PAVEMENT DESIGN AND SELECTION UPDATES
 Often blurred as one
 Each stands alone
 Could update each alone or together
   • Updates = pain
   • Tend to want to do any updates together
   • Need to update either one as warranted
Material selection
Guidance to the Designer
Design details
Minimums
How thick
Selection

- Economics of the alternatives - which is lower cost to owner?

- Present worth (PW) is a function of:
  - Construction cost
  - Out year cost (repairs and rehabs)
    - Period of time
    - Discount rate
    - Needs to be representative of what actually doing

- $PW = Con $ + PW Rehab 1 $ + PW Rehab 2 $...$

- Select lowest cost $PW$   HMA Vs. PCC
PAVEMENT DESIGN HISTORY
1950’s – empirical design
- AASHO Road Test
### AASHO Road Test

<table>
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<tr>
<th>Loop</th>
<th>Lane</th>
<th>Front Axle</th>
<th>Load Axle</th>
<th>Gross Weight</th>
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</table>

Mixed Axles Converted to:

- 18,000 lb Equivalent Single Axle Load
- 1 axle at 18,000 lbs = 1 ESAL
Rigid Nomograph

TRAFFIC

SOIL

THICKNESS
Flexible Nomograph

TRAFFIC

SOIL

S.N.

4.75
Structural Number Concept

4” = 1.76
9” = 1.26
16” = 1.76
Total = 4.78
IDOT Design History

- 1950’s – empirical design
  - AASHO Road Test

- 1980’s - 90’s – mechanistic-empirical design
  - UIUC research
How thick for HMA

• Early 1980’s
  – UIUC research looked at update of AASHTO design
  – Many problems
  – Embarked on development of Mechanistic Design
Fatigue Theory

High Strain = Short Life
Low Strain = Long Life
Fatigue Cracking

Repeated Bending

Leads to Fatigue Cracking
Fatigue Cracking

Repeated Bending Leads to Fatigue Cracking
PCC Design

• Late start

• Developed a Jointed Plain PCC design
  – Mechanistic based
Alternate Pavements

13” HMA

12” Mod Soil
12” Agg

4” HMA Subbase

8” PCC

12” Mod Soil
12” Agg
Selection

- 1980’s – LCCA
  - Maintenance models developed by expert panel
  - Multiple HMA models to handle rutting
  - One PCC model for all traffic
- Implementation……
Mechanistic Wars!

- Design (HMA and PCC) attacked
- Claims of being flawed
- Selection process attacked
- Investigations
  - News
  - Private Investigators
  - FBI
  - FHWA
  - Legislative hearings
20 Years Later….

- Overdue for update of selection process
To Revise or Not to Revise
That is the Question

- IDOT and Industry met in 2003 and 2005 to discuss revisions to the pavement performance models
We took a right turn.....

- 2003 and 2005/2006 attempts ended in failure
  - Many reasons
  - Limited resources prevented detailed data collection after 2000
  - Reviewed rut depths, video images to determine maintenance and rehabilitation activities
  - Changes in upper management at IDOT
2009 – Third Time is a Charm

- Series of IDOT/Industry meetings set for Fall 2009
  - 2009 legislation passes LCCA for state projects where the pav’t cost exceeds $500,000
  - August 2009 – IDOT presented proposed design and selection changes
    - JPCP design
    - Full-Depth HMA design
    - Maintenance models
2009, cont’d.

• September 2009
  – Industry presented their concerns

• October 2009
  – IDOT responded to industry’s concerns
  – IDOT suggested modifications based on industry’s comments

• December 2009
  – Industry has unresolved concerns
Proposed Changes to BDE Manual

• Change minimum TF (lower)
  – Actual traffic used more often
• Add PCC inlays/overlays
• Increase LCCA analysis period from 40 to 45 years
• Add alternate bids when LCCA cost comparison ≤ 10 percent
• Bring in unbonded concrete overlays and rubblizing as mainstream treatments
Proposed PCC Changes

• Eliminated diamond grind – last grinding job done some 10 years ago +/-
• Overlaid with HMA at year 30
• Decrease patching in early years
• Update JPCP thickness design charts
• Revise requirement for stabilized subbase under PCC - raising TF from 0.7 to 1.0 (later modification)
• Allow use of CRC when TF $\geq 60$ from 35
  – Increases JPCP and HMA selection process
• Work underway on maximum JPCP design
• Work underway on new M-E CRCP design
Proposed HMA Changes

• New fatigue curve
• Update Full-Depth HMA thickness design charts
• IDOT binder PG grades from AC 10/20
• Introduce limiting strain design for Full-Depth HMA design for maximum thickness design
• Single Maintenance Model - HMA life 15 years
• Use Class III TF equations for Class IV routes
Max Pavement Thickness
Reviewed for Fatal Flaws

• HMA – Carl Monismith/Rita Leahy

• PCC - Lev Khazanovich

• LCCA – Carl Monismith/Rita Leahy

• No fatal flaws – suggestions for next round
Current Status

• Looking at low volume PCC
  – Original PCC design started at 7.5 inches +/-

• Reviewing industry concerns
  – HMA
  – PCC