Rubblization / Reconstruction I-39

Steve Robinson
D-5 Acting Materials Engineer
Mixtures Control Engineer

I-39 N.W. of Bloomington-Normal in McLean County

Built in 1989
15 ft Hinge Jtd.
10 ¾" PCC
Tied PCC Shldr.
4" CAM II
16" Lime Mod.Soil
19,000 ADT, 28 % Trks
33 Mill. ESAL

Existing Conditions

I-39 Condition Rating Survey

2012 CRS
- NB 3.8 / SB 3.0
- Poor Condition

Pavement Distress

Durability Cracking
- High Level Infrequent

Transverse Cracking
- Medium to High level

Existing Conditions

I-39 Condition Rating Survey

Joint Deterioration
- Frequent / Spalling
- > 6 inches

Centerline Deterioration
- High Level / Spalling
- > 6 inches

Project Scope

I-39 Pavement Issues

- Extensive patching in both NB & SB
- Patch survey identified 12% patching required
- IRI
  - NBL 127
  - SBL 193

I-39 Patching

Class B Patching
Six Patching Contracts since 2009 totaling $2,090,000

Operations and Day Labor Patching also

Structure and Field Testing Investigation

Pavement & Subgrade investigation Nov. 2011

Pavement cores: 13 ¼" max (plan 10 3/4")

CAM II cores: 6" max (plan 4")

- No thin sections

Core Analysis

Alkali Silica Reactivity (ASR) possible culprit

- Reaction of Alkali in cement with reactive silicas in Fine Agg.
- Reaction forms a hygroscopic gel
- Gel absorbs water, expands into void structure and cracks paste/aggregates
- Process continues until one of the three elements is used up or eliminated

Core Analysis

- BMPR assistance
  - Cores submitted to consultant lab for petrographic analysis
- Analysis determined "**distress is primarily, if not wholly due to the effects of expansion associated with ASR"**
- Existing Materials
  - **High Alkali cement, no fly ash**
  - **Expansive sand source**
  - **Freeze/Thaw durable coarse aggregate**

Samples of Alternatives Analyzed

- Patch and Policy O/L
- Patch and Structural O/L
- Rubblization and 11 ¼" HMA
- Rubblization and 8" HMA

Case Study - SHRP Section

I-57 north of Pesotum in Champaign Co.

- 6 and 8 inch HMA on rubblized PCC
- Constructed in 1990
- Resurfaced in 2010
- 20 year service life

Rehab Strategy – Experimental Work Plan

Rubblize PCC and Experimental Thin Overlay

- 8” HMA in lieu of 11 ¼”

Objectives of the experiment

- Evaluate performance of a thin O/L on a low-volume interstate
- Establish recommendations for the rehab of ASR-distressed, hinge jointed pavements

Experimental Work Plan

- Evaluations – 5 Years
  - Annual visual distress surveys
  - Rutting measurements
  - Falling Weight Deflectometer testing

Control Section

- I-57 SB North of Champaign (~5 mi. long)
  - Similar Average Daily Traffic and Truck Volumes
  - HMA Overlay on Rubblized PCC Pavement, 11 ¼”
  - Pipe Underdrain Removal and Replacement
    - Completed Fall 2012

2013 Construction

- June 2013 Letting
- 2.8 Mi. S.B. direction only due to funding
- ~2.4 Mi. HMA, (PFP on 3 separate mixtures)
- ~0.4 Mi. PCC Removal & Replacement

Multi Head Breaker

Multi Head Breaker

Ultimate Remote Control

Rubblized Pavement

Live Bottom Trailers

Lightweight MTD

Fine Graded IL 19.0, N90

F.G. IL 19.0 Texture

PFP Sampling Plates

PFP Results

- 3 ¾” Neat 19.0 FG, N90 Final Pay = **103.0%**
- 2 ¼” Polymer 19.0 FG, N90 Final Pay = **101.9%**
- 2” Polymer Surface Mix D, N90 Final Pay = **103.0%**

Fine Graded IL 19.0 Benefits

- Reduced Segregation
- Consistent Mat Texture
- Improved Density
- Reduced Permeability
- Stable - Excellent Hamburg Wheel Performance
- Durable - Long Term Performing Mixture

Questions?