Cement Stabilization of Reclaimed Runway Pavement at the Tuscaloosa National Airport

Runway 4-22 Reconstruction at the Tuscaloosa National Airport
A presentation to the 65th Annual Alabama Transportation Conference
February 10, 2022

OUTLINE:
- Original Construction History
- Project Development and Justification
- Key Design Elements
- Surface Gradient
- Airport Operations / Phasing
- Pavement Design
- Construction Schedule

Runway 4-22 Reconstruction

Original Construction History
Construction, Resurfacing, and Maintenance Leading up to the Reconstruction Project

Runway Dimensions / Use
- 6,500-ft x 150-ft (15.4 lane miles)
- Runway Design Code C-II
- Forecasted to be C-III

Runway Design Code (RDC)
Existing and Projected Future Critical Aircraft

Runway 4-22
History
- Constructed in late 1960s
- Resurfacing #1 unknown
- Resurfacing #2 in 1995
- Crack Sealing in 2009
- 2018 Planned for Resurfacing #3...
- 2018 FAA Requirement for Pavement Classification Number (PCN) Publication

Photo Credit: Jeff R. Powell, C.M., Airport Manager at TCL
Project Development and Justification
Pavement Classification Number and Pavement Condition Index

Pavement Classification Number (PCN)
Load Bearing Capacity Determination – 2018 Pavement Study

PCN Determination
Traffic Mix for Pavement Analysis
Most demanding aircraft in the fleet mix are narrow body aircraft 200,000-lb. with Dual-wheel (D) main gear:
- B727-100 and -200 cargo operations (MBUSI)
- A319, A320, A321, B737 Athletics Charters

PCN Determination
Traffic Mix for Pavement Analysis
Heavier (but less intense) loading from B757 Athletics Charters:
- 255,000-lb. MTOW
- Dual Tandem (2D) main landing gear

PCN Determination
Geotechnical Investigation
- Pavement Cores
- Dynamic Cone Penetrometer (DCP) testing
- Heavy Weight Deflectometer (HWD) testing

PCN Determination
PCN Results
- Pavement Thicknesses
  (8" asphalt / 4" Stone Base)
- Subgrade Category
  (CBR = 5.5, Category “C” Low)
- PCN: 13/F/C/X/T

PCN Load Rating (x 1,000 lbs.)
- S (Single Wheel)
- D (Dual Wheel)
- 2D (Dual Tandem)

PCN: 13/F/C/X/T
- S: 36
- D: 53
- 2D: 101

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PCN versus Aircraft Classification Number (ACN) Comparison

<table>
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<tr>
<th>Facility</th>
<th>PCN</th>
<th>Aircraft Type</th>
<th>ACN</th>
<th>Maximum Take Off Weight (x 1,000 lbs.)</th>
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Facility PCN Load Rating (x 1,000 lbs.)

- S (Single Wheel)
- D (Dual Wheel)
- 2D (Dual Tandem)

Runway 4-22

- S (Single Wheel): 53
- D (Dual Wheel): 53
- 2D (Dual Tandem): 101

Pavement Condition Index (PCI)

Surface Condition Assessment – 2019 ALDOT Aeronautics Bureau State-wide APM Program

- PCI Determination
- Major Rehabilitation Indicated
- Design Authorized in Summer 2019
- Targeting AIP Discretionary Grant in Summer 2020

PCI Determination

- Surface Condition: "Poor"
- Last Resurfaced in 1995
- Extensive Cracking
- PCI = 53 (poor on the 7-color scale)

Key Design Elements

- Surface Gradient Correction
- Maximizing Airport Operations through Phasing
- Pavement Design
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Key Element 1: Surface Gradient Corrections
Vertical Curve Shift Needed, Cross Slopes Varied to Minimize Shoulder Disturbance

Crown Slopes Varied to Minimize Shoulder Disturbance
Largely avoided disturbing the runway edge lighting system (2 fixtures)
Minor Grading – minimized the need for operational impacts (runway closure) to re-dress potential shoulder erosion

Key Element 2: Phasing for Added Operational Access
Maintenance of Access to the Secondary Runway - Reopen Main Runway at Partial Length

Phase 1 – Maintain Access Route to Secondary Runway
Runway 22 Threshold area left out of initial reconstruction efforts to keep FBO access to Runway 12-30
Phase 2 – Reopen 5,300 feet - Runway 22 Displacement
Temporary displaced threshold markings and lights for 1,200-ft displacement of Runway 22.

Key Element 3: Economical Pavement Section
Construction Time and Cost Savings through Recycling of Existing Pavement Materials

Economical Pavement Section

Budget Cost Comparison:
- **Designed Section:**
  - 14” P-207 In-Place Reclaimed layer
  - VS.
  - Excavate 12” of material
  - Place 10” of 2 crushed stone base
  - Place 2 extra inches of asphalt base material

  - **Alternative Section:**
    - Excavate 12” (1” asphalt, 4” stone, 7” soil) (3394k)
    - Place 10” of P-209 Crushed Stone Base ($2,754k)
    - 2” additional inches of P-401 HMA Base (1,093k)

  - **Budget Cost Comparison:**
    - **Designed Section:** $1.2 Million
    - **Alternative Section:** $4.2 Million

65th Annual Alabama Transportation Conference
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Economical Pavement Section

Budget Cost Comparison:

$1.2 Million-as designed vs. $4.2 Million-alternate without stabilized recycled base

› $3.0 Million savings
› 39% of $7.6 Million final project construction cost.

Project Schedule

Runway 4-22 reconstructed with just 50 days of full closure and reopened at full length after 75 days.

Design and Bid Schedule

- Topographic survey
- Geotechnical investigation
- Conceptual Plans
- Final Design Plans / Detail Drawings
- Technical Spec
- Bid Documents
- Advertisements
- FAA AIP Discretionary Award Period

Preconstruction and Construction Schedule

- Scheduled Athletic Charter Flight Season
- Rainy, Wet, Cool Season
- Construction Season

Construction Schedule

› Phase 1 (50 Days):
  › 4/19/21 through 6/8/21
  › Reopened (5,300 ft)
  › 1,200 ft displacement of Runway 22 threshold

› Phase 2 (25 Days):
  › 6/9/21 through 7/22/21
  › Full 6,500 ft reopened
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Construction Schedule

- Phase 3 (Series of night closures)
- Pause 2 weeks for asphalt surface weathering
- Saw cut grooves (10)
- Final markings (5)
- Completed 8/1/21

Completed on schedule, and 4% under budget at $7.6M

Photo Credit: Stan Adams, TTL, Inc.

Photo Credit: Judd Jones, PE, S.T. Bunn Construction Co., Inc.

Thanks for your interest in the project!

February 10, 2022

Photo Credit: Jeff R. Powell, C.M., Airport Manager at TCL