# Recent Changes to FAA's AC 150/5370-10 Airfield Construction Specification


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# Airfield Pavement Challenges

**Airfields provide unique pavement challenges:**

**Heavier Loadings**
**can exceed 1M pounds**

**Higher Tire Pressures**
**can exceed 300 psi**
**(semi truck ≈ 100 psi)**

**Foreign Object**
**Debris (FOD)**
**higher serviceability**

# Airport Pavements in US

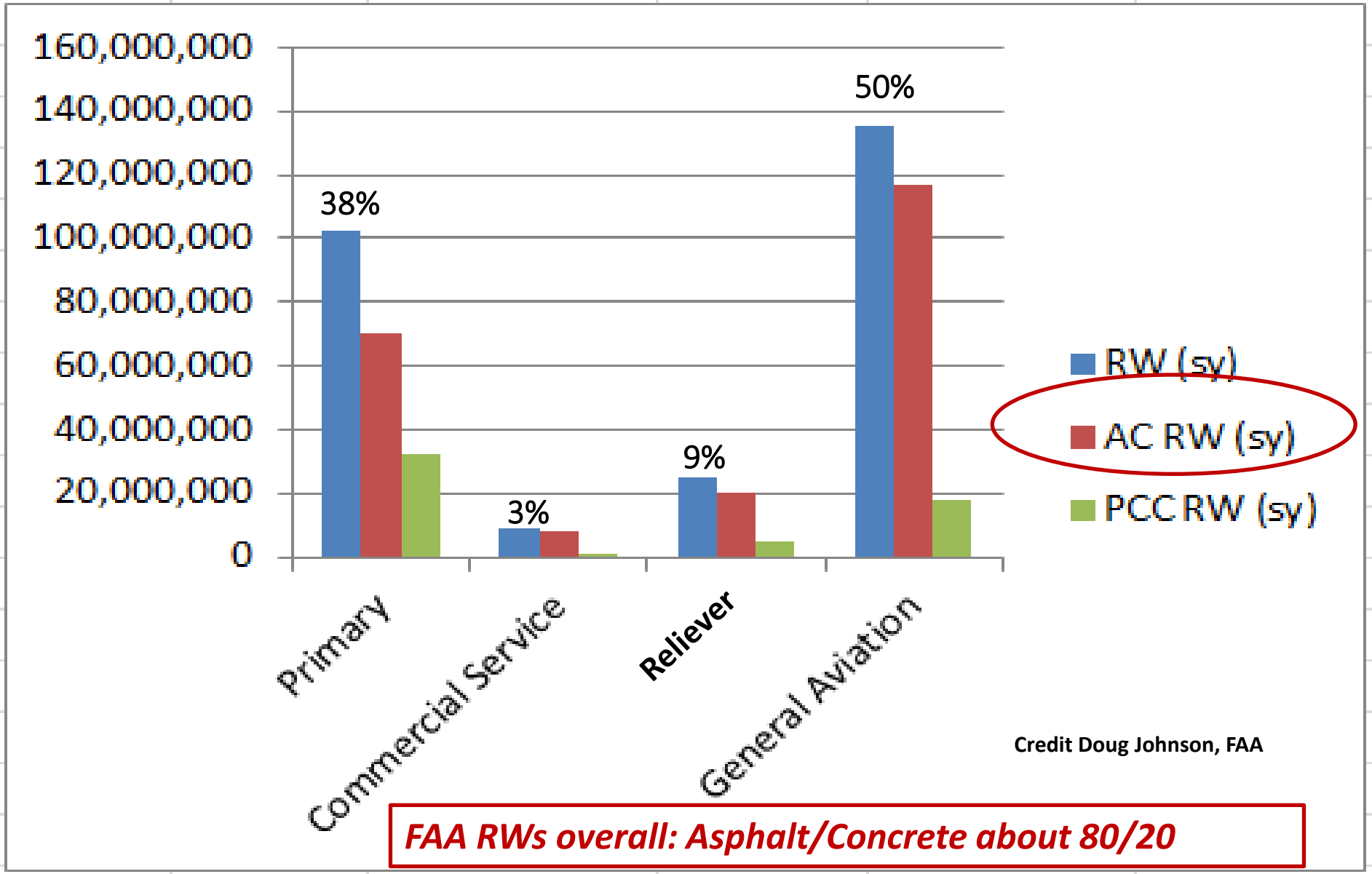
- Paved Areas

| | 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

***Compare Total U.S. Interstate Lane Miles:* 226,304**
FHWA Table HM-60 - Highway Statistics 2017

# Runway Surface in US, per FAA




Credit Doug Johnson, FAA

***FAA RWs overall: Asphalt/Concrete about 80/20***

# Overview: Principal -10H Changes

- Renamed/reorganized Parts/items, even title
- Updated references
- Extensive technical and editorial edits
- Added 6 new specs
- Provided enhanced guidance in Engineer Notes on use of individual specifications
- Clarified 5370-10H intended to be for airfield pavement & airfield development
- Formatted material properties (requirements) in tables
- Focused on Quality Control throughout

# Renamed/New Parts

| 10G | 10H | Title |
|---|---|---|
| Part 1 | Part 1 | General Contract Provisions |
| | Part 2 | ~~Earthwork~~ General Construction Items * |
| Part 2 | Part 3 | ~~Earthwork~~ Sitework |
| Part 3 | Part 4 | ~~Flexible~~ Base Courses |
| Part 4 | Part 5 | ~~Rigid~~ Stabilized Base Courses |
| Part 5 | Part 6 | Flexible ~~Surface Courses~~ Pavements |
| Part 6 | Part 7 | Rigid Pavement |
| Part 7 | Part 8 | ~~Miscellaneous~~ Surface Treatments * |
| Part 7 | Part 9 | Miscellaneous |
| Part 8 | Part 10 | Fencing |
| Part 9 | Part 11 | Drainage |
| Part 10 | Part 12 | Turfing |
| Part 11 | Part 13 | Lighting Installation |

# Renamed and Moved Specifications

| 10G | 10H | Title |
|---|---|---|
| GP Section 100 | Part 2 – Gen Construct Items, C-100 | Contractor Quality Control Program (CQCP) |
| GP Section 105 | Part 2 – Gen Construct Items, C-105 | Mobilization |
| Part 2 - Earthwork, P-156 | Part 2 – Gen Construct Items, C-102 | Temporary Air and Water Pollution, Soil Erosion, and Siltation Control |
| Part 1 – GP Section 110 | Part 2 – Gen Construct Items, [ C-110 ] | [ Method of Estimating Percentage of Material Within Spec Limits (PWL) ] |
| Part 2 - Earthwork, P-101 | Part 3 – Site Work, P-101 | ~~Surface~~ Preparation/Removal of Existing Pavement |
| Part 2 - Earthwork, P-157 | Part 3 – Site Work, P-157 | ~~Cement Kiln Dust (CKD)~~ [ Cement ][ Lime ] Kiln Dust Treated Subgrade |
| Part 3 - Flexible Base Courses, P-217 | Part 4 - Base Courses, P-217 | Aggregate-Turf ~~Pavement~~ Runway/Taxiway |
| Part 4 - Rigid Base Courses, P-301 | Part 4 - Base Courses, P-220 | ~~Soil-~~Cement Treated Soil Base Course |
| Part 4 - Rigid Base Courses, P-304 | Part 5 – Stabilized Base Courses, P-304 | Cement-Treated Aggregate Base Course (CTB) |
| Part 5 - Flexible Surface Courses, P-401 | Part 6 – Flexible Pavements, P-401 | ~~Hot Mix Asphaltic (HMA)~~ Asphalt Mix Pavements |
| Part 7 - Miscellaneous, P-601 | Part 6 – Flexible Pavements, P-404 | Fuel-Resistant ~~Hot Mix (HMA)~~ Asphalt Mix Pavement |
| Part 6 - Rigid Pavement, P-501 | Part 7 – Rigid Pavement, P-501 | ~~Portland Cement Concrete (PCC)~~ Cement Concrete Pavement |
| Part 7 - Miscellaneous, P-609 | Part 8 – Surface Treatments, P-609 | ~~Bituminous Surface Treatments~~ Chip Seal Coat |
| Part 7 - Miscellaneous, P-602 | Part 9 – Miscellaneous, P-602 | ~~Bituminous~~ Emulsified Asphalt Prime Coat |
| Part 7 - Miscellaneous, P-603 | Part 9 – Miscellaneous, P-603 | ~~Bituminous~~ Emulsified Asphalt Tack Coat |
| Part - Miscellaneous, P-605 | Part 9 – Miscellaneous, P-605 | Joint Sealants for ~~Concrete~~ Pavements |
| Part 7 - Miscellaneous, P-610 | Part 9 – Miscellaneous, P-610 | ~~Structural Portland Cement~~ Concrete for Miscellaneous Structures |
| Part 7 – Miscellaneous, P-632 | Part 8 – Surface Treatments, P-632 | ~~Bituminous~~ Asphalt Pavement Rejuvenation |

# -10H Focuses on QC Throughout

- Improving & Embracing Contractor QC
- Establishing & Maintaining a “culture of quality”
- Clarifying QC and QA roles & responsibilities
- Understanding QA

# QC Emphasis:

**Item C-100 Contractor Quality Control Program (CQCP)**

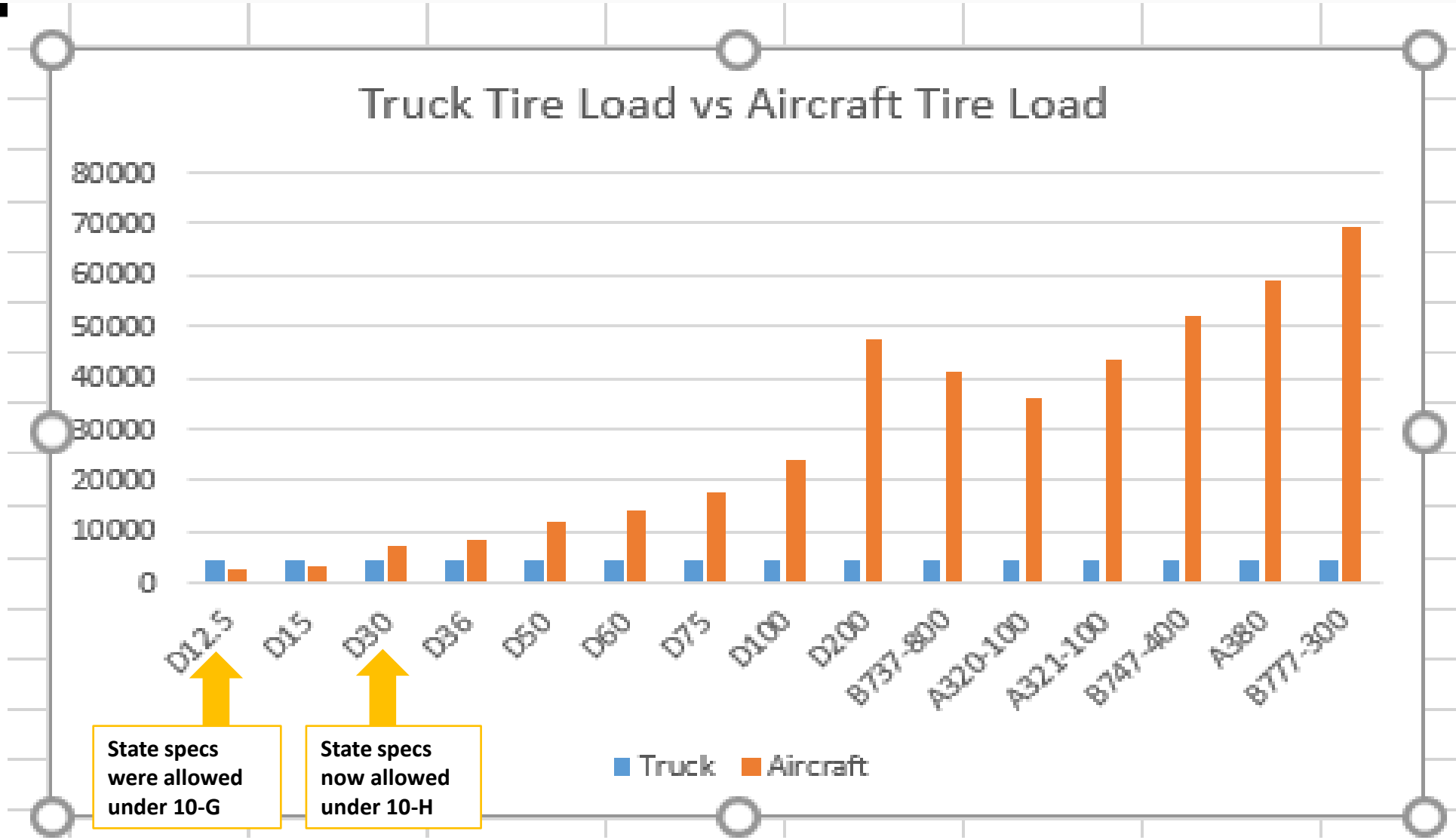
- Quality Control (QC)
  - Construction is a manufacturing process
  - Contractor is in control of materials and processes
- Encouraged for all projects
  - Required > $500K in paving
    - New Pay Item for CQCP
    - Assure continuous monitoring of quality materials and processes
    - Establish corrective action plans

# Specifications: FAA AC 5370-10H

**Section P-401**

- **Mandatory if federal funds involved**
- **10G allowed DOT specs below 12,500# aircraft**
- **10H recommends DOT specs below 30,000# aircraft**
  - **Difference between highway and airport**
    - **Wheel loads not significantly different**
- **Impacts a significant number of airports**
  - **~30% of NP have a rating less than 30,000#**

# Airport vs Highway





Credit Doug Johnson, FAA

# Significant Changes to P-401

- Adjusted gradation bands
- Improved minimum lift thickness guidance
- Tack coat is a separate pay item
- New guidance on PG grade selection
- New test requirements for mix design
- Compaction now % of TMD
- Greater use of state highway standards
- P-404 Jet Fuel Resistant mixtures

# Significant Changes to P-401

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**Table 2. Aggregate - Asphalt Pavements**

| Sieve | Gradation 1 | Gradation 2 | Gradation 3 |
|---|---|---|---|
| 1 inch | 100 | - - | - - |
| 3/4 inch | 90 - 100 | 100 | - - |
| 1/2 inch | 68 - 88 | 90 - 100 | 100 |
| 3/8 inch | 60 - 82 | 72 - 88 | 90 - 100 |
| No. 4 | 45 - 67 | 53 - 73 | 58 - 78 |
| No. 8 | 32 - 54 | 38 - 60 | 40 - 60 |
| No. 16 | 22 - 44 | 26 - 48 | 28 - 48 |
| No. 30 | 15 - 35 | 18 - 38 | 18 - 38 |
| No. 50 | 9 - 25 | 11 - 27 | 11 - 27 |
| No. 100 | 6 - 18 | 6 - 18 | 6 - 18 |
| No. 200 | 3 - 6 | 3 - 6 | 3 - 6 |

- 3 Gradations
- Matching Dept of Defense airfield specs

# Significant Changes to P-401

## Graduation Changes

**Table 2. Aggregate - Asphalt Pavements**

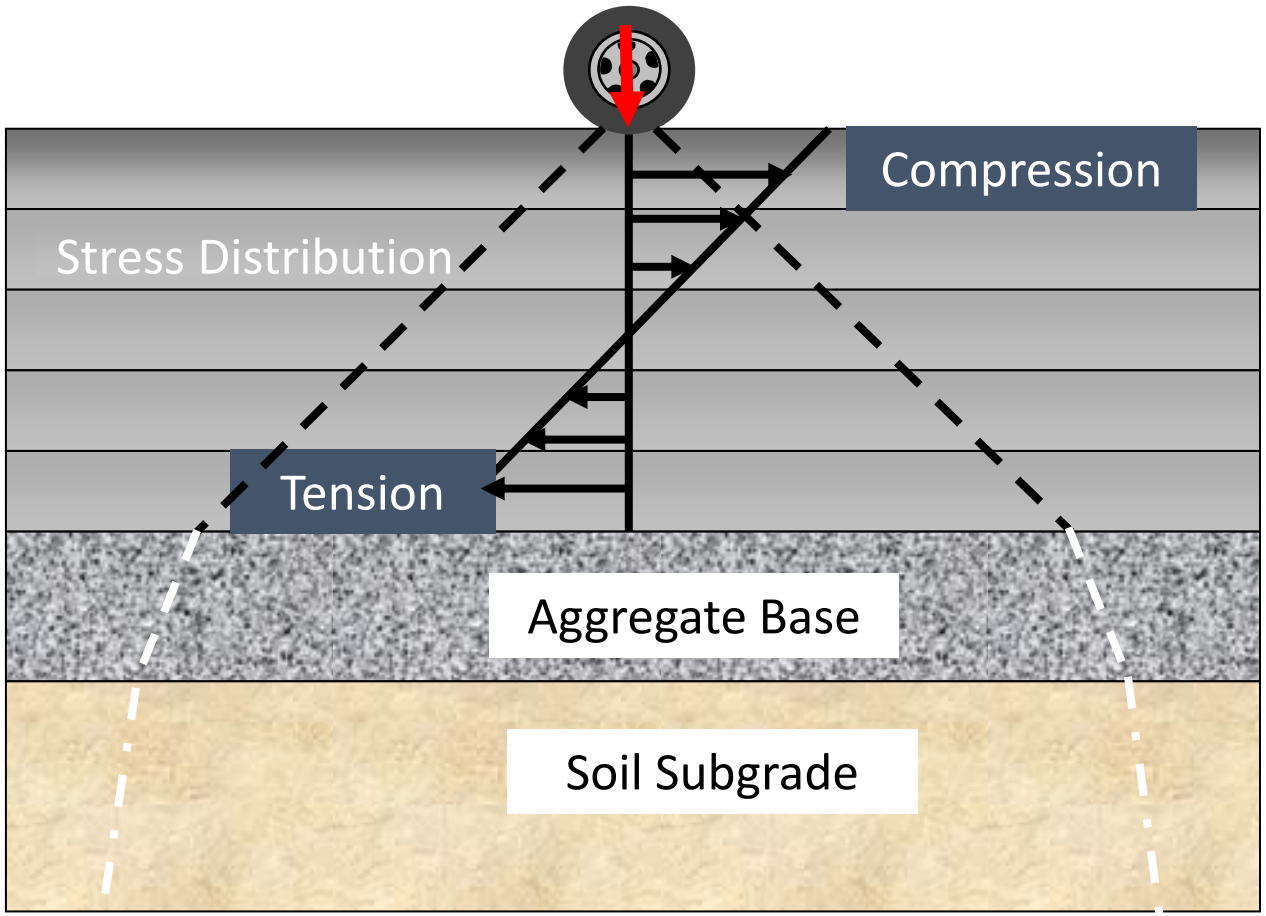
| | Gradation 1 | Gradation 2 | Gradation 3 |
|---|---|---|---|
| VMA | 14.0 | 15.0 | 16.0 |
| Asphalt percent by total weight of mixture: | | | |
| Stone or gravel | 4.5 - 7.0 | 5.0 - 7.5 | 5.5 - 8.0 |
| Slag | 5.0 - 7.5 | 6.5 - 9.5 | 7.0 - 10.5 |
| ***Recommended Minimum Lift Thickness*** | **3 inch** | **2 inch** | **1-1/2 inch** |

- **Lift thickness recommendations**

**Gradation 3 is intended for leveling courses**

# Significant Changes to P-401

- **Tack Coat is now a pay item**




# Significant Changes to P-401

**Asphalt binder shall conform to ASTM D6373 Performance Grade (PG)**

- **Essentially AASHTO M320 Performance Grade**

**Asphalt Binder PG Plus Test Requirements**

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

# Significant Changes to P-401

## Using the initial PG selected, apply the applicable grade bump

### Required Grade Bump

| Aircraft Gross Weight | High Temperature Adjustment to Asphalt binder Grade | |
|---|---|---|
| | All Pavement Types | Slow or stationary aircraft |
| ≤ 12,500 lbs | -- | 1 Grade |
| < 100,000 lbs | 1 Grade | 2 Grade |
| ≥ 100,000 lbs | 2 Grade | 3 Grade |

- Grade bump applies only to high temp, not low temp
- Low temp remains same as DOT's base grade for the location

# Significant Changes to P-401

## Grade adjustment for RAP

- No RAP for surface mixes, except on shoulders
- Max RAP content is 30%
- When using RAP:
  - For 0-20% RAP, no change in binder grade
  - For 20-30% RAP, one grade softer
    - Grade drop
      - A PG 64-22 would be adjusted to 58-28
  - RAP must not contain any coal tar sealers
  - No Recycled Asphalt Shingles (RAS)

# Significant Changes to P-401

## Graduation Changes

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| **VMA** | **14.0** | **15.0** | **16.0** |
| Asphalt percent by total weight of mixture: | | | |
| Stone or gravel | 4.5 - 7.0 | 5.0 - 7.5 | 5.5 - 8.0 |
| Slag | 5.0 - 7.5 | 6.5 - 9.5 | 7.0 - 10.5 |
| *Recommended Minimum Lift Thickness* | 3 inch | 2 inch | 1-1/2 inch |

- **VMA now included**

# Significant Changes to P-401

| Test Property | Value | Test Method |
|---|---|---|
| # of Blows or Gyrations | 75 | Marshall/ Gyrotory |
| Air voids (%) | 3.5 | ASTM D 3203 |
| Minimum VMA (%) | See Table 2 | ASTM D 6995 |
| Tensile Strength Ratio (TSR)[1] | 80+ at a saturation of 70-80% | ASTM D 4867 |
| Asphalt Pavement Analyzer (APA)[2] | Less than 10 mm @ 4000 passes | AASHTO T 340 at 250 psi hose pressure at 64°C |

[1] In areas subject to freeze-thaw, use freeze- thaw conditioning in lieu of moisture conditioning per ASTM D4867

[2] AASHTO T340 at 100 psi pressure at 64°C may be used, the requirement shall be less than 5 mm @ 8000 passes

- Hamburg wheel test criterion of less than 10mm rutting @ 20,000 passes

# Significant Changes to P-401

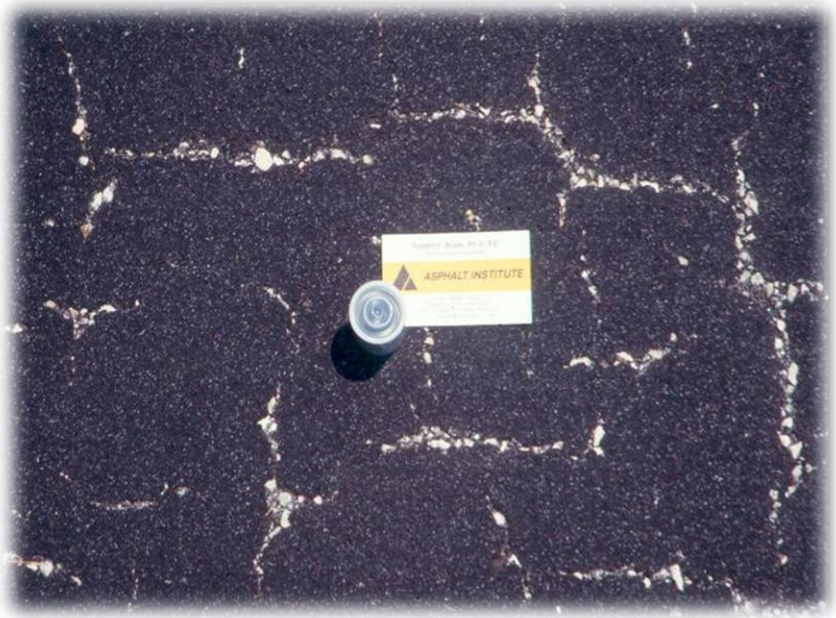
**Compaction standards:**

- **Targets % of Theoretical Maximum Density (TMD)**
  - **Previously % Lab Bulk Density**
  - **Matches DOT standards**

**If the PWL of the lot equals or exceeds 90%, the lot will be acceptable**

| Excerpt from Table 5. Acceptance Limits for Air Voids and Density | | |
|---|---|---|
| **Test Property** | **Tolerance Limits** | |
| | **L** | **U** |
| **Surface Course Mat Density (%)** | **92.8** | **-** |
| **Base Course Mat Density (%)** | **92.0** | **-** |

# Significant Changes included in 10H




- Coal tar sealers used to protect from fuel spills
- Different coefficient of expansion causes:
  - Alligator cracking within 2-3 years
- Cracking allows fuel penetration
  - Shortens service life
- Coal tar sealers fallen out of favor
  - Polyaromatic hydrocarbons
  - State and local EPA's limit use
  - Limits recyclability as RAP

# Fuel Resistant Asphalt Mixtures

## La Guardia Airport

- Placed Fuel-Resistant Mix on Taxiway GG  August 2002
- 2018 Excellent condition
  - No rutting
  - No cracking
  - No surface deterioration
- Pavement condition survey found Taxiway GG the only pavement at LaGuardia not rutted

# Fuel Resistant Asphalt Mixtures

## Boston Logan Airport

- Narrow alleyways
- De-icing is done at the gates
- Alleyway after 15 winters of exposure to de-icing chemicals
- 2020 - “It does not need replacing anytime soon”

# Fuel Resistant Asphalt Mixtures

## Partial List of projects:

- Boston, MA - Logan Airport
  - Alleyway Projects – 2005, 2006, 2007
- Charlotte, NC - Douglas International
  - Runway Project – 2006
- Portland, ME - Jetport Apron, 2015
- Fryeburg, ME – Eastern Slopes Airport
  - Apron, 2016
- BWI Marshall Airport – Freight Apron, 2016
- Burbank - Bob Hope Airport Apron, 2019
- Numerous GA airports in SE US

# Fuel Resistant Asphalt Mixtures

## FAA P-601 Specification

- FAA needing an alternative to coal tar sealers
- Issued Advisory Circular # 150/5370-10G
  - Dated July 21, 2014
- Basically adopted Boston Logan FR specification as:
  - Surface treatment
  - P-601 Fuel-Resistant Hot Mix Asphalt Pavement

# Fuel Resistant Asphalt Mixtures

## FAA P-404 Specification

- Advisory Circular-10H
- Renumbers:
  - P-601 Jet Fuel-Resistant Hot Mix Asphalt Pavement
  - P-404 Fuel-Resistant Asphalt Mix Pavement
    - Moved from surface treatment to structural mixture

# Fuel Resistant Asphalt Mixtures

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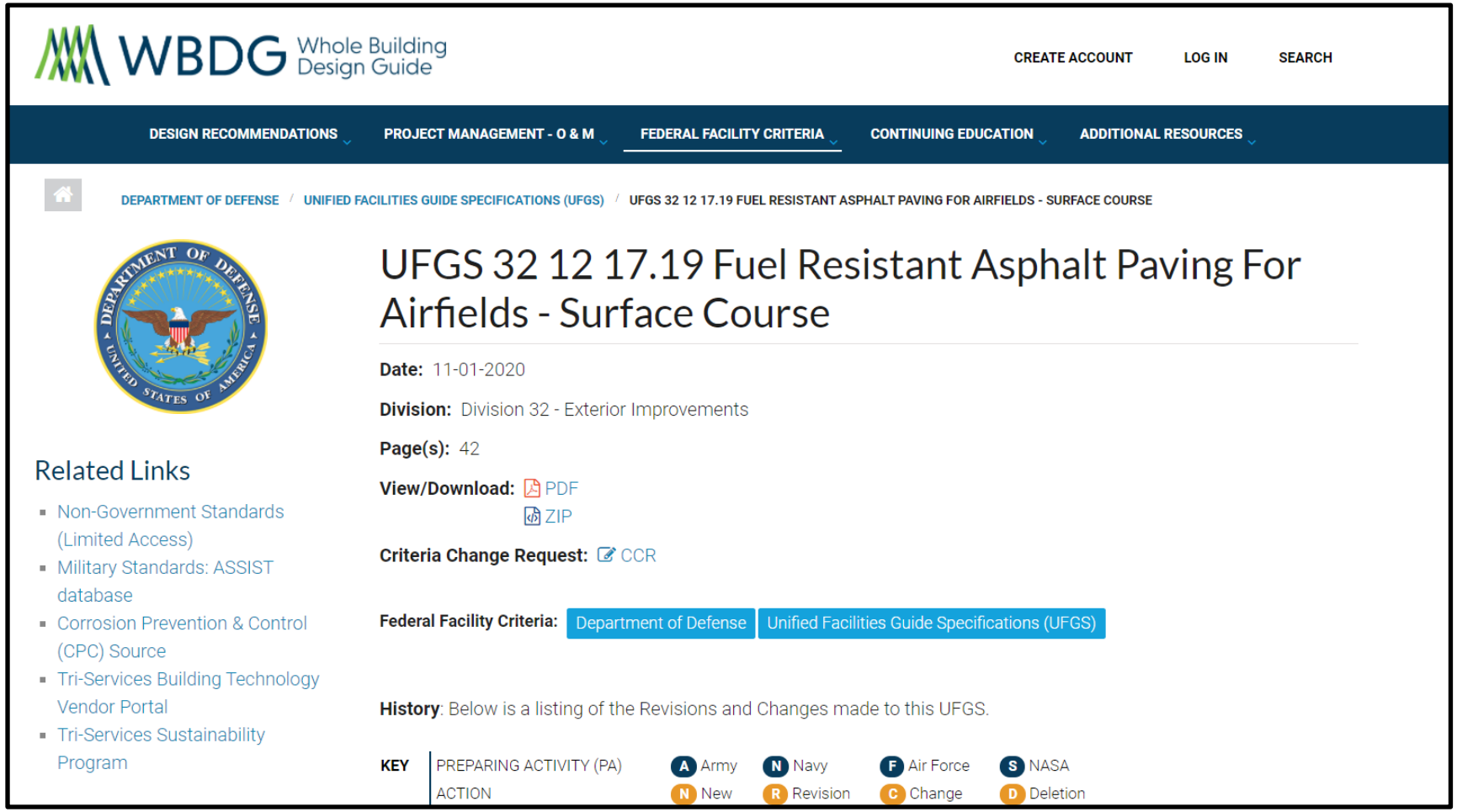
## UFGS 32 12 17.19 Fuel Resistant Asphalt Paving For Airfields - Surface Course

**Posted WBDG:**

- **November 1, 2020**



WBDG Whole Building Design Guide

CREATE ACCOUNT LOG IN SEARCH

DESIGN RECOMMENDATIONS | PROJECT MANAGEMENT - O & M | FEDERAL FACILITY CRITERIA | CONTINUING EDUCATION | ADDITIONAL RESOURCES

DEPARTMENT OF DEFENSE / UNIFIED FACILITIES GUIDE SPECIFICATIONS (UFGS) / UFGS 32 12 17.19 FUEL RESISTANT ASPHALT PAVING FOR AIRFIELDS - SURFACE COURSE

Related Links

- Non-Government Standards (Limited Access)
- Military Standards: ASSIST database
- Corrosion Prevention & Control (CPC) Source
- Tri-Services Building Technology Vendor Portal
- Tri-Services Sustainability Program

UFGS 32 12 17.19 Fuel Resistant Asphalt Paving For Airfields - Surface Course

**Date:** 11-01-2020

**Division:** Division 32 - Exterior Improvements

**Page(s):** 42

**View/Download:** PDF ZIP

**Criteria Change Request:** CCR

**Federal Facility Criteria:** Department of Defense | Unified Facilities Guide Specifications (UFGS)

**History**: Below is a listing of the Revisions and Changes made to this UFGS.

**KEY** | PREPARING ACTIVITY (PA) | A Army | N Navy | F Air Force | S NASA

ACTION | N New | R Revision | C Change | D Deletion

# Fuel Resistant Asphalt Mixtures

## Cost comparisons on FR Asphalt mixtures:

- Using known bid numbers
- P-404 mix costs approximately 25% more than regular P-401 mix
- Two factors contribute to increase
  - Two to three times more polymer
  - 1.0-1.5% more liquid asphalt in the mix

# Fuel Resistant Asphalt Mixtures

## Cost comparisons on FR Asphalt mixtures:

- P-404 cost increase affects only one item
- All other items are unaffected
  - Milling
  - Patching/prep
  - Base & intermediate layers
  - Striping
  - Electrical work
- Cost increase compared to total project (depending on scope) is typically 5-7%

# Fuel Resistant Asphalt Mixtures

## Benefits of FR Mix:

- Highly polymer-modified asphalt provides:
  - Outstanding rut resistance
  - Improved fatigue resistance
  - Resistance to fuel & oil damage – eliminates need for sealers
  - Excellent workability
  - Longer life
- Mix design has increased asphalt content, which provides:
  - Improved fatigue (cracking) resistance
  - Increased pavement life (durability)
- Combination provides resistance to all potential pavement distresses
  - Results in longer pavement life and lower life cycle cost

# Fuel Resistant Asphalt Mixtures

## Not just for airside anymore:


- Bus lanes for example:
  - Heavy, channelized
  - Slow-moving traffic
  - With oil and fuel leaks
  - Rutting may be an issue
- Logan Airport has used FR mix in bus lanes to solve the problem
- City bus stops with similar issues??

For more detailed information:

www.asphaltinstitute.org

APTW
The Asphalt Institute | Airport Pavement Technical Workshop

**October 2021**
**3 Days - 22 PDHs**

- Pavement design and evaluation taught by FAA
- Materials, mix design, construction
- Preservation and rehabilitation practices

APC
The Asphalt Institute | Airfield Paving Clinic
*focusing on P-401*

**1.5 days dates TBD**