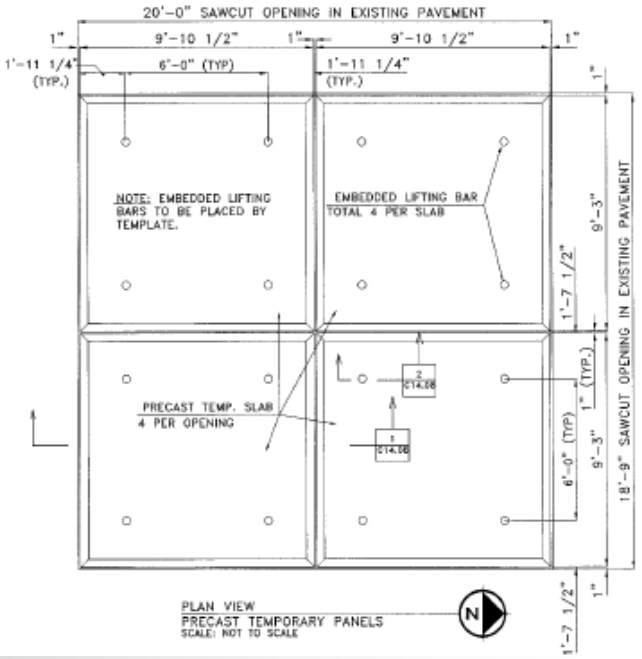


Accelerated Practices for Airfield Concrete Pavement Construction

Innovative Pavement Research Foundation (IPRF)
Project No. 01-G-002-02-3

ACI-NA
Kansas City, MO
September 30, 2007

David Peshkin, P.E.
Applied Pavement Technology, Inc.

Concrete Airfield Pavements

- Ability to carry heavy loads without deforming under temperature extremes
- Greater resistance to environmental effects
- Less need for maintenance
- Longer life without rehabilitation

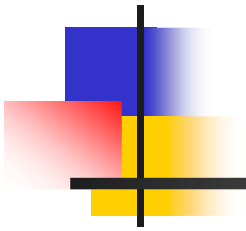
The Challenge

- Airports operate near or at capacity
- Maintenance and rehabilitation with portland cement concrete (PCC) increasingly problematic

The solution

- Accelerated rigid pavement techniques
- Not just materials

…but little formal guidance available on this in the past



Project Introduction

Project Goal

- Develop a *Guide* to accelerated rigid pavement techniques for airfields
- Target audience: airport owners and operators, planners, designers, and contractors
- Base *Guide* on experiences of target audience

Project Approach

- Airport project review
- Identify “case studies”
- Collect and summarize information
  - Phone/e-mail
  - Personal interview
  - Site visit
- Detailed case studies and summary of “lessons”

Case Studies: Identified Projects

- 68 potential projects identified
  - Literature search
  - Industry web sites and publications
  - Requests to FAA, AAAE, ACC, ACI-NA, and ACPA
  - Project team experience
- Reduced to 16 case studies

Final Case Studies

- Airborne Airpark (Ohio)
  - Runway 4L-22R partial reconstruction
- Charleston (South Carolina) International Airport
  - Intersection of Runways 15-33 and 3-21 reconstruction
- Cincinnati/Northern Kentucky International Airport
  - Taxiway M reconstruction
- Cleveland Hopkins International Airport
  - Runway 6L-24R construction

Final Case Studies (cont.)

- Colorado Springs Municipal Airport
  - Runway 17L-35R repairs
- Columbia Regional Airport
  - Runway 2-20 partial reconstruction
- Denver International Airport
  - Runway 16R-34L construction
- Detroit Metropolitan Wayne County International Airport
  - Fourth deicing apron construction

Final Case Studies (cont.)

- Hartsfield-Jackson Atlanta International Airport
  - Runway 9R-27L reconstruction
- Memphis International Airport
  - Runway 18R-36L reconstruction
- Mineta San Jose International Airport
  - Runway 12L-30R extension
- Phoenix Sky Harbor International Airport
  - Runway 8-26 reconstruction

Final Case Studies (cont.)

- Savannah Hilton Head International Airport
  - Intersection of Runways 9-27 and 18-36 reconstruction
- Seattle-Tacoma International Airport
  - Runway 16R-34L repairs
- Washington Dulles International Airport
  - Runway 12-30 repairs
- William P. Hobby Houston Airport
  - Intersection of Runways 12R-30L and 4-22 reconstruction

Lessons Learned About the Design Phase

- Alternate designs
- Performance/risk assessment
- Innovative materials
- Available closure times
- Opening requirements
- Plans and specifications

Alternate Designs

- Consider where accelerated construction not needed
- For different construction windows
- Re-use of existing layers may affect overall schedule

Alternate Design Examples

- Atlanta and Houston left in place existing stabilized base
- "Work-arounds" for FAA stablized base requirement—
  - Thickened slabs, monolithic slabs, slab-on-grade analysis
  - Airborne project also used aggregate base and thickened slab, but was not FAA funded
- Cleveland and Savannah eliminated dowel bars based on additional analyses

Performance/Risk Assessment

- Typical performance expected in design
- Meeting, exceeding, or falling short of typical performance periods
- Risk becomes more important the longer the performance period

Performance/Risk Assessment Examples

- San Jose selected 30- to 40-year designs to minimize interim maintenance/repairs
- Seattle and Dulles both considered slab replacements temporary
- Memphis intentionally selected conventional materials and methods
- Detroit's apron design had been used elsewhere on the Airport

Use of Innovative Materials/ Available Closures

- Type I cement and admixtures often are adequate
- Closure windows categorized as—
  - Overnight (< 12 hours; often 6 to 8)
  - Weekend
  - Longer-than-weekend

Overnight Closure Lessons

- Use rapid-setting PCC to minimize curing, maximize prep time
- Early sawcutting (previous closure) allows quick slab removal
- Reducing layers shortens construction time
- Use temporary pre-cast slabs
- Have on hand sufficient equipment and labor
- Evaluate opening requirements

Charleston's Use of Pre-Case Panels

Weekend Closure Lessons

- PCC mix not as critical
- Complete areas of multiple rather than individual slab replacement
- Allows time for additional items
- May use different mixes in different areas

Longer-Than-Weekend Closure Lessons

- Use more conventional designs, construction methods, and materials
- Keep tasks on track
- Incorporate high levels of communication
- Anticipate weather delays through the use of stabilized materials

Opening Requirements

- Strength at opening
- Temporary pavement surface

Opening Requirements: Strength

- Typical requirement
  - 550 psi flexural strength or 14 days
- Projects included 500 psi at 4 hours, 550 psi at 5 hours, 650 psi at 24 hours, 700 psi at 72 hours, and 750 psi compressive strength at opening
- Flexibility based on location/use, anticipated traffic

Opening Requirements: Temporary Surface

- Used by Charleston, Savannah, and Seattle
- Designs based on
  - Slab size
  - Available equipment
- Innovations in leveling

Mix Design

- Type I cement and admixtures often are adequate
  - > 600 lbs/yd^3, admixtures, supplementary cementitious materials
- Field changes often made
- Specify general requirements, but leave details to contractor

Development of Plans and Specifications

- Ensure sufficient design and review staff to complete work on accelerated schedule
- Perform preliminary design studies to reduce potential for delays
  - Anticipated haul road
  - "Soft dig" to locate utilities
  - Site investigation; e.g., FWD

Development of Plans and Specifications (continued)

- Require additional equipment
- Controls of material delivery
- Require a test section
- Evaluate strength measurement requirements

Standard is AC 150/5370-10B, Standards for Specifying Construction of Airports

IPRF Final Report

Project Number 02-02:

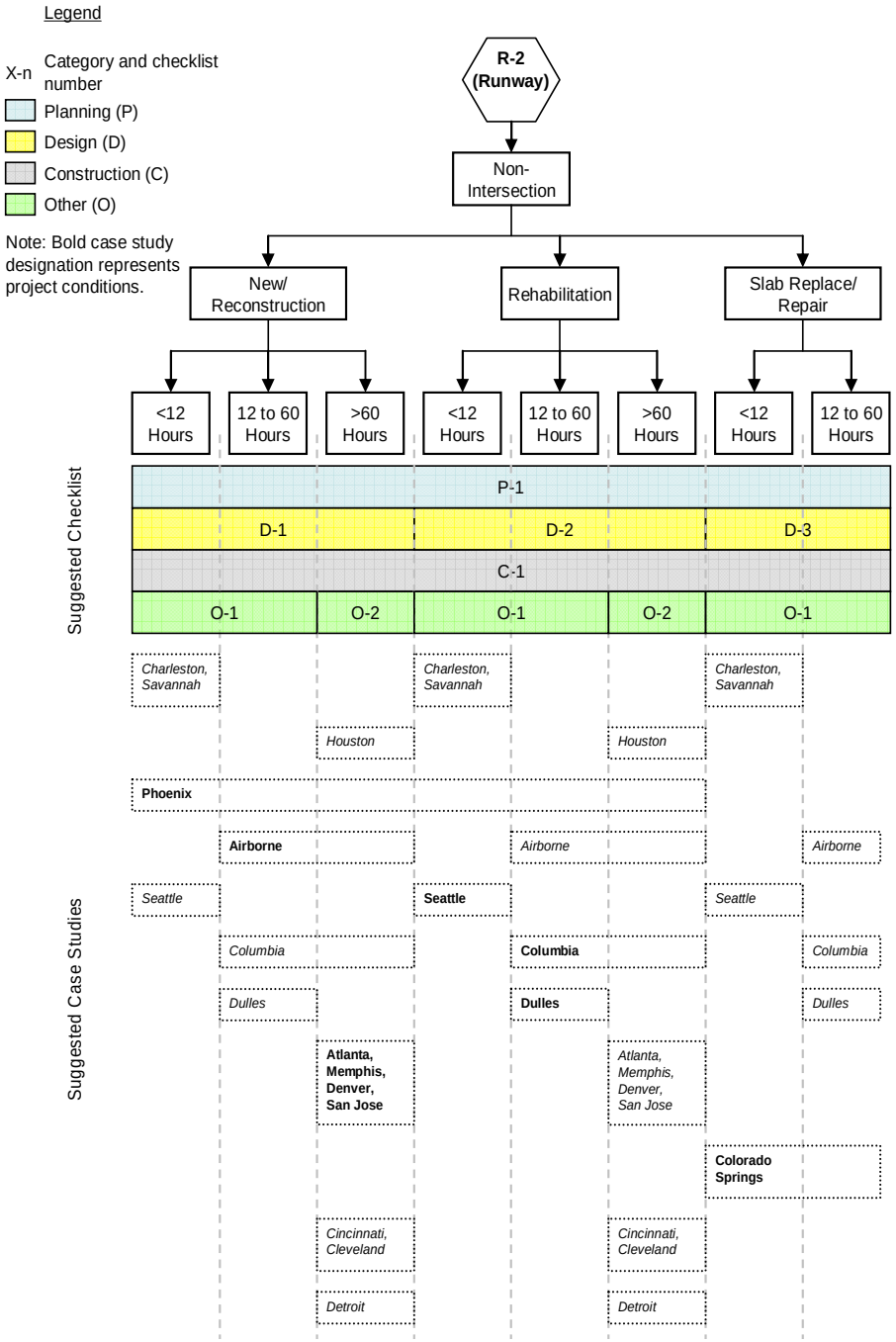
- Volume I: Planning Guide
  - Decision tools
    - Decision trees
    - Checklists
- Volume II: Case Studies

www.iprf.org/products/main.html

Report Guidance

- Project Phase
  - Planning, Design, Construction
  - Ancillary issues
- Type of facility
  - Runway, Taxiway, Apron
  - Intersections, Safety Areas
- Type of project
  - New construction, reconstruction, major rehabilitation, repair
- Available closure time
  - Overnight, weekend, longer

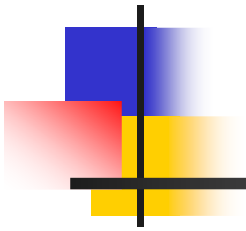
Decision Tool



"Checklist"

P-1 Runway	P-2 Taxiway	P-3 Apron
☐Coordinate with FAA early in the project, particularly with NAVAIDS, lighting, and required inspections. ☐Consider reduced runway lengths for phasing sections. ☐Minimize potential of future work closures; construct proposed future facilities so future construction will be outside of any runway safety area. ☐Schedule critical work areas first, such as NAVAID areas.	☐Coordinate with FAA early in the project, particularly with NAVAIDS, lighting, and required inspections.	

☐Include all stakeholders early in process and continue coordination throughout entire project.
☐Use partnering to instill team attitude with all levels (managers to field personnel) in the planning process.
☐Identify key personnel with availability and authority to make decisions.
☐Commit to an accelerated bid/award period.
☐Use currently available contracts to begin portions of work.
☐Include pre-qualification as part of the bid process.
☐Make provisions for discretionary funds for the unforeseen, such as discretionary funds or "miscellaneous modifications" line item (Note that the FAA does not provide funding for discretionary funds).
☐Provide an extended mobilization period prior to closure of facility to allow obtaining long-lead items.
☐Allow for progress payments during mobilization.
☐Assist with long-lead item stockpiling, such as light cans or reinforcing.
☐Incorporate multiple Notices-to-Proceed to control schedule.
☐Plan schedule for period of slowest operations.
☐Plan schedule for best construction season.
☐Maintain flexibility in decisions throughout the project.
☐Use adjacent facilities to minimize impact of closure, if available.



Questions?

Many Thanks to…

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  - Jim Bruinsma
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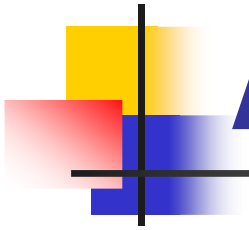
  - Norb Delatte
  - Additional assistance from CH2M-HILL



Also, thanks to…

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  - Gary Garlow
  - Butch Gowder
  - Mike Devoy
  - Jack Scott

And thank you!

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