ADVANCED PAVEMENT TECHNOLOGY USED FOR REHABILITATION OF RUNWAYS AT EDMONTON INTERNATIONAL AIRPORT

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PRESENTATION OUTLINE

- Introduction
- Pavement Investigation and Design
- Specification Development
- Construction
- Conclusions
INTRODUCTION

- Located in Leduc, Alberta
- Serves about 7 million passengers each year
- Flights – domestic and international
- Airside pavements include:
  - Runways 02-20 and 12-30
  - Network of taxiways
  - Multiple aprons
- Project included multi-year rehabilitation of both runways
PAVEMENT INVESTIGATION

- Review information from previous investigations
- Limited new geotechnical investigation by others
- Pavement visual condition inspection
- Limited Falling Weight Deflectometer (FWD) testing
- Limited Ground Penetrating Radar (GPR) survey
RUNWAYS 02-20 AND 12-30

- Original old concrete pavement overlaid with asphalt

- Typical pavement structure
  - 70 to 120 mm of HMA
  - 280 to 310 mm of PCC
  - > 600 to 1000 mm of granular base/subbase
  - Clay and silty clay subgrade
VISUAL INSPECTION FINDINGS

- Pavement distresses
  - Medium to high severity reflective cracking of PCC joints and cracks
  - Severe map cracking
  - Spalling
  - Localized severe ravelling
VISUAL INSPECTION FINDINGS

- Pavement distresses
  - Pumping
  - Permanent deformation
Pavement distresses

- Asphalt shoving
VISUAL INSPECTION FINDINGS

- Causes of distresses
  - Poor asphalt durability
  - Asphalt stripping
  - Poor condition of underlying concrete – joints and cracks
  - Drainage issues
  - Unsuitable asphalt mixes
REHABILITATION DESIGN

- Safety of the travelling public and minimizing potential for Foreign Object Debris (FOD)
- Minimize the need for emergency closures
- Staging of rehabilitation to minimize delays and impacts on airport operation;
- Time constraints
- Budget constrains

- FAA methodology
Rehabilitation sequence

- End 02 of Runway 02-20;
- End 12 of Runway 12-30;
- End 20 of Runway 02-20;
- End 30 of Runway 12-30;
- Centre portion of Runway 12-30
- Centre portion of Runway 02-20.
First year of the multi year program

- Rehabilitation of 900 m of Runway 02-20 starting from the Runway 02 threshold;
- Limited treatment on the Touchdown Area 12 on Runway 12-30;
- Limited treatment on the Touchdown Area 30 on Runway 12-30
- Emergency repairs of localized areas on both runways posing imminent potential of FOD
REHABILITATION DESIGN

- Runway 02-20
  - HMA removal from 900 m
  - Removal and replacement of 12 m of PCC along CL
  - Repair PCC in Rows 2 and 3
  - Place new HMA

- Runway 12-30
  - Partial or full depth removal of HMA
**SPECIFICATION DEVELOPMENT**

- Custom specifications to meet budget, material, environmental and loading requirements at the airport

- Specifications to address the causes of the distresses

- Specifications for
  - Concrete slab replacement
  - Concrete slab repairs
  - Granular base materials and placement
  - Asphalt tack coat
  - Asphalt mixes and paving

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ASPHALT SPECIFICATION

- Customized Marshall mixes
- Focus on
  - Moisture susceptibility – TSR min 80
  - Crushed aggregates
  - PSV min 65
  - Tighter LA abrasion
  - Tighter gradation envelope
  - Polymer modified asphalt cements
  - Higher minimum asphalt cement content
  - Increased Marshall stability
PAVING REQUIREMENTS

- Tighter production tolerances
- Echelon paving to minimize number of cold longitudinal joints
- Joint heaters to improve quality of cold longitudinal joints
- Shuttle Buggy® to minimize thermal and gradation segregation, eliminate bumps during mix downloading
PAVING REQUIREMENTS

- Tighter compaction
- Joint construction and compaction
- Smoothness requirements
- Trial batches
- Test strip
Mixes developed using the 75 blow Marshall method

Mix design submitted for review and acceptance

Surface course mix

- 100% crushed aggregate
- 4.8% polymer modified asphalt cement (PG 64-37) in base course and 5.3% in surface course
- 4.0% air voids
- TSR 85% for base mix and 90.5% in surface mix
HAMA milling and slab repair and replacement
Exposed PCC slabs evaluation

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CONSTRUCTION

- Concrete paving
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- Concrete paving
Selected slabs replacement and repair using cross stitching
TRIAL BATCH AND TEST STRIP

- Trial batch and test strip required
- Trial batch samples were tested and accepted
- Test strip for the surface and binder course placed on the runway in non major areas
- Asphalt samples obtained from the test strip placement
- Compaction pattern established during test strip
Asphalt cores obtained from test strip to calibrate nuclear gauge

Test strip pavement surface inspected for
- Segregation
- Texture to ensure adequate friction
- Flushing and bleeding
HMA placement and compaction
HMA placement and compaction
CONSTRUCTION

HMA joint construction

COLD JOINT CHALLENGES

Innovative Approach to Construction of Durable Longitudinal Joints

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CONCLUSIONS

- Critical aspects
  - Team work
  - Communication
  - Knowledge
  - Experience

- Proper pavement design

- Field and laboratory investigation
  - Identify causes of distresses and address them

- Specifications
  - Customize to reflect local conditions
CONCLUSIONS

- Mix designs
- Good construction practice
  - Trial batches
  - Test strips
  - Placement
  - Compaction
  - Joints
- No magic bullets available
- Good, advanced paving technology is available – use it!
THANK YOU!

QUESTIONS?

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