Practical Approach to Rehabilitation of Aged Airport Concrete Pavements

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PRESENTATION OUTLINE

- Introduction
- Aged airside concrete pavements
- Distresses
- Maintenance, repairs, rehabilitation
- Case study
- Summary
INTRODUCTION

- Objectives
  - Sharing observations from airports in Canada
  - Sharing practical experience and solutions
Based on observations at airports in Canada

- Saskatoon
- Edmonton
- Toronto (Pearson)
- Thunder Bay
- London
- Sudbury
- Vancouver
INTRODUCTION

- Part 1 – Aged concrete pavements condition, distresses, applied maintenance/repairs and rehabilitation

- Part 2 – Case Study from Saskatoon International Airport
  - Engineering
  - Rehabilitation design
  - Construction
AGED CONCRETE PAVEMENTS

- Typical expectation – PCC pavements to last 30 years
- Numerous pavements significantly older
- Transport Canada
- Engineering, design, QA, acceptance
- Exhibit extensive distresses mainly in heavily loaded areas
- Pavements originally designed to carry much lower aircraft traffic than currently
AGED CONCRETE PAVEMENTS

Engineering required

- Pavement visual condition inspection (ASTM D5340)
- Borehole and coring investigation
  - Soils, moisture, layers type and condition
- Laboratory testing
- FWD Load Transfer Efficiency (LTE) testing
- Drainage inspection

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DISTRESSSES

Typical distresses

- Longitudinal and transverse cracks of various severity (low to high)
- Corner breaks, joint and crack spalling, D-cracking, scaling, faulting, pumping of fines
- Low to severe Alkali Silica Reactivity (ASR) damage
- Typically poor drainage
Low severity distresses, mainly cracking
- Do nothing or stop gap
- Monitoring condition
- Checking for FOD potential
- Medium severity
  - Crack filling
  - Crack routing and sealing
  - Crack epoxy repair
  - Crack repair with HMA
  - Joint spall repairs – partial depth
  - Corner breaks
  - Joint resealing
MAINTENANCE, REPAIR, REHABILITATION

- High severity
  - Structural failure
  - Very severe cracks
  - Shattered slabs
  - Severe faulting
  - Severe corner breaks
  - Severe D-cracking and scaling
Identify the cause of distresses
Determine LTE
Pavement rehabilitation
  - Soil and moisture condition
  - Granular layers, CTB or fillcrete
  - Stitching
  - Dowel bars retrofitting
  - Slab replacement (the same thickness)
  - Structural HMA overlay
  - Bonded concrete overlay (?)
  - Reconstruction
MAINTENANCE, REPAIR, REHABILITATION

- Joints
  - Keyway
  - Sawcut
  - Dowel and tie bars

- Specifications
  - As covered in morning’s presentation
  - Based on practice and experience in Canada
  - Some aspects from FAA specifications
Taxiway and apron yellow line versus joint locations
MAINTENANCE, REPAIR, REHABILITATION

- ASR damage
  - Low severity
  - High severity
  - Current concrete mix design
  - Action required in old pavements
Drainage
- Surface
- Subsurface – subdrain systems
CASE STUDY

Saskatoon International Airport

- Aprons 2, 3 and 5
- Concrete pavement repairs and rehabilitation
- Years 2015 to 2017
CASE STUDY

Engineering

- Pavement visual condition inspection
- Borehole and coring investigation
- Laboratory testing
- Pavement rehabilitation design
CASE STUDY

Operational Considerations

- Closures are disruptive
- Need to accommodate scheduled and irregular operations
CASE STUDY

Cross Stitching

- Helps to immobilize low and medium severity cracks
- Low cost and low operational impact
- Part of a larger long term solution
Concrete Removal

- Requires brute force
- Avoid damaging more areas with sawcutting
Concrete Removal

- Requires brute force
- Avoid damaging more areas with sawcutting
Poor Granular Base
- Hydrocarbon contamination
- Soft subgrade and granular
Poor Granular Base

- Fillcrete replacement
- Grade control is critical
CASE STUDY

Poor Granular Base

- Fillcrete replacement
- Grade control is critical
CASE STUDY

Dowel Installation

- Important that dowels are level and square
CASE STUDY

Formwork

- Alignment and Grade control is critical
Concrete Placement

- Pump trucks can accelerate work
- Important to manage concrete supply rates
- Finishing is time sensitive
CASE STUDY

Finishing and Curing

■ Curing needs to match the conditions
■ Finishing is very time sensitive
CASE STUDY

Green Cutting

- Time is of the essence
- Great variability due to weather and mix design
Joint Sealing

- Alignment is crucial
- Consider fuel resistance and curing times
Finished Product

- 128 panels replaced on Aprons II, III & V since 2015
Numerous airports have 40 to 60 years old concrete pavements

They typically exhibit extensive distresses

Full reconstruction rarely an option due to the extent of work, cost and impact on airport operation

Extensive experience with repairing of low, medium and high severity distresses and pavement rehabilitation

Include proper engineering
In PCC pavements rehabilitation

- Realize they were originally designed for lower traffic than they are carrying now
- Yellow line versus joints location
- Check for ASR damage and protect
- Take care during pavement construction
- Many factors and details can affect the service life of replacement pavements
THANK YOU!

QUESTIONS?

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