ICAO/FAA Comprehensive Aerodrome Certification Inspector Workshop

Paved Areas: Standards and Maintenance Program

Presented To: Caribbean Aviation Professionals
By: FAA Office of Airports
Presentation outline

- Part 139 versus ICAO Doc 9157 Part 3
- Three types of pavement information
  - Pavement Classification Number (PCI)
  - Pavement Surface Evaluation (PASER)
  - Pavement Condition Index (PCI)
- Reporting condition to users
Pavement edges must not exceed 3” between

- Pavement and abutting areas
- Abutting pavement sections

Regulation requirements - 309.305(a)(1)
SECTION 139.305(a)(2)

Holes over 5” across may not

• Exceed 3” depth
• Slope 45° or more
Regulation requirements – 309.305(a)(3)

• Pavement must be free of cracks and surface variations that could impair air carrier aircraft directional control

• Any crack or surface deterioration that produces loose aggregate or other contaminants must be repaired immediately
Regulation requirements –309.305

- Airport Certification Manual
- **Maintenance and prompt repair**
  - (a)(1): Maximum 3 inches lips (edges)
  - (a)(2): No holes
  - (a)(3): Cracks and surface variation
  - (a)(4): Foreign Object Debris (FOD)
  - (a)(5): Chemicals
  - (a)(6): Drained, water accumulation
Pavement crack
Regulation requirements – 309.305(a)(4)

- Remove promptly and as completely as possible all
  - ✔ Mud
  - ✔ Dirt
  - ✔ Sand
  - ✔ Debris
  - ✔ Loose aggregate
  - ✔ Foreign objects
  - ✔ Rubber deposits
  - ✔ Other contaminants

- Does not apply to snow, ice, deicing materials (139.305(b))
RUBBER BUILDUP

Foreign Object Debris FOD
Regulation requirements – 309.305(a)(6)

◆ Pavement shall be sufficiently drained and free of depressions to prevent ponding that

✓ Obscures marking

✓ Impairs safe aircraft operations
Regulation requirements – 309.305(a)(5)

- Remove as soon as possible chemical solvents used to clean any movement area
- Does not apply to snow, ice, deicing materials (139.305(b))
Types of pavement

• Flexible pavement: transmit the load from granular contact. It is made of asphalt concrete surface.
• Rigid pavement: transmit the load like a beam, It is made of Portland Cement Concrete
Types of Pavement

• Pavement is the structure we build over a supporting surface (soil) to transmit the traffic load (aircraft). The load at the soil must be less than what the soil is capable to support.

• Pavement structure consist on a series of layer being the surface layer the highest quality and the bottom one the lowest quality
Pavement stages of life
Types of pavement

• Flexible = Asphalt
• Rigid = Portland cement
• Asphalt over concrete
• Concrete over asphalt (asphalt is basically a base course)
• Resurfacing (asphalt over asphalt)
• Thin layer (concrete)
Causes of pavement deterioration

- **Loading:** passages of loads (aircraft)
- **Climate:** pavement expansion and contraction due to temperature
- **Environment:** snow, rain etc.
- **Natural deterioration**
Pavement distresses

• Cracking
• Joint seal damage (rigid pavement)
• Distortion
• Disintegration
• Loss of skid resistance
Fatigue [Alligator] Cracking

- Possible Causes
  - Weak base/subgrade
  - Thin pavement
  - Poor Drainage
  - Overloading
- Bottom-up cracking
- Typically with Rutting

Block Cracking

Joint Reflective Cracking
Rutting

- In Subgrade/Base
  - Design Problem
  - Later Stages Will Develop Fatigue Cracking
- In the AC Layer
  - Plastic Flow—Material/Mix Design
  - Consolidation—Compaction

Shoving

Depression

Raveling/Weathering
Pavement Information reporting method - How to express the pavement condition

• PASER: National method to report comfort

• PCI: Pavement Condition Index – Standard method to report used pavement life

• PCN: Pavement Classification Number-ICAO method to report strength
Pavement Strength – Current Method and Pavement Classification Number

- Define the size and weight of aircraft that can operate on the runway without restrictions
- Current FAA methodology in 5010 elements
- ICAO method to report pavement loading capacity
- Where do airports report that number?
- Who use PCN: airlines/airport operators
The ACN-PCN System

• Aircraft Classification Number (ACN) is precisely specified as a standard by ICAO in Annex 14.

• Aircraft manufacturers are required to publish properly computed ACN values for all of their aircraft.
ACN/PCN Definitions

- **ACN**
  - “A number expressing the relative effect of an aircraft on a pavement for a specified standard subgrade strength.”

- **PCN**
  - “A number expressing the bearing strength of a pavement for unrestricted operations.”

- **Aerodrome Design Manual, Part 3 Pavements, Chapter 1**
ACN/PCN System - Limitations

- Only intended as a method for airport operators to evaluate acceptable operations of airplanes

- It provides a load, or damage rating relative to a specified reference load.

- ACN is not a pavement design procedure.
ACN/PCN System – Official ACN

• Official ACN values are provided by the Aircraft Manufacturer

• Airplane Characteristics for Airport Planning
ACN-PCN SYSTEM – PCN Values

• PCN values are reported in a coded format using 5 parts separated by “/”
• Sample 39/R/B/W/T

• Information includes:
  • Numerical PCN Value
  • Pavement Type
  • Subgrade Category
  • Allowable Tire pressure
  • Method used to determine the PCN value
ACN-PCN SYSTEM

39/R/B/W/T

PCN Numerical value

- PCN Numerical value is a relative indication of the load carrying capacity of a pavement in terms of a standard single wheel load 181 psi (1.25 MPa)
- PCN value derived from the ACN value of the most demanding airplane.
- PCN values can be determined in two ways
  - Using Aircraft
  - Technical Evaluation
ACN-PCN SYSTEM

Pavement Type

• Pavement may be either Rigid (R) or Flexible (F)
  – Rigid – Single Stiff Layer to support and distribute load
  – Flexible – Multiple flexible layers to distribute load
• Composite pavements (overlays etc.) are reported as the type which most accurately reflects the structural action
## ACN-PCN SYSTEM

### Allowable Tire Pressure

<table>
<thead>
<tr>
<th>Category</th>
<th>Code</th>
<th>Tire Pressure Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>W</td>
<td>No pressure limit</td>
</tr>
<tr>
<td>Medium</td>
<td>X</td>
<td>Pressure limited to 218 psi (1.5 MPa)</td>
</tr>
<tr>
<td>Low</td>
<td>Y</td>
<td>Pressure limited to 145 psi (1.00 MPa)</td>
</tr>
<tr>
<td>Very Low</td>
<td>Z</td>
<td>Pressure limited to 73 psi (0.50 MPa)</td>
</tr>
</tbody>
</table>

Recent request to ICAO have proposed modifying this table to increase allowable tire pressures.
ACN-PCN SYSTEM

Method used to determine PCN

PCN values can be determined in two ways

• **U** = Using Aircraft
  – Simply select highest ACN from all airplanes using facility

• **T** = Technical Evaluation
  – PCN based on technical study of pavement structure and traffic data.
• Pavement Program Management

• Airport Pavement Management Program (PMP)

• AC 150/5380-7B
  • Historic & current information
  • Surface & subsurface degradation/analysis
  • Scheduling & maintenance planning
Questions?