Specifying Construction of Airports

FAA Role in Pavements in USA

- **Airport's Individually Owned / Operated**
- **FAA Certification for Commercial Operations "49 CFR Part 139"**
- **FAA Administers a Grant in Aid Program**

  Airport Improvement Program (AIP)

  ~ 3.2 B (US) Total AIP (FY 2016)

  ~ 2.5 B (US) Federal Funding to Airside Pavements

  ~ 60% of the Airport Improvement Program

  ~ 20% of the Passenger Facility Charge

Airports in US

FAA generally limited to NPIAS Facilities

(National Plan Integrated Airport System)

Type of Facility	Total U.S. Facilities	Private-Use Facilities	Public-Use Facilities	Existing NPIAS Facilities
Airport	13,112	8,266	4,857	3,283
Heliport	5,579	5,513	66	10
Seaplane Base	488	272	216	38
Balloonport	13	12	1	
Gliderport	35	30	5	
Ultralight	122	119	3	
Total	**19,360**	**14,212**	**5,148**	**3,331**[5]

Commercial Service Airports in US

Category	No.	Passengers
Commercial Service	506	At least 2,500
Primary	394	> 10,000
Large Hub	30	1% or more
Medium Hub	33	.25% < 1%
Small Hub	71	.05% < .25%
Non	260	> 10,000 < .05%
Part 139 Cert.	541	

Airport Pavements in US

Paved Areas (NPIAS Airports)

	AREA (millions sy)	AREA (millions sq m)	~14' wide Lane Mile
RW	273	228	~33,000
TW*	105	88	~13,000
Apron**	81	68	~10,000
Total	460	385	~56,000

* TW Area estimated at 38.6% of RW

** Apron Area estimated at 29.8% of RW

NOTE: FAA tracks and reports Paved Runway Conditions of all NPIAS Airports (~ 4410 Runways in the ~3280 NPIAS Airports)

FAA HQ AAS Activities

- **Standards and Guidance**
  - Advisory Circulars (ACs) / Engineering Briefs (EBs)
  - CertAlerts

- **Engineering Standards**
  - Airport/Heliport/Seaplane Base Design and Construction
  - Pavement Design and Management
  - Lighting, Marking, and Signs
  - New Technology / Research & Development (R&D)
  - Airports Geographic Information Systems (GIS)

- **Safety and Operations**
  - Part 139 Certification Program
  - Aircraft Rescue and Fire Fighting
  - Wildlife Hazard Mitigation

Airport Engineering Division AAS-100

- Division Manager
- Deputy Division Manager
- Secretary / Administrative Assistant
- National Resource Expert on Air Space (vacant)
- 7 Civil Engineers (2-vacant) [2 Pavements Engineers]
- 4 Electrical/Electronics Engineers (1-vacant)
- 2 ACRP (1 Engineer; 1 Program Analyst/Engineer (vacant))
- 3 Airports GIS (1 Computer Scientist (vacant); 2 Data Analyst)
- Airport Safety Data Program [Program Manager]
- Technical Support Contractor

FAA Guidance

- FAA guidance is part of the authorizing legislation for airport development using Federal funds.
- FAA airport design, construction, and maintenance guidance are contained in Advisory Circulars, the 150's series.
- Interim FAA airports engineering guidance is provided in Engineering Briefs.
- FAA airport guidance is available from FAA web sites : http://www.faa.gov/arp/

FAA Guidance

FAA Advisory Circulars (AC's)

Required when federal funds used (AIP or PFC)

List Provided with each AIP Grant Agreement

Establishing or Changing Guidance

- HQ Office Initiates and Prepares Draft.
- Review by HQ Airports Offices and Regions.
- Revised Draft for Industry Review & Comment.
  - Posted to FAA Web Page
  - Sent by email
    - The Boeing Company and the Airports Consultants Council (ACC)
    - Tri-Service Airfield Pavement Working Group Team and ASCE T&DI APC
    - The Asphalt Institute (AI), National Asphalt Pavement Association (NAPA), and American Concrete Pavement Association (ACPA)
- Comments Accepted for ~ 3 weeks to 3 months.
- Change Finalized.
- FAA Legal Review, Office Director Signs.

What Delays a Change

- Non-Concurrence from HQ Offices.
- Non-Concurrence from FAA Regions.
- Inability to Reconcile Comments from Boeing, ACC, Peer Review Associations, or Industry.
- Substantive Alterations to a Proposed Change May Require New Draft.

Pavement Advisory Circulars

Advisory Circular			Title
AC 150/5370-10G	*	2014	Standards for Specifying Construction of Airports
AC 150/5320-6F		2016	Airport Pavement Design & Evaluation
AC 150/5335-5C	-	2014	Standardized Method of Reporting Airport Pavement Strength (PCN)
AC 150/5320-5D	-	2013	Surface Drainage Design
AC 150/5320-12C	*	1997	Measurement, Construction & Maintenance of Skid Resistant Airport Pavement Surfaces
AC 150/5370-11B	*	2011	Use of Non Destructive Testing in the Evaluation of Airport Pavements
AC 150/5380-6C		2014	Guidelines & Procedures for Maintenance of Airport Pavements
AC 150/5380-7B		2014	Airport Pavement Management Programs (PMP)
AC 150/5380-9	-	2009	Guidelines & Procedures for Measurement of Pavement Roughness
AC 150/5370-12B (Combined 5370-12, 5370-6, 5300-9)		2015	Quality Management for Federally Funded Airport Construction Projects
AC 150/5100-13B	-	2011	Development of State Standards for Nonprimary Airports
AC 150/5000-15B		2013	Announcement of Availability of Airport-Related Research and Development Products

Pavement Engineering Briefs

Engineering Brief		Title
EB66	2004	Rubbilized Portland Cement Concrete Base Course
EB57	1999	Extended Q-Value Table for Estimating Percent of Lot Within Limits (PWL)
EB56	1999	Development of Revised Acceptance Criteria for Item P401 and Item P501
EB42	1989	Geocomposite Edge Drains
EB34A	2002	Referee Testing of Hardened Portland Cement Concrete Pavement-Percentage within Limits Revision

Pavement Computer Programs

Software	Description
FAARFIELD v 1.41	Airport Pavement Design
COMFAA 3.0	PCN/ACN
COMFAA 3.0 Support	Excel Spreadsheet to assist with PCN evaluation (development of reference section)
BAKFAA	Back-calculation of modulus from NDT testing
FAA PaveAir	FAA Pavement Management Software
PWL Spreadsheet	Asphaltic Concrete Payment Adjustments for Densities and Air Voids
Downloads	http://www.airporttech.tc.faa.gov/naptf/download/index1.asp#soft

Note minor updates to programs periodically posted
Be sure to check that you are using the latest version

Airports Web Site

http://www.faa.gov

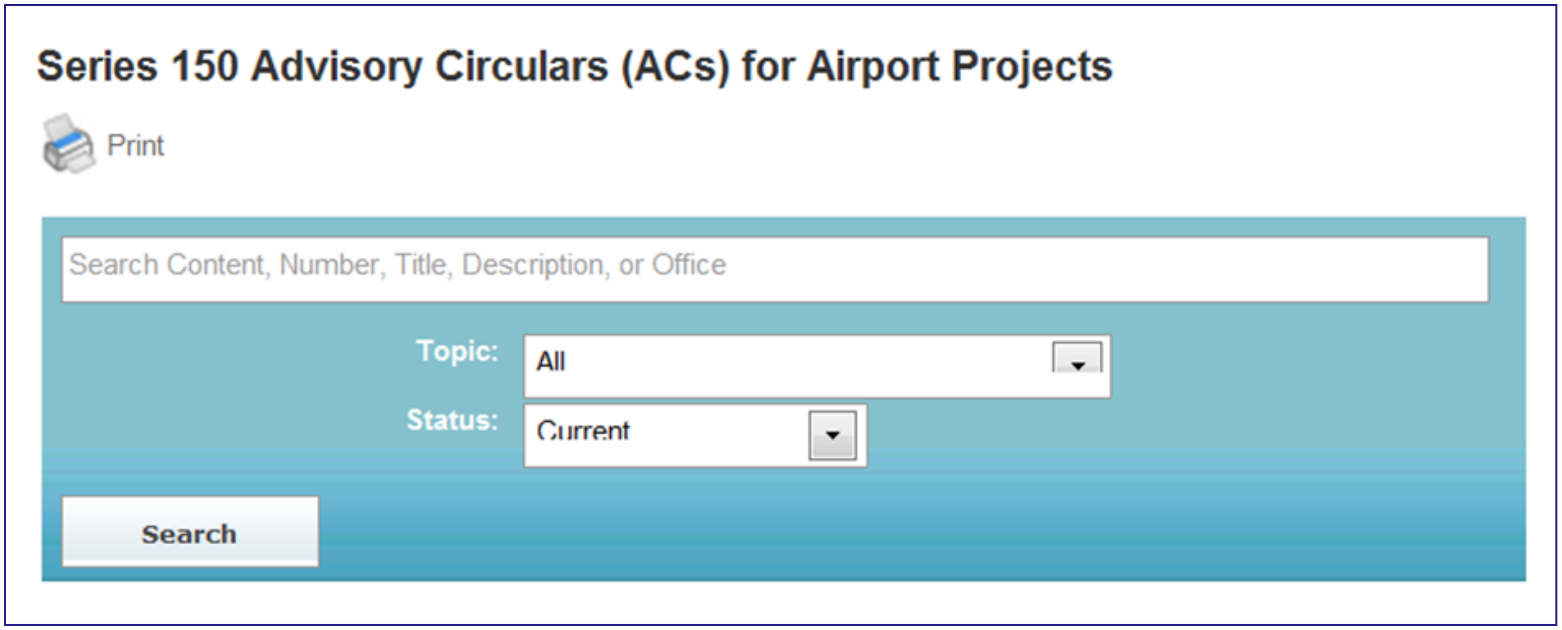
FAA Pavement Advisory Circulars

https://www.faa.gov/airports/engineering/pavement_design/

Often quickest to just do a search engine query for AC, e.g. AC 150/5370-10

FAA Pavement Advisory Circulars

http://www.faa.gov/airports/resources/advisory_circulars/



FY 16 & FY 17 Updates & Changes to Pavement Advisory Circulars

AC 150/5320-6F Airport Pavement Design and Evaluation

- Published and Posted 11/10/2016
- FAARFIELD V 1.41 (V 2.0 in 5320-6G)
- Updated Figures
- Consolidated Information on minimums
- Incorporate NDT as appendix

AC 150/5370-10H Standards for Specifying Construction of Airports

- Editing throughout (Will not be changing format as previously indicated)
- Focus on stronger Construction Quality Control throughout
- Other new Items (subgrade modifications, surface treatments, FDR, etc)

Advisory Circular 150/5320-6F Airport Pavement Design and Evaluation

Overview and Highlight Principle Changes

AC 150/5320-6F Organization

Chapter	Topic
1	Airport Pavements – Their Function and Purpose
2	Soil Investigations and Evaluation
3	Airport Pavement Design
4	Pavement Rehabilitation
5	Pavement Structural Evaluation
6	Pavement Design for Shoulders
Appendix A	Soil Characteristics
Appendix B	Design of Structures
Appendix C	Nondestructive Testing (NDT) using falling-weight type impulse load devices
Appendix D	Reinforced Isolation Joint
Appendix E	Related Reading Material

AC 150/5320-6F Why Change

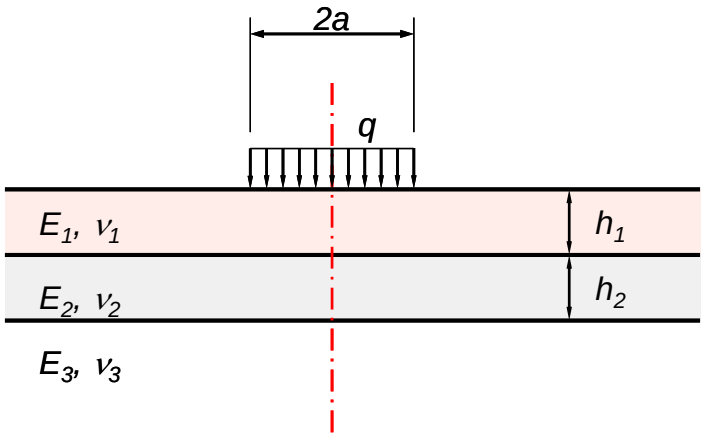
- **Updated FAARFIELD v1.41**
- **Just Airport Pavement Design**
  - no longer a separate chapter on light duty design since all designs require use of FAARFIELD
- **Tables of Minimums based upon weight**
- **More emphasis on evaluation**
- **Step by Step Examples**

FAA Pavement Design
(Structural Models in FAARFIELD)

Flexible pavement design

Layer elastic theory

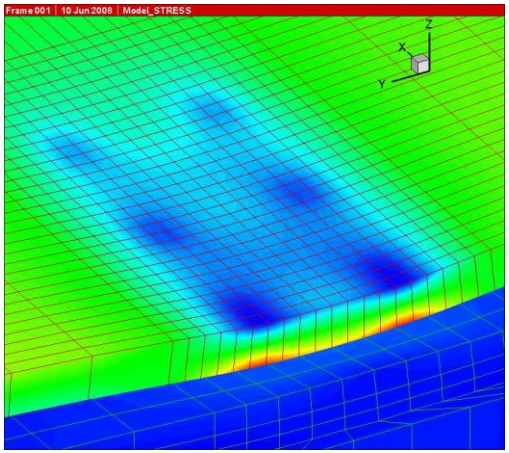
- LEAF is used for all structural computations.
- Maximum vertical strain at top of subgrade and maximum horizontal strain bottom HMA



Rigid pavement design

Three-dimensional finite element theory

- LEAF is used to generate a preliminary thickness.
- Final iterations are done using a 3D finite element model (3D-FEM (NIKE3D)).
- Max horizontal stress bottom PCC

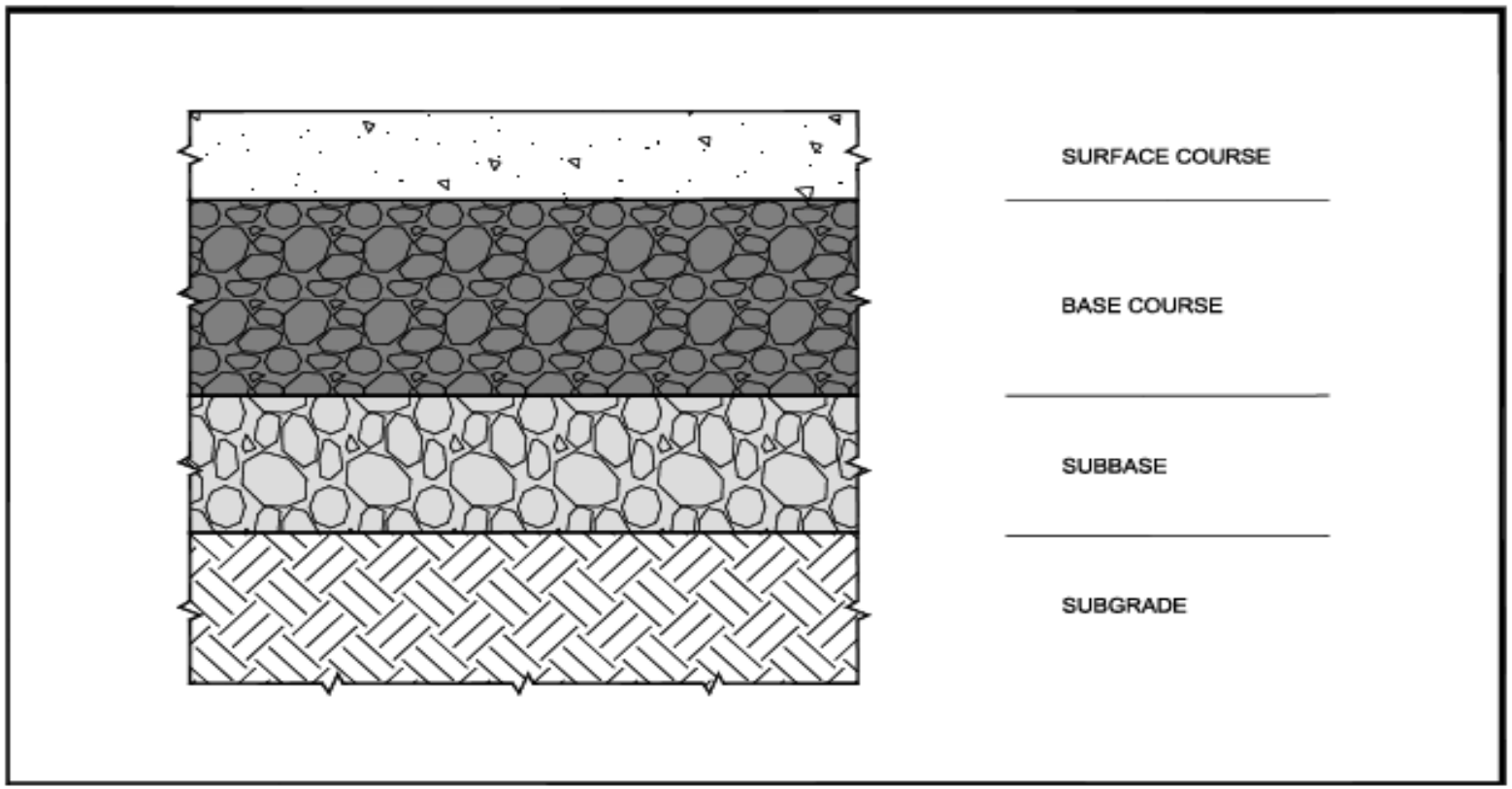


Selection of Pavement Type

Remember what do you need pavement to do…

- **Provide a surface to safely operate aircraft**
- **Smooth, durable, FOD free surface, properly drained and with adequate macro / micro texture to facilitate control of aircraft**
- **It is assumed that all alternatives will achieve desired result**
- **Cost Effectiveness Analysis following OMB A-94**

Typical Pavement Structure



Typical Pavement Structure

- **Surface:** Surface courses typically include Portland cement concrete (PCC) and Hot-Mix Asphalt (HMA).
- **Base:** Base courses generally fall into two classes:
  - **Unstabilized bases:** crushed and uncrushed aggregates.
  - **Stabilized bases:** crushed and uncrushed aggregates stabilized with cement or asphalt.
- **Subbase:** Subbase courses consist of granular material, which may be unstabilized or stabilized.
- **Subgrade:** Subgrade consists of natural or modified soils.

Typical Materials
(Refer to AC150/5370-10)

Pavement Layer	Flexible Pavement	Rigid Pavement
Surface Course	P-401/P-403[2]	P-501
Stabilized Base Course	P-401/403 P-304[3] P-306[3]	P-401/403 P-304[3] P-306[3]
Base Course	P-209[4] P-208[5] P-211	P-209[4] P-208[5] P-211
Subbase Course	P-154 P-213[6] P-219[7]	P-154 P-301[6] P-219[7]
Subgrade	P-152 P-155 P-157 P-158	P-152 P-155 P-157 P-158

Typical Materials

Lots of information in the footnotes

When substituting material consider what you need the material to do

Notes:

1. Refer to AC 150/5370-10, *Standards for Specifying Construction of Airports*, for the individual specifications.
2. P-601 may be used for locations that need a fuel resistant surface
3. P-304 and P-306 use with caution, susceptible to reflective cracking
4. P-209, Crushed Aggregate Base Course, used as a base course is limited to pavements designed for gross loads of 100,000 pounds (45 360 kg) or less.
5. P-208, Aggregate Base Course, used as base course is limited to pavements designed for gross loads of 60,000 pounds (27 200 kg) or less.
6. Use of P-213 and P-301 as subbase course is not recommended where frost penetration into the subbase is anticipated.
7. P-219, Recycled Concrete Aggregate Base Course, may be used as base depending on quality of materials and gradation.

Subgrade Support

2.1.3.2 → The design value for subgrade support should be conservatively selected to ensure a stable subgrade and should reflect the long term subgrade support that will be provided to the pavement. The FAA recommends selecting a value that is one standard deviation below the mean. Where the mean subgrade strength is lower than a California Bearing Ratio (CBR) of 5, it may be necessary to improve the subgrade through stabilization or other means in order to facilitate compaction of the subbase. When the design CBR is lower than 3, it is required to improve the subgrade through stabilization or other means. See paragraph 2.6.¶

CBR < 5 **Recommend** Improvement

CBR < 3 **Require** Improvement

Pavement Design

- **Design Guidance for Airfield Pavements**
  - All pavement designs require FAARFIELD
    no differentiation between light and aircraft > 30K
  - Tables of Minimum Layer Thickness by weight
- **Stabilized Base Course**
  - Full Scale Performance Tests prove that pavements with stabilized bases have superior performance
  - Exception: < 5% Traffic > 100K and < 110K

Minimum Thickness

Table 3-3. Minimum Layer Thickness for Flexible Pavement Structures

Layer Type	FAA Specification Item	Maximum Airplane Gross Weight Operating on Pavement, lbs (kg)		
		<12,500 (5 670)	< 100,000 (45 360)	≥100,000 (45 360)
HMA Surface[1, 2,3]	P-401, Hot Mix Asphalt (HMA) Pavements	3 in. (75 mm)	4 in. (100 mm)	4 in. (100 mm)
Stabilized Base	P-401 or P-403; P-304; P-306[4]	Not Required	Not Required	5 in. (125 mm)
Crushed Aggregate Base[5,6]	P-209, Crushed Aggregate Base Course	3 in. (75 mm)	6 in. (150 mm)	6 in. (150 mm)
Aggregate Base[5,7,8]	P-208,Aggregate Base Course	3 in. (75 mm)	Not Used[7]	Not Used
Subbase[5,8]	P-154, Subbase Course	4 in. (100 mm)	4 in. (100 mm) (If required)	4 in. (100 mm) (if required)

Minimum Thickness

Notes:

1. P-601-Fuel Resistant Hot Mix Asphalt may be used to replace the top 2 in (75 mm) of P-401 where a fuel resistant surface is needed; structurally, P-601 considered same as P-401.
2. Additional HMA surface above minimum typically in 0.5-inch (10-mm) increments.
3. P-403 may be used as surface course < 12,500 pounds (5,760 kg) or for HMA base or leveling course.
4. Use of P-306 requires FAA approval on federally funded projects to assure adequate measures taken to control potential for reflective cracking.
5. Use the larger of the thicknesses in this table or the thickness calculated by FAARFIELD rounded to the nearest 0.5 inch (10 mm). Additional thickness may be required for frost protection above minimums.
6. P-209, Crushed Aggregate Base Course, when used as a stabilized base course, is limited to pavements designed for gross loads of 100,000 pounds (45,360 kg) or less, except as noted in paragraph 3.6, Stabilized Base Course.
7. P-208, Aggregate Base Course, when used as a base course, is limited to pavements designed for gross loads of 60,000 pounds (27,220 kg) or less.
8. P-219 Recycled Concrete Aggregate Base Course may be used as an aggregate base or subbase. How P-219 will perform is related to the quality of the material it is made from combined with the method used to process it into an aggregate base.

Minimum Thickness

Table 3-4. Minimum Layer Thickness for Rigid Pavement Structures

Layer Type	FAA Specification Item	Maximum Airplane Gross Weight Operating on Pavement, lbs (kg)		
		<12,500 (5,670)	< 100,000 (45,360)	≥ 100,000 (45,360)
PCC Surface	P-501, Portland Cement Concrete (PCC) Pavements	5 in. (125 mm)	6 in. (150 mm)[1]	6 in. (150 mm)[1]
Stabilized Base	P-401 or P-403; P-304; P-306	Not Required	Not Required	5 in. (125 mm)
Base	P-208, P-209, P-211, P-301	Not Required	6 in. (150 mm)[2]	6 in. (150 mm)
Subbase[3,4]	P-154, Subbase Course	4 in. (100 mm)	As needed for frost or to create working platform	As needed for frost or to create working platform

Notes:

1. FAARFIELD thickness to be rounded to the nearest 0.5 inch (10 mm).
2. For pavements for aircraft greater than 30,000 lbs (13,610 kg), base may be replaced with subbase.
3. Subbase layer is required for pavements designed for gross loads of 12,500 pounds (5,670 kg) or less only when the following soil types are present: OL, MH, CH, or OH.
4. The following specification items may also be used as subbase: P-208, Aggregate Base Course; P-209, Crushed Aggregate Base Course; P-211, Lime Rock Base Course; P-219 Recycled Concrete Aggregate Base Course; P-301, Soil-Cement Base Course. If more than one layer of subbase is used, each layer should meet the minimum thickness requirement in this table.

Pavement Life

- **Structural Life**: Strength to carry loads
- **Functional Life**: Acceptable Service relative to: foreign object debris (FOD), Skid Resistance or roughness
- **FAARFIELD Structural Life** = **Design Life**
- **Theoretically** possible to perform for any period
- **Actual Life** f(airplane mix, quality of materials and construction, routine & preventative maintenance)

No pavement will achieve its design life without routine and preventative maintenance.

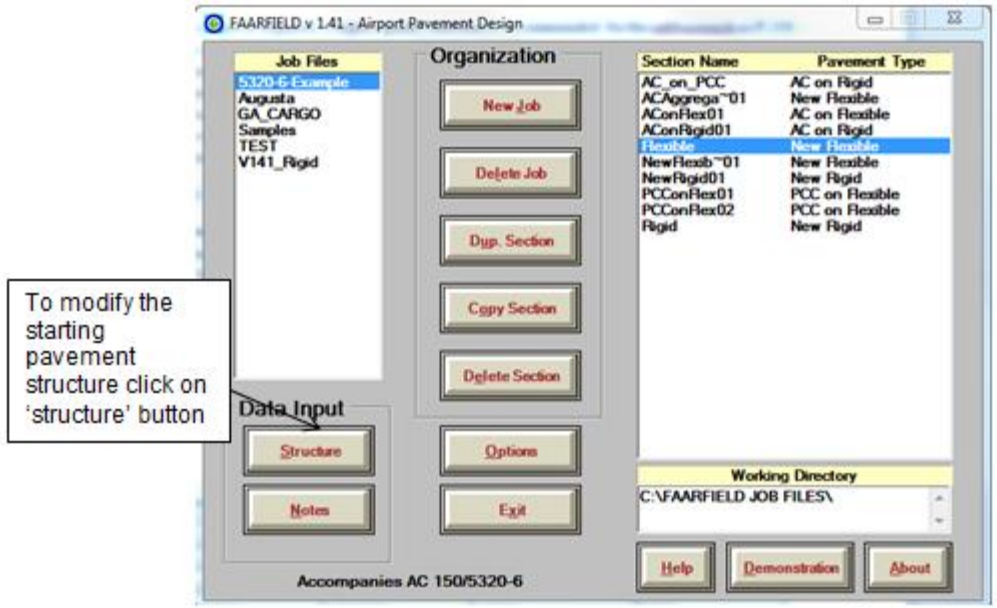
Traffic

- **In general design for ‘regularly’ using aircraft**
- **‘Regular’ use 250 annual departures (500 operations)**
- **Sensitivity analysis for occasional or seasonal**
  - Design Section
  - After adjusting structure for rounding and construction evaluate impact of all aircraft

Chapter 3 FAARFIELD EXAMPLES

- New examples
- Detailed step by step examples
  Flexible & Rigid Design

Figure 3-5. Flexible Design Example Step 1



FAARFIELD 1.4

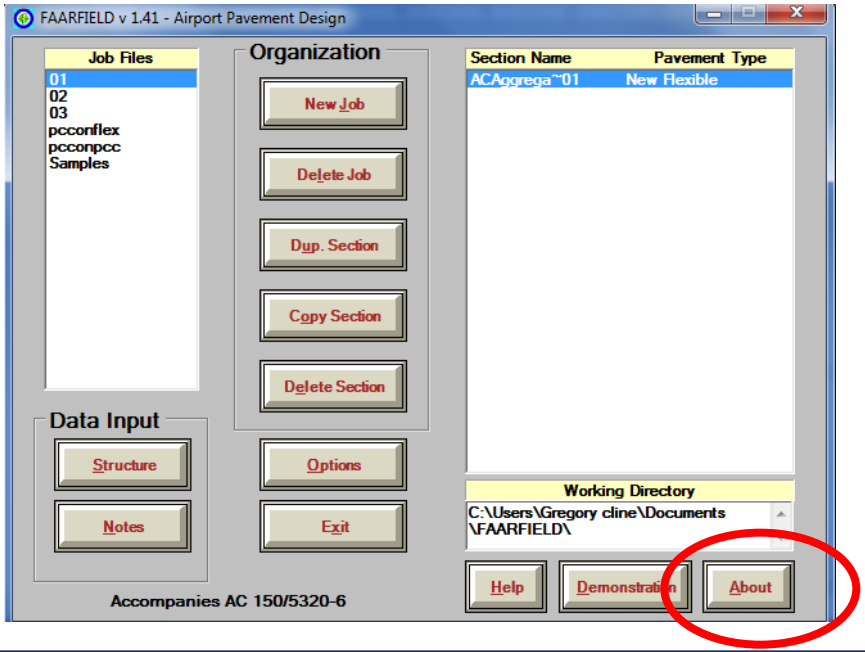
FAARFIELD UPDATES

- Minor changes/fixes occur
- i.e. most recent was about 2 weeks ago – fixed automatic minimum thickness

- Most recent version

  1.41.0113

- What Version do I have?



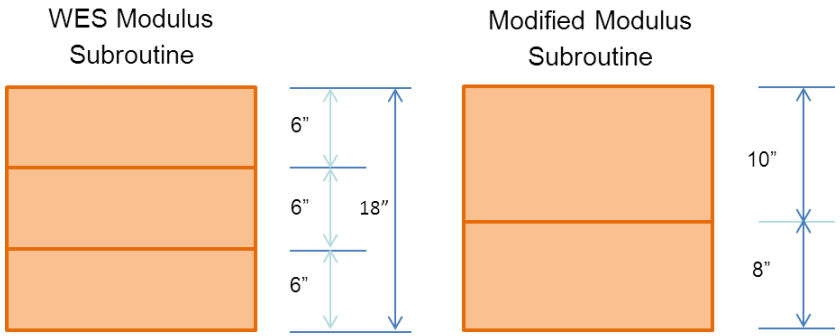
FAARFIELD 1.4 – What's New?

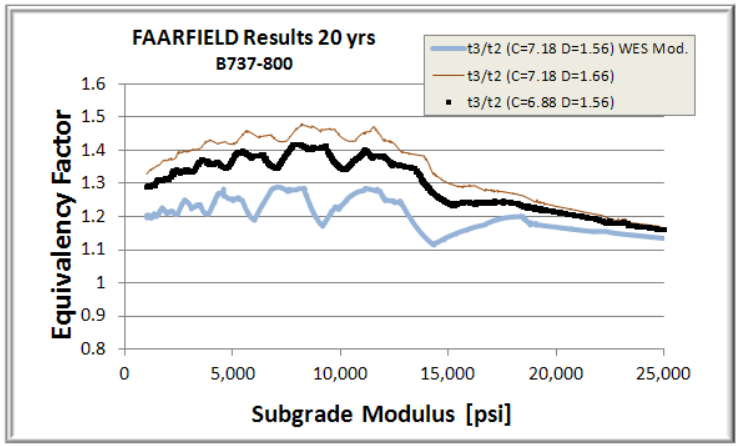
FAARFIELD 1.4 has:

- Completely revised flexible and rigid failure models based on newest full-scale test data.
- Improved, more accurate 3D finite element model.
- Completely rewritten concrete overlay design procedure.
- Support for user-defined gear configurations.
- Updated aircraft library aligned with COMFAA 3.0.
- Automated, software-based compaction criteria.
- All data files now stored in document directories.
- Automatically generates PDF design report.

New Aggregate Modulus Model

- **FAARFIELD 1.4 implements a new sublayering and modulus computation procedure for aggregate subbase (P-154 & P-209)**
  - New model provides a continuous function of modulus with changes in P-154 thickness.
  - Better overall agreement with the P-209/P-154 equivalency factor used in PCN computations.
  - Previous procedure (WES Modulus subroutine) had gaps that caused illogical results under some circumstances





Automated Compaction Criteria

Computes compaction control points for rigid & flexible pavements.

FAARFIELD v 1.41 - Notes and Information for Job REDAC

Section Names

- NewFlexible
- NewRigid

Design Information for Section NewRigid

Subgrade Compaction Requirements

NonCohesive Soil

Percent Maximum Dry Density(%)	Depth of compaction from pavement surface (in)	Depth of compaction from top of subgrade (in)	Critical Airplane for Compaction
100	0 - 16	--	B777-200 ER
95	16 - 70	0 - 43	B777-200 ER
90	70 - 183	43 - 156	B747-200B Combi Mixed

Cohesive Soil

Percent Maximum Dry Density(%)	Depth of compaction from pavement surface (in)	Depth of compaction from top of subgrade (in)	Critical Airplane for Compaction
95	0 - 16	--	B777-200 ER
90	16 - 28	0 - 1	B777-200 ER
85	28 - 96	1 - 69	B747-200B Combi Mixed
80	96 - 178	69 - 151	B747-200B Combi Mixed

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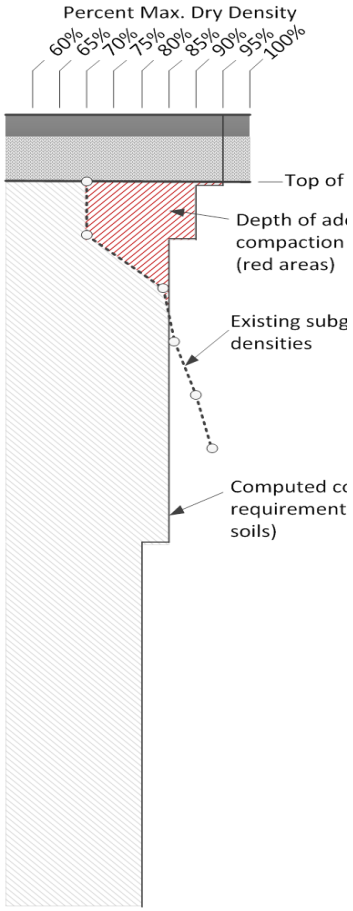
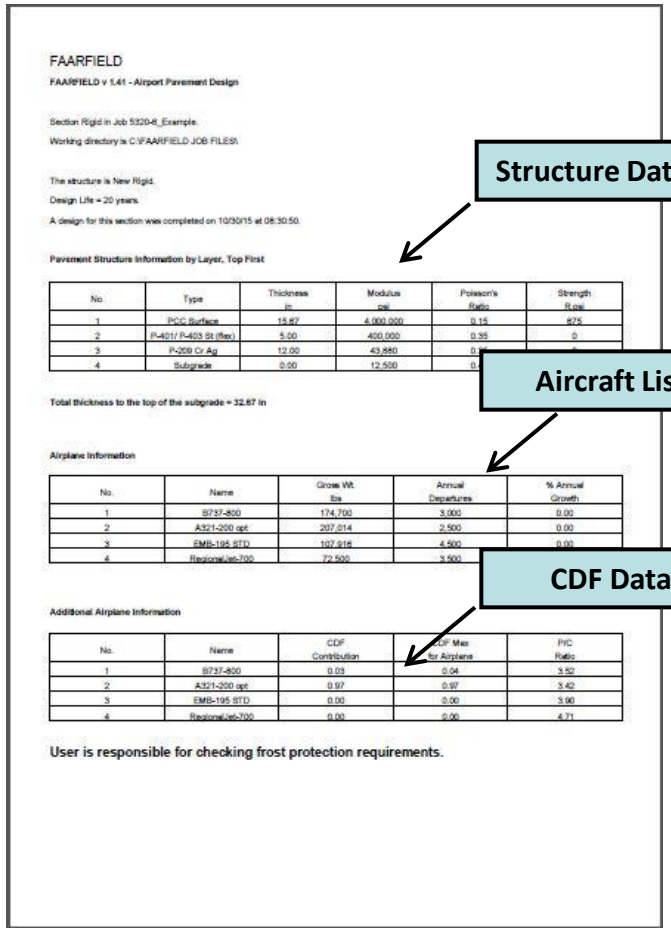


Design Report Automatically Saved as PDF to working directory

File Name: *JobName_SectionName*.pdf



FAARFIELD

FAARFIELD v 1.41 - Airport Pavement Design

Section Rigid in Job 5320-6_Example.

Working directory is C:\FAARFIELD JOB FILES\

The structure is New Rigid.

Design Life = 20 years.

A design for this section was completed on 10/30/15 at 08:30:50.

Structure Data

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R psi
1	PCC Surface	15.67	4,000,000	0.15	675
2	P-401/ P-403 St (flex)	5.00	400,000	0.35	0
3	P-209 Cr Ag	12.00	43,880	0.35	0
4	Subgrade	0.00	12,500	0.35	0

Total thickness to the top of the subgrade = 32.67 in

Aircraft List

Airplane Information

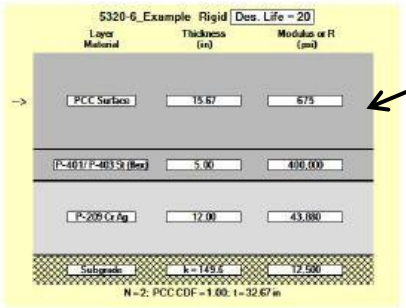
No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	B737-800	174,700	3,000	0.00
2	A321-200 opt	207,014	2,500	0.00
3	EMB-195 STD	107,916	4,500	0.00
4	RegionalJet-700	72,500	3,500	0.00

CDF Data

Additional Airplane Information

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	B737-800	0.03	0.04	3.52
2	A321-200 opt	0.97	0.97	3.42
3	EMB-195 STD	0.00	0.00	3.90
4	RegionalJet-700	0.00	0.00	4.71

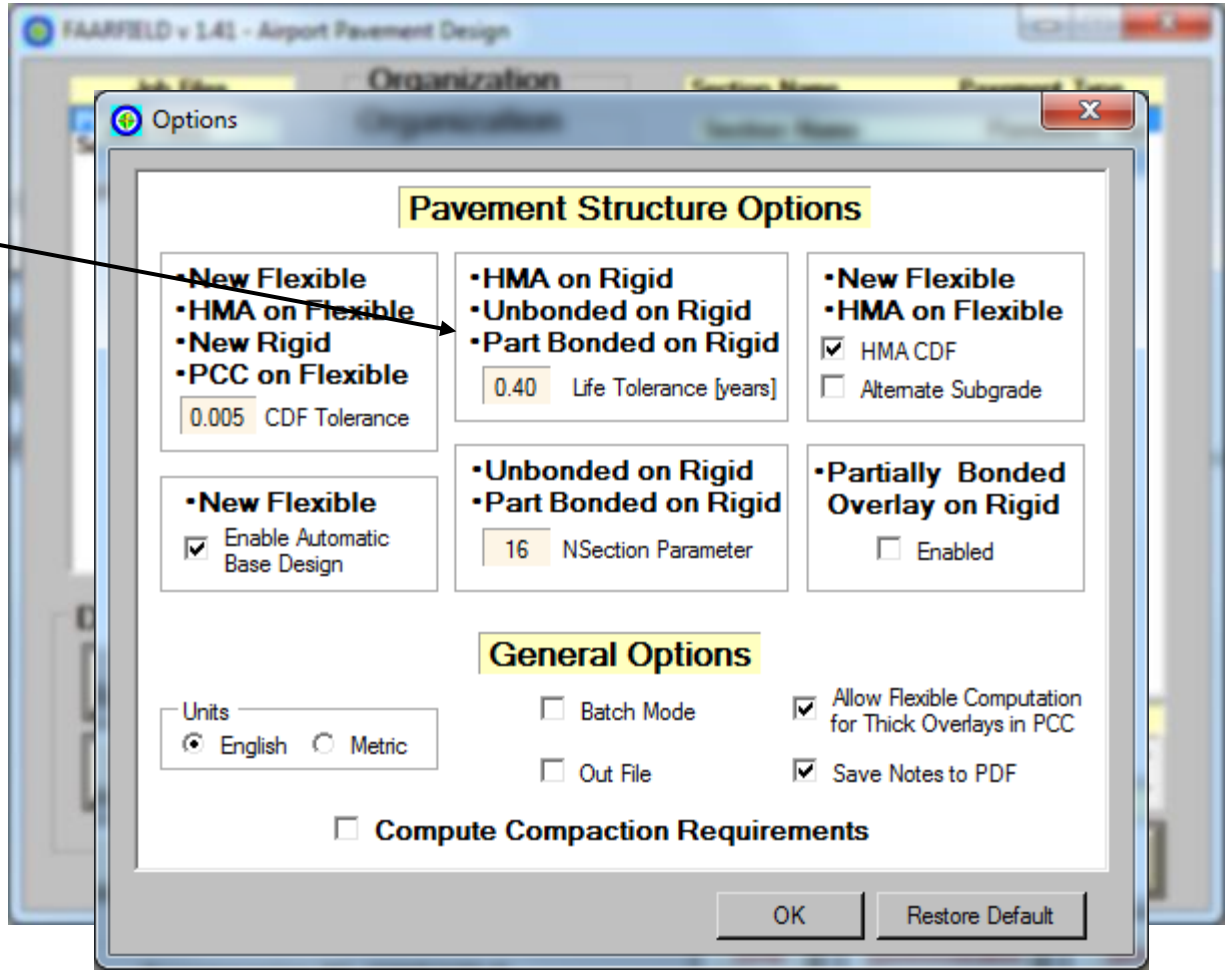
User is responsible for checking frost protection requirements.



Designed Pavement Section

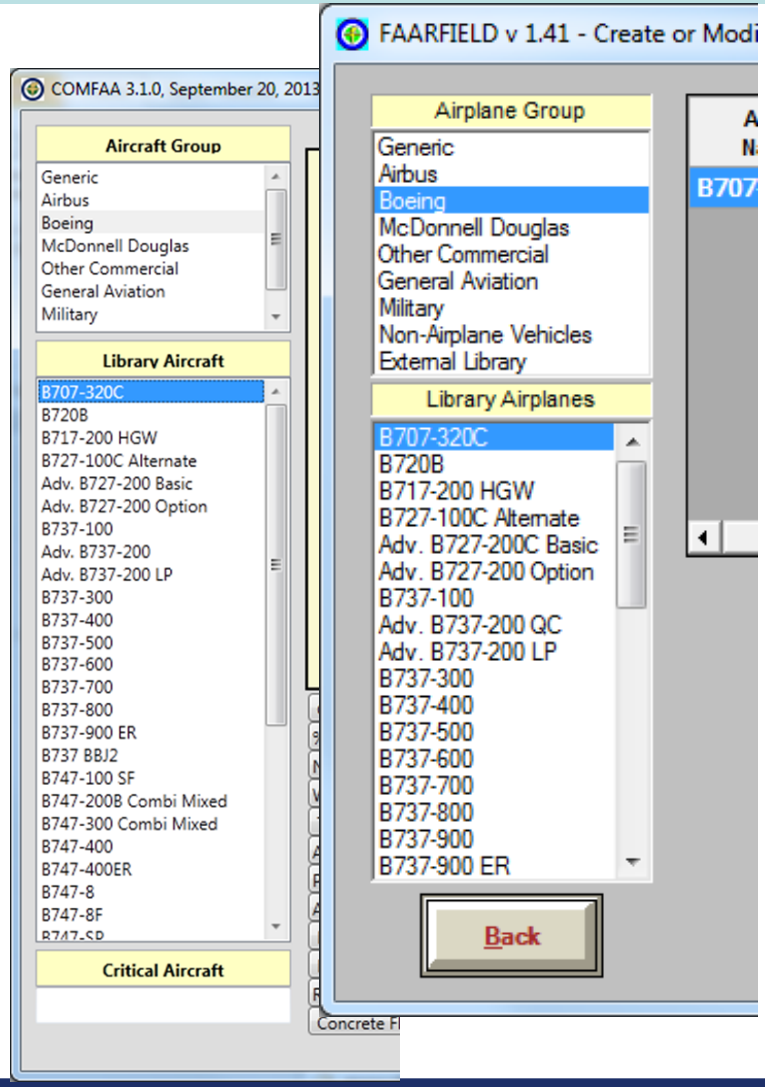
Pavement Structure Options

CDF tolerances, life tolerances may be adjusted;
Many of these options are for research or other analysis, if in doubt leave at the default value.

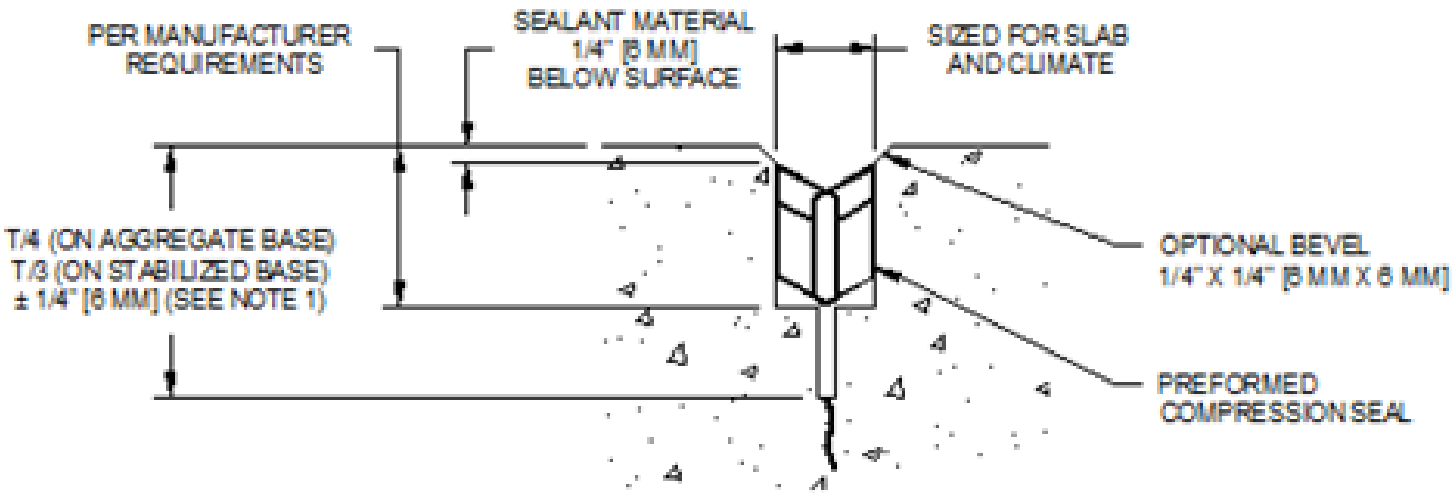


Aircraft Libraries

- **FAARFIELD & COMFAA aircraft libraries aligned to the extent possible.**
- **All Multigear AC split into main & belly, but linked for weight & activity**
- **Included new aircraft:**
  - A350-900 (Preliminary)
  - B747-8
  - B787-9
  - Embraer Fleet



Typical Details (new)

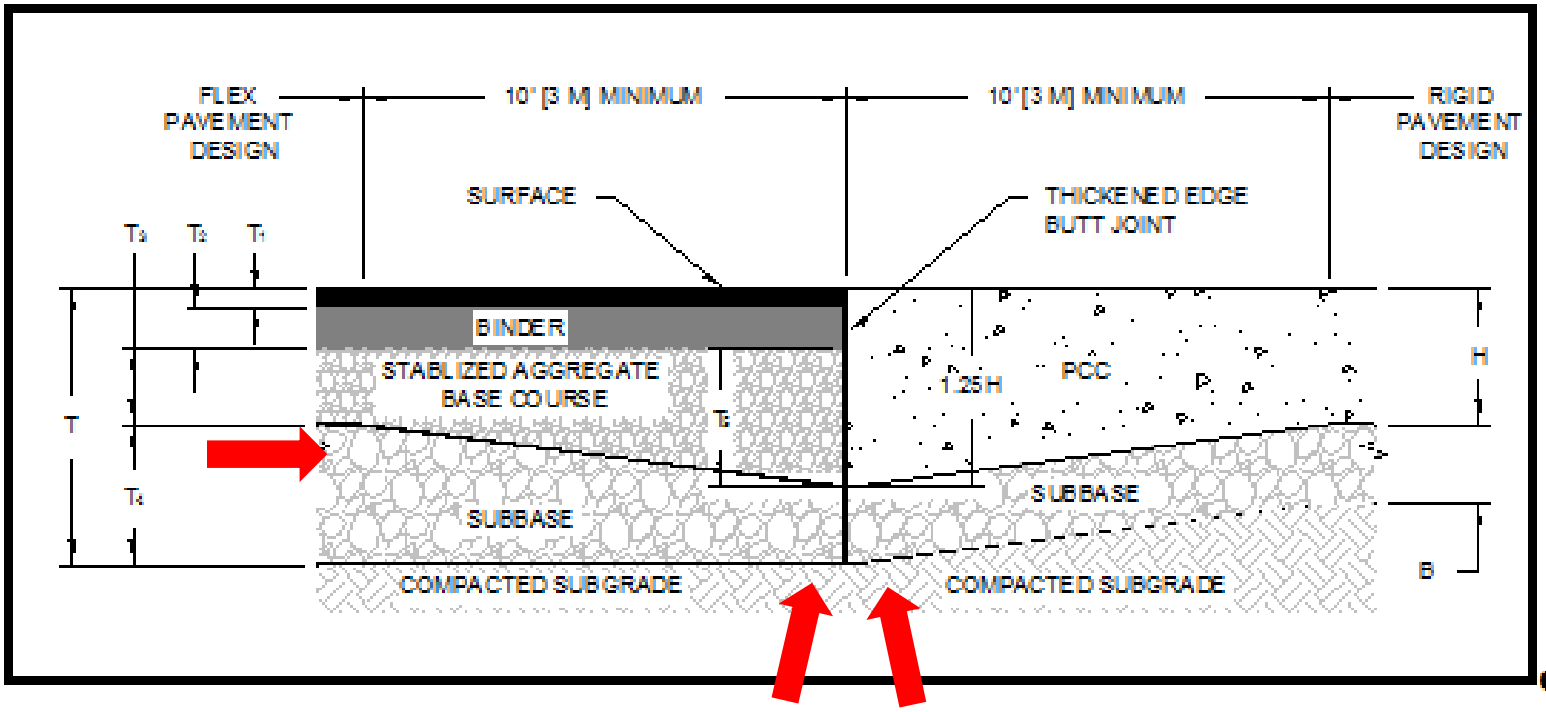


DETAIL 2 - PREFORMED SEAL

Note: Preformend Neoprene seals jet fuel resistant

Typical Details (new)

Figure 3–18. Transition between PCC and HMA Pavement Sections



Note: Not shown, but good idea to seal joint between HMA and PCC

Passenger Loading Bridge

- **Solid Tires with very high contact pressure**
- **Loads on bridges significant**
- **Consider rigid pavement where bridge operates**

3.18 → **Passenger Loading Bridge.**¶

Design of the passenger loading bridge operating area is separate from the design of the adjacent aircraft apron. Loads of passenger loading bridges range from 40,000 – 100,000 pounds supported on two solid tires resulting in loads ranging from 600-700 psi per tire. Due to the large range of potential loads verify the actual loads and contact tire pressure with the manufacturer of the passenger loading bridge. The FAA recommends rigid pavement be used where the passenger loading bridge will operate. Drainage structures and fuel hydrants should not be located in the jet bridge operation area. The design of the adjacent aircraft parking apron should only consider the aircraft and any equipment that will use the apron and not the load of the passenger loading bridge.

Overlay Design

- **Reason for Rehabilitation**
  - Why is pavement ready for rehabilitation
  - Structural, material distress, other
- **Start with condition assessment**
  - Complete assessment of pavement materials and structural integrity
  - Thickness, condition, nature and strength of each layer
- **Design must correct reason for rehabilitation**

Overlay Design

- **FAARFIELD overlay design**
  - Layered Elastic and finite element analysis
- **Four types of overlay**
  - HMA overlay of flexible or rigid
  - PCC overlay of existing flexible or rigid
- **Structural Overlay**
  - Minimum 3”
  - Thicker overlays better long term performance
- **Non-Structural Overlay**
  - Minimum 2”

Pavement Design for Shoulders

- **Paved shoulders**
  - Required for Aircraft Group IV and higher
  - Recommended Aircraft Group III
- **Stabilized Shoulders**
  - Recommended Aircraft Group I & II
  - (Turf, aggregate-turf, soil cement, lime or bituminous stabilized soil)
- **Most Demanding of**
  - 15 Passes of most demanding airplane or anticipated traffic from maintenance vehicles

Pavement Design for Shoulders

Table 6-1. Minimum Shoulder Pavement Layer Thickness

Layer Type	FAA Specification Item	Minimum Thickness, in (mm)
HMA Surface	P-401, P-403	4.0 (100)
PCC Surface	P-501	6.0 (150)
Aggregate Base Course	P-209, P-208,	6.0 (150)1
Subbase (if needed)	P-154	4.0 (100)

Note:

1. Minimum thickness of aggregate base

Overview AC 150/5370-10G Standards for Specifying Construction of Airports

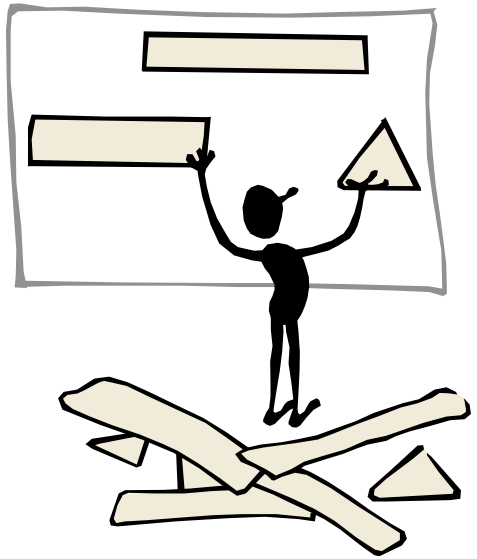
Construction Quality Control and Acceptance Testing

Update to 10H

FAA AC 150/5370-10G OVERVIEW

Deleted "Notice to Users" - moved information to the title page under "Developing Project Specifications" & "Changes, additions and deletions to the FAA Standard Specifications"

- **"How-To" use this AC**
- **Brackets designate where a choice must be made**
- **AC Engineer Notes (shown between lines of asterisks)**
- **Modifications per Order 5300.1**
  - **Update in 2017**



FAA AC 150/5370-10G PRINCIPAL CHANGES

New Sections/Items

- 90-10 Construction Warranty and
- 90-11 Project Closeout
- Section 105, Mobilization
- Item P601, Fuel Resistant Hot Mix Asphalt (HMA) Pavement
- Item P608, Emulsified Asphalt Seal Coat
- Item P629, Thermoplastic Coal Tar Emulsion Surface Treatment
- Item F 164, Wildlife Exclusion Fence

FAA AC 150/5370-10G PRINCIPAL CHANGES

Deleted Sections/Items:

- Section 120 Nuclear Gauges
- Item P402, Porous Friction Course
- Item T907, Tiling
- Item L-102 Hazard Beacons

Significant Changes in Many ‘P’ Specs

AC 150/5370-10G, Section 100 Contractor Quality Control Program

The intent of this section is to encourage the Contractor to establish a level of control that will:

- Provide for the production of acceptable quality materials.
- Allow the Contractor as much latitude as possible to develop their own standard of control.
- Provide assurance to the Engineer that specification requirements can be met.

Contractor Quality Control Program

Contractor Quality Control

- Program not same as Construction Management Program (CMP) required by Grant Special Conditions
- Major Projects require on site QC Manager

Paving projects Preconstruction Workshop

- Required when >$500K
- Engineer, Contractor, Subs, Testing laboratories, Owner
- QC/QA Requirements of Specification
- Acceptance Testing By Engineer

Contractor Quality Control Program

100-01

"The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer."

- **Responsibility of Contractor**
- **Contractor controls processes, making corrections to assure meeting spec's**

Contractor Quality Control Program

Separate Quality Control Organization

- Full time Administrator with authority to carry out all actions necessary to ensure compliance with Plans and technical specifications.
- QC Technicians (may be contract) w/appropriate NICET or State Certification

Contractor Quality Control Program

Components Required as Part of the QC Program

- Description Of Program
- Quality Control Organization
- Project Progress Schedule
- Submittals Schedule
- Quality Control Testing and Inspection Plan
- Documentation of QC
  (daily; test & Inspection reports)
- Corrective Action Requirements

Contractor Quality Control Program

- **Quality Control Program**
  - Plant production
  - Field placement
  - Contractor controls processes, making corrections to assure meeting spec's
- **Statistical quality control measures (run charts and range charts)**

Contractor Quality Control, i.e. P401-6.1

These items specifically noted - may be more:

- Mix Design
- Aggregate Grading
- Quality of Materials
- Stockpile Management
- Proportioning
- Mixing & Transportation
- Placing and finishing
- Joints
- Compaction
- Smoothness
- Personnel
- Laydown Plan

Contractor can always do more

Contractor Quality Control, i.e. P401

- **Quality Control Testing** ← **P401-6.3**
  - Asphalt Content
  - Gradation
  - Moisture of aggregate
  - Moisture of HMA
  - Temperatures
  - Density Monitoring

P401-6.5 ↓

- **Control Charts**
  Action & Suspension Limits
  - Gradation
  - Asphalt Content
  - VMA

AC 150/5370-10G, Section 110 Method of Estimating Percentage of Material within Specification Limits (PWL)

FAA Acceptable Quality

- Item P-401 assumes process control parameters that are “not unreasonable” for mat density, air voids, and joint density.
- All acceptance criteria is based on processes with variation in quality conforming to a normal “bell” curve.
- Each day’s production is evaluated and pay is based on daily evaluation of 4 random samples and possible retest sampling.

Item P152
Excavation Subgrade and Embankment

Proof Rolling

- **After compaction is completed**
- **In the presence of the Engineer**
- **Note - The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade**

12’ Straight Edge

- **Note - for consistency all straight edge testing in specification went to 12’ straight edge**
  - Note that in 5370-10F we had 10’, 12’ and 16
  - Now all specifications use 12’

Subgrade Compaction

- **ASTM D 698 & D1557 apply when 70% of material passes ¾” sieve**

the laboratory, that is, do not reuse compacted soil.

1.2.1 For relationships between unit weights and molding water contents of soils with 30 % or less by mass of material retained on the ¾-in. (19.0-mm) sieve to unit weights and molding water contents of the fraction passing ¾-in. (19.0-mm) sieve, see Practice D4718.

1.3 Three alternative methods are provided. The method

Subgrade Compaction

- **DOTs sometimes call “too rocky to test”**

5.3.1 *Oversize Fraction*—Soils containing more than 30 % oversize fraction (material retained on the 3⁄4-in. (19-mm) sieve) are a problem. For such soils, there is no ASTM test method to control their compaction and very few laboratories are equipped to determine the laboratory maximum unit weight (density) of such soils (USDI Bureau of Reclamation, Denver, CO and U.S. Army Corps of Engineers, Vicksburg, MS). Although Test Methods D4914 and D5030 determine the “field” dry unit weight of such soils, they are difficult and expensive to perform.

Subgrade Compaction

5.3.1.1 One method to design and control the compaction of such soils is to use a test fill to determine the required degree of compaction and the method to obtain that compaction, followed by use of a method specification to control the compaction. Components of a method specification typically contain the type and size of compaction equipment to be used, the lift thickness, acceptable range in molding water content, and the number of passes.

NOTE 3—Success in executing the compaction control of an earthwork project, especially when a method specification is used, is highly dependent upon the quality and experience of the contractor and inspector.

Subgrade Compaction

- Type
- Size (Weight)
- Lift Thickness
- Moisture Content
- Number of Passes to achieve maximum density (without breakdown of material)
- Challenge is requires constant monitoring by both QC and QA

P208 Aggregate Base Course & P209 Crushed Aggregate Base

Clarified "aggregate base" and "crushed aggregate base" & quality requirements for both:

	P208	P209
ASTM C131	50	45
Sulfate Soundness	12% / 18%	12% / 18%
Fractured Faces	60%/2, 75%/1	90%/2, 100%/1
Flat and Elongated	15% 1:3	15% 1:3

& Clarified Fractured Faces and Flat and Elongated aggregate

P208 Aggregate Base Course & P209 Crushed Aggregate Base (also in 210, 211, 212, 213, 219)

- Added option for whose laboratory will do QA for density
- 12’ straight edge
- Added Grade check; Want to be checking grade as pavement section is built so no surprises on surface
- Job Control Grading Band relative to Contractor Gradation
- Remember: we only pay for ‘accepted’ material (gradation, thickness, grade, density (moisture & density))

P304 Cement Treated Base Course
P306 Lean Concrete Base Course

Now Similar strength requirements

- P-304 Lowered 7-day compressive strength requirements to 400 psi min and 800 psi max; added 28-day strength not to exceed 1000 psi.

Use with caution!

- **Potential for reflective cracking,**
- **Need to saw control joints, within 6” of joints in PCC if strength > 500 psi**
- **Bond breaker**

P400's Hot Mix Asphalt (HMA)

Option for Marshall & Gyratory Mix Design

- Engineer needs to select one, edit specification paragraphs
- EB59A is Cancelled and not to be used
- Aggregate gradation requirements same for either

Aggregate Requirements

- Note to check for Ferrous Sulfides & Iron Oxides
- **NOT** a highway / state DOT gradation!
- No gradation changes – but . . .
  - Gradation – not Maximum or Nominal
  - FAA Gradation 1, 2, and 3
  - Aggregate size should be no greater than ¼ the lift thickness to be constructed

P401-3.2 & P403-3.2

- P401-3.2 "…The aggregate size should be no greater than ¼ the lift thickness to be constructed…"

****

The aggregate gradation shall be specified by the Engineer from the gradations shown in this note. The gradation shall be inserted into Table 3. Asterisks denote insert points. The aggregate size should be no greater than 1/4 the lift thickness to be constructed.

Where locally-available aggregates cannot be economically blended to meet the grading requirements of the gradations shown, the gradations may be modified to

fit the characteristics of such local aggregates with approval of the FAA. The modified gradation must produce a paving mixture that satisfies the mix design requirements.

P401-3.2 & P403-3.2

- FAA HQ Guidance to field Jan 20, 2016
- Structural Thickness of HMA needed may not equal lift thickness to be constructed.
- HMA with modified binders and angular aggregates + less natural sand may require thicker lifts
- P401 recommends aggregate size be no greater than ¼ the lift thickness to be constructed
- Minimum lift thickness = 4 x largest aggregate

P401-3.2 & P403-3.2

Minimum lift thickness = 4 x largest aggregate

- Largest aggregate = largest actual aggregate piece
- Generally use 4 x nMAS
  - Nominal Maximum Aggregate Size
  - One size larger than first sieve to retain more than 10%
- Minimum Recommended Lift Thickness
  - FAA Gradation 1 – 3 inches
  - FAA Gradation 2 – 2 inches
  - FAA Gradation 3 – 1 ½ inches

P401-3.2 & P403-3.2

Keep lift thickness between 3 x and 6 x largest aggregate

See

NCAT NCHRP Report 531

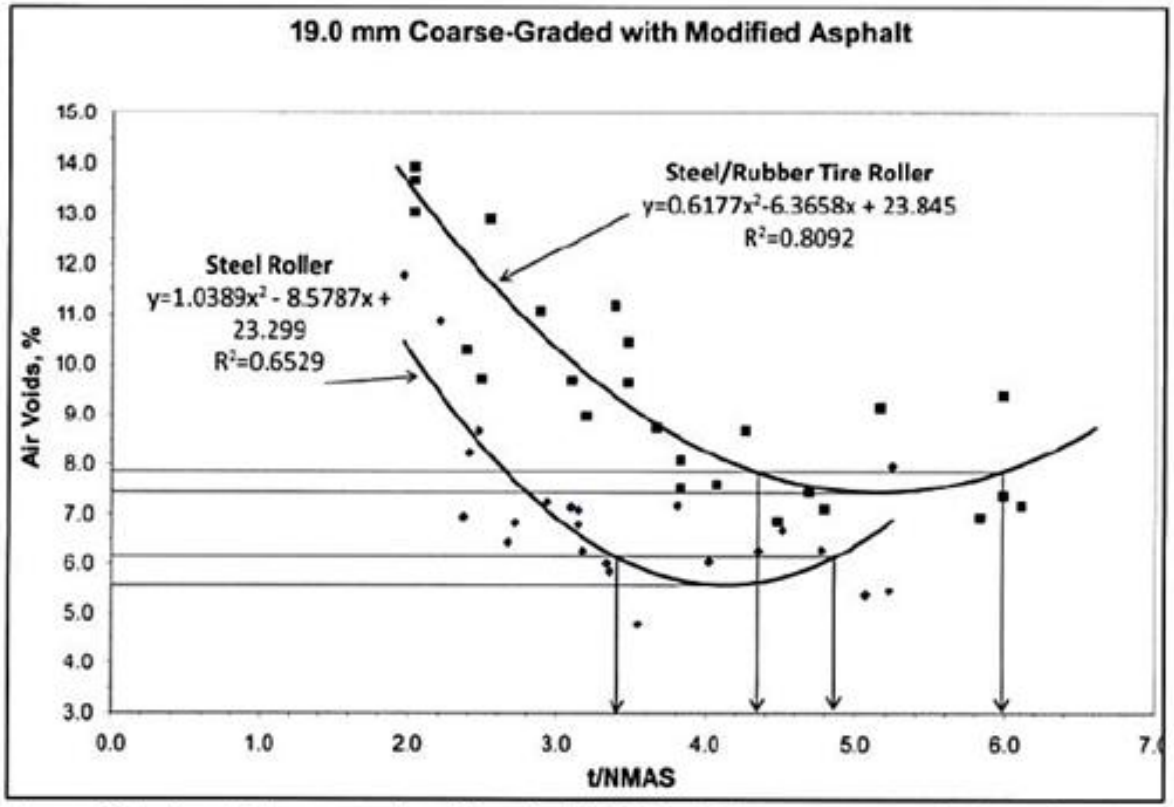


Figure 1 Relationship between air voids and t/NMAS for 19.0 mm coarse-graded mix, showing optimum t/NMAS ranges.

P401-3.2 & P403-3.2

Example Cases

New Construction:

FAARFIELD gives the structural pavement thickness needed to support the Aircraft Traffic. For new construction it is up to the designer to designate what gradation to use based upon materials available.

For example if the pavement design requires: 4" P401 / 5" P403 / 12" P209;

If using Gradation 1	P209 placed in 2 lifts of 6", P403 in one lift of 5", P401 placed in 1 lift of 4"
If using Gradation 2	P209 in 2 lifts of 6", P403 in 2 lifts of 2 ½", P401 in 1 lift of 4" or 2 lifts of 2"
If using Gradation 3	Cannot use Gradation 3

P401-3.2 & P403-3.2

For example consider an existing pavement structure that consists of: 3" P401 / 5" P403 / 12" P209 Some of the options for rehabilitation of wearing surface may include:

Option 1 (assuming P401 in good condition)
Mill 1"existing P401, Overlay with 2" of P401 Gradation 2

Option 2 (assuming P401 in fair condition)
Mill 3" of existing P401, Overlay with 3" P401 Gradation 1

Option 3a (assuming P401 in fair condition and need to correct profile)
Mill 4" of existing P401/P403, Overlay with 2 -2" lifts of P401 Gradation 2

Option 3b (assuming P401 in fair condition and need to correct profile)
Profile mill 4" of existing P401/P403, Overlay with 1 lift of P401 Gradation 1

Bottom Line: When choosing which gradation to use FAA HQ AAS100 recommends keeping construction lift thickness to at least 4 x nMAS.

Standards vs Specifications

- State Standards for Airport Pavements
  - Standards developed **by state** for use at any non primary airport within state
  - Once developed and approved for use, may be used at non primary airports within the state

- Standard Specifications for Highway Pavement
  - With appropriate clarifications may follow state highway specifications for materials, construction and acceptance
  - Incorporation of materials meeting state specifications for an individual project

Standards vs Specifications

- Have been permitted for < 60,000 since 1976
  (first under ADAP, continued with AIP, expanded when NP Entitlement emerged)
- Incorporation of State Specifications for Pavements requires more than just saying 'use state specs'
- Use requires Specification developed in accordance with AC 150/5100-13
- State Specifications are set up with State DOT being owner and contracting officer
- When used on airport need State Highway Specifications need to be modified to reflect that work is on and for airport

AC 150/5100-13B
Development of Standards for Nonprimary Airports

- **Airport Pavements and Highway Pavements**
- Highway:
  - DOT owns and maintains
  - Channelized High Volume
  - Structural failure
  - FOD not a major issue
- Airport:
  - Individually owned and maintained
  - High Wheel and Gross Loading
  - Environment & Climate may be major distress
  - FOD major issue

AC 150/5100-13B
Development of Standards for Nonprimary Airports

- Materials
  - Specify which materials to use,
  - e.g. Stone & Gravel or Crushed Aggregate
- Composition
  - Mix or gradation to be used; JMF requirements; # gyrations
    Airport loads different so typically need to adjust requirements
- Construction
  - Clarify differences, e.g mat density, joint density
  - Rare for highway specifications to check joint density on the joint.
  - With HMA pavements raveling joints common FOD creator

P400's Hot Mix Asphalt (HMA) Testing Laboratory

Job Mix Formula (JMF) Laboratory

Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D 3666.

Laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation.

A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction

Acceptance Sampling and Testing

Laboratory requirements - Same as above

P501 Portland Cement Concrete Aggregate and Gradation

Reactivity Tests

- **Expansion < 0.10% @ 28 days @ ASTM C1260**
  - Considered Innocuous (> 0.10 deleterious/potentially del.)
- **Combined < 0.10% @ 28 days @ ASTM C1567**
  - Basis for acceptance
  - If Lithium nitrate follow Corps of Engineers CRD 662

Fine Aggregate Requirements

- **ASTM C33 and FM 2.5 to 3.4**
- **Soundness (ASTM C88)**
- **Deleterious Limits in Table**

P501 Portland Cement Concrete Aggregate and Gradation

Coarse Aggregate Requirements

- *Should* be free of ferrous sulfides, such as pyrite
- Percent Wear (ASTM C131)
- Flat, elongated, and flat and elongated particles (D4791)
- Soundness (ASTM C88)
- Deleterious Limits in Table. Tighter than -10F but still may not be tight enough if in an area with know problems
- In areas affected by Durability Cracking (D-cracking), the Engineer *should* add ASTM C 666 to the list of testing requirements.

P501 Portland Cement Concrete Aggregate and Gradation

Conform to ASTM C33 for Fine Aggregate &
501-2.1 Table 1. Gradations for Coarse Aggregate

Combined Aggregate Gradation
(May substitute only when approved by the Engineer)

- ✓ Define what must be submitted for ‘optimized’ mix
- ✓ Coarseness Factor (CF): cumulative % retained on 3/8 / cumulative % retained on sieve no 8
- ✓ Workability Factor (WF): % passing No 8
- ✓ CF and WF Plotted on Diagram (within parallelogram)

P501 Portland Cement Concrete Testing Laboratory

Concrete Mix Design Laboratory

Contractor's laboratory used to develop the Concrete Mix Design shall be accredited in accordance with ASTM C 1077.

Laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the Concrete Mix Design must be listed on the lab accreditation.

A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction

Acceptance Sampling and Testing

Laboratory requirements - Same as above

Item P-601, Fuel Resistant Hot Mix Asphalt (HMA) Pavement

Purpose: **Provide a fuel-resistant surface where pavements are subjected to fuel spills.**

Use: **This mix is to be used only as a surface course.**

What: **Minimum coarse thickness 1 inch (25mm)**
Maximum coarse thickness 2 inches (50 mm)

PG 82-22 w/85% min Elastic Recovery at 25°C and fuel resistance requirements in Table 1

Marshall Mix

50 blow 2150 Stability 2.5% $\pm$ 0.2% Air Voids 14% VMA

Weight Loss by Fuel Immersion: 2.5 maximum

Tensile Strength Ratio (TSR): 80 minimum

Item P-608 Emulsified Asphalt Seal Coat

Emulsified Asphalt surface treatments for:

- Taxiways and Runways w/application of a suitable aggregate to maintain adequate surface friction
- Airfield Secondary and Tertiary Pavements including low-speed taxiways, shoulders, overruns, roads, parking areas, and other general applications with or without aggregate applied
- New Asphalt Pavement and pavements in fair or better condition as defined in ASTM D 5340 or AC 150/5320-17

Item P-608 Emulsified Asphalt Seal Coat

Emulsified asphalt surface treatment composed of:

- An emulsion of natural* and refined asphalt materials,
- Water, and if specified,
- A polymer additive.

For taxiways and runways, aggregate shall be:

- Dry, clean, dust and dirt free,
- Sound, durable, angular shaped manufactured specialty sand (such as that used as an abrasive),
- A Mohs hardness of 6 to 8,
- A specified percent retained gradation

***The asphalt material base residue shall contain not less than 20% gilsonite, or uintaite and shall not contain any tall oil pitch or coal tar material.**

Item P-629 Thermoplastic Coal Tar Emulsion Surface Treatments

Item P-629 is based on and replaces EB35A (1994)

Composition and Application

- Thermoplastic Coal Tar Emulsion Micro-Surfacing
- Thermoplastic Coal Tar Emulsion Sand Slurry Seal
- Spray Seal with [without] Sand Aggregate

For use on general aviation airports serving small airplanes 12,500 lb or less (Note: The Engineer, with FAA approval, may specify this item for airports serving airplanes 60,000 lbs. or less)

Thermoplastic coal tar spray seal treatments may be used on

- Airfield Secondary and Tertiary Pavements
- Taxiways and Runways w/application of a suitable aggregate to maintain adequate surface friction

FAA AC 150/5370-10
Testing Laboratory
(Presentation reviews for HMA; similar for PCC)

401-3. & 403-3.4: Job Mix Formula (JMF) Laboratory

401-5.1 & 403-5.1: Acceptance Sampling and Testing

401-6.2 & 403-6.2: Contractor testing laboratory

- History leading to where we are today
  (Job Mix Formula (JMF) Laboratory)
- Clarify “Shall be Accredited” vs. “Shall Meet Requirements”

P-401 History of Testing Laboratory Laboratory to Develop JMF

5370-10G Jul 2014

401-3.2 Job mix formula (JMF). No hot-mixed asphalt (HMA) for payment shall be produced until a JMF has been approved in writing by the Engineer. The asphalt mix-design and JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.4. The HMA shall be designed using procedures contained in [ ].

401-3.4 Job mix formula (JMF) laboratory. The Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

FAA AC 150/5370-10
History of Testing Laboratory

5370-10A Feb 1989 / Jan 1991

401-3.5 TESTING LABORATORY. The laboratory used to develop the job mix formula shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements shall be submitted to the Engineer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program

FAA AC 150/5370-10
History of Testing Laboratory

5370-10B April 2005

401-3.5 TESTING LABORATORY. The Contractor's laboratory used to develop the job mix formula shall meet the requirements of ASTM D 3666 including the requirement to be accredited by a national authority such as the National Voluntary Laboratory Accreditation Program (NVLAP), the American Association for Laboratory Accreditation (AALA), or AASHTO Accreditation Program (AAP). Laboratory personnel shall meet the requirements of Section 100 of the General Provisions. A certification signed by the manager of the laboratory stating that it meets these requirements shall be submitted to the Engineer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program

e. ASTM D 3666 certification of accreditation by a nationally recognized accreditation program

FAA AC 150/5370-10
History of Testing Laboratory

5370-10C, 10D, 10E Sep 2007, 2008, 2009

401-3.5 TESTING LABORATORY. The Contractor's laboratory used to develop the job mix formula shall meet the requirements of ASTM D 3666 including the requirement to be accredited by a national authority such as the National Voluntary Laboratory Accreditation Program (NVLAP), the American Association for Laboratory Accreditation (AALA), or AASHTO Accreditation Program (AAP). Laboratory personnel shall meet the requirements of Section 100 of the General Provisions. A certification signed by the manager of the laboratory stating that it meets these requirements shall be submitted to the Engineer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
b. A listing of equipment to be used in developing the job mix.
c. A copy of the laboratory's quality control system.
d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program
e. ASTM D 3666 certification of accreditation by a nationally recognized accreditation program

FAA AC 150/5370-10
History of Testing Laboratory

5370-10F Sep 2011

401-3.5 ~~TESTING~~ LABORATORY. The Contractor's laboratory used to develop the job mix formula shall meet the requirements of ASTM D 3666 ~~including the requirement to be accredited by a national authority such as the National Voluntary Laboratory Accreditation Program (NVLAP), the American Association for Laboratory Accreditation (AALA), or AASHTO Accreditation Program (AAP). Laboratory personnel shall meet the requirements of Section 100 of the General Provisions. A certification signed by the manager of the laboratory stating that it meets these requirements shall be submitted to the Engineer prior to the start of construction. The certification shall contain as a minimum:~~

~~a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.~~

~~b. A listing of equipment to be used in developing the job mix.~~

~~c. A copy of the laboratory's quality control system.~~

~~d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program~~

~~e. ASTM D 3666 certification of accreditation by a nationally recognized accreditation program~~

FAA AC 150/5370-10
History of Testing Laboratory

5370-10F Sep 2011

401-3.5 JOB MIX FORMULA (JMF) LABORATORY. The Contractor's laboratory used to develop the job mix formula shall meet the requirements of ASTM D 3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

5370-10G Jul 2014

401-3.4 Job mix formula (JMF) laboratory. The Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

P-401 Reference to Testing Laboratories Laboratory to Develop JMF

- **401-3.2 Job mix formula (JMF).** No hot-mixed asphalt (HMA) for payment shall be produced until a JMF has been approved in writing by the Engineer. The asphalt mix-design and JMF **shall be prepared by an accredited laboratory** that meets the requirements of paragraph 401-3.4. The HMA shall be designed using procedures contained in [ ].

- **401-3.4 Job mix formula (JMF) laboratory.** The Contractor's laboratory used to develop the JMF **shall be accredited** in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

P-401 Reference to Testing Laboratories Owners Quality Assurance Laboratory

- **401-5.1 Acceptance sampling and testing.** Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor except that coring [and profilograph testing] as required in this section shall be completed and paid for by the Contractor.

  Testing organizations performing these tests [except profilograph] **shall be accredited in accordance with ASTM D3666**. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction. All equipment in Contractor furnished laboratories shall be calibrated by an independent testing organization prior to the start of operations at the Contractor's expense.

P-401 Reference to Testing Laboratories Contractors Quality Control Laboratory

- 401-6.2 Contractor testing laboratory. The lab **shall meet the requirements** of ASTM D3666 including all necessary equipment, materials, and current reference standards to comply with the specifications.

P-401 Related Reference ~ Contractors Testing Facilities

- 401-4.2 HMA plant. b.)Testing facilities. The Contractor shall ensure laboratory facilities are provided at the plant for the use of the Engineer. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab **shall meet the requirements** of ASTM D3666 including all necessary equipment, materials, calibrations, current reference standards to comply with the specifications and a masonry saw with diamond blade for trimming pavement cores and samples.

Components of Accreditation

Three Basic Components to be accredited in accordance with D3666

Quality Management System (QMS)

On-Site Assessment

Proficiency Testing

- **QMS - evaluated for content and compliance within the lab during the On-Site Assessment**
- **On-Site Assessment (Inspection of Facilities)**
  - **Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.**
  - **Equipment Calibration, Standardization and Check Records**
  - **Evaluate/check/measure each piece of equipment for each test being accredited**
  - **Evaluate performance of test for each test being accredited**
- **Proficiency Testing - Review participation (i.e. AASHTO Materials Reference Laboratory (AMRL)**
  - **Response provided to any results not within acceptable Std Dev**

Accreditation granted - (once Acceptable Response on how each deficiency was corrected)

ASTM D 3666
National Authority Accreditation

- **AASHTO Accreditation Program (AASHTO R18)**
  - **AASHTO**

- **NACLA Recognized Accreditation 'Authorities'**
  - **CMEC** (AASHTO R18 and/or ISO/IEC 170250) Construction Materials Testing (CMET)
  - **ANAB** (ISO/IEC 170250) Construction Materials Testing (CMET)

NACLA - National Cooperation for Laboratory Accreditation
CMEC - Construction Materials Engineering Council
ANAB - ANSI-ASQ National Accreditation Board [Laboratory Accreditation Bureau (L-A-B)]

Others but Not National Authorities
National Voluntary Laboratory Accreditation Program (NVLAP)
American Association for Laboratory Accreditation (AALA) (*A2LA*)

How to go about it
For development of JMF

✈Get an accredited laboratory.

Laboratory technicians sample materials, bring back to Lab, develop JMF (Registered Engineer of Lab Signs)

Send materials and they develop JMF

~ Registered Engineer of Lab Signs and therefore responsible for sample being representative; JMF to note Not Sampled by Lab and/or material source identification indicated by others ~ or something similar. "Others" to be identified on the JMF.

~ Should only be considered if Contractor and Laboratory have worked successfully together

How to go about it
For Quality Assurance

- ✈ **Accredited laboratory uses mobile laboratory.**
- **Accredited Laboratory bring samples to own laboratory.**
- **Accredited laboratory verify testing equipment on Plant Laboratory and use equipment.**
  Current P401 allows this, but is not desirable; future P401 will not allow.

How to go about it
For Quality Control

- **Plant laboratory to have acceptable calibrated equipment per D3666.**
- **Plant laboratory to have a QC manual**
- **Test done by qualified plant technicians.**

Note: Some States “certify”/“Accredit” plants via National Voluntary Laboratory Accreditation Program (NVLAP). Acceptable for Contractor Quality Control.

Thank You

Questions / Discussion

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