Extended Life HMA Design in Illinois

North Central Hot Mix Asphalt

Illinois Bituminous Paving Conference

January 9, 2008

What is an extended life design?

- Built to last longer than the standard 20-year design
- Will not require major rehabilitation or patching
- Surface is sacrificial
- How do you design?

IDOT-INDUSTRY MEETINGS

- 4 Meetings in 2000
- Partnership approach
  - **Illinois Contractors**
  - **Asphalt Suppliers**
  - **Aggregate Suppliers**
  - **Academia**
  - **Industry Associations**
  - **National Experts**

IDOT-INDUSTRY MEETINGS

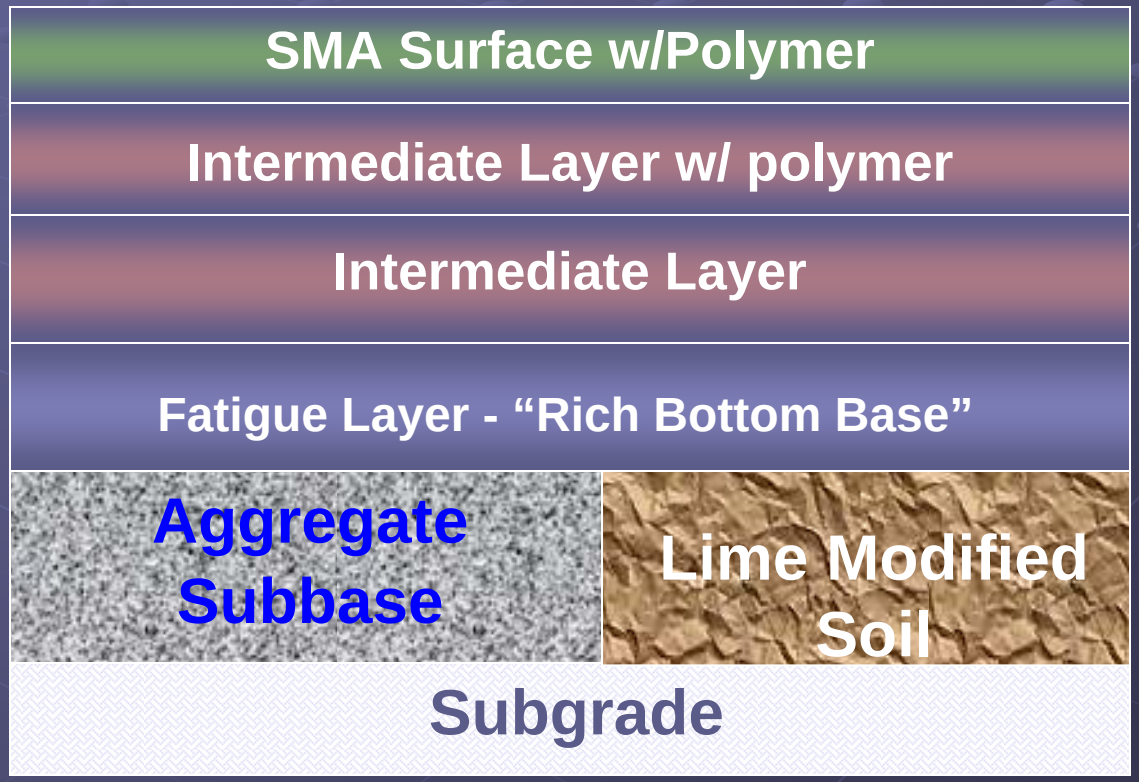
- **Identify and Address:**
  - **Thickness Design**
  - **Cross Section**
  - **Material Durability**
  - **Pavement Construction**
- **Goal - Develop Specifications By End of 2000**

Key Issues

- Thickness Design
  - Use existing design

Key Issues

- IDOT-Industry Cross Section



Key Issues

- Material Durability
  - Polymers in top 4-6 inches (zone of influence)
  - Require use of hydrated lime
- Pavement Construction
  - MTD
  - Positive dust control
  - Polymer tack between lifts
  - Improved density specs
  - Improved joint construction

Extended Life Projects in Illinois

- 8 constructed to date
- A la carte special provision
- Performance good to date

Standard HMA Design

- In current design procedures, as traffic ↑, pavement thickness ↑
- How thick is too thick?
- Enter the Fatigue Endurance Limit

Fatigue Endurance Limit

HMA Fatigue Endurance Limit –

A level of strain below which there is no cumulative damage over an indefinite number of load cycles.

Proposed definition – NCHRP 9-44

IHR-39-1, Validation Of Extended Life HMA Pavement Design Concepts

- Lab work
  - Characterize dynamic modulus and fatigue for current IDOT mixes
  - Determine existence/magnitude of Fatigue Endurance Limit
- Field work
  - Construct test sections
  - Test for responses and fatigue behavior

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- IDOT mixes
  - Pre-Superpave and Superpave mixes
  - Surface and binder mixes
  - 4% and 7% voids
- Beam fatigue testing at various strain levels

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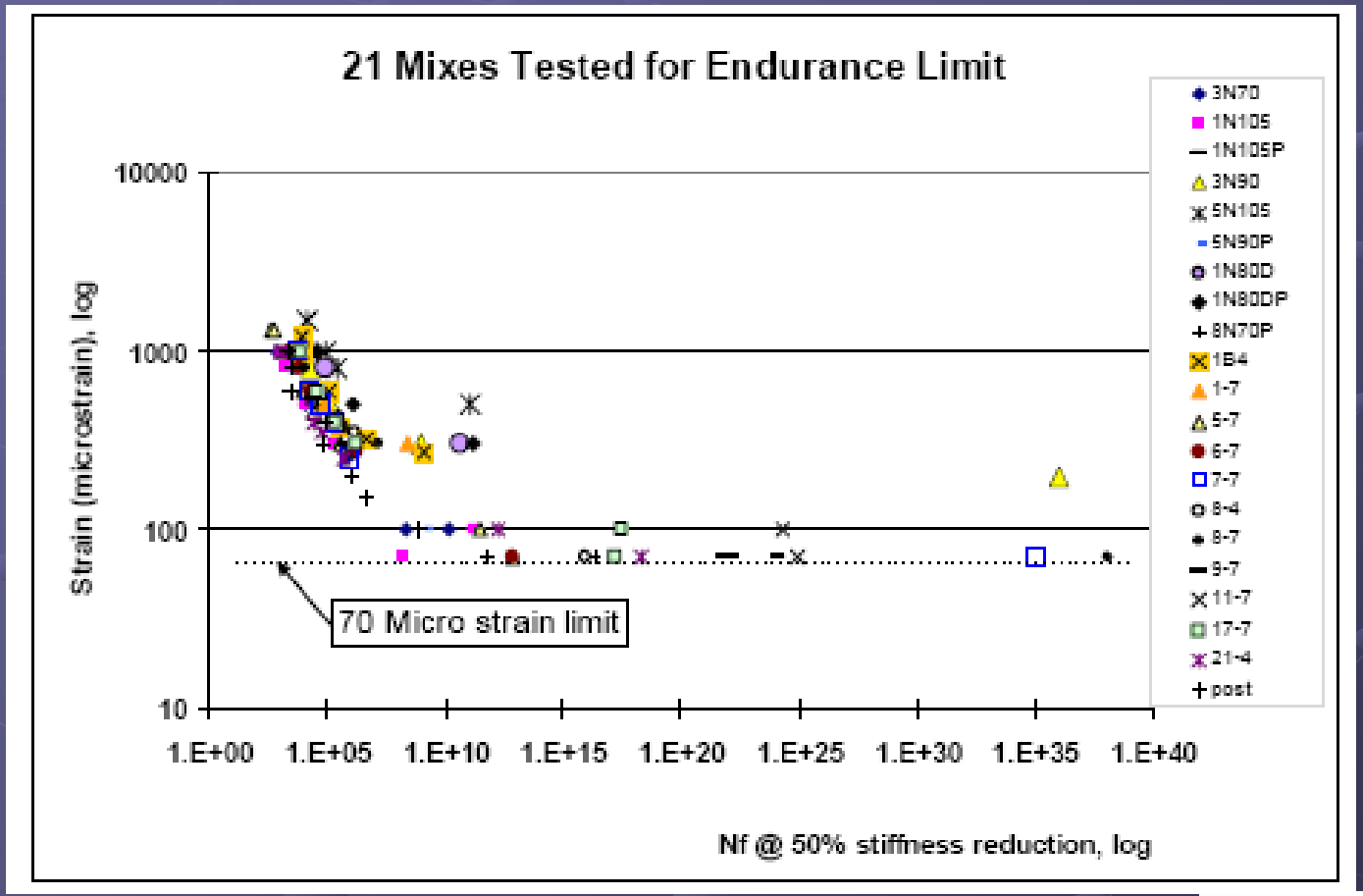
IHR-39-1, Validation Of Extended Life HMA Pavement Design Concepts



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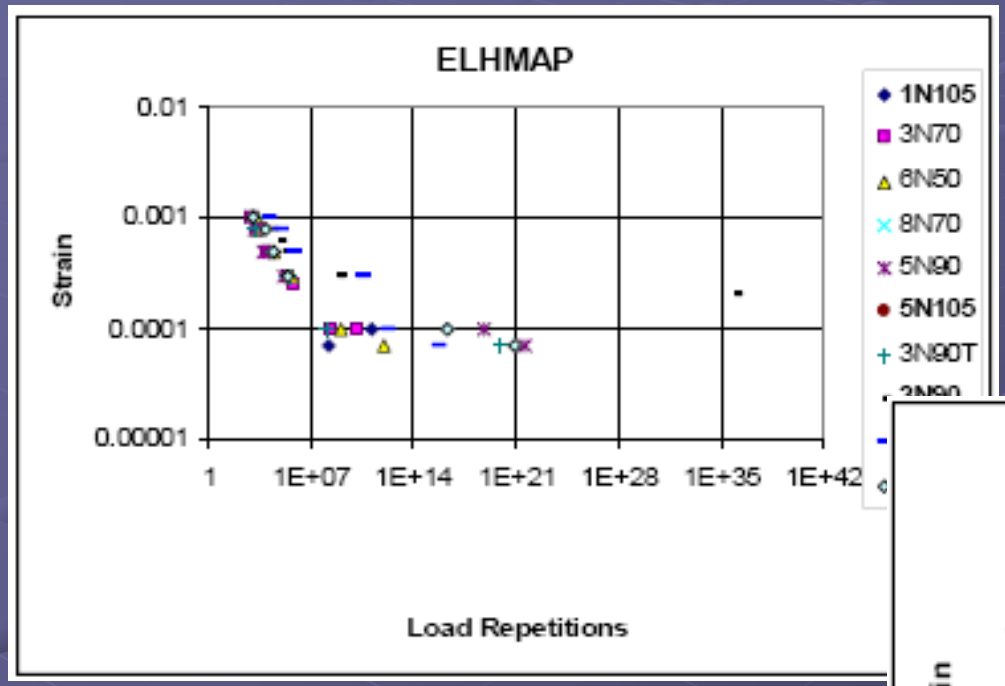

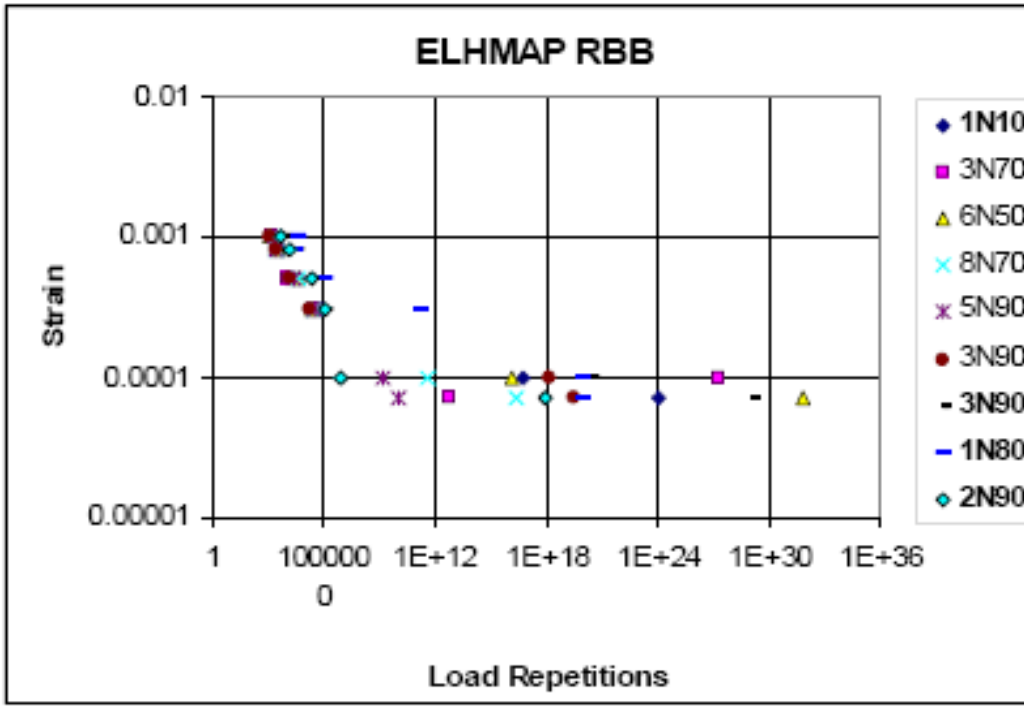

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Extended Life HMA Design

- Design for hottest month of the year – July
- 19-mm binder mix w/PG 64-22 = base mix
- Use 70 microstrain input in full-depth HMA algorithm to determine max. thickness
  - $\text{Log } \varepsilon_{AC} = 5.746 - 1.589 \log T_{AC} - 0.774 \log E_{AC} - 0.097 \log E_{Ri}$
  - Consider impact of alternate binders and mixes

What's Next?

- Develop design procedure for extended life HMA
- Develop policy on use of extended life HMA
- Develop standard extended life HMA cross-section
- Meet with industry

Extended Life HMA Design in Illinois

Putting the strain back in pavement design